DAWEI
RESIDENCE
COMPANY LIMITED

FINAL REPORT

Environmental Impact Assessment

For

The Initial Township

In Dawei District, The Republic of the Union of Myanmar

UNITED ANALYST AND ENGINEERING
CONSULTANT COMPANY LIMITED

United Analyst and Engineering Consultant Co., Ltd.

April 2018

ပြည်ထောင်စုသမ္မတမြန်မာနိုင်ငံတော်အစိုးရ
သယံဇာတနှင့်သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဝန်ကြီးဌာန
ပြည်ထောင်စုဝန်ကြီးရုံး

စာအမှတ် (သစ်တော) ၃(၂)/၁၆(ဃ)(၃၄၄၄/၂၀၁၇)
ရက်စွဲ ၂၀၁၇ ခုနှစ်၊ အောက်တိုဘာလ ၂၃ ရက်

သို့

ထားဝယ်အထူးစီးပွားရေးဇုန်စီမံခန့်ခွဲမှုကော်မတီ

အကြောင်းအရာ။ **Dawei Residence Co.,Ltd. မှ ထားဝယ်အထူးစီးပွားရေးဇုန်တွင် အကောင်အထည်ဖော်ဆောင်ရွက်မည့် Initial Township စီမံကိန်းနှင့် ပတ်သက်၍ ပြန်လည်တင်ပြလာသည့် ESIA အစီရင်ခံစာအပေါ် အတည်ပြုနိုင်ပါကြောင်း တင်ပြခြင်းကိစ္စ**

ရည်ညွှန်းချက် ။ ထားဝယ်အထူးစီးပွားရေးဇုန်စီမံခန့်ခွဲမှုကော်မတီ၏ ၁-၆-၂၀၁၇ ရက်စွဲပါ စာအမှတ်၊ထဝ-၁၆/DSEZ/၂၀၁၇(၁၈၆)

ထားဝယ်အထူးစီးပွားရေးဇုန်အတွင်း Dawei Residence Co.,Ltd. မှ အကောင်အထည်ဖော်ဆောင်ရွက်မည့် ကနဦးမြို့ပြစီမံကိန်းလုပ်ငန်း၏ ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း (Environmental Impact Assessment-EIA)အစီရင်ခံစာတင်ပြလာသည့် ကိစ္စနှင့်ပတ်သက်၍ အဆိုပါအစီရင်ခံစာသည် ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ထုံးလုပ်နည်း အပိုဒ်(၆၃)ပါအချက်များနှင့် ကိုက်ညီမှုရှိကြောင်း စိစစ်တွေ့ရှိရသဖြင့် တင်ပြလာသည့် အစီရင်ခံစာကို အတည်ပြုပါကြောင်းနှင့် လုပ်ငန်းများဆောင်ရွက်ရာတွင် အောက်ဖော်ပြပါအချက်များကို အလေးထားလိုက်နာ အကောင်အထည်ဖော်ဆောင်ရွက်ရန် လိုအပ်ပါကြောင်း အကြောင်းပြန်ကြားအပ်ပါသည်-

(က) စီမံကိန်းအဆိုပြုသူသည် ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်၊ စီမံကိန်း ကတိကဝတ်အားလုံးနှင့် စည်းကမ်းချက်များကို အပြည့်အဝအကောင်အထည်ဖော်ရမည့်အပြင် ယင်း၏ကိုယ်စား စီမံကိန်းကို ဆောင်ရွက်ပေးသူကန်ထရိုက်တာနှင့် လက်ခွဲဆောင်ရွက်ပေးသူဆပ်ကန်ထရိုက်တာများအားလုံးက စီမံကိန်းအတွက် လုပ်ငန်းများဆောင်ရွက်ရာတွင် သက်ဆိုင်ရာဥပဒေ၊ နည်းဥပဒေများ၊ ဤလုပ်ထုံးလုပ်နည်း၊ ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်နှင့် စည်းကမ်းချက်များအားလုံးကို အပြည့်အဝလိုက်နာဆောင်ရွက်စေရန်၊

(ခ) စီမံကိန်းအဆိုပြုသည် ပတ်ဝန်းကျင်၊ လူမှုရေးနှင့် ကျန်းမာရေးဆိုင်ရာ ထိခိုက်နိုင်မှုများကို လျော့ချမည့်နည်းလမ်းများ၊ ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှု အစီအစဉ်များ၊ ၎င်းနှင့်ဆက်စပ်သည့် အစီအစဉ်ခွဲများ၊ စောင့်ကြပ်ကြည့်ရှုမည့် နည်းလမ်းများ

30.10.2017

အပါအဝင် ဆောင်ရွက်ရမည့် ကိစ္စရပ်များအားလုံးကို အတည်ပြုထားသည့် ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း အစီရင်ခံစာတွင် ဖော်ပြထားသည့်အတိုင်း လိုက်နာ အကောင်အထည်ဖော်ဆောင်ရွက်ရန်၊

(ဂ) စီမံကိန်းအဆိုပြုသူသည် ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်နှင့် အစီအစဉ်ခွဲများ၊ စောင့်ကြပ်ကြည့်ရှုမည့်အစီအစဉ်များအတွက် လုံလောက်သည့် ရန်ပုံငွေထားရှိ သုံးစွဲရန်နှင့် ၎င်းအစီအစဉ်များကို အကောင်အထည်ဖော်ဆောင်ရွက်မည့် အဖွဲ့အစည်းများ ဖွဲ့စည်းဆောင်ရွက်ရန်၊

(ဃ) စီမံကိန်းအဆိုပြုသူသည် အတည်ပြုထားသည့် ပတ်ဝန်းကျင်ထိခိုက်မှု ဆန်းစစ်ခြင်း အစီရင်ခံစာကို အများပြည်သူသိရှိနိုင်စေရေး ထုတ်ဖော်ကြေငြာရန်နှင့် အစီရင်ခံစာအား အများပြည်သူသိရှိနိုင်ရန်နှင့် သဘောထားမှတ်ချက်များ ရယူရန်အတွက် သက်ဆိုင်ရာ ကုမ္ပဏီ၏ Website တွင် လွှင့်တင်ရန်၊

(င) ဒေသခံပြည်သူများ (stakeholders) နှင့်စဉ်ဆက်မပြတ်တွေ့ဆုံဆွေးနွေးပြီး ၎င်းတို့၏ အကြံပြုချက်နှင့် လိုလားချက်များအား အလေးထားပေါင်းစပ် ဆောင်ရွက်ရန်၊

(စ) စီမံကိန်းအဆိုပြုသူသည် အောက်ဖော်ပြပါ စံချိန်စံညွှန်းပါ ပြဋ္ဌာန်းချက်များ အတိုင်း လိုက်နာဆောင်ရွက်ရန်-

(ကက) အဆိုပြုစီမံကိန်း လုပ်ငန်းများလည်ပတ်ရာတွင် အမျိုးသားပတ်ဝန်းကျင်ဆိုင်ရာ အရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန်ချက်များရှိ စွန့်ထုတ်အရည် အဆင့်သတ်မှတ်ချက်များနှင့် ထုတ်လွှတ်အခိုးအငွေ့ အဆင့်သတ်မှတ်ချက်များအတိုင်း လိုက်နာဆောင်ရွက်ရန်၊

(ခခ) စီမံကိန်းလည်ပတ်ရာတွင် အလုပ်သမားဝန်ထမ်းများအတွက် IFC EHS General Guideline အတိုင်းလိုက်နာဆောင်ရွက်ရန်၊

(ဂဂ) စီမံကိန်းအား International Standard ဖြစ်သည့် ISO 14001 Environmental Management System (EMS) နှင့်အညီ စီမံခန့်ခွဲသွားမည်ဟု အစီရင်ခံစာတွင် ကတိကဝတ်ပြုဖော်ပြထားသည့်အတိုင်း လိုက်နာဆောင်ရွက်ရန်၊

(ဆ) အစီရင်ခံစာတွင် သဘာဝဘေးအန္တရာယ်များကျရောက်ပါက အရေးပေါ်တုံ့ပြန်မည့် အစီအစဉ်များနှင့်ပတ်သက်၍ Emergency Response Plan ကို ရေးဆွဲဖော်ပြထားသော်လည်း ဖြစ်ပေါ်ပြောင်းလဲနေသည့် သဘာဝအခြေအနေ အပေါ်မူတည်ကာ လိုအပ်သလိုပြန်လည်ပြင်ဆင်ရေးဆွဲ၍ ထားဝယ်အထူးစီးပွားရေးဇုန်စီမံခန့်ခွဲမှုကော်မတီနှင့် ဤဝန်ကြီးဌာနသို့ တင်ပြသွားရန်၊

(ဇ) Community Support Programme နှင့်ပတ်သက်၍ စီမံကိန်းအကောင်အထည်ဖော်ဆောင်ရွက်မည့်သူသည် ပြည်သူ့ကျန်းမာရေး စောင့်ရှောက်မှု၊ ဒေသခံ

များအတွက် လမ်း၊ လျှပ်စစ်မီး၊ ရေရရှိမှုစသည့် အခြေခံအဆောက်အဦ လိုအပ်ချက်များနှင့် ဘေးအန္တရာယ် ကင်းရှင်းရေးဆောင်ရွက်ချက် စသည့် Community Support Programme များ အကောင်အထည်ဖော်ဆောင်ရွက်မှု၏ ရလဒ်များကို စောင့်ကြပ်ကြည့်ရှုခြင်းအစီရင်ခံစာ (Monitoring Report) တွင် ထည့်သွင်းဖော်ပြ၍ စီမံကိန်း တည်ဆောက်သည့်ကာလ၊ လုပ်ငန်းလည်ပတ်သည့် ကာလနှင့် ပိတ်သိမ်းမည့်ကာလတို့အတွင်း ထားဝယ်အထူးစီးပွားရေးဇုန် စီမံခန့်ခွဲမှုကော်မတီနှင့် ဤဝန်ကြီးဌာနသို့ တင်ပြသွားရန်၊

(ဈ) လူထုတွေ့ဆုံပွဲအား ၂၀၁၅ ခုနှစ်တွင် တစ်ကြိမ်သာ ဆောင်ရွက်ရာတွင် ဒေသခံများ တောင်းဆိုထားသည့် အချက်များအတွက် မည်သို့ဆောင်ရွက်မည်ကို ရှင်းလင်းစွာ ဖော်ပြထားခြင်းမရှိကြောင်း စိစစ်တွေ့ရှိရသဖြင့် အများပြည်သူနှင့် တိုင်ပင်ဆွေးနွေးမှုအစီအစဉ် တစ်ကြိမ်ထပ်မံဆောင်ရွက်ပြီး ထားဝယ်အထူးစီးပွားရေးဇုန်၏ ကနဦးမြို့ပြစီမံကိန်းဧရိယာအတွင်း ပတ်ဝန်းကျင်နှင့် လူမှုရေးအခြေအနေတိုးတက်ကောင်းမွန်ရေးအတွက် ထိန်းသိမ်းစောင့်ရှောက်ခြင်းနှင့် ပတ်သက်၍ လူထုနှင့်စဉ်ဆက်မပြတ် ဆွေးနွေးညှိနှိုင်းမှုများ ဆောင်ရွက်ခြင်း၊ ဆွေးနွေးညှိနှိုင်းမှုများအပေါ် အကောင်အထည်ဖော်ဆောင်ရွက်ခြင်း၊ ထိုမှရရှိသည့် အကျိုးရလဒ်များ စသည်တို့ကို Monitoring Report တွင် ထည့်သွင်းဖော်ပြ၍ ထားဝယ်အထူးစီးပွားရေးဇုန်စီမံခန့်ခွဲမှုကော်မတီနှင့် ဤဝန်ကြီးဌာနသို့ တင်ပြ သွားရန်၊

(ည) စီမံကိန်းအကောင်အထည်ဖော် ဆောင်ရွက်မည့်သူသည် စီမံကိန်း၏ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း အစီရင်ခံစာတွင်ပါဝင်သည့် လိုက်နာရန်ကတိကဝတ်များအတိုင်း လိုက်နာဆောင်ရွက်သွားရမည့်အပြင် အကြိုတည်ဆောက်ရေးကာလ၊ တည်ဆောက်ရေးကာလ၊ လုပ်ငန်းလည်ပတ်စဉ်ကာလနှင့် လုပ်ငန်းပိတ်သိမ်းမည့် ကာလများအတွင်း ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးနှင့်လူမှုရေး ထိခိုက်နိုင်မှုအခြေအနေများကို စောင့်ကြပ်ကြည့်ရှုစစ်ဆေးခြင်း၊ သက်ဆိုင်ရာဌာနများသို့ အစီရင်ခံတင်ပြခြင်းတို့ကို မပျက်မကွက် ဆောင်ရွက်သွားရမည့်အပြင် စီမံကိန်းအကောင်အထည်ဖော်ဆောင်ရွက်သူနှင့် ပြည်သူလူထုအကြား ပွင့်လင်းမြင်သာမှုရှိစေရေးအတွက် ပတ်ဝန်းကျင်နှင့်လူမှုရေးဆိုင်ရာကိစ္စရပ်များ ဆောင်ရွက်ရာတွင် စဉ်ဆက်မပြတ် ဆွေးနွေးညှိနှိုင်းမှုများ ဆောင်ရွက်ရန်နှင့် ဆောင်ရွက်မှုရလဒ်များကို စောင့်ကြပ်ကြည့်ရှုသည့်အစီရင်ခံစာတွင် ထည့်သွင်း၍ ထားဝယ်အထူးစီးပွားရေးဇုန် စီမံခန့်ခွဲမှုကော်မတီနှင့် ဤဝန်ကြီးဌာနသို့တင်ပြသွားရန်၊

(ဋ) စီမံကိန်းအကောင်အထည်ဖော်ဆောင်ရွက်သူသည် ဤဝန်ကြီးဌာနမှ ထုတ်ပြန်ထားသည့် တည်ဆဲပတ်ဝန်းကျင်ထိန်းသိမ်းရေး ဥပဒေ၊နည်းဥပဒေနှင့် ပတ်ဝန်းကျင်ထိခိုက်မှု ဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ထုံးလုပ်နည်းကိုလည်းကောင်း၊ ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးနှင့်ဆက်နွယ်သည့် တည်ဆဲဥပဒေ၊ နည်းဥပဒေများကိုလည်းကောင်း၊ ထားဝယ်အထူးစီးပွားရေးဇုန် စီမံခန့်ခွဲမှုကော်မတီ၏ ညွှန်ကြား

ချက်များ/စည်းမျဉ်းစည်းကမ်းများနှင့် ဆက်လက်ထုတ်ပြန်မည့် သက်ဆိုင်ရာ လုပ်ထုံးလုပ်နည်းများကို လိုက်နာဆောင်ရွက်သွားရန်၊

(ဠ) စီမံကိန်းပိုင်ရှင်မှ ကနဦးမြို့ပြစီမံကိန်းအတွင်း အကောင်အထည်ဖော်ဆောင်ရွက်မည့် လုပ်ငန်းများနှင့်ပတ်သက်၍ ပတ်ဝန်းကျင်ထိခိုက်မှု ဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ထုံးလုပ်နည်း (၂၀၁၅)၊ နောက်ဆက်တွဲ (က) ပါပြဋ္ဌာန်းသတ်မှတ်ချက်များနှင့်အညီ လိုအပ်သော EIA၊ IEE၊ EMP ရေးဆွဲဆောင်ရွက်စေရန်၊

(ဍ) စီမံကိန်းအတွက် ကျွမ်းကျင်သောဝန်ထမ်းများ ပေါ်ပေါက်လာရေးအတွက် ဝန်ထမ်းများအား သင်တန်းပေးခြင်း အစီအစဉ်များရေးဆွဲ၍ အကောင်အထည်ဖော်ဆောင်ရွက်ရန်၊

(ဃ) စွန့်ပစ်ရေသန့်စင်မှုနှင့်ပတ်သက်၍ စွန့်ပစ်ရေများကို စွန့်ပစ်ရေထုတ်မြောင်းများသို့ မစွန့်ထုတ်မီ သန့်စင်ကန်ထဲတွင် သန့်စင်ရန်၊

(ဏ) ပတ်ဝန်းကျင်စောင့်ကြပ်ကြည့်ရှုသည့် အစီရင်ခံစာကို(၆)လတစ်ကြိမ် သယံဇာတနှင့် သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဝန်ကြီးဌာနသို့ တင်ပြရန်။

၂၅/၁၀/၂၀၁၇

ပြည်ထောင်စုဝန်ကြီး(ကိုယ်စား)
(ဝင်းဇော်၊ဒုတိယအမြဲတမ်းအတွင်းဝန်)

မိတ္တူကို

ညွှန်ကြားရေးမှူးချုပ်
ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာန

The Republic of the Union of Myanmar

Ministry of Natural Resource and Environmental Conservation

The Union Minister's Office

Letter No: (Thittaw) 3(2) 16 (Gagyi) (3444/2017)

Date: 25th October 2017

To :

Dawei Special Economic Zone Management Committee

Subject: Reporting on approval of re-submitted ESIA Report on Initial Township Project to be implemented in Dawei Special Economic Zone by Dawei Residence Co., Ltd

Reference: Letter of Dawei Special Economic Zone Management Committee, dated 1st June 2016, Letter No. HtaWa-16/DSEZ/2017 (186)

In the matter of the submission of report on Environmental Impact Assessment (EIA) on constructing Initial Township Project by Dawei Residence Co., Ltd. in Dawei Special Economic Zone, we found that the assessment report is in compliance with paragraph 63 of the Environmental Assessment Procedure and thus we approve the report and in response that we recommend following to be complied with:

(a) The proponent shall ensure that all environmental management procedures, project-related undertakings and regulations are implemented, and that all contractors and sub-contractors which carry out the project activities on behalf of the proponent to fully comply with applicable law, regulations, this procedure, environmental management programmes and rules

(b) The proponent shall carry out the programmes exactly as what is proposed in the approved environmental impact assessment report, including methods to minimize impact on environment, social and health which may be caused by the proposed project, arrangement for environmental programmes, related sub-programmes, methods of supervision

(c) The proponent shall keep sufficient fund for monitoring programmes and sub-programs of environmental management and form the committees to implement them.

(d) The proponent shall publicize the approved environmental assessment report and post on the respective company's website to obtain public recommendations.

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หจก. โมเดิร์นพับลิชชิ่ง
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TEL. 02-938-7113
April / 11 / 2018

(e) The project proponent shall continuously discuss with the stakeholders and incorporate their recommendations in the plan

(f) The project proponent shall comply with the following standards:

(aa) In operating the proposed activities, to comply with the prescription of the National Environmental Quality (Emission) Guideline and Standard of Smoke Emission

(bb) In operating the project, to comply with IFC EHS General Guideline in terms of the employees management.

(cc) To comply with the undertaking as stated in the report to comply with ISO 14001 Environmental Management System (EMS) which is the international standard

(g) With regard to emergency response plan, although it is provided in the report, the project proponent shall revise the plan as necessary according to changing environmental situation and submit the same to the Management Committee and this Ministry

(h) With regard to community support programme, the project proponent shall, during pre-construction period, construction period, operation period and closing period, provide support such as public health, public roads, electricity, water supply and other infrastructure, and public safety programmes; and to include the results in the monitoring report and submit the same to Dawei Special Economic Zone Management Committee and this Ministry.

(i) For the project proponent only held one stakeholders meeting in 2015, and the fulfilment of the requests of stakeholders are not clearly mentioned in the report, therefore, the project proponent shall hold another stakeholders meeting and include the results of (1) the plan for environment and social development in the Initial Township Project in the Dawei Special Economic Zone, (2) continual discussion with the stakeholders, (3) implementation of stakeholders' recommendations from continual discussion, in the in the monitoring report and submit the same to Dawei Special Economic Zone Management Committee and this Ministry.

(j) The project proponent shall comply with the undertakings contained in the Environmental Impact Assessment Report. In addition, during pre-construction period, construction period, operation period and closing period, it shall carry out without fail monitoring and scrutinising environmental conservation and social impacts, and reporting to relevant departments. Besides, in carrying out activities relating to environment and community, the project proponent shall continuously conduct public consultation and negotiate for transparency and to include the results

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in the monitoring report and submit the same to Dawei Special Economic Zone Management Committee and this Ministry.

(k) The project proponent shall comply with existing Environmental Conservation Law, regulations and the Environmental Impact Assessment Procedure issued by the Ministry, directives/regulations and the relevant procedures to be issued by Dawei Special Economic Zone Management Committee.

(l) Regarding the activities to be implemented by the owner of the project in the Initial Township Project, EIA, IEE, EMP shall be developed in accordance with the provisions contained in the Annex (A) of the Environmental Impact Assessment Procedure (2015) and comply with them.

(m) To obtain more skilled employees, the employees training programmes are to be planned and implemented.

(n) Regarding water drainage, before draining the used water into the drainage, the used water shall be firstly cleaned and disinfected in the water holding tanks.

(o) The proponent shall submit monitoring report to the Environmental Conservation Department every six months.

Sd/

On behalf of the Union Minister
(Win Zaw, Deputy Permanent Secretary)

CC

Director General

Department of Environmental Conservation

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April, 11, 2018

DAWEI RESIDENCE COMPANY LIMITED

DRC DAWEI RESIDENCE COMPANY LIMITED

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Tel: (662) 716 1600 ext. 2000,
Direct Line: (662) 716 1591,
Fax: (662) 716 1401

Reference No. DRC 02/2017

29th May 2017

Director
Environmental Conservation Department of the Ministry of Natural Resources and Environmental Conservation ("ECD-MONREC")

Subject: Submission of the Revised Draft Final Environmental Impact Assessment ("EIA") Reports addressing comments from ECD

Attachments: Revised Draft Final report and CD – Environmental Impact Assessment of the Initial Township Project

Your Excellency,

Dawei Residence Company Limited ("DRC") is pleased to attach herewith the updated the EIA reports for the proposed development of the Initial Township for the Dawei Initial Development Phase. DRC and EIA Consultant have addressed comments received from ECD on the 02 February 2017 on the previous version of the reports.

Your Excellency's kind acknowledgement and approval on the revised draft final EIA reports as attached herein will be greatly appreciated.

Sincerely Yours,

DRC DAWEI RESIDENCE COMPANY LIMITED

Somchet Thinaphong
Managing Director
Dawei Residence Company Limited

CC: Dawei Special Economic Zone Management Committee ("DSEZ MC"), Nay Pyi Taw, Republic of the Union of Myanmar

ပြည်ထောင်စုသမ္မတမြန်မာနိုင်ငံတော်အစိုးရ

သယံဇာတနှင့်သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဝန်ကြီးဌာန

ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာန

ရုံးအမှတ် (၅၃)၊နေပြည်တော်

ပတ်ဝန်းကျင်ထိန်းသိမ်းရေး ဦးစီးဌာန

စာအမှတ်၊ အီးအိုင်အေ-၂/၇ (၁၃၄ /၂၀၁၇)

ရက်စွဲ ၊ ၂၀၁၇ ခုနှစ် ဇန်နဝါရီလ ၃၀ရက်

သို့

ဥက္ကဋ္ဌ

ထားဝယ်အထူးစီးပွားရေးဇုန်စီမံခန့်ခွဲမှုကော်မတီ

အကြောင်းအရာ။ **Myandawei Industrial Estate Co., Ltd. မှ ထားဝယ်အထူးစီးပွားရေးဇုန် ကနဦးအဆင့်တွင် အကောင်အထည်ဖော်ဆောင် ရွက်မည့် ကနဦးမြို့ပြစီမံကိန်း (Initial Township Project) နှင့်ပတ်သက်၍ ပြန်လည်တင်ပြလာသော နယ်ပယ်အတိုင်းအတာသတ်မှတ်ခြင်း အစီရင်ခံစာ (Scoping Report) အပေါ် အတည်ပြုပြန်ကြားခြင်း**

ရည်ညွှန်းချက်။

(၁) ထားဝယ်အထူးစီးပွားရေးဇုန် စီမံခန့်ခွဲမှုကော်မတီ၏ ၃၀-၁၁-၂၀၁၅ ရက်စွဲပါ စာအမှတ်၊ထဝ-၁/DSEZ/၂၀၁၅ (၂၂၃)

(၂) ဤဝန်ကြီးဌာန၏ ၁၄-၁၂-၂၀၁၅ ရက်စွဲပါစာအမှတ်၊ ၃(၂)/၁၆(ဃ)(၆)/ (၃၅၇၆/၂၀၁၅)

(၃) ထားဝယ်အထူးစီးပွားရေးဇုန်စီမံခန့်ခွဲမှုကော်မတီ၏ ၁-၂-၂၀၁၆ ရက်စွဲပါ စာအမှတ်၊ ထဝ-၁/DSEZ-၄/၂၀၁၆ (၀၃၃)

(၄) သယံဇာတနှင့်သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဝန်ကြီးဌာန၊ ပြည်ထောင်စုဝန်ကြီးရုံး၏ ၂၇-၁-၂၀၁၇ ရက်စွဲပါစာအမှတ်၊ (သစ်တော) ၃/၁၆(ဃ) (၂၉၁/၂၀၁၇)

၁။ အကြောင်းအရာပါကိစ္စနှင့်ပတ်သက်၍ ထားဝယ်အထူးစီးပွားရေးဇုန်အတွင်း Myandawei Industrial Estate Co., Ltd. မှ အကောင်အထည်ဖော်ဆောင်ရွက်မည့် ကနဦးမြို့ပြစီမံကိန်း (Initial Township Project) နှင့်ပတ်သက်သော Scoping အစီရင်ခံစာအား ထားဝယ်အထူးစီးပွားရေးဇုန် စီမံခန့်ခွဲမှုကော်မတီမှ ရည်ညွှန်း (၁) ပါစာဖြင့် ပေးပို့လာရာ အစီရင်ခံစာတွင် လိုအပ်သည့်အချက်များအား ဖြည့်စွက်၍ Scoping အစီရင်ခံစာအား ပြန်လည်ရန်လိုအပ်ကြောင်း ရည်ညွှန်း (၂) ပါစာဖြင့် သဘောထား မှတ်ချက်ပြန်ကြားခဲ့ရာ ပြန်လည်ပြုစုရေးဆွဲထားသည့် Scoping အစီရင်ခံစာအား ထားဝယ်အထူး စီးပွားရေးဇုန်စီမံခန့်ခွဲမှုကော်မတီမှ ရည်ညွှန်း (၃) ပါ စာဖြင့် ပြန်လည်ပေးပို့လာပါသည်။

၂။ ပြန်လည်တင်ပြလာသည့် ကနဦးမြို့ပြစီမံကိန်း (Initial Township Project) ၏ Scoping အစီရင်ခံစာအား စိစစ်၍ အတည်ပြုပြန်ကြားခွင့်ပြုပါရန် ပြည်ထောင်စုဝန်ကြီးရုံးသို့တင်ပြခဲ့ရာ အတည်ပြု ပြန်ကြားရန် ရည်ညွှန်း (၄) ပါစာဖြင့် ညွှန်ကြားလာပါသည်။

၃။ သို့ဖြစ်ပါ၍ ထားဝယ်အထူးစီးပွားရေးဇုန်အတွင်း အကောင်အထည်ဖော်ဆောင်ရွက်မည့် ကနဦး မြို့ပြစီမံကိန်း (Initial Township Project) နှင့်ပတ်သက်၍ ပြန်လည်တင်ပြလာသော Scoping

အစီရင်ခံစာအား အတည်ပြုပါကြောင်းနှင့် Scoping အစီရင်ခံစာတွင် အောက်ဖော်ပြပါအချက်များကို ဖြည့်စွက်လိုက်နာဆောင်ရွက်ရန် လိုအပ်ပါကြောင်း ပြန်ကြားအပ်ပါသည်-

(က) မြန်မာဘာသာဖြင့် ပြန်ဆိုထားသော အကျဉ်းချုပ်အစီရင်ခံစာ ထည့်သွင်းဖော်ပြရန်၊

(ခ) အခန်း (၃) Overview of the Policy, Legal and Institutional Framework Myanmar တွင် ပြင်ဆင်ရမည့် ဥပဒေ၊ နည်းဥပဒေများနှင့် လုပ်ထုံးလုပ်နည်းတို့ကို ပြင်ဆင်ဖော်ပြရန်နှင့် စီမံကိန်းနှင့်သက်ဆိုင်သော ဖြည့်စွက်ရန်လိုအပ်သည့် ဥပဒေ၊ နည်းဥပဒေများနှင့် လုပ်ထုံးလုပ်နည်းတို့ကို ထည့်သွင်းဖော်ပြရန်၊

(ဂ) Setting the Study Limits အပိုင်းတွင် လေ့လာမည့်နယ်နိမိတ်သတ်မှတ်မှုအား ၁ ကီလိုတာသာ သတ်မှတ်ဆောင်ရွက်ထားသဖြင့် ၃ ကီလိုမီတာ ခန့်ထားရှိသတ်မှတ်ပေးရန်နှင့် မြေငလျင်တိုင်းတာမှု အချက်အလက်များအား Update Data များဖြင့် ဖြည့်စွက်ဖော်ပြရန်၊

(ဃ) အခန်း (၇) တွင် Public Consultation နှင့်သက်ဆိုင်သောအချက်များအား Initial Industrial Estate စီမံကိန်းအတွက် ပြုလုပ်ထားသော အချက်အလက်များကို သုံးစွဲမည်ဖြစ်ကြောင်းဖော်ပြထားသဖြင့် Initial Township စီမံကိန်းအတွက် Social Consultation အား သီးခြားဆောင်ရွက်ရန်၊

(င) စီမံကိန်းလုပ်ငန်းဆောင်ရွက်နေစဉ် တွေ့ကြုံလာသည့် ကိစ္စရပ်များအပေါ် မူတည်၍ သက်ဆိုင်ရာကဏ္ဍအလိုက် လိုအပ်သည့် ဥပဒေ၊ နည်းဥပဒေ၊ လုပ်ထုံးလုပ်နည်း၊ ညွှန်ကြားချက်များကိုထပ်မံဖြည့်စွက်ပြီး စီမံကိန်းအကောင်အထည်ဖော်ဆောင်ရွက်သူမှ လိုက်နာမည်ဖြစ်ကြောင်း ကတိကဝတ်အား ထည့်သွင်းဖော်ပြရန်၊

(စ) ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းအစီရင်ခံစာရေးဆွဲပြုစုသည့် ပြည်ပမှ တတိအဖွဲ့အစည်းများနှင့်ပတ်သက်၍ သက်ဆိုင်ရာနိုင်ငံ၏ အစိုးရအဖွဲ့အစည်းတစ်ခုမှ အသိအမှတ်ပြုလက်မှတ်ရရှိပြီးဖြစ်ကြောင်း အထောက်အထားဖြင့် တင်ပြရန်၊

(ဆ) Scoping အစီရင်ခံစာနှင့် အဆိုပြု TOR နှင့်အညီ အကောင်အထည်ဖော် ဆောင်ရွက်ရန်၊

(ဇ) ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ထုံးလုပ်နည်းပါ သတ်မှတ်ချက်များအရ Scoping အစီရင်ခံစာနှင့် အဆိုပြု TOR နှင့်အညီ ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း အစီရင်ခံစာအား သယံဇာတနှင့်သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဝန်ကြီးဌာနသို့ တင်ပြရန်။

(လှမောင်သိန်း)

ညွှန်ကြားရေးမှူးချုပ်

မိတ္တူကို

ပြည်ထောင်စုဝန်ကြီးရုံး၊ သယံဇာတနှင့်သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဝန်ကြီးဌာန

ရုံးလက်ခံ၊ မျှောစာတွဲ၊ အမှတ်တွဲချုပ်

ပြည်ထောင်စုသမ္မတမြန်မာနိုင်ငံတော်အစိုးရ
သယံဇာတနှင့်သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဝန်ကြီးဌာန
ပြည်ထောင်စုဝန်ကြီးရုံး

စာအမှတ် (သစ်တော) ၃/၁၆(ဃ)(၂၈၁ /၂၀၁၇)
ရက်စွဲ ၂၀၁၇ ခုနှစ်၊ ဇန်နဝါရီလ ၂၇ ရက်

အကြောင်းအရာ။ **ထားဝယ်အထူးစီးပွားရေးဇုန် ကနဦးအဆင့်တွင် အကောင်အထည်ဖော်ဆောင်ရွက်မည့် ကနဦးမြို့ပြစီမံကိန်း(Initial Township Project)နှင့် ပတ်သက်၍ ပြန်လည်ပြင်ဆင်တင်ပြလာသည့် နယ်ပယ်အတိုင်းအတာသတ်မှတ်ခြင်းအစီရင်ခံစာ (Scoping Report) အပေါ် အတည်ပြုပြန်ကြားခွင့်ပြုရန် တင်ပြလာခြင်းကိစ္စ**

ရည်ညွှန်းချက်။ ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာန၏ ၂၀-၁-၂၀၁၇ ရက်စွဲပါ စာအမှတ်၊ အီးအိုင်အေ-၂/၇ (၀၇၄/၂၀၁၇)

၁။ ထားဝယ်အထူးစီးပွားရေးဇုန်အတွင်း Myandawei Industrial Estate Co., Ltd. မှ အကောင်အထည်ဖော်ဆောင်ရွက်မည့် ကနဦးမြို့ပြစီမံကိန်း (Initial Township Project)နှင့် ပတ်သက်၍ ပြန်လည်ပြင်ဆင် ပေးပို့လာသည့် Scoping Report သည် ဤဝန်ကြီးဌာန၏ သဘောထားမှတ်ချက်နှင့်အညီ ပြင်ဆင်ဖြည့်စွက် တင်ပြထားသည်ကို စိစစ်တွေ့ရှိရပါသဖြင့် အတည်ပြုနိုင်ပါကြောင်းနှင့် အတည်ပြုပြန်ကြားရာတွင် လိုက်နာဆောင်ရွက်ရမည့်အချက်များ ထည့်သွင်းဖော်ပြ၍ သက်ဆိုင်ရာသို့ ဆက်လက်ပြန်ကြားနိုင်ရေးအတွက် ရည်ညွှန်းပါစာဖြင့် တင်ပြလာခြင်းအပေါ် ပြည်ထောင်စုဝန်ကြီးက **"ECD ပြန်ကြားရန် "** ဟု မိန့်မှတ်ချက်ပြုထားပါသည်။

၂။ သို့ဖြစ်ပါ၍ အထက်ပါပြည်ထောင်စုဝန်ကြီး၏ မိန့်မှတ်ချက်နှင့်အညီ သက်ဆိုင်ရာသို့ ပြန်ကြားနိုင်ရေးအတွက် လိုအပ်သလိုဆက်လက်ဆောင်ရွက်နိုင်ပါရန် အကြောင်းကြားအပ်ပါသည်။

၂၇/၁/၂၀၁၇

ပြည်ထောင်စုဝန်ကြီး(ကိုယ်စား)
(ဝင်းဇော်၊ ဒုတိယအမြဲတမ်းအတွင်းဝန်)

ညွှန်ကြားရေးမှူးချုပ်
<u>ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာန</u>

The Republic of the Union of Myanmar
Ministry of Natural Resources and Environmental Conservation
Environmental Conservation Department
Office No (53), Nay Pyi Taw

Letter No – EIA- 2/7 (134/ 2017)

Date – January 30th, 2017

Chairman
DSEZ Management Committee

Subject: **Matter about the replying of confirmation for Scoping Report of re-submission in accordance with Initial Township Project which plan to implement at DSEZ Initial Phase, by Myandawei Industrial Estate Co. Ltd**

Reference: **1. Letter No. Hta Wa – 1/ DSEZ/ 2015 (223), dated on 30-11-2015 by DSEZ Management Committee**

2. Letter No. 3(2)/ 16 (D) (6)/ (3576/2015), dated on 14-12-2015 by this Ministry

3. Letter No. Hta Wa – 1/ DSEZ- 4/ 2016 (033), dated on 1-2-2016 by DSEZ Management Committee

4. Letter No. (Forest) 3/ 16 (D) (291/ 2017), dated on 27-1-2017 by Union Minister Office, Ministry of Natural Resources and Environmental Conservation

1. As per aforesaid subject, there was resubmitting the Scoping Report of resubmission of Myandawei Industrial Estate Co. Ltd for Initial Township Project, which plan to implement at DSEZ Initial Phase, together with reference letter (1) by DSEZ Management Committee, and Ministry of Natural Resources and Environmental Conservation replied the comment for that submission with reference letter (2). DSEZ Management Committee, therefore, resubmitted the Scoping Report, after complying, with reference letter (3), again.

2. In accordance with the proposed Project, resubmitted Scoping Report of Initial Township Project was submitted to Union Minister Office for confirmation, after analyzing, and it was instructed to reply the confirmation with reference letter (4).

3. Therefore, we would like to inform as confirm the Scoping Report of resubmission according to the Initial Township Project of DSEZ Initial Phase, because of in line with the EIA Procedure and inform to emphasize the following:

a. To express the summarized report with Myanmar version

b. To express law, act and procedure of additional, which related with project, and law, act and procedures od amendment, which have to amend, at Clause 3 Overview of Policy, Legal and Institutional Framework

c. To make additional expression of Earthquake Data with Update Data and 1 Km Study Demarcation should be change 3 Km Study Demarcation at Setting the Study Limits

d. To make Social Consultation of Initial Township individually except using the data of Initial Industrial Estate Project at Clause 7 Public Consultation

e. To express the commitment of Project Developer after inserting the laws, acts, rules and regulations, procedures and instruction, which was required each sector in accordance with the any matters during implementation

f. To submit the any evidence of Certificate or Identification of relevant country of third parties from abroad, who prepared the ESIA Report

g. To implement the Scoping Report in line with the Terms of Reference (TOR)

h. To submit the EIA report, after preparing with proposed TOR and specifications of EIA Procedure, to Ministry of Natural Resources and Environmental Conservation

Signature

Hla Maung Thein
Director General

Cc to;

- Union Minister Office, Ministry of Natural Resources and Environmental Conservation
- Office record/ Delivered to/ Cases Master File

The Republic of the Union of Myanmar
Ministry of Natural Resources and Environmental Conservation
Union Minister Office

Letter No – (Forest) 3/ 16 (D) (289/ 2017)

Date – January 27th, 2017

Subject: **Matter about submitting to reply the confirmation for Scoping Report of resubmission for Initial Township Project which plan to implement at DSEZ Initial Phase**

Reference: **1. Letter No. EIA- 2/7 (074/ 2017), dated on 20-1-2017 by Environmental Conservation Department**

1. There is able to reply as confirm for Scoping Report of resubmission of Initial Township Project, which plan to implement at DSEZ Initial Phase, by Myandawei Industrial Estate Co. Ltd according to the comment of Ministry, because of in line with EIA Procedures, and Union Minister noted as **"to reply ECD"** for the submission with reference letter to reply continuously after inserting the some points to comply, when reply the confirmation.

2. Therefore, we would like to inform implementing as per requirements to reply to relevant in accordance with the note of Union Minister.

Signature

Behalf of Union Minister
Win Zaw, Vice Permanent Secretary

Cc to;
- Director General, Environmental Conservation Department

Translation

Official Emblem

Form SorWorLor.4

License

To be the person entitled to make a report on studies and preventive measure

and remedy for the effects on the environmental quality.

License No.15/2558

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(1) No terms and conditions;

(2) ....

(3) ....

(4) ....

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Given on 26 June 2015

-Signature-

(Mr. Phongbun Rongthong)

Secretary-General of Office of Human Resources and Environmental Policy and Planning

26 June 2015

UAE
UNITED ANALYST AND ENGINEERING
CONSULTANT COMPANY LIMITED

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Report Certification

18th December 2017

This is to certify that United Analyst and Engineering Consultant Company Limited was the company who prepared The Environmental Impact Assessment Report of Initial Township Project that located in the Dawei Special Economic Zone, in Dawei District, the Republic of the Union of Myanmar by the Environmental Impact Assessment Experts and Environmental Scientists that are in the list:

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United Analyst and Engineering Consultant Co., Ltd

ကနဦးမြို့နယ်စီမံကိန်းက လိုက်နာဆောင်ရွက်ရမည့် ဥပဒေဆိုင်ရာကတိကဝတ်များ

၁။ ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဥပဒေ(၂၀၁၂)

၂။ ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးနည်းဥပဒေ(၂၀၁၄)

၃။ ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ထုံးနည်းလုပ်နည်း(၂၀၁၅)

၄။ အမျိုးသားပတ်ဝန်းကျင်ဆိုင်ရာအရည်အသွေးထုတ်လွှတ်မှုလမ်းညွှန်ချက်(၂၀၁၅)

၅။ မြန်မာနိုင်ငံ ရင်းနှီးမြှုပ်နှံမှု ဥပဒေ (၂၀၁၆)

၆။ တိုင်းရင်းသားလူမျိုးများ အကျိုးစီးပွားကာကွယ်စောင့်ရှောက်ရေး ဥပဒေ(၂၀၁၅)

၇။ ပြည်သူ့ကျန်းမာရေးဥပဒေ(၁၉၇၂)

၈။ ကူးစက်ရောဂါများကာကွယ်နှိမ်နင်းရေးဥပဒေ(၁၉၉၅)

၉။ ဆေးလိပ်နှင့်ဆေးရွက်ကြီးထွက်ပစ္စည်းသောက်သုံးမှုထိန်းချုပ်ရေးဥပဒေ(၂၀၁၆)

၁၀။ မြန်မာနိုင်ငံမီးသတ်တပ်ဖွဲ့ဥပဒေ(၂၀၁၅)

၁၁။ မော်တော်ယာဉ်ဥပဒေ(၂၀၁၅)နှင့်မော်တော်ယဉ်နည်းဥပဒေများ(၁၉၈၇)

၁၂။ မြန်မာ့အာမခံလုပ်ငန်းဥပဒေ(၁၉၉၃)

၁၃။ အလုပ်သမားအဖွဲ့အစည်းဥပဒေ(၂၀၁၁)

၁၄။ အလုပ်သမားရေးရာအငြင်းပွားမှုဖြေရှင်းရေးဥပဒေ(၂၀၁၂)

၁၅။ အလုပ်အကိုင်နှင့်ကျွမ်းကျင်မှုဖွံ့ဖြိုးတိုးတတ်ရေးဥပဒေ(၂၀၁၃)

၁၆။ ၂၀၁၃ခုနှစ်၊အနည်းဆုံးအခကြေးငွေ ဥပဒေ

၁၇။ ၂၀၁၆ခုနှစ်၊အခကြေးငွေပေးချေရေးဥပဒေ

၁၈။ အလုပ်သမားလျော်ကြေးအက်ဥပဒေ(၁၉၅၁)

၁၉။ ခွင့်နှင့်အလုပ်ပိတ်ရက်များအက်ဥပဒေ(၁၉၅၁)

၂၀။ လူမှုဖူလုံရေးဥပဒေ(၂၀၁၂)

၂၁။ ရေနံအက်ဥပဒေ(၁၉၃၄)

၂၂။ ရေနံနည်းဥပဒေများ(၁၉၃၇)

၂၃။ ရေအရင်းအမြစ်နှင့် မြစ်၊ ချောင်းများထိန်းသိမ်းရေး ဥပဒေ(၂၀၀၆)

၂၄။ ရေချိုငါးလုပ်ငန်း ဥပဒေ (၁၉၉၁)

၂၅။ မြန်မာ့ပင်လယ်ငါးလုပ်ငန်းဥပဒေ (၁၉၉၁)

၂၆။ ယဉ်ကျေးမှုအမွေအနှစ်ဒေသများ ကာကွယ်ထိန်းသိမ်းရေး ဥပဒေ (၁၉၉၈)

၂၇။ ရှေးဟောင်းဝတ္ထုပစ္စည်းများ ကာကွယ်ထိန်းသိမ်းရေး ဥပဒေ (၂၀၁၅)

၂၈။ ရှေးဟောင်းအဆောက်အအုံများ ကာကွယ်ထိန်းသိမ်းရေး ဥပဒေ (၂၀၁၅)

၂၉။ သစ်တောဥပဒေ (၁၉၉၂)

၃၀။ မြန်မာ့အထူးစီးပွားရေးဇုန်ဥပဒေ (၂၀၁၄)

၃၁။ မြန်မာနိုင်ငံအင်ဂျင်နီယာကောင်စီဥပဒေ (၂၀၁၃)

၃၂။ တနင်္သာရီတိုင်းဒေသကြီး စည်ပင်သာယာရေးအဖွဲ့များ ဥပဒေ

၃၃။ မြန်မာ့ဆိပ်ကမ်းအာဏာပိုင်ဥပဒေ (၂၀၁၅)

၃၄။ ပို့ကုန်သွင်းကုန်ဥပဒေ (၂၀၁၂)

၁။ ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဥပဒေ(၂၀၁၂)

စီမံကိန်းပိုင်ရှင်သည်-

(က) ပတ်ဝန်းကျင်ကိုညစ်ညမ်းစေခဲ့လျှင်ဝန်ကြီးဌာနက သတ်မှတ်သည့်လျော်ကြေးငွေကို ပေးလျော်ပါမည်။ (ပုဒ်မ၇၊ ပုဒ်မခွဲ(ဏ) အရ)

(ခ) ပတ်ဝန်းကျင်ကိုညစ်ညမ်းမှုဖြစ်ပေါ်စေသည့်ထုတ်လွှတ်ခြင်းကို သတ်မှတ်ထားသည့် ပတ်ဝန်းကျင်အရည်အသွေး စံချိန်စံညွှန်းများနှင့်အညီ ထုတ်လွှတ်ပါမည်။(ပုဒ်မ၁၄အရ)

(ဂ) ပတ်ဝန်းကျင်ညစ်ညမ်းမှုများကို စောင့်ကြပ်ကြည့်ရှုရန်၊ ထိန်းချုပ်ရန်၊ စီမံခန့်ခွဲရန်၊ လျော့ချရန် သို့မဟုတ် ပပျောက်စေရန်လုပ်ငန်းခွင် အထောက်အကူပြုပစ္စည်း သို့မဟုတ် ထိန်းချုပ်ရေးပစ္စည်းကိရိယာကို တပ်ဆင်ခြင်း သို့မဟုတ် သုံးစွဲခြင်းပြုပါမည်။ ထိုသို့မဆောင်ရွက်နိုင်ပါက စွန့်ပစ်ပစ္စည်းများကို ပတ်ဝန်းကျင်ကိုမထိခိုက်စေသော နည်းလမ်းများနှင့်အညီ စွန့်ပစ်ပါမည်။(ပုဒ်မ၁၅အရ)

(ဃ) ဝန်ကြီးဌာနကထုတ်ပေးသည့် ကြိုတင်ခွင့်ပြုချက်ပါစည်းကမ်းချက်များနှင့်အညီ ဆောင်ရွက်ခြင်း ရှိမရှိ လာရောက်စစ်ဆေးသည့် တာဝန်ရှိပုဂ္ဂိုလ် သို့မဟုတ် အဖွဲ့အစည်းအား စစ်ဆေးခွင့်ပြုပါမည်။ (ပုဒ်မ၂၄အရ)

(င) ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဥပဒေအရထုတ်ပြန်သော နည်းဥပဒေများ၊ အမိန့်ကြော်ငြာစာ၊ အမိန့်၊ ညွှန်ကြားချက်နှင့် လုပ်ထုံးလုပ်နည်းပါ တားမြစ်ချက်များကိုလိုက်နာပါမည်။(ပုဒ်မ၂၉အရ)

၂။ ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးနည်းဥပဒေ(၂၀၁၄)

စီမံကိန်းပိုင်ရှင်သည်-

(က) နည်းဥပဒေ၆၉၊ နည်းဥပဒေခွဲ(က)အရ ပတ်ဝန်းကျင်ကိုညစ်ညမ်းစေသည့် ပစ္စည်းများကို အများပြည်သူအား တိုက်ရိုက်ဖြစ်စေ သွယ်ဝိုက်၍ဖြစ်စေ ထိခိုက်စေနိုင်မည့် နေရာတစ်ခုခုတွင် တစ်နည်းနည်းဖြင့် ထုတ်လွှတ်ခြင်း၊ ထုတ်လွှတ်စေခြင်း၊ စွန့်ပစ်ခြင်း၊ စွန့်ပစ်စေခြင်း၊ စုပုံခြင်း၊ စုပုံစေခြင်း မပြုပါ။

(ခ) နည်းဥပဒေ၆၉၊ နည်းဥပဒေခွဲ(က)အရ ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဥပဒေ၊ နည်းဥပဒေများ တစ်ခုခုအရ အမိန့်ကြော်ငြာစာဖြင့် သတ်မှတ်ထားသော ဘေးအန္တရာယ်ရှိပစ္စည်းများကို အများပြည်သူအား တိုက်ရိုက်ဖြစ်စေ သွယ်ဝိုက်၍ဖြစ်စေ ထိခိုက်စေနိုင်မည့်နေရာတစ်ခုခုတွင် တစ်နည်းနည်းဖြင့်ထုတ်လွှတ်ခြင်း၊ ထုတ်လွှတ်စေခြင်း၊ စွန့်ပစ်ခြင်း၊ စွန့်ပစ်စေခြင်း၊ စုပုံခြင်း၊ စုပုံစေခြင်း မပြုပါ။

(ဂ) နည်းဥပဒေ၆၉၊နည်းဥပဒေခွဲ(ခ)အရ ဂေဟာစနစ်နှင့်ယင်းစနစ်ကြောင့် ဖြစ်ပေါ်ပြောင်းလဲနေသော သဘာဝပတ်ဝန်းကျင်ကို ထိခိုက်ပျက်စီးစေနိုင်သည့် ပြုလုပ်မှုကို ဆောင်ရွက်ခြင်းမပြုပါ။

၃။ ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာလုပ်ထုံးနည်းလုပ်နည်း (၂၀၁၅)

စီမံကိန်းပိုင်ရှင်သည်-

(က) မိမိကိုယ်တိုင်ကြောင့်ဖြစ်စေ၊ မိမိကိုယ်စား ဆောင်ရွက်သည့်ကန်ထရိုက်တာ၊ လက်ခွဲ ဆောင်ရွက်ပေးသူ ဆပ်ကန်ထရိုက်တာ၊ အရာရှိ၊ အလုပ်သမား၊ ကိုယ်စားလှယ် သို့မဟုတ် အတိုင်ပင်ခံ၏ပြုလုပ်မှု သို့မဟုတ် ပျက်ကွက်မှုကြောင့်ပေါ်ပေါက်သည့် ဆိုးကျိုးသက်ရောက်မှုကို တာဝန်ယူပါမည်။ (အပိုဒ်၁၀၂(က)အရ)

(ခ) စီမံကိန်းကြောင့်ထိခိုက်ခံစားရသူကို လက်ရှိ သို့မဟုတ် စီမံကိန်းမဆောင်ရွက်မီကာလထက် မနိမ့်ကျသော လူမှုစီးပွားရေး တည်ငြိမ်ခိုင်မာမှုရရှိသည်အထိ ဆောင်ရွက်ပေးရန်နှင့် သက်မွေးဝမ်းကျောင်းလုပ်ငန်းများ ပြန်လည်တည်ထောင်ရေးနှင့် ပြန်လည်နေရာချထားရေး အစီစဉ်များကို စီမံကိန်းကြောင့်ထိခိုက်ခံစားရသူများ၊ သက်ဆိုင်ရာအစိုးရဌာန၊ အဖွဲ့အစည်းများ၊ အခြားသက်ဆိုင်သူများနှင့် တိုင်ပင်ဆွေးနွေး၍ လိုအပ်သလိုပံ့ပိုးပေးပါမည်။ (အပိုဒ်၁၀၂(ခ)အရ)

(ဂ) ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်၊ စီမံကိန်းကတိကဝတ်အားလုံးနှင့် စည်းကမ်းချက်များကို အပြည့်အဝ အကောင်အထည်ဖော်ပါမည်။ မိမိကိုယ်စားဆောင်ရွက်သည့် ကန်ထရိုက်တာ၊ လက်ခွဲဆောင်ရွက်ပေးသူ ဆပ်ကန်ထရိုက်တာများက စီမံကိန်းအတွက်လုပ်ငန်းများ ဆောင်ရွက်ရာတွင် သက်ဆိုင်ရာဥပဒေ၊ နည်းဥပဒေများ၊ ဤလုပ်ထုံးလုပ်နည်း၊ ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှု အစီအစဉ်နှင့် စည်းကမ်းချက်များအားလုံးကို အပြည့်အဝ လိုက်နာဆောင်ရွက်စေပါမည်။ (အပိုဒ်၁၀၄အရ)

(ဃ) ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဆိုင်ရာ လိုက်နာဆောင်ရွက်မှု သက်သေခံလက်မှတ်၊ သက်ဆိုင်ရာဥပဒေများ၊ နည်းဥပဒေများ၊ ဤလုပ်ထုံးလုပ်နည်းနှင့် စံချိန်စံညွှန်းတို့တွင်ပါရှိသော လိုအပ်ချက်အားလုံးကို တာဝန်ယူသည့်အပြင် ထိရောက်စွာအကောင်အထည်ဖော် ဆောင်ရွက်ပါမည်။ (အပိုဒ်၁၀၅အရ)

(င) အကြိုတည်ဆောက်ခြင်း၊ တည်ဆောက်ခြင်း၊ လုပ်ငန်းလည်ပတ်ဆောင်ရွတ်ခြင်း၊ လုပ်ငန်းရပ်စဲခြင်း၊ လုပ်ငန်းပိတ်သိမ်းခြင်းနှင့် လုပ်ငန်းပိတ်သိမ်းပြီးကာလတို့တွင် ဆိုးကျိုးသက်ရောက်မှု

အားလုံးအတွက် စီမံကိန်းနှင့်ဆက်စပ်ဆောင်ရွက်မှုများကို စဉ်ဆက်မပြတ် ဘက်စုံစောင့်ကြပ်စစ်ဆေးပါမည်။(အပိုဒ်၁၀၆အရ)

(စ) မိမိ၏တာဝန် သို့မဟုတ် ဆောင်ရွက်ချက်ပျက်ကွက်မှုကို အမြန်ဆုံး စာဖြင့်တင်ပြပါမည်။ ပျက်ကွက်မှုကြောင့် ပတ်ဝန်းကျင်အပေါ် သက်ရောက်မှုဖြစ်နိုင်သည့်ကိစ္စ သို့မဟုတ် ဝန်ကြီး ဌာနက အမြန်သိရန်လိုအပ်သည့်ကိစ္စကို ၂၄နာရီအတွင်းလည်းကောင်း အခြားကိစ္စဖြစ်ပါက စတင်သိရှိချိန်မှ ၇ ရက် အတွင်းလည်းကောင်း ဝန်ကြီးဌာနသို့ တင်ပြပါမည်။ (အပိုဒ်၁၀၇အရ)

(ဆ) ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီစဉ်၏ဇယားပါအတိုင်းစောင့်ကြပ်ကြည့်ရှုမှု အစီရင်ခံစာကို ၆လ တစ်ကြိမ် သို့မဟုတ် ဝန်ကြီးဌာနကသတ်မှတ်သည့်အတိုင်း ဝန်ကြီးဌာနသို့ အစီရင်ခံ တင်ပြပါမည်။ (အပိုဒ်၁၀၈အရ)

(ဇ) စောင့်ကြပ်ကြည့်ရှုမှု အစီရင်ခံစာတွင် အပိုဒ်၁၀၉ပါ သတ်မှတ်ချက်များ အနည်းဆုံး ထည့်သွင်းဖော်ပြပါမည်။ (အပိုဒ်၁၀၉အရ)

(ဈ) အပိုဒ် ၁၀၈ အရ တင်ပြသည့်နေ့ရက်မှ ၁၀ရက်အတွင်း အများပြည်သူသိရှိနိုင်ရန် စီမံကိန်း၏ဝက်ဘ်ဆိုဒ်၊ စာကြည့်တိုက်၊ ပြည်သူခန်းမ၊ အများပြည်သူစုဝေးရာနေရာနှင့် စီမံကိန်းရုံးဌာနတို့တွင် အများပြည်သူသိရှိစေရန် ယင်းအစီရင်ခံစာကိုတင်ပြပါမည်။ ယင်းအစီရင်ခံစာ၏ ဒီဂျီတယ်မိတ္တူ တောင်းခံချက်ကို လက်ခံရရှိသည့်နေ့မှစ ၁၀ရက်အတွင်း အီးမေလ်ဖြင့် ဖြစ်စေ၊ တောင်းခံသူနှင့် သဘောတူညီထားသည့် အခြားနည်းလမ်းဖြင့် ဖြစ်စေ တောင်းခံသူအား ပေးပါမည်။ (အပိုဒ်၁၁၀အရ)

(ည) စောင့်ကြပ်ကြည့်ရှုရန်နှင့် စစ်ဆေးရန်တာဝန်ရှိသူကို သာမန်အလုပ်ချိန်အတွင်း ဝင်ရောက်ခွင့်ပြုပါမည်။ (အပိုဒ်၁၁၃(က)အရ) စီမံကိန်း၏ရုံးများ၊ လုပ်ငန်းခွင်၊ စီမံကိန်းနှင့် သက်ဆိုင်သော လုပ်ငန်းများ ဆောင်ရွက်နေသည့်အခြားနေရာများသို့ လိုအပ်ပါက အချိန်မရွေး ဝင်ရောက်ခွင့်ပြုပါမည်။ (အပိုဒ်၁၁၃(ခ)အရ)

(ဋ) အရေးပေါ်အခြေအနေတွင်ဖြစ်စေ၊ ပတ်ဝန်းကျင်ဆိုင်ရာနှင့် လူမှုရေးဆိုင်ရာ လိုအပ်ချက်ကို ဆောင်ရွက်ပေးရန် ပျက်ကွက်လျှင်ဖြစ်စေ၊ ထိုသို့ပျက်ကွက်နိုင်သည်ဟု ယူဆလျှင်ဖြစ်စေ စစ်ဆေးရန်တာဝန်ရှိသူက ဝင်ရောက်စစ်ဆေးလိုသည့်အချိန်တွင် ချက်ချင်းခွင့်ပြုပါမည်။ (အပိုဒ်၁၁၅အရ)

(ဌ) ကိုယ်စားဆောင်ရွက်ပေးသူ ကန်ထရိုက်တာနှင့် လက်ခွဲဆောင်ရွက်သူ ဆပ်ကန်ထရိုက်တာတို့ကို တာဝန်ရှိသူက စစ်ဆေးခြင်းကိုခွင့်ပြုပါမည်။ (အပိုဒ်၁၁၇အရ)

၄။ မျိုးသားပတ်ဝန်းကျင်ဆိုင်ရာအရည်အသွေးထုတ်လွှတ်မှု လမ်းညွှန်ချက်(၂၀၁၅)

စီမံကိန်းပိုင်ရှင်သည် လမ်းညွှန်ချက်ပါ စံချိန်စံညွှန်းများနှင့်အညီ ထုတ်လွှတ်ခြင်း၊ စွန့်ပစ်ခြင်းပြုပါမည်။

၅။ **မြန်မာနိုင်ငံ ရင်းနှီးမြှုပ်နှံမှု ဥပဒေ (၂၀၁၆)**

စီမံကိန်းပိုင်ရှင်သည်-

(က) ငှားရမ်းခွင့် ရရှိထားသည့် အစိုးရစီမံခန့်ခွဲခွင့်ရှိသော မြေကို စာချုပ်စာတမ်းများ မှတ်ပုံတင်ခြင်း အက်ဥပဒေနှင့်အညီ စာချုပ်စာတမ်း မှတ်ပုံတင်ရုံးတွင် မှတ်ပုံတင်ပါမည်။ (ပုဒ်မ ၅၀အရ)

(ခ) အဆင့်ဆင့်သော စီမံခန့်ခွဲမှု၊ နည်းပညာ၊ လုပ်ငန်းကျွမ်းကျင်သူ နေရာတို့တွင် နိုင်ငံသားများကို စွမ်းဆောင်ရေမြှင့်တင်ပေးပြီး အစားထိုးခန့်ထားပါမည်။ (ပုဒ်မ ၅၁ (ခ)အရ)

(ဂ) ကျွမ်းကျင်မှုမလိုအပ်သည့် လုပ်ငန်းများတွင် မြန်မာနိုင်ငံသားများကိုသာ ခန့်ထားပါမည်။ (ပုဒ်မ ၅၁ (ဂ)အရ)

(ဃ) မြန်မာနိုင်ငံသားနှင့် နိုင်ငံခြားသားများကို အလုပ်ခန့်ထားမှုဆိုင်ရာ သဘောတူညီချက် စာချုပ်ဖြင့် တည်ဆဲဥပဒေနှင့်အညီ ခန့်ထားပါမည်။ (ပုဒ်မ ၅၁ (ဃ)အရ)

(င) တည်ဆဲဥပဒေများ နည်းဥပဒေများ၊ လုပ်ထုံးလုပ်နည်းများနှင့် နိုင်ငံတကာတွင် ကျင့်သုံးသည့် အကောင်းဆုံး စံချိန်စံညွှန်းများနှင့်အညီ သဘာဝပတ်ဝန်းကျင်နှင့် လူမှုပတ်ဝန်းကျင် ထိခိုက်ပျက်စီးမှု၊ ညစ်ညမ်းမှု မဖြစ်စေရန်နှင့် ယဉ်ကျေးမှု အမွေအနှစ်များကို ထိခိုက်ပျက်စီးမှု မဖြစ်ပေါ်စေရန် လိုက်နာဆောင်ရွက်ပါမည်။ (ပုဒ်မ ၆၅ (ဆ)အရ)

(စ) အလုပ်ခန့်ထားမှုဆိုင်ရာ သဘောတူစာချုပ် ဖောက်ဖျက်ခြင်း၊ ရင်းနှီးမြှုပ်နှံမှု အပြီး ပိတ်သိမ်းခြင်း၊ လွှဲပြောင်းရောင်းချခြင်း၊ ရင်းနှီးမြှုပ်နှံမှု ရပ်ဆိုင်းခြင်း၊ လုပ်သားအင်အား လျှော့ချခြင်းတို့အတွက် အလုပ်သမားများကို တည်ဆဲဥပဒေ များနှင့်အညီ နစ်နာကြေးပေးပြီးမှသာ ရင်းနှီးမြှုပ်နှံမှုကို ရပ်ဆိုင်းပိတ်သိမ်း ပါမည်။ (ပုဒ်မ ၆၅ (ဈ)အရ)

(ဆ) ခိုင်လုံသောအကြောင်းပြချက်ဖြင့် ရင်းနှီးမြှုပ်နှံမှု ယာယီပိတ်သိမ်းပါက ပိတ်သိမ်းထားရသည့် ကာလအတွင်း အလုပ်သမားများကို တည်ဆဲဥပဒေ၊ နည်းဥပဒေများ၊ ညွှန်ကြားချက်များ၊ လုပ်ထုံးလုပ်နည်းများနှင့်အညီ လုပ်ခ၊ လစာ ပေးပါမည်။ (ပုဒ်မ ၆၅ (ည)အရ)

(ဇ) အလုပ်ကြောင့် ထိခိုက်ဒဏ်ရာ ထိခိုက်မှု၊ ကိုယ်အင်္ဂါအစိတ်အပိုင်း ချို့ယွင်းဆုံးရှုံးမှု၊ ရောဂါရရှိမှု၊ သေဆုံးမှုတို့ ဖြစ်ပွားသော အလုပ်သမားများအတွက် သက်ဆိုင်ရာအလုပ်သမား သို့မဟုတ် အမွေဆက်ခံခွင့်ရှိသူကို တည်ဆဲဥပဒေနှင့် အညီ ရထိုက်သည့် နစ်နာကြေးနှင့် လျော်ကြေးပေးပါမည်။ (ပုဒ်မ ၆၅ (ဋ)အရ)

(ဈ) လာရောက်အလုပ်လုပ်ကိုင်နေသည့် နိုင်ငံခြားသား ကျွမ်းကျင်ပညာရှင်များနှင့် ကြီးကြပ်သူများ၊ မိသားစုဝင်များသည် တည်ဆဲဥပဒေများ၊ နည်းဥပဒေများ၊ အမိန့်နှင့်

ညွှန်ကြားချက်များ၊ ယဉ်ကျေးမှုနှင့် ဓလေ့ထုံးစံများကို လေ့လာလိုက်နာ ရန် ကြပ်မတ်ပါမည်။ (ပုဒ်မ ၆၅ (ဎ)အရ)

(ည) စီမံကိန်းလိုအပ်ချက်အရ ခွင့်ပြုထားခြင်း မဟုတ်သော ဆောင်ရွက်ခြင်းကြောင့် သဘာဝပတ်ဝန်းကျင် ထိခိုက်ပျက်စီးစေခြင်းနှင့် လူမှုစီးပွားအပေါ် ဆိုးရွားမှုများ ဖြစ်ပေါ်စေပါက အဆိုပါ ဆိုးရွားနစ်နာမှုအတွက် ထိရောက်သည့် လျော်ကြေးကို နစ်နာသူထံသို့ ပေးလျော်ပါမည်။ (ပုဒ်မ ၆၅ (ဏ)အရ)

(ဋ) ကော်မရှင်က စစ်ဆေးကြည့်ရှုရန် ကြိုတင်အကြောင်းကြားလာပါက မည်သည့် နေရာကိုမဆို ဝင်ရောက်စစ်ဆေးခွင့်ပြုပါမည်။ (ပုဒ်မ ၆၅ (တ)အရ)

(ဌ) ကော်မရှင်၏ ခွင့်ပြုမိန့် သို့မဟုတ် အတည်ပြုမိန့်ကို ပတ်ဝန်းကျင်ထိခိုက်မှု ဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ငန်းစဉ်များ မဆောင်ရွက်မီ ဦးစွာရယူပါမည်။ ပတ်ဝန်းကျင်ထိခိုက်မှု ဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ငန်းစဉ်များ ဆောင်ရွက်မှု အခြေအနေကို ကော်မရှင်သို့ တင်ပြပါမည်။ (ပုဒ်မ ၆၅ (ထ)အရ)

(ဍ) နည်းဥပဒေ၌ ဖော်ပြသတ်မှတ်ထားသော အာမခံအမျိုးအစားများကို အာမခံ ထားရှိပါမည်။ (ပုဒ်မ ၇၃ အရ)

၆။ တိုင်းရင်းသားလူမျိုးများအကျိုးစီးပွားကာကွယ်စောင့်ရှောက်ရေး ဥပဒေ(၂၀၁၅)

စီမံကိန်းပိုင်ရှင်သည်-

(က) စီမံကိန်းကို အကောင်အထည်ဖော်မည့် ဒေသရှိ ဌာနေတိုင်းရင်းသား လူမျိုးများအား စီမံကိန်း၏ အကြောင်းအရာများကို ပြည့်စုံတိကျစွာ ကြိုတင်ချပြ အသိပေးပါမည်။ (ပုဒ်မ ၅ အရ)

(ခ) စီမံကိန်းကို အကောင်အထည်ဖော် ဆောင်ရွက်ရာတွင် စီမံကိန်းကို အကောင်အထည်ဖော်မည့် ဒေသရှိ ဌာနေတိုင်းရင်းသား လူမျိုးများနှင့် ညှိနှိုင်းဆောင်ရွက်ပါမည်။ (ပုဒ်မ ၅ အရ)

၇။ ပြည်သူ့ကျန်းမာရေးဥပဒေ(၁၉၇၂)

စီမံကိန်းပိုင်ရှင်သည်-

(က) ပြည်သူ့ကျန်းမာရေးအတွက် ပုဒ်မ ၃ ပါ ကိစ္စများနှင့် စပ်လျဉ်း၍ မည်သည့် စည်းကမ်းသတ်မှတ်ချက်များ၊ ညွှန်ကြားချက်များကိုမဆို လိုက်နာဆောင်ရွက်ပါမည်။ (ပုဒ်မ ၃ အရ)

(ခ) လိုအပ်ချက်အရ ဤဥပဒေအရ တာဝန်ရှိသူများက လာရောက်စစ်ဆေးခြင်းနှင့် စပ်လျဉ်း၍ မည်သည့်နေရာ၊ မည်သည့်အချိန်တွင် မည်သည့် စစ်ဆေးမှုကိုမဆို ခွင့်ပြုပါမည်။ (ပုဒ်မ ၅ အရ)

၈။ ကူးစက်ရောဂါများကာကွယ်နှိမ်နင်းရေးဥပဒေ(၁၉၉၅)

စီမံကိန်းပိုင်ရှင်သည်-

(က) အလုပ်သမားများကို ကူးစက်ရောဂါ မဖြစ်ပွားစေရေးအတွက် လုပ်ငန်းခွင်တွင် ကျန်းမာရေးနှင့် ညီညွတ်သော နေအိမ်ဆောက်လုပ်ပေးပါမည်။ ကျန်းမာရေးနှင့် ညီညွတ်သော သောက်ရေနှင့် သုံးရေရရှိအောင် ဆောင်ရွက်ပေးပါမည်။ အညစ်အကြေးများကို စနစ်တကျ စွန့်ပစ် စေရန် ဆောင်ရွက်ပေးပါမည်။ (ပုဒ်မ ၃ (က) (၉) အရ)

(ခ) ကျန်းမာရေးဝန်ကြီးဌာနနှင့် ကျန်းမာရေးဦးစီးဌာနတို့က ညွှန်ကြားသည်နှင့် အညီ လိုက်နာဆောင်ရွက်ပါမည်။ (ပုဒ်မ ၄ အရ)

(ဂ) အောက်ပါကိစ္စရပ်များ ဖြစ်ပွားကြောင်း သိရှိလျှင် သိရှိခြင်း အနီးဆုံး ကျန်းမာရေး ဌာန သို့မဟုတ် ဆေးရုံသို့ ချက်ချင်း သတင်းပို့ပါမည် –

   (၁) ကြွက်နှင့် အပါအဝင် တရိစ္ဆာန်များ အစုအလိုက်၊ အပြုံလိုက် သေဆုံးခြင်း၊

   (၂) ကြွက်ကျခြင်း၊

   (၃) ကူးစက်မြန်ရောဂါဖြစ်သည်ဟု သံသယရှိခြင်း သို့မဟုတ် ယင်းရောဂါ ဖြစ်ပွားခြင်း

   (၄) တိုင်ကြားရမည့် ကူးစက်ရောဂါဖြစ်ပွားခြင်း၊

(ဃ) ကျန်းမာရေးအရာရှိက လိုအပ်၍ လာရောက်စစ်ဆေးလျှင် မည်သည့်နေရာ၊ မည်သည့်အချိန်တွင်မဆို ခွင့်ပြုပါမည်။ (ပုဒ်မ ၁၁ အရ)

၉။ ဆေးလိပ်နှင့်ဆေးရွက်ကြီးထွက်ပစ္စည်း သောက်သုံးမှုထိန်းချုပ်ရေး ဥပဒေ(၂၀၁၆)

စီမံကိန်းပိုင်ရှင်သည်-

(က) ဆေးလိပ်သောက်သုံးခွင့်မရှိသော နေရာများတွင် ထိုသို့ခွင့်မပြုကြောင်း ဖော်ညွှန်း သည့် စာတမ်းနှင့် အမှတ်အသားများကို သတ်မှတ်ချက်နှင့်အညီ ထားရှိပါမည်။ (ပုဒ်မ ၉ (က) အရ)

(ခ) ဓာတ်အားပေး စက်ရုံ ဧရိယာအတွင်း ဆေးလိပ်သောက်သုံးရန် နေရာကို စီစဉ်ပေးပြီး သတ်မှတ်ချက်နှင့်အညီ ယင်းသို့ခွင့်ပြုသည့် နေရာဖြစ်ကြောင်း ဖော်ညွှန်းသည့် စာတမ်းနှင့် အမှတ်အသား ထားရှိပါမည်။ (ပုဒ်မ ၉ (ခ) အရ)

(ဂ) ဆေးလိပ်သောက်ခွင့်မရှိသော နေရာ၌ မည်သူမျှ ဆေးလိပ်သောက်ခြင်းမပြုရန် ကြပ်မတ်ပါမည်။ (ပုဒ်မ ၉ (ဂ) အရ)

(ဃ) ကြီးကြပ်ရေးအဖွဲ့ လာရောက်စစ်ဆေးသည့်အခါ စစ်ဆေးခြင်းကို ခံယူပါမည်။ (ပုဒ်မ ၉ (ဃ) အရ)

၁၀။ မြန်မာနိုင်ငံမီးသတ်တပ်ဖွဲ့ ဥပဒေ(၂၀၁၅)

စီမံကိန်းပိုင်ရှင်သည်-

(က) သီးသန့်မီးသတ်တပ်ဖွဲ့ ဖွဲ့စည်းပါမည်။ (ပုဒ်မ ၂၅ (က) အရ)

(ခ) မီးဘေးလုံခြုံရေးဆိုင်ရာ ပစ္စည်းများကို ထားရှိပါမည်။ (ပုဒ်မ ၂၅ (ခ) အရ)

၁၁။ မော်တော်ယာဉ် ဥပဒေ(၂၀၁၅) နှင့် မော်တော်ယဉ်နည်းဥပဒေများ(၁၉၈၇)

စီမံကိန်းပိုင်ရှင်သည်-

လေထုညစ်ညမ်းစေခြင်း၊ အသံဆူညံစေခြင်းနှင့် အသက်အန္တရာယ် လုံခြုံစိတ်ချမှုတို့နှင့် သက်ဆိုင်သည့် ဤဥပဒေနှင့် နည်းဥပဒေများပါ ပြဋ္ဌာန်းချက်များကို လိုက်နာဆောင်ရွက် ပါမည်။

၁၂။ မြန်မာ့အာမခံလုပ်ငန်းဥပဒေ(၁၉၉၃)

စီမံကိန်းပိုင်ရှင်သည်-

(က) ကိုယ်ပိုင်ယာဉ်များ သုံးစွဲမည်ဆိုပါက လူထိခိုက်မှုဆိုင်ရာ အာမခံ ထားရှိပါမည်။ (ပုဒ်မ ၁၅ အရ)

(ခ) ပတ်ဝန်းကျင်ကို ထိခိုက်စေခြင်းနှင့် ပြည်သူလူထုကို နစ်နာစေခြင်းဖြစ်ပေါ်လျှင် ယင်းအထွေထွေ ဆုံးရှုံးနစ်နာမှုကို ပေးလျော်နိုင်ရန် ထားရှိရမည့် အာမခံကို ထားရှိပါမည်။ (ပုဒ်မ ၁၆ အရ)

၁၃။ အလုပ်သမားအဖွဲ့အစည်းဥပဒေ(၂၀၁၁)

စီမံကိန်းပိုင်ရှင်သည်-

(က) အလုပ်သမား ဥပဒေနှင့် မညီဘဲ အလုပ်ထုတ်ခံရသည့် အလုပ်သမားကို ပြန်လည် အလုပ်ခန့်ထားရန် တောင်းဆိုသည်ကို ခွင့်ပြုပါမည်။ (ပုဒ်မ ၁၈အရ)

(ခ) အလုပ်ရှင်နှင့် အလုပ်သမားအကြား အငြင်းပွားမှုကို ညှိနှိုင်းဖျန်ဖြေရေးအဖွဲ့က ဖြေရှင်းရာတွင် ယင်းအဖွဲ့သို့ အလုပ်သမားကိုယ်စားလှယ် စေလွှတ်ခြင်းကို ခွင့်ပြုပါမည်။ (ပုဒ်မ ၁၉ အရ)

(ဂ) အလုပ်သမားဥပဒေများပါ အလုပ်သမားအခွင့်အရေး သို့မဟုတ် အကျိုးစီးပွားနှင့် စပ်လျဉ်း၍ အစိုးရ၊ အလုပ်ရှင်နှင့် တောင်းဆိုသူ အလုပ်သမားတို့ ဆွေးနွေးရာတွင် အလုပ်သမား အဖွဲ့အစည်း၏ ကိုယ်စားလှယ်ကို ပါဝင်ဆွေးနွေးခွင့်ပြုပါမည်။ (ပုဒ်မ ၂၀ အရ)

(ဃ) အလုပ်သမား ဥပဒေများနှင့်အညီ အလုပ်သမားများ၏ စုပေါင်းအရေးဆိုမှုများကို ဖြေရှင်းရာတွင် အလုပ်သမားအဖွဲ့အစည်းကို ပါဝင်ဆောင်ရွက်ခွင့်ပြုပါမည်။ (ပုဒ်မ ၂၁ အရ)

(င) အလုပ်သမား အဖွဲ့အစည်းက သက်ဆိုင်ရာ အလုပ်သမား အဖွဲ့ချုပ်က ချမှတ်ထားသော လုပ်ထုံးလုပ်နည်းများ၊ စည်းမျဉ်းစည်းကမ်း၊ ညွှန်ကြားချက်များနှင့်အညီ အစည်းအဝေးများပြုလုပ်ခြင်း၊ သပိတ်မှောက်ခြင်းတို့ကို ခွင့်ပြုပါမည်။ (ပုဒ်မ ၂၂ အရ)

၁၄။ အလုပ်သမားရေးရာအငြင်းပွားမှုဖြေရှင်းရေးဥပဒေ(၂၀၁၂)

စီမံကိန်းပိုင်ရှင်သည်-

(က) တောင်းဆို တိုင်ကြားချက်နှင့် စပ်လျဉ်း၍ သတ်မှတ်ကာလအတွင်း ဆွေးနွေး ညှိနှိုင်းဖြေရှင်းရာတွင် ပျက်ကွက်မည် မဟုတ်ပါ။ (ပုဒ်မ ၃၈ အရ)

(ခ) ခုံသမာဓိအဖွဲ့သို့မဟုတ် ခုံအဖွဲ့က အငြင်းပွားမှု စစ်ဆေးနေစဉ် ကာလအတွင်း ထိုအငြင်းပွားမှု မစမီက ချမှတ်ထားသော အလုပ်သမားများနှင့် သက်ဆိုင်သည့် စည်းကမ်းများကို အလုပ်သမားများ၏ အကျိုးစီးပွားထိခိုက်စေရန် ရုတ်တရက် ပြောင်းလဲခြင်း မပြုပါ။ (ပုဒ်မ ၃၉ အရ)

(ဂ) အငြင်းပွားမှု တစ်ခုနှင့် စပ်လျဉ်း၍ ဤဥပဒေနှင့်အညီ ဆွေးနွေးညှိနှိုင်းခြင်း၊ ဖျန်ဖြေခြင်းနှင့် ခုံသမာဓိအဖွဲ့ဖြင့် ဆုံးဖြတ်ခြင်းတို့ကို မပြုဘဲ အလုပ်မထုတ်ပါ။ (ပုဒ်မ ၄၀ အရ)

(ဃ) ခုံသမာဓိ သို့မဟုတ် ခုံအဖွဲ့က ပုဒ်မ ၅၁ အရ ဆုံးဖြတ်သည့် လျော်ကြေးငွေကို ပေးဆောင်ပါမည်။ (ပုဒ်မ ၅၁ အရ)

၁၅။ အလုပ်အကိုင်နှင့် ကျွမ်းကျင်မှုဖွံ့ဖြိုးတိုးတတ်ရေး ဥပဒေ(၂၀၁၃)

စီမံကိန်းပိုင်ရှင်သည်-

(က) အလုပ်သမားခန့်ထားရာတွင် ဤဥပဒေ ပုဒ်မ ၅ ပါ ပြဋ္ဌာန်းချက်များနှင့်အညီ စာချုပ်ချုပ်ဆို၍ ခန့်ထားပါမည်။ (ပုဒ်မ၅အရ)

(ခ) ခန့်ထားရန် လျာထားသော အလုပ်သမားနှင့် လုပ်ငန်း၌ လုပ်ကိုင်လျက်ရှိသော အလုပ်သမားများ၏ အလုပ်အကိုင်ဆိုင်ရာ ကျွမ်းကျင်မှုအဆင့် မြင့်မားစေရန် လေ့ကျင့်ရေး အစီအစဉ်များကို လုပ်ငန်းလိုအပ်ချက်အရ ကျွမ်းကျင်မှု ဖွံ့ဖြိုးတိုးတက်ရေးအဖွဲ့၏ မူဝါဒနှင့်အညီ ဆောင်ရွက်ပါမည်။ (ပုဒ်မ ၁၄ အရ)

(ဂ) မိမိ၏ လုပ်ငန်း၌ အလုပ်သမားကြီးကြပ်သူအဆင့်နှင့် ယင်းအဆင့်အောက်ရှိ အလုပ်သမားများကို ပေးချေရသည့် စုစုပေါင်းလုပ်ခ၊ လစာ၏ ၀.၅ ရာခိုင်နှုန်း အောက် မနည်းသောငွေကို ရန်ပုံငွေသို့ ထည့်ဝင်ခြင်းအဖြစ် လစဉ်ပေးသွင်းပါမည်။ ယင်းထည့်ဝင်ကြေးအတွက် အလုပ်သမားများ၏ လုပ်ခ၊ လစာမှ ဖြတ်တောက်ခြင်းမပြုပါ။ (ပုဒ်မ၃၀အရ)

၁၆။ ၂၀၁၃ခုနှစ်၊ အနည်းဆုံးအခကြေးငွေဥပဒေ

စီမံကိန်းပိုင်ရှင်သည်-

(က) ပုဒ်မ ၁၂ ပါ သတ်မှတ်ချက်များနှင့်အညီ အခကြေးငွေ ပေးချေပါမည်။ (ပုဒ်မ၁၂အရ)

(ခ) သတ်မှတ်ထားသော အနည်းဆုံးအခကြေးငွေ နှုန်းထားများကို အလုပ်သမား များကို အသိပေးမည့်အပြင် လုပ်ငန်းခွင်တွင် မြင်နိုင်စေရန် ကြော်ငြာထားပါမည်။ (ပုဒ်မ၁၃ (က)အရ)

(ဂ) ပုဒ်မ ၁၃ ပါ ပြုစုရမည့် စာရင်းဇယားနှင့် စာတမ်းအမှတ်အသားများကို ပြုစုခြင်း၊ သက်ဆိုင်ရာ ဦးစီးဌာနသို့ သတ်မှတ်ချက်များနှင့်အညီ အစီရင်ခံခြင်း၊ ယင်းတို့ကို တောင်းခံသည့်အခါ တင်ပြခြင်းတို့ ပြုပါမည်။ (ပုဒ်မ ၁၃ (ခ)၊ (ဂ)၊ (ဃ) တို့အရ)

(ဃ) ပုဒ်မ ၁၃ (င)နှင့် ပုဒ်မ ၁၈ အရ စစ်ဆေးရေးအရာရှိများက လာရောက် စစ်ဆေးခြင်းကို ခွင့်ပြုပါမည်။ (ပုဒ်မ ၁၃ (င)နှင့် ၁၈ အရ)

(င) အလုပ်သမား ဖျားနာ၍ အလုပ်မလုပ်နိုင်သည့်အခါ ဆေးကုသရန် သတ်မှတ်ချက်များနှင့်အညီ နားခွင့်ပေးပါမည်။ (ပုဒ်မ ၁၃ (စ) အရ)

(စ) အလုပ်သမားများ၏ မိသားစုဝင် သို့မဟုတ် မိဘနာရေးဖြစ်သည့်အခါ အနည်းဆုံး အခကြေးငွေမှာ ဖြတ်တောက်ခြင်းမပြုဘဲ သတ်မှတ်ချက်များနှင့် အလုပ်နားခွင့် ပြုပါမည်။ (ပုဒ်မ ၁၃ (ဆ) အရ)

၁၇။ ၂၀၁၆ခုနှစ်၊ အခကြေးငွေပေးချေရေးဥပဒေ

စီမံကိန်းပိုင်ရှင်သည်-

(က) အခကြေးငွေ ပေးချေခြင်းနှင့် စပ်လျဉ်း၍ ပုဒ်မ ၃ နှင့် ပုဒ်မ ၄ ပါပြဋ္ဌာန်းချက် များနှင့်အညီ ပေးချေပါမည်။ (ပုဒ်မ၃ နှင့် ၄အရ)

(ခ) သဘာဝဘေးအန္တရာယ်အပါအဝင် မမျှော်လင့်သော ထူးခြားသည့်အခြေအနေ ပေါ်ပေါက်ပါက အခကြေးငွေ ပြောင်းလဲပေးချေလိုကြောင်းကို သက်ဆိုင်ရာ အလုပ်သမားများ၏ သဘောတူညီချက်ဖြင့် တင်ပြပါမည်။ (ပုဒ်မ၅အရ)

(ဂ) အလုပ်သမားထံမှ နုတ်ယူရန် လိုအပ်သည့်ငွေကြေးနှင့် စပ်လျဉ်း၍ အခန်း (၃)ပါ ပြဋ္ဌာန်းချက်နှင့်အညီ လိုက်နာဆောင်ရွက်ပါမည်။ (အခန်း ၃ အရ)

(ဃ) အချိန်ပို လုပ်ကိုင်ရသည့် အလုပ်သမားကို ဥပဒေက သတ်မှတ်သည့် နှုန်းထားအတိုင်း အချိန်ပိုလုပ်ခပေးပါမည်။ (ပုဒ်မ၁၄ အရ)

၁၈။ အလုပ်သမားလျော်ကြေး အက်ဥပဒေ(၁၉၅၁)

စီမံကိန်းပိုင်ရှင်သည် ရရှိသည့် ထိခိုက်နစ်နာမှု အမျိုးအစားအလိုက် ကိစ္စရပ်တစ်ခုချင်း အပေါ်တွင် ဤဥပဒေပါ ပြဋ္ဌာန်းချက်များနှင့်အညီ လျော်ကြေးငွေကို ပေးလျော်ပါမည်။

၁၉။ ခွင့်နှင့် အလုပ်ပိတ်ရက်များ အက်ဥပဒေ(၁၉၅၁)

စီမံကိန်းပိုင်ရှင်သည် ဤဥပဒေပါ ပြဋ္ဌာန်းချက်များနှင့်အညီ ခွင့်နှင့် အလုပ်ပိတ်ရက် များကို ခွင့်ပြုပါမည်။

၂၀။ လူမှုဖူလုံရေးဥပဒေ(၂၀၁၂)

စီမံကိန်းပိုင်ရှင်သည်-

(က) သက်ဆိုင်ရာ လူမှုဖူလုံရေးရုံးတွင် မှတ်ပုံတင်ထားရှိပါမည်။ (ပုဒ်မ၁၁ (က)အရ)

(ခ) ပုဒ်မ ၁၅၊ ပုဒ်မ၄၈ (က)ပါကျန်းမာရေးနှင့် လူမှုရေး စောင့်ရှောက်မှု ရန်ပုံငွေ၊ အလုပ်လုပ်ကိုင်နိုင်စွမ်းမရှိမှု အကျိုးခံစားခွင့်၊ သက်ပြည့်အငြိမ်းစား အကျိုးခံစားခွင့်နှင့် ကျန်ရစ်သူ အကျိုးခံစားခွင့် ရန်ပုံငွေ၊ အလုပ်လက်မဲ့ အကျိုးခံစားခွင့် ရန်ပုံငွေနှင့် သတ်မှတ်ထားသော မထည့်မနေရ ထည့်ဝင်ရမည့် ရန်ပုံငွေများကို မှတ်ပုံတင်ထည့်ဝင်ပါမည်။ (ပုဒ်မ၁၅ (ခ) အရ)

(ဂ) အလုပ်သမားက ပေးသွင်းရမည့် ထည့်ဝင်ကြေးကို ယင်း၏ လုပ်ခထဲမှ နုတ်ယူပြီး မိမိက ပေးသွင်းရမည့် ထည့်ဝင်ကြေး ငွေနှင့်အတူ သက်ဆိုင်ရာ လူမှုဖူလုံရေး ရန်ပုံငွေသို့ ပေးသွင်းပါမည်။ ထိုသို့ပေးသွင်းရသည့် ကုန်ကျစားရိတ်ကို မိမိက ကျခံပါမည်။ (ပုဒ်မ၁၈ (ခ) အရ)

(ဃ) အလုပ်တွင် ထိခိုက်မှု အကျိုးခံစားခွင့် ရန်ပုံငွေသို့ သတ်မှတ်ထားသော ထည့်ဝင်ကြေးပေးပြီး အာမခံထားရှိပါမည်။ (ယင်းရန်ပုံငွေသည် အလုပ်သမား လျော်ကြေး အက်ဥပဒေပါ ပြဋ္ဌာန်းချက်များနှင့် သက်ဆိုင်ခြင်းမရှိကြောင်း သိရှိပါသည်။) (ပုဒ်မ၄၈ (ခ)နှင့် ၄၉ (က) တို့အရ)

(င) ပုဒ်မ ၁၇ တွင် ဖော်ပြထားသည့် မှတ်တမ်းနှင့် စာရင်းများကို မှန်ကန်စွာပြုစုပြီး သက်ဆိုင်ရာ လူမှုဖူလုံရေးရုံးသို့ သတ်မှတ်ချက်များနှင့်အညီ တင်ပြပါမည်။ (ပုဒ်မ၇၅အရ)

၂၁။ ရေနံအက်ဥပဒေ(၁၉၃၄)

စီမံကိန်းပိုင်ရှင်သည် စီမံကိန်းအတွက် လိုအပ်သည့် လောင်စာဆီများကို တင်သွင်းခြင်း၊ သယ်ယူပို့ဆောင်ခြင်းနှင့်သိုလှောင်ခြင်းတို့အတွက် ပုဒ်မ ၃ အရ လိုအပ်သည့် လိုင်စင်ကို ရယူပါမည်။ ထို့ပြင် ယင်းလိုင်စင်ပါ စည်းကမ်းချက်များကိုလည်း လိုက်နာပါမည်။

၂၂။ ရေနံနည်းဥပဒေများ(၁၉၃၇)

စီမံကိန်းပိုင်ရှင်သည် စီမံကိန်းအတွက် လိုအပ်သည့် လောင်စာဆီများကို တင်သွင်းခြင်း၊ သယ်ယူပို့ဆောင်ခြင်းနှင့်သိုလှောင်ခြင်းတို့အတွက် နည်းဥပဒေများ အခန်း (၃) နှင့် (၄) ပါ သတ်မှတ်ပြဋ္ဌာန်းချက်များနှင့်အညီ လိုက်နာဆောင်ရွက်ပါမည်။ (အခန်း (၃)နှင့် (၄)အရ)

၂၃။ ရေအရင်းအမြစ်နှင့် မြစ်၊ ချောင်းများထိန်းသိမ်းရေး ဥပဒေ(၂၀၀၆)

စီမံကိန်းပိုင်ရှင်သည်-

(က) ရေအရင်းအမြစ်နှင့်မြစ်၊ ချောင်းများထိခိုက်ပျက်စီးစေရန် ရည်ရွယ်၍ တစ်စုံတစ်ရာပြုလုပ်ခြင်း မပြုပ။ (ပုဒ်မ၈ (က) အရ)

(ခ) ဦးစီးဌာနက မြစ်၊ ချောင်းအတွင်း ရေထုညစ်ညမ်းမှု မဖြစ်ပေါ်စေရေးနှင့် ရေလမ်းကြောင်းမပြောင်းလဲစေရေးအတွက် သတ်မှတ်ထားသော စည်းကမ်းချက် များကို ဖောက်ဖျက်ခြင်းမပြုပါ။ (ပုဒ်မ ၂၄ (က)အရ)

၂၄။ ရေချိုငါးလုပ်ငန်း ဥပဒေ (၁၉၉၁)

စီမံကိန်းပိုင်ရှင်သည်ရေချိုငါးလုပ်ငန်း ရေပြင်အတွင်း ရေထုညစ်ညမ်းစေခြင်းနှင့် ငါးနှင့် အခြားရေးနေသတ္တဝါများကို နှောက်ယှက်ခြင်း မပြုပါ။ (ပုဒ်မ ၄၀ အရ)

၂၅။ မြန်မာ့ပင်လယ်ငါး လုပ်ငန်းဥပဒေ (၁၉၉၀)

စီမံကိန်းပိုင်ရှင်သည် ငါး၊ အခြားရေနေသတ္တဝါတို့ကို အနှောင့်အယှက်ဖြစ်စေရန် သို့မဟုတ် ရေထုကို ညစ်ငြမ်းစေရန် သက်ရှိရေသတ္တဝါကို ဖြစ်စေ၊ အရာဝတ္ထုပစ္စည်းတစ်ခုခုကို ဖြစ်စေ၊ မြန်မာ့ ပင်လယ်ငါးလုပ်ငန်း ရေပြင်တွင် စွန့်ပစ်ခြင်းမပြုပါ။ (ပုဒ်မ ၃၉ အရ)

၂၆။ ယဉ်ကျေးမှုအမွေအနှစ်ဒေသများ ကာကွယ်ထိန်းသိမ်းရေး ဥပဒေ (၁၉၉၈)

စီမံကိန်းဧရိယာသည် ရှေးဟောင်းအမွေအနှစ် ဒေသအတွင်း ကျရောက်ပါက စီမံကိန်းပိုင်ရှင်သည် ပုဒ်မ ၁၃ နှင့် ၁၅ တို့ပါ ပြဋ္ဌာန်းချက်များနှင့်အညီ လိုက်နာဆောင်ရွက် ပါမည်။

၂၇။ ရှေးဟောင်း ဝတ္ထုပစ္စည်းများ ကာကွယ်ထိန်းသိမ်းရေး ဥပဒေ (၂၀၁၅)

စီမံကိန်းပိုင်ရှင်သည် မိမိ၏ စီမံကိန်း ဧရိယာအတွင်း ရှေးဟောင်းဝတ္ထုပစ္စည်းကို တွေ့ရှိပါက အနီးဆုံးရပ်ကွက် သို့မဟုတ် ကျေးရွာအုပ်စု အုပ်ချုပ်ရေးမှူးထံ အကြောင်းကြားပါမည်။ (ပုဒ်မ၁၂ အရ)

၂၈။ ရှေးဟောင်းအဆောက်အအုံများ ကာကွယ်ထိန်းသိမ်းရေး ဥပဒေ (၂၀၁၅)

စီမံကိန်းပိုင်ရှင်သည်-

(က) စီမံကိန်း နယ်နမိတ်အတွင်း မြေအောက် သို့မဟုတ် မြေပေါ်တွင် ရှေးဟောင်း အဆောက်အအုံကို တွေ့ရှိပါက အနီးဆုံးရပ်ကွက် သို့မဟုတ် ကျေးရွာအုပ်စု အုပ်ချုပ်ရေးမှူးထံ အကြောင်းကြားပါမည်။ (ပုဒ်မ၁၂အရ)

(ခ) စီမံကိန်း ဧရိယာသည် ရှေးဟောင်းအဆောက်အအုံ ဧရိယာအဖြစ် သတ်မှတ်သည့် ဧရိယာအတွင်း ကျရောက်ပါက ရှေးဟောင်းသုတေသန ဦးစီးဌာန၏ ကြိုတင်ခွင့် ပြုချက်ကို ရယူပါမည်။ (ပုဒ်မ ၁၅ အရ)

(ဂ) ရှေးဟောင်းအဆောက်အအုံ နယ်နမိတ်အတွင်း အစိုင်အခဲများ စွန့်ပစ်ခြင်းနှင့် ဓာတုပစ္စည်းများ စွန့်ပစ်မည်ဆိုပါက ရှေးဟောင်းသုတေသန ဦးစီးဌာန၏ ကြိုတင်ခွင့်ပြုချက်ကို ရယူပါမည်။ (ပုဒ်မ ၂၀ (စ) အရ)

၂၉။ သစ်တောဥပဒေ (၁၉၉၂)

စီမံကိန်းပိုင်ရှင်သည် သစ်တောနယ်မြေ သို့မဟုတ် သစ်တောဖုံးလွှမ်းသော နယ်မြေတွင် စီမံကိန်းကို ဆောင်ရွက်ရမည်ဖြစ်ပါက သယံဇာတနှင့် သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေး ဝန်ကြီးဌာန၏ ခွင့်ပြုချက်ရယူပြီးမှ ဆောင်ရွက်ပါမည်။ (ပုဒ်မ ၁၂ (က) အရ)

၃၀။ မြန်မာ့အထူးစီးပွားရေးဇုန်ဥပဒေ (၂၀၁၄)

စီမံကိန်းပိုင်ရှင်သည် -

(က) စီမံခန့်ခွဲမှုကော်မတီက အမိန့်ကြော်ငြာစာ၊ အမိန့်၊ ညွှန်ကြားချက်နှင့် လုပ်ထုံးလုပ်နည်းများဖြင့် သတ်မှတ်ပေးသည့် လိုက်နာရမည့် သတ်မှတ်ချက်များကို လိုက်နာဆောင်ရွက်ပါမည်။ (ပုဒ်မ ၁၁(စ) အရ)

(ခ) သဘာဝပတ်ဝန်းကျင် ထိန်းသိမ်းကာကွယ်ရေးအတွက် စီမံခန့်ခွဲမှုကော်မတီ၏ တည်ဆဲဥပဒေများနှင့်အညီ ကြီးကြပ်ကွပ်ကဲခြင်းကို လိုက်နာဆောင်ရွက်ပါမည်။ (ပုဒ်မ ၁၁(တ) အရ)

(ဂ) မြန်မာနိုင်ငံ ပတ်ဝန်းကျင်ထိန်းသိမ်းရေး ဥပဒေပါစံချိန်စံညွှန်းများနှင့် နိုင်ငံတကာ စံချိန်စံညွှန်းများကို လိုက်နာပါမည်။ ထို့ပြင် လူမှုရေးနှင့် ကျန်းမာရေးဆိုင်ရာ ထိခိုက်မှုများ မရှိစေရန် တည်ဆဲဥပဒေများနှင့်အညီ လိုက်နာဆောင်ရွက်ပါမည်။ (ပုဒ်မ ၃၅ အရ)

(ဃ) အဆင့်မြင့်နည်းပညာနှင့် ကျွမ်းကျင်မှုဆိုင်ရာ မလိုအပ်သော လုပ်ငန်းများတွင် နိုင်ငံသားများကိုသာ ခန့်ထားပါမည်။ (ပုဒ်မ ၇၄ အရ)

(င) အဆင့်မြင့်နည်းပညာနှင့် ကျွမ်းကျင်မှုဆိုင်ရာ လိုအပ်သော လုပ်ငန်းများတွင် နိုင်ငံသားကျွမ်းကျင်သူ အလုပ်သမားများ၊ အတတ်ပညာရှင်များနှင့် ဝန်ထမ်းများကို -

(၁) လုပ်ငန်းစတင်သည့်နှစ်မှ ပထမ ၂ နှစ်အတွင်း၌ အနည်းဆုံး ၂၅ ရာခိုင်နှုန်း၊

(၂) လုပ်ငန်းစတင်သည့်နှစ်မှ ဒုတိယ ၂ နှစ်အတွင်း၌ အနည်းဆုံး ၅၀ ရာခိုင်နှုန်း၊

(၃) လုပ်ငန်းစတင်သည့်နှစ်မှ တတိယ ၂ နှစ်အတွင်း၌ အနည်းဆုံး ၇၅ ရာခိုင်နှုန်း၊

ခန့်ထားပါမည်။ (ပုဒ်မ ၇၅ အရ)

(စ) မိမိနှင့် အလုပ်သမား၊ အတတ်ပညာရှင် သို့မဟုတ် ဝန်ထမ်းတို့အကြား အငြင်းပွားမှု ပေါ်ပေါက်ပါက စီမံခန့်ခွဲမှုကော်မတီ၏ စေ့စပ်ညှိနှိုင်းခြင်းနှင့် ဖြန်ဖြေခြင်းကို ခံယူပါမည်။ (ပုဒ်မ ၇၆(က) အရ)

(ဆ) မိမိခန့်ထားမည့် နိုင်ငံခြားသားဝန်ထမ်းများအတွက် ထားဝယ်အထူးစီးပွားရေးဇုန်အတွင်း ဖွင့်လှစ်ထားသည့် အလုပ်သမားကိုယ်စားလှယ်ရုံးက ထုတ်ပေးသည့် အလုပ်လုပ်ခွင့် ပါမစ်ကို ရယူပါမည်။ (ပုဒ်မ ၇၇ အရ)

(ဇ) နိုင်ငံခြားသားဝန်ထမ်းကို သတ်မှတ်ထားသည့် အရေအတွက်ထက် ပိုမို ခန့်ထားလိုပါက စီမံခန့်ခွဲမှုကော်မတီ၏ ခွင့်ပြုချက်ရရှိမှသာ ခန့်ထားပါမည်။ (ပုဒ်မ ၇၈ အရ)

(ဈ) အသုံးပြုခွင့်ရရှိထားသည့် စီမံကိန်းမြေပေါ်တွင် လူနေအိမ်ခြေများ၊ အဆောက်အအုံများ၊ လယ်ယာဥယျာဉ်ခြံမြေများ၊ သီးပင်စားပင်များ၊ စိုက်ခင်းများ၊ ပြောင်းရွှေ့ရှင်းလင်းပေးရန် လိုအပ်ပါက ထိုသို့ပြောင်းရွှေ့နေရာချထားခြင်းနှင့် လျော်ကြေးပေးခြင်းတို့အတွက် ကုန်ကျစရိတ်များကို ချုပ်ဆိုထားသည့် သဘောတူညီချက်နှင့်အညီ ကျခံပါမည်။ (ပုဒ်မ ၈၀(က) အရ)

(ည) ပြောင်းရွှေ့ရသူများအတွက် မူလအဆင့်အတန်းထက် မနိမ့်ကျစေရန်၊ ယင်းတို့၏အခြေခံ လိုအပ်ချက်များ ပြည့်စုံစေရန်နှင့် အဆိုပါလုပ်ငန်းများ အဆင်ပြေချောမွေ့စေရန် စီမံခန့်ခွဲမှု ကော်မတီနှင့် ညှိနှိုင်းဆောင်ရွက်ပါမည်။ (ပုဒ်မ ၈၀(ခ) အရ)

(ဋ) အသုံးပြုခွင့်ရရှိသော စီမံကိန်းမြေကို သတ်မှတ်ထားစည်းကမ်းချက်များနှင့်အညီ အသုံးပြု ပါမည်။ (ပုဒ်မ ၈၀(ဂ) အရ)

(ဌ) အသုံးပြုခွင့်ရရှိသော စီမံကိန်းမြေ၏ သဘာဝမြေမျက်နှာသွင်ပြင် သို့မဟုတ် မြေ အနိမ့် အမြင့် အနေအထားကို စီမံခန့်ခွဲမှုကော်မတီ၏ ခွင့်ပြုချက်မရှိဘဲ သိသာထင်ရှားစွာ ပြုပြင် ပြောင်းလဲခြင်းမပြုပါ။ (ပုဒ်မ ၈၀(ဃ) အရ)

(ဍ) အသုံးပြုခွင့်ရရှိသော စီမံကိန်းမြေ၏ မြေပေါ်သို့မဟုတ် မြေအောက်၌ မိမိအားခွင့်ပြုသည့် လုပ်ငန်းနှင့် မသက်ဆိုင်သည့် သဘာဝသယံဇာတ တွင်းထွက်ပစ္စည်းကိုဖြစ်စေ၊ ရှေးဟောင်းဝတ္ထုပစ္စည်းကို ဖြစ်စေ၊ ရတနာသိုက်ကိုဖြစ်စေ တွေ့ရှိလျှင် စီမံခန့်ခွဲမှုကော်မတီ သို့ ချက်ချင်းအကြောင်းကြားပါမည်။ ထို့ပြင် စီမံခန့်ခွဲမှုကော်မတီက အစားထိုးစီစဉ်ပေးသည့် နေရာသို့ ပြောင်းရွှေ့ဆောင်ရွက်ပါမည်။ (ပုဒ်မ ၈၅ အရ)

၃၁။ မြန်မာနိုင်ငံအင်ဂျင်နီယာကောင်စီဥပဒေ (၂၀၁၃)

စီမံကိန်းပိုင်ရှင်သည် -

(က) အင်ဂျင်နီယာဆိုင်ရာလုပ်ငန်းနှင့် နည်းပညာဆိုင်ရာ လုပ်ငန်းများကို ကောင်စီကထုတ်ပေး သော မှတ်ပုံတင်လက်မှတ် ရရှိထားသည့် အင်ဂျင်နီယာများကိုသာ ခန့်အပ်ဆောင်ရွက်စေ ပါမည်။ (ပုဒ်မ ၃၇ အရ)

(ခ) အင်ဂျင်နီယာဝန်ထမ်းများက မှတ်ပုံတင်လက်မှတ်ပါ စည်းကမ်းချက်များကို လည်းကောင်း၊ မြန်မာနိုင်ငံအင်ဂျင်နီယာ ကောင်စီဥပဒေပါ ပြဋ္ဌာန်းချက်များကို လည်းကောင်း၊

ယင်းဥပဒေအရ ထုတ်ပြန်သည့် နည်းဥပဒေများ၊ အမိန့်နှင့် ညွှန်ကြားချက် တို့ပါ
တားမြစ်ချက်များကို လည်းကောင်း လိုက်နာစေရပါမည်။ (ပုဒ်မ ၃၄ အရ)

၃၂။ **တနင်္သာရီတိုင်းဒေသကြီး စည်ပင်သာယာရေးအဖွဲ့များ ဥပဒေ**

စီမံကိန်းပိုင်ရှင်သည် မြို့နယ်စီမံကိန်း ပြုလုပ်ရာတွင် ထွက်ပေါ်လာသည့် အညစ်အကြေး စွန့်ပစ်ခြင်းနှင့် မြို့နယ်အဖြစ် ဆက်လက်အသုံးပြုရာတွင် ထွက်ပေါ်လာနိုင်သည့် အညစ်အကြေး စွန့်ပစ်ခြင်းတို့နှင့် စပ်လျဉ်းသည့် သတ်မှတ်ချက်များကို လိုက်နာဆောင်ရွက်ပါမည်။

၃၃။ **မြန်မာ့ဆိပ်ကမ်းအာဏာပိုင်ဥပဒေ (၂၀၁၅)**

စီမံကိန်းပိုင်ရှင်သည် ဆိပ်ကမ်းနယ်နိမိတ်အတွင်း ကမ်းပါးနယ်နှင့် ကုန်းမြေမှ ဘေးအန္တရာယ် ဖြစ်စေတတ် သော ပစ္စည်းများ၊ အဆိပ်သင့်ပစ္စည်းများ၊ အမှိုက်သရိုက်များ၊ အညစ်အကြေးများနှင့် စွန့်ပစ်ပစ္စည်းများကို ရေထုအတွင်း ပြစ်ချခြင်းမပြုရန် ဆိပ်ကမ်းအာဏာပိုင်၏ စီမံချက်နှင့်အညီ လိုက်နာဆောင်ရွက်ပါမည်။ (ပုဒ်မ ၂၃(က) အရ)

၃၄။ **ပို့ကုန်သွင်းကုန်ဥပဒေ (၂၀၁၂)**

စီမံကိန်းပိုင်ရှင်သည် ပြည်ပမှပစ္စည်းများ တင်သွင်းပါက ခွင့်ပြုချက်ပါ စည်းကမ်းချက်များအတိုင်း လိုက်နာပါမည်။ (ပုဒ်မ ၇ အရ)

လက်မှတ်...

Dr. Somchet Thinaphong

မန်နေးဂျင်းဒါရိုက်တာ

ထားဝယ်ေဂဟာကုမလဏီလစ္မတ္တက်

Applicable Laws and Legal Commitments for Initial Township Project in Dawei Special Economic Zone

No.	Legislation	Proposes	To be implemented legal commitments
1.	The Environmental Conservation Law (2012)	To construct a healthy and clean environment and to conserve natural and cultural heritage for the benefit of present and future generations and to maintain the sustainable development through effective management of natural resources and to enable to promote international, regional and bilateral cooperation in the matters of environmental conservation.	• The Project Proponent has to pay the compensation for damages if the project will causes injuries to environment under the sub-section (o) of section 7 of said law. • The Project Proponent has to purify, emit, dispose and keep the polluted materials in line with the stipulated standards, under section 14 of said law • The Project Proponent has to install or use the apparatus which can control or help to reduce, manage, control or monitor the impacts on the environment, under section 15 of said law. • The Project Proponent has to allow relevant governmental organization or department to inspect whether performing is conformity with the terms and condition included in prior permission, stipulated by the ministry, or not, under section 24 of said law. • The Project Proponent has to comply with the terms and conditions included in prior permission, under section 25 of said law. • The Project Proponent has to abide by the stipulations included in the rules, regulation, by-law, order, notification and procedure issued by said law, under section 29.
2.	The Environmental Conservation Rules (2014)		• The Project Proponent has to avoid emit, discharge or dispose the materials which can pollute to environment, or hazardous waste or hazardous material prescribed by notification in the place where directly or indirectly injure to public under sub- rule (a) of rule 68. • The Project Proponent has to avoid performing to damage to ecosystem and the environment generated by said ecosystem under sub-rule (b) of rule 68.
3.	Environment Impact Assessment Procedure (2015)		• The Project Proponent has to be liable for all adverse impacts caused by doing or omitting of project owner or contractor, sub-contractor, officer, employee, representative or consultant who is appointed or hired to perform on behalf of project owner, under sub-paragraph (a) of paragraph 102. • The Project Proponent has to support, after consultation with effected persons by project, relevant government organization, government department and other related persons, to resettlement and rehabilitation for livelihood until the effected persons by the project receiving the stable socio-economy which is not lower than the status in pre-project, under sub-paragraph (b) of paragraph 102. • The Project Proponent has to fully implement all commitments of project and conditions included in EMP. Moreover the Project Proponent has to be liable for contractor and sub-contractor who perform on behalf of

Applicable Laws and Legal Commitments for Initial Township Project in Dawei Special Economic Zone

No.	Legislation	Proposes	To be implemented legal commitments
			him/her have to fully abide by the relevant laws, rules, this procedure, EMP and all conditions, under paragraph 103. • The Project Proponent has to be liable and fully & effectively implement all requirements included in ECC, relevant laws and rules, this procedure and standards under rule 104. • The Project Proponent has to inform the completed information, after specifying the adverse impacts caused by the project, from time to time, under paragraph 105. • The Project Proponent has to continuously monitor all adverse impacts in the pre-construction phrase, construction phrase, operation phrase, suspension phrase, closure phrase and post-closure phrase, moreover has to implement the EMP with abiding the all conditions included in ECC, relevant laws & rules and this procedure, under paragraph 106. • The Project Proponent has to submit, as soon as possible, the failures of his or her responsibility, other implementation, ECC or EMP. If dangerous impact caused by this failure or failure should be known by the Ministry the Project Proponent has to submit within 24 hours and other than this situation has to submit within 7 days from knowing it, under paragraph 107. • The Project Proponent has to submit the monitoring report dually or prescribed time by Ministry in line with the schedule of EMP, under paragraph 108. • The Project Proponent has to prepare the monitoring report in accord with the rule 109. • The Project Proponent has to show this monitoring report in public place such as library, hall and website and office of project for the purpose to know this report by public within 10 days from the date which the report is submitted to the Ministry. Moreover, has to give the copy of this report, by email or other way which way agreed with the asked person, to any asked person or organization, under paragraph 110. • The Project Proponent has to allow inspector to enter and inspect in working time and if it is needed by Ministry has to allow inspector to enter and inspect in the office and work-place of project and other work-place related to this project in any time, under paragraph 113. • The Project Proponent has to allow inspector to immediately enter and inspect in any time if it is emergency or failure to implement the requirements related to social or environment or caused to it, under paragraph 115. • The Project Proponent has to allow inspector to inspect the contractor and sub-contractor who implement on behalf of project, under paragraph 117.

Applicable Laws and Legal Commitments for Initial Township Project in Dawei Special Economic Zone

No.	Legislation	Proposes	To be implemented legal commitments
4.	Emission Quality Standards Guideline (2015)		• The Project Proponent has to emit, discharge or dispose in line with the standards stipulated in said guideline.
5.	The Myanmar Investment Law (2016)	To ensure the appointing of employees, fulfilling the rights of employees, avoiding any injury to environment, social and cultural heritage, insure the prescribed insurance in line with the above law.	• The Project Proponent has to lease the land or building owned by government or private with lease agreement and register it by the registration of deeps law under sub- section (a) and (d) of section 50 of said law. • The Project Proponent has to appoint the nationalities in the various levels of administrative, technical and expert work by the arrangement to develop their expertise, in line with the sub-section (b) of section 51 of said law. • The Project Proponent has to appoint the nationalities only in normal work without expertise, in line with the sub-section (c) of section 51 of said law. • The Project Proponent has to appoint either foreigner or nationality with the appointment agreement in accord with the law, in line with the sub-section (d) of section 51 of said law. • The Project Proponent has to comply with the international best practices, existing laws, rules and procedures to not damage, pollute, and injure to environment, cultural heritage and social, in line with the sub-section (g) of section 65 of said law. • The Project Proponent has to close the project after paying the compensation to the employees in accord with the existing laws if violates the appointment agreement or terminate, transfer or suspend the investment or reduce the number of employees, in line with the sub-section (i) of section 65 of said law. • The Project Proponent has to pay the wages or salary to the employees in accord with the laws, rules, order and procedures in the suspension period, in line with the sub-section (j) of section 65 of said law. • The Project Proponent has to pay the compensation or injured fees to the respected employees or their inheritors if injury in or loss of part of body or death caused by work, in line with the sub-section (k) of section 65 of said law. • The Project Proponent has to stipulate the foreign employees to respect the culture and custom and abide by the existing laws, rules, orders, directives, in line with the sub-section (l) of section 65 of said law. • The Project Proponent has to abide by labour laws, in line with the sub-section (m) of section 65 of said law.

Applicable Laws and Legal Commitments for Initial Township Project in Dawei Special Economic Zone

No.	Legislation	Proposes	To be implemented legal commitments
			• The Project Proponent has to pay the compensation to the injured person for damages if damages of environment or socio-economy is occurred by misuse of project, in line with the sub-section (o) of section 65 of said law. • The Project Proponent has to allow to inspect in anywhere of project if Myanmar Investment Commission inform to inspect the project, in line with the sub-section (p) of section 65 of said law. • The Project Proponent has to obtain the permission of MIC before EIA process and report back this process to MIC, in line with the sub-section (q) of section 65 of said law. • The Project Proponent has to insure the prescribed insurance by rules, under section 73 of said law.
6.	Protection the Rights of National Races Law (2015)	To ensure to disclose to residents ethnic nationalities about the project fully, moreover to ensure to cooperate with them.	• The Project Proponent has to disclose to the residents national races all about the project fully, under section 5 of said law. • The Project Proponent has to cooperate with the residents national races.
7.	The Public Health Law (1972)	To ensure the public health include not only employees but also resident people and cooperation with the authorized person or organization of health department.	• The project owner will cooperate with the authorized person or organization in line with the section 3 and section 5 of said law. • The Project Proponent has to abide by any instruction or stipulation for public health, under section 3 of said law. • The Project Proponent has to allow any inspection, anytime, anywhere if it is needed, under section 5 of said law.
8.	Prevention and Control of Communicable Diseases Law (1995)	To ensure the healthy work environment and prevention the communicable diseases by the cooperation with the relevant health department.	• The Project Proponent has to build the housing in line with the health standards, distribute the healthful drinking water & using water and arrange to systematically discharge the garbage & sewage, under clause (9) of sub-section (a) of section 3 of said law. • The Project Proponent has to abide by any instruction or stipulation by Department of health and Ministry of Health, under section 4 of said law. • The Project Proponent has to inform promptly to the nearest health department or hospital if the following are occurred: (section 9) (a) Mass death of animals included in birds or chicken; (b) Mass death of mouse;

Applicable Laws and Legal Commitments for Initial Township Project in Dawei Special Economic Zone

No.	Legislation	Proposes	To be implemented legal commitments
			(c) Suspense of occurring of communicable disease or occurring of communicable disease; (d) Occurring of communicable disease which must be informed. • The Project Proponent has to allow any inspection, anytime, anywhere if it is needed to inspect by health officer, under section 11 of said law.
9.	The Control of Smoking and Consumption of Tobacco Product Law (2006)	To ensure the creation of smoking area and non-smoking area in the power plant area for health and control of smoking.	• The Project Proponent has to keep the caption and mark referring that is non- smoking area in the project area, under sub-section (a) of section 9 of said law. • The Project Proponent has to arrange the specific place for smoking in the project area and keep the caption and mark in accordance with the stipulations, under sub-section (b) of section 9 of said law. • The Project Proponent has to supervise and carry out the measures so that no one shall smoke at the non-smoking area, under sub-section (c) of section 9 of said law. • The Project Proponent has to allow the inspection of supervisory body in the township area, under sub-section (d) of section 9 of said law.
10.	The Myanmar Fire Force Law (2015)	To ensure to prevent the fire, to provide the precautionary material and apparatuses, if the fire caused in the project area to be defeated because the project is business in which electricity and any inflammable materials such as petroleum are used. So, the project owner has to institute the specific fire service in line with the above law.	• The Project Proponent has to institute the specific fire services, under sub-section (a) of section 25 of said law. • The project owner has to provide materials and apparatuses for fire precaution and prevention, under Sub-section (b) of section 25 of said law.
11.	The Motor Vehicles law (2015) and Rules (1987)	When the construction period and if it is needed in operation and production period for the all vehicles.	• The Project Proponent has to promise to abide by the nearly all provisions of said law and rules, especially the provisions related to air pollution, noise pollution and life safety.
12.	The Myanmar Insurance Law	The project can cause the damages to the environment and injuries to public	• If the Project Proponent uses the owned vehicles the project owner has to insure the insurance for injured person, under section 15 of said law.

Applicable Laws and Legal Commitments for Initial Township Project in Dawei Special Economic Zone

No.	Legislation	Proposes	To be implemented legal commitments
		so to ensure the needed insurances are insured at Myanmar Insurance.	• The Project Proponent has to insure the insurance to compensate for general damages because the project may cause the damages to the environment and injury to public, under section 16 of said law.
13.	Labour Organization Law (2011)	To ensure protection the rights of the employees, having the good relationships between the employees and employer and enabling to form and carry out the labour organizations systematically and independently.	• The project owner has to allow the labour organization to negotiate and settle with the employer if the workers are unable to obtain and enjoy the rights of the workers contained in the labour laws and to summit demands to the employer and claim in accord with the relevant law if the agreement cannot be reached, under section 17 of said law. • The Project Proponent has to allow the demand for the re-appointment of worker who is dismissed by the employer without the conformity with the labour laws, under section 18. • The Project Proponent has to send the representatives to the Conciliation Body in settling a dispute between the employer and the worker, under section 19 of said law. • The Project Proponent has to allow the labour organization to participate and discuss in discussing with the government, the employer and the complaining employees in respect of employee's rights or interest contained in the labour laws, under section 20 of said law. • The Project Proponent has to allow the labour organization to participate in solving the collective bargains of the employees in accord with the labour laws, under section 21 of said law. • The Project Proponent has to allow the labour organization to carry out the holding the meetings, going on strike and other collective activities in line with the procedure, regulation,by-law and directive of relevant Chief Labour Organization, under section 22 of said law.
14.	The Settlement of Labour Dispute Law,2012	To ensure negotiation and discussion between employees and Project Proponent, abiding the decision of Tribunal.	• The Project Proponent has to not absent to negotiation within the stipulated time for complaint, under section 38 of said law. • The Project Proponent has to not change the existing stipulations for employees within conducting period before Tribunal, under section 39 of said law. • The Project Proponent has to not close the work without negotiation, discussion on dispute in accord with this law, decision by Tribunal, under section 40 of said law. • The Project Proponent has to pay the compensation decided by Tribunal if violates any act or any omission to damage the interest of labour by reducing of product without efficient cause, under section 51 of said Law.

Applicable Laws and Legal Commitments for Initial Township Project in Dawei Special Economic Zone

No.	Legislation	Proposes	To be implemented legal commitments
15.	Employment and Skill Development Law (2013)	To ensure the job security and to develop the employee's skill with the fund of project owner.	• The Project Proponent has to appoint employees with the contract in line with the provision of section 5 of said law. • The Project Proponent has to carry out the training programs with the policy of Skill Development Body to develop the employment skill of employees who is appointed or will be appointed, under section 14 of said law. • The Project Proponent has to monthly pay to the fund, which is fund for development of skill of employees, not less below 0.5 percentage of the total payment to the level of worker supervisor and the workers below such level, under sub-section (a) of section 30 of said law. • The Project Proponent has to deduct from the payment of employees for above mentioned fund, under sub-section (b) of section 30 of said law.
16.	The Minimum Wages Law (2013)	To ensure the project owner pay the wages not less than prescribed wages and notify obviously this wages in work place, moreover to be inspected.	• The Project Proponent has to pay the wages in line with section 12 of said law. • The Project Proponent has to notify the prescribed wages obviously in work place, under sub-section (a) of section 13 of said law. • The Project Proponent has to correctly record the lists, schedules, documents and wages and report these to the relevant department and give if these are asked while inspecting, in accord with the stipulations, under sub-section (b) (c) (d) of section 13 of said law. • The Project Proponent has to allow to be inspected by the inspector, under sub-section (d) and (e) of section 13 and section 18 of said law. • The Project Proponent has to allow holiday for medical treatment if the employee' health is not fit to work, under sub-section (f) of section 13 of said law. • The Project Proponent has to allow holidays without deducting from the wages if one of parents or one of family dies, under sub-section (g) of section 13 of said law.
17.	Payment of Wages Law (2016)	To ensure the way of payment and avoiding delay payment to the employees.	• The Project Proponent has to pay the wages in accord with the section 3 and 4 of said law, under section 3 & 4 of said law. • The Project Proponent has to submit with the agreements of employees & reasonable ground to department if it is difficult to pay because of force majeure included in natural disaster, under section 5 of said law.

Applicable Laws and Legal Commitments for Initial Township Project in Dawei Special Economic Zone

No.	Legislation	Proposes	To be implemented legal commitments
			• The Project Proponent has to abide by the provisions of section 7 to 13 in chapter (3) in respect of deduction from wages. • The Project Proponent has to pay the overtime fees, prescribed by law, to the employees who work over working hours, under section 14 of said law.
18.	Workmen's Compensation Act (1923)	To ensure the compensations to injured employee while implementing in line with the above law. To pay the prescribed compensations in various kinds of injury.	• The Project Proponent has to pay the compensation in line with the provisions of said law base on kind of injury and case by case.
19.	The Leaves and Holiday Act (1951)	The employees can take the leaves and get the holidays legally and to ensure the right to get the holidays and leaves.	• The Project Proponent has to allow the leaves and holidays in line with the law.
20.	Social Security Law	The Project Proponent has to create the social security for the employees because the project is the business under the Myanmar Citizen Investment Law. To ensure the social security for employees of the project, the project owner has to register to the social security offices and to pay the prescribed fund.	• The Project Proponent has to register to the respected social security office, under sub-section (a) of section 11 of said law • The Project Proponent has to pay the social security fund for at least four types of social security included in sub-section (a) of section 15, under section 15 of said law. • The Project Proponent has to pay the fund which has to be paid itself and together with the fund which has to be paid from their salary by the employees. Moreover, the project owner will pay the cost for paying the above mentioned fund only itself under sub-section (b) of section 18 of said law. • The Project Proponent has to pay the fund for accidence, under sub-section (b) of section 48 of said law. (But this fund is not related to workmen compensation) • The Project Proponent has to make correctly and submit the list and record provided in section 75 to respected social security office, under section 75 of said law.
21.	Petroleum Act (1934)	The project will carry the oil in any phase and may import it. So, to ensure to take the license for importation and	• The Project Proponent has to obtain the license for importation, transportation and storage of the fuel under section 3 of said law and abide by the stipulations in the license.

Applicable Laws and Legal Commitments for Initial Township Project in Dawei Special Economic Zone

No.	Legislation	Proposes	To be implemented legal commitments
		storage and abide by the stipulations in the license.	
22.	The Petroleum Rules (1937)	To ensure the project owner has to abide by the stipulations for transportation of oil.	• The Project Proponent will abide by the provision of chapter (3) of the Petroleum Rules for transportation and the provisions of chapter (4) of said rules for storage.
23.	The Underground Water Act (1930)	To ensure to obtain the license before sinking the groundwater if it is needed to sink the ground water.	• The Project Proponent has to obtain the license granted by the water officer for sinking the underground water before sinking water, under section 3 of said law
24.	Conservation of Water Resources and Rivers Law (2006)	The Project Proponent will avoid the disposal of stipulated materials into river-creek.	• The Project Proponent has to avoid any performing to damage to the river, creek and water resource, under sub-section (a) of section 8 of said law. • The Project Proponent has to avoid the violation of conditions stipulated by the directorate for prevention of water pollution, under sub-section (b) of section 24 of said law.
25.	Freshwater Fisheries Law (1991)	According to the sub-section (e) of section 2 of said law, the freshwater area includes any river, creek, pond and water area so the project will be near by the river or creek which is freshwater area the safety of freshwater and aquatics.	• The Project Proponent has to avoid any water pollution and disturbing to fish &other aquatic lives in any fresh-water such as river or creek, under section 40 of said law.
26.	Myanmar Marine Fishery Law (1990)	According to the sub-section (f) of section 2 of said law, the Myanmar marine fishery water area includes the water area along the sea cost of Myanmar from the high tide mark toward the open sea and on the seaside of the straight line drawn from one extreme end of one bank to the extreme end of the other bank of the river and creek mouths so the project will be nearby Myanmar marine water	• The Project Proponent has to avoid any water pollution and disturbing to fish &other aquatic lives in any Myanmar marine-water under section 39 of said law.

Applicable Laws and Legal Commitments for Initial Township Project in Dawei Special Economic Zone

No.	Legislation	Proposes	To be implemented legal commitments
		area, river or creek which is freshwater area.	
27.	The Protection and Preservation of Cultural Heritage Regions Law (1998)	To ensure the protection of cultural heritages and the cultural heritage area from the damage by the natural disaster or man-made.	• The Project Proponent has to apply to get the prior permission of Directorate of Ancient-Research to build the road, bridge or dam in the cultural heritage area, under section 13 of said law. • The Project Proponent promises not to build the building which is not in line with the stipulations prescribed by the Ministry of Culture in the cultural heritage area.
28.	The Protection and Preservation of Antique Objective Law (2015)	To ensure the protection of ancient monument and information about it if it was in the project area.	• The Project Proponent has to inform to the village-tract or ward administrator if any antique objective is found in project area under section 12 of said law.
29.	The Protection and Preservation of Ancient Monument Law (2015)	To ensure the protection of ancient monument and information about it if it is in the project area.	• The Project Proponent has to report to the village-tract or ward administrators if the Project Proponent will find any ancient monument under the ground or on the ground or under the water under section 12 of said law. • The Project Proponent has to obtain the prior permission of Department of Ancient Research Museum if the project area is in the prescribed area of Ancient monument under section 15 of said law. • The Project Proponent has to obtain the prior permission, by written, of Department of Ancient Research and National Museum if the Project Proponent dispose the chemical and solid waste in the Ancient Monument area under sub-section of section 20 of said law.
30.	The Forest Law (1992)	To sustain forest resources and ensure perpetual supply of benefits from forest for next generation and to protect soil, water, wildlife, biodiversity and environment	• Under sub-section (a) of section 12, the Project Proponent has to obtain the approval of Ministry if the project area is included in the forest land or the land administrated by the government which covers the forest under section 1 of said law.
31.	The Special Economic Zone Law (2014)	The project locates in Dawei special economic zone. According to section 89 of said law the project has to abide by said law so to ensure the responsibilities of Project Proponent.	• The Project Proponent has to abide by the any stipulation included in the notification, order, directive and procedure issued by special economic zone administrative committee, under sub-section (f) of section 11 of said law. • The Project Proponent has to comply with the stipulations of SEZ administrative committee, under sub-section (p) of section 11 of said law.

Applicable Laws and Legal Commitments for Initial Township Project in Dawei Special Economic Zone

No.	Legislation	Proposes	To be implemented legal commitments
			• The Project Proponent has to abide by the standards included in the environmental conservation law and international standards, moreover has to abide by the existing laws to not injure to social and health, under section 35 of said law. • The Project Proponent has to appoint the nationalities only for normal work without expertise, under section 27 of said law. • The Project Proponent has to appoint the nationalities in the high- technical work and expert work at least 25 % in first two years later the date which is commencement of project, and at least 50% in second two years later, and at least 75% in third two years later, under section 75 of said law. • The Project Proponent has to abide by the negotiation by the administrative committee if the dispute, between employees and me, is occurred, under sub-section (a) of section 76 of said law. • The Project Proponent has to obtain the work permit for foreign employees issued by representative office of labour department before starting to work, under section 77 of said law. • The Project Proponent has to obtain the approval of administrative committee before appointment if it is needed to appoint the foreign employees in administrative and technical work over the limited numbers, under section 78 of said law. • The Project Proponent has to pay the cost for compensation and resettlement for project land if housing, buildings, farm, garden, fruit trees or other plantation is in the project area, in accord with the agreement, under sub-section (a) of section 80. • The Project Proponent has to coordinate with the administrative committee to facilitate in resettlement process for to not low the original living standards and fulfill their basic needs, under sub-section (b) of section 80 of said law. • The Project Proponent has to use the project land in accord with the stipulations under sub-section (C) of section 80 of said law. • The Project Proponent do not change the physical features of land without the approval of administrative committee, under sub-section (d) of section 80 of said law. • The Project Proponent has to inform to the administrative committee if any antique objective or any natural resource or treasure trove is found on or under the land in project area, moreover has to move to the replaced land for project if the original land cannot be allowed to continue the project, under sub-section (e) of section 80 of said law.

Applicable Laws and Legal Commitments for Initial Township Project in Dawei Special Economic Zone

No.	Legislation	Proposes	To be implemented legal commitments
32.	The Engineering Council Law (2013)	To ensure the safety in technical and engineering work in the project.	• The Project Proponent has to appoint the employees, who obtained the registration certificate issued by the Myanmar Engineering Council, in the technical and engineering work, under section 37 of said law. • The Project Proponent has to ensure the employees who are engineers abide to the provisions of Myanmar Engineering Council law, prohibitions included in the rules, order and directive issued under said law, conditions included in the registration certificate issued by the Myanmar engineering council, under section 34 of said law.
33.	Myanmar Port Authority Law (2015)	To abide by the conditions included in permit if it is needed to import the material for project and export products from the project.	• The Project Proponent has to abide by the conditions included in permit, under section 7 of said law.

Signed...

Dr. Somchet Thinaphong

Managing Director

Dawei Residence Company Limited

ကနဦးမြို့နယ်စီမံကိန်းအတွက် စီမံကိန်း အဓိက ကတိပြုချက်များ

စဉ်	ခေါင်းစဉ်	ကတိကဝတ်များ
အခန်း (၃) ဥပဒေ၊ နည်းဥပဒေနှင့် မူဘောင်များ		
၁	စီမံကိန်းတခုလုံး အတွက် စီမံခန့်ခွဲမှု	မြန်မာနိုင်ငံ၏ဖွဲ့စည်းပုံအခြေခံဥပဒေ အမှတ် ၁/၂၀၀၈ ပုဒ်မ ၄၅ နှင့် ပုဒ်မ ၃၉၀ တွင် ပြဋ္ဌာန်းထားသည့်အတိုင်း သဘာဝပတ်ဝန်းကျင်၊ လူသားအရင်းအမြစ်ဖွံ့ဖြိုးတိုးတက်မှုနှင့် အများပြည်သူပိုင်ပစ္စည်းများ မပျက်စီးစေရန် ကာကွယ်ရန်နှင့် ထိမ်းသိမ်းစောင့်ရှောက်ရန် ကတိပြုသည်။
		၂၀၁၆ ခုနှစ် ရင်းနှီးမြှုပ်နှံမှုဥပဒေ ပုဒ်မ ၃၅ အရ စီမံကိန်းအတွက် ရင်းနှီးငွေရှာဖွေရန်လိုအပ်ပြီး ဒေသအတွက် မဟာဗျူဟာ ကျသောကြောင့် ရင်းနှီးမြှုပ်နှံမှုအတွက် ခွင့်ပြုချက်ရယူရန် ကတိပြုသည်။
၂	EIA လေ့လာမှု	ပတ်ဝန်းကျင်ထိမ်းသိမ်းရေးဥပဒေ (၂၀၁၂) အမှတ် ၉/၂၀၁၂ ပုဒ်မ ၄၂ (ခ) နှင့် ရင်းနှီးမြှုပ်နှံမှုဥပဒေ ပုဒ်မ ၇၂ အရ လိုအပ်ချက် အတိုင်း EIA လေ့လာမှု ပြုလုပ်သည်။
		EIA လေ့လာမှုအား ပတ်ဝန်းကျင်ဆိုင်ရာအကျိုးသက်ရောက်မှုအကဲဖြတ်မှုအတွက် လမ်းညွှန်ချက်များ (၂၀၁၄)၊ လုပ်ထုံးလုပ်နည်း (၂၀၁၅) တို့နှင့် ကိုက်ညီစွာ လုပ်ဆောင်မည်ဟု ကတိပြုသည်။
		စီမံကိန်းဖော်ဆောင်သည့်အချိန် EIA, IEE နှင့် EMP အချိန်အတွင်း လုပ်ငန်းလုပ်ဆောင်မှုအားလုံးအတွက် ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း ဆိုင်ရာလုပ်ထုံးလုပ်နည်း (၂၀၁၅) နောက်ဆက်တွဲ (က) နှင့် ကိုက်ညီစေရန် ကတိပြုသည်။
		ပတ်ဝန်းကျင်ဆိုင်ရာအကျိုးသက်ရောက်မှုအကဲဖြတ်ချက်အစီခံစာတွင် လုပ်ဆောင်ရမည့်အချက်များ၊ ပတ်ဝန်းကျင် လူမှုအသိုင်းအဝန်းနှင့် ကျန်းမာရေး အကျိုးသက်ရောက်မှုလျှော့ချရန်နည်းလမ်းမျိုးစုံ၊ ပတ်ဝန်းကျင်စီမံခန့်ခွဲရေးပရိုဂရမ်၊ သက်ဆိုင်ရာလုပ်ငန်းခွဲများ၊ ထိမ်းချုပ်ကွပ်ကဲမှုနည်းလမ်းများနှင့် အားလုံး ကိုက်ညီစွာ ဆောင်ရွက်ရန် ကတိပြုသည်။
၃	ထုတ်လွှတ်မှုအတွက် လိုက်နာမှုများ	လေထုညစ်ညမ်းမှု နည်းနိုင်သမျှနည်းစေရန်၊ တားဆီးရန် သို့မဟုတ် လျှော့ချရန်နှင့် အထူးစီးပွားရေးဇုန်ဥပဒေ ပုဒ်မ ၃၅ တွင် ဖော်ပြထားသည့်အတိုင်း ပြဋ္ဌာန်းထားသော မြန်မာနိုင်ငံ ပတ်ဝန်းကျင်ဆိုင်ရာ အရည်အသွေးစံချိန်စံညွှန်းများ သို့မဟုတ် နိုင်ငံတကာစံချိန်စံညွှန်းများနှင့် ကိုက်ညီစေရန် လုပ်ထုံးလုပ်နည်း၊ အလေ့အထ၊ နည်းလမ်းများ ဖော်ဆောင်ပြီး လေထုညစ်ညမ်းမှု ကာကွယ်ရန် ကတိပြုသည်။
		အောက်ပါ ပြဌာန်းချက်များတွင် ပါဝင်သည့် စံချိန်စံညွှန်းများနှင့် ကိုက်ညီရန် ကတိပြုသည်။ နိုင်ငံတော်ပတ်ဝန်းကျင်ဆိုင်ရာ အရည်အသွေး (ဖန်လုံအိမ်ဓာတ်ငွေ့ထုတ်လွှတ်မှု) လမ်းညွှန်၊ ကမ္ဘာ့ကျန်းမာရေးအဖွဲ့ (WHO)၊ အမေရိကန်နိုင်ငံပတ်ဝန်းကျင် ထိမ်းသိမ်းရေးအေဂျင်စီ (EPA)၊ ကမ္ဘာ့ဘဏ်နှင့် နိုင်ငံတကာဘဏ္ဍာရေးအဖွဲ့ (IFC)
	ပတ်ဝန်းကျင်နှင့် လူမှုရေး ဆိုင်ရာ လိုက်နာမှု	ဇယား ၃.၁-၃** ပါသက်ဆိုင်ရာဥပဒေနှင့် စည်းကမ်းများနှင့် ကိုက်ညီစွာ လုပ်ကိုင်ဆောင်ရွက်ရန် ကတိပြုသည်။
		စီမံကိန်းမှ ပတ်ဝန်းကျင်နှင့် လူမှုရေးဆိုင်ရာ အကျိုးသက်ရောက်မှုအကဲဖြတ်အစီခံစာတွင်

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ကနဦးမြို့နယ်စီမံကိန်းအတွက် စီမံကိန်း အဓိက ကတိပြုချက်များ

စဉ်	ခေါင်းစဉ်	ကတိကဝတ်များ
		ဖော်ပြထားသည့်အတိုင်း ကိုက်ညီမှုရှိစေရန် ကတိပြုသည်။ ထို့အပြင် ဆောက်လုပ်မှုအကြိုကာလ၊ ဆောက်လုပ်မှု၊ လုပ်ငန်းလည်ပတ်မှုနှင့် ပြီးဆုံးချိန်ကာလအတွင်း ပတ်ဝန်းကျင် ထိမ်းသိမ်းစောင့်ရှောက်ရေးနှင့် လူမှုရေးအကျိုးသက်ရောက်မှုများ၊ သက်ဆိုင်ရာဌာနများသို့ အစီရင်ခံစာပေးပို့ခြင်း မပျက်မကွက် ထိမ်းချုပ်ကွပ်ကဲ ဆောင်ရွက်ရန် ကတိပြုသည်။ ထို့အပြင်ပတ်ဝန်းကျင်၊ လူမှုအသိုင်းအဝိုင်း ပတ်သက်သောလှုပ်ရှားမှုများ ဆောင်ရွက်ရန်၊ ဖောက်ထွင်းမြင်သာစွာဖြင့် အများပြည်သူအကြေံပေးခြင်း ညှိနှိုင်းတိုင်ပင်ခြင်း ပြုလုပ်ရန်၊ ထိမ်းချုပ်ကွပ်ကဲမှုအစီရင်ခံစာတွင် ဖော်ပြရန်နှင့် DSEZ နှင့် MONREC သို့တင်ပြရန် ကတိပြုသည်။
၅	မြေယာပိုင်ဆိုင်မှု	စီမံကိန်းခွင့်ပြုချက်ပြုချက် ရယူရန် သက်ဆိုင်ရာ ဥပဒေများနှင့်အညီ မြေနှစ်ရှည်ငှားရမ်းပိုင်ခွင့် ရရှိရန် ၂၀၁၆ ခုနှစ် ရင်းနှီးမြှုပ်နှံမှု ဥပဒေ ပုဒ်မ ၅၁ (က) နှင့် (ခ) တွင် ပြဌာန်းထားသည့်အတိုင် ခွင့်ပြုချက်ရရှိပြီးနောက် ပထမဦးဆုံးမြေငှားရမ်းချိန်ကာလ ၅၀ နှစ်ထိ ငှားရမ်းရန် ကတိပြုသည်။
၅	ပြောင်းရွှေ့ခြင်း ပြန်လည်နေရာချခြင်း	ပြောင်းရွှေ့စရိတ်နှင့် လျော်ကြေးတို့အား ပြောင်းရွှေ့ရန်လိုအပ်သည့် ပစ္စည်းဥစ္စာ သဘောတူညီချက်များအတိုင်း ပေးဆောင်ရန်၊ လူပုဂ္ဂိုလ်များအား မူလလူနေမှုအဆင့်အတန်းထက် နိမ့်ကျမှုမရှိဘဲ ပြောင်းရွှေ့ရန်၊ ၂၀၁၁ ခုနှစ် အထူးစီးပွားရေးဇုန်ဥပဒေ ပုဒ်မ ၈၀ တွင် ပြဌာန်းထားသည့် အခြေခံလိုအပ်များ ဖြည့်ဆည်းပေးရန် ကတိပြုသည်။
အခန်း (၄) စီမံကိန်းဖော်ပြချက်နှင့် အခြားနည်းလမ်းများ		
၆	မြေရှင်းလင်းခြင်းနှင့် အကြိုဆောက်လုပ်ရေး	၁၉၉၂ ခုနှစ် သစ်တောဥပဒေ ပုဒ်မ ၁၂ နှင့် ပုဒ်မ ၂၃ ဆက်နွယ်မှုရှိသော သစ်တော သို့မဟုတ်သစ်တောအမျိုးအစားအားလုံး ထိမ်းသိမ်းစောင့်ရှောက်ရန် အလိုရှိသည့် လုပ်ငန်းဆောင်ရွက်ချက်များမစတင်မီ သက်ဆိုင်ရာအဖွဲ့အစည်းထံမှ ခွင့်ပြုချက် ရရှိရန် ကတိပြုသည်။
		၁၉၉၄ ခုနှစ် တောရိုင်းတိရစ္ဆာန်နှင့် သဘာဝဇရိယာထိမ်းသိမ်းမှု ကာကွယ်ရေးတွင် ပြဌာန်းထားသော တောရိုင်းတိရိစ္ဆာန်/ရှားပါးတိရိစ္ဆာန် သို့မဟုတ် သဘာဝပတ်ဝန်းကျင်နှင့် ဂေဟစနစ်ထိခိုက်မှုရှိသော အလိုရှိသည့် လုပ်ငန်းဆောင်ရွက်ချက်များမစတင်မီ သက်ဆိုင်ရာအဖွဲ့အစည်းထံမှ ခွင့်ပြုချက် ရယူရန် ကတိပြုသည်။
		၂၀၁၅ ခုနှစ် ရှေးဟောင်းအဆောက်အဦးများ ကာကွယ်ထိန်းသိမ်းရေးဥပဒေ ပုဒ်မ ၁၅ အရ ရှေးဟောင်းအဆောက်အဦး အစိတ်အပိုင်း တခုခုအား ပြောင်းရွှေ့ခြင်း ပြင်ဆင်ခြင်း တူးဖော်ခြင်း သို့မဟုတ် တိုးချဲ့ခြင်း မပြုလုပ်မီ သက်ဆိုင်ရာအေဂျင်စီထံမှ ခွင့်ပြုချက် ရယူရန် ကတိပြုသည်။
		၂၀၁၅ ခုနှစ် မီးသတ်ဥပဒေ ပုဒ်မ ၁၇ တွင်ပြဌာန်းထားသည့်အတိုင်း မြို့နယ်အဆောက်အဦ ဆောက်လုပ်ခြင်းမပြုမီ မီးဘေးကြိုတင်ကာကွယ်ရေးနှင့် တားဆီးရေး (နှင့်/သို့မဟုတ် အရေးပေါ်အစီအစဉ်) ခွင့်ပြုချက် ရယူရန် ကတိပြုသည်။
၇	ဆောက်လုပ်ရေး လုပ်ငန်းအားလုံး	စီမံကိန်းဧရိယာတွင်၂၀၁၅ ခုနှစ် ရှေးဟောင်းအဆောက်အဦးများ ကာကွယ်စောင့်ရှောက်ရေးဥပဒေ နှင့် ၂၀၁၅ ခုနှစ် ရှေးဟောင်းဝတ္ထုပစ္စည်းများ ကာကွယ်ထိန်းသိမ်းရေးဥပဒေ အရ သတ်မှတ်ထားသော ရှေးဟောင်းအမွေအနှစ် သို့မဟုတ်

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စဉ်	ခေါင်းစဉ်	ကတိကဝတ်များ
		ရှေးဟောင်းအဆောက်အဦး တခုခု တွေ့ရှိပါက သက်ဆိုင်ရာအေဂျင်စီထံ အကြောင်းကြားရန် ကတိပြုသည်။
		အထူးစီးပွားရေးဇုန်ဥပဒေ ပုဒ်မ ၈၈ (င) အရ ငှားယူသည့် သို့မဟုတ် အသုံးပြုသည့် စီမံကိန်းမြေပေါ် သို့မဟုတ် မြေအောက်တွင် သဘာဝသယံဇာတများ သို့မဟုတ် ရှေးဟောင်းအမွေအနှစ်များ သို့မဟုတ် သယံဇာတများ သို့မဟုတ် သတ္တုတွင်း တွေ့ရှိပါက သက်ဆိုင်ရာ အေဂျင်စီသို့ ချက်ချင်း သတင်းပို့ရန် ကတိပြုပြီး သက်ဆိုင်ရာအေဂျင်စီမှ ဆက်လက်လုပ်ဆောင်ရန် ခွင့်ပြုပါက ဆက်လက်လုပ်ကိုင်နိုင်သည်။ ခွင့်မပြုပါက စီမံကိန်းအား အစားထိုးစီစဉ်ပေးသည့်နေရာသို့ ရွှေ့ပြောင်းမည်။
		၂၀၁၆ ခုနှစ် ရင်းနှီးမြှုပ်နှံမှုဥပဒေ ပုဒ်မ ၆၆ နှင့် အထူးစီးပွားရေးဇုန်ဥပဒေ ပုဒ်မ ၈၈ (ဃ) အရ ခွင့်ပြုချက်မရရှိဘဲ မြေ၏ ပင်လယ်ပြင်အမြင့် သို့မဟုတ် မြေမျက်နှာသွင်ပြင်အား သိသာထင်ရှားစွာပြောင်းလဲခြင်း မပြုလုပ်ရန် ကတိပြုသည်။
၈	အနည်ထိုင်ကန် ဆောက်လုပ်ခြင်း	၂၀၀၆ ခုနှစ် မြစ်-ချောင်း နှင့် ရေအရင်းအမြစ် ထိမ်းသိမ်းရေးဥပဒေ ပုဒ်မ ၈၊ ပုဒ်မ ၁၂ နှင့် ပုဒ်မ ၁၅ တို့တွင် ပြဌာန်းထားသည့် အတိုင်း သက်ဆိုင်ရာအေဂျင်စီ၏ခွင့်ပြုချက်မရဘဲ မြစ်ချောင်းနယ်နမိတ်၊ ကမ်းပါးနယ်နမိတ်နှင့် ကမ်းနားနယ်နမိတ်တို့အား ပုဒ်မ ၁၂ တွင် ပြဌာန်းထားသည့်အရာ တခုခုပြုလုပ်ခြင်း သို့မဟုတ် လိုင်းပြောင်းလဲခြင်း သို့မဟုတ် တားဆီးခြင်း မပြုရန်၊ ပုဒ်မ ၁၅ တွင် ပြဌာန်းထားသည့်အဆောက်အဦ ဆောက်လုပ်ခြင်းမပြုရန် ကတိပြုသည်။
အခန်း (၆) သက်ရောက်မှုနှင့် ဘေးအန္တရယ်အကဲဖြတ်ခြင်းနှင့် လျော့ပါးစေရေးနည်းလမ်းများ		
၉	မြို့နယ်တွင်း လုပ်ငန်းလည်ပတ်မှု	၂၀၀၆ ခုနှစ် မြစ်-ချောင်း နှင့် ရေအရင်းအမြစ် ထိမ်းသိမ်းရေးဥပဒေ ပုဒ်မ ၁၁ (က) နှင့် ပုဒ်မ ၁၉ တွင်ပြဌာန်းထားသည့်အတိုင်း မြစ်-ချောင်းအတွင်းသို့ ရေလမ်းကြောင်းနှင့် ပတ်ဝန်းကျင်ထိခိုက်မှု ဖြစ်ပွားနိုင်သော အင်ဂျင်ဝိုင်၊ ဓာတုဗေဒပစ္စည်း၊ အရာဝတ္ထု သို့မဟုတ် ပစ္စည်းများ စွန့်ပစ်ခြင်းမပြုရန် ကတိပြုသည်။
		၁၉၉၀ ခုနှစ် မြန်မာ့ပင်လယ် ငါးလုပ်ငန်းဥပဒေ ပုဒ်မ ၃၉ တွင် ပြဌာန်းထားသည့်အတိုင်း အဏ္ဏဝါရေလမ်းကြောင်းသို့ သက်ရှိရေနေ သတ္တဝါများ သို့မဟုတ် အခြားပစ္စည်းများ စွန့်ပစ်ခြင်းမပြုရန် ကတိပြုသည်။
		၁၉၉၁ ခုနှစ် ရေချိုငါးလုပ်ငန်းဥပဒေ ပုဒ်မ ၄၀ တွင် ပြဌာန်းထားသည့် ရေချိုငါးလုပ်ငန်းတွင် သက်ရှိရေသတ္တဝါများ ညစ်ညမ်းမှု နှောင့်ယှက်မှု မဖြစ်ပွားစေရန် သို့မဟုတ် ပုဒ်မ ၄၁ တွင် ပြဌာန်းထားသည့်အတိုင်း ရေအရည်အသွေး သို့မဟုတ် ရေပမာဏ ပြောင်းလဲခြင်း မပြုရန် ကတိပြုသည်။
		၂၀၁၁ ခုနှစ် အလုပ်သမားအဖွဲ့အစည်းဥပဒေ ပုဒ်မ ၄၁ (က) နှင့် (ဃ)၊ ပုဒ်မ ၄၃၊ ပုဒ်မ ၄၄ (က) မှ (ဃ) နှင့် ပုဒ်မ ၅၁ နှင့် ကိုက်ညီစွာ ဝန်ဆောင်မှုများ လည်ပတ်လုပ်ကိုင် ပံ့ပိုးရန် စီမံကိန်းမှ ကတိပြုသည်။ ထို့အပြင် အလုပ်သမားအစည်းအရုံး ဖွဲ့စည်းမှုနှင့် လှုပ်ရှားမှုများ သတိမူရန် ကတိပြုသည်။
		စီမံကိန်းနှင့် အလုပ်သမားအစည်းအရုံး သို့မဟုတ် ဝန်ထမ်း သို့မဟုတ် အလုပ်သမားများအကြား အငြင်းပွားမှုများအား ၂၀၁၂ ခုနှစ် အလုပ်သမားရေးရာ

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စဉ်	ခေါင်းစဉ်	ကတိကဝတ်များ
		အငြင်းပွားမှုဖြေရှင်းရေးဥပဒေနှင့် ၂၀၁၁ ခုနှစ် အထူးစီးပွားရေးဇုန် ပုဒ်မ ၇၆ (က) နှင့် (ခ) နှင့်အညီ ဖြေရှင်းပေးရန် ကတိပြုသည်။
၁၀	အလုပ်အကိုင်ရရှိမှု	အထူးစီးပွားရေးဇုန်ဥပဒေ ပုဒ်မ ၇၅ တွင် ပြဋ္ဌာန်းထားသည့်အတိုင်း နိုင်ငံသားကျွမ်းကျင်အလုပ်သမား၊ ပညာရှင်များနှင့် ဝန်ထမ်းများအား လုပ်ငန်းစတင်လည်ပတ်သည့် ပထမ ၂ နှစ်တွင် အနဲဆုံး ၂၅ ရာခိုင်နှုန်း ခန့်အပ်ရန်၊ ဒုတိယ ၂ နှစ်တွင် ၅၀ ရာခိုင်နှုန်း ခန့်အပ်ရန်၊ တတိယ ၂ နှစ်တွင် ၇၅% ခန့်အပ်ရန် ကတိပြုသည်။
		စီမံကိန်းမှ အလုပ်သမားများ နှင့်/သို့မဟုတ် ဝန်ထမ်းများအား သတ်မှတ်ထားသောဥပဒေများ - ၂၀၁၃ ခုနှစ်အနည်းဆုံးအခကြေးငွေ ဥပဒေ၊ ၂၀၁၆ ခုနှစ် အခကြေးငွေပေးချေရေး အက်ဥပဒေ၊ ၂၀၁၃ ခုနှစ် အလုပ်အကိုင် နှင့် ကျွမ်းကျင်မှုဖွံ့ဖြိုးတိုးတက်ရေးဥပဒေ၊ ခွင့်နှင့် အလုပ်ပိတ်ရက်အက်ဥပဒေကို ပြင်ဆင်သည့်ဥပဒေတို့နှင့်အညီ တန်းတူညီမျှ၍ တရားမျှတစွာ အလုပ်ခန့်အပ်ရန်၊ လုပ်အားခပေးရန်၊ ခွင့်ရက်နှင့် အများပြည်သူရုံးပိတ်ရက်များ ခွင့်ပြုရန် ကတိပြုသည်။
		၂၀၁၂ခုနှစ် လူမှုဖူလုံရေးဥပဒေနှင့်အညီ စီမံကိန်းမှ ဝန်ထမ်းများ နှင့်/သို့မဟုတ် အလုပ်သမားများအတွက် လိုအပ်ချက်များနှင့် ညီညွတ်စေရန်၊ အကျိုးခံစားခွင့်ပေးရန် ကတိပြုသည်။
၁၁	သင်တန်းပို့ချမှု	၂၀၁၃ ခုနှစ် အလုပ်အကိုင်နှင့် ကျွမ်းကျင်မှုဖွံ့ဖြိုးတိုးတက်ရေးဥပဒေ ပုဒ်မ ၁၆ မှ ပုဒ်မ ၂၃ အထိ ကိုက်ညီစွာသင်တန်းပို့ချရေးအစီအစဉ်နှင့် စက်မှုလုပ်ငန်းအတွက် သင်တန်းဌာန တည်ထောင်ရန်၊ နေရာရွှေ့ပြောင်းခြင်းနှင့် ပြန်လည်နေရာချထားရေးအစီအစဉ်အတွက် စီမံကိန်းအကျိုးသက်ရောက်သူများ (PAPs) ပါဝင်ရန် ကတိပြုသည်။
၁၂	လုပ်ငန်းခွင် ကျန်းမာရေးနှင့် အန္တရာယ်ကင်းရှင်းမှု	အလုပ်သမားများအတွက် ၂၀၀၇ ခုနှစ် IFC EHS အထွေထွေလမ်းညွှန်ချက်များနှင့် ကိုက်ညီမှုရှိရန် ကတိပြုသည်။ [ပတ်ဝန်းကျင်ဆိုင်ရာ အန္တရာယ်ကင်းဝေးရေးနှင့် ကျန်းမာရေးအခန်းကဏ္ဍတွင် ဖော်ပြထားသည့်အတိုင်း။ မြန်ထားဝယ် DSEZ ကနဦးစက်မှုဇုန်ဌာန၏ ပတ်ဝန်းကျင်ထိမ်းသိမ်းစောင့်ရှောက်ရေးနှင့် အန္တရာယ်ကင်းဝေးရေး ကျန်းမာရေးအခန်းကဏ္ဍအား တည်ထောင်ပြီး တာဝန်နှင့်ဝတ္တရား သတ်မှတ်ချက်များအတိုင်း စနစ်တကျ ဖွဲ့စည်းရမည်။
၁၃	စီးပွားရေးလုပ်ငန်းဇရိယာ	၁၉၉၂ ခုနှစ် အမျိုးသားဆေးဝါးဥပဒေနှင့် ၁၉၉၇ ခုနှစ် အမျိုးသားအစားအစာဥပဒေ နှင့်ကိုက်ညီစွာ လက်လီဆိုင်များ၊ ဆေးဆိုင်နှင့် အစားအသောက်ဝန်ဆောင်မှုများပါဝင်သည့် စီးပွားဖြစ်လုပ်ငန်းဇရိယာ တည်ထောင်၍ စီမံခန့်ခွဲရန် ကတိပြုသည်။
၁၄	ဆေးရုံနှင့် ကျန်းမာရေး ဌာန တည်ထောင်ခြင်း	မြို့နယ်ရှိ နေထိုင်သူလူဦးရေသည် သက်ဆိုင်ရာဥပဒေပြဋ္ဌာန်းချက် ပြည့်မီပါက ဆေးရုံ သို့မဟုတ် ကျန်းမာရေးဌာန တည်ထောင်ရန် ကတိပြုသည်။
၁၅	ကူးစက်ရောဂါ ကာကွယ်တားဆီးရေး နှင့်ထိမ်းချုပ်ရေး	၁၉၉၅ ခုနှစ် ကူးစက်ရောဂါ ကာကွယ်တားဆီးရေး နှင့်ထိမ်းချုပ်ရေးဥပဒေ ပုဒ်မ ၈ တွင် ပြဋ္ဌာန်းထားသည့်အတိုင်း ကူးစက်ရောဂါ ပြန့်ပွားမှုကာကွယ်ရေးနှင့် ထိရောက်သောထိမ်းချုပ်ရေးတွင် ကျန်းမာရေး တာဝန်ရှိအရာရှိများ၏ လမ်းညွှန်ချက်လိုက်နာရန်နှင့် ပူးပေါင်းဆောင်ရွက်ရန် ကတိပြုသည်။

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စဉ်	ခေါင်းစဉ်	ကတိကဝတ်များ
၁၆	ဆေးလိပ်သောက်ရန်နေရာ/ဆေးလိပ်မသောက်ရနေရာ	၂၀၀၆ ခုနှစ် ဆေးလိပ်နှင့် ဆေးရွက်ကြီးထွက်ပစ္စည်းသောက်သုံးမှုထိန်းချုပ်ရေးဥပဒေ ပုဒ်မ ၆ နှင့် သယ်ဆောင်မှုအတိုင်းအတာနှင့် စစ်ဆေးမှုလက်ခံခြင်း ပုဒ်မ ၉ (ဂ) နှင့် (ဃ) တို့တွင်ပြဌာန်းထားသည့်အတိုင်း ဆေးလိပ်သောက်ရန်နေရာနှင့် ဆေးလိပ်မသောက်ရ နေရာ စီစဉ်ဆောင်ရွက်ရန် ကတိပြုသည်။
၁၇	ယာဉ်အသုံးပြုမှု	ရည်ရွယ်ချက်အားလုံးနှင့် ပေးဆပ်ရန်တာဝန်များ၏ ပိုင်ဆိုင်မှု ရယူရာတွင် ၂၀၁၅ ခုနှစ် မော်တော်ယာဉ်ဥပဒေနှင့် ညီညွတ်စေရန် ကတိပြုသည်။ စီမံကိန်းမှ မော်တော်ယာဉ်မောင်းများအား ဥပဒေပြဌာန်းချက်အတိုင်းရှိစေရန် ပညာပေး လှုပ်ရှားမှုဆောင်ရွက်မည်။
၁၈	ရေအရင်းအမြစ်ထိမ်းသိမ်းစောင့်ရှောက်ခြင်း	ရေအရင်းအမြစ်အား အမြော်အမြင်ရှိစွာ စီမံခန့်ခွဲရန်နှင့် ရေကြောင်းအကျိုးသက်ရောက်မှု အောက်ပါအတိုင်း ထိမ်းချုပ်ရန် ကတိပြုသည်။ ရေပြန်လည်အသုံးပြုခြင်း ပြန်လည်သန့်စင်အသုံးပြုခြင်း၊ ရေထိမ်းသိမ်းစောင့်ရှောက်ရေးအစီအစဉ်၊ ညစ်ညမ်းရေနှင့် ရေဆိုး နည်းနိုင်းသမျှနည်းအောင်ပြုလုပ်ခြင်း။
၁၉	မိလ္လာနှင့်ရေဆိုးစွန့်ပစ်မှု စီမံခန့်ခွဲရေး	ပြည်တွင်းအလေအလွင့်အား ရေရှည်တည်တံ့သောအပြုအမူများ ဥပမာ စွန့်ပစ်မှုပမာဏနှင့် စွန့်ပစ်မှုအတွက်နေရာ လျော့နည်းစေရန် လျှော့ချခြင်း၊ ပြန်လည်အသုံးပြုခြင်း၊ ပြန်လည်သန့်စင်ခြင်း (3Rs) စီမံခန့်ခွဲရန် ကတိပြုသည်။ စွန့်ပစ်ပစ္စည်းများအား ၁၉၇၂ ခုနှစ် ပြည်သူ့ကျန်းမာရေးဥပဒေနှင့် ၁၉၉၃ ခုနှစ် အမျိုးသားကျန်းမာရေးမူဝါဒနှင့်အညီ စီမံခန့်ခွဲရန် ကတိပြုသည်။
၂၀	အရေးပေါ်တုန့်ပြန်မှု အစီအစဉ်	ဓာတုဗေဒပစ္စည်းညစ်ညမ်းမှု/ဖြစ်ပွားမှုနှင့် အခန်း ၄.၃ တွင် ဖော်ပြထားသောဖြစ်ရပ်များဖြစ်သည့် ဖြစ်နိုင်သောဘေးအန္တရာယ်အားလုံး ဥပမာရေကြီးခြင်း၊ အပူပိုင်းမုန်တိုင်း/ဆိုင်ကလုန်းမုန်တိုင်း၊ မီးလောင်ခြင်း၊ ဓာတုဗေဒပစ္စည်းညစ်ညမ်းမှုများနှင့် ပတ်သက်၍ အရေးပေါ်တုန့်ပြန်မှုအစီအစဉ် အကောင်အထည်ဖော်ရန် ကတိပြုသည်။
		အရေးပေါ်တုန့်ပြန်မှုအစီအစီတွင် ဖော်ပြထားသည့်အတိုင်း မီးအန္တရာယ်အခြေအနေပြောင်းလဲမှု၊ ဓာတုဗေဒပစ္စည်း၊ မြေငလျှင်နှင့် သဘာဝဘေးအန္တရာယ် စသည်တို့မှ ဘေးကင်းလုံခြုံမှုအပေါ်မူတည်၍ နောက်ဆုံး EIA အစီရင်ခံစာအား ပြင်ဆင်ရန်၊ DSEZMC နှင့် MONREC ထံသို့ ပေးပို့ရန် ကတိပြုသည်။
၂၁	ဖန်လုံအိမ်ဓာတ်ငွေ့ထုတ်လွှတ်မှု	လက်ရှိ မြန်မာနိုင်ငံဖန်လုံအိမ်ဓာတ်ငွေ့မူဝါဒနှင့်အညီ စီမံကိန်း လှုပ်ရှားမှုများနှင့် တည်ထောင်မှုကြောင့် ဖန်လုံအိမ်ဓာတ်ငွေ့လျှော့ချရေး လုပ်ဆောင်ရန် ကတိပြုသည်။
၂၂	CSR အစီအစဉ်	နှစ်စဉ်အမြတ်ရရှိမှုအပေါ်မူတည်၍ လူမှုအသိုင်းအဝိုင်းတာဝန်ယူမှု (CSR) သီးသန့်ထားပြီး ဆောင်ရွက်ရန် ကတိပြုသည်။ စီမံကိန်းမှ မြို့နယ်အနီးပိုက်ရှိ ကျေးရွာများတွင်နေထိုင်သည့် လူငယ်များအတွက် ပညာရေးဆိုင်ရာ ပညာသင်ထောက်ပံ့ကြေး လှူဒါန်းပြီး အနီးတပိုက်ရှိကျေးရွာများအား အရေးပေါ် ဥပမာ မီးလောင်ခြင်း သို့မဟုတ် သဘာဝဘေးအန္တရာယ်ကျရောက်ခြင်းတွင် ထောက်ပံ့မည်။
		စီမံကိန်းပံ့ပိုးသူသည် CSR လှုပ်ရှားမှုများ နှစ်စဉ် ပုံမှန် လုပ်ဆောင်သွားရန် ကတိပြုသည်။ CSR ကုန်ကျစရိတ်သည် ပုံမှန်အားဖြင့် ကော်ပိုရေးရှင်း၏ ဘဏ္ဍာရေးအဆင်သင့်ဖြစ်မှုအပေါ်မူတည်သည်။

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စဉ်	ခေါင်းစဉ်	ကတိကဝတ်များ
၂၃	အာမခံ	၁၉၉၃ ခုနှစ် မြန်မာ့အာမခံဥပဒေ ပုဒ်မ ၁၆ နှင့်အညီ စီမံကိန်းသည် အသက်နှင့် ပြည်သူပိုင်ပစ္စည်း ပျက်စီးဆုံးရှုံးခြင်း သို့မဟုတ် ပတ်ဂန်းကျင်ညစ်ညမ်းမှု ဖြစ်ပွားခြင်းရှိပါက မြန်မာ့အာမခံနှင့် မထားမနေရ အထွေထွေတာဂန်ယူမှုအာမခံထားရှိရန် ကတိပြုသည်။
၂၄	လျော်ကြေးပေးခြင်း	ပတ်ဂန်းကျင်ထိမ်းသိမ်းရေးဥပဒေ ပုဒ်မ ၇(ဏ) နှင့် ၂၀၁၆ ခုနှစ် ရင်းနှီးမြှုပ်နှံမှုဥပဒေ ပုဒ်မ ၆၆ အရ စီမံကိန်းကြောင့် သဘာဂပတ်ဂန်းကျင်ထိခိုက်ပျက်စီးပြီး လူမှုရေးစီးပွားရေး ပျက်စီးဆုံးရှုံးမှုဖြစ်ပွားပါက ဖြစ်ပွားသည့်ပျက်စီးဆုံးရှုံးမှုအတွက် ထိရောက်သောနစ်နာကြေးပေးဆောင်ရန် ကတိပြုသည်။
အခန်း (၈) ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှု အစီအစဉ်		
၂၅	ISO 14001	ရေရှည်တည်တံ့သောပတ်ဂန်းကျင်ထိမ်းသိမ်းစောင့်ရှောက်ရန် ပတ်ဂန်းကျင်ကာကွယ်ထိမ်းသိမ်းရေး ကောင်းမွန်စွာ လိုက်နာနိုင်ရန်အတွက် ISO 14001 လိုက်နာကျင့်သုံးရန် ကတိပြုသည်။
၂၆	ပတ်ဂန်းကျင်စီမံခန့်ခွဲမှုနှင့် စောင့်ကြည့်လေ့လာမှု အစီအစဉ်	ဆောက်လုပ်ရေးအချိန်ကာလ၊ လုပ်ငန်းလုပ်ပတ်မှုအချိန်ကာလနှင့် ပိတ်သိမ်းချိန်ကာလအတွင်းတွင် နောက်ဆုံး EMPs နှင့် EMoPs အားလုံး လုပ်ကိုင်ဆောင်ရွက်ရန် ကတိပြုသည်။
၂၇	ပတ်ဂန်းကျင် စောင့်ကြည့်လေ့လာမှု အစီရင်ခံစာ	အခြေခံအဆောက်အဦ စဉ်းစားဆောင်ရွက်ချက်ရလာဒ်များ ဥပမာ ပြည်သူ့ကျန်းမာရေးအစီအစဉ်၊ ဒေသခံများအတွက် လမ်းများ၊ လျှပ်စစ်မီး၊ ရေ စသည်တို့နှင့် တည်ဆောက်မှု၊ လုပ်ငန်းလည်ပတ်မှု၊ လုပ်ငန်းပိတ်သိမ်းမှု စီမံကိန်းဖော်ဆောင်မှုကာလအတွင်း အန္တရာယ်ကင်းဂေးရေးအစီအစဉ်များ ထိမ်းချုပ်ကွပ်ကဲရေးအစီရင်ခံစာတွင် ထည့်သွင်းဖော်ပြပြီး DSEZMC နှင့် MONREC သို့ အစီရင်ခံစာ ပေးပို့ရန် ကတိပြုသည်။
		ပတ်ဂန်းကျင်စီမံခန့်ခွဲရေးအစီအစဉ်နှင့် အသေးစိတ်အစီအစဉ်များ စောင့်ကြည့်စစ်ဆေးရန်နှင့် ၄င်းတို့အား အကောင်အထည်ဖော်နိုင်ရေး ကော်မီတီဖွဲ့စည်းရန်အတွက် ရံပုံငွေ ထားရှိရန် ကတိပြုသည်။
		စောင့်ကြည့်စစ်ဆေးရေးအစီရင်ခံစားအား ပြည်သူလူထုသတိမူနိုင်ရေးအတွက် ပုံနှိပ်ထုတ်ဂေရန်နှင့် ၆ လတကြိမ် MONREC သို့ ပေးပို့ရန် ကတိပြုသည်။
၂၈	ကန်ထရိုက်တာများ / ဆပ်ကန်ထရိုက်တာများ	စီမံကိန်းဖော်ဆောင်သူ၊ ကန်ထရိုက်တာနှင့် ဆပ်ကန်ကရိုက်တာအားလုံးမှ သက်ဆိုင်ရာဥပဒေများ၊ စည်းကမ်းများ၊ လုပ်ထုံးလုပ်နည်းများ၊ EMP နှင့် စည်းကမ်းသတ်မှတ်ချက်အားလုံးအား အပြည့်အဂ လိုက်နာနိုင်ရန် EMP, ဆောင်ရွက်ရမည့်အရာနှင့် စည်းကမ်းသတ်မှတ်ချက် အားလုံး အပြည့်အဂ အကောင်အထည်ဖော်ရန် ကတိပြုသည်။
အခန်း (၉) အများပြည်သူတွေ့ဆုံခြင်းနှင့် ထုတ်ဖော်ပြောကြားခြင်း		
၂၉	အများပြည်သူတွေ့	ပတ်ဂန်းကျင်နှင့်လူမှုရေးအခြေအနေများ၊ သဘောပေါက်နားလည်မှုနှင့် ရလာဒ်များ

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စဉ်	ခေါင်းစဉ်	ကတိကဝတ်များ
	ဆုံဆွေးနွေးခြင်း	အဆက်မပြတ် တိုးတက်ကောင်းမွန်စေရန်အတွက် ဒေသခံပြည်သူများနှင့် အများပြည်သူဆိုင်ရာ အကြံပေးခြင်း ဆွေးနွေးတိုင်ပင်ခြင်း ပြုလုပ်ရန်နှင့် DSEZMC နှင့် MONREC သို့ ပေးပို့ရန် ကတိပြုသည်။
		ရှယ်ယာဝင်များနှင့် အဆက်မပြတ် ဆွေးနွေးတိုင်ပင်ပြီး အစီအစဉ်တွင် ၎င်းတို့၏ထောက်ခံချက်များ ပူးပေါင်းပါဝင်ရန် ကတိပြုသည်။
၃၀	အချက်အလက် ဖြန့်ဝေခြင်း	ပတ်ဝန်းကျင်အကျိုးသက်ရောက်မှုအကဲဖြတ်အစီရင်ခံစာ ထုတ်ဝေရန် ကတိပြုသည်။
၃၁	နစ်နာမှုအတွက် ဖြေရှင်းချက်များ	တိုင်ကြားမှုလက်ခံရေးအဖွဲ့အစည်း တည်ထောင်ဖွဲ့စည်းရန်နှင့် အကြံပြုချက် သို့မဟုတ် ဤအခန်းနှင့် ပြန်လည်နေရာချထားရေး လုပ်ငန်းစီမံချက် (၂၀၁၇) အခန်း ၁၃ တွင် ဖော်ပြထားသည့် ဒေသခံများ/PAPs

လက်မှတ်...

Dr. Somchet Thinaphong

မန်နေးဂျင်းဒါရိုက်တာ

ထားဝယ်ဝေဟာကုမ္ပဏီလစ်မစ်တက်

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Project Key Commitments For Initial Township Project

No.	Issues	Commitments
CHAPTER 3 OVERVIEW OF LAWS AND REGULATION AND INSTITUTIONAL FRAMEWORK		
1.	Overall Project Management	The Project commits to conserve and protect natural environment, development of human resource and preservation of public property, as stated in *The Constitution of the Union of Myanmar No.1/2008 Section 45 and Section 390.*
		The Project commits to get permission for investment, as the Project is capital intensive and strategic to the region according to *The Investment Law 2016, Section 35.*
2.	EIA Study	EIA study is conducted, as mandated by *The Environmental Conservation Law (2012), in No.9/2012 Section 42 (b) and The Investment Law Section 72.*
		The Project commits itself that the EIA study is undergone in concordant with *the Guidelines (2014) and Procedure (2015) for Environmental Impact Assessment.*
		The Project commits to comply with the Environmental Impact Assessment Procedure (2015) and annexure (A) for all implemented activities during the project development including in EIA, IEE and EMP.
		The Project commits to implement in compliance with what all matters contained in the environmental impact assessment report to be carried out including all method to reduce environmental, social and health impacts, environmental management programs, sub-programs related to them, method for monitoring.
3.	Emission Compliance	The Project commits to prevent pollution, through the implementation of processes, practices and techniques that will minimize, avoid or reduce the pollution and comply with the enacted Myanmar Environmental Quality Standards or the International Standards, as prescribed in *The Special Economic Zone Law, Section 35.*
		The Project commits to comply with the standards contained in the following provisions: *The National Environmental Quality (Emission) Guidance*, World Health Organization (WHO), U.S Environmental Protection Agency (EPA), World Bank and International Finance Corporation (IFC).
	Environmental and Social compliance	The Project commits to implement and comply with the relevant laws and regulations in Table 3.1-3**
		The Project commits to comply with the undertakings contained in the Environmental and Social Impact Assessment Report. In addition, the Project commit to carry out without fail monitoring and scrutinizing environmental conservation and social impacts during pre-construction, construction, operation and closing period and reporting to relevant departments. Besides, The Project commits to carryout activities relate to environment and community and conduct public consultation and negotiation for transparency and include in the Monitoring Reports and then submit to DSEZ and MONREC.
4.	Land Acquisition	The Project commits in receivable authorization and has right to obtain a long-term lease of land in according with the relevant laws and may lease land up to an initial period of 50 years after approval of the permit, as enacted in *The Investment Law 2016*, *Section 51 (a) and (b).*
5.	Relocation and Resettlement	The Project commits to bear the expenses of relocating and paying compensation in accordance with the agreements of the assets those are required to relocate and shall relocate the persons so as not to lower their original standard of living, to fulfill the fundamental needs as promulgated in *The Special Economic Zone Law 2011, Section 80.*

Project Key Commitments For Initial Township Project

No.	Issues	Commitments
CHAPTER 4 PROJECT DESCRIPTION AND ALTERNAITVES		
6.	Land clearing and Pre-Construction	The Project commits to get permission from the relevant agency before establishing any desirous activities to/in reserve forest or all type of forests that in affiliate of *The Forest Law 1992*, *Section 12 and Section 23.*
		The Project commits to get permission from the relevant agency before establishing any desirous activities to wild life/endanger species or threatening their natural habit and ecosystem as promulgated in *The Protection of Wildlife and Conservation of Natural Area 1994.*
		The Project commits to get permission from the relevant agency before relocating, modifying or excavating or extending any parts of ancient monuments in according with *The Protection and Preservation of Ancient Monuments Law 2015, Section 15*
		The Project commits to obtain approval of Fire precaution and prevention (and/or Emergency Plan) prior construction of the township buildings as enacted in *The Fire Brigade Law 2015 Section 17.*
7.	Overall Construction	The Project commits to inform the relevant agency that if any antique objects or ancient monuments as defined in *The Protection and Preservation of Ancient Monuments Law 2015* and *The Protection and Preservation of Antique Objects 2015* are found within the Project area.
		The Project commits to report immediately to the relevant agency, if natural mineral resources or antiques or treasure or mine are found above or under the land which the Project is entitled to lease or use, according to *The Special Economic Zone Law Section 80 (e)* and may continue the work on such land if the relevant agency allow. If not, the Project shall move the substituted arranged area.
		The Project commits to not make any significant alteration of topography or elevation of the land prior receiving the approval, according to *The Investment Law 2016, Section 66* and *The Special Economic Zone Law Section 80 (d).*
8.	Retention Ponds construction	The Project commits itself to not carry out any acts or channel shifting or disturbance as prescribed in *Section 12* and construction of such the structures as defined in *Section 15*, in the river-creek boundary, bank boundary and waterfront boundary without permission of the relevant agency, as prescribed in *The Conservation of Rivers, Creeks and Water Resources Law 2006, Section 8, Section 12 and Section 15.*
CHPATER 6 IMPACT ASSESSMENT AND MITIGATION MEASURES		
9.	Operation of the Township	The Project commits to not dispose of engine oil, chemicals, materials or substances which may cause water way/course and environmental damages into the river-creek, as prescribed in *The Conservation of Rivers, Creeks and Water Resources Law 2006, Section 11 (a) and Section 19.*
		The Project commits to not dispose living aquatic creatures or any materials in marine water courses as prescribed *in Section 39 of The Myanmar Marine Fishery Law 1990.*
		The Project commits to not cause pollution or harassment of aquatic organisms in a freshwater courses as prescribed *in Section 40* or alter water quality and volume as prescribed *in Section 41* in *The Freshwater Fishery Law 1991.*
		The Project commits to operate and provide services in accordance with *The Labor Organization Law 2011, Section 41 (a) and (d), Section 43, Section 44 (a) to (d) and Section 51.* Also, The Project commits itself to aware of the formation of labor organization and its activities.

Project Key Commitments For Initial Township Project

No.	Issues	Commitments
		The Project commits to settle any disputes between the project and labor organization or employee or workers in accordance with *the Settlement of Labor Dispute Law 2012 and The Special Economic Zone Law 2011, Section 76 (a) and (b).*
10.	Employment	The Project commits to employ citizen skilled workers, technicians and staff at least 25 percent in the first two years from the commencing year of operation and at least 50 percent in the second two years and at least 75 percent in the third two years, as prescribed in *The Special Economic Zone Law, Section 75.*
		The Project commits to employ, pay wages, and grant leaves and holidays in fairness and equity manners to the workers and/or employee in accordance with the stipulated laws: *The Minimum Wages Laws 2013, The Payment of Wages Act 2016, The Employment and Skill Development Law 2013*, *The Law Amending the Leave and Holidays Act 2006.*
		The Project commits to comply requirements and establish benefits for the employee and/or workers by the Project in accordance with *The Social Security Law 2012.*
11	Training Program	The Project commit to establish training program and the center for training for industries and may include the Project Affected Persons (PAPs) from the relocation and resettlement program in accordance with *The Employment and Skill Development Law 2013 Section 16 to Section 23.*
12	Occupational Health and Safety	The Project commits to comply the IFC EHS General guideline 2007 for workers.
13	Commercial Area	The Project commits to establish and manage the commercial area which include retail shops, drug store and food services in accordance with *The Nation Drug Law 1992 and the Nation Food Law 1997*
14	Foundation of Hospital or Health Center	The Project commits to establish hospital or health center when appropriate number of residents in the Township have reached requirement that promulgated in the relevant law.
15	Prevention and Control of Communicable Diseases	The Project commits to follow the guidance and co-operate with health officers in prevention of the outbreak and effective control of the communicable disease as prescribed *in Section 8 of The Prevention and Control of Communicable Diseases Law 1995.* The Project will report immediately to the nearest health department or hospitals if the defined epidemics *in Section 9* occur.
16	Smoke/Non-Smoking Areas	The Project commits to arrange the smoking and non-smoking area as prescribed *in Section 6 and Section 7 of The Control of Smoking and Consumption of Tobacco Product Law 2006* including carry measures and accepting the inspection in *Section 9 (c) and (d).*
17	Uses of Vehicles	The Project commits to comply *The Motor Vehicle Law 2015* in obtaining ownership of all purposes and liabilities. The Project shall educate and campaign the vehicles' drivers in such manners as prescribed by the Law.
18	Conservation of Water Resources	The Project commits to manage water resources wisely and control the impacts to water courses as following: Reuse and Recycling of water, Water conservation program, minimization of contaminated water and wastewater effluent.
19	Sanitation and waste management	The Project commits to manage domestic waste in sustainable manners i.e. reduce, reuse and recycling (3Rs) in order to diminish quantity of waste and the spaces for disposal. The Project commits itself to manage the waste in

Project Key Commitments For Initial Township Project

No.	Issues	Commitments
		accordance with *The Public Health Law 1972* and *The National Health Policy 1993.*
20.	Emergency Responses Plans	The Project commits to implement the emergency response plans with regard to chemical pollution/incidents and all potential hazards such as flood, tropical storm/cyclone, fire, chemical pollution, incidents as stated *Section 4.3*
		The Project commits to revise the Final EIA report, depending on changing of conditions in fire hazard, safety from chemical elements, earthquake and natural disaster etc. addressed in the Emergency Response Plans and then submit to DSEZMC and MONREC.
21.	Green House Gases Emission	The Project commits to promote reduction of the Green House Gases by the Project activities and the establishment in accordance with the current Myanmar Green House Gases Policy
22.	CSR Program	The Project commits to reserve and conduct Cooperate Social Responsibility (CSR) program base on the yearly profit. The project will donated for education such as scholarships donation for young people who live in villages nearby the Township and to support the nearby villages in Emergency such as Fire or Natural disasters.
		The Project Proponent commits to conduct the CSR activities regularly every year. The CSR spending normally depends on corporate financial readiness. In addition, the Project Proponent commits to invest in CSR, gradually increasing each year until it reaches budget of 3 million THB per year.
23.	Insurance	The Project commits to effect compulsory general liability insurance with the Myanmar Insurance, if the Project may cause damage to the life and property of public or cause pollution to the environment, in accordance with *The Myanmar Insurance Law 1993, Section 16.*
24.	Compensation	The Project commits to pay effective compensation for loss incurred, if the Project causes damage to the natural environment and causes socioeconomic losses, according to *The Environmental Conservation Law, Section 7(o)* and *The Investment Law 2016, Section 66.*
CHAPTER 8 ENVIRONMENTAL MANAGEMENT PLAN		
25.	ISO 14001	The Project commits to develop ISO 14001 for better compliance with environmental protection and conservation for sustainable environment.
26.	Environmental Management and Monitoring Plans	The Project commits to develop and implement all the updated EMPs and EMoPs during construction phase, operation phase and decommissioning phase.
27.	Environmental Monitoring Report	The Project commits to report the results of realizing infrastructure such as public health programme, road for the locals, electricity, water supply etc. and safety programme during the project development period covering construction, operation and decommissioning in the Monitoring Report and then submit to DSEZMC and MONREC.
		The Project commits to keep fund for monitoring programmes and sub-programs of environmental management and form the committees to implement them.
		The Project commits to submit the Monitoring Reports every 6 months to MONREC for publishing for public awareness.

Project Key Commitments For Initial Township Project

No.	Issues	Commitments
28.	Contractors/Sub-Contractors	The Project commits to fully implement the EMP, all undertakings, terms and condition and ensure that all developer, contract and sub-contractors fully comply with relevant laws, regulations, procedures, EMP and all terms and conditions.
CHAPTER 9 PUBLIC CONSULTATION AND DISCLOSURE		
29.	Public Consultation	The Project commits to conduct public consultation and negotiate with the local community continuously for improvement of environmental and social conditions, realization and outcomes in the Monitoring Reports and then submit to the DSEZMC and the MONREC.
		The Project commits to continuously discuss with the stakeholders and incorporate their recommendations in the plan.
30.	Information Dissemination	The Project commits to publish the environmental impact assessment report.
31.	Grievance Redress	The Project commits to establish grievance organization and implement the grievance procedures in order to receive and responses to grievances in relating feedback or concerns of the locals / PAPs.

Signed...

Dr.Somchet Thinaphong

Managing Director
Dawei Residence Company Limited

Certify The Environmental Mitigation Measures and Environmental Monitoring Program

Environmental Impact Assessment for

Initial Township Project

UNITED ANALYST AND ENGINEERING CONSULTANT COMPANY LIMITED

Certified Report by

Suparatana J.
....

(Suparatana Jotisakulratana)

Chief Executive Officer

United Analyst And Engineering Consultant

Date...30 April 2018...

Mitigation Measures and Monitoring Program During Construction Phase For Initial Township Project

Management Issue	Mitigation Measure	Monitoring Program	Responsibilities
Erosion and Sedimentation Control	CC shall prepare an *Erosion and Sediment Control Plan* for construction activities and submit to DRC for approval prior to commencement of construction activities in the area. The plan shall have the following components: • An assessment of the potential for contamination of natural waterways. Basic principles include the size of the disturbed area, site drainage, and waterways receiving storm water from the disturbed area; • Plans for water management during construction shall be established and include adequate drainage system to manage runoff from 2-year ARI storm flow; • Sedimentation controls shall be implemented in the form of silt trap fences and sedimentation basins where appropriate, and all runoff from the disturbed area shall be directed to the sediment controls; • Measures to be taken to collect, store and treat storm water prior to discharge from the site considering options for water re-use onsite; • Management of material storage area - Stockpile and spoil disposal area shall not be located on drainage line and; • Control of erosion and sedimentation shall be constructed progressively prior to commencement of each stage of earthworks until the permanent protection is established.	• Inspect construction area every 6 months for the following: - Erosion and sediment control are in place prior to wet season - Drainage system and sediment controls are functional during wet season - Sediment basins have a capacity of reducing the suspended solid from storm water by 50% • Monitor water quality every 6 months for Total Suspended Solid in 2 locations; upstream and downstream of the entry points of surface water runoff from construction area. • Monitor sediment quality every 6 months following: - 9+1 phase monitor 2 sampling stations (TS-SW02 and TS-SW03) - Full phase monitor 6 sampling stations in Figure 8.2-1	CC with DRC's approval
Surface Water Quality and Aquatic Biology	• Prepared and implement the measures for erosion and sedimentation control, waste management, and construction work camp. • Release of oil and grease from workshop facilities is prohibited. Used oil need to be stored separately and managed as per the *Waste Management Plan*. • Stock yards; gasoline, oil, lubricant and hydraulic oil storage areas; and machines/vehicles cleaning areas should be located at least 100 meter away from natural waterways. • Used water shall be treated and disinfected before discharge into natural drainage.	• Monitor every 6 months before and after rainy season through the construction period or at least for 3 years of all parameters in Table 8.2-1 and analysis methods as indicated in Table 8.2-1. • 9+1 phase monitor 2 sampling stations (TS-SW02 and TS-SW03). • Full phase monitor 6 sampling stations as shown in Figure 8.2-1.	CC with approval and under DRC's supervision

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Signed...
Managing Director
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Registered Environmental Impact Assessment Expert
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Mitigation Measures and Monitoring Program During Construction Phase For Initial Township Project (Cont.)

<table>
<tr><th>Management Issue</th><th>Mitigation Measure</th><th>Monitoring Program</th><th>Responsibilities</th></tr>
<tr><td>Terrestrial Biology</td><td>Only clear the area needed for construction of infrastructure and utility system. Avoid disturbance of forest and mangrove as much as possible.
Wherever possible, identify the endangered species and transfer them to safe locations prior to clearing the vegetation.
Hunting of wildlife is prohibited.
Disturbance of forest areas outside the project area by CC and their subcontractors is prohibited.</td><td>Monitor every 6 months progress of construction work and vegetation clearing in construction areas/natural forests mangrove areas.</td><td>CC under DRC's supervision</td></tr>
<tr><td>Air Emission and Noise Control</td><td>All equipment and vehicles will need to be maintained in good mechanical conditions.
Stationary noise sources (such as generators, concrete batching plants shall be sited as far as possible from villages, construction camps and resettlement areas.
Construction works within the distance of 500 m from villages and resettlement areas will be carried out between 06:00 to 18:00.
Dump trucks with loads that may generate dust will be covered when travelling though communities.
Water spraying at least once a day in the construction areas and on unpaved roads is required in the following conditions:
On the section of unpaved transportation routes that pass through communities or construction work camps;
When dust generating activities i.e. from modification of topography of land are being carried out within 100 m of a village or construction work camp;
When visual inspection indicates excessive dust generation in the construction areas and unpaved roads used for material transportation and;
Limit vehicle speed to 40 km per hour when pass through communities.
Burning of waste materials including waste vegetation from site clearing will be allowed under the following conditions:
The materials that are allowed to be burned are general garbage and vegetation waste. No burning of materials that may generate toxic gases is allowed;
A trained fire protection officer with appropriate firefighting equipment has to be present near the burning areas;
Burning is not allowed during severe wind condition and;
Burning is carried out at a safe distance from vegetated areas and not within 2 km from a village, a construction work camp, or resettlement areas on the upwind direction.</td><td>Monitor every 6 months in construction areas following:
- Inspection construction machineries with a written certificate/maintenance records of each machinery provided by qualified mechanics of the CC.
- Dust suppression measures are implemented according to the mitigation measures.
- Burning of waste materials are conducted according to the relevant mitigation measures.</td><td>CC under DRC's supervision</td></tr>
</table>

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Mitigation Measures and Monitoring Program During Construction Phase For Initial Township Project (Cont.)

Management Issue	Mitigation Measure	Monitoring Program	Responsibilities
	• Avoid impact pile-driving where possible in vibration-sensitive areas. Drilled piles or the use of a sonic or vibratory pile driver causes lower vibration levels where the geological conditions permit their use. • Construction workers exposed to noise levels of 80 dB(A) or more shall be provided with adequate Personal Protective Equipment (PPE) for hearing protection.		
Waste Management	DRC shall develop *Waste Management Plan* that will be applicable to all contractors in the project. The Waste Management Plan shall include the following components: • Identify classification of waste. The minimum waste classification shall be non-hazardous and hazardous waste; • Identify the size and location of the temporary hazardous waste storage area and non-hazardous waste disposal site for the construction phase of the initial township; • A mechanism for coordination between DRC and CC in waste separation, waste transfer, and record of waste quantity; • Hazardous waste shall include, but not limited to, the following waste materials. Any mixed waste stream that contains any of the hazardous waste shall be categorized as hazardous waste: - Acids and acid waste; - Alkalis and caustic waste; - Batteries; - Spent catalysts, solvents, and chemicals; - Empty containers which held chemicals, paint, oil and solvents; - Oil contaminated waste including oily rags, oil filters, used gloves; - Used oil, hydraulic fluids, chemicals and solvents; - First aid and medical waste; - Spill clean-up waste; - Waste from grease trap and; - Sludge from chemical wastewater treatment system. • Hazardous waste shall be stored in appropriate temporary hazardous waste storage areas until the permanent hazardous waste management facilities for the operation phase is functional. Minimum requirements of the temporary hazardous waste storage areas include; 1. Impervious floor without cracks or spaces that may allow spills to perforate into the ground;	• Monitor every 6 months in construction areas the following issues: - Appropriate containers for type of waste as categorized in the *Waste Management Plan* are provided for construction work camps, workshops, construction sites and other supporting facilities; - Weekly inspection of waste segregation at the construction facilities and at the hazardous waste storage area and record of hazardous waste inventory; - The location of waste burning area is designated and no waste burring is conducted outside the area. - Inspect waste management training record.	DRC to develop *Waste Management Plan*; CC to implement the plan under DRC's supervision

UNITED ANALYST AND ENGINEERING CONSULTANT COMPANY LIMITED

Mitigation Measures and Monitoring Program During Construction Phase For Initial Township Project (Cont.)

Management Issue	Mitigation Measure	Monitoring Program	Responsibilities
	2. Surrounded by secondary containment bunds. The secondary containment bunds shall be at least 0.5 m high with a volume large enough to contain the spill of the largest container expected in the storage area; 3. Designate storage area for liquids or materials that are not allowed to be mixed, such as acids and alkalis; 4. Equipped with spill response kits; 5. Consider providing the area with roofing and temporary walls with a provision that the temporary hazardous waste storage area will have to be in use for at least 3 years until the permanent hazardous waste management facilities of the initial township are functional; 6. Type and quantity of hazardous waste in the storage area shall be recorded and kept up to date; • Burning of the following non-hazardous waste is allowed: cardboard, pallets, papers, and wood/vegetation waste. The waste burning site shall be designated in the *Waste Management Plan* and shall be at least 2 km from any villages, construction work camps, or resettlement areas. • Other non-hazardous waste shall be transferred to non-hazardous waste disposal site to be used during construction phase shall meet the following minimum requirements: 1. The disposal site shall be on higher ground not subject to flood; 2. The disposal site shall be at least 2 km from any groundwater well that is being used by workers or local villagers; 3. The disposal site shall be in the area where no excavation is planned. It shall be delineated with clear sign boards; 4. The waste shall be covered with soil on daily basis; 5. The location of all disposal sites during construction period shall be recorded as expanded appendices to the *Waste Management Plan*; • Establish a training program for workers related to waste classification, storage and disposal; • The *Waste Management Plan* may be expanded to cover recyclable waste and compostable waste in the future.		

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Mitigation Measures and Monitoring Program During Construction Phase For Initial Township Project (Cont.)

Management Issue	Mitigation Measure	Monitoring Program	Responsibilities
On-Site Traffic and Access Management	• All access roads in the construction area shall be signposted with information in Myanmese and English; 1. Speed limit 2. Construction activities and machinery; 3. Roadside borrow pits and material stockpiles; 4. Any applicable load limit, particularly for temporary bridges; and 5. Road features that may affect driving conditions such as curves, hidden accesses etc. • A speed limit of 40 km/hr shall be applied in village areas and construction camps. Drivers shall be trained and notified of such limit; • Consider building speed humps before and after each village, where appropriate; • Route for heavy vehicles used for transportation of construction materials shall be designated. Route with least number of villages and residential area is most preferable; • Survey of the access roads to identify blind spots need to be regularly conducted. Improvement to the blind spots such as removal of obstructing objects when necessary; and • Access road used for the construction activities shall be maintained in good conditions.	• Ensure that relevant mitigation measures implemented in construction area and nearby areas throughout construction phase for all parties. • Ensure that the most appropriate transportation routes were selected to contribute the least impact to locals using the road for their daily travel.	CC under DRC's supervision
Construction Work Camps	• Camp rules shall be established and informed to all residences. The rules should contain the following components: 1. Policy on alcohol and substance abuse; 2. Safety measures and emergency response particularly in case of fire; 3. Waste management requirements; 4. Other measures to prevent dissemination of vectors and transmissible disease including STDs and HIV/AIDs; • General areas of the camp shall be kept clean and tidy. Waste shall be collected regularly to avoid accumulation of waste in the camp; • Toilets shall be provided at a ratio as 1 toilet per 15 workers. All toilets shall be equipped with septic and seepage tanks of adequate size. The toilets need to be at least 100 meters from any natural waterways. Sludge from tank cleaning shall be stabilized by adding lime (pH = 12 for 30 minutes) and disposed of in designated pit for sludge disposal. The pit shall be at least 1 kilometer from any groundwater wells and is higher than groundwater table; • Proper drainage has to be provided. Improve areas with stagnant water as much as possible and; • Pest control measures shall be planned and implemented. All bedrooms need to be equipped with mosquito protection.	• Ensure that relevant mitigation measures implemented in construction area throughout construction phase and the camps are periodically inspected.	CC under DRC's supervision

UNITED ANALYST AND ENGINEERING CONSULTANT COMPANY LIMITED

Mitigation Measures and Monitoring Program During Construction Phase For Initial Township Project (Cont.)

Management Issue	Mitigation Measure	Monitoring Program	Responsibilities
Historical and Cultural Resources	• Inform ward/village general administrator if antiques object or ancient monument are found in the project area. • Sites with historical and cultural values shall be identified, recorded and located in the map. This information shall be agreed upon by the local authorities and villagers. • If construction activities have to be carried out within 50 meters from these sites, the leaders of the communities that the sites belong to need to be notified at least 1 week prior to commencement of the activities. • Establish a plan and communication channel in case an unidentified site is encountered during the construction work to avoid damage to the site. • Removal and relocation method and destination shall be a mutual agreement between DRC, local authorities, and the leader of the communities that the site belongs to.	• Ensure that the records and maps are kept and up to date and available to all parties. • Locations subjected to be disturbed by the construction have been informed or notified about construction progress.	CC under DRC's supervision
Risk Assessment	Require the ITD contractor to: • Prepare a Construction Phase Environmental Management Plan (CEMP) base on the EIA report and associated CEMP, detailed design and construction plan and schedule. The CEMP must clear define: 1. The project's environmental requirements and obligation; 2. Physical measures that are needed to comply with the requirements and obligation; 3. Construction measures that are needed to comply with the requirements and obligation and; 4. Assignment of responsibilities to each subcontractor. • TOR for procurement of the ITD contract must clearly state the project's environmental requirements during the construction phase that the ITD contractor must ensure that the project construction will meet the requirements; • The ITD contract must clearly prescribes environmental management responsibility of the ITD contractor; • The supervision consultant will be required to submit a supervision and monitoring plan that clearly indicates the environmental tasks to be supervised and monitored. This supervision and monitoring plan for the implementation of the environmental mitigation measures; • Monthly reviews of the ITD contractor environmental performance; • Close supervision of truck operations especially during the site filling period; • Changes in designs or construction methods may be initiated by the ITD contractor or the project proponent. The request for changes must be subject to the change procedure in project management. The request for changes must be accommodated by an analysis of environmental implications and revised mitigation measures and;		CC under DRC's supervision

UNITED ANALYST AND ENGINEERING CONSULTANT COMPANY LIMITED

Mitigation Measures and Monitoring Program During Construction Phase For Initial Township Project (Cont.)

Management Issue	Mitigation Measure	Monitoring Program	Responsibilities
	• Change in the environmental requirements may be initiated by DRC or the project proponent with approval of DRC. The change must be subject to the change procedure in project management. The ITD contractor will analyze environmental implications of the changes and revise the originally proposed mitigation measures accordingly.		
Occupational Health and Safety	• Accidents and Injuries: 1. Establish occupational and safety management plan and program for the construction should be established to assess and manage EHS impacts and risks. Project or activity-specific plans or procedures should be prepared and the basic site rules of work should be included; 2. Perform occupational accidents and disease recording and reporting, and investigate all incidents to understand the cause of accident and to identify measures necessary to prevent a recurrence; 3. Provide contractor management plan to ensure that the contractor will have safety performances and procedures to protect their employee. Supervise and monitor contractor performance periodically; 4. Train and provide information to employees. Occupational health training program should be provided as needed; for example, hazard awareness, specific hazards and safe work practices, to ensure that workers are capable of work safely and; 5. Provide appropriate personal protective devices to employee and ensuring that personal protective devices will be worn during working at all time. 6. Restrict local community to access the site or area using fencing, signage and risks communication: 7. Appropriately mark area signage and labeling of equipment, determine hazardous area; for example, electrical rooms, compressor, etc., as well as installations, materials and emergency exits, and label in accordance with international standards, and easily to understand by workers, visitors and public. • Occupational, Sexual Transmission and Communicable Diseases: 1. Supervise and monitor performance of contractors and sub-contractors on housekeeping in the camp site; 2. Include training programs for workers with these following topics: health awareness, hygiene and sanitary, waste management, communicable and transmission diseases, cultural awareness, regulations and compliance, and drug abuse; 3. Register foreign or migrated workers should be seriously performed to ensure that these workers have medical and health certificates to guarantee their personal health conditions;	• Ensure that relevant mitigation measures are implemented through the construction phase in construction area the following: - Health and safety statistics and records are kept and updated. - Performance of construction health and safety is monitored against a set benchmark. - Inspect health and safety conditions of the CC and subcontractor's constructions sites and camps periodically. - Emergency equipment and facilities in response to fire, accidents are available and well maintenance. - Emergency response plan is appropriate to changes of the environmental condition such fire situation and natural disasters. • Revised Emergency Responses Plan are submitted to relevant agencies and the State Management Committee.	CC under DRC's supervision

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Managing Director
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Signed Lunanadano T.
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Mitigation Measures and Monitoring Program During Construction Phase For Initial Township Project (Cont.)

Management Issue	Mitigation Measure	Monitoring Program	Responsibilities
	4. Conduct surveillance and active screening and treatment of workers. Immunization program may be required. • Emergency Response and First-Aid: 1. Establish emergency response plan and procedures which also should be in place for any remote sites. Emergency response plan shall be appropriate to change such environmental condition and natural disasters; 2. Provide appropriate emergency services and personnel to expedite emergency response when needed, maintain equipment facilities, fire-fighting equipment in good working order, accessible and adequate for the dimension and the basis use. 3. Provide health services and first-aid unit at all time, with comprehensive and appropriate equipment, establish the qualified the first-aid unit to properly handle with serious or trauma cases, and sufficient to meet the requirements, treat and/or patients to appropriate medical facilities in time.		
Community Health	• Housing and Sanitation: 1. Provide sufficient infrastructure amenities and public health services in the camp site; for example, accommodations, water and drinking water availability, solid wastes disposal and sewage treatment. • Environmental/Communicable Diseases: 1. In close collaboration with the community health authorities, implement an integrated control strategy for environmental and occupational diseases, such as integrated vector control programs, eliminating of breeding habitats in the camp site, and eradicating disease reservoirs; 2. Collaborate with community health authorities to enhance the worker families to access public health services, and promote immunization and; 3. Distribute appropriate education materials; for example, health awareness, sexual transmission disease and communicable disease. • Accidents/Fire/Chemical Leaks: 1. Consider the level of local firefighting capacity to identify firefighting equipment that should be available when needed, and provide all necessary equipment with regular maintenance program; 2. Communicate potential accidents and/or hazards to local authorities, communities and relevant parties; 3. Conduct emergency response practices/training with local response organizations and local responders and;	• Ensure that relevant mitigation measures are implemented.	CC under DRC's supervision

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Mitigation Measures and Monitoring Program During Construction Phase For Initial Township Project (Cont.)

Management Issue	Mitigation Measure	Monitoring Program	Responsibilities
	4. Revise or/and establish Emergency Response Plans as necessary according to changing of environmental situation including notify the Minister and Dawei Special Economic Zone Management Committee. • Adequacy and Readiness of Healthcare Services: 1. Provide the first aid unit at the camp site for their workers, assess whether the local health service capacity sufficient for worker's family and supporting industries, and in close collaborating with local authorities, consider supporting/additional health service facility. 2. Risk and impact to environment from construction of Health Centre Services i.e. hospital shall be assessed including establishment of environmental management plan and mitigation measures.		
Public Participation and Dissemination	• Establish *Public Relation and Public Participation Plan* to incorporate in requests and recommendation of the continuous engagement of stakeholders following: 1. Inform about project activities to community 2. Support nearby community as appropriate to build good relationship with community 3. Communicate to build community understanding about - Construction activities and progress - Potential environmental impacts and mitigation measures 4. Conduct by DRC consistent with the applicable standard for public meeting/consultation 5. Disclose about project information and public relation activities through channels such as website, e-mails, meeting/visiting and local exhibition board or local media. 6. Take account the results of the public consultation in improving and revised the EMPs	• Monitor 1 time for entire construction phase using questionnaire for communities within 1 km of the Project area.	DRC
Grievances Redress	• Establish *Grievance Redress Procedure* to address any complaints/grieves to resolve/settle disputes that brought forward by community pertaining to project activities.	• Ensure that complaints/grieves are recorded and cases are settled.	DRC

Remarks: MC: Management Committee

DRC: Dawei Residence Company Limited

CC: Construction Contractors

UNITED ANALYST AND ENGINEERING CONSULTANT COMPANY LIMITED

Signed..

Managing Director

Dawei Residence Company Limited

Signed..

Registered Environmental Impact Assessment Expert

The United Analyst and Engineering Consultant Company Limited

Mitigation Measures and Monitoring Program During Operation Phase For Initial Township Project

Management Issue	Mitigation Measure	Monitoring Program	Responsibilities
Environmental Policy, Rules, and	DRC as the project owner has to establish the Environmental Policy and Rules for Initial Township based on the following principles: • Eco city concept which have the following key components: 1. Integration with natural system; 2. Maximize energy efficiency through facility design and other means; 3. Material flow through the whole area and ensure maximum reuse and recycling and; 4. Water conservation, reuse, and recycling in the Initial Township. • Prepare *Environmental, Health and Safety Plan* or *EHS Management Plan* or programs should also be reassessed periodically to ensure that the key environmental health and safety risks are determined in accordance with changes in order that the potential risks will be appropriately addressed. Thus, EHS system and performance should be improved continuously by a combination of ongoing monitoring of the Initial Township and high performances as well as effective accountability of the facility and; • Establish *Environmental Rules* that the township has to follow.These rules will be in accordance with the EMP for operation period.The rules will be attached with the contractual document between the contractor, operator and DRC.		DRC
Overall Roles and Responsibilities of Project Owner	DRC has to establish a strong organization to handle the dynamic and changes that will occur during the operation phase of the project, and should consider the following measures: • DRC should establish a sector responsible for safety health and environmental management of the Initial Township to prepare and perform the environmental management plan and programs to ensure that the Initial Township comply with environmental legislation and other relevant safety health and environmental requirements, and to achieve the most up-to-date environmental protection requirements/measures/standards; • DRC should periodically assess/reassess the environmental management plan or programs to ensure that the key environmental health and safety risks are evaluate and; • Due to the long period of the Initial Township project, DRC should ensure that EHS performance will be improved continuously via a combination of ongoing monitoring program and cooperation with the residences and community mall inside the Initial Township;		DRC

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Mitigation Measures and Monitoring Program During Operation Phase For Initial Township Project (Cont.)

Management Issue	Mitigation Measure	Monitoring Program	Responsibilities
	• DRC needs to prepare and commission a database system to keep track of and analyze environmental data, flow of materials and waste, water consumption, wastewater generation rate and quality, and energy consumption. The data base will help organize the data from monitoring program of DRC and of the township, and can also be used as a tool to promote conservation of material, energy, and water among the industries, if the database is designed properly and; • DRC should provide provisions to ensure that the project can apply proper environmental health and safety management to protect health and safety of workers and the public.		
Air Emission and Noise Control	• Provide some space areas for tree planting within the project area. • Care and maintain the trees planted; in case the trees are dead, shall plant trees to replace the dead ones. • Install sign to notice that "*Do not start the car while parking for waiting*" at the parking area and reiterate the security guards to control strictly including in Myanmese language. • Limit vehicle speed inside township area as 30 km/hr to mitigate possible noise impacts on nearby area. • Install the "*No Audible*" sign within residential and township areas in obvious places. • Plan for emission of GHGs from the Project shall be established and/or revised in concurrently with the relevant policy and regulations.	• Ensure that relevant mitigation measures are implemented and been reported to MC every 6 months.	DRC or MC's Authorized Agency
Waste Management	• Design and construction of the landfill shall be in accordance with *Solid Waste Disposal Facility Criteria* – Technical Manual published by U.S. EPA (1993) or other applicable standards. • Detailed hydrogeological condition of the proposed landfill area has to be studied in the design of landfill. • Groundwater monitoring wells will be installed. As a minimum, 1 well is to be installed up-gradient of the landfill and at least 3 wells is to be installed down-gradient of the landfill. Depth of screens and well construction depends on the results from the hydrogeological condition study. • The components of the waste management facility i.e. sanitary landfill, secured landfill and incinerator shall be designed and constructed according to the internationally accepted standards.	• Monitor groundwater very month for the first 6 months and then every 6 months unless unusual concentration are observed and compared the results with Thailand's groundwater quality standards or other applicable international standards following: - Collect baseline groundwater quality before the operation of the landfill. - For where the hazardous waste stabilization and disposal are conducted, monitor the following parameters: pH, redox potential, dissolved oxygen, temperature	DRC or MC's Authorized Agency

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Mitigation Measures and Monitoring Program During Operation Phase For Initial Township Project (Cont.)

Management Issue	Mitigation Measure	Monitoring Program	Responsibilities
	• The facility shall create its *Standard Operating Procedure* covering steps from receiving waste, laboratory analysis, stabilization, temporary storage, incineration and disposal. Audit by third party is necessary. • The landfill shall be closed daily to prevent vectors and odors. • Classify hazardous and non-hazardous waste according to the definitions in the Waste Management Plan prepared. • Workers need to be trained of *Waste Management Plan*. • All hazardous and non-hazardous waste generated shall be transferred to the facility for disposal. • Waste manifest system has to be created and implemented. • Record of type of waste including its quality shall be kept in the database of DRC. • Waste Management Facility (if constructed in landfill).	conductivity, turbidity and metals; Cd, Cu, Pb, Mn, Ni, As, Se and Hg. • Monitor every 6 months runoff and wastewater.	DRC or MC's Authorized Agency
Water and Sediment Quality	• Prepare and implement the measures for *Waste Management* and *Wastewater Management*. • The discharged of untreated wastewater into the receiving water is strictly prohibited at all time. Wastewater must be treated and comply with NEQG standard before discharge into natural drainage. • Wastewater from the initial township operation shall be reused to water the trees planted in the initial township. • *Emergency plan for operation of wastewater treatment* should be established to prevent untreated effluent discharged into the receiving water.	• Monitor 3 times (dry, early wet and end of wet season) per year surface water and sediment with parameters as prescribed in Table 8.3-1: - For full phase: 6 sampling stations with parameters as in Figure 8.3-1. - For 9+1 phase: 2 sampling stations (TS-SW2 and TS-SW3).	DRC or MC's Authorized Agency
Terrestrial Ecology	• Wherever possible, conserve the existing trees, particularly in the green areas, • Coordinate with local authorities and engage local communities for reforestation projects surrounding the project area. • Discourage and educate the workers towards wildlife consumption to reduce demand and indirect impacts to the wildlife in reserved forests elsewhere outside the project area.		DRC or MC's Authorized Agency
Land Use, Township, and Community Management	• Special Plan and Buffer Zone: 1. A special specific area plan, legitimate and authorized by the state, is needed to control the land use adjacent to the project estate; 2. A clear and marked buffer zone all around the township boundary should be set up to control and prevent any uses other than agriculture and forest;	• Ensure that mitigation measures and land use plan are implemented and in long-term communities located in safe distance from the initial township and conflicts were reduced.	DRC or MC's Authorized Agency

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Mitigation Measures and Monitoring Program During Operation Phase For Initial Township Project (Cont.)

Management Issue	Mitigation Measure	Monitoring Program	Responsibilities
	3. The size of the buffer zone should be determined by land use expert to ensure that in case of fire or other hazards, only a minimum number of people will be affected and rescue and relocation efforts will be with ease and; 4. A comprehensive plan authorized by the state for the future of Dawei is needed for appropriate growth. • A Management Committee Overseeing the Project Land Use: 1. A team or committee should be set up to monitor and manage activities and structures built in and around the project area. 2. The team should have legitimate authority to control the areas adjacent or nearby, though outside the township boundary. 3. Squatters must be notified that they are only allowed to operate temporarily and must be relocated when the time comes in order to prevent scattered temporary structures from evolving into unsuitable permanent settlements outside the initial area. • Transportation and Infrastructure outside the Estate Area: 1. For the area immediately outside the township and other infrastructures that will enable setting up structures and services, such as, local roads, electricity, water supply, and drainage, should be also well planned and controlled. 2. The strategic locating or prohibiting of these basic infrastructures will be needed to induce and encourage early settlers and services outside designated township zone into the planned area. • Enforcement: 1. The proposed set-up land use management committee/team should have duty to regularly monitor land use activities outside and inside the township area as the development progresses. 2. Co-operation with local or state authority is needed to be able to control, direct, or enforce private buildings outside the project boundaries to prevent unsuitable and obstructing growth nearby the project area.		
Occupational Health and Safety	• Accidents and Injuries: 1. Provide the environmental health and safety management system and programs for the whole initial township. 2. Establish occupational health and safety management plans and programs to assess and manage EHS impacts and risks which are based on comprehensive job safety analyses.	• Ensure that occupational health and safety statistics and records were monthly update.	DRC

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Mitigation Measures and Monitoring Program During Operation Phase For Initial Township Project (Cont.)

Management Issue	Mitigation Measure	Monitoring Program	Responsibilities
	3. Include the following issues in the occupational health and safety management system: - Accident investigation, recording and reporting - Surveillance of the employee's health - Training and hazard communication - Monitoring and auditing procedures to evaluate the effectiveness of prevention and control measures. 4. Perform occupational accidents and disease recording and reporting, investigate all incidents to understand the cause of accident and to identify measures necessary to prevent a recurrence. 5. Provide area signage and labeling of equipment in accordance with international standards and easily to understand by employees, visitors and general public. 6. Promote traffic safety programs to all personnel, for example; - Improving driving skill - Use of speed control devices • Occupational, Sexual Transmission and Communicable Diseases: 1. Conduct surveillance and active screening and treatment of employees. Immunization program may be required. 2. Provide training programs for employees in these following topics: health awareness, and promote health protection strategies including encouraging condom use. 3. Perform periodic employee's health checks in accordance with the potential risks. • Fire and Other Hazards 1. Provide comprehensive emergency preparedness and response plan and procedures covering fire and other hazards control. 2. Provide appropriate emergency services and personnel to execute emergency response when needed, and maintain equipment facilities, fire-fighting equipment in good working order, accessible and adequate for the dimension and the basis use. 3. Establish appropriate fire safety system to ensure its capability to cope with all the potential hazards. 4. Conduct annual training and updating emergency preparedness and response plan to account for changes in equipment, personnel and facilities. • Adequacy and Readiness of Healthcare Services:	• Monitor performance of health and safety operation against a set benchmark • Inspect periodically health and safety conditions. • Ensure implementation of the following: - Emergency equipment and facilities in response to fire, natural disasters and accidents are available and well maintenance. - Emergency response plan is appropriate to changes of the environmental condition such fire situation and natural disasters. • Revised Emergency Responses Plan are submitted to relevant agencies.	DDC or MC's Authorized Agency

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Mitigation Measures and Monitoring Program During Operation Phase For Initial Township Project (Cont.)

Management Issue	Mitigation Measure	Monitoring Program	Responsibilities
	1. Establish the hospital in the township area, and periodically evaluate in terms of adequacy, capacity and readiness in accordance with the change in numbers of population in the township.		
Community Health	- Sanitation: 1. Provide sufficient infrastructure amenities and public health services for the township; for example, accommodations, water and drinking water availability, solid wastes disposal and sewage treatment in order to reduce pressure on local authorities in servicing public. 2. Technically support or collaborate with local authorities to enhance potentiality of communities in solid waste disposal by means of 3 R (Reduce, Reuse and Recycle). - Environmental/Communicable/Non-Communicable Diseases: 1. Establish the buffer strip/zone to separate the township and industrial estate to protect dwellers from pollutions emitted. 2. Implement engineering preventive measures to install physical separation between industry and community; for example, fence or tree plantation as buffer zone along the estate boundaries, and use of air modeling results and/or potential pollutions of each industry as the criteria for the distance between industries and affected community. 3. Set up a grievance procedure to manage complaints, if any. - Accidents/Fire: 1. Invite representative of local emergency and securities services to participate in annual site inspections to ensure familiarity with the potential hazards present. 2. Inform and communicate potential accidents that may impact to community to local communities and relevant parties. 3. Prepare and train employees, people in township and nearby communities to respond to accidents, including providing technical and financial resources in order to control and response such events effectively and safely, and provide periodic emergency response practice with communities. 4. Establish *Emergency Response Plans* in concordance with recent policy, law and regulation. Emergency response plan shall be appropriate to such current environmental condition and natural disasters and;		DRC in collaboration with local authorities

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Mitigation Measures and Monitoring Program During Operation Phase For Initial Township Project (Cont.)

Management Issue	Mitigation Measure	Monitoring Program	Responsibilities
	5. Revise Emergency Response Plans as necessary according to changing of environmental situation including notify the Minister and Dawei Special Economic Zone Management Committee. • Adequacy and Readiness of Healthcare Services: 1. Promote collaboration with local authorities to enhance access of community to public health services for the employee's families and people being at residences in township to develop health service facility. 2. Risk and impact to environment from operation of Health Centre Services i.e. hospital shall be assessed including establishment of environmental management plan and mitigation measures.		
Employment and Training Program	• Comply with IFC EHS General guideline/Laws and regulations in terms of the employee management and established plan for training programme and implement.		DRC
Public Participation and Dissemination.	• Establish *Public Relation and Public Participation Plan* to incorporate in requests and recommendation of the continuous engagement of stakeholders following: 1. Inform about project activities to community 2. Support nearby community as appropriate to build good relationship with community 3. Communicate to build community understanding about - Potential environmental impacts and mitigation measures - CSR activity 4. Conduct by DRC consistent with the applicable standard for public meeting/consultation 5. Disclose about project information and public relation activities through channels such as website, e-mails, meeting/visiting and local exhibition board or local media. 6. Take account the results of the public consultation in improving and revised EMPs	• Monitor every 5 years for entire operation phase using questionnaire for communities within 1 km of the Project area. Ensure that sufficient number of questionnaires are sampling and base on reliable statistic.	DRC
Grievances Redress	Establish *Grievance Redress Procedure* to address any complaints/grieves to resolve/settle disputes that brought forward by community pertaining to project activities.	• Ensure that complaints/grieves are recorded and cases are settled.	DRC

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Mitigation Measures and Monitoring Program During Operation Phase For Initial Township Project (Cont.)

Management Issue	Mitigation Measure	Monitoring Program	Responsibilities
Revised and Report	1. Revised EMP and Emergency Response Plan depending on the changing in condition such fire hazard, safety from chemicals, flooding and earthquake and submitted to DSEZMC and MONREC 2. Reporting on performance of basic infrastructure e.g. local roads, electricitity, water supply, safety and results of continuous public consultation in the monitoring reports that will carry out every 6 months and submitted to DSEZMC and MONREC	• Ensure that monitoring reports included performance of basic infrastructure and submit to relevant agencies every 6 months or as stated in the EMP • Ensure that revised ERP is submitted to relevant agencies depend on the changes condition.	DRC

Remarks: MC: Management Committee

DRC: Dawei Residence Company Limited

CC: Construction Contractors

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LIST OF ABBREVIATION

ADB	Asian Development Bank
AEC	Asian Economic Community
BAT	Best Available Technology
CA	Concession Agreement
CB	Central Body
CC	Construction Contractor
CEMP	Construction phase Environmental Management Plan
CERMP	Construction phase Environmental Risk Management Plan
CO	Construction Phase
CSR	Corporation Social Responsibility
CWB	Central Working Body
DRC	Dawei Residence Company Limited
DSEZ	Dawei Special Economic Zone
DSEZMC	Dawei Special Economic Zone Management Committee
EC	Emergency Response Commander
ECC	Environmental Compliance Certificate
ECD	Environmental Conservation Department
ECL	Environmental Conservation Law
ECR	Environmental Conservation Rules
ED	Emergency Response Director
EHIA	Environmental and Health Impact Assessment
EHS	Environmental Health and Safety
EIA	Environmental Impact Assessment
EMoP	Environmental Monitoring Plan
EMP	Environmental Management Plan
EMS	Environmental Management System
EPC	Engineering Procurement and Construction
ERA	Environmental Risk Assessment
ERC	Emergency Response Center
ERP	Environmental Response Plan
ESIA	Environmental and Social Impact Assessment
FCS	Flood Controlling System
FFS	Fire Fighting System
FHWA	Federal Highway Administration
GIIP	Good International Industry Practice

IE	Initial Industrial Estate
IEC	International Engineering Consultant
IEE	Initial Environmental Examination
IFC	International Financial Cooperation
ITD	Italian Thai Development Company Limited
MAPDRR	Myanmar Action Plan on Disaster Risk Reduction
MIE	Myandawei Industrial Estate Company Limited
MOECAF	Ministry of Environmental Conservation And Forestry
MONREC	Ministry of Natural Resource and Environmental Conservation
MOU	Memorandum Of Understanding
MOU	Memorandum Of Understanding
NCEA	National Commission for Environmental Affairs
NECC	National Environmental Conservation Committee
NEQG	National Environmental Quality (Emissions) Guidelines
NESDB	National Economic and Social Development Board
OEMP	Operation phase Environmental Management Plan
OERMP	Operation phase Environmental Risk Management Plan
OHSA	Occupational Health and Safety Administration
OP	Operation Phase
PAH	Project Affected Households
PAP	Project Affected People
PCCD	Pollution Control and Cleaning Department
PIC	Person In Charge
PPAH	Pollution Prevention and Abatement Handbook
PPP	Public Private Participation
PRMP	Project Risk Management Plan
PS	Performance Standard
PTW	Permit To Work
REM	Resource and Environment Myanmar Limited
SEATEC	SEATEC Engineering Consultant
SEZ	Special Economic Zone
SIA	Social Impact Assessment
SWB	Support Working Body
TEAM	TEAM Group Consultant
TOR	Term Of Reference
UAE	United Analyst and Engineering Consultant
US EPA	US Environmental Protection Agency
WHO	World Health Organization

LIST OF TECHNICAL ABBREVIATION

BOD	Biological Oxygen Demand
CC	Construction Contractor
CCTV	Closed-Circuit Television
CD	Chart Datum
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CO	Carbon Monoxide
COD	Chemical Oxygen Demand
DO	Dissolve Oxygen
FCB	Fecal Coliform Bacteria
FOG	Fat Oil and Grease
GDS	Generator Docking Station
GHG	Green House Gases
GPS	Global Positioning System
HIV/AIDs	Human Immunodeficiency Virus/Acquired Immune Deficiency syndrome
HRT	Hydraulic Retention Time
ISO	International Organization for Standardization
IT	Information Technology
IUCN	Red Data List of Threatened Species
IVI	Important Value Index
L_{Aeq}	Equivalent Continuous Noise Level
L_{Amax}	Maximum value of A-weighted sound pressure Level
LNG	Liquefied Natural Gas
MHC	Methane Hydrocarbon
MR	Main Road
NMHC	Non Methane Hydrocarbon
PCE	Passenger Car Equivalent
PCU	Passenger Car Unit
PM	Particular Matter
SR	Secondary Road
TCB	Total Coliform Bacteria
TR	Tertiary Road
TSP	Total Suspended Particulate
TSS	Total Suspended Solid
VOC	Volatile Organic Compounds
VPN	Virtual Private Network

WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant
Tc	Retention Time
FCP	Fire Alarm Control Panel
ANN	Graphic Annunciator
F	Fire Alarm Manual Station
B	Fire Alarm Bell
FHC	Fire Hose Cabinet
FDC	Fire Department Connection
OTU	Onsite Treatment Unit
WGS	World Geodetic System
FSD	Foundation for Sustainable Development

LIST OF UNITS

dB(A)	A-weight decibels (Noise level unit)
DWT	Deadweight Tonnage
Gbps	Gigabits Per Second
kV	Kilo Volts
KYATs	Myanmar Currency Unit
MVA	Mega Volts Amperes
MW	Mega Watt
NTU	Nephilometric Turbidity Unit
PCU	Passenger Car Unit
TEU	Twenty-Foot Equivalent Unit
UTM	Universal Transvers Mercator (Geographic Location)
CFU	Colony Forming Unit
KNU	Karen National Union
VA	Volt-Ampere

အခန်း (၁)

အကျဉ်းချုပ်

၁.၁ စီမံကိန်းအကြောင်းအရာ

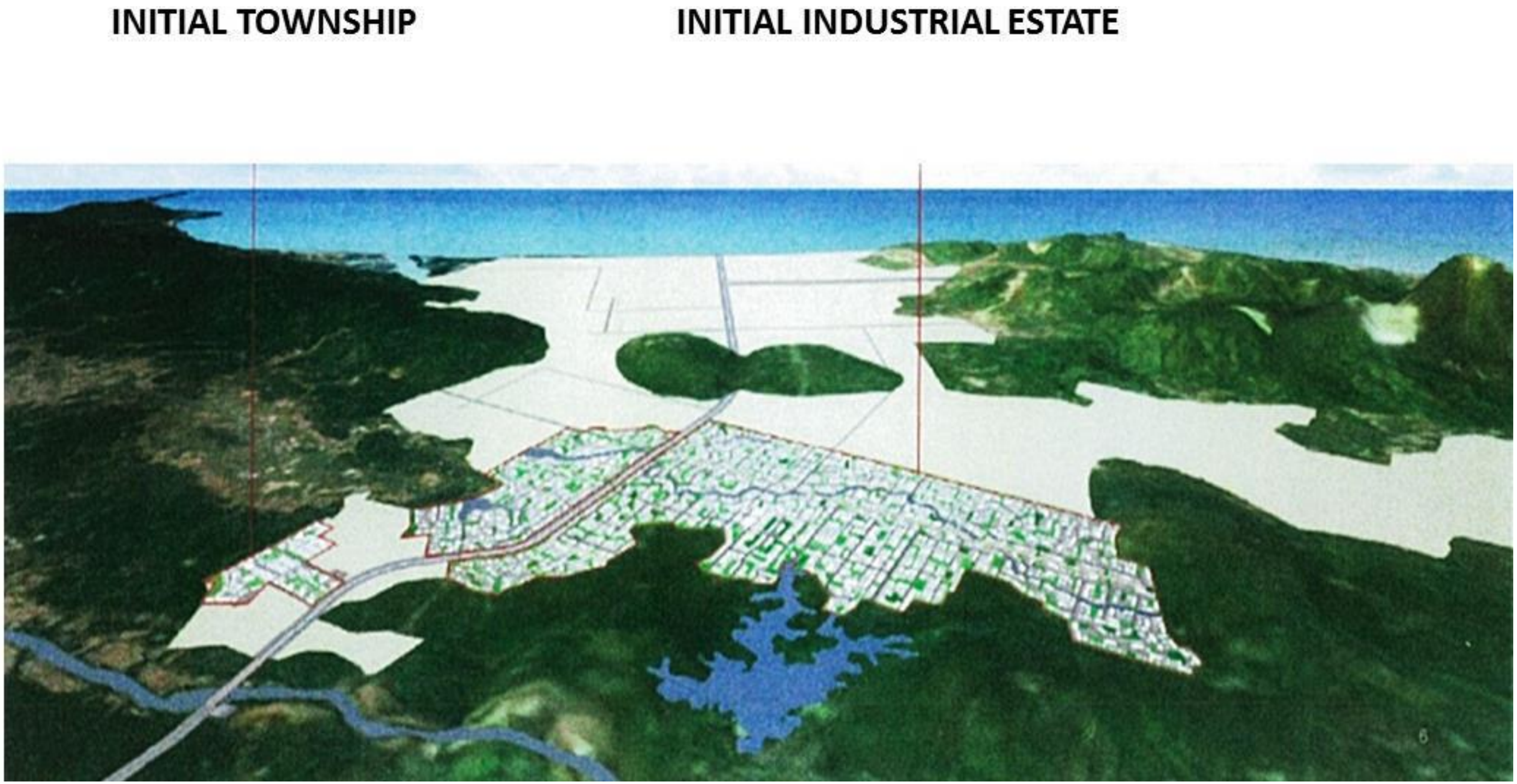
၁.၁.၁ လေ့လာချက်များ

ပတ်ဝန်းကျင်နှင့် လူမှုရေးဆိုင်ရာ သက်ရောက်မှုအကဲဖြတ်ခြင်း (ESIA) ၏ ရည်ရွယ်ချက်သည် Dawei Residence Company Limited (DRC) မှဆောင်ရွက်သော ထားဝယ် အထူးစီးပွားရေးဇုန်ရှိ ကနဦးမြို့ပြ ဖွံ့ဖြိုးတိုးတက်မှု (နောက်ပိုင်းတွင် စီမံကိန်းဟု သုံးနှုန်းပါမည်)ကြောင့် ဖြစ်ပေါ်လာသော ပတ်ဝန်းကျင်နှင့် လူမှုရေးဆိုင်ရာ သက်ရောက်မှုများကို အကဲဖြတ်ရန်ဖြစ်ပြီး စီမံကိန်းကြောင့် ဖြစ်ပေါ်လာသော ဆိုးကျိုးများကို လျော့ချရန်အတွက် လျော့ပါးစေရေးနည်းလမ်းများ ပါဝင်သော ပတ်ဝန်းကျင်ဆိုင်ရာ စီမံခန့်ခွဲမှု အစီအစဉ် (EMP) ကိုလဲ ထည့်သွင်းစဉ်းစားပါသည်။

DSEZ ရှိ ၁၃၆၅ စတုရန်းကီလိုမီတာခန့်ကို စီးပွားရေးလုပ်ငန်းများနှင့် အပန်းဖြေနေရာများပါဝင်သော အဆင့်မြင့် လူနေအိမ်များအဖြစ် ဆောင်ရွက်မည်ဖြစ်ပြီး DSEZ အတွင်းနေထိုင်၊ အလုပ်လုပ်ကြသော မြန်မာနိုင်ငံသားနှင့် နိုင်ငံခြားသားများ၏ လူနေမှု အဆင့်အတန်းကို မြင့်တက်စေနိုင်ပါသည်။ စီမံကိန်းသည် ကနဦးအဆင့်တွင် အများဆုံး လူ၁၃၅၀၈၀ ဦးအတွက် ပုံစံရေးဆွဲထားပြီး နောက်ဆုံးအဆင့်တွင် လူ၃၇၀၁၁၆ ဦးအတွက် ၅.၅၈ စတုရန်းကီလိုမီတာ ချဲ့နိုင်ပါသည်။ အောက်ပါတို့ကို ဆောက်လုပ်ဆောင်ရွက်သွားပါမည်။

- အထပ်မြင့်တိုက်ခန်းများ
- အရောင်းဆိုင်ခန်းများ
- စီးပွားရေးလုပ်ငန်းနေရာများ
- ဝန်ဆောင်မှုလုပ်ငန်းများ
- မီးဘေးကာကွယ်ခြင်းနှင့် အရေးပေါ်တုန့်ပြန်မှုစနစ်
- ဆက်သွယ်မှုစနစ်
- လုံခြုံရေးစနစ်
- ပို့ဆောင်ရေးနှင့်
- အပန်းဖြေအနားယူခြင်း

ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဥပဒေ (၂၀၁၃) နှင့် သယံဇာတနှင့် ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဝန်ကြီးဌာန (MONREC)မှ ပြဌာန်းထားသော ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းလုပ်ငန်း (No.616/2015) အရ ဟိုတယ်နှင့် ခရီးသွားလာရေးလုပ်ငန်းများသည် EIA လေ့လာမှု ဆောင်ရွက်ရန် လိုအပ်ပါသည်။ ဥပဒေအရ လေးစားလိုက်နာမှုများကို အကောင်အထည်ဖော်ရန် DRC သည် စီမံကိန်းအတွက် EIA အစီရင်ခံစာ ဆောင်ရွက်ရန် United Analyst and Engineering Consultant Co., Ltd. (UAE) ကို တာဝန်ပေးခဲ့ပါသည်။ (UAE သည် EIA လေ့လာရေးအဖွဲ့ကိုဆိုလိုပါသည်။)



Source: DRC (2015)

ပုံ ၁.၁-၁ ထားဝယ် SEZ ရှိ စီမံကိန်းတည်နေရာ

Source: DRC (2015)

ပုံ ၁.၁-၂ စီမံကိန်းဖော်ပြချက်

၁.၁.၂ ဆက်စပ်နေသော စီမံကိန်းများ

DSEZ စီမံကိန်းသည် ၂၀၁၀ ခုနှစ်ကတည်းက စတင်ဆောင်ရွက်ခဲ့ပြီး ပင်လယ်ရေနက်ဆိပ်ကမ်းနှင့် စက်မှုဇုန်၏ မူဘောင်သဘောတူညီချက်မှ စတင်ဆောင်ရွက်ခဲ့ပါသည်။ ၂၀၁၅ နောက်ပိုင်းတွင် DSEZ ကနဦးအဆင့် သည် ယခင်ဆောင်ရွက်မှုများနှင့် ရုပ်လုံးပေါ်လာပြီး နိုင်ငံခြားသား ရင်းနှီးမြှုပ်နှံသူများအတွက် များစွာ ဆွဲဆောင်လာနိုင်ပါသည်။ မကြာသေးခင်က ဆောင်ရွက်ထားသော စီမံကိန်းများ (ပုံ ၁.၁-၂) မှာ အောက်ပါဆောင်ရွက်မှုများနှင့်အတူ ကျယ်ပြန့်လာပါသည်။

- ထိုင်းနိုင်ငံသို့ လမ်းပန်းဆက်သွယ်ရေး
- ဆိပ်ကမ်းနှင့် LNG Terminal
- ကနဦးစွမ်းအင်စက်ရုံ
- ရေလှောင်ကန်နှင့် တာတမံများ
- ကနဦးစက်မှုဇုန်
- စကားပြောဆက်သွယ်ရေးလိုင်းများ

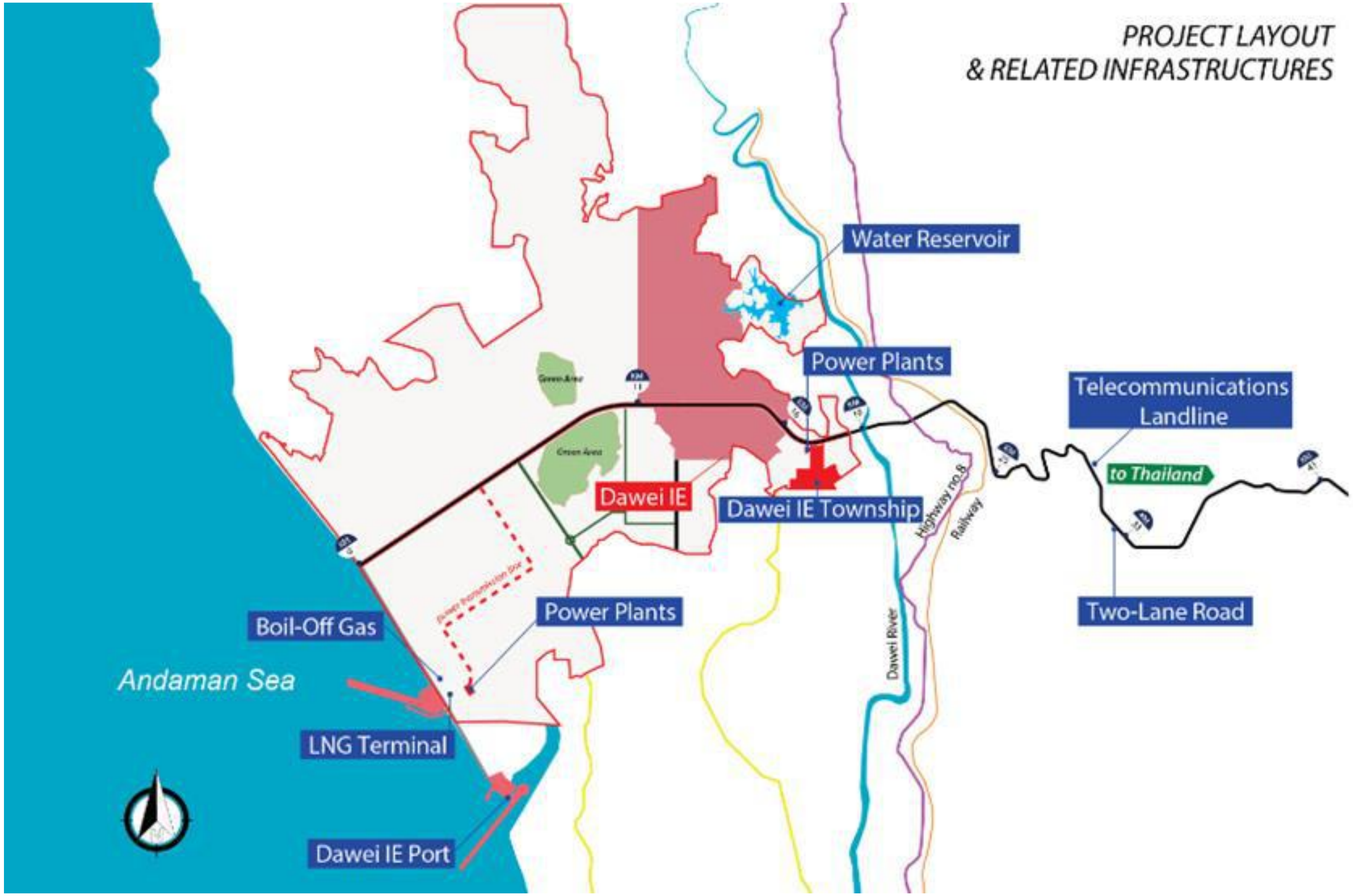
နှစ်လမ်းသွားလမ်းသည် DSEZ နှင့် ထိုင်းနိုင်ငံကြား အဓိကဆက်သွယ်ရေးလမ်းကြောင်းဖြစ်ပြီး အခြားအရှေ့တောင်အာရှ ဒေသများနှင့်လည်း ဆက်သွယ်ထားပါသည်။ လမ်းမကြီးသည် အက်ဒမန်ပင်လယ်ကမ်းရိုးတန်းမှ ထိုင်းပင်လယ်ကွေ့တစ်လျှောက်နှင့် တောင်တရုပ်ပင်လယ်ထိ ဆက်သွယ်ထားပါသည်။ စီမံကိန်းသည် ၁၃၈ ကီလိုမီတာ အရှည်ရှိပြီး ၁၈ ကီလိုမီတာ + ၅၀၀ ထိခီး တွင် ဆုံးသော ထိုင်းမြန်မာ နယ်စပ်ကိုဖြတ်သွားသော DSEZ ရှိ အဓိကလမ်းမကြီး ဖြစ်ပါသည်။ လမ်းသည် ထိုင်းနိုင်ငံ၊ ကန်ချနာပူရီရှိ ဘန်ဖူနန်ရွှန်ဒေသကို ဆက်သွယ်ထားပါသည်။ လမ်းပိုင်းအများစုမှာ မြန်မာနိုင်ငံတွင်းရှိပြီး ၅ ကီလိုမီတာရှည်လျားသော အပုင်း ၃ လမ်းတစ်ခုတည်းသာ ထိုင်းနိုင်ငံအတွင်း တည်ရှိပါသည်။ လမ်းအသုံးပြုစဉ်အတွင်း လမ်းအသုံးပြုခ၊ အခွန်အခများကို ကောက်ခံသွားပါမည်။

တစ်နှစ်လျှင် ၃၃၀၀၀၀ တန် ခံနိုင်ဝန်ရှိသော ရေယာဉ်များ (Approx. 400 TEU or 13,000 DWT) အသုံးပြုရန်အတွက် မီတာ ၁၀၀ ဆိပ်ခံတံတားပါဝင်သော ထားဝယ်ဆိပ်ကမ်းကို မကြာသေးမီက တည်ဆောက်ပြီးစီးထားပါသည်။ ဆိပ်ကမ်းခံနိုင်ဝန်ကို တိုးချဲ့ရန်အတွက် တစ်နှစ်လျှင် တန်ချိန် ၁၄ သန်းခံနိုင်ဝန်နှင့် ၆၀၀၀၀ DWT ရှိသော Panamax ရေယာဉ်များအတွက် ၎င်းကျောက်ချရပ်နားခြင်းကို တိုးချဲ့ရန် စီစဉ်ထားပါသည်။ ၎င်းကျောက်ချရပ်နားနေရာသည် ဆောက်လုပ်ဆဲဖြစ်ပြီး ၂၀၂၀ ခုနှစ်တွင် စတင်အသုံးပြုနိုင်ရန် စီစဉ်ထားပါသည်။ LNG Terminals များသည် ထားဝယ်ဆိပ်ကမ်း မြင်ကွင်းနေရာတွင် တည်ရှိပြီး ဒေသအတွက် စီးပွားရေးနှင့် စွမ်းအင်များကို ထောက်ပံ့ပေးပါမည်။ LNG terminal ပေါင်း တစ်နှစ်လျှင် ၆ သန်း တန်ရှိပြီး ၎င်းဓါတ်ငွေ့သည် ဓါတ်ငွေ့မီးစွမ်းအင်စက်ရုံများကို အဓိက ထောက်ပံ့ပေးပါမည်။

၄၅၀ MW လျှပ်စစ်စက်ရုံသည် ထားဝယ် SEZ စက်ရုံများ (ဥပမာ- ကနဦးစက်မှုဇုန်၊ မြို့နှင့် ရေနံဓါတုစက်ရုံများ) အတွက် အဓိကလျှပ်စစ်ထောက်ပံ့ရာ နေရာတစ်ခုဖြစ်ပါသည်။ ၎င်းစက်ရုံတွင် လဲလှယ်သည့် ကွင်းပြင်၊ အရေးပေါ် ဒီဇယ်သုံးမီးစက်များ၊ ဒီဇယ်သိုလှောင်သည့် တိုင်ကီများနှင့် ၁၁၅ KV လျှပ်စစ်မီးလိုင်းများ ရှိပါသည်။

ပယင်းဖြူရေလှောင်တမံနှင့် တနိုင်းဂ ဆည်တို့သည် စစချင်း စက်ရုံတည်ဆောက်မှုများနှင့်ကနဦးစက်မှုဇုန်အတွက် ရေအသုံးပြုမှုကို ထောက်ပံ့ပေးပါမည်။ ရေလှောင်တမံသည် ရေထိန်းဧရိယာ ၇.၁၄ စတုရန်းကီလိုမီတာရှိပြီး အများတုံး ၈.၅၄ cubic မီတာ ရှိပါသည်။ ဗဟို ရေသန့်စင်စက်ရုံသည် ရေလှောင်တမံအနီးတွင် တည်ရှိပြီး တစ်ရက်လျှင် ၃၆ဂဂဂ m^3 သန့်စင်ပေးနိုင်ပါသည်။ ဖုန်း (IP phone)၊ CCTV၊ VPN၊ video အစရှိသည့်တို့ အပါအဝင် မြေစိုက်နှင့် 10 Gbps အမြန်နှုန်းမြင့် အင်တာနက်၊ မိုဘိုင်းလ် ဝန်ဆောင်မှုများကို နိုင်ငံ၏ လက်ရှိ ဆက်သွယ်ရေးလုပ်ငန်းများအားဖြင့် ဆောင်ရွက်ပေးပါမည်။

ကနဦးစက်မှုဇုန်သည် ထုတ်လုပ်လျှက်ရှိပြီး စက်ရုံများသည် ရင်းနှီးမြှုပ်နှံမှုအတွက် ဖွင့်လှစ်လျှက်ရှိပါသည်။ ၄င်းသည် ဇုန် A, B, C နှင့် D အသီးသီးမှ စတင်၍ (သို့) ဈေးကွက်လိုအပ်ချက်ကိုလိုက်၍ အသီးသီးအဆင့်အလိုက်တိုးတက်လာပါသည်။ စက်မှုဇုန်တွင် ဗဟိုရေဆိုးသန့်စင်စနစ်၊ မြေဆီလွှာ စွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲမှုစနစ်၊ ရေကြီးရေလျှံ ထိန်းချုပ်မှုစနစ်ကဲ့သို့ ဆောင်ရွက်မှုများ ပါဝင်ပါမည်။



Source: DRC (2015)

ပုံ၁.၁-၃ ထားဝယ် SEZ အတွင်း ဆက်စပ်နေသော စီမံကိန်းများ

၁.၂ ပတ်ဝန်းကျင်နှင့် လူမှုရေးဆိုင်ရာ ထည့်သွင်းစဉ်းစားမှုများ

ပတ်ဝန်းကျင်ဆိုင်ရာ ဥပဒေသတ်မှတ်ချက်သည် စီမံကိန်းလည်ပတ်ခြင်းနှင့် စီမံခန့်ခွဲခြင်းတို့တွင် အဓိကကျပါသည်။ ထို့ကြောင့် ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအတွက် မူများကို နိုင်ငံ၏ မူဝါဒ၊ ဥပဒေနှင့် စည်းမျဉ်းစည်းကမ်းများကို ထည့်သွင်းစဉ်းစားကာ ဖော်ထုတ်ရပါသည်။ ဤနေရာတွင် ဖော်ပြထားသော ဥပဒေအများစုသည် မကြာသေးမီက (သို့) ယခုအကောင်အထည်ဖော်နေဆဲဖြစ်ပြီး အချို့ဥပဒေများမှာ British India လက်အောက်ခံကတည်းက ပြဌာန်းထားသော ဥပဒေများ ဖြစ်ပါသည်။ ဤအခန်းသည် အကြိုဆောက်လုပ်ဆဲ၊ ဆောက်လုပ်ဆဲ၊ လုပ်ငန်းလည်ပတ်ချိန်နှင့် လုပ်ငန်းဖျက်သိမ်းချိန် အစရှိသော စီမံကိန်းဖွံ့ဖြိုးတိုးတက်မှု၏ အဆင့်တိုင်းအတွက် ထည့်သွင်းစဉ်းစားထားပါသည်။

၁.၂.၁ မြန်မာ့ဥပဒေမူဘောင်

၁.၂.၁.၁ နိုင်ငံအဆင့် ဖွဲ့စည်းပုံ

မေ ၂၀၁၇အရ မြန်မာနိုင်ငံတွင် နိုင်ငံတော်သမ္မတရုံးလက်အောက်တွင် ဝန်ကြီးဌာန ၂၁ ခုရှိပါသည်။ ပတ်ဝန်းကျင်နှင့် လူမှုရေးထည့်သွင်းစဉ်းစားမှုများအတွက် သက်ဆိုင်သော ဝန်ကြီးဌာနများမှာ သယံဇာတနှင့် ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဝန်ကြီးဌာန (MONREC) လက်အောက်ရှိ ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဌာန (ECD) ဖြစ်ပါသည်။

၁.၂.၁.၂ ပတ်ဝန်းကျင်၊ လူမှုရေးနှင့် ကျန်းမာရေး ထည့်သွင်းစဉ်းစားမှုများနှင့် သက်ဆိုင်သော ဥပဒေများ

ပတ်ဝန်းကျင်၊ လူမှုရေးနှင့် ကျန်းမာရေး ထည့်သွင်းစဉ်းစားမှုများနှင့် သက်ဆိုင်သော အခြေခံ ဥပဒေများနှင့် စည်းမျဉ်းစည်းကမ်းများကို ဇယား ၁.၂-၁ နှင့် ဇယား ၁.၂-၂ တွင် ဖော်ပြထားပါသည်။ မြန်မာအစိုးရက သဘောတူလက်မှတ်ရေးထိုးထားသော သဘောတူညီချက်များနှင့် မဟာမိတ်များကို ဇယား ၁.၂-၃ တွင် ဖော်ပြထားပါသည်။

ဇယား ၁.၂-၁ စီမံကိန်းတွင် ပတ်ဝန်းကျင်နှင့် လူမှုရေးဆိုင်ရာ ဥပဒေများ ထည့်သွင်းစဉ်းစားမှု

စဉ်	မေ၂၀၁၇ ရှိ ဥပဒေများနှင့် စည်းမျဉ်းစည်းကမ်းများ
ပတ်ဝန်းကျင်ဆိုင်ရာမူဘောင်	
၁	အမျိုးသားပတ်ဝန်းကျင်ဆိုင်ရာမူဝါဒ(၁၉၉၄)
၂	ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဥပဒေ(၂၀၁၂)
၃	ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးနည်းဥပဒေ(၂၀၁၄)
EIA / ပတ်ဝန်းကျင်ဆိုင်ရာ စံချိန်စံညွှန်းများ	
၄	ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာလုပ်ထုံးလုပ်နည်း(၂၀၁၅)
၅	အမျိုးသားပတ်ဝန်းကျင်ဆိုင်ရာအရည်အသွေး(ထုတ်လွှတ်မှု)လမ်းညွှန်ချက်များ(၂၀၁၅)
ပတ်ဝန်းကျင်ဆိုင်ရာ အရင်းအမြစ်နှင့် အသုံးချမှု	
၆	မြေယာပိုင်ဆိုင်မှုအက်ဥပဒေ(၁၈၉၄)

၇	တာတမံအက်ဥပဒေ(၁၉၀၉)
၈	လယ်ယာမြေဥပဒေ(၂၀၁၂)
၉	လယ်ယာမြေနည်းဥပဒေ(၂၀၁၂)
၁၀	မြေလွတ်၊မြေလပ်နှင့်မြေရိုင်းများစီမံခန့်ခွဲရေးဥပဒေ(၂၀၁၂)
၁၁	မြေလွတ်၊မြေလပ်နှင့်မြေရိုင်းများစီမံခန့်ခွဲရေးနည်းဥပဒေများ(၂၀၁၂)
၁၂	သစ်တောဥပဒေ(၁၉၉၂)
၁၃	တောရိုင်းတိရစ္ဆာန်နှင့်အပင်များကာကွယ်ခြင်းနှင့်သဘာဝဧရိယာများထိန်းသိမ်းရေးဥပဒေ(၁၉၉၄)
၁၄	ရေအရင်းမြစ်များနှင့်မြစ်များထိန်းသိမ်းရေးဥပဒေ(၂၀၀၆)
၁၅	ရေအရင်းမြစ်များနှင့်မြစ်များထိန်းသိမ်းရေးနည်းဥပဒေများ(၂၀၁၃)
၁၆	ပင်လယ်ရေပိုင်နက်နှင့်ရေကြောင်းသွားလာရေးဇုန်ဥပဒေ(၁၉၉၇)

ဇယား ၁.၂-၂ စီမံကိန်းတွင် ပတ်ဝန်းကျင်နှင့် လူမှုရေးဆိုင်ရာ ဥပဒေများ ထည့်သွင်းစဉ်းစားမှု

စဉ်	မေ ၂၀၁၇ ရှိ ဥပဒေများနှင့် စည်းမျဉ်းစည်းကမ်းများ
စွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲမှု	
၁၇	မြေအောက်ရေအက်ဥပဒေ(၁၉၃၀)
၁၈	ရေစွမ်းအားအက်ဥပဒေ(၁၉၂၇)
၁၉	ရန်ကုန်မြို့တော်စည်ပင်သာယာရေးအက်ဥပဒေ(၁၉၂၂)
၂၀	ရန်ကုန်မြို့တော်ဖွံ့ဖြိုးရေး(၁၉၂၂)
၂၁	ဖွံ့ဖြိုးရေးကော်မတီ (၁၉၉၃)
၂၂	မြန်မာ့သတ္တုတွင်းဥပဒေ(၂၀၁၄)
လူမှုရေးနှင့် ယဉ်ကျေးမှု	
၂၃	ယဉ်ကျေးမှုအမွေအနှစ်ဒေသကာကွယ်ထိန်းသိမ်းရေးဥပဒေ(၁၉၉၄)
၂၄	ရှေးဟောင်းအဆောက်အအုံများကာကွယ်ထိန်းသိမ်းရေးဥပဒေ(၂၀၁၅)
၂၅	ရှေးဟောင်းဝတ္ထုပစ္စည်းများကာကွယ်ထိန်းသိမ်းရေးဥပဒေ(၂၀၁၅)
၂၆	အမျိုးသားလူမျိုးကာကွယ်ရေးဥပဒေ(၂၀၁၅)
ပြည်သူ့ကျန်းမာရေးနှင့် ဘေးကင်းလုံခြုံမှု	
၂၇	ပြည်သူ့ကျန်းမာရေးဥပဒေ(၁၉၇၂)
၂၈	အမျိုးသားကျန်းမာရေးမူဝါဒ(၁၉၉၃)
၂၉	ကူးစက်ရောဂါထိန်းချုပ်ခြင်းနှင့်တားဆီးကာကွယ်ရေးဥပဒေ(၁၉၉၅)
၃၀	ဆေးရွက်ကြီးထုတ်ကုန်သောက်သုံးခြင်းဆိုင်ရာထိန်းချုပ်ရေးဥပဒေ(၂၀၀၆)
၃၁	မော်တော်ယာဉ်ဥပဒေ(၂၀၀၁၅)

၃၂	မြန်မာနိုင်ငံမီးသတ်တပ်ဖွဲ့ဥပဒေ(၂၀၁၅)
အလုပ်အကိုင်နှင့် လုပ်ငန်းခွင်	
၃၃	အလုပ်ရုံများအက်ဥပဒေ(၁၉၅၁)
၃၄	အလုပ်သမားလျော်ကြေးအက်ဥပဒေ(၁၉၂၃)
၃၅	အခကြေးငွေပေးချေရေးအက်ဥပဒေ(၁၉၃၆)
၃၆	အလုပ်အကိုင်နှင့်ကျွမ်းကျင်မှုဖွံ့ဖြိုးတိုးတက်ရေးဥပဒေ(၂၀၁၃)
၃၇	အနည်းဆုံးအခကြေးငွေဥပဒေ/နည်းဥပဒေများ(၂၀၁၃)
၃၈	ခွင့်ရက်နှင့်အလုပ်ပိတ်ရက်အက်ဥပဒေ (1951, partially revised in 2014)
၃၉	အလုပ်သမားအဖွဲ့အစည်းဥပဒေ(၂၀၁၁)
၄၀	အလုပ်သမားအဖွဲ့အစည်းနည်းဥပဒေ(၂၀၁၂)
၄၁	အလုပ်သမားရေးရာအငြင်းပွားမှုဖြေရှင်းရေးဥပဒေ(၂၀၁၂)
၄၂	လူမှုဖူလုံရေးဥပဒေ(၂၀၁၂)
၄၃	ဆိုင်များနှင့်အလုပ်ဌာနများအက်ဥဒေ(၁၉၅၁)
စက်မှုဇုန်ဥပဒေ	
၄၄	ပေါက်ကွဲစေတတ်သည့်အရာများအက်ဥပဒေ(၁၈၈၄)
၄၅	ပေါက်ကွဲစေတတ်သောပစ္စည်းများအက်ဥပဒေ(၁၉၀၈)
၄၆	ပင်လယ်ရေကြောင်းငါးဖမ်းလုပ်ငန်းများဥပဒေ(၁၉၉၀)
၄၇	ရေချိုငါးဖမ်းလုပ်ငန်းများဥပဒေ(၁၉၉၁)
၄၈	ဓာတုပစ္စည်းနှင့်ဆက်စပ်ပစ္စည်းများအန္တရာယ်မှတားဆီးကာကွယ်ရေးဥပဒေ(၂၀၁၃)
၄၉	ရေနံအက်ဥပဒေ (၁၉၃၄)

ဇယား ၁.၂-၃ စီမံကိန်းတွင် ပတ်ဝန်းကျင်နှင့် လူမှုရေးဆိုင်ရာ ဥပဒေများ ထည့်သွင်းစဉ်းစားမှု

No.	မေ ၂၀၁၇ ရှိ ဥပဒေများနှင့် စည်းမျဉ်းစည်းကမ်းများ
၅၀	ရေနံနည်းဥပဒေများ(၁၉၃၇)
၅၁	မြေသြဇာဥပဒေ(၂၀၁၂)
၅၂	မြန်မာနိုင်ငံရင်းနှီးမြှုပ်နှံမှုဥပဒေ(၂၀၁၆)
၅၃	နိုင်ငံခြားရင်းနှီးမြှုပ်နှံမှုဥပဒေ(၂၀၁၂)
၅၄	မြန်မာနိုင်ငံသားများရင်းနှီးမြှုပ်နှံမှုဥပဒေ(၂၀၁၃)
၅၅	မြန်မာ့အာမခံလုပ်ငန်းဥပဒေ(၁၉၉၃)
၅၆	ပုဂ္ဂလိကစက်မှုလုပ်ငန်းဥပဒေ(၁၉၉၀)
၅၇	အခြေခံထောက်ပံ့ဝန်ဆောင်မှုဥပဒေ(၂၀၁၅)
၅၈	စံချိန်စံညွှန်းသတ်မှတ်ခြင်းဆိုင်ရာဥပဒေ(၂၀၁၄)
၅၉	လျှပ်စစ်ဥပဒေ(၂၀၁၄)
၆၀	ဘွိုင်လာဥပဒေ(၂၀၁၅)
အထူးစီးပွားရေးဇုန်ဥပဒေ	
၆၁	မြန်မာ့အထူးစီးပွားရေးဇုန်ဥပဒေ(၂၀၁၄)
၆၂	မြန်မာ့အထူးစီးပွားရေးဇုန်နည်းဥပဒေ(၂၀၁၅)
၆၃	ထားဝယ်အထူးစီးပွားရေးဇုန်ဥပဒေ(၂၀၁၂)

ဇယား ၁.၂-၄ စီမံကိန်းတွင် ပတ်ဝန်းကျင်နှင့် လူမှုရေးဆိုင်ရာ ဥပဒေများ ထည့်သွင်းစဉ်းစားမှု

စဉ်	မေ ၂၀၁၇ အမိန့်ကြော်ငြာစာများ
၁	အမိန့်ကြော်ငြာစာ အမှတ်.၁/၂၀၁၃ နှင့် အမှတ်.၅၀/၂၀၁၄၊ မြန်မာ့ရင်းနှီးမြှုပ်နှံမှုကော်မရှင်အားဖြင့် ပတ်ဝန်းကျင်ဆိုင်ရာ သက်ရောက်မှုအကဲဖြတ်ခြင်းလိုအပ်သော စီးပွားရေးဆောင်ရွက်ချက်များ
၂	အမိန့်ကြော်ငြာစာ အမှတ် ၈၁/ ၂၀၁၄ ထားဝယ်အထူးစီးပွားရေးဇုန်တွင် ရင်းနှီးမြှုပ်နှံမှုအတွက် အမျိုးသားစီမံကိန်းနှင့် စီးပွားရေးဖွံ့ဖြိုးတိုးတက်မှု ဝန်ကြီးဌာန၏ ခွင့်ပြုချက်
၃	အိုဇုန်းလွှာပျက်စီးစေသော စီးပွားရေးလုပ်ငန်းများ - အမိန့်ကြော်ငြာစာ အမှတ် ၃၇/ ၂၀၁၄
စဉ်	**မေ၂၀၁၇ လုပ်ဆောင်ချက်များ**
၁	The Myanmar National Building Code, Part 1, 2 and 5 (2012)

Source: ECD suggestion on draft final report on 2nd February 2017 and EIA Study Team

ဇယား ၁.၂-၅ ပတ်ဝန်းကျင်နှင့် လူမှုရေးဆိုင်ရာ ထည့်သွင်းစဉ်းစားမှုများနှင့် သက်ဆိုင်သော အဓိကအပြည်ပြည်ဆိုင်ရာ သဘောတူညီချက်များ

စဉ်	အပြည်ပြည်ဆိုင်ရာ သဘောတူဆောင်ရွက်ချက်များ	လက်မှတ်ရေးထိုးသည့်နှစ်
၁	Basel Convention, 1989	2015
၂	Ramsar Convention, 1971	2005
၃	Stockholm Convention on Persistent Organic Pollutants, 2001	2004
၄	Convention on International Trade in Endangered Species of Wild Fauna and Flora, 1979	1997
၅	United Nations Framework Convention on Climate Change, 1992	1994
၆	Convention on Biological Diversity, 1992	1994
၇	Montreal Protocol on Substances that Deplete the Ozone Layer, 1989	1993
၈	London Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer, 1990	1993

Source: EIA Study Team

၁.၂.၂ လမ်းညွှန်ချက်များနှင့် စံနှုန်းများ

မြန်မာ့အမျိုးသားပတ်ဝန်းကျင်ဆိုင်ရာ အရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန်ချက်ကို ၂၀၁၅ ခုနှစ်တွင် ပြဌာန်းခဲ့ပါသည်။ လေနှင့် ရေအရည်အသွေး၊ ဆူညံမှုနှင့် တုန်ခါခြင်းအတွက် အသုံးပြုသော ထုတ်လွှတ်မှု (သို့) စွန့်ထုတ်ခြင်း လမ်းညွှန်ချက်သည် ဤလေ့လာမှုတွင် ရည်မှန်းထားသော တန်ဖိုးများအတွက် အဓိက စံချိန်စံညွှန်းဖြစ်ပါသည်။ NO_2, CO (သို့) ဝန်းကျင်လေထု အရည်အသွေးကဲ့သို့ တချို့ တိုင်းတာမှုများသည် မြန်မာ NEQG တွင် မပါဝင်ပဲ ဂျပန်၊ အင်ဒိုနီးရှား၊ ထိုင်းနှင့် ဗီယက်နမ်ရှိ တင်းကျပ်သော စံချိန်စံညွှန်းများကို အသုံးပြုပါမည်။ IFC EHS လမ်းညွှန်ချက်ကို ရေအရည်အသွေးနှင့် ရေရရှိမှု အပါအဝင် လူမှုရေးနှင့် ကျန်းမာရေး၊ အဆောက်အဦး၊ သက်ရှိနှင့် မီးဘေး၊ လမ်းပိတ်ဆို့မှုလုံခြုံရေး စံချိန်စံညွှန်းများအတွက် အသုံးပြုပါမည်။

၁.၂.၃ ပတ်ဝန်းကျင်နှင့် လူမှုရေးဆိုင်ရာ မူဝါဒများ

စီမံကိန်း အဆိုပြုသူသည် စီမံကိန်း၏ တည်ဆောက်ဆဲနှင့် လုပ်ငန်းလည်ပတ်စဉ်အတွင်း ပတ်ဝန်းကျင်နှင့် လူမှုရေးဆိုင်ရာ စီမံခန့်ခွဲမှုများကို ထိန်းချုပ်ရန် ပတ်ဝန်းကျင်နှင့် လူမှုရေး စီမံခန့်ခွဲမှု မူဝါဒအရ အကောင်အထည်ဖော်ဆောင်ရွက်ပါမည်။ ထိုကိစ္စနှင့် ပတ်သက်၍ စီမံကိန်းအဆိုပြုသူသည် စီမံကိန်း၏ ပတ်ဝန်းကျင်ဆိုင်ရာကဏ္ဍများကို ISO 14001 ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုစနစ်အရ

ဆောင်ရွက်ပါမည်။ တဆက်တည်းမှာပင် စီမံကိန်းအဆိုပြုသူသည် စီမံကိန်းအတွက် ပတ်ဝန်းကျင်ဆိုင်ရာ စီမံခန့်ခွဲမှုစနစ်ကို အကောင်အထည်ဖော်မည်ဖြစ်ပြီး ISO14001 လိုအပ်ချက်များပြည့်မီရန် EMS ကို ဆောင်ရွက်ပါမည်။ EMS စီမံခန့်ခွဲမှုကို ဆောက်လုပ်ရေးစတင်လုပ်ဆောင်သည့် ရက်မှစ၍ စတင်ဆောင်ရွက်ပါမည်။

၁.၂.၄ နယ်ပယ်သတ်မှတ်ခြင်းနှင့် အစီရင်ခံစာမူကြမ်းအပေါ်တွင် MONREC ၏သုံးသပ်ချက်များ

အစီရင်ခံစာမူကြမ်းကို MONREC က ၂၀၁၇ ဇူလိုင်လ ၁၇ ရက်တွင် နောက်ဆုံး သုံးသပ်ပေးခဲ့ပါသည်။ ECD သည် တချို့ကဏ္ဍများ (ပြန်လည်နေရာချထားရေးနှင့် လျော်ကြေး၊ သဘာဝဘေးအန္တရာယ် အရေးပေါ် တုန့်ပြန်မှု အစီအစဉ်၊ ပတ်ဝန်းကျင်၊ ကျန်းမာရေးနှင့် လုံခြုံရေးအစီအစဉ်နှင့် ဥပဒေလေးစားလိုက်နာမှုများ၊ သင်တန်းများနှင့် CSR လုပ်ငန်းများ) ကို ပြန်စစ်ဆေးရန်နှင့် ပြန်လည်သုံးသပ်ရန် အကြံပေးခဲ့ပါသည်။ သုံးသပ်ချက်များကို အခန်း ၂.၆ တွင် ဖော်ပြထားပါသည်။

၁.၃ စီမံကိန်းအကြောင်း တင်ပြမှု

၁.၃.၁ စီမံကိန်းတည်နေရာ

စီမံကိန်းသည် တနင်္သာရီတိုင်းဒေသကြီး ထားဝယ်ခရိုင်တွင် တည်ရှိပြီး ထားဝယ်အထူးစီးပွားရေးဇုန်အတွင်း ရှိပါသည်။ ၄င်းသည် အနောက်ဘက်တွင် အက်ဒမန်ပင်လယ်နှင့် အရှေ့ဘက်တွင် ထားဝယ်မြစ် ရှိပါသည်။ စီမံကိန်းသည် ထားဝယ်လေဆိပ်မြောက်ဘက် ၃၀ ကီလိုမီတာနှင့် ထားဝယ်မြို့လယ်တွင် တည်ရှိပါသည်။ စီမံကိန်းသို့ ရန်ကုန်-မန္တလေး အဝေးပြေးလမ်းမကြီးနှင့် မြောက်ဘက်တွင် အမှတ် ၈ အဝေးပြေးလမ်းမကြီးတို့မှ ရောက်ရှိနိုင်ပါသည်။

၁.၃.၂ စီမံကိန်း ဖွံ့ဖြိုးတိုးတက်မှု

ကနဦးမြို့ပြ ဖွံ့ဖြိုးတိုးတက်မှုကို အဆင့်များဖြင့် ဆောင်ရွက်ပါမည်။ အပိုင်း ၉+၁ နှင့် အဆင့် A, B, C နှင့် D တို့ကို စတင်ဆောင်ရွက်ပါမည်။ ဖွံ့ဖြိုးတိုးတက်မှု အစီအစဉ်ကို ဇယား ၁.၃-၁ တွင် ဖော်ပြထားပါသည်။

၁.၃.၂.၁ ၉+၁ အဆင့်

ကနဦးမြို့ပြဖွံ့ဖြိုးမှုကို ၉+၁ အဆင့်ဖြင့် စတင်ပါမည်။ အလုပ်သမားအဆောင်ပါဝင်သော အဆောက်အဦး ၉ ခုနှင့် ဝန်ဆောင်မှုအဆောက်အဦးတစ်ခုကို ဤအဆင့်တွင် စတင်ဆောက်လုပ်ပါမည်။ အခြေခံလိုအပ်သော အဆောက်အဦးများ (ဥပမာ- မြို့ပြအဓိကလမ်းမ၊ ရေနှင့် မီးထောက်ပံ့မှု)များကို ဆောင်ရွက်ပါမည်။ ၉+၁ အဆင့် တည်နေရာကို ပုံ ၁.၃-၁ တွင် ဖော်ပြထားပါသည်။

ဇယား ၁.၃-၁ စီမံကိန်းဖွံ့ဖြိုးတိုးတက်မှုအဆင့်

နှစ်	အဆင့်	Construction Plan					
		အလုပ်သမားဆောင် ၅ လွှာ (အဆောက်အဦးတခုလျှင် လူဦးရေ ၇၀၀ယောက်)	ဆံ့သောလူဦးရေ	၈ လွှာ ဝန်ဆောင်မှု အဆောက်အဦး (အဆောက်အဦး တစ်ခုလျှင် လူဦးရေ ၂၂ဦး)	ဆံ့သောလူဦးရေ	၃ လွှာ ဆိုင်ခန်းများ (အဆောက်အဦး တစ်ခုလျှင် လူဦးရေ ၁၂၀ ဦး)	ဆံ့သောလူဦးရေ
Year 1	Start Construction 9+1	9	6,300	1	167	0	0
Year 3	A	26	18,200	ဈေးကွက်လိုအပ်ချက်ကိုလိုက်၍ အများဆုံး အဆောက်အဦး ၂၀ ခု		ဈေးကွက်လိုအပ်ချက်ကိုလိုက်၍ အများဆုံး အဆောက်အဦး ၆၂ ခု	
Year 5		23	16,100				
Year 6	B	23	16,100				
Year 7		23	16,100				
Year 8	C	23	16,100				
Year 9		23	16,100				
Year 10	D	17	11,900				
SUM		**167**	**116,900**	**20**	**4,440**	**62**	**7,440**

Source: DRC (2015)

Source: DRC (2017)

ပုံ ၁.၃-၁ ၉+၁ အဆင့်နှင့် အခြားအဆင့်များ၏ တည်နေရာများ

၁.၃.၂.၂ အခြားအဆင့်များ

ကနဦးမြို့ပြကို လူနေအဆောက်အဦးများ၊ အခြေခံအဆောက်အဦးများနှင့် ဝန်ဆောင်မှုများကို အပြည့်အဝ ထည့်သွင်းဆောင်ရွက်သွားပါမည်။ အခြေခံအဆောက်အဦးများတွင် လမ်းပန်းဆက်သွယ်ရေး၊ ရေနှင့် မီးထောက်ပံ့မှုနှင့် ရေကြီးရေလျှံကာကွယ်ရေးစနစ်များ ပါဝင်ပါသည်။ ဝန်ဆောင်မှုများတွင် အပန်းဖြေနေရာများ (ပြည်သူ့ပိုင်ဇရိယာနှင့် စိမ်းလန်းစိုပြေနေရာများ၊ စီးပွားရေးဆောင်ရွက်သည့်နေရာ၊ ပို့ဆောင်ဆက်သွယ်ရေး အချက်အချာနေရာ၊ မီးသတ်စခန်းနှင့် ရဲစခန်း) တို့ဖြစ်ပါသည်။ ၎င်းဝန်ဆောင်မှုများကို စီမံကိန်း ပြီးဆုံးသည့်တိုင်အောင် အစီအစဉ်များဖြင့် အဆင့်အလိုက် ဆောင်ရွက်သွားပါမည်။ ကျန်းမာရေးစင်တာ (သို့) ဆေးရုံနှင့် ကျောင်းများကဲ့သို့ ထောက်ပံ့မှု ဆောင်ရွက်ချက်များကို သတ်မှတ်ထားသော လူဦးရေရောက်သည်နှင့် တပြိုင်နက် တည်ဆောက်သွားပါမည်။

၁.၃.၃ စီမံကိန်းအချိန်ဇယား

စီမံကိန်းကာလသည် EIA ကာအတွင်း စတင်ပါမည်။ စီမံကိန်းတစ်ခုလုံးအတွက် နှစ် ၅၀ သဘောတူညီချက်ဖြင့် ဆောင်ရွက်ပါမည်။ ၉+၁ အဆင့် ဆောက်လုပ်မှုကို EIA ခွင့်ပြုမိန့်ရသည်နှင့် တပြိုင်နက် ၂၀၁၇ ခုနှစ်ဝန်းကျင်ခန့်တွင် စတင်ပါမည်။ အဆင့် A ကို ၃ နှစ်တွင် စတင်ပါမည် (ဇယား ၁.၂-၁)။ သို့သော်လည်း အခြားအဆင့်များတွင် အချိန်ထပ်မံလိုအပ်မှုသည် ဈေးကွက်လိုအပ်ချက်အပေါ်တွင်

မှုတည်ပါမည်။ အဆင့် ၉+၁ လုပ်ငန်းလည်ပတ်မှုကို ၂၀၂၀ တွင် စတင်ပါမည်။ ခွင့်ပြုမိန့် သဘောတူညီချက်ကာလ မဆုံးခင်တွင် စီမံကိန်းဖျက်သိမ်းခြင်းကို ဆောင်ရွက်ပါမည်။

၁.၃.၄ စီမံကိန်းတွင်ပါဝင်သော အစိတ်အပိုင်းများ

စီမံကိန်းတွင် လူနေအိမ်၊ စီးပွားရေးလုပ်ငန်းများ၊ ဝန်ဆောင်မှုစင်တာနှင့် အခြေခံအဆောက်အဦးများ ပါဝင်ပါသည်။ ၎င်းတို့ကို လူဦးရေ ၁၃၅၀၈၀ ပေါ်တွင် အခြေခံ ရေးဆွဲထားပါသည်။

၁.၃.၄.၁ မြေယာရှုခင်းများ

ကနဦးမြို့ပြကို ပတ်ဝန်းကျင်ဖွဲ့စည်းမှုတွင် ပြောင်းလဲမှု အနည်းဆုံးဖြစ်သော သဘာဝနှင့် မြေမျက်နှာသွင်ပြင်ပေါ် အခြေခံ၍ ရေးဆွဲပါမည်။ ဤလေ့လာမှုတွင် မြေမျက်နှာသွင်ပြင် စီစစ်ခြင်းနှင့် မြေအဆင့်ခွဲခြားခြင်း နည်းပညာများကို ပုံ၁.၃-၂ တွင်ဖော်ပြထားသည့်အတိုင်း လူနေအိမ်နှင့် အဆောက်အဦးများ၏ အမျိုးအစား၊ လူနေမှုပုံစံကိုလိုက်၍ မြို့ပြပုံစံချရာတွင် ထည့်သွင်းဆောင်ရွက်သွားပါမည်။

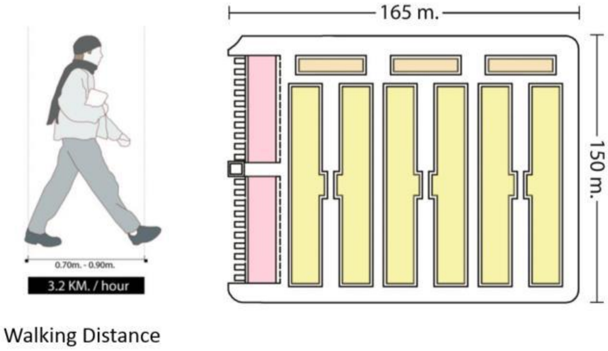
Source: DRC (2017)

ပုံ ၁.၃-၂ မြေမျက်နှာသွင်ပြင် ဆန်းစစ်ခြင်း

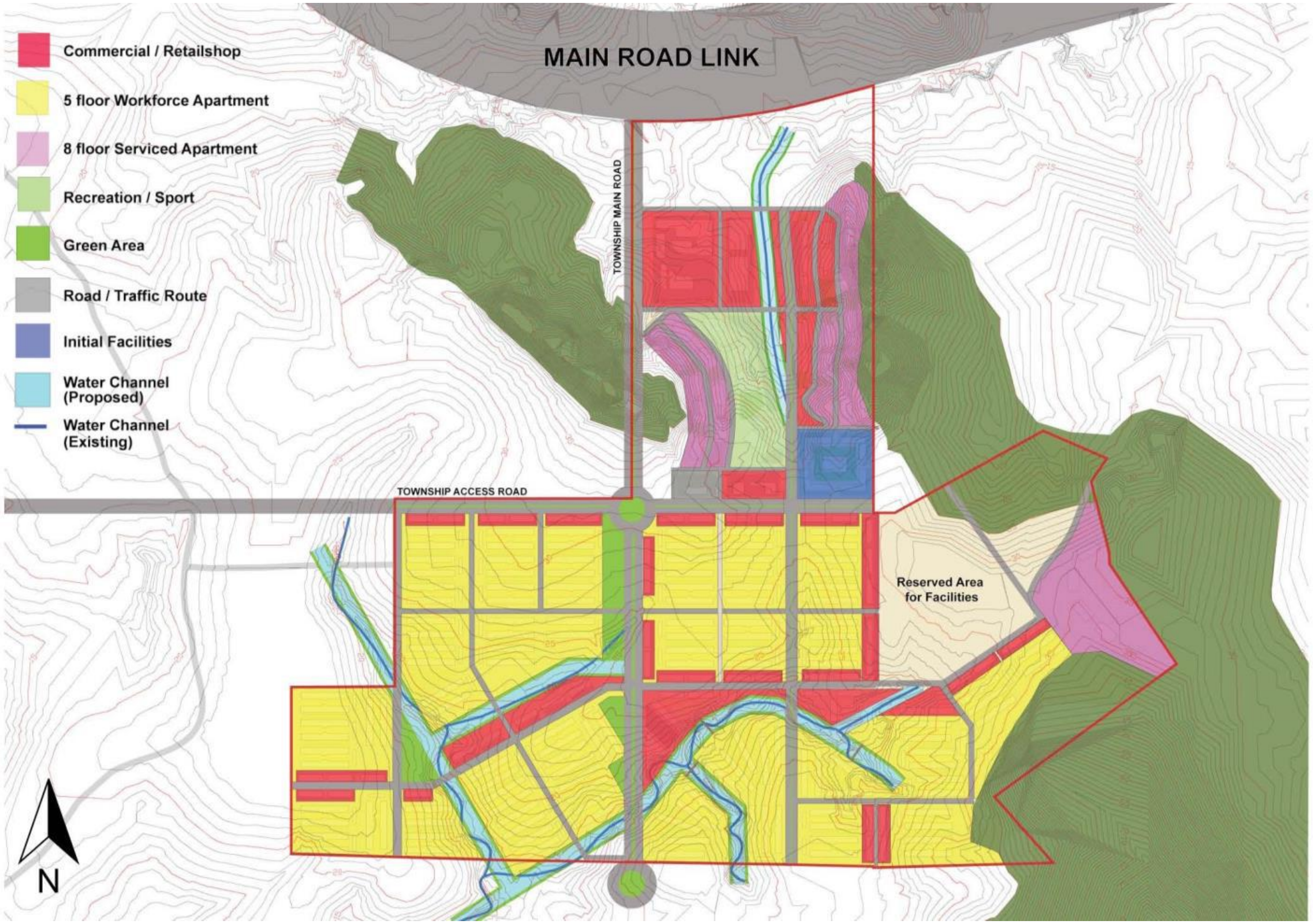
(က) ဖုံနှင့် ဂရစ်လိုင်း ဆက်သွယ်မှုများ

မြို့ပြတွင် လူနေအိမ်၊ စီးပွားရေးဆိုင်ရာနှင့် အပန်းဖြေအနားယူစိမ်းလန်းစိုပြေနေရာဟူ၍ အဓိက သုံးမျိုး ပါဝင်ပါသည်။ ၎င်းဧရိယာများနှင့် ပြည်သူလူထု၏ နေထိုင်မှုပုံစံနှင့် လိုက်လျောညီထွေဖြစ်စေရန် ပုံ ၁.၃-၄ တွင် ဖော်ပြထားသည့်အတိုင်း နေထိုင်သူများ ၎င်းတို့၏ ပတ်ဝန်းကျင်နှင့် ဆက်သွယ်မှု

အဆင်ပြေရုံသာမဟုတ်ပဲ စွမ်းအင်ပြည့်စုံလုံလောက်စေရန်အတွက်ပါ လမ်းနှင့် ဂရစ်လိုင်း ဆက်သွယ်မှုများကို ပုံစံရေးဆွဲထားပါသည်။ လူနေအိမ်များကြား ကူးလူးဆက်ဆံမှု တိုးမြင့်စေရန်နှင့် ကွာဝေးနေမှုကို လျော့ချရန် စီးပွားရေးနှင့် ဈေးဆိုင်ဇရိယာများသည် ပုံ ၁.၃-၃ တွင် ဖော်ပြထားသည့်အတိုင်း အဆောက်အဦးများကြားတွင် တည်ရှိပါမည်။



ပုံ ၁.၃-၃ စံပြပုံစံချထားမှု

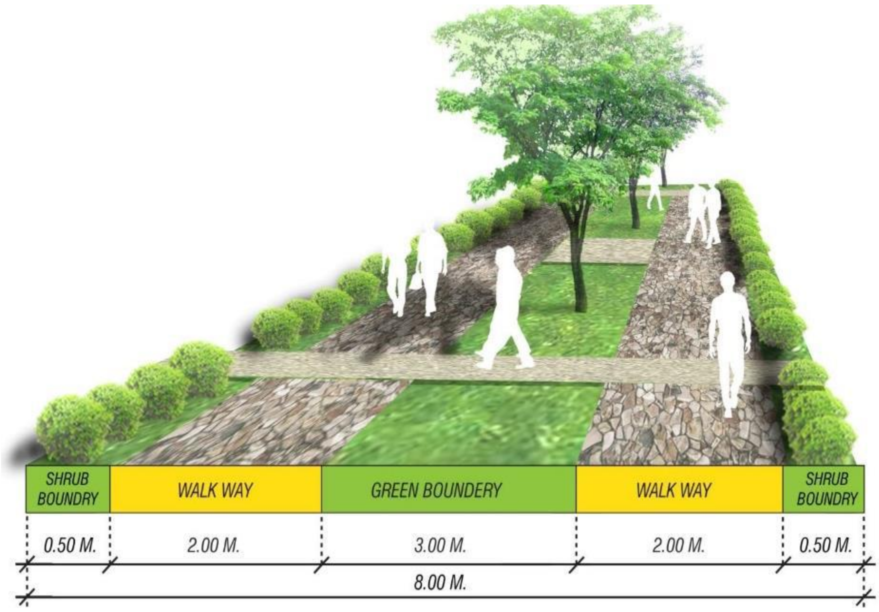


Source: DRC (2015)

ပုံ ၁.၃-၄ ကနဦးမြို့ပြဇုန်

(ခ) အပန်းဖြေအနားယူ စိမ်းလန်းစိုပြေဧရိယာများ

နေထိုင်သူများအတွက် ရေရှည်တည်တံ့သော နေထိုင်မှုပုံစံကို ရရှိစေရန် အမျိုးမျိုးသော ပြည်သူ့ပန်းခြံများကို မြို့ပေါ်တွင် ဆောင်ရွက်သွားပါမည်။ လူနေထိုင်ဧရိယာတွင် အနည်းဆုံးပမာဏမှာ ပုံ ၁.၃-၅ တွင် ဖော်ပြထားသည့်အတိုင်း အဆောက်အဦးနစ်ခုကြား နေရာလပ်မှစတင်ပြီး တိုက်တန်းများ၊ မြို့နှင့် ခရိုင်များအကြား ဆက်သွယ်မှုများတွင် စတင်ဆောင်ရွက်ပါမည်။



Source: DRC (2017)

ပုံ ၁.၃-၅ လျှောက်လမ်းနှင့် အစိမ်းရောင်ဘောင်များ

စုစုပေါင်း စိမ်းလန်းဧရိယာမှာ ၁.၇ စတုရန်းကီလိုမီတာရှိပါသည်။ အတွင်း၊ အပြင်၊ ဆက်စပ်ဧရိယာများ၊ အားကစားနှင့် ပျော်ပွဲစားထွက်သည့် နေရာများကဲ့သို့ တစ်နေရာစီတွင် တိုးလာသော လူဦးရေကို ထောက်ပံ့ပေးနိုင်ရန် စိမ်းလန်းဧရိယာကို စီမံကိန်း၏ ထပ်တိုးအဆင့်အနေဖြင့် ဆောင်ရွက်ပါမည်။

Source: DRC (2017)

ပုံ ၁.၃-၆ ပန်းခြံနှင့် အပန်းဖြေအနားယူ ဧရိယာများ ဖွံ့ဖြိုးမှု

(ဂ) ပြည်သူပိုင် ဧရိယာများ

ပြည်သူပိုင်ဧရိယာများမှာ ကားရပ်နားနေရာ၊ အဆောက်အဦးနှစ်ခုကြား ဧရိယာများ (အရှေ့နှင့် အနောက်) နှင့် ဘုံစားသောက်ခန်းများ ဖြစ်ပါသည်။ ၃ လွှာ ဆိုင်ခန်းတိုင်းတွင် အရှေ့ဘက်တွင် ကိုယ်ပိုင် ကားပါကင် ရှိပါသည်။ ဆိုင်ကယ်ရပ်နားနေရာကို ပုံ ၁.၃-၆ တွင် ဖော်ပြထားသည့်အတိုင်း အဆောက်အဦး နှစ်ခုကြားနေရာကို မျှသုံးပါမည်။

၁.၃.၄.၂ လူနေအိမ်ယာများ

လူနေအဆောက်အဦးများသည် အပြည့်ပြည့်ဆိုင်ရာ နေထိုင်မှု အဆင့်ရှိသော ၅ လွှာ အလုပ်သမားအဆောင်များ၊ ၈ လွှာ ဝန်ဆောင်မှုအခန်းများ (စီမံခန့်ခွဲမှုအဆင့်) နှင့် ၃ လွှာ ဈေးဆိုင်ခန်းများ ပါဝင်ပါသည်။

(က) ၅ လွှာတိုက်ခန်းများ

၅ လွှာ တိုက်ခန်းသည် အလုပ်သမားများအတွက် နေထိုင်ရန် ပုံစံရေးဆွဲထားပါသည်။ အဓိကရည်ရွယ်ချက်မှာ ကနဦးစက်မှုဇုန်ဝင်းရှိ စက်ရုံ၊ အလုပ်ရုံများတွင် ပုံမှန်အလုပ်လုပ်သော အလုပ်သမားများအတွက် ဖြစ်ပါသည်။ အခန်းတွင် မျှဝေအသုံးပြုရသော ရေချိုးခန်း၊ မီးဖိုချောင်နှင့် ဘုံပိုင်ဧရိယာများ ပါဝင်ပါသည်။ အခန်းတွင်းတွင် ၂၀ ကီလိုမီတာခန့်ရှိပြီး ကုတင်လေး (၄) လုံး ပါဝင်ပါသည်။ (ပုံ ၁.၃-၇)

(ခ) ၈ လွှာ တိုက်ခန်းများ

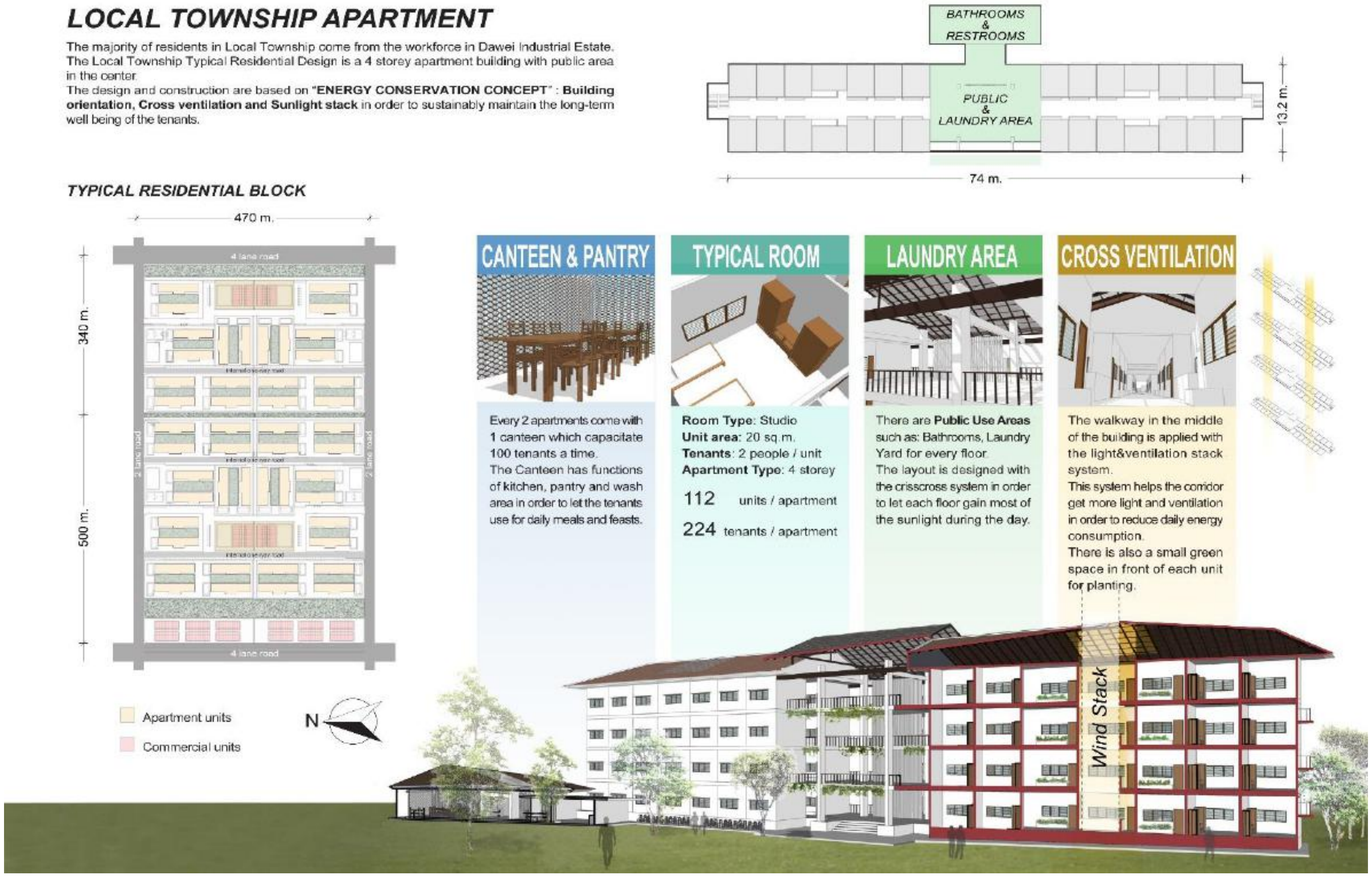
၈ လွှာတိုက်ခန်းသည် DSEZ အနီး (သို့) ကနဦးစက်မှုဇုန်၏ စက်ရုံအလုပ်ရုံများတွင် အလုပ်လုပ်ကိုင်ကြသော အရာရှိများနေထိုင်ရန် ပုံစံရေးဆွဲထားပါသည်။ အခန်းပေါင်း ၁၀၀ ပါဝင်ပါသည်။ ကုတင်တစ်လုံးပါအိပ်ခန်းသည် ၃၄- ၅၄.၅ စတုရန်းကီလိုမီတာရှိပြီး Studio, Deluxe type 1 and Deluxe type 2 ဟူ၍ အမျိုးအစား ၃ မျိုး ရှိပါသည်။

(ဂ) ၃ လွှာ ဆိုင်ခန်းများ

၃ လွှာတိုက်ခန်း (သို့) ၃လွှာ ဈေးဆိုင်ခန်းသည် လူနေနှင့် စီးပွားရေးလုပ်ငန်း ပေါင်းထားသော အဆောက်အဦးဖြစ်ပါသည်။ ပထမထပ်သည် စီးပွားရေးဆိုင်ရာ ဆိုင်ခန်းများအတွက် ပုံစံရေးဆွဲထားပြီး ဒုတိယနှင့် တတိယထပ်သည် လူနေအိမ်နှင့် အခြားစီးပွားရေးလုပ်ငန်းများအတွက် အသုံးပြုပါမည်။ ၄ မီတာအထက်အကြယ်နှင့် ၁၀ မီတာအရှည်ရှိပြီး အထပ်တိုင်းအတွက် အရှေ့တွင် ကားပါကင် ပါဝင်ပါသည်။

၁.၃.၄.၃ စီးပွားရေး အဆောက်အဦးများ

စီးပွားရေးဧရိယာများတွင် ဆိုင်များ စားသောက်ခန်းများ ပါဝင်ပါသည်။ စီးပွားရေးလုပ်ငန်းများ ဆောင်ရွက်ရန်အတွက် ပုံစံရေးဆွဲထားပြီး ပြည်သူများ၏ လှုပ်ရှားမှုများအတွက် ပြည်သူ့ဧရိယာများ ပါဝင်ပါသည်။ ဤဧရိယာတွင်ပလက်ဖောင်းခင်းခြင်းကို အရေးပေါ်အခြေအနေတွင် ဘက်စုံအသုံးပြုနိုင်ရန်အတွက် မြေသားဖြင့် ဆောင်ရွက်ပါမည်။ (ပုံ ၁.၃-၁၁)



ပုံ ၁.၃-၇ ၅ လွှာ အလုပ်သမားတိုက်ခန်းများ

STUDIO TYPE
area 34 sq.m.
(79 unit/building)

DELUXE TYPE 1
area 49 sq.m.
(16 unit/building)

DELUXE TYPE 2
area 54.5 sq.m.
(16 unit/building)

Source: DRC (2017)

ပုံ ၁.၃-၈ ဧလ္လာ ဝန်ဆောင်မှု တိုက်ခန်းများရှိ အခန်းအမျိုးအစားများ

Source: DRC (2017)

ပုံ ၁.၃-၉ ၈ လွှာ ဝန်ဆောင်မှုတိုက်ခန်းတွင် deluxe type 1 ဒီဇိုင်းပုံစံ

Source: DRC (2017)

ပုံ ၁.၃-၁၈ ၃ လွှာ ဈေးဆိုင်ခန်းများ

Source: DRC (2017)

ပုံ ၁.၃-၁၁ စီးပွားရေးဆိုင်ရာဇရိယာများအတွက် ပုံစံ

ဇယား ၁.၃.၂ နေထိုင်သော နေရာများ၏ ပုံစံနှင့် အချိုးအစား

မြေနှင့် ပတ်ဝန်းကျင်ဧရိယာများ၏ ရာခိုင်နှုန်း						
ဆောင်ရွက်မှု	၃ လွှာဆိုင်ခန်းများ		၅ လွှာ အလုပ်သမားဆောင်များ		၈ လွှာ ဝန်ဆောင်မှုတိုက်ခန်းများ	
	မြေဧရိယာ (အဆောက်အဦး ၁ခုနှင့် ပတ်ဝန်းကျင်)	%	မြေဧရိယာ (အဆောက်အဦး ၁ခုနှင့် ပတ်ဝန်းကျင်)	%	မြေဧရိယာ (အဆောက်အဦး ၁ခုနှင့် ပတ်ဝန်းကျင်)	%
အဆောက်အဦး (အောက်ခြေ)	652.00	27.6	1,796.00	55.0	1,530.00	29.1
လမ်း	426.27	18.0	366.54	11.2	928.69	17.7
ကားပါကင်	228.75	9.7	196.70	6.0	498.38	9.5
ရှုခင်းများ						
- Hard scape	426.01	18.0	366.32	11.2	928.13	17.6
- Soft scape	631.01	26.7	542.60	16.6	1,374.75	26.1
Total	**2,364.04**	**100.0**	**3,268.16**	**100.0**	**5,259.94**	**100.0**

မြေနှင့် ပတ်ဝန်းကျင်ဧရိယာများ၏ အချိုးအစား									
အဆောက်အဦး အမျိုးအစား	**မြေဧရိယာ (sq.m.)**	**အဆောက်အဦးဧရိယာ ၁ (sq.m.)**	**အောက်ခြေဧရိယာ (sq.m.)**	**လမ်း/ ယာဉ်သွားလာမှု (sq.m.)**	**ကားပါကင် (sq.m.)**	**အဆောက်အဦး မရှိသော မြေဧရိယာ (sq.m.)**	**FAR/1**	**OSR/2**	**BCR/3**

၃ လွှာဆိုင်ခန်းများ	2,364	2,400	652	426	229	1,057	1.02	44.04	27.58
၅ လွှာ အလုပ်သမားဆောင်များ	3,268	5,810	1,796	367	197	909	1.78	15.64	54.95
၈ လွှာ ဝန်ဆောင်မှုတိုက်ခန်းများ	5,260	6,137	918	929	498	2,915	1.17	47.50	17.45

Remark /1 FAR = Floor Area Ratio

/2 OSR = Open Space Ratio

/3 BCR = Building Coverage Ratio

Source: DRC (2017)

၁.၃.၄.၄ ဝန်ဆောင်မှု စင်တာများ

(က) ဆေးရုံ

ဆေးရုံ (သို့) ကျန်းမာရေး စင်တာများ၏ တည်နေရာသည် ပြည်သူ့ဝန်ဆောင်မှု ဇရိယာတွင် တည်ရှိပါမည် (ပုံ ၁.၃-၁၂)။ ဆေးရုံသည် ကုတင် ၆၀ ရှိပြီး ၂၅ Rai (သို့) ၄၀၀၀၀ စတုရန်းမီတာ ရှိပြီး ၁၅ ကီလိုမီတာအတွင်းရှိ လူဦးရေ ၅၀၀၀၀- ၁၀၀၀၀၀ အထက်ကို ဝန်ဆောင်မှု ပေးနိုင်ပါသည်။ သတ်မှတ်ထားသော မြို့လူဦးရေ ရောက်ပါက ဆေးရုံကို အပြည့်ပြည့်ဆိုင်ရာ စံချိန်စံညွှန်းများနှင့်အညီ ပုံစံရေးဆွဲမည်ဖြစ်ပါသည်။ မူလပထမတွင် မြို့တွင် နေထိုင်သူများသည် ထားဝယ်ဆေးရုံကိုသာ အားပြုရပါမည်။

(ခ) ရဲစခန်း

ရဲစခန်းသည် ပြည်သူ့ဝန်ဆောင်မှုဇရိယာတွင် တည်ရှိပါမည်။ ရဲစခန်းသည် ၁၅ ကီလိုမီတာအတွင်းရှိ လူဦးရေ ၅၀၀၀၀- ၁၀၀၀၀၀ အထက် လူဦးရေကို ဝန်ဆောင်မှု ပေးနိုင်ပါသည်။

(ဂ) ကျောင်း

ကျောင်းသည် ပြည်သူ့ဝန်ဆောင်မှု ဇရိယာတွင် တည်ရှိပါမည်။ မူလတန်း၊ အလယ်တန်းနှင့် အထက်တန်း ကျောင်းအမျိုးအစားများသည် လူဦးရေ လိုအပ်ချက်ပေါ်တွင် မူတည်ပါမည်။ ကျောင်းသည် ၁.၅ ကီလိုမီတာပတ်ဝန်းကျင်ရှိ ကျောင်းသား ၆၀၀- ၁၀၀၀ ခန့် သင်ကြားပေးနိုင်မည်ဟု ခန့်မှန်းထားပါသည်။

(ဃ) မီးသတ်ဌာန

မီးသတ်စခန်းသည် ပြည်သူ့ဝန်ဆောင်မှု ဇရိယာတွင် တည်ရှိပါမည်။ မီးသတ်စခန်းတွင် မီးသတ်ဝန်ထမ်းများ အပါအဝင် မီးသတ်ပစ္စည်းများ၊ မီးသတ်ကားများ ပါဝင်ပါမည်။ မီးဘေးနှင့် အရေးပေါ်တုန့်ပြန်ရေး စနစ်များကို အခန်း ၄.၁.၁၄ တွင် ဖော်ပြထားပါသည်။

(င) ဆက်သွယ်ရေးစခန်း

ဆက်သွယ်ရေးစနခန်းတည်နေရာသည် ပြည်သူ့ဝန်ဆောင်မှု ဇရိယာတွင် တည်ရှိပါမည်။ ၎င်းစခန်းသည် ၀.၅ Rai အတွက်သာ ဝန်ဆောင်မှု ပေးနိုင်ပါသည်။

(စ) ပို့ဆောင်ဆက်သွယ်ရေး အချက်အချာနေရာ

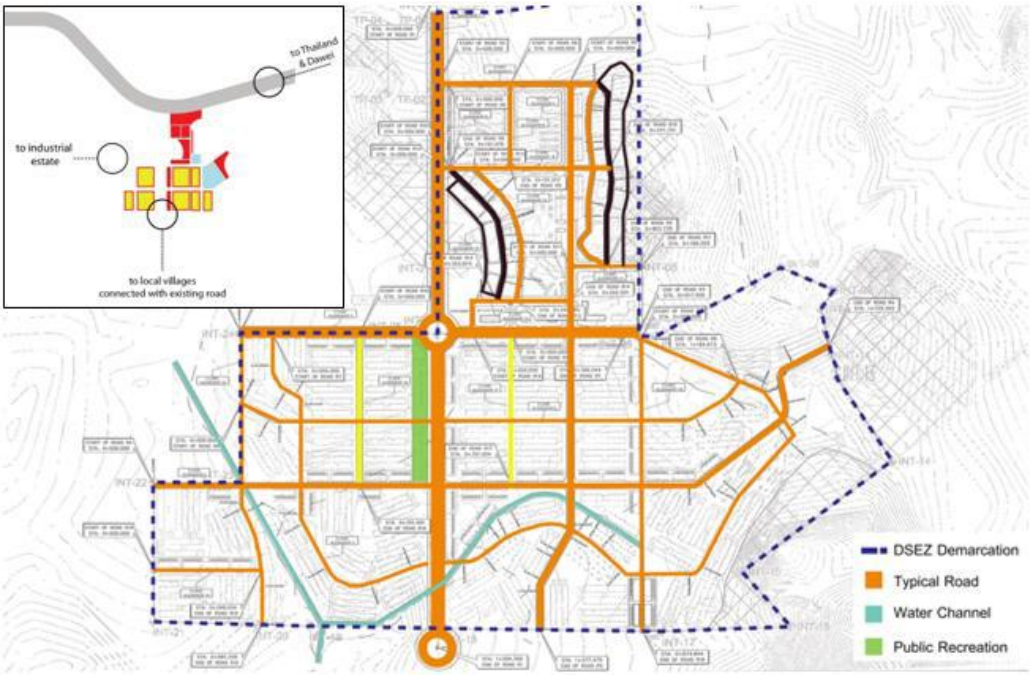
ပို့ဆောင်ဆက်သွယ်ရေး အချက်အချာနေရာသည် ဝန်ဆောင်မှုတိုက် ဇုန် ၁ နှင့် အလုပ်သမား အဆောင်တိုက် ဇုန် ၂ ကြား လူနေအိမ် ဇရိယာ ဖြစ်ပါသည်။ ၎င်းသည် ၁၆၀၀၀ စတုရန်းမီတာ ရှိပါမည်။

၁.၃.၄.၅ Road Network

စီမံကိန်းမြေပုံစံသည် ယပ်တောင်ပုံ ဖြစ်နေသောကြောင့် လမ်းကြောင်းစနစ်ရေးဆွဲရာတွင် လူနေအိမ်များသို့ ရောက်ရှိရန်နှင့် လမ်းပိတ်ဆို့မှုကို ကာကွယ်နိုင်ရန် ဆောင်ရွက်ထားပါသည်။ လမ်းကြောင်းစနစ်သည် အလုပ်သမားတိုက်တန်း ဧရိယာများထိ ရောက်ရှိအောင် စီစဥ်ထားပြီး လမ်းလျှောက်ရသည့် အကွာအဝေးတူညီစေရန် ၄င်းတိုက်တန်းများကို အိမ်ယာအလိုက် ညီတူညီမျှ ပိုင်းခြား ဆောက်လုပ်ထားပါသည်။ ဝန်ဆောင်မှုတိုက်ခန်းများကဲ့သို့ ပြည်သူ့အတွက် ရည်ရွယ်ထားသော အမျိုးအစားများအတွက် တစ်လမ်း (သို့) ၂ လမ်း ရှိပါမည်။ ၄င်းသည် လုံခြုံရေးအဆင့် တိုးမြင့်စေရန် ဖြစ်ပါသည်။ လမ်းနှင့် လမ်းကြောင်းစနစ်ကို အောက်ပါအတိုင်း (၃) မျိုး ခွဲခြားထားပါသည်။

- တတိယလမ်းမ (၂) လမ်း
- ဒုတိယလမ်းမ (၄) လမ်း
- အဓိကလမ်းမ (၆) လမ်း

ဒုတိယလမ်းမနှင့် တတိယလမ်းမများ၏ လမ်းပိုင်းများကို ပုံ ၁.၃-၁၂ တွင် ဖော်ပြထားပါသည်။



Source: DRC (2015)

ပုံ ၁.၃-၁၂ ကနဦးမြို့ပြရှိ လမ်းမနှင့် လမ်းကြောင်းစနစ်များ

၁.၃.၄.၆ ရေကြီးရေလျှံကာကွယ်ရေးနှင့် ရေနုတ်မြောင်းစနစ်

ကနဦးမြို့ပြသည် ထားဝယ်မြစ်ဝှမ်း၏ အခွဲဖြစ်သော ခွန်ချောင်းမြစ်၏ အထက်ပိုင်းတွင် တည်ရှိပါသည်။ စီမံကိန်းသည် ရာသီအလိုက် ရေကြီးရေလျှံဖြစ်သော နေရာတွင်မဟုတ်သော်လည်း

လေ့လာချက်များအရ ခွန်ချောင်းမြစ် အောက်ပိုင်းသည် ၂၀၀၆ ခုနှစ်တွင် Chart Datum အထက် ၁၃ မီတာထိ ရောက်ဖူးပါသည်။

စီမံကိန်းဧရိယာသည် အမြင့်နေရာတွင် တည်ရှိပါသည်။ ရေလွှမ်းမိုးမှု ဖြစ်စေသော ရာသီလိုက် မိုးရေကို ထိန်းထားရန် ရေလှောင်ကန်များကို ပုံစံရေးဆွဲထားပါသည်။ ရေလှောင်ကန်တစ်ခုသည် ကနဦးမြို့ရှိ မြောက်ဘက်ဧရိယာအတွက်ဖြစ်ပြီး အခြားနှစ်ခုသည် အဆင့်အားလုံးအတွက် ဒီဇိုင်းရေးဆွဲထားပါသည်။ ရေလှောင်ကန်တစ်ခုစီကို ဇယား ၁.၃-၃ တွင် ဖော်ပြထားပါသည်။

ဇယား ၁.၃-၃ မြို့နယ်ရှိ ရေလှောင်ကန်ပုံစံ

DESIGN RETENTION POND				
duration	6 HR	Rainfall collection	46.45	mm

Zone	Area of Zone	Volum for Retention pond
	m^2	m^3
Retention pond TW 1	381,437.960	12,720
Retention pond TW 2	582,473.227	19,590
Retention pond TW 3	639,139.803	21,310

Source: SEATEC (2012)

ရေလှောင်ကန်များ၏ ပုံစံများကို ရရှိသည့်အချိန်ပေါ် မူတည်ပြီး ဆောင်ရွက်ထားပါသည်။ ခြောက်နာရီကြာ မိုးရေကို ထိန်းထားနိုင်ရန်အတွက် ရေလှောင်ကန်များကို ပုံစံရေးဆွဲထားပါသည်။ ခြောက်နာရီအတွင်း ရွာသော အများဆုံးမိုးရေချိန်မှာ နှစ် (၅၀) အတွင်း ၄၆.၅ မီလီမီတာ ရှိပါသည်။

၁.၃.၄.၇ စွမ်းအင်နှင့် လျှပ်စစ်ဖြန့်ဝေမှုစနစ်

ရှစ်လွှာ ဝန်ဆောင်မှုအဆောက်အဦးနှင့် ငါးလွှာ အလုပ်သမားဆောင်အတွက် လျှပ်စစ်လိုအပ်ချက်သည် ၉၀၃၆ နှင့် ၃၇၈၀၀ VA အသီးသီး ဖြစ်ကြပါသည်။

၁.၃.၄.၈ ရေသန့်စင်မှုနှင့် ဖြန့်ဝေမှု စနစ်

ကနဦးမြို့အတွက် အကြမ်းသုံး ရေအရင်းအမြစ်မှာ ပယင်းဖြူ ရေလှောင်တမံငယ်မှ ဖြစ်ပါသည်။ ကနဦးမြို့နှင့် ကနဦးစက်မှုဇုန် နှစ်ခုစလုံးအတွက် ထောက်ပံ့ပေးရန် ရေလှောင်တမံကို တည်ဆောက်ထားပါသည်။ ရေပမာဏသည် အများဆုံး သန်းပေါင်း ၈.၅၄ ကုဗမီတာရှိပြီး အနာဂတ် ရေအသုံးပြုမှုအတွက် လုံလောက်ပါသည်။ ပယင်းဖြူ ရေလှောင်တမံ အသေးစိတ်ကို နောက်ဆက်တွဲ ၄.၂ တွင် ဖော်ပြထားပါသည်။

အကြမ်းသုံးရေကို ရေလှောင်တမံအနီးရှိ စွန့်ပစ်ရေသန့်စင်စက်ရုံတွင် သန့်စင်ပြီး ကနဦးစက်မှုဇုန်ဝန်ဆောင်မှုဇုန်၏ အစိတ်အပိုင်းတစ်ခု ဖြစ်ပါသည်။ သန့်စင်ထားသော ရေများကို

လမ်းမအောက်ရှိ စတီးပိုက်လိုင်းများဖြင့် ကနဦးစက်မှုဇုန်၏ ဇုန် A2 နှင့် လမ်းမကြီးတစ်လျောက် ကနဦးမြို့ပြ ၁၇ နှင့် ၁၈ ကီလိုမီတာအထိ ဖြန့်ဝေပေးပါမည် (ပုံ ၄.၁-၃၆)။

ရံဖန်ရံခါ မြေအောက်ရေကို အသုံးပြုသော်လည်း မြေအောက်ရေ အရည်အသွေးသည် မကောင်းလှပါ။ လက်ရှိ ရေတွင်းများ စမ်းသပ်ချက်အရ မြေအောက်ရေသည် အနည်းငယ် နောက်ပြီး အက်ဆစ်ဓါတ် ပေါက်နေပါသည်။ တွင်းအများစုသည် PH တန်ဖိုး ၄.၇ နှင့် ၆.၂ ကြားရှိပြီး အချို့တွင်းများမှာ ကတ်ဒမီယမ်နှင့် ဇင့်သည် စံချိန်စံညွှန်းထက် ကျော်လွန်နေပါသည်။ အကြမ်းသုံးရေအဖြစ် မြေအောက်ရေ အသုံးပြုမှုသည် သန့်စင်ရန် လိုအပ်ပါသည်။

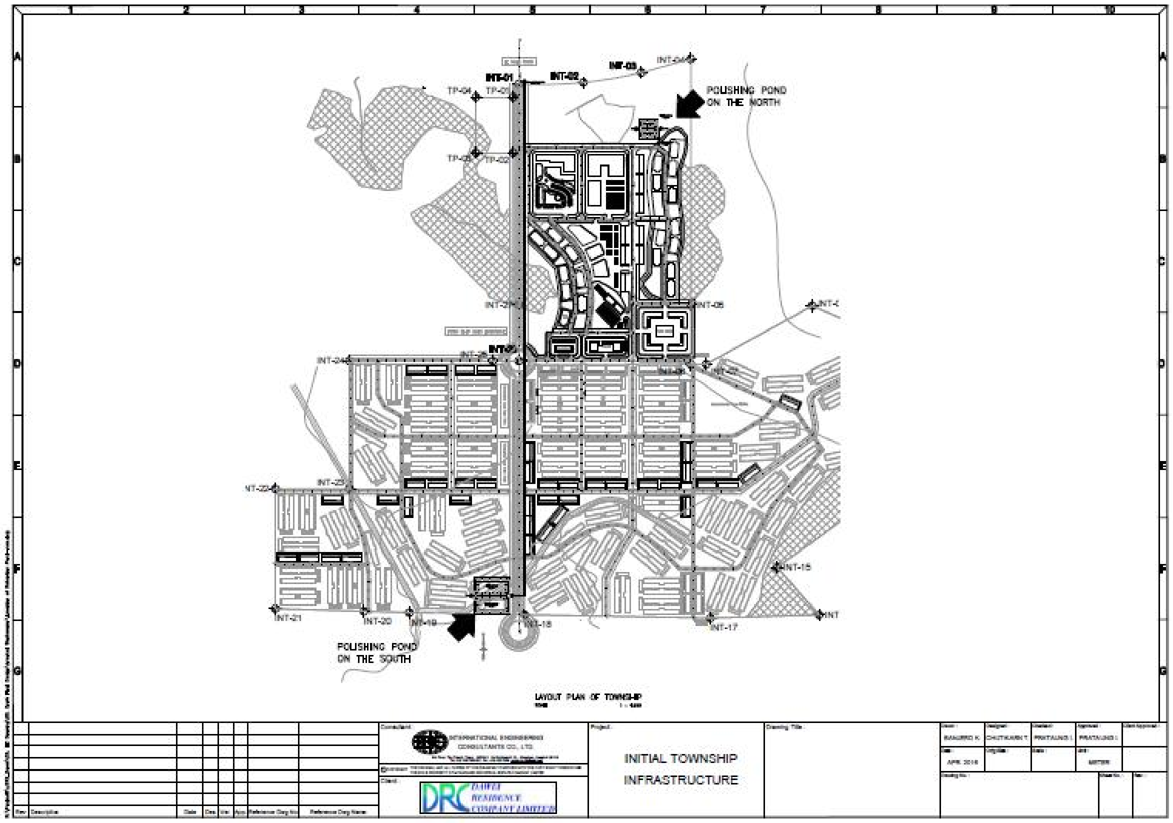
၁.၃.၄.၉ စွန့်ပစ်ရေ သန့်စင်မှုစနစ်

၉၀ m^3/ day ရှိသော အနည်ထိုင်ကန်ကို အလုပ်သမား ငါးလွှာဆောင်မှ စွန့်ပစ်ရေ သန့်စင်ရန်နှင့် ၅၄ m^3/ day ရှစ်လွှာ ဝန်ဆောင်မှု အဆောက်အဦးမှ စွန့်ပစ်ရေများကို သန့်စင်ရန် စီစဉ်ထားပါသည်။ စွန့်ပစ်ရေ သန့်စင်စက်ရုံ တည်နေရာကို ပုံ ၁.၃-၁၃ တွင် ဖော်ပြထားပါသည်။ အနည်ထိုင်ကန်မှ စွန့်ပစ်ရေများကို ပြည်သူ စွန့်ပစ်ရေထုတ် မြောင်းများအတွင်းသို့ မစွန့်ထုတ်မီ အချောသတ် သန့်စင်ကန်ထဲတွင် သန့်စင်ပါမည်။ အချောသတ်ကန်မှ စွန့်ထုတ်ရေများကို ထားဝယ်မြစ်အတွင်းသို့ စွန့်ထုတ်ပါမည်။

အနယ်ထိုင်ကန်မှ စွန့်ပစ်ရေများကို BOD 20 mg/ l အတွက် စံချိန်စံညွှန်းများကို ပြောင်းလဲရပါမည်။ အရေးပေါ်အခြေအနေများအတွက် အချောသတ် သန့်စင်ကန်အားလုံးသည် ၁၂ နာရီကြာ စွန့်ပစ်ရေများကို ထိန်းထားနိုင်ပါသည်။ မြို့ဖွံ့ဖြိုးတိုးတက်မှု၏ အဆင့်အားလုံးတွင် မြောက်ဘက်ဇရိယာရှိ စွန့်ပစ်ရေများကို လိုအပ်သော BOD 20 mg/l ပါဝင်မှု စံနှုန်းနှင့် ခွန်ချောင်းမြစ်အတွင်းသို့ စွန့်ထုတ်ပါမည်။

၁.၃.၄.၁၀ အစိုင်အခဲ စွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲမှုစနစ်

စီမံကိန်း ဆောင်ရွက်မှုများ၊ အလုပ်သမားနှင့် ကန်ထရိုက်တာခွဲများမှ ထွက်လာသော စွန့်ပစ်ပစ္စည်းများကို (နောက်ဆက်တွဲ ၄-၃) ထားဝယ် စွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲမှု အစီအစဉ်အရ ဆောင်ရွက်ပါမည်။ ၎င်းသည် စည်ပင်နှင့် စက်မှုဇုန် စွန့်ပစ်ပစ္စည်းများ စီမံခန့်ခွဲမှုဖြစ်ပြီး PCCD စွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲမှု မူဝါဒနှင့် လုပ်ထုံးအတိုင်း ဆောင်ရွက်ပါမည်။



Source: DRC (2015)

ပုံ ၁.၃-၁၃ မြို့၏ ရေဆိုးသန့်စင်မှုစနစ် တည်နေရာ

စီမံကိန်းသည် အရင်းအမြစ်များ ဖယ်ရှားခြင်း၊ လျော့ချခြင်း၊ ပြန်လည်အသုံးပြုခြင်း၊ အသစ်ပြန်လုပ်ခြင်း၊ ကာကွယ်ခြင်း၊ သန့်စင်ခြင်းနှင့် စွန့်ပစ်ခြင်းကဲ့သို့သော စွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲမှုအရ စွမ်းအင်နှင့် အသုံးပြုမှုများကို ထိန်းသိမ်းသွားပါမည်။ ထို့ပြင် စွန့်ပစ်ပစ္စည်းများကို ၎င်းတို့ သတ်မှတ်ချက်များအရ ခွဲခြားသတ်မှတ်ပါမည်။ အခြေခံအရ အန္တရာယ်မရှိသော စွန့်ပစ်ပစ္စည်းနှင့် အန္တရာယ်ရှိ စွန့်ပစ်ပစ္စည်းဟူ၍ ရှိပြီး အခန်း (၄) တွင် အသေးစိတ် ဖော်ပြထားပြီး အစိုင်အခဲ စွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲမှုစနစ်ကို အောက်တွင် အကျဉ်းချုပ် ဖော်ပြထားပါသည်။

(က) ခွဲခြားသတ်မှတ်ခြင်း

စွန့်ပစ်ပစ္စည်းများ အားလုံးကို မစွန့်ပစ်မီ ခွဲခြားရန် လိုအပ်ပါသည် (ပုံ ၁.၃-၁၅)။ စီမံကိန်းသည် အမျိုးအစား သတ်မှတ်ချက်အလိုက် အမှိုက်ပုံးအရောင်များကို ခွဲခြားသတ်မှတ်ထားပါမည်။ (ပုံ ၁.၃-၁၄)

Source: EIA Study Team

ပုံ ၁.၃-၁၄ စွန့်ပစ်ပစ္စည်းအတွက် အမှိုက်ပုံးအရောင်များ ခွဲခြားသတ်မှတ်ခြင်း

<u>အန္တရာယ်မရှိ စွန့်ပစ်ပစ္စည်းများနှင့် ပြန်လည်အသုံးပြုခြင်း</u>

အန္တရာယ်မရှိသော စွန့်ပစ်ပစ္စည်းများနှင့် ပြန်လည်အသုံးပြုခြင်းတွင် အလူမီနီယမ်ဘူး၊ ပလပ်စတစ်ဘူးနှင့် စက္ကူများကို အဝါရောင်ပုံးထဲထည့်ပြီး ပြန်လည်အသုံးပြုရန်အတွက် စီစဉ်ပါမည်။ သိုလှောင်ထားနိုင်သည့်အချိန်မှာ တစ်ပတ်ခန့် ဖြစ်ပါသည်။

<u>အန္တရာယ်မရှိ စွန့်ပစ်ပစ္စည်းများနှင့် ပြန်လည်အသုံးမပြုခြင်း</u>

အစားအစာ (သို့) အစားအစာထည့်သည့် ပလပ်စတစ်ဘူးများ ဖြစ်ပါသည်။ အမှိုက်များကို အမှိုက်စုပုံရာနေရာပို့ဆောင်ခြင်းကဲ့သို့ အခြားစီမံခန့်ခွဲမှုများကို မဆောင်ရွက်မီ အပြာရောင်ပုံးများတွင် သိုလှောင်ထားပါမည်။ အမှိုက်များကို နေ့စဉ် သိမ်းယူပြီး စွန့်ပစ်ခြင်း (သို့) အခြားပစ္စည်းများ သယ်ယူပို့ဆောင်ခြင်းအတွင် လိုင်စင်ရ တတိယအဖွဲ့အစည်း (သို့) ထားဝယ်စွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲမှု စင်တာအားဖြင့် စွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲမှုစနစ် (အခန်း ၄ တွင် အသေးစိတ်ကြည့်ရန်)သို့ ပို့ဆောင်ပါမည်။

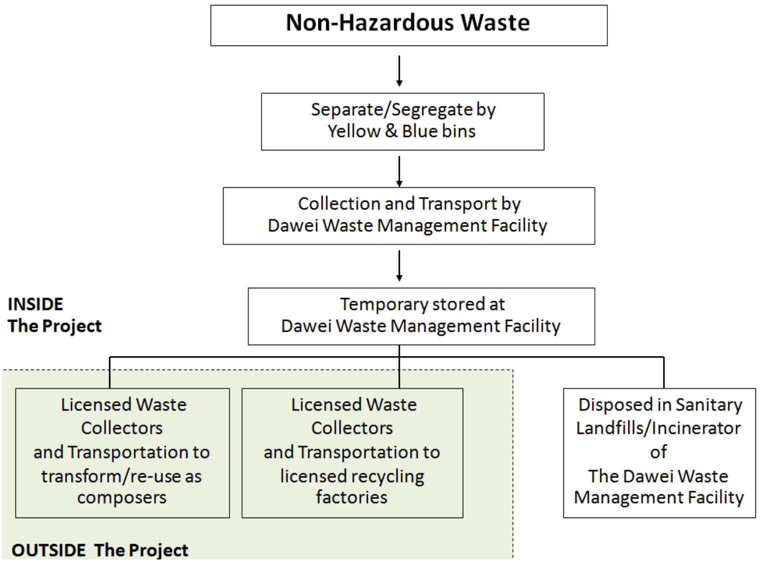
<u>အန္တရာယ်ရှိ စွန့်ပစ်ပစ္စည်း</u>

အနီရောင်ပုံးများသို့ ထည့်ရပါမည်။ အန္တရာယ်ရှိ စွန့်ပစ်ပစ္စည်းများကို တစ်ပတ်နှစ်ကြိမ် သိမ်းယူပြီး ထားဝယ် စွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲမှုဝန်ဆောင်မှုသို့ ပို့ဆောင်ရပါမည်။ အန္တရာယ်ရှိ စွန့်ပစ်ပစ္စည်းများ ကိုင်တွယ်ခြင်းကို ထားဝယ် စွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲမှုစင်တာကိုယ်တိုင် (သို့) လိုင်စင်ရ တတိယ အဖွဲ့အစည်းအားဖြင့် စီမံခန့်ခွဲပါမည်။

(ခ) စွန့်ပစ်ပစ္စည်း သိုလှောင်မှု

စွန့်ပစ်ပစ္စည်းများကို စင်တာရှိ အန္တရာယ်ရှိ သတ်မှတ်ချက်များအရ သင့်တော်သော ၂၀၀ လီတာပုံးများတွင် ထည့်ထားပါမည်။ အန္တရာယ်ရှိ စွန့်ပစ်ပစ္စည်းများ သိုလှောင်ထားရှိမှုကို သက်ဆိုင်ရာ ဥပဒေများနှင့်အညီ လိုက်နာဆောင်ရွက်ပါမည်။ အခြေခံအရ စွန့်ပစ်ပစ္စည်းကို ကွန်ကရစ်ခင်း ခိုင်မာသော

အမိုးအကာရှိ အဆောက်အဦးအောက်တွင် ထိန်းသိမ်းထားပြီး ၎င်းအဆောက်အဦးသည် လေဝင်လေထွက်ကောင်းပြီး ကောင်းမွန်သော စွန့်ပစ်ရေများထိန်းသိမ်းထားသည့် နေရာများ ရှိရပါမည်။ စွန့်ပစ်ပစ္စည်းကို ထားဝယ် စွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲမှု ဝန်ဆောင်မှု၏ အန္တရာယ်ရှိ စွန့်ပစ်ပစ္စည်း စွန့်ပစ်ရာ နေရာ (သို့) မီးရှို့စက်တွင် စွန့်ပစ်မှု (သို့) သန့်စင်မှုများ မပြုလုပ်မီ ထိန်းသိမ်းထားမှုသည် ခြောက်လထက် မကျော်ရပါ။

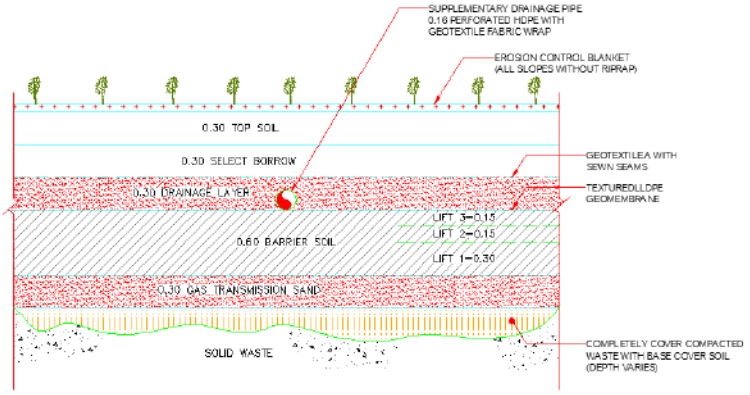


Source: EIA Study Team

ပုံ ၁.၃-၁၅ စီမံကိန်းတွင် အန္တရာယ်မရှိ စွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲမှု

(ဂ) စွန့်ပစ်မှု

အစိုင်အခဲစွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲမှု ဝန်ဆောင်မှုသည် ကနဦးစက်မှုဇုန်၏ ဇုန် A1 တွင်တည်ရှိပါသည်။ စီမံကိန်းသည် စွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲမှု လေ့လာခြင်းများ ဆောင်ရွက်ပါသည်။ (ဥပမာ- နှစ် ၅၀ အထက် ဖွံ့ဖြိုးတိုးတက်မှု စီမံကိန်းများတွင် စွန့်ပစ်နေရာများ ဆောင်ရွက်ခြင်း)။ အမှိုက်စွန့်ပစ်ရာစုစုပေါင်း ၁၀ ခုရှိပြီး စက်ရုံနှင့် မြို့ နှစ်ခုလုံးမှ အမှိုက်များကို ဆောင်ရွက်ပါမည်။ စွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲမှုနှင့် စွန့်ပစ်မှု ပုံစံကို နောက်ဆက်တွဲ ၄-၂ တွင် ဖော်ပြထားပါသည်။ အမျိုးအစားနှင့် စွန့်ပစ်ပစ္စည်း အရင်းအမြစ်များ လေ့လာခြင်း၊ အမှိုက်ပုံ၏ ထိန်းသိမ်းထားနိုင်မှု ပမာဏနှင့် ကြာရှည်ခံမှု၊ အမှိုက်ပုံအစွန်း (ပုံ ၄.၁-၄၄)၊ စွန့်ပစ်ပစ္စည်း ပို့ဆောင်မှု၊ အမှိုက်ပုံမှထွက်သော ဓါတ်ငွေ့များနှင့် စီမံခန့်ခွဲမှုစနစ်ကဲ့သို့ အသေးစိတ်များ ပါဝင်ပါသည်။



Source: IEC (2016)

ပုံ ၁.၃-၁၆ အန္တရာယ်မရှိ စွန့်ပစ်ပစ္စည်းနှင့် အန္တရာယ်ရှိ စွန့်ပစ်ပစ္စည်းများ နောက်ဆုံးစုပုံရာနေရာ

ကနဦးမြို့အတွင်း ဆေးရုံ၊ ဆေးပေးခန်းများမှ ထွက်လာသော ကူးစက်နိုင်သော စွန့်ပစ်ပစ္စည်းများကို မြို့တွင်း မီးရှို့စက်တွင် စွန့်ပစ်ပါမည်။ သို့သော် ကျန်းမာရေး ဝန်ဆောင်မှု လိုအပ်ချက်အပေါ် မူတည်ပြီး ကူးစက်တတ်သော စွန့်ပစ်ပစ္စည်းများကို ထားဝယ်ဆေးရုံ (သို့) ရန်ကုန် အမှိုက်စုပုံရာနေရာများတွင် ဦးစွာ စွန့်ပစ်ပါမည်။ ကူးစက်တတ်သော စွန့်ပစ်ပစ္စည်းများ ပို့ဆောင်ခြင်းကို ပုံမှန် ဆောင်ရွက်ရန် လိုအပ်ပါသည်။ ကူးစက်တတ်သော စွန့်ပစ်ပစ္စည်းများ ဆောင်ရွက်နည်း အခန်း (၄) ရှိ ဇယား (၄.၁-၁၁) တွင် ဖော်ပြထားပါသည်။

၁.၃.၄.၁၁ မီးဘေးကာကွယ်ရေးစနစ်

စီမံကိန်းသည် မြန်မာနိုင်ငံ ဥပဒေ၊ နည်းဥပဒေများ (အပိုင်း ၃.၂.၃.၄ (စ) နှင့် နောက်ဆက်တွဲ ၄-၄)၊ ထိုင်းနိုင်ငံ အဆောက်အဦး ထိန်းချုပ်မှု အက်ဥပဒေ (၁၉၇၉)နှင့် NFPA စံချိန်စံညွှန်းအရ မီးဘေးကာကွယ်ခြင်းစနစ်ကို ပုံစံရေးဆွဲထားပါသည်။ ငါးလွှာ အလုပ်သမားဆောင်နှင့် ရှစ်လွှာ ဝန်ဆော်မှု အဆောက်အဦးအပါအဝင် အဆောက်အဦးများအတွက် မီးကာကွယ်ခြင်းစနစ်ကို အောက်ပါအတိုင်း အပိုင်းခွဲ၍ ဆောင်ရွက်ထားပါသည်။

(က) မီးဘေးအချက်ပေးစနစ်

မီးဘေးအချက်ပေးစနစ်တွင် အချက်ပေးထိန်းချုပ်ခြင်း၊ အများသိစေရန် ကြေငြာခြင်း၊ မီးဘေးအချက်ပေးဌာန၊ Fire Phone Jack၊ မီးအချက်ပေးစပီကာဟူ၍ (၇) မျိုးပါဝင်ပါသည်။

(ခ) မိုးကြိုးလွှဲစနစ်

စနစ်တွင် မိုးကြိုးလွှဲတိုင်၊ ဆက်သွယ်သည့်အရာနှင့် မြေအောက်စိုက်ထူခြင်းများ ပါဝင်ပါသည်။ မြေအောက်ဆယ်သွယ်ရေးကို ကော့ပါးဖြင့် ပြုလုပ်ထားပြီး လျှပ်စစ်ရရှိရန် ဆက်သွယ်ထားမှုဖြစ်ပါသည်။ စီမံကိန်းသည် အဆောက်အဦးတစ်ခုစီ၏ မြေညီထပ်တွင် မိုးကြိုးလွှဲစနစ်များကို တပ်ဆင်ပေးပြီး မိုးကြိုးလွှဲတိုင်များကို အဆောက်အဦးတစ်ခုစီ၏ အမိုးတွင် တပ်ဆင်ပါမည်။

(ဂ) မီးသတ်စနစ်

စီမံကိန်းသည် မီးဘေးနှင့် အရေးအပေါ် အခြေအနေအဆင့်တစ်ခုအတွက် စွမ်းဆောင်နိုင်သော မီးငြိမ်းသတ်စနစ် (FFS) စနစ်ကို ဆောင်ရွက်ရန် စီစဉ်ထားပါသည်။ စီမံကိန်းသည် FFS ကိုယ်တိုင် လူနေထိုင်ရာ အဆောက်အဦးတစ်ခုစီအတွက် FFS တပ်ဆင်ခြင်းနှင့် ပြင်းထန်သော မီးဘေးရှိပါက အနီးအနားမြို့များမှ မီးသတ်ပစ္စည်းများ ကူညီပေးခြင်းများ ရှိပါသည်။

<u>လူနေထိုင်ရာ အဆောက်အဦးတွင် မီးငြိမ်းသတ်စနစ်</u>

မီးငြိမ်းသတ်စနစ်တွင် ပါဝင်မှု ၆ ခု၊ မတည်ထားသော ပိုက်စနစ်၊ မီးသတ်ပစ္စည်း box များ၊ ဆက်သွယ်ရမည့် မီးသတ်ဌာန၊ မီးသတ်ဆေးဘူး၊ အရေးပေါ်ထွက်ပေါက်၊ မီးဘေးအရေးပေါ်ထွက်ပေါက် ဆိုင်းဘုတ်များနှင့် အရေးပေါ်မီးနှင့် အရေးပေါ်ထွက်ပေါက်ပြမြေပုံနှင့် မီးသတ်ဆေးဘူးနေရာများ ပါဝင်ပါသည်။

မြို့နယ်မီးသတ်ဌာန

စီမံကိန်းသည် မီးသတ်ဌာန တည်ဆောက်ရန် အစီအစဉ်ရှိပြီး ကနဦးစက်မှုဇုန်နှင့် စီမံကိန်းကြား ဝန်ဆောင်မှုများကို မျှသုံးရပါမည်။ မီးသတ်အဖွဲ့ ဖွဲ့စည်းဆောင်ရွက်ရန် စီမံကိန်းကစီစဉ်ထားပြီး ၎င်းသည် မီးသတ်ဌာန လည်ပတ်ဆောင်ရွက်ဂုန်သာမက မီးလောင်မှုအတွက် ပြင်ဆင်မှုအဖြစ် မီးသတ်ဝန်ဆောင်မှု အဖွဲ့များနှင့် သင့်တော်ရာ အေဂျင်စီများနှင့် ပူးပေါင်းဆောင်ရွက်ပြီး ဝန်ထမ်းနှင့် နေထိုင်သူများအတွက် သင်တန်းများလည်း ဆောင်ရွက်သွားပါမည်။ (နောက်ဆက်တွဲ ၄-၄၊ မီးဘေးသင်တန်းနှင့် ပစ္စည်းများ)။ မီးသတ်ဌာန တည်နေရာသည် ကနဦးမြို့ ပြည်သူ့ဝန်ဆောင်မှုဧရိယာတွင် တည်ရှိပါမည်။ ပုံ (၁.၃-၁၇)

Source: DRC (2017)

ပုံ ၁.၃-၁၇ မီးသတ်ဌာန တည်ဆောက်ခြင်း

မီးသတ်ကား၊ မီးသတ်စက်၊ မီးသတ်ပစ္စည်းများ အရေအတွက်ကို ကနဦးမြို့နှင့် လူဦးရေ အရေအတွက်အလိုက် ဆောင်ရွက်ရန် စီစဉ်ထားပါသည်။ (ဇယား ၄.၁-၁၄၊ အခန်း၄)။ စီမံကိန်း၏ ၎င်းအရင်းအမြစ်များသည် အရေးပေါ် အဆင့် (၁)နှင့် (၂)ထိန်းချုပ်ရန် လုံလောက်မှုရှိပါသည်။ အကယ်၍ အဆင့် (၃) မီးဘေးဖြစ်ပွားပါက စီမံကိန်းပိုင် မီးသတ်ပစ္စည်းများဖြင့် မလုံလောက်ဘဲ စီမံကိန်းဧရိယာပတ်ဝန်းကျင်များကို ကူးစက်နိုင်ပါသည် (အပိုင်း ၄.၁.၁၀.၁ကိုကြည့်ပါ)။ စီမံကိန်းသည် ရေဖြူ မီးသတ်စခန်းကဲ့သို့ အနီးဆုံး မြို့မှ မီးသတ်ဌာနနှင့် မီးသတ်တပ်ဖွဲ့ကဲ့သို့ ဒေသဝန်ဆောင်မှု (သို့) အေဂျင်စီများမှ အထောက်အပံ့များရယူရန် လိုအပ်ပါသည်။

မီးသတ်ဌာန ကူညီခြင်း

ရေဖြူ မီးသတ်ဌာနသည် ရေဖြူမြို့တွင်တည်ရှိပြီး စီမံကိန်းနှင့် ၆ ကီလိုမီတာခန့်အကွာတွင် တည်ရှိပါသည်။ မြို့နှင့် လမ်းဆက်သွယ်ရေး ကောင်းမွန်ပါသည်။ ရေဖြူ မီးသတ်ဌာနတွင် မီးသတ်တပ်ဖွဲ့ (၇ဦး)၊ မီးသတ်ကား (၄) စီး၊ ရေသယ်ကား (၁)စီး၊ fire tank tractor (1) စီး (ပုံ ၄.၁-၄၈ မှ ပုံ ၄.၁-

၅၁)တွင်ပြထားသည့်အတိုင်း ရှိပါသည်။ မီးသတ်ကန်များသည် တစ်စက္ကန့် လီတာ (၃) ထောက်ပံ့နိုင်ပြီး ရေသယ်ယဉ်များသည် လီတာ ၄၀၀၀ ဝင်ဆံ့ပြီး tank tractors များသည် လီတာ ၁၀၀၀ ပါဝင်ပါသည်။

(ဃ) စုဝေးရပ်

စီမံကိန်းသည် နေထိုင်သူများကို လုံခြုံရာနေရာသို့ မပြောင်းရွှေ့မီ နေထိုင်သူ အရေအတွက်စစ်ဆေးရန် လုံလောက်သော စုဝေးရပ်ကို ထားရှိပါမည်။ စုဝေးရပ်မှာ ၀.၂၅ စတုရန်းမီတာထက် မကျဉ်းရပါ။

အရေးပေါ်တုန့်ပြန်မှု အစီအစဉ်

လူထုကျန်းမာရေးနှင့် လုံခြုံရေးအတွက် IFC EHS လမ်းညွှန်ချက်များအရ စီမံကိန်း အဆိုပြုသူသည် မီးအန္တရာယ် (လူကြောင့်ဖြစ်သော မီးလောင်မှုနှင့် အခင်းမီးလောင်မှုများ နှစ်ခုလုံးအတွက်)၊ သဘာဝဘေးအန္တရာယ်များ၊ ငလျင်၊ ဆူနာမီ၊ ရေကြီးမှုနှင့် မြေပြိုမှုများအတွက် အရေးပေါ် တုန့်ပြန်မှု အစီအစဉ်များကို ပြင်ဆင်ထားရပါမည်။ မြန်မာနိုင်ငံ ဘေးအန္တရာယ် လျော့ချရေး ဆောင်ရွက်ချက်များ (MAPDRR)၏ အစိတ်အပိုင်းတစ်ခုအဖြစ် ESIA အတွက် စီမံကိန်း၏ အရေးပေါ် တုန့်ပြန်ရေး အစီအစဉ်များ လိုအပ်ပါသည်။ သက်ဆိုင်ရာ ဥပဒေ စည်းမျဉ်းစည်းကမ်းများအရ စီမံကိန်း အဆိုပြုသူများ အပါအဝင် စက်ရုံတစ်ခုစီသည် အရေးပေါ် အခြေအနေများအတွက် အရေးပေါ်ပစ္စည်း အသုံးပြုမှုများ၊ ဆောင်ရွက်မှုများကို သက်ဆိုင်ရာများနှင့် ပူးပေါင်းပြီး အရေးပေါ် တုန့်ပြန်ရေးအဖွဲ့ကို ဖွဲ့စည်းထားရပါမည်။ အရေးပေါ်အခြေအနေအတွင်း သက်ရောက်ခံ လူထုအတွက် ငွေကြေးထောက်ပံ့မှုများစီစဉ်ထားပါသည်။ အသေးစိတ်ကို စီမံကိန်း၏ CSR တွင် ဖော်ပြထားပါသည်။

၁.၃.၅.၁ အရေးအပေါ်အဆင့်

ထားဝယ်ကနဦးစက်မှုဇုန်၏ အထွေထွေအရေးပေါ် တုန့်ပြန်မှုအစီအစဉ်ကို အောက်ပါ အဆင့် (၃)ခု - အဆင့် (၁)၊ အဆင့် (၂)၊ အဆင့် (၃)ဟူ၍ ပိုင်းခြားထားပါသည်။

- **အဆင့် ၁** သည် အရေးပေါ် အသေးစားဖြစ်ပြီး လူနေအိမ်နှင့် စီးပွားရေးဆိုင်ရာ အဆောက်အဦးများတွင် တွေ့ရပါသည်။ ဖြစ်ပွားမှုကို စက်ရုံရှိ အဖွဲ့ (သို့) စက်ရုံမှကိုယ်တိုင်ထိန်းချုပ်နိုင်ပါသည်။ သက်ရောက်မှုများကို ထိန်းချုပ်ရန်၊ လျော့နည်းစေရန် စက်ရုံက အကောင်းဆုံး ဆောင်ရွက်ရပါသည်။ ဖြစ်ပွားမှုကို ကနဦးစက်မှုဇုန် အရေးပေါ် တုန့်ပြန်မှုစင်တာ/ အဖွဲ့သို့ အကြောင်းကြားရပါမည်။

- **အဆင့် ၂** သည် အရေးပေါ် အလယ်အလတ်အဆင့်ဖြစ်ပြီး ကနဦးမြို့ပြအတွင်းရှိ အခြားလူနေအိမ်များသို့ ကူးနိုင်သော အခြေအနေရှိပါသည်။ သို့သော်လည်း အရေးပေါ်အခြေအနေကို စက်မှုဇုန်ကိုယ်တိုင် (သို့) အနီးအနားရှိ မြို့များမှ အကူအညီအားဖြင့် ထိန်းချုပ်နိုင်ပါသည်။ ကနဦးမြို့ပြသည် သက်ရောက်မှုများကို ထိန်းချုပ်ရန်၊ လျော့နည်းစေရန် စက်ရုံက အကောင်းဆုံး ဆောင်ရွက်ရမည်ဖြစ်ပြီး ကနဦးစက်မှုဇုန်ဝင်း၏ အာဏာပိုင် (သို့) PIC သို့ တင်ပြရပါမည်။

- **အဆင့် ၃** သည် အရေးပေါ်အကြီးစားအခြေအနေဖြစ်ပြီး အနီးအနား လူထုနှင့် ပတ်ဝန်းကျင်ကို ကူးနိုင်သော အခြေအနေရှိပါသည်။ သက်ရောက်မှုကို ထိန်းချုပ်ရန် လျော့နည်းစေရန် ပြင်ပနေရာ သုံးခုမှ အကူအညီနှင့် အနီးအနားရှိ အဖွဲ့အစည်းများ၏ ပူးပေါင်းဆောင်ရွက်မှု လိုအပ်ပါသည်။ ဖြစ်စဉ်ကို ကျေးရွာ (သို့) မြို့ပြအုပ်ချုပ်ရေးရုံး (သို့) မြန်မာတာဝန်ရှိဌာနများသို့ တင်ပြရပါမည်။

၁.၃.၅.၂ မီးနှင့် ပေါက်ကွဲမှုများအတွက် အစီအစဉ်

မီးငြိမ်းသတ်ခြင်း၊ ပေါက်ကွဲများတွင် အဆင့်သုံးဆင့်ပါဝင်ပါသည် (ကာကွယ်ခြင်း၊ တိမ်းရှောင်ခြင်းနှင့် ပြန်လည်ကုစားခြင်းအစီအစဉ်)။ အဆောက်အဦးများ တည်ဆောက်ခြင်းနှင့် စီမံကိန်းအဆိုပြုသူသည် မြန်မာနိုင်ငံဥပဒေအရ သတ်မှတ်ထားသော ဆောင်ရွက်ချက်များကို လိုက်နာရပါမည်။ ကနဦးမြို့ပြသည် ဥပဒေတွင် ဖော်ပြထားသည့်အတိုင်း နှစ်စဉ် မီးဘေးအန္တရယ် ကြိုတင်လေ့ကျင့်မှုများ၊ မီးကာကွယ်ခြင်းစနစ်များကို ဆောင်ရွက်ရပါမည်။ အရေးပေါ်အခြေအနေတွင် မီးနှင့် ပေါက်ကွဲမှုဖြစ်စဉ်များကို အရေးပေါ်မီးသတ်အဆင့်အရ ဆောင်ရွက်ရပါမည်။

၁.၃.၅.၃ မုန်တိုင်းနှင့် ရေကြီးခြင်းများအတွက် အစီအစဉ်

မုန်တိုင်းနှင့် ရေကြီးခြင်းများအတွက် အစီအစဉ်တွင် အခြေအနေသုံးရပ်ပါဝင်ပါသည်။ (ကာကွယ်ခြင်း၊ သတိပေးခြင်းနှင့် တိမ်းရှောင်ခြင်း၊ ပြန်လည်ကုစားရေးအစီအစဉ်)။ ရေနုတ်မြောင်းနှင့် ရေကြီးမှု ကာကွယ်ရေးစနစ်ကို မိုးရာသီမတိုင်မီ ပြင်ဆင်ထားရပါမည်။ ထို့ပြင် ရေကြီးခြင်း (သို့) မိုးရာသီ အတောအတွင်း အရေးပေါ် သတင်းပေးခြင်းများကိုလည်း လိုက်နာရန် လိုပါသည်။

၁.၃.၆ လုပ်ငန်းခွင် ကျန်းမာရေးနှင့် ဘေးကင်းလုံခြုံရေး

စီမံကိန်းသည် ISO14001, ISO9001 and OHSA 18001စံချိန်စံညွှန်းနှင့်အညီ စီမံကိန်းကို အကောင်အထည်ဖော်ဆောင်ရွက်ရန် ဘေးကင်းလုံခြုံသည့် ကျန်းမာရေးပတ်ဝန်းကျင် အဓိကအစီအစဉ်ကို ဖော်ဆောင်ခဲ့ပါသည်။ လုံခြုံရေးအစီအစဉ်တွင် ကျန်းမာရေးမူဝါဒနှင့် နည်းလမ်းများ (နှစ်စဉ်ကျန်းမာရေးစစ်ဆေးမှု၊ မူးရစ်ဆေးဝါးစစ်ဆေးမှု၊ ဆေးလိပ်သောကန်ရန် သတ်မှတ်နေရာ၊ အဆင့်အတန်းရှိသော အလုပ်ခွင်နှင့် အစားအစာ) များအပါအဝင် အလုပ်စနစ်၊ တစ်ဦးချင်းကာကွယ်ရေးပစ္စည်းများ (PPE)၊ မြေသယ်ယူမှုစနစ်၊ ဆောက်လုပ်ရေးအတွင်း လုံခြုံမှု၊ ကာကွယ်ရေးများပါဝင်ပါသည်။ ၁၀နှစ်အတွင်း SHE master plan အသေးစိတ်ကို နောက်ဆက်တွဲ ၄-၄ တွင် ဖော်ပြထားပါသည်။

၁.၃.၇ စီမံကိန်း ဆောင်ရွက်ချက်များ

၁.၃.၇.၁ စီမံကိန်းအဆင့်

(က) အဆောက်အဦးဆောက်လုပ်ခြင်း

ကနဦးမြို့ဧရိယာနှင့် အဆောက်အဦးများ ပြင်ဆင်ခြင်းတွင် မြေသားရွှေ့ပြောင်းခြင်း၊ အပင်များ ရှင်းလင်းခြင်းတို့ ပါဝင်ပါသည်။ ပန်းခြံဧရိယာများမှ လွဲ၍ လက်ရှိ ရှိနေသော အပင်များအားလုံးကို ရှင်းလင်းရပါမည်။ အသုံးပြုမှုနှင့် အဆောက်အဦးများ ဆောက်လုပ်ခြင်းသည် ကနဦးမြို့ ဖွံ့ဖြိုးတိုးတက်မှုအတွက် အဓိက ဆောင်ရွက်ချက်တစ်ခု ဖြစ်ပါသည်။ ဆောက်လုပ်ရေးတွင် လိုအပ်သော မြေသား၊ ကွန်ကရစ်အလုပ်များနှင့် လိုအပ်သော စက်၊ ကိရိယာများ ပါဝင်ပါမည်။

(ခ) အလုပ်တဲများနှင့် အလုပ်နေရာများ ဆောက်လုပ်ခြင်း

အလုပ်သမားများ နေထိုင်ရန်အတွက် အသုံးပြုသော အဓိက အလုပ်သမားတဲမှာ ကနဦးမြို့ ဆောက်လုပ်ခြင်းတွင် ပါဝင်ပြီး အဓိကလမ်းမကြီး တောင်ဘက် ၁၈ ကီလိုမီတာအကွာတွင် တည်ရှိပါသည်။ နေထိုင်ရာနေရာသည် အီတလီ- ထိုင်း PLC အားဖြင့် အများဆုံး အလုပ်သမား ၃၇၁ဦးအတွက် ဆောင်ရွက်ပေးနိုင်ရန် မျှော်မှန်းထားပါသည်။ ၂၅၆၀၀ စတုရန်းမီတာ ဧရိယာကို ဆောက်လုပ်ရေး လုပ်ငန်းများ ဆောင်ရွက်ရန် အတွက် အသုံးပြုပါမည်။ အိမ်ယာ၊ ကုန်ကြမ်းပစ္စည်းများ (စတီး၊ ဘိလပ်မြေနှင့် ဗိသုကာ ပစ္စည်းများ (တံခါးနှင့် ပြတင်းပေါက်))လိုအပ်ချက်ကို ဆောင်ရွက်နိုင်ရန်ထိုင်းနိုင်ငံမှ ကန်တင်ကားကြီးများဖြင့် ပို့ဆောင်ပါမည်။ အခြား ဆောက်လုပ်ရေး ကုန်ကြမ်းပစ္စည်းများ (ဥပမာ- သဲနှင့် ကျောက်)ကို DSEZ အနီးပတ်ဝန်းကျင် ဒေသမိုင်းတွင်းများမှ ထောက်ပံ့ပေးပါမည်။

(ဂ) ဆောက်လုပ်ရေးပစ္စည်းများ သယ်ယူပို့ဆောင်ခြင်း

ဆောက်လုပ်ရေးပစ္စည်းများကို ထိုင်းနိုင်ငံမှ သယ်ယူပြီး ကန်ချနာပူရီနယ် မြန်မာ-ထိုင်း နယ်စပ်ကို ဖြတ်၍ သယ်ယူပါမည်။ မြို့တွင်း အဓိကလမ်းမကြီးကို အဆင့်မြင့်တင်ပြီး ပစ္စည်းနှင့် စက်များသယ်ယူပို့ဆောင်ရ အဆင်ပြေစေရန် ချဲ့ထွင်သွားပါမည်။

(ဃ) အလုပ်သမားတဲ မိလ္လာစနစ်

အလုပ်သမားတဲများကို ထိုင်းနိုင်ငံ အင်ဂျင်နီယာအသင်း၏ စံချိန်စံညွှန်းနှင့်အညီ ဆောက်လုပ်ပါမည်။ အလုပ်သမားတဲအတွက် မိလ္လာစီမံခန့်ခွဲမှုကို ယာယီ ဆောက်လုပ်ရေး အလုပ်သမားတဲအတွက် နေရာချထားပုံနှင့် ထိုင်းနိုင်ငံ H.M the King's Patronage ၏ အင်ဂျင်နီယာအသင်းအားဖြင့် ထုတ်ပြန်ထားသော စံချိန်စံညွှန်းများအတိုင်း ဆောင်ရွက်သင့်ပါသည်။ (Wor Sor Tor. 1010-34 Standard)

၁.၃.၇.၂ လုပ်ငန်းလည်ပတ်ဆဲအဆင့်

စီမံကိန်းလည်ပတ်မှုသည် အပိုင်း ၄.၁.၁.၄ တွင် ဖော်ပြထားသည့်အတိုင်း အဆင့်များဖြင့် ဖြစ်ပါမည်။ လုပ်ငန်းလည်ပတ်ဆဲအဆင့်အတွင်း ဆောင်ရွက်မှုများမှာ အောက်ပါအတိုင်းဖြစ်ပါသည်။

(က) နေထိုင်သူများ ဆောင်ရွက်ချက်

စီမံကိန်းသည် အဆင့်အလိုက် ဖွံ့ဖြိုးလာမည်ဖြစ်သောကြောင့် မြို့ပြလူနေထိုင်ရာ ဧရိယာအတွင်း ပြည်သူ့ပန်းခြံများ အပါအဝင် နေထိုင်မှုနှင့် အားကစားနှင့် ပတ်သက်သော ဆောင်ရွက်မှုများကို ဇုန် ၉ + ၁ ၏ ဧရိယာအနည်းငယ်တွင် စတင်ဆောင်ရွက်ပါမည်။ ထို့နောက် နေထိုင်သူများ ဆောင်ရွက်ချက်များသည် အဆင့် A, B, C နှင့် D အားဖြင့် မြို့အတွင်း လူဦးရေအရွယ်အစားအလိုက် ကျယ်ပြန့်လာပါမည်။

(ခ) အဖွဲ့အစည်း ဆောင်ရွက်ချက်များ

လက်လီအရောင်းဆိုင်များ ၎င်းတို့၏ လုပ်ငန်းများ စတင်ဆောင်ရွက်ချိန်တွင် အဖွဲ့အစည်းဆောင်ရွက်ချက်များစတင်ဆောင်ရွက်ပါမည်။ ၎င်းတွင် စီးပွားရေးဆိုင်ရာ ဧရိယာများတွင် စီးပွားရေးဆိုင်ရာ ခန်းမများပါဝင်ပြီး သင့်တော်သော အချိန်တွင် စတင်ဆောင်ရွက်ပါမည်။

(ဂ) ယဉ်ကြောပိတ်ဆို့မှုနှင့် ဆက်သွယ်ပို့ဆောင်မှု

လုပ်ငန်းလည်ပတ်စဉ်အတွင်း အဓိက သယ်ယူပို့ဆောင်ရေးသည် နေထိုင်သူများ၏ နေထိုင်ရာနေရာနှင့် အလုပ်သို့ သွားရာလမ်းကြောင်းအတိုင်း ဖြစ်ပါမည်။ (ဥပမာ- စက်မှုဇုန်နှင့် DSEZ ရှိ စက်ရုံများ)။ နေထိုင်သူများ၏ သွားလာရေးသည် မော်တော်ယဉ်များဖြင့် ဖြစ်ပါမည်။ (ဥပမာ- ကား၊ ဆိုင်ကယ်)။ ပြည်သူ့ပို့ဆောင်ရေးကားများ (သို့) ဘတ်စ်ကားများသည် မြို့တွင်းနှင့် အနီးအနားမြို့များ အပါအဝင် မြို့နှင့် DSEZ သို့ လမ်းကြောင်း ဖြစ်နိုင်ပါသည်။

မြို့တွင်း စီးပွားရေးများ ကျယ်ပြန့်လာသောအခါ ကုန်ပစ္စည်း ပို့ဆောင်ရေးလုပ်ငန်းများ စတင်ပါမည်။ ကနဦးတွင် ယဉ်ကြောပိတ်ဆို့မှု သိပ်မဖြစ်သေးသော်လည်း ကုန်စည်များ ပို့ဆောင်ရေး ယဉ်များအတွက် လုံလောက်သော လမ်းစနစ် ရှိရပါမည်။ သို့သော် အခြားမြို့၏ ဆောက်လုပ်ရေးလုပ်ငန်းများသည် လုပ်ငန်းလည်ပတ်မှုနှင့် အပြိုင် ဆောင်ရွက်သောကြောင့် ဆောက်လုပ်ရေးပစ္စည်း ကိရိယာများ သယ်ယူပို့ဆောင်မှုသည် မြို့၏ အချို့လမ်းကြောင်းများကို မျှသုံးရပါမည်။

(ဃ) ရေလွှမ်းမိုးမှု ကာကွယ်ခြင်း

စီမံကိန်းသည် ခြောက်နာရီကြာ ရေလွှမ်းမိုးမှု ကာကွယ်နိုင်သော ရေလွှမ်းမိုးမှု ကာကွယ်ခြင်းစနစ်ကို ဒီဇိုင်းရေးဆွဲထားပါသည် (အပိုင်း ၄.၁.၄ တွင် အသေးစိတ်ကြည့်ရှုပါ)။ မိုးရေသည် မြို့၏ ရေနုတ်မြောင်းများ၊ တူးမြောင်းများကို ဖြတ်၍ စုဆောင်းပါမည်။ စနစ်ဆောင်ရွက်ချက်များတွင် မြောက်ဘက် ရေသိုလှောင်ကန်အတွက် ထားဝယ်မြစ်နှင့် တောင်ဘက် ရေသိုလှောင်ကန်အတွက် ခွန်ချောင်းမြစ်သို့ လျှံသောရေများ စီးဆင်းနိုင်ရန် ရေစုပ်စက်များ ဂိတ်များဖြင့် ဆောင်ရွက်ထားပါသည်။

(င) အစိုင်အခဲ စွန့်ပစ်ပစ္စည်း

အစပိုင်းအဆင့်တွင် ညစ်ညမ်းမှုနည်းနိုင်သောကြောင့် စွန့်ပစ်ပစ္စည်း အနည်းငယ်သာ ထွက်ရှိပါမည်။ စွန့်ပစ်ပစ္စည်းကို အပိုင်း ၄.၁.၈.၁ တွင် ဖော်ပြထားသည့်နည်းအတိုင်း ကနဦးမြို့ပြ ဝန်ထမ်းများနှင့် ဝန်ဆောင်မှုအားဖြင့် ဆောင်ရွက်ပါမည်။ အန္တရာယ်မရှိ စွန့်ပစ်ပစ္စည်းများကို စုဆောင်း၊ သိုလှောင်၊ ပို့ဆောင်ပြီး အနီးဆုံး စွန့်ပစ်နေရာ၌ စွန့်ပစ်ပါမည်။ အန္တရာယ် ရှိ စွန့်ပစ်ပစ္စည်းများနှင့် ကူးစက်တတ်သော စွန့်ပစ်ပစ္စည်းများကို 200 drums (သို့) သင့်တော်သော ကွန်တိန်နာများတွင် သိုလှောင်ထားပြီး စွန့်ပစ်ရန်အတွက် ရန်ကုန်သို့ ပို့ဆောင်ပါမည်။

ထားဝယ် ကနဦး စက်မှုဇုန်၏ စွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲမှုစနစ်သည် စတင်ဆောင်ရွက်ပြီး စွန့်ပစ်ပစ္စည်းများကို အပိုင်း ၄.၁.၈ နှင့် နောက်ဆက်တွဲ ၄-၃ တွင် ဖော်ပြထားသည့် လုပ်ထုံးလုပ်နည်းများအတိုင်း ဆောင်ရွက်ပါမည်။

(စ) စွန့်ပစ်ရေ စီမံခန့်ခွဲမှု

စွန့်ပစ်ရေကို စီမံကိန်း စွန့်ပစ်ရေသန့်စင်မှု ဝန်ဆောင်မှုသို့ မရောက်ခင် အဆောက်အဦးတိုင်းတွင် တပ်ဆင်ထားသော သန့်စင်စက်ရုံအားဖြင့် ကနဦးသန့်စင်ပါမည်။ ကန်သည်BOD 20mg/ L ထက်ကျော်ပြီး စွန့်ထုတ်ရေသည် NEQG (အပိုင်း ၄.၁.၇) စံနှုန်းများကို ကျော်လွန်နေသောအခါ ဆောင်ရွက်ပါမည်။ pumps များ အဆင်သင့်ထားရှိပြီး အရံ pump များကို အရေးပေါ်အတွက် အရံသင့် ပြင်ဆင်ထားရပါမည်။ မြောက်ဘက် အထိုင်ကန်မှ စွန့်ပစ်ရေများကို ထားဝယ်မြစ်အတွင်းသို့ စွန့်ထုတ်ပြီး တောင်ဘက် အထိုင်ကန်မှ စွန့်ပစ်ရေများကို ခွန်ချောင်းမြစ်အတွင်းသို့ စွန့်ထုတ်ပါမည်။

(ဆ) မီးကာကွယ်ခြင်းနှင့် အရေးပေါ်

စီမံကိန်းသည် နေထိုင်သူများနှင့် ဝန်ထမ်းများအတွက် မီးဘေး ရှောင်ခြင်းနှင့် အရေးပေါ်များ ကြိုတင်လေ့ကျင့်မှုများ ရှိပါမည်။ ၄င်းသည် အပိုင်း ၄.၁.၁၀ တွင် ဖော်ပြထားသည့် ဆောင်ရွက်မှုများအတိုင်း မီးနှင့် အရေးပေါ် ဖြစ်ရပ်များအတွက် ကြိုတင်ဆောင်ရွက်မှုဖြစ်ပါသည်။ မီးနှင့် အရေးပေါ် တားဆီးမှု အစီအစဉ်တွင် တားဆီးမှုများ၊ အဖွဲ့များ၏ တာဝန်နှင့် ဆောင်ရွက်ရမည့် ကဏ္ဍ၊ ပြန်လည်ကုစားခြင်းနှင့် စုံစမ်းခြင်းတို့ ပါဝင်ပါသည်။

(ဇ) အလုပ်အကိုင်

စီမံကိန်းသည် ဒေသခံ ဝန်ထမ်းများကို စိမ်းလန်းဧရိယာများ စီမံခန့်ခွဲမှုနှင့် မြို့နယ်ထိန်းသိမ်း လည်ပတ်ရန်အတွက် စတင်ခန့်အပ်သွားပါမည်။ (ဥပမာ- လျှပ်စစ်ပညာရှင်၊ ရေပိုက်သမား၊ ဥယာဉ်မှူးနှင့် သန့်ရှင်းရေး စသည်ဖြင့်)။ အလုပ်ခန့်အပ်မှု စံနှုန်းများသည် နောက်ဆက်တွဲ ၄-၄ လုပ်ငန်းခွင်ကျန်းမာရေးနှင့် ဘေးကင်းလုံခြုံမှု စံချိန်စံညွှန်း၏ ယခင်အပိုင်း ၃.၂.၃.၃ တွင်ဖော်ပြပြီး ဥပဒေနှင့် စည်းမျဉ်းစည်းကမ်းများကို လိုက်နာပါမည်။

၁.၃.၈ စီမံကိန်း အခြားရွေးချယ်စရာများ ဖော်ပြချက်

၁.၃.၈.၁ စီမံကိန်းနေရာ ရွေးချယ်ခြင်း

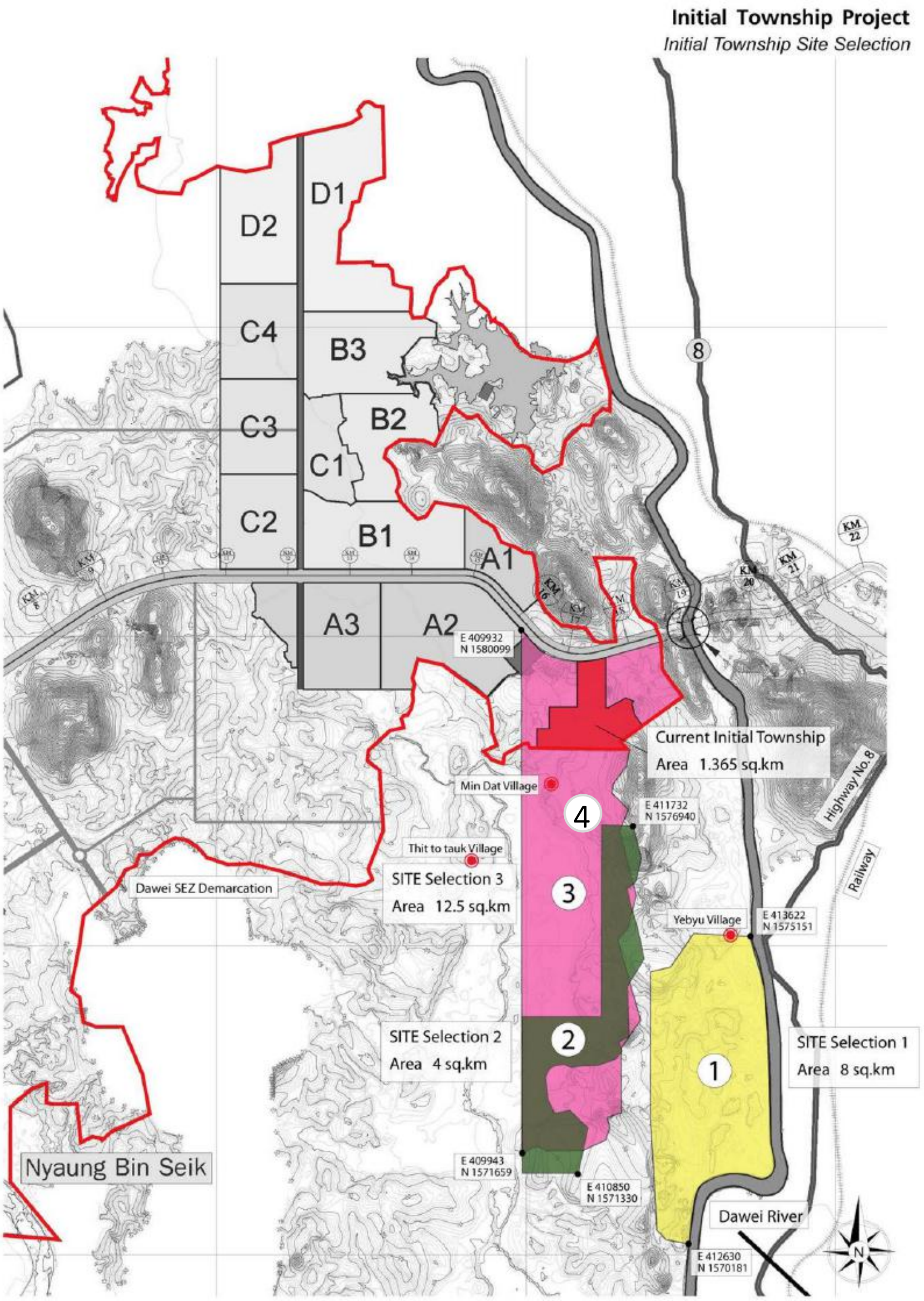
နေရာ (၄) နေရာကို DSEZ ၏ အခြားရွေးချယ်စရာနေရာများအဖြစ် ရွေးချယ်ထားပါသည်။

(က) နေရာ (၁)

စုစုပေါင်း ၈ စတုရန်း ကီလိုမီတာသည် မြေပြန့်ဖြစ်ပြီး ထားဝယ်မြစ်တစ်လျှောက် ဝန်းရံထားသော တောင်တန်းနှစ်ခု ရှိပါသည်။ နေရာသည် ဖွံ့ဖြိုးသော မြစ်ကမ်းပါးမြို့ဖြစ်ပြီး အပန်းဖြေအနားယူ ပန်းခြံများ ရှိပါသည်။ သို့သော်လည်း လက်ရှိ ယဉ်ကျေးမှုနှင့် တောင်တန်းနေရာများရှိ ကိုးကွယ်မှုများကို သက်ရောက်မှုများ မဖြစ်ခင် ရေဖြူ၊ ကျောက်ထုနှင့် စင်ပုနစ် ရွာ သုံးရွာကို နေရာပြောင်းရွှေ့ရပါမည်။ နေရာသည် ထားဝယ်မြစ်မှ ရေလွှမ်းမိုးမှု ခံနေရပြီး လက်ရှိ အမြင့်ထက် ၁၀ မီတာ တိုးမြင့်သွားပါမည်။ (၂၀၁၅ မေးမြန်းခြင်းမှ)။ မြို့နယ်တည်ဆောက်ရန် နေရာသည် DSEZ အဓိကလမ်းမကြီးမှ လမ်းဆက်သွယ်မှု အကွာအဝေးများကို တိုးမြင့်ရန် လိုအပ်ပါသည်။ ပို့ဆောင်ရေးနှင့် နေထိုင်မှုများအတွက် ကုန်ကျစရိတ်များ ရှိလာနိုင်ပြီး လမ်းပိတ်ဆို့မှုများမှာ ပြဿနာတစ်ရပ် ဖြစ်လာနိုင်ပါသည်။

(ခ) နေရာ (၂)

ယခင် နေရာ (၁) ကဲ့သို့ စုစုပေါင်း ၄ စတုရန်းကီလိုမီတာရှိသော်လည်း ထားဝယ်မြစ်မှ ဝေးပါသည်။ ထို့ကြောင့် နေရာသည် ရေလွှမ်းမိုးမှု သက်ရောက်နိုင်ချေ နည်းပါသည်။



Source: DRC (2015)

ပုံ ၁.၄-၁ နေရာရွေးချယ်ခြင်းနှင့် အခြားနည်းလမ်းများ

(a) ***Site No.3***

The total of 12.5 square kilometers has similar feature as the previous site no. 2.The site is al bounded by three hills, KaNyin Gauk, Tha Pye Zun and Ga Nan Taung and the demarcation line of the Dawei Industrial Estate in the south. The site is potentially developed as a nice mountainous community. However has one existing village, Min Dat village.

(ဃ) နေရာ (၄)

ထားဝယ်မြစ် ကုန်းမြင့်တွင် တည်ရှိပြီး ၁.၃၅၆ စတုရန်းကီလိုမီတာနှင့် အများဆုံး ၅.၅၈ စတုရန်းကီလိုမီတာ ရှိနိုင်ပါသည်။ နေရာသည် မြောက်ဘက်တွင် ထားဝယ်မြစ် အလွန် တောင်တန်းများနှင့် တောင်ဘက်တွင် စိုက်ပျိုးရေး ဧရိယာများဖြင့် ဝန်းရံထားပါသည်။ နေရာသည် DSEZ အဓိကလမ်းမကြီးနှင့် ဆက်သွယ်ထားပါသည်။ နေရာသည် ယပ်တောင်ပုံသဏ္ဍာန်ရှိပြီး ယဉ်ပိတ်ဆို့မှု လျော့ချရန်အတွက် လမ်းအမျိုးမျိုးမှ ရောက်ရှိအောင် ပုံစံရေးဆွဲထားပါသည်။ ကနဦးတည်ဆောက်ခြင်း လုပ်ငန်းများအတွက် စီမံကိန်းမြေနေရာ (၄) ခုအား ကနဦးရွေးချယ်ပြီး အောက်ပါအချက်များ အဆင်ပြေစေမည့် နေရာကို ITD အနေဖြင့်အဓိကထား အကောင်ထည်ဖော် ဆောင်ရွက်မည်ဖြစ်ပါသည်။ မြေနေရာရွှေပြောင်းခြင်း၊ ယဉ်ကျေးမှုဆိုင်ရာ မြေနေရာ နှင့် လူမှုပတ်ဝန်းကျင်နှင့် စီးပွားရေး အခြေအနေ၊တည်နေရာ နှင့် သွားလာရလွယ်ကူခြင်း၊ တည်ဆောက်မည့် မြို့နယ်၏ အရွယ်အစား နှင့် ပုံသဏ္ဍာန်၊ မြေမျက်နှာသွင်ပြင်နှင့် မြေယာရှုခင်းအလှ၊ ရေနစ်မြုပ်နိုင်မှု၊ မြေနေရာဝယ်ယူရန် (မြေဝယ်ယူရရှိနိုင်မှု)၊ သယ်ယူပို့ဆောင်ရေးနှင့် ယာဉ်ကြောကြပ်တည်းမှုအခြေအနေ၊ အခြေခံအဆောက် အဦးတည်ဆောက်ခြင်း နှင့် မြေနေရာရှင်းလင်းခြင်းများအတွက် ကုန်ကျစရိတ်များပေါ် မူတည်၍ ရွေးချယ်ခဲ့ပါသည်။ အထက်ပါအချက်များအရ No (4) အကွက်သည် အခြားရွေးချယ်ထားသော အကွက်များထက် စီမံကိန်းတည်ဆောက်ရန် အတွက် အရွယ်အစား နှင့် ပုံသဏ္ဍာန်၊တည်နေရာ နှင့် သွားလာရလွယ်ကူခြင်း၊လူမှုပတ်ဝန်းကျင်နှင့် စီးပွားရေး အခြေအနေ အပေါ်အကျိုးသက်ရောက်မှု၊ တည်ဆောက်မည့် ငွေကြေးပမာဏတို့အတွက် အသင့်လျော်ဆုံးဖြစ်ပါသည်။ ထို့ကြောင့် နေရာ (၄) ကို ကနဦး မြို့ပြအတွက် အသင့်လျော်ဆုံးနေရာအဖြစ် ရွေးချယ်ထားပါသည်။

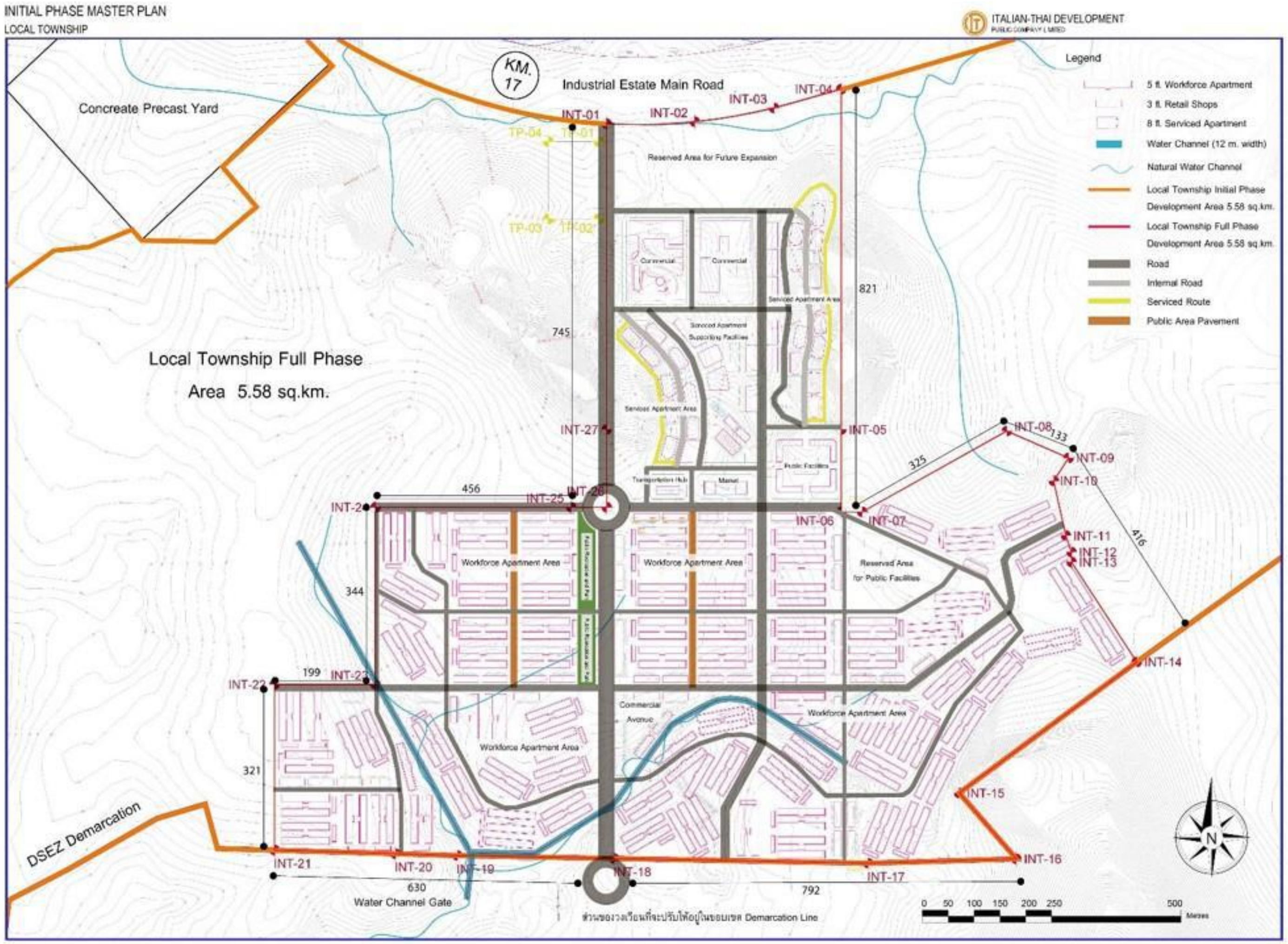
၁.၃.၈.၂ စီမံကိန်း၏ နောက်ဆုံး နေရာချထားမှုပုံစံ (အဓိကစီမံချက်)

အထက်ပါအချက်အလက်များနှင့် ကိုက်ညီသော အကွက်အမှတ် (၄) အတွက် လွှမ်းခြုံရေးဆွဲထားသောစီမံချက်ကို ပုံ (၁.၄-၁) တွင်ဖော်ပြထားပါသည်။ စီမံကိန်းဧရိယာစုစုပေါင်းမှာ (၅.၅၈) စတုရန်းကီလိုမီတာရှိပြီး ကနဦးတည်ဆောက်မည့်မြို့နယ်မှာ (၁.၃၆၅) စတုရန်းကီလိုမီတာရှိပါသည်(ဇယား ၁.၃.၂)။တည်ဆောက်မည့်မြို့နယ်ကို ဧရိယာ (၇) ခု ဖြင့် ပိုင်းခြားထားပါသည်။(၁) လက်လီ/လက်ကား ဆိုင်၊ (၂) ငါးထပ်အလုပ်သမားအိပ်ဆောင်၊(၃) ၈ ထပ်ဝန်ဆောင်မှုတိုက်ခန်း၊ စိတ်အပန်းဖြေရန်နှင့် အားကစားခန်းမ၊ အစိမ်းရောင် ဧရိယာ (ပန်းခြံ)၊လမ်း နှင့် အခြားလိုအပ်သောအထောက်အပံ့များ ပါဝင်မည်ဖြစ်ပါသည်။နောက်ဆုံးအဓိကစီမံချက်ကို ဖော်ပြထားပါသည်။ ရွေးချယ်ထားသော နေရာနှင့် နောက်ဆုံး အဓိက စီမံချက်သည် EIA အစီရင်ခံစာတွင် သက်ရောက်နိုင်ခြေများ အကဲဖြတ်ရန် ရွေးချယ်ထားသော စီမံချက် ဖြစ်ပါသည်။

ဇယား ၁.၃.၂ နောက်ဆုံးအဓိကစီမံချက်တွင် ပါဝင်မည့်အချက်များ

ဖော်ပြချက်	နောက်ဆုံး တည်ဆောက်မည့် ဧရိယာ
လက်လီ/လက်ကားဆိုင်	၄၇၂၃၄ စတုရန်းမီတာ (0.047 sq.km)
၅ ထပ် အလုပ်သမားအိပ်ဆောင်	၂၈၄၁၇၅ စတုရန်းမီတာ (0.284 sq.km)
၈ ထပ် ဝန်ဆောင်မှုတိုက်ခန်း	၆၇၅၀၀ စတုရန်မီတာ (0.068 sq.km)
၃ ထပ် လက်ကားဆိုင်	၁၀၃၂၇၅ စတုရန်းမီတာ (0.103 sq.km)
စိတ်အပန်းဖြေရန်နှင့် အားကစားခန်းမ	၃၆၃၅၄ စတုရန်းမီတာ (0.036 sq.km)
အစိမ်းရောင် ဧရိယာ	၅၅၇၁၂၁ စတုရန်းမီတာ (0.557 sq.km)
လမ်း	၂၂၂၈၈၅ စတုရန်းမီတာ (0.223 sq.km)
ကနဦး အထောက်အပံ့	၄၆၅၄၆ စတုရန်းမီတာ (0.047 sq.km)
စုစုပေါင်း	၁၃၆၅၀၀၀ စတုရန်းမီတာ (1.365 sq.km)

Source: DRC (2015)



Source: DRC (2015)

ပုံ ၁.၃-၃ စီမံကိန်းနေရာချပုံနှင့် နောက်ဆုံး အဓိကစီမံချက်

၁.၄ ပတ်ဝန်းကျင်ဖော်ပြချက်

၁.၄.၁ ဘူမိဗေဒလေ့လာမှုနေရာ

၁.၄.၁.၁ ဘူမိဗေဒ လေ့လာမှုနေရာ

ဘူမိဗေဒလေ့လာမှုနေရာသည် အခြေခံအချက်အလက်ကောက်ယူသော စီမံကိန်းနေရာဝန်းကျင် ဖြစ်သင့်ပါသည်။ ဤလေ့လာမှုနယ်ပယ်တွင် ဘူမိဗေဒ လေ့လာမှုနယ်ပယ်သည် စီမံကိန်းနေရာဗဟိုမှ ၅ ကီလိုမီတာအကွာထိ ရှိပါမည်။ ဤဘူမိဗေဒလေ့လာမှုနယ်ပယ်သည် ပုံ ၁.၄-၁ တွင်ပြထားသည့်အတိုင်း စီမံကိန်းနေရာပတ်လည် ၇၈.၅၇ စတုရန်းကီလိုမီတာထိ ရှိပါသည်။

၁.၄.၁.၂ နောက်ဆက်တွဲ လေ့လာမှုနယ်ပယ်များ

EIA လမ်းညွှန်ချက်ထဲတွင် နောက်ဆက်တွဲ လေ့လာမှုနယ်ပယ် (၄) ခုရှိပါသည်။

(၁) ရုပ်ပိုင်းဆိုင်ရာကဏ္ဍ (၂) ဇီဝဗေဒဆိုင်ရာကဏ္ဍ (၃) လူမှုစီးပွားဆိုင်ရာကဏ္ဍ နှင့် (၄) ယဉ်ကျေးမှုကဏ္ဍ တို့ ဖြစ်ပါသည်။

၁.၄.၂ ရုပ်ပိုင်းဆိုင်ရာကဏ္ဍ

၁.၄.၂.၁ မြေမျက်နှာသွင်ပြင်

စီမံကိန်းဧရိယာသည် မြေပြန့်ဖြစ်ပါသည်။ ခွန်ချောင်းမြစ်သည် မြောက်မှတောင်သို့ စီးဆင်းနေသော ဧရိယာအတွင်း တစ်ခုတည်းသော မြစ်ဖြစ်ပါသည်။ စီမံကိန်း ဧရိယာအနီးဝန်းကျင်ရှိ မြစ်သုံးမြစ်မှာ နတ်ဘီလူးမြစ်၊ ထားဝယ်မြစ်နှင့် ပန်းဒင်အင်းချောင်းမြစ်တို့ ဖြစ်ပါသည်။

၁.၄.၂.၂ ဘူမိဗေဒ

စီမံကိန်းဧရိယာသည် ပြည်ထောင်စု သမ္မတမြန်မာနိုင်ငံ၏ ဘူမိဗေဒ မြေပုံအရ Q-2 Holocene နုန်းမြေပေါ်တွင် တည်ရှိပါသည်။ Holocene မြေလွှာများကို ကျောက်စရစ်ခဲကြီးများမှစ၍ သဲ၊ နုန်းမြေ၊ နှင့် ကျောက်စရစ်ခဲ အသေး၊ အလယ်အလတ်နှင့် ဝါကျင်ကျင် ရွှံ့စေးများအဖြစ် ခွဲခြား သတ်မှတ်ထားပါသည်။

၁.၄.၂.၃ လျှောင်တိုင်းတာခြင်း

စီမံကိန်းဧရိယာသည် ဇုန် (၁) တွင် တည်ရှိပြီး ၄င်းဇုန်သည် ထိခိုက်မှုနည်းသောဇုန်ဖြစ်ပါသည်။ ဤဇုန်တွင် မြေတုန်နှုန်း ၀.၀၇၅ ဂရမ်နှုန်း ရှိပါသည်။

၁.၄.၂.၄ ဆူနာမီ

အနည်အနစ်များ ဆုံးရှုံးခြင်း (သို့) များပြားလာခြင်းမှ ကြီးကြီးမားမား ထိခိုက်မှုများ ထားဝယ်ကမ်းရိုးတန်းတစ်လျှောက် မရှိခဲ့ဖူးပါ။

၁.၄.၂.၅ ရေ

အနောက်ဘက်တွင် အက်ဒမန်မြစ်ဝှမ်းနှင့် အရှေ့ဘက်တွင် ထားဝယ်မြစ်ဝှမ်းတို့ရှိပြီး ထားဝယ်မြစ်နှင့် ခွန်ချောင်းမြစ်တို့သည် ထားဝယ်မြစ်ဝှမ်းတွင် ပါဝင်ပါသည်။

၁.၄.၂.၆ လေအရည်အသွေး

လေအရည်အသွေး တိုင်းတာရန်အတွက် စီမံကိန်းဧရိယာအနီးတွင် နမူနာကောက်ယူသည့်နေရာ လေးခုရှိပါသည်။

- ၂၄ နာရီအတွက်TSP နှင့် PM_{10} တို့၏ ပါဝင်မှုသည် အထူးသဖြင့် နွေပိုင်းတွင် မြင့်မားနေတတ်ပါသည်။
- SO_2၊ NO_2 နှင့် CO ပါဝင်မှုများကို World Bank၊ U.S.EPA နှင့် WHO စံချိန်စံညွှန်းများနှင့်အညီ ဆောင်ရွက်ပါသည်။
- THC၊ MHCနှင့် NMHC တို့အတွက် စံချိန်စံညွှန်းများ မရှိသေးသော်လည်း အခြေခံအချက်အလက်များအဖြစ် ကောက်ယူပါမည်။

၁.၄.၂.၇ ဆူညံသံနှင့် တုန်ခါမှု

L_{Aeq} နှင့် L_{Amax} တို့ကို U.S.EPA နှင့် ထိုင်းစံနှုန်းအရ ခြောက်သွေ့ရာသီနှင့် မိုးရာသီ နှစ်ရာသီလုံး ၂၄ နာရီ တိုင်းတာပါသည်။ မည်သည့်အဆောက်အဦးမျှ မထိခိုက်သော အမြင့်ဆုံး တုန်ခါမှုနှုန်းမှာ ၂.၀ mm/s ထက် မများရပါ။

၁.၄.၂.၈ မြေအောက်ရေ အရည်အသွေး

၂၀၁၅ ခုနှစ် မတ်လ ၂၈ရက်မှ ၁၄ ရက်အတွင်း စီမံကိန်းဧရိယာအနီး မြေအောက်ရေနမူနာကောက်ယူရာ နေရာနှစ်ခုမှ နမူနာ ကောက်ယူခဲ့ပါသည်။ သတ္တုမှလွဲ၍ ရလဒ်များအားလုံးကို စံချိန်စံညွှန်းများနှင့်အညီ ဆောင်ရွက်ပါသည်။

၁.၄.၂..၉ မြေပေါ်ရေအရည်အသွေး

ဖေဖော်ဝါရီ ၂၀၁၅ တွင် ရေနမူနာငါးခုကို ကောက်ယူခဲ့ပါသည်။ နမူနာနှစ်ခုကို ထားဝယ်မြစ်မှ ကောက်ယူပြီး အခြား သုံးခုကို စီမံကိန်းဧရိယာရှိ မြစ်နှင့် ချောင်းမှ ကောက်ယူခဲ့ပါသည်။ SW1 ကို စီမံကိန်းမြောက်ဘက်ရှိ အီကနီမြစ်မှ ယူခဲ့ပြီး SW2 ကို စီမံကိန်းတောင်ဘက်ရှိ Yalai ချောင်းကွေ့မှ ယူခဲ့ပါသည်။

တိုင်းတာမည့် Parameters များကို ထိုင်းနိုင်ငံ ရေစံချိန်စံညွှန်းနှင့် ဆောင်ရွက်ပါသည် (အခန်း ၅ တွင် အသေးစိတ် ဖော်ပြထားပါသည်)။ SW1 တွင် Do 5.8 mg/l၊ အစိုင်အခဲနည်းပြီး မာကျူရီ 0.0002mg/l ရှိပါသည်။ သို့သော် အဝါရောင် SW2သည် DO 4.2 mg/l နှင့် BOD၊ COD နည်းသည်ကို တွေ့ရပါသည်။ ထားဝယ်မြစ်မှ နမူနာများသည် DO ပါဝင်မှု များပြားပြီး (6mg/l နီးပါး) အနည်များသည်ကို တွေ့ရပါသည်။

၄င်းတို့၏ TSS သည် 1417 မှ 1836 mg/l ထိ ရှိပါသည်။ Coliform bacteria နှင့် E. Coli များကို ထားဝယ်မြစ်မှ နမူနာများအားလုံးထဲတွင် မတွေ့ရပါ။

၁.၄.၂..၁၀ အနည်အရည်အသွေး

မာကျူရီမှလွဲ၍ အနည်နမူနာအားလုံးကို အဆိုပြု အနည်အရေအသွေး စံနှုန်းများနှင့် ဆောင်ရွက်ပါသည်။ SW1 နှင့် SW2 54.9 နှင့် 44% သဲများဖြင့် ဖွဲ့စည်းထားပြီး Heavy metals အချို့ကိုလည်း တွေ့ရပါသည်။ SW3 နမူနာကောက်ယူရာနေရာသည် ရွံ့စေး (58.39%) နှင့် မာကျူရီနှင့် သံ (0.719 နှင့်26,078 mg/kg) ဖြင့် ဖွဲ့စည်းထားပါသည်။ SW4 နှင့် SW5 ကို ရွံ့စေး (47 နှင့် 63.7 %) ရှိသော ထားဝယ်မြစ်မှ ကောက်ယူထားပါသည်။ အနည်နမူနာများတွင် တွေ့ရသော Heavy metals များမှာ arsenic, zinc၊ ကြေးနီ၊ သံ၊ ခဲ၊ နီကယ်နှင့် ခရိုမီယမ် တို့ဖြစ်ပါသည်။

၁.၄.၃ ဇီဝဗေဒ အစိတ်အပိုင်းများ

၁.၄.၃.၁ ရေနေဂေဟဗေဒနှင့် ငါးလုပ်ငန်းများ

- ရေညှိစိမ်းနှင့် diatom တို့သည် phytoplankton ၏ လွှမ်းမိုးသော taxa များဖြစ်ကြပါသည်။ Wilhm နှင့် Dorris (1968) လမ်းညွှန်ချက်အရ စီမံကိန်းဧရိယာအနီးရှိ ရေအရေအသွေးအတွက် အကြံပြုထားသော မျိုးစုံမျိုးကွဲ အညွှန်း (H’) သည် ရေနေသတ္တဝါများအတွက် သင့်တော်လက်ခံနိုင်သော အခြေအနေတွင် ရှိပါသည်။
- *Nauplius* Copepod နှင့် *Arcella* protozoan များကို ပေါပေါများများ တွေ့ရပါသည်။
- အဆစ်ပါသော တီကောင်များ၊ အထူးသဖြင့် ရေနှင့် နီးစပ်သော အကောင်များသည် တိုင်းတာသည့်နေရာအားလုံးတွင် လွှမ်းမိုးနေသော မြေအောက်သတ္တဝါများ ဖြစ်ပါသည်။
- ရေချိုပုဇွန်များသည် တိုင်းတာသည့် နေရာအားလုံးတွင် လွှမ်းမိုးနေသော ရေနေသတ္တဝါများဖြစ်ပါသည်။
- *Actinoscirpus grossus (ရေနေအပင်ကြီးမျိုး)* သည် ရေထုတွင် လွှမ်းမိုးနေသော မျိုးစိတ်ဖြစ်ပြီး *Acanthus ebracteatus (ပင်လယ် holly ပင်)နှင့် Nypa fructicans* (ဓနိ) တို့သည် ထားဝယ်မြစ် တိုးတာသည့်နေရာများတွင် လွှမ်းမိုးနေသော အပင်များဖြစ်ပါသည်။
- Cyprinid fishes (Cyprinidae: Barb and Minnow) နှင့် Gobiidae (Goby)တို့သည် လွှမ်းမိုးနေသော မျိုးစိတ်များဖြစ်ပါသည်။ ငါးစုစုပေါင်းမှာ တစ်ဟက်တာ ၁၄၀၀မှ ၄၄၀၀ ကောင်အထိရှိပြီး ငါးပေါများမှုမှာ တစ်ဟက်တာလျှင် ၆.၇၉၅မှ ၈.၅၁၀ ကီလိုဂရမ်အထိ ရှိပါသည်။
- ငါးလုပ်ငန်းများ- Pushnet boats၊ gillnet၊ fish trap၊ dip net၊ fish net နှင့် ငါးမျှားချိတ်များသည် ဒေသခံငါးဖမ်းသမားများ အသုံးပြုသော ငါးဖမ်းကိရိယာများ ဖြစ်ပါသည်။

၁.၄.၃.၂ သစ်တောများ

စီမံကိန်းဧရိယာအတွင်း သစ်တောများကို ဒီရေတော၊ ကြိုးဝိုင်းတောနှင့် သဘာဝတောဟူ၍ သုံးမျိုး ခွဲခြားထားပါသည်။ IUCN Red list အရ Ceriops decandra မျိုးစိတ်ကို ဒီရေတောတွင်

တွေ့ရပါသည်။ ကြိုးဝိုင်းတောအတွင်းတွင် IUCN Red list အတွင်းရှိ မျိုးစိတ်များ မပါဝင်ပါ။ IUCN Red list တွင် ပါဝင်သော မျိုးသုန်းပျောက်ကွယ်ရန် အန္တရယ်ရှိသော မျိုးစိတ်တစ်ခုနှင့် အရေးပေါ် မျိုးသုန်းပျောက်ကွယ်ရန် အန္တရယ်ရှိသော မျိုးစိတ်နှစ်ခုကို သဘာဝတောတွင် တွေ့ရပါသည်။ ပထမတစ်ခုမှာ Diospyros crumentata ဖြစ်ပြီး နောက်နှစ်ခုမှာ Dipterocarpus kerrii နှင့် Dipterocarpus turbinatus တို့ ဖြစ်ပါသည်။ Hopea odorata မျိုးစိတ်ကိုလည်း တောထဲတွင် တွေ့ရပါသည်။

၁.၄.၃.၃ တောရိုင်းတိရစ္ဆာန်

ကျောရိုးရှိ သတ္တဝါလေးမျိုးကို တွေ့ရှိရပါသည်။ (တွားသွားသတ္တဝါ၊ ကုန်းနေရေနေသတ္တဝါ၊ ငှက်မျိုးစိတ်များနှင့် နို့တိုက်သတ္တဝါများ ဖြစ်ပါသည်။ စပါးကြီးမြွေ (*Python molurus bivittatus*) သည် IUCN Red list တွင်ပါဝင်သော အန္တရယ်ရှိ မျိုးစိတ်တစ်ခု ဖြစ်ပါသည်။ is an endangered species reptile listed in the IUCN Red-list. အရှေ့ဒေသအာဆီယမ် porcupine (*Hystrix brachyuran*) နှင့် အမြီးရှည်ဆိတ် (*Naemorhedus caudatus*) တို့သည် IUCN Red list ရှိ ထိခိုက်ခံစားလွယ်သော နို့တိုက်သတ္တဝါမျိုးစိတ် ဖြစ်ပါသည်။

၁.၄.၄ လူမှုစီးပွားအခြေအနေများ

- ရွာ၁၈ ရွာတွင် အိမ်ခြေ ၅၈၃၄ အိမ်ထောင်စု ရှိပါသည်။ စုစုပေါင်းလူဦးရေမှာ ၃၅၄၄၃ (ကျား- ၁၆၆၂၈ နှင့် မ- ၁၈၈၀၅) ရှိပါသည်။ အများဆုံးလူဦးရေ ၇၇၀၀ ဦးမှာ ပဂေါ်ဖွန်းရွာတွင်ရှိပြီး လူဦးရေအနည်းဆုံး (၃၂၈ဦး) မှာ ညောင်ပင်ဆိတ်ရွာတွင် ဖြစ်ပါသည်။
- ၂၀၁၃ တွင် REM ၏ ရွာတွင်း ကွင်းဆင်းလေ့လာမှုအရ သက်ရောက်ခံ ၁၈ ရွာတွင် တိုင်းရင်းသား လူမျိုးစုများ နေထိုင်ခြင်း မရှိပါ။
- လေ့လာမှုအရ မြန်မာနိုင်ငံပညာရေးစနစ်ကို မူကြို၊ မူလတန်း၊ အလယ်တန်းနှင့် အထက်တန်းဟူ၍ လေးဆင့် ခွဲထားပါသည်။ တစ်ရွာစီတွင် ကျောင်းတစ်ကျောင်းစီရှိပြီး ကျခတ်တပင်ရွာတွင် နှစ်ကျောင်းရှိပါသည်။
- မြေအသုံးချ လေ့လာမှုကို ရေဖြူနှင့် လောင်းလုံတွင် ဆောင်ရွက်ပါသည်။ ရေဖြူကွင်းဆင်းလေ့လာမှုအရ ဧရိယာ၏ သုံးပုံနှစ်ပုံသည် သစ်တောအဖြစ် ထိန်းသိမ်းထားခြင်း မရှိသေးပါ။ ၁၂% ခန့်ကို စိုက်ပျိုးမြေအဖြစ် ပြောင်းလဲပြီး ဖြစ်ပါသည်။ လောင်းလုံ ကွင်းဆင်းလေ့လာမှုအရ စုစုပေါင်းဧရိယာ၏ သုံးပုံတစ်ပုံကို စိုက်ပျိုးမြေအဖြစ် အသုံးပြုပြီး ကျန်သုံးပုံနှစ်ပုံကို သဘာဝအတွက် ချန်ထားပါသည်။
- လဲရှောင်နှင့် ပန်းဒင်ရွာရှိ ကျေးလက်ဆေးခန်းများကို အတွေ့အကြုံရှိ အပြာဝတ်သူနာပြုများက ကူညီလုပ်ဆောင်ပေးပါသည်။(LHV Lady Health Assistance)
- လူဦးရေ ၇၀.၈% သည် ဆေးရွက်ကြီးဆေးလိပ်သောက်နေဆဲဖြစ်ပြီး ၁၂%သည် အရက်သောက်ကြပါသည်။
- နေထိုင်သူများအတွက် အဓိကအစားအစာကို ကိုယ်ပိုင်စိုက်ခင်းမှ (၈၄.၇၂%)၊ ဈေးမှ (၉.၉၄%) နှင့် သဘာဝအရင်းအမြစ်များ(ငါးဖမ်းခြင်း၊ သစ်တောနှင့် မြစ်)မှ (၅.၅၆%) ရရှိပါသည်။

- လေ့လာသောနေရာ၏ ရေရရှိမှုမှာ ရေတွင်းတိမ်မှ ဖြစ်ပါသည်။ ဒေသခံများအသုံးပြုရန် အခြားရေအရင်းအမြစ်များမှာ အဝီစိတွင်းနှင့် မိုးရေစုဆောင်ခြင်းတို့ ဖြစ်ပါသည်။ ဘဝက်ရွာကဲ့သို့ လေ့လာသောဧရိယာရှိ အိမ်ထောင်စုအများစုသည် ရေတိမ်တွင်းများနှင့် ချောင်းများမှ ရေသန့်များ ရရှိပါသည်။
- စီမံကိန်းဧရိယာပတ်ဝန်းကျင်ရှိ သောက်သုံးရေအခြေအနေမှာ ကောင်းပါသည်။ ဒေသခံ ၅၀% ကျော်သည် ရေစစ်သုံးကြပြီး ၂၆.၅% သည် ရေကျိုချက် အသုံးပြုကြပါသည်။
- လေ့လာသော နေရာတွင် လျှပ်စစ်မီးမရရှိပါ။ အိမ်ထောင်စုတစ်ခုတွင်သာ မီးစက်အသေးမှ လျှပ်စစ်ရရှိပါသည်။ ဆောက်လုပ်ဆဲကာလအတွင်း စီမံကိန်းဧရိယာတွင် မီးစက်ကြီးကို အသုံးပြုပါသည်။
- ထားဝယ်ဧရိယာတွင် အစိုင်အခဲ စွန့်ပစ်ပစ္စည်းနှင့် အနည်များကို စီမံခန့်ခွဲမှု ညံ့ဖျင်းနေဆဲ ဖြစ်ပါသည်။ ဒေသခံ အဖွဲ့အစည်းများမှ ကျန်းမာရေးနှင့် ပတ်သက်သော ကွင်းဆင်းလေ့လာရေးမှ ရလဒ်များကို ကန့်သတ်ထားပါသည်။ ဥပမာ- လူနေထိုင်ရာနေရာအိမ်ထောင်စုများမှ စွန့်ပစ်ရေများကို မြေပေါ်သို့ တိုက်ရိုက် စွန့်ပစ်ပါသည် (၈၂.၂%)။ ရေနုတ်မြောင်းများထဲသို့ စွန့်ပစ်မှုသည် ၅.၉%၊ ဥယာဉ်ခြံထဲသို့ စွန့်ပစ်မှုသည် ၅.၁% ရှိပြီး မြစ်ထဲသို့ စွန့်ပစ်မှုသည် ၄% ရှိပါသည်။
- လူနေအိမ်အများစုမှ အစိုင်အခဲအညစ်အကြေးများကို မီးရှို့ဖျက်ဆီးပါသည် (၉၃.၈%)။ အိမ်အပြင်ဘက် စုပုံထားမှု ၂.၇%၊ မြေမြှုပ်ခြင်း ၂.၂%နှင့် ပြည်သူပိုင်နေရာတွင် စွန့်ပစ်မှု ၁.၈% တို့ ဖြစ်ပါသည်။
- စီမံကိန်းနေရာ နှင့် ဒေသခံရွာများလမ်းအခြေအနေနှင့် သည် အုတ်ပြားခင်းထားခြင်း မရှိသေးပါ။ လမ်းအကျယ်သည် ၄ မီတာခန့် ရှိပါသည်။
- အဝေးပြေးလမ်းနံပါတ် (၈)သည် နှစ်လမ်းသွားဖြစ်ပြီး စီမံကိန်းနေရာနှင့် မြန်မာနိုင်ငံ အခြားအပိုင်းများကို ဆက်သွယ်ထားပါသည်။ ထိုလမ်းသည် ထားဝယ်လေဆိပ်နှင့်လည်း ဆက်သွယ်ထားပါသည်။ အပြည်ပြည်ဆိုင်ရာ လေကြောင်းကို အပြည်ပြည်ဆိုင်ရာ မြန်မာ့လေကြောင်းဖြင့် ဆောင်ရွက်ပါသည်။ ပြည်တွင်းလေကြောင်းများကို Air Mandalay၊ Air Kanbawza၊ Asian Winds၊ Air Bagan နှင့် Yangon Airways တို့ဖြင့် ဆောင်ရွက်လျက်ရှိပါသည်။ ရန်ကုန်မှ ထားဝယ်လေကြောင်းသည် တစ်နာရီခန့် ကြာမြင့်ပါသည်။ ထားဝယ်-ရေးမီးရထားလမ်းသည် ရေဖြူမြို့မှ ဖြတ်သွားပါသည်။ မီးရထားလမ်းသည် တောင်မြောက်ဖြစ်ပြီး ထားဝယ်- ရေး အဝေးပြေးလမ်းနှင့် အပြိုင် တည်ရှိပါသည်။ ကုန်စည်များကို ထားဝယ်ဆိပ်ကမ်းကို အသုံးပြု၍ သင်္ဘောများဖြင့် ပို့ဆောင်ပါသည်။
- မြေအသုံးချမှုလေ့လာရေးကို အီတလီ- ထိုင်း ဖွံ့ဖြိုးရေးအားဖြင့် အကောင်အထည်ဖော် ဆောင်ရွက်ပါသည်။ လေ့လာမှုအရ စီမံကိန်းဧရိယာအတွင်း အဓိက မြေအသုံးချမှု သုံးမျိုး ရှိပါသည်။
- စိုက်ပျိုးရေးအတွက် မြေယာသည် မြေပြန့်ဖြစ်ပြီး သီးနှံနှင့် စပါးများကို ကျယ်ကျယ်ပြန့်ပြန့် စိုက်ပျိုးပါသည်။ စိုက်ခင်းများသည် မြင့်မားသော တောင်ကုန်းများနှင့် လှိုင်းတွန့်ပုံ ကုန်းပြင်မြင့်များတွင် ဖြစ်ပါသည်။ အဓိက စိုက်ခင်းအမျိုးအစားများမှာ ဆီအုန်း၊ သီဟိုဠ်၊ ရာဘာ၊ အုန်းနှင့် ကွမ်းတို့ ဖြစ်ပါသည်။

- တောင်တန်းများကို သစ်တောများဖြင့် ဖုံးအုပ်ထားပါသည်။ ရွက်ကြွေတောများက လွှမ်းမိုးထားပြီး မတ်စောက်ပြီး လမ်းမကောင်းသောကြောင့် သွားလာရ ခက်ခဲပါသည်။
- ဒေသခံများနေထိုင်မှု။ စီမံကိန်းဧရိယာတွင် ရွာ ၁၆ ရွာ ရှိပါသည်။

၁.၄.၅ ယဉ်ကျေးမှု အမွေအနှစ်

၂၀၁၃ ခုနှစ် REM ၏ ရွာကွင်းဆင်းလေ့လာမှုအရ စီမံကိန်းအနီးအနားတွင် စိတ်ဝင်စားစရာ ယဉ်ကျေးမှုသုံးမျိုးကို တွေ့ရပါသည်။ ပရဒက်ရွာတွင် ကျွဲခြေရာဘုရားနှင့် လဲဆောင်းရွာတွင် ဘုရားခြေတော်ရာ ရှိပါသည်။ မုဒုရွာတွင် ဘုန်းကြီးကျောင်းတစ်ကျောင်းနှင့် မင်းတပ်နှင့် ပန်းဒင်တွင် ဘုရားနှစ်ဆူ ရှိပါသည်။

၁.၅ သက်ရောက်မှု၊ အန္တရာယ် အကဲဖြတ်ခြင်းနှင့် လျော့ပါးစေရေး နည်းလမ်းများ

၁.၅.၁ သက်ရောက်မှု အကဲဖြတ်ခြင်း နည်းလမ်း

ဤခေါင်းစဉ်သည် စီမံကိန်း ဆောင်ရွက်မှုများကြောင့် ပတ်ဝန်းကျင်အပေါ် ထိခိုက်နိုင်မှုများကို အကဲဖြတ်ရန် ထည့်သွင်းထားပါသည်။ သက်ရောက်နိုင်မှု အကဲဖြတ်ခြင်းကို ရုပ်ပိုင်းဆိုင်ရာ အရင်းအမြစ်များ၊ ဂေဟဗေဒ အရင်းအမြစ်များ၊ စီးပွားရေး ဖွံ့ဖြိုးတိုးတက်မှုနှင့် လူမှု၊ ယဉ်ကျေးမှု အရင်းအမြစ်များ အပေါ်တွင် ဆောင်ရွက်ပါမည်။

၁.၅.၂ ဆောက်လုပ်ရေးကာလအတွင်း သက်ရောက်မှု အကဲဖြတ်ခြင်း

၁.၅.၂.၁ ရုပ်ပိုင်းဆိုင်ရာ အစိတ်အပိုင်းများ

<u>လေအရည်အသွေး</u>

1) ဆောက်လုပ်ဆဲကာလအတွင်း လေအရည်အသွေးပေါ် သက်ရောက်နိုင်မှုသည် ကျောက်မခင်းထားသော သယ်ယူပို့ဆောင်ရေး လမ်းကြောင်းများမှ ဖုန်မှုန့်များ၊ ဆောက်လုပ်ရေးနေရာနှင့် လမ်းရှင်းလင်းရေးမှ ဖုန်မှုန့်များကြောင့် ဖြစ်နိုင်ပါသည်။ အထက်ပါအကြောင်းအချက်များကြောင့် သက်ရောက်မှုများသည် ဆောင်ရွက်မှုနှင့် အလွန်နီးကပ်သော နေရာတွင် ဖြစ်တတ်ပါသည်။ ၎င်းသည် သက်ရောက်မှု အတော် အတန်သက်ရောက်မှု ရှိနိုင်ပါသည်။

<u>ဆူညံသံနှင့် တုန်ခါမှု</u>

2) အချို့ ဆောက်လုပ်ရေး လုပ်ငန်းများသည် ဆူညံမှု ဖြစ်ပေါ်စေပါသည်။ (တပြိုင်တည်း မောင်းနှင်ခြင်းများ သို့မဟုတ် မြေသားထုခွဲခြင်း)။ ဆူညံသံ အကဲဖြတ်ခြင်းအတွက် ဆောက်လုပ်ရေးသုံး ကိရိယာများကို အထိုင်နှင့် ရွေ့လျားစက်ဟူ၍ နှစ်မျိုး ထည့်သွင်းစဉ်းစားရပါမည်။ ဆောက်လုပ်ရေးကိရိယာ အရင်းအမြစ်မှ ပေ ၁၀၀ (၃၃ မီတာ)မှ ပေ ၃၃၀၀ (၁၀၀၀ မီတာ) အတွင်း ခန့်မှန်းထားသော ဆူညံမှု အဆင့်မှာ 85 မှ 101 dB(A) အတွင်းဖြစ်ပြီး ဆူညံမှုအားလုံးကို ဖုံးလွှမ်းနိုင်ပါသည်။ အမြင့်ဆုံး

ဆူညံမှုအရင်းအမြစ်မှာ pile-driverမှ 101 dB(A) ဖြစ်ပြီး ခန့်မှန်းဆူညံမှုအဆင့်မှာ 1650 ft (500m) တွင် 70.6 dB(A) ဖြစ်ပါသည်။

3) ထို့ကြောင့် 101 dB(A) ထက် နိမ့်သော မည့်သည့်အသံမဆို 500m တွင် 70 dB(A)ထက် နိမ့်ပါသည်။ သို့သော်လည်း 500m ထက်နည်းသော အကွာအဝေးရှိ လူနေထိုင်မှုကို ဆူညံသံ သက်ရောက်နိုင်ပါသည်။ ထိုသို့ သက်ရောက်နိုင်သောကြောင့် ဆောက်လုပ်ရေးလုပ်ငန်းများကို နေ့အချိန်သာဆောင်ရွက်ခြင်း၊ လုပ်ငန်းဆောင်ရွက်မှုအချိန်ကို အနီးအနားရှိ ဒေသခံများနှင့် သဘောတူညီမှုယူခြင်းအားဖြင့် ဆောက်လုပ်ရေးလုပ်ငန်းများကို ထိန်းချုပ်ရပါမည်။ ဆိုးကျိုးအနည်းငယ်သာ ဖြစ်နိုင်ပါသည်။

ဆောက်လုပ်ရေးလုပ်ငန်းများကြောင့် တုန်ခါမှုသည် စက်ကိရိယာနှင့် အသုံးပြုသော နည်းလမ်းများပေါ် မူတည်ပြီး အဆင့်အမျိုးမျိုး ရှိနိုင်ပါသည်။ ဆောက်လုပ်ရေးကြောင့် မြေတုန်ခါမှုသည် အဆောက်အဦးများ ပျက်ဆီးနိုင်သော အဆင့်သို့ မရောက်ရှိနိုင်သော်လည်း လုပ်ငန်းခွင်နှင့် နီးသော နေရာများတွင် တုန်ခါမှုကို ကြားနိုင်၊ ခံစားနိုင်သော အဆင့်တွင် ရှိပါသည်။ ဆောက်လုပ်ရေးကြောင့် တုန်ခါမှုသည် ထိခိုက်လွယ်သောအနီးအနားတွင် ဖောက်ခွဲမှုများ၊ အစုအပြုံလိုက် မောင်းနှင်ခြင်း၊ vibratory compaction၊ ဖြိုချခြင်းနှင့် စမ်းသပ်တွင်းများ တူးဖော်ခြင်းများကြောင့် ဖြစ်ပေါ်နိုင်ပါသည်။ ဆောက်လုပ်ရေးစက်ပစ္စည်းများမှ တုန်ခါမှုကြောင့် သက်ရောက်မှုအားလုံးသည် မပြောပလောက်ဟု ခန့်မှန်းရပါသည်။

<u>မြေမျက်နှာသွင်ပြင်နှင့် မြေဆီလွှာ</u>

ဆောက်လုပ်ရေးကာလအတွင်း မြေမျက်နှာသွင်ပြင် ပြောင်းလဲမှုနှင့် သက်ရောက်မှုများသည် အတော်နည်းနိုင်ပါသည်။ စီမံကိန်းဧရိယာအတွင်း မြေတိုင်စိုက်ခြင်းကို မြေပြိုခြင်း၊ ပြိုကျခြင်းများ မဖြစ်အောင် ဂရုတစိုက် လုပ်ရပါမည်။

ဆိုးကျိုးသက်ရောက်မှု နည်းပါသည်။

<u>အပေါ်ယံရေနှင့် အနည်အနှစ်</u>

4) ကနဦးမြို့ မြေဖွံ့ဖြိုးမှုတွင် မိုးရာသီ အပေါ်ယံစီးဆင်းရေများမှ အနည်ကျခြင်းများ တိုးလာနိုင်ပါသည်။ ဆောက်လုပ်ရေး နေရာများမှ ရေစီးလမ်းကြောင်းများတွင် အနည်ထိုင်ခြင်း လျော့ချရန် အနည်ထိုင်ခြင်း ထိန်းချုပ်ရန် လိုအပ်ပါမည်။ ဆောက်လုပ်ရေးလုပ်ငန်းများအတွက် လိုအပ်မှသာ အပင်ရှင်းလင်းခြင်းကို ဆောင်ရွက်ပါမည်။ သဘာဝ ရေစီးလမ်းကြောင်းများတွင် အနည်ထိုင်ခြင်း လျော့ချရန် အနည်ထိုင်ကန်နှင့် နုန်းစစ်ကန်များကဲ့သို့ ထိန်းချုပ်မှုနည်းလမ်းများ လိုအပ်ပါသည်။ ဆောက်လုပ်ဆဲကာလ အနည်ထိုင်ခြင်းကြောင့် သက်ရောက်နိုင်ချေများသည် ဆောက်လုပ်ဆဲကာလအတွင်းသာ ဖြစ်ပေါ်နိုင်ပါသည်။ အပေါ်ယံရေကို မှီခိုနေသော ဒေသခံများသည် စိုက်ပျိုးရေးနှင့် သောက်သုံးရန်အတွက်ရေကို မြေအောက်ရေတိမ်တွင်းများမှ ရရှိပါသည်။ ထို့ကြောင့် ရေအသုံးပြုမှုတွင် သက်ရောက်မှုသည် ကန့်သတ်ချက်ရှိပြီး ရေတိုသာဖြစ်နိုင်သည်ဟု ခန့်မှန်းထားပါသည်။

ဆောက်လုပ်ရေး အလုပ်သမားတဲများမှ အိမ်သုံး စွန့်ပစ်ရေများ ထုတ်လွှတ်မှုသည် ရေလမ်းကြောင်းကို ညစ်ညမ်းစေသော အခြား အရင်းအမြစ်များ ဖြစ်ပါသည်။ အသုံးပြုမှုအပေါ်မူတည်ပြီး တစ်ယောက်လျှင် ၈၀ လီတာနှုန်းကို အခြေခံပြီး အဓိက ဆောက်လုပ်ရေးတဲမှ အိမ်သုံး စွန့်ပစ်ရေများ တစ်ရက်လျှင် ၂၉.၆၈ ကုဗမီတာခန့် ခန့်မှန်းထားပါသည်။ ၎င်းတဲများတွင် အနည်ထိုင်ကန်များဖြင့် ရေအိမ်သာများ ထားရှိထားပါသည်။ ၎င်းကန်များကို သဘာဝ ရေလမ်းကြောင်းနှင့် အနည်းဆုံး ၁၀၀ မီတာ အကွာတဝါင် ရှိရန် လိုအပ်ပြီး ရေလွှမ်းမိုးနိုင်သော အမြင့်အထက်တွင် ရှိရပါမည်။ အတော်အတန် ထိခိုက်မှု ရှိပါမည်။

မြေအောက်ရေ

မြေအောက်ရေ အရည်အသွေးကို သက်ရောက်စေနိုင်သော စီမံကိန်းလုပ်ဆောင်မှုသည် မိလ္လာနှင့် အမှိုက်ပုံများ တည်ရှိသော စွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲမှု ဆောင်ရွက်ချက်မျာ ဖြစ်ပါသည်။ မြေအောက်ရေ စောင့်ကြည့်စစ်ဆေးမှု အစီအစဉ်သည် စွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲမှု ဆောင်ရွက်ချက်များအတွက် လိုအပ်ပါသည်။ စီမံကိန်းဧရိယာသည် မြေနိမ့်ပိုင်း တောင်တန်းများ ဝန်းရံထားသော နေရာတွင် တည်ရှိသောကြောင့် ရေစီးဆင်းမှုသည် ကမ်းရိုးတန်း ဧရိယာများသို့ စီးဆင်းသွားနိုင်ပြီး လူနေထိုင်ရာ မြေအောက်ရေ စနစ်များနှင့် ဆက်သွယ်မှု မရှိနိုင်ပါ။ စီမံကိန်း အပြည့်အဝ ဖွံ့ဖြိုးသည့်အခါ မြေအောက်ရေ အသုံးပြုမှု သက်ရောက်မှုသည် ကန့်သတ်ထားပါသည်။ ၎င်းသည် ထိခိုက်မှုများ ရှိပါသည်။

အစိုင်အခဲ စွန့်ပစ်ပစ္စည်း

အဓိက ဆောက်လုပ်ရေးတဲတွင် အလုပ်သမား ၃၇၁ ယောက်နှင့် အန္တရယ်မရှိသော စွန့်ပစ်ပစ္စည်း တစ်ရက်လျှင် တစ်ယောက် ၁ ခန့်မှန်း ၃၇၁ ကီလိုဂရမ် ထွက်ရှိမည်ဟု ခန့်မှန်းထားပါသည်။ ဆီများ၊ သုတ်ဆေး စွန့်ပစ်ပစ္စည်းများ၊ စက်သုံးချောဆီနှင့် အခြား အန္တရယ်ရှိ စွန့်ပစ်ပစ္စည်းများသည် စည်ပင်အမှိုက်များ၏ ၃% ရှိနိုင်ပြီး တစ်ရက်လျှင် ၁၁.၁၃ ကီလိုဂရမ်ရှိနိုင်ပါသည်။ အန္တရယ်မရှိ စွန့်ပစ်ပစ္စည်းနှင့် အန္တရယ်ရှိ စွန့်ပစ်ပစ္စည်း စွန့်ပစ်မှုသည် ကနဦးစက်မှုဇုန်၏ စွန့်ပစ်မှု ဝန်ဆောင်မှုများကို အသုံးပြုပါမည်။ ရေရှည် စီမံခန့်ခွဲမှုစနစ်ရှိပြီး ထားဝယ်မြစ်အတွင်း စွန့်ထုတ်မှုများ မရှိပါ။ ထိခိုက်မှု နည်းနိုင်ပါသည်။

ဘူမိဗေဒနှင့် ငလျှင်လှုပ်ခြင်း

အခြေခံ အချက်အလက်များ လေ့လာချက်အရ စီမံကိန်းဧရိယာသည် ဇုန် (၁) အတွင်း တည်ရှိပြီး အသေးစားထိခိုက်မှု (မြေအရှိန် 0.075gအတွင်း ရှိပြီး) သည် MMI အတန်းအစား (5)နှင့် ညီမျှနိုင် (သို့) နည်းနိုင်ပါသည်။ ငလျှင်တိုင်းတာမှု မှတ်တမ်းများအရ ထားဝယ်နှင့် စီမံကိန်းဧရိယာအတွင်း ငလျှင်လှုပ်ရှားမှုများ မရှိခဲ့ပါ။ ထိခိုက်မှုနည်းနိုင်သော်လည်း စီမံကိန်းကို ငလျှင်ဆိုင်ရာ အချက်အလက်များအရ ဒေသခံ အာဏာပိုင်များနှင့် ပူးပေါင်းဆောင်ရွက်သင့်ပါသည်။ ထိခိုက်မှု နည်းနိုင်ပါသည်။

(ခ) ဇီဝဗေဒဆိုင်ရာ အစိတ်အပိုင်းများ

အပေါ်ယံ ရေဇီဝဗေဒ

မျက်နာပြင် ရေစီးဆင်းမှုတိုးလာမှုသည် ရေအရင်းအမြစ် မျက်နာပြင်တွင် အနည်ကျမှု များလာပြီး phytoplankton နေရောင်ခြည်သုံး အစာချက်လုပ်မှုကို သက်ရောက်စေပြီး ရေထွက်ရှိမှုကို အတားအဆီး ဖြစ်နိုင်ပါသည်။ အနည်ထိန်းချုပ်ခြင်း လျော့ပါးစေရေး နည်းလမ်းများကို အကောင်အထည်ဖော် ဆောင်ရွက်ရန် လိုအပ်ပါသည်။

ဆောက်လုပ်ရေးအလုပ်သမားတဲများမှ စွန့်ပစ်ရေများသည် ရေအရေအသွေးနှင့် အောက်ဆီဂျင်ပါဝင်မှုကို သက်ရောက်နိုင်ပါသည်။ အနည်ထိုင်ကန်များ အသုံးပြုပြီး သက်ရောက်နိုင်ခြေများကို လျော့ချရန် ၄င်း အနည်ထိုင်ကန်များကို သဘာဝရေလမ်းကြောင်းမှဝေးရာတွင် ထားရှိရမည်။

စက်ကိရိယာ ထိန်းသိမ်းခြင်းနှင့် အလုပ်ရုံသုံး ဆီများသည် ရေနေသတ္တဝါများကို ထိခိုက်နိုင်ပါသည်။ ရေနေသတ္တဝါများ ထိခိုက်မှုကို လျော့ချရန် အသုံးပြုပြီးသော ဆီများကို ယာယီ ထိန်းသိမ်းထားရန် အကြံပြုထားပါသည်။ ထိုသို့ ဆောင်ရွက်ခြင်းသည် ဆိုးကျိုးများကို လျော့နည်းစေပါသည်။

ကမ္ဘာမြေ ဂေဟဗေဒ

ကနဦးမြို့အတွက် သတ်မှတ်ထားသော သဘာဝ သစ်တောများသည် လယ်ယာနှင့် ရွာများအဖြစ် ကျူးကျော်ခံနေရပါသည်။ ယခင်လေ့လာမှုအရ စီမံကိန်းဧရိယာအတွင်း တွေ့ရသော တောရိုင်းတိရစ္ဆာန်များမှာ တွေ့နေကျ မျိုးစိတ်များ ဖြစ်ပါသည်။

ဆောက်လုပ်ရေးကာလအတွင်း ပေါက်ပင်များ ရှင်းလင်းခြင်းသည် မရှောင်လွှဲနိုင်သော ဆောင်ရွက်မှု ဖြစ်သော်လည်း လျော့ပါးစေရေး နည်းလမ်းများဖြင့် သက်ရောက်မှုများကို လျော့ချနိုင်ပါသည်။ ထိခိုက်မှု လျော့နည်းပါသည်။

(ဂ) စီးပွားရေး ဖွံ့ဖြိုးတိုးတက်မှု

အဆောက်အဦး ဝန်ဆောင်မှုများ

မြေအောက်ရေ၊ ဒီဇယ်စက် (သို့) LNG ပါဝါစက်ရုံတို့သည် ရေနှင့် လျှပ်စစ်အတွက် အရင်းအမြစ်များ ဖြစ်ပါသည်။ ထို့ကြောင့် ဒေသခံများ၏ လက်ရှိ ရေနှင့် လျှပ်စစ် အသုံးပြုမှုများကို သက်ရောက်မှုမရှိပါ။ စွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲခြင်းဝန်ဆောင်မှု မဆောင်ရွက်မီ အန္တရယ်ရှိ စွန့်ပစ်ပစ္စည်းများကို ယာယီထိန်းသိမ်းထားပါမည်။ ဆောက်လုပ်ရေး ကာလအတွင်း အန္တရယ်မရှိ စွန့်ပစ်ပစ္စည်းများ စွန့်ပစ်ရန် နေရာကို သတ်မှတ်ပေးရန် လိုအပ်ပါသည်။ ၄င်းသည် အကျိုးရှိသော သက်ရောက်မှု ဖြစ်ပါသည်။

ယဉ်လမ်းကြောနှင့် သယ်ယူပို့ဆောင်ရေး

ကုန်တင်ယဉ်အသေးကဲ့သို့ ယဉ်အသေးများ အများအပြား သွားလာမှုသည် စီမံကိန်းကာလမတိုင်မီတွင် ပိုများနိုင်ပါသည်။ ထို့ကြောင့် စီမံကိန်းသုံး ယဉ်နှင့် ဒေသခံများ အသုံးပြုသော မော်တော်ဆိုင်ကယ်များကြား

ထိခိုက်မှုများ တိုးလာနိုင်ပါသည်။ သို့သော်လည်း မတော်တဆ ထိခိုက်မှုများကို လျော့ချရန် စီမံကိန်းသုံး ယဉ်များ အသုံးပြုသော လမ်းတစ်လျောက်တွင် အချက်ပြသင်္ကေတ ဆိုင်းဘုတ်များ တပ်ဆင်ပေးပါမည်။

မြေအသုံးပြုမှု

ဆောက်လုပ်ရေး ကာလအတွင်းတွင် မြေအသုံးပြုမှုအပေါ် အဓိက သက်ရောက်နိုင်ပြီး အလုပ်သမား လိုအပ်ချက်များအရ ယာယီ ဝန်ဆောင်မှု၊ အဆောက်အဦးများကို ပုံမှန် စောင့်ကြည့်စစ်ဆေးရန် လိုအပ်ပါသည်။ နေရာပြောင်းရွှေ့မှုများကို လိုအပ်သလို ဆောင်ရွက်သွားမည်ဖြစ်ပြီး စီမံကိန်း ဝန်ဆောင်မှုများ အားလုံးကို သတ်မှတ်ထားသော မြို့နယ်သတ်မှတ်ချက် အပြင်ဘက်တွင် ခွင့်ပြုလိမ့်မည်မဟုတ်ပါ။

(ဃ) လူမှုရေးနှင့် ယဉ်ကျေးမှု

လူမှု- စီးပွား အခြေအနေ

စီမံကိန်းဆောင်ရွက်မှုနှင့် အစီအစဉ်များကို ဗဟုသုတမရှိခြင်းသည် ပြည်သူလူထု တွေ့ဆုံဆွေးနွေးခြင်းမှ ရရှိသော အဓိက အကြောင်းအရာတစ်ခု ဖြစ်ပါသည်။ ၎င်းသည် မကောင်းသတင်းများနှင့် စီမံကိန်းအပေါ် အထင်အမြင်လွဲမှားမှုများ ဖြစ်ပေါ်နိုင်ပါသည်။ ပြည်သူများ၏ စိုးရိမ်ပူပန်မှုများကို တွေ့ဆုံဆွေးနွေးစဉ်အတွင်း ကောက်ယူပြီး ဖြေရှင်းနိုင်ပါသည်။ ထားဝယ် အထူးစီးပွားရေးဇုန်ဥပဒေတွင် မြန်မာအလုပ်သမားများကို နစ်စဉ် ရာခိုင်နှုန်းတစ်ခု သတ်မှတ်ပြီး ခန့်ထားရပါမည်။ ၎င်းလိုအပ်ချက်များရှိသော်လည်း ဒေသခံများ၏ ဗဟုသုတနှင့် ကျွမ်းကျင်မှုသည် စက်ရုံလိုအပ်ချက်များနှင့် မပြည့်မီပါက အခြားဒေသမှ (ရန်ကုန်ကဲ့သို့) မြန်မာလုပ်သားများကို ခန့်သွားမည်ဖြစ်ပြီး ဒေသခံများအတွက် အလုပ်အကိုင်အခွင့်အလမ်းများ ဆုံးရှုံးနိုင်ပါသည်။ နောင်လုပ်ငန်းခန့်အပ်မှုအတွက် ဒေသခံများလိုအပ်သည့် လုပ်ငန်းပိုင်းဆိုင်ရာ ကျွမ်းကျင်မှုများကို တိုးမြင့်ပေးရန် လုပ်ငန်းခွင် သင်တန်းများကို ဆောက်လုပ်ရေး အဆင့်ကတည်းက ဆောင်ရွက်ရန် လိုပါသည်။

သမိုင်းဝင်နှင့် ယဉ်ကျေးမှုဆိုင်ရာ အရေးပါသော နေရာများ

သမိုင်းဝင်နှင့် ယဉ်ကျေးမှုဆိုင်ရာ နေရာ(၃)ခုရှိပါသည် (နဖူးလည်စက်တော်ရာ (သို့) ဗုဒ္ဓခြေတော်ရာ (လေရှောင်းရွာ)၊ ဘုန်းကြီးကျောင်း (မုဒုရွာ)နှင့် ဘုရား (မင်းတပ်))။ ၎င်းနေရာများမှာ စီမံကိန်းဧရိယာအတွင်းကျရောက်ပြီး မည်ကဲ့သို့ ထိန်းသိမ်းမည်၊ ပြန်လည်နေရာချမည်ကို ဂရုတစိုက် စီစဉ်ပါမည်။ ဘာသာရေးဆိုင်ရာနေရာများသည် မြန်မာနိုင်ငံတွင် အရေးကြီးနေရာများဖြစ်ပြီး ၎င်းနေရာများကို စီမံမှု မှားယွင်းခြင်းကြောင့် သက်ရောက်မှုများမှာ ကြီးမားပါသည်။ ထို့ကြောင့် ၎င်းသည် အတော်အတန် ဆိုးကျိုးသက်ရောက်မှု ရှိနိုင်ပါသည်။

(င) ပြည်သူနှင့် လုပ်ငန်းခွင် ကျန်းမာရေး

ဆောက်လုပ်ရေးကာလအတွင်း ပြည်သူနှင့် လုပ်ငန်းခွင်ကျန်းမာရေးကို သက်ရောက်နိုင်ခြေရှိသော အရာများမှာ အောက်ပါအတိုင်း ဖြစ်ပါသည်။

(က) လုပ်ငန်းခွင်ကျန်းမာရေးနှင့် လုံခြုံရေး

မတော်တဆထိခိုက်မှုနှင့် ဒဏ်ရာရရှိမှု

မတော်တဆ ထိခိုက်မှုနှင့် ဒဏ်ရာရမှုများသည် အထူးသဖြင့် မလေ့ကျင့်ထားသော အလုပ်သမားများတွင် ဖြစ်နိုင်ပါသည်။ ထိခိုက်မှုများသည် အသေးအဖွဲမှ ဒုက္ခိတဖြစ်လောက်သော ထိခိုက်မှု (သို့) အသက်ဆုံးနိုင်လောက်သည်အထိ ရှိနိုင်ပါသည်။ လျှပ်စစ်ပစ္စည်းများ မှားယွင်းမှု၊ ထိခိုက်မှု၊ ပြတ်ရှဒဏ်ရာ၊ ပြုတ်ကျမှု၊ မျက်လုံးယားယံမှုနှင့် မီးလောင်မှုတို့သည် ဖြစ်နေကျဖြစ်ပြီး အရိုးကျိုးခြင်း၊ ပြင်းထန်စွာ ထိခိုက်မှုများလည်း တွေ့ရနိုင်ပါသည်။ ၎င်းအပြင် ယဉ်မတော်တဆဖြစ်မှုလည်း ဖြစ်လာနိုင်ပါသည်။ ထို့ကြောင့် တားမြစ်မှုနှင့် လျော့ပါးစေရေးနည်းလမ်းများ ဆောင်ရွက်ရန် လိုအပ်ပါသည်။

လုပ်ငန်းခွင်ဆိုင်ရာ၊ လိင်ပိုင်းဆိုင်ရာနှင့် ကူးလူးဆက်ဆံမှုဆိုင်ရာ ရောဂါများ

ဖုန်မှုန့်၊ ဂတ်စ်၊ ဓါတုပစ္စည်းများ (သို့) ပျော်ရည်ကဲ့သို့ အလုပ်ခွင်တွင် ညစ်ညမ်းပစ္စည်းများ ထိတွေ့နေရမှုကြောင့် အသက်ရှုလမ်းကြောင်းဆိုင်ရာ ရောဂါများ ပိုမိုဆိုးဝါးလာနိုင်ပါသည်။ အန္တရယ်ရှိ ဓါတုစွန့်ပစ်ပစ္စည်းများကြောင့် ပန်းနာရင်ကျပ်၊ ဓါတ်မတည့်ခြင်း၊ အစာအိမ်နာ (သို့) စိတ်ပုံမှန်မဟုတ်ခြင်းကဲ့သို့ နာတာရှည်ရောဂါများ ဖြစ်လာနိုင်ပါသည်။ ထို့အပြင် တကိုယ်ရေသန့်ရှင်းမှုနှင့် ပတ်ဝန်းကျင်မိလ္လာစနစ်အားနည်းခြင်းတို့ကြောင့် ဝမ်းပျက်ဝမ်းလျော၊ အသည်းရောင်နာနှင့် ကူးလူးဆက်ဆံမှုရောဂါများ တိုးလာနိုင်ပါသည်။ ငှက်ဖျား၊ တုတ်ကွေးနှင့် ဒေသဆိုင်ရာ ရောဂါများသည် အလွယ်တကူ ကူးစက်ပျံ့နှံ့နိုင်ပါသည်။ လိင်ပိုင်းဆိုင်ရာ ကူးစက်ရောဂါနှင့် HIVs ရောဂါအတွက် ပြင်းထန်သော ကာကွယ်ထိန်းချုပ်မှုများ လိုအပ်ပါသည်။

အရေးပေါ်တုန့်ပြန်မှုနှင့် ရှေးဦးသူနာပြုနည်း

မီးတောက်သော ပစ္စည်းများကို မီးညှိခြင်း (သို့) ဓါတ်ပြုဓါတုပစ္စည်းများမှ မီးနှင့် ပတ်သက်၍ မတော်တဆများ ထိခိုက်မှုများ ဖြစ်နိုင်ပါသည်။ ထို့ကြောင့် မီး၊ ပေါက်ကွဲမှုနှင့် ဓါတုယိုစိမ့်မှုများနှင့် ပတ်သက်၍ အရေးပေါ်တုန့်ပြန်မှုအစီအစဉ်ကို ဆောင်ရွက်ထားသင့်ပါသည်။ Dawei Residence (Myanmar) စီမံကိန်းပိုင်ရှင်သည် လုပ်ငန်းခွင်တွင် အချိန်ပြည့် ရှေးဦးသူနာပြုပစ္စည်းများကို ထောက်ပံ့ထားပါသည်။ အရေးပေါ်အခြေအနေများနှင့် ကြုံသောအခါ သေချာစေရန် အရည်အသွေးကောင်းသော ရှေးဦးသူနာပြုပစ္စည်းများကို ထားရှိသင့်ပါသည်။ လူနာများကို အချိန်မီ သင့်တော်သော ဆေးခန်းဆေးရုံများသို့ ပို့ဆောင်ပေးသင့်ပါသည်။

လူထုကျန်းမာရေး

ဆောက်လုပ်ဆဲကာလအတွင်း စီမံကိန်း ဆောင်ရွက်မှုများတွင် စီမံကိန်းဆောင်ရွက်မှု နယ်ပယ်ကို ကျော်လွန်ပြီး အချို့သက်ရောက်မှုများ ရှိနိုင်ပါသည်။ စီမံကိန်းဧရိယာ ပတ်ဝန်းကျင်ရှိ လူထုတွင် အမျိုးမျိုးသော ပြဿနာများ သက်ရောက်နိုင်ပါသည်။

လူနေထိုင်မှုနှင့် မိလ္လာစနစ်

၎င်းသည် လူထုကျန်းမာရေး ဝန်ဆောင်မှုများ၊ ပြည်သူကျန်းမာရေး ဝန်ဆောင်မှုများနှင့် မိလ္လာစနစ်တို့တွင် အဆင်မပြေမှုများ ဖြစ်လာပါမည်။ လက်ရှိ ဒေသအာဏာပိုင်မှ ဆောင်ရွက်ပေးထားသော လူထုကျန်းမာရေးဝန်ဆောင်မှုသည် အကန့်အသတ်နှင့်သာ ဖြစ်ပါသည်။ မသင့်တော်သော ရေနုတ်မြောင်း၊ ရေဆိုးနှင့် အစိုင်အခဲစွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲမှုသည် ရောဂါများ ဖြစ်ပေါ်လာနိုင်ပါသည်။ ထို့ကြောင့် သက်ရောက်မှုများကို လျော့ချရန် ပြည့်စုံလုံလောက်သော၊ နစ်လိုဖွယ်ကောင်းသော ဝန်ဆောင်မှုများကို ထောက်ပံ့ပေးသင့်ပါသည် (ဥပမာ- အစိုင်အခဲ စွန့်ပစ်ပစ္စည်းစွန့်ပစ်မှု)။

ပတ်ဝန်းကျင်ဆိုင်ရာ၊ ကူးလူးဆက်ဆံမှုဆိုင်ရာ ရောဂါများ

ဆောက်လုပ်ရေးလုပ်ငန်းနှင့် ပို့ဆောင်ရေး လုပ်ငန်းများကြောင့် အသက်ရှုလမ်းကြောင်းရောဂါနှင့် စိတ်အနှောင့်အယှက်ဖြစ်စေသော ဖုန်မှုန့်နှင့် ဆူညံသံများ ရှိနိုင်ပါသည်။

လုပ်သားပြောင်းရွှေ့မှုများကြောင့် HIV/ AIDS ကဲ့သို့သော လိင်ပိုင်းဆိုင်ရာ ကူးစက်ရောဂါများသည် ကူးလူးဆက်ဆံမှုဆိုင်ရာ ရောဂါများထဲတွင် အဖြစ်အများဆုံး ဖြစ်လာပါလိမ့်မည်။ ၎င်းရောဂါများသည် ကျယ်ကျယ်ပြန့်ပြန့် ပျံ့နှံ့နိုင်ပါသည်။ မိလ္လာစနစ် ညံ့ဖျင်းမှုကြောင့် ငှက်ဖျား၊ တုတ်ကွေး၊ ဝမ်းရောဂါ၊ အသည်းရောဂါ၊ အဆုတ်ရောင်နာနှင့် အဆုတ်ရောဂါများလည်း ဖြစ်လာနိုင်ပါသည်။

ပြောင်းရွှေ့လာသော အလုပ်သမားများသည် စီမံကိန်းဧရိယာသို့ ရောဂါများ သယ်လာနိုင်ပါသည်။ ထိုသို့ ဖြစ်လာလျှင် ဒေသခံများသို့ ရောဂါအသစ်များ ရောက်ရှိလာပါမည်။ အအေးပတ်ခြင်း၊ တုတ်ကွေးနှင့် အသက်ရှုလမ်းကြောင်းဆိုင်ရာကူးစက်မှုများလည်း ဖြစ်လာနိုင်ပါသည်။ အရက်သောက်သုံးမှုများလာခြင်း၊ ဆေးလိပ်သောက်သုံးမှု များလာခြင်း၊ အလုပ်သမားများ ရွှေ့ပြောင်းလာမှု တိုးလာခြင်းနှင့် လူမှုရေးဆိုင်ရာ အနှောင့်အယှက်များကိုလည်း ကြိုတင်မျှော်လင့်ထားရပါမည်။ ထိုသို့ ဖြစ်ပေါ်နိုင်သော သက်ရောက်မှုများကို လျော့ချရန် သင့်တော်သော လျော့ပါးစေရေး နည်းလမ်းများကို အကောင်အထည်ဖော်သင့်ပါသည်။

မတော်တဆထိခိုက်မှု၊ မီးဘေးနှင့် ဓါတုယိုစိမ့်မှု

မတော်တဆထိခိုက်မှုများသည် ဆောက်လုပ်ရေးသုံး ပစ္စည်းများ သယ်ယူခြင်း (သို့) gasoline၊ ပျော်ရည်နှင့် ချောဆီများကဲ့သို့ ဓါတုပစ္စည်းများ သယ်ယူစဉ်အတွင်း ဖြစ်ပေါ်နိုင်ပါသည်။ ၎င်းမတော်တဆထိခိုက်မှုများမှတစ်ဆင့် မီးလောင်ခြင်း၊ ပေါက်ကွဲမှု (သို့) အဆိပ်ရှိ ဓါတုပစ္စည်းများ ပတ်ဝန်းကျင်သို့ ယိုစိမ့်ခြင်းများ ဖြစ်ပေါ်နိုင်ပါသည်။ ထို့ကြောင့် အရေးပေါ် တုန့်ပြန်မှု အစီအစဉ်ကို ဆောင်ရွက်သင့်ပါသည်။

<u>ကျန်းမာရေးဆောင်ရွက်ချက်များ ပြည့်စုံမှုနှင့် အသင့်ပြင်ဆင်ထားရှိမှု</u>

ဒေသကျန်းမာရေး ဆောင်ရွက်မှုနှင့် တစ်ဦးချင်းကျန်းမာရေးဆောင်ရွက်မှုများသည် လက်ရှိတွင် အကန့်အသတ်နှင့် ဖြစ်ပါသည်။ သို့သော်လည်း ဒဏ်ရာရရှိမှုနှင့် ဖျားနာမှုများသည် တိုးလာနိုင်ပါသည်။ ထို့ကြောင့် ကျန်းမာရေး ဆောင်ရွက်မှုများအပေါ်ဖိအားများ လျော့ချရန် လျော့ပါးစေရေး ဆောင်ရွက်ချက်များကို ဆောင်ရွက်သင့်ပါသည်။

၁.၅.၃ လုပ်ငန်းလည်ပတ်စဉ်အတွင်း သက်ရောက်မှု အကဲဖြတ်ခြင်း

(က) ရုပ်ပိုင်းဆိုင်ရာ ကဏ္ဍ

<u>လေအရည်အသွေး</u>

လုပ်ငန်းလည်ပတ်စဉ်အတွင်း လေညစ်ညမ်းစေသော ဆောင်ရွက်မှုများမှာ ယဉ်များမှ ထုတ်လွှတ်သော မီးခိုးများ ဖြစ်နိုင်ပါသည်။ အရိပ်ရစေရန်နှင့် ကာဗွန်ဒိုင်အောက်ဆိုဒ်အပါအဝင် အပူလျော့ချရန်အတွက် အပင်များ စိုက်ပျိုးခြင်းကဲ့သို့ လေထုညစ်ညမ်းမှု လျော့ချသော နည်းလမ်းများ လိုအပ်ပါသည်။ ဆိုးကျိုးများ နည်းနိုင်ပါသည်။

<u>ဆူညံသံနှင့် တုန်ခါမှု</u>

လုပ်ငန်းလည်ပတ်ခြင်းကြောင့် အနီးအနားဧရိယာများတွင် ဆူညံသံနှင့် တုန်ခါမှုများ မရှိနိုင်ပါ။

<u>မြေမျက်နှာသွင်ပြင်နှင့် မြေဆီလွှာ</u>

ဆောက်လုပ်ရေးလုပ်ငန်း ပြီးဆုံးသွားပြီး လုပ်ငန်းလည်ပတ်ဆဲအဆင့်တွင် ထိခိုက်မှုများ မရှိနိုင်ပါ။

<u>ရေမျက်နှာပြင်နှင့် အနည်အနှစ်</u>

အဆောက်အဦးတစ်ခုစီနှင့် အချောသတ်သတ်သန့်စင်ကန်ရှိ စွန့်ပစ်ရေသန့်စင်စက်ရုံတွင် ခန့်မှန်း စွန့်ပစ်ရေပမာဏ ရှိပါသည်။ စွန့်ပစ်ရေသန့်စင်စက်ရုံကို တောင်ဘက်နှင့် မြောက်ဘက်ဇုန်တွင် နှစ်ပိုင်းခွဲထားပါသည်။ မြောက်ဘက်ဇုန်တွင် အဆောက်အဦးတစ်ခုစီမှ တစ်ရက်လျှင် စွန့်ပစ်ရေ ၁၅ ကုဗမီတာနှုန်းနှင့် (အဆောက်အဦး ၁၀ ခုမှ ၁၅၀ ကုဗမီတာ) အလုပ်သမားဆောင် သုံးလွှာမှ စွန့်ပစ်ရေသန့်စင်ရန်၊ တစ်ရက်လျှင် ၈၄ ကုဗမီတာနှုန်းနှင့် (အဆောက်အဦး ၁၈ ခုမှ ၁၅၁၂ ကုဗမီတာ) အလုပ်သမားဆောင် ၅လွှာမှ စွန့်ပစ်ရေသန့်စင်ရန်နှင့် တစ်ရက်လျှင် ၂၇ ကုဗမီတာနှုန်းနှင့် (အဆောက်အဦး ၆ခုမှ ၁၆၂ ကုဗမီတာ) အလုပ်သမားဆောင် ၈ လွှာမှ စွန့်ပစ်ရေသန့်စင်ရန်အတွက် ပြင်ဆင်ထားပါသည်။ မြောက်ဘက်ဇုန်မှ စွန့်ပစ်ရေသည် တစ်ရက်လျှင် ၁၈၂၄ ကုဗမီတာရှိပါသည်။ တောင်ဘက်ဇုန်တွင် အဆောက်အဦးတစ်ခုမှ စွန့်ပစ်ရေထွက်ရှိမှုသည် ၁၅ ကုဗမီတာနှုန်းနှင့် (အဆောက်အဦး ၅၂ ခုမှ ၇၈၀ ကုဗမီတာ) အလုပ်သမားဆောင် သုံးလွှာမှ စွန့်ပစ်ရေသန့်စင်ရန်၊ တစ်ရက်လျှင် ၈၄ ကုဗမီတာနှုန်းနှင့် (အဆောက်အဦး ၁၅၈ ခုမှ ၁၃၂၇၂ ကုဗမီတာ) အလုပ်သမားဆောင် ၅လွှာမှ စွန့်ပစ်ရေသန့်စင်ရန် ပြင်ဆင်ထားပါသည်။ တောင်ဘက်ဇုန်မှ စွန့်ပစ်ရေထွက်ရှိမှု စုစုပေါင်းမှာ တစ်ရက်လျှင် ၁၄၀၅၂ ကုဗမီတာရှိပါသည်။ စီးထွက်ရေ BOD ပမာဏမှာ 20 mg/l ထက်မကျော်ဘဲ

သယံဇာတနှင့် ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဌာန စွန့်ပစ်ရေစံချိန်စံနှုန်းများနှင့် ကိုက်ညီရပါမည်။ စီးထွက်ရေများကို ပြည်သူသုံး မြောင်းများနှင့် ထားဝယ်မြစ်အတွင်းသို့ မစွန့်ပစ်ရပါ။ ထို့ကြောင့် စီမံကိန်းလည်ပတ်ဆဲအဆင့်သည် အပေါ်ယံရေမျက်နှာပြင် အရည်အသွေးကို ထိခိုက်ညစ်ညမ်းစေမှု မဖြစ်စေပါ။ အတန်အသင့် ဆိုးကျိုးသာ ရှိစေနိုင်ပါသည်။

သို့သော်လည်း ကနဦးမြို့၏ ကနဦးအဆင့်မစတင်မီ ငါးထပ်ဆောင် ကိုးခုနှင့် စီမံကိန်းအလုပ်သမားများနှင့် ရုံးခန်းများအတွက် ငါးထပ်ဆောင်တစ်ခု ဆောက်လုပ်ရန်ရှိပါသည်။ လူဦးရေနည်းသောကြောင့် (ငါးထပ်ဆောင်တွင် အများဆုံး လူ ၇၀၀ နှင့် ရှစ်ထပ်ဆောင်တွင် အများဆုံး ၂၂၂ဦး) ရေမျက်နှာပြင်အပေါ် ထိခိုက်မှုမှာ လုပ်ငန်းလည်ပတ်ဆဲအဆင့်တွင် သက်ရောက်မှုထက် နည်းပါမည်။ စွန့်ထုတ်မည့်နေရာမှာ ခွန်ချောင်းမြစ်တွင်သာ ဖြစ်ပါသည်။

အစိုင်အခဲ စွန့်ပစ်ပစ္စည်း

လုပ်ငန်းလည်ပတ်စဉ်ကာလအတွင်း အစိုင်အခဲစွန့်ပစ်ပစ္စည်းများကို (အန္တရာယ်မရှိ စွန့်ပစ်ပစ္စည်း၊ အန္တရာယ်ရှိ စွန့်ပစ်ပစ္စည်းနှင့် ကူးစက်တတ်သော စွန့်ပစ်ပစ္စည်းဟူ၍) သုံးမျိုး ခွဲခြားထားပါသည်။ အန္တရာယ်မရှိ စွန့်ပစ်ပစ္စည်းနှင့် အန္တရာယ်ရှိ စွန့်ပစ်ပစ္စည်းများကို သင့်တော်သလိုစွန့်ပစ်ပါမည်။ ကူးစက်တတ်သော စွန့်ပစ်ပစ္စည်းကို မီးရှို့စက်တွင် စွန့်ပစ်ပါမည်။ သင့်တော်သော စီမံခန့်ခွဲမှုစနစ်ရှိပြီး ထားဝယ်မြစ်တွင်းသို့ မစွန့်ပစ်ပါ။ ထို့ကြောင့် အစိုင်အခဲ စွန့်ပစ်ပစ္စည်းကြောင့် ထိခိုက်မှု မရှိနိုင်ပါ။

(ခ) ဇီဝဆိုင်ရာ အရင်းအမြစ်များ

ရေမျက်နှာပြင် ဇီဝဗေဒ

သန့်စင်ထားသော စွန့်ပစ်ရေများကို ပြည်သူများအသုံးပြုနေသော ချောင်းမြောင်းများကို မဖြတ်စေပဲ ရေနုတ်မြောင်းများမှတဆင့် စွန့်ပစ်ပါမည်။ ထို့ကြောင့် စီမံကိန်းလည်ပတ်မှုသည် ရေမျက်နှာပြင် အရည်အသွေးနှင့် ရေသတ္တဝါများကို သက်ရောက်မှုမရှိနိုင်ပါ။

ဂေဟဗေဒစနစ်

လုပ်ငန်းလည်ပတ်စဉ်ကာလအတွင်း ဂေဟဗေဒစနစ်ကို တိုက်ရိုက်သက်ရောက်မှုများမှာ နည်းနိုင်ပါသည်။ အဘယ့်ကြောင့်ဆိုသော် ဆောက်လုပ်ဆဲအဆင့်တွင် အလုပ်သမားများသည် စက်မှုဇုန်ဧရိယာနှင့် ကနဦးမြို့များသို့ ပြောင်းရွှေ့သွားခြင်း၊ ထိန်းသိမ်းတောများတွင် အမဲလိုက်မှုများမပြုလုပ်နိုင်သောကြောင့် တောတွင်းသားနှင့် အစိတ်အပိုင်းများ လိုအပ်မှု တိုးများလာနိုင်ပါသည်။ စီမံကိန်းကာလအတွင်း တောရိုင်းတိရိစ္ဆာန်များကို သုံးစွဲမှုအပေါ် ဟန့်တားခြင်း၊ အသိပညာပေးခြင်းများ ဆောင်ရွက်ရန် လိုအပ်ပါသည်။

(ဂ) စီးပွားရေး ဖွံ့ဖြိုးတိုးတက်မှု

ဝန်ဆောင်မှု ဆောင်ရွက်ချက်များ

လုပ်ငန်းလည်ပတ်မှု ကာလအတွင်း အကြမ်းသုံး ရေအရင်းအမြစ်မှာ ရေလှောင်ကန်ငယ်များ (ပယင်းဖြူနှင့် တလိုင်းကျ) မှ ဖြစ်ပါသည်။ အကြမ်းသုံးရေများကို ကနဦးမြို့သို့ မဖြန့်ဝေမီ ရေလှောင်ကန်အနီးတွင် တည်ရှိသော သန့်စင်စက်ရုံသို့ အရင်ဖြန့်ဝေပါမည်။ လျှပ်စစ်ကို စက်မှုဇုန်ဝင်းအတွင်း ဓါတ်အားသုံးစက်ရုံများအားဖြင့် ဆောင်ရွက်ပါမည်။ ကနဦးမြို့မှ စွန့်ပစ်ပစ္စည်းများကို မြို့၏ စွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲမှုအရ စွန့်ပစ်ပါမည်။

အချုပ်အားဖြင့် ဒေသခံလူများ၏ လက်ရှိဝန်ဆောင်မှုများကို စီမံကိန်းမှ သက်ရောက်မှု မရှိနိုင်ပါ။

ယဉ်သွားလာမှုနှင့် သယ်ယူပို့ဆောင်မှု

ယဉ်ကြောပိတ်ဆို့များမဖြစ်စေရန် ကနဦးမြို့စနစ်သည် မြို့အများအပြားနှင့် ဆက်သွယ်နိုင်သော ယပ်တောင်ပုံ ဒီဇိုင်းရေးဆွဲထားပါသည်။ အလုပ်သမားနေရာများအတွက် အလုပ်သမားများ ဘတ်စ်ကားစီးရန် အဆင်ပြေသော အကွာအဝေးနှင့် အိမ်အပြန်အဆင်ပြေစွာ လမ်းလျှောက်နိုင်ရန် လမ်းကြောင်းများကို အညီအမျှ ပိုင်းခြားထားပါသည်။ ဝန်ဆောင်မှုဆောင်ရွက်ပေးသော နေရာကဲ့သို့ ဂိတ်စနစ်များကို နေထိုင်သူများ ကိုယ်ရေးကိုယ်တာ အကြောင်းအရာများနှင့် လုံခြုံရေးများအတွက် ထားရှိထားပါသည်။ မီးတိုင်များနှင့် ရေနုတ်မြောင်းစနစ်ကို လမ်းကြောင်းများတစ်လျောက် ထားရှိပါမည်။

မြေအသုံးပြုမှု

မြေအသုံးပြုမှုတွင် ဆိုးကျိုးသက်ရောက်နိုင်မှုသည် ထားဝယ်မြို့ကိုလည်း သက်ရောက်နိုင်သည်ဟု ခန့်မှန်းထားပါသည်။ စီမံကိန်း လည်ပတ်ဆဲကာလတွင် မြို့နယ်ဇုန်အတွင်း ထောက်ပံ့သော အခြားတစ်ရက်ပြီးတစ်ရက်ထက် ဆောင်ရွက်မှုများ လိုအပ်ပါလိမ့်မည်။ အတော်အတန် အဆောက်အဦးများနှင့် လူမှု ဝန်ဆောင်မှုများရှိသော ထားဝယ်မြို့နယ်သည် စီမံကိန်းရှိ လူပုဂ္ဂိုလ်များ၏ လိုအပ်ချက်များလိုက်ပြီး အမြန် ဖွံ့ဖြိုးလာပါမည်။ (ဥပမာ- စက်မှုဇုန်ဝင်းအတွင်း မနေထိုင်လိုသော ကြီးကြပ် (သို့) အကြံပေးများ၊ စီမံကိန်းအတွက်လာသော စီးပွားရေး လုပ်ငန်းရှင်နှင့် ဧည့်သည်များ၊ သို့မဟုတ် ဇုန်အတွင်း နေထိုင်ခွင့်မပြုထားသော စီမံကိန်းရှိလူများအတွက် ဆောင်ရွက်နေသော အလုပ်သမားများ နားနေရိပ်သာများ)။ စနေ၊ တနင်္ဂနွေရက်များတွင် အလုပ်သမားအင်အားအတွက် ဖျော်ဖြေရေး ဆောင်ရွက်မှုများကို ထားဝယ်က ဆောင်ရွက်ပေးသွားပါမည်။ မလိုလားအပ်သော အချို့ အသုံးပြုမှုများကို

စီမံကိန်း မြို့နယ်ဇုန်တွင် ခွင့်မပြုထားသော်လည်း မြို့၏ အခြားနေရာများတွင် ရှာဖွေသွားပါမည်။ ဤဖျော်ဖြေမှုများအတွက် နယ်မြေသတ်မှတ် ထိန်းချုပ်မှုကို ထားဝယ်မြို့အတွက် ချပြသင့်ပါသည်။

(ဃ) **လူမှုရေးနှင့် ယဉ်ကျေးမှုဆိုင်ရာများ**

လူမှု-စီးပွားအခြေအနေ

လုပ်ငန်းလည်ပတ်စဉ်ကာလအတွင်း လူမှု-စီးပွားနှင့် လူမှုရေးဆိုင်ရာ ပြဿနာရပ်များမှာ ဆောက်လုပ်ရေးကာလနှင့် အတူတူပင်ဖြစ်ပါသည်။

ရှေးဟောင်းအမွေအနှစ်နှင့် ယဉ်ကျေးမှုဆိုင်ရာ အရေးကြီးနေရာများ

ဆောက်လုပ်ရေးကာလအတွင်း ရှေးဟောင်းအမွေအနှစ်နှင့် ယဉ်ကျေးမှုဆိုင်ရာနေရာများကို ရွှေ့ပြောင်းရမှုများ ရှိပါက လုပ်ငန်းလည်ပတ်စဉ်ကာလအတွင်း သက်ရောက်နိုင်မှုများမရှိနိုင်ဟု ခန့်မှန်းထားပါသည်။

ပြည်သူနှင့် လုပ်ငန်းခွင်ကျန်းမာရေး

ဆောက်လုပ်ရေးကာလအတွင်း ပြည်သူနှင့် လုပ်ငန်းခွင်ကျန်းမာရေးဆိုင်ရာ အခြေအနေများအပေါ် သက်ရောက်နိုင်မှုများမှာ အောက်ပါအတိုင်းဖြစ်ပါသည်။

(င) *လုပ်ငန်းခွင်ကျန်းမာရေးနှင့် လုံခြုံရေး*

လိင်ပိုင်းဆိုင်ရာ ကူးစက်မှုများနှင့် ကူးလူးဆက်ဆံမှုဆိုင်ရာ ရောဂါများ

လိင်ပိုင်းဆိုင်ရာ ကူးစက်မှုများနှင့် ကူးလူးဆက်ဆံမှုဆိုင်ရာ ရောဂါများမှာ တစ်ကိုယ် ရေသန့်ရှင်းမှုနှင့် သန့်ရှင်းသောမိလ္လာစနစ်မရရှိခြင်းတို့ကြောင့်ဖြစ်ပါသည်။ကနဦးမြို့နယ် တွင်နေထိုင်မည့် နိုင်ငံခြားသားများနှင့် ရွှေ့ပြောင်းအလုပ်သမားများမှာလည်း ငှက်ဖျားရောဂါ နှင့် သွေးလွန်တုပ်ကွေးရောဂါ အစရှိသည့်များအပြင် အခြားကူးစက်ရောဂါများပါ ဖြစ်ပေါ်စေနိုင်ပါသည်။လူနေမှုဘဝအဆင့်မြှင့်စေရန် ကျန်းမာရေးအသိရှိမှုကို ကြပ်ကြပ်မတ်မတ် ဆောင်ရွက်သွားမည်ဖြစ်ပါသည်။

ပြည့်စုံသော ကျန်းမာရေးစောင့်ရှောက်ခြင်း ဝန်ဆောင်မှုများ

စီမံကိန်းဧရိယာရှိ အလုပ်သမားအရေအတွက်အရ ဆေးရုံ၊ ကျန်းမာရေးဝန်ဆောင်မှုများကို စီမံကိန်းမြို့နယ်အတွင်း ဆောက်လုပ်ပေးရပါမည်။ ယခင်ဒေသခံအာဏာပိုင်များက ဆောင်ရွက်ပေးထားသော ပြည်သူ့ကျန်းမာရေး ဝန်ဆောင်မှုများမှာ ကန့်သတ်ထားသော အခြေအနေတွင် ရှိသောကြောင့် ၎င်းအသစ်ဆောက်လုပ်ထားသော ကျန်းမာရေးဝန်ဆောင်မှုများသည် လုံလောက်မှုရှိခြင်း၊ ဆောင်ရွက်မှုမြင့်မားပြီး သွားလာမှုလွယ်ကူသော နေရာတွင် ရှိသင့်ပါသည်။

(စ) *လူထုကျန်းမာရေး*

<u>မိလ္လာရေဆိုးစနစ်</u>

စက်ရုံများနှင့် ပတ်ဝန်းကျင်ဇရိယာများ မြင့်မားခြင်းသည် ပြည်သူ့ကျန်းမာရေး ဝန်ဆောင်မှုများ အပါအဝင် အဆောက်အဦး၊ ဝန်ဆောင်မှု အသုံးပြုမှုများအပေါ် ဖိအားဖြစ်စေပါသည်။ မိလ္လာ၊ စွန့်ပစ်ရေနှင့် အစိုင်အခဲအညစ်အကြေးစီမံခန့်ခွဲမှုညံ့ဖျင်းမှုသည် သန့်ရှင်းမှုနှင့် ပတ်ဝန်းကျင်ကျန်းမာရေးကို နိမ့်ကျစေပါသည်။ လက်ရှိတွင် ဒေသခံအာဏာပိုင်များက ဆောင်ရွက်ထားသော ပြည်သူ့ကျန်းမာရေး ဝန်ဆောင်မှုများမှာ ကန့်သတ်ထားသော အခြေအနေတွင် ရှိပါသည်။ ထို့ကြောင့် နောက်ဆက်တွဲ ပြဿနာများ မဖြစ်ပေါ်စေရန် စီမံကိန်းပိုင်ရှင်သည် လျော့ပါးစေရေး နည်းလမ်းများကို ဒေသခံ အာဏာပိုင်များနှင့် အနီးကပ် ဆွေးနွေးသင့်ပါသည်။

<u>ပတ်ဝန်းကျင်ဆိုင်ရာ၊ ကူးလူးဆက်ဆံမှု/ကူးလူးဆက်ဆံမှုမဟုတ်သော ရောဂါများ</u>

ဒေသခံ နေထိုင်သူများ၊ အထူးသဖြင့် တကိုယ်ရေသန့်ရှင်းမှုနည်းသော ဇရိယာများတွင် ပျံ့နှံ့နိုင်ပါသည်။ HIV/ AIDs ကဲ့သို့ လိင်ပိုင်းဆိုင်ရာ ကူးစက်ရောဂါများနှင့် ကူးလူးဆက်ဆံမှုဆိုင်ရာ ရောဂါများမှာ အလုပ်သမားများ နေထိုင်မှုနှင့် သက်ဆိုင်ပါသည်။

ပြည်သူများ၏ ဝင်ငွေမြင့်မားမှုသည် မကျန်းမာစေသော အလေ့အကျင့်များကို ဖြစ်ပေါ်စေပါသည်။ (ဥပမာ- အဟာရနည်းသော အစားအစာများ၊ အရက်သောက်ခြင်းနှင့် လေ့ကျင့်ခန်းလုပ်မှုနည်းခြင်း တို့သည် နာတာရှည်ရောဂါများကို ဖြစ်ပေါ်စေပါသည်။ - သွေးတိုးရောဂါ၊ ဆီးချိုရောဂါ၊ နှလုံးရောဂါ၊ အကျိတ်နှင့် ကင်ဆာရောဂါ။) အရက်သောက်သုံးခြင်းနှင့် ဆေးလိပ်သောက်ခြင်းများကို ပိုမိုတွေ့ရပါသည်။ အမှန်တကယ်တွင် ၄င်းကူးလူးဆက်ဆံမှုမှမဟုတ်သော ရောဂါများမှာ ပိုပြင်းထန်ပြီး ကုသရန်အတွက် ခေတ်မှီနည်းစနစ်များ လိုအပ်ပါသည်။

<u>ကျန်းမာရေးဝန်ဆောင်မှုများ လုံလောက်မှုနှင့် အသင့်ထားရှိမှု</u>

နာမကျန်းဖြစ်ခြင်း၊ ဒဏ်ရာရခြင်း၊ မတော်တဆနှင့် အသေအပျောက်ဖြစ်ခြင်းများ တိုးလာခြင်းကြောင့် ပြည့်စုံသော ကျန်းမာရေး ဝန်ဆောင်မှုများ လိုအပ်ပါသည်။ ဒဏ်ရာရခြင်းနှင့် သွေးတိုးရောဂါများအဖြစ်များသောကြောင့် ကျန်းမာရေးဝန်ဆောင်မှုများ ပိုမိုထားရှိရန် လိုအပ်ပါသည်။ တဆက်တည်းတွင် ထိရောက်သော ကျန်းမာရေးစောင့်ကြည့်မှုစနစ် လိုအပ်ပါသည်။

၁.၅.၄ ဘေးအန္တရာယ် အကဲဖြတ်ခြင်း

ဘေးအန္တရာယ်လျော့ပါးစေရေး နည်းလမ်းများကို ဆောင်ရွက်ရန် လိုအပ်ပါသည်။ သတ်မှတ်ထားသော ဖြစ်ရပ်များအတွက် ဘေးအန္တရာယ် လျော့ပါးစေသော နည်းလမ်းများကို ဇယား ၁.၅-၁ တွင် ဖော်ပြထားပါသည်။ နည်းလမ်းများကို အသေးစိတ်အကောင်အထည်ဖော် ဆောင်ရွက်ပါမည်။

ဇယား ၁.၅-၁ ဆောက်လုပ်ရေးကာလအတွင်း ပတ်ဝန်းကျင်ဆိုင်ရာ ဘေးအန္တရာယ် စီမံခန့်ခွဲမှုအတွက် လျော့ပါးစေရေး နည်းလမ်းများ

အကြောင်းအရာ	လျော့ပါးစေရေး နည်းလမ်းများ
ITD ကန်ထရိုက်တာနှင့် ကန်ထရိုက်တာခွဲတို့သည် စီမံကိန်း၏ ပတ်ဝန်းကျင်ဆိုင်ရာ ဆောင်ရွက်မှု လိုအပ်ချက်များကို နားလည်သဘောပေါက်မှု နည်းပါးခြင်း။	ITD ကန်ထရိုက်တာလိုအပ်ချက်များမှာ - EIA အစီရင်ခံစာနှင့် CEMP၊ အသေးစိတ်ပုံစံနှင့် ဆောက်လုပ်ရေး အစီအစဉ်၊ အချိန်ဇယားများကို အခြေခံပြီး ဆောက်လုပ်ရေးကာလ ပတ်ဝန်းကျင်ဆိုင်ရာ စီမံခန့်ခွဲမှု အစီအစဉ် (CEMP) ကို ပြင်ဆင်ရန်။ CEMP သည် ရှင်းလင်းစွာ ဖော်ပြထားရပါမည်။ - စီမံကိန်း၏ ပတ်ဝန်းကျင်ဆိုင်ရာ လိုအပ်ချက်များနှင့် တာဝန်ယူခြင်း။ - လိုအပ်ချက်များနှင့် တာဝန်ယူမှုများကို လိုက်နာဆောင်ရွက်ရန် လိုအပ်သော ရုပ်ပိုင်းဆိုင်ရာ နည်းလမ်းများ။ - လိုအပ်ချက်များနှင့် တာဝန်ယူမှုများကို လိုက်နာဆောင်ရွက်ရန် လိုအပ်သော ဆောက်လုပ်ရေး နည်းလမ်းများ။ - ကန်ထရိုက်တာခွဲတခုစီမှ တာဝန်ယူမှုရှိခြင်း။
ITD ကန်ထရိုက်တာနှင့် ကန်ထရိုက်တာခွဲတို့သည် စာချုပ်တွင် ပါဝင်သော ပတ်ဝန်းကျင်ဆိုင်ရာ လိုအပ်ချက်များကို ရည်ရွယ်ချက်မရှိဘဲ မှားယွင်းစွာ ချန်လှပ်မိခြင်း။	၁။ ITD စာချုပ်ကို ပြန်လည်ကုစားရန်အတွက် TOR သည် ဆောက်လုပ်ရေးကာလအတွင်း စီမံကိန်း၏ ပတ်ဝန်းကျင်ဆိုင်ရာ လိုအပ်ချက်များကို ရှင်းလင်းစွာ ဖော်ပြထားရပါမည်။ ၂။ ITD စာချုပ်သည် ITD ကန်ထရိုက်တာများ၏ ပတ်ဝန်းကျင်ဆိုင်ရာ စီမံခန့်ခွဲမှုတွင် တာဝန်ရှိမှုများကို ရှင်းလင်းစွာ ဖော်ပြထားရမည်။
ITD ကန်ထရိုက်တာနှင့် ကန်ထရိုက်တာခွဲများ၏ ပတ်ဝန်းကျင်ဆိုင်ရာ လျော့ပါးစေရေး ဆောင်ရွက်မှုများကို ကြီးကြပ်မှု၊ စောင့်ကြည့်မှုများ မလုံလောက်ခြင်း။	၁။ ကြီးကြပ်အကြံပေးသည် ပတ်ဝန်းကျင်ဆိုင်ရာ ဆောင်ရွက်မှုများကို ရှင်းလင်းစွာ ဖော်ပြထားသော ကြီးကြပ်မှုနှင့် စောင့်ကြည့်မှု အစီအစဉ်များကို တင်ပြရန် လိုအပ်ပါမည်။ ၎င်း ကြီးကြပ်မှုနှင့် စောင့်ကြည့်မှုအစီအစဉ်သည် ပတ်ဝန်းကျင်ဆိုင်ရာ လျော့ပါးစေရေး နည်းလမ်းများကို အကောင်အထည်ဖော်ရန် ဖြစ်ပါသည်။ ၂။ ITD ကန်ထရိုက်တာသည် ပတ်ဝန်းကျင်ဆိုင်ရာ

ဇယား ၁.၅-၁ ဆောက်လုပ်ရေးကာလအတွင်း ပတ်ဝန်းကျင်ဆိုင်ရာ ဘေးအန္တရာယ် စီမံခန့်ခွဲမှုအတွက် လျော့ပါးစေရေး နည်းလမ်းများ

အကြောင်းအရာ	လျော့ပါးစေရေး နည်းလမ်းများ
	ဆောင်ရွက်မှုများကို လစဉ်ပြန်လည်ဆန်းစစ်ခြင်း။ ၃။ အထူးသဖြင့် လုပ်ငန်းခွင် ဖြည့်တင်းမှု ကာလအတွင်း ကုန်တင်ယဉ်ဖြင့် ဆောင်ရွက်မှုကို အနီးကပ် ကြီးကြပ်ခြင်း။
မူလအဆိုပြုလျော့ပါးစေရေး နည်းလမ်းများကို ပြန်လည်မဆန်းစစ်ဘဲ ဆောက်လုပ်ရေး နည်းလမ်း (သို့) ပုံစံ ပြောင်းလဲခြင်း။	ဆောက်လုပ်ရေးနည်းလမ်း (သို့) ပုံစံပြောင်းလဲခြင်းကို ITD ကန်ထရိုက်တာ (သို့) စီမံကိန်းအဆိုပြုသူအားဖြင့် ဆောင်ရွက်ပါသည်။ ပြောင်းလဲခြင်းအတွက် တောင်းဆိုမှုသည် စီမံကိန်း စီမံခန့်ခွဲမှုနည်းလမ်း ပြောင်းလဲမှုကို ဦးတည်ပါသည်။ ပြောင်းလဲခြင်းအတွက် တောင်းဆိုမှုကို ပတ်ဝန်းကျင်ဆိုင်ရာ ဆောင်ရွက်မှုကို စီစစ်ပြီး လျော့ပါးစေရေး နည်းလမ်းများကို ပြန်လည် စစ်ဆေးခြင်းဖြင့် ဆောင်ရွက်ရပါမည်။
မူလအဆိုပြုလျော့ပါးစေရေး နည်းလမ်းများကို ပြန်လည်မဆန်းစစ်ဘဲ ဆောက်လုပ်ရေး ကာလအတွင်း ပတ်ဝန်းကျင်ဆိုင်ရာ လိုအပ်ချက်များကို ပြောင်းလဲခြင်း။	ပတ်ဝန်းကျင်ဆိုင်ရာလိုအပ်ချက်များ ပြောင်းလဲခြင်းကို DRC (သို့) DRC ခွင့်ပြုချက်ဖြင့် စီမံကိန်းအဆိုပြုသူအားဖြင့် ဆောင်ရွက်ပါသည်။ ပြောင်းလဲခြင်းအတွက် တောင်းဆိုမှုသည် စီမံကိန်း စီမံခန့်ခွဲမှုနည်းလမ်း ပြောင်းလဲမှုကို ဦးတည်ပါသည်။ ITD ကန်ထရိုက်တာသည် ပြောင်းလဲမှု၏ ပတ်ဝန်းကျင်ဆိုင်ရာ ဆောင်ရွက်မှုကို စီစစ်ပြီး မူလအဆိုပြု လျော့ပါးစေရေး နည်းလမ်းများကို စစ်ဆေးပါမည်။

လူနေထိုင်မှု အဆောက်အဦး၏ လုပ်ငန်းလည်ပတ်မှုအဆင့်တွင် ဘေးအန္တရာယ် ဖြစ်ပွားမှုများ မရှိပါ။ ထို့ကြောင့် ကနဦး မြို့လည်ပတ်မှုသည် အနီးအနား ဧရိယာများကို သက်ရောက်မှု မရှိနိုင်ပါ။

၁.၆ စုပေါင်းသက်ရောက်မှု အကဲဖြတ်ခြင်း

စုပေါင်းသက်ရောက်မှုအကဲဖြတ်ခြင်းကို ထားဝယ် ကနဦးမြို့ လည်ပတ်မှုအဆင့် အားလုံးအတွက် ဆောင်ရွက်ပါသည်။ သက်ရောက်နိုင်ခြေ အဆင့်များကို အထက်ပါ ရွေးချယ်မှုများနှင့် အကောင်းဆုံး လက်တွေ့ကျကျ ဝေဖန်ပိုင်းခြားနိုင်မှုများမှ ရရှိသော သတင်းအချက်အလက်များအပေါ် အခြေခံ၍ အကဲဖြတ်ပါသည်။ ဇယား ၁.၆-၁ သည် တန်ဖိုးဖြတ်ခြင်း ရလဒ်ကို ပြသထားပါသည်။

ဇယား ၁.၆-၁ စုပေါင်းသက်ရောက်မှု တန်ဖိုးဖြတ်ခြင်း အခြေအနေ

သက်ရောက်နိုင်ခြေရှိသော ဧရိယာ	ဆောင်ရွက်မည့် လုပ်ဆောင်ချက်	ယခင် ဆောင်ရွက်ချက်	အခြား လက်ရှိ ဆောင်ရွက်ချက်	အနာဂတ် ဆောင်ရွက်ချက်	စုပေါင်းသက်ရောက်မှု
ရုပ်ပိုင်းဆိုင်ရာ အရင်းအမြစ်					
လေအရည်အသွေး	**			*	**
ဆူညံမှုနှင့် တုန်ခါမှု	*				*
မျက်နှာပြင်ရေနှင့် အနည်အနစ်	**	*	*	**	**
မြေအောက်ရေ	*	*	*	*	*
ဘူမိဗေဒနှင့် လျှောင်					
ဇီဝဗေဒ အရင်းအမြစ်					
မျက်နှာပြင်ရေနှင့် ဇီဝဗေဒ	*				
စီးပွားရေး ဖွံ့ဖြိုးတိုးတက်မှု					
အဆောက်အဦး ဝန်ဆောင်မှုများ	+				+
ယဉ်သွားလာမှုနှင့် သယ်ယူပို့ဆောင်ရေး	*			**	**
မြေအသုံးပြုမှု	***			**	***
လူမှုရေးနှင့် ယဉ်ကျေးမှု အရင်းအမြစ်များ					
လူမှု- စီးပွား အခြေအနေများ	+			+	+
သမိုင်းဝင်နှင့် ယဉ်ကျေးမှုဆိုင်ရာ အရေးကြီးနေရာများ	**				**
လူထုနှင့် လုပ်ငန်းခွင်ကျန်းမာရေး	*	*	*	**	**
ထိခိုက်မှု အကဲဖြတ်ခြင်း					

ပတ်ဝန်းကျင်ထိခိုက်မှု အကဲဖြတ်ခြင်း	*				*

Note: * - ဆိုးကျိုးနည်း ** - ဆိုးကျိုးအတန်အသင့် *** - ဆိုးကျိုးမြင့်မား
+ - ကောင်းသော သက်ရောက်မှု

၁.၇ ပတ်ဝန်းကျင်ဆိုင်ရာ စီမံခန့်ခွဲမှု အစီအစဉ်

ပတ်ဝန်းကျင်ဆိုင်ရာ စီမံခန့်ခွဲမှု အစီအစဉ် သတ်မှတ်ခြင်း

လျော့ပါးစေရေး နည်းလမ်းများ အကောင်အထည်ဖော်ခြင်းအတွက် အဓိက တာဝန်ရှိ အဖွဲ့အစည်းများမှာ မြန်နိုင်ငံ အစိုးရ၊ စီမံကိန်းပိုင်ရှင်၊ ဆောက်လုပ်ရေး ကန်ထရိုက်တာနှင့် တစ်ဆင့်ခံ ကန်ထရိုက်တာ (ဆောက်လုပ်ဆဲအဆင့်အတောအတွင်း) နှင့် ရင်းနှီးမြှုပ်နှံသူများ ဖြစ်ပါသည်။ သို့သော်လည်း စီမံကိန်း၏ ဖွံ့ဖြိုးတိုးတက်မှုသည် လေ့လာရေးကာလတွင် မြန်ဆန်စွာ ပြောင်းလဲသွားနိုင်သည်ကို သိထားသင့်ပါသည်။ ၎င်းတွင် စီမံကိန်း၏ အဖွဲ့အစည်းများနှင့် အခြား သက်ဆိုင်သော အဖွဲ့အစည်းများ ပါဝင်ပါမည်။ အခြေခံ အသုံးပြုသော အချက်အလက်များကို အစီရင်ခံစာ ပြင်ဆင်ချိန်တွင် ခိုင်လုံသော အကြောင်းအရာအဖြစ် သတ်မှတ်ရပါမည်။ စီမံကိန်း အချက်အလက် ပြောင်းလဲခြင်းများကို အချိန်နှင့်အမျှ တွေ့ရနိုင်သောကြောင့် စစ်ဆေးခြင်းနှင့် အကောင်အထည်ဖော်ချိန်တို့တွင် စီမံကိန်း အသေးစိတ်အချက်အလက်များကို စစ်ဆေးပြီး အတည်ပြုရန် စာဖတ်သူနှင့် စီမံကိန်း အကောင်အထည်ဖော်သူများကို အကြံပြုထားပါသည်။

၁.၇.၁ စီမံကိန်းပိုင်ရှင်လျော့က်ထားမှု - EMPs

ဤစီမံကိန်းအတွက် စီမံကိန်း ပိုင်ရှင်သည် မန်းထားဝယ် စက်မှုဇုန် (မြန်မာ) (MIE) ကိုကိုယ်စားပြုပြီး ၎င်းသည် မြန်မာ အထူးစီးပွားရေးဇုန် ဥပဒေ (၂၀၁၄) အရ ဖွံ့ဖြိုးတိုးတက်အောင်ဆောင်ရွက်သူ ကဏ္ဍအောက်တွင် ရှိပါသည်။ စီမံကိန်းတွင် MIE ကဏ္ဍတွင် ထားဝယ်စက်မှုဇုန်တွင်း ပုံစံ၊ ဆောက်လုပ်မှုနှင့် အဆင်ပြေစေရန်အဆောက်အဦးများ ပါဝင်ပါသည်။ MIE သည် နည်းပညာ စီစဉ်မှု၊ အတည်ပြုခြင်းနှင့် EMP တွင် ပြဌာန်းထားသည့်အတိုင်း ပတ်ဝန်းကျင်ဆိုင်ရာ လျော့ပါးစေရေး နည်းလမ်းများအားလုံးကို စောင့်ကြည့်ခြင်းအတွက် တာဝန်ရှိပါသည်။ စီမံကိန်း ပိုင်ရှင်သည် အုပ်ချုပ်ရေးပိုင်းကို အစီရင်ခံရပါသည်။

ဆောက်လုပ်ရေး ကန်ထရိုက်တာနှင့် တစ်ဆင့်ခံ ကန်ထရိုက်တာများသည် ထားဝယ် ကနဦးစက်မှုဇုန်၏ ကန်ထရိုက်တာနှင့် တစ်ဆင့်ခံ ကန်ထရိုက်တာများနှင့် လွှဲပြောင်းဆောင်ရွက်ပါမည်။ ၎င်းတွင် စုပေါင်း စနစ် ဆောက်လုပ်ခြင်းများ (ရေသန့်စင်ခြင်းနှင့် ဖြန့်ဝေခြင်းစနစ်၊ စွန့်ပစ်ရေ စုဆောင်းခြင်းနှင့် သန့်စင်ခြင်းစနစ်၊ ရေနုတ်မြောင်းစနစ်၊ လျှပ်စစ်ထုတ်လုပ်ခြင်းနှင့် ဖြန့်ဝေခြင်းစနစ်၊ အစိုင်အခဲနှင့် အန္တရာယ်ရှိ စွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲမှု ဆောင်ရွက်ချက် စသည်ဖြင့်)၊ အတွင်းပိုင်းလမ်းများ၊ နှင့် စက်မှုဇုန်အတွက် အခြေခံ အဆောက်အဦးများ ပါဝင်ပါသည်။ ၎င်းတွင် စက်ရုံတစ်ခုစီ (သို့) ထုတ်လုပ်မှု ဆောင်ရွက်ချက်များ မပါဝင်ပါ။ ဆောက်လုပ်ရေး တစ်ဆင့်ကန်ထရိုက်တာ (CC) သည် ESIA အစီရင်ခံစာတွင် ပြဌာန်းထားသော လျော့ပါးစေရေး နည်းလမ်းများအတိုင်း ဆောင်ရွက်ရပါမည်။ CC သည် စီမံကိန်း ပိုင်ရှင်ကို အစီရင်ခံရပါမည်။

၁.၇.၂ စီမံကိန်း EHS မူဝါဒနှင့် ကတိကဝတ်များ၊ ဥပဒေဆိုင်ရာ လိုအပ်ချက်များ

၁.၇.၂.၁ ဆောက်လုပ်ရေး

ဆောက်လုပ်ရေးကာလအတောအတွင်း စီမံကိန်းသည် ကနဦး စက်မှုဇုန် တည်ဆောက်ခြင်းတွင် ကြုံတွေ့ခဲ့ရသော ပတ်ဝန်းကျင်ဆိုင်ရာ အနှောင့်အယှက်များမှလွဲ၍ အဓိက ပတ်ဝန်းကျင်ဆိုင်ရာ သက်ရောက်မှုများကို မျှော်မှန်းထားရပါမည်။ စီမံကိန်း အကောင်အထည်ဖော်သူသည် ဆောက်လုပ်ဆဲကာလအတွင်း သက်ရောက်မှုများကို လျော့ကျစေရန် အကောင်းဆုံး ကြိုးစားအားထုတ်ပါမည်။ စီမံကိန်း အကောင်အထည်ဖော်သူသည် Contractor-CEMP သည် Owner-CEMP တွင် ဖော်ပြထားသည့်အတိုင်း ကနဦး စက်မှုဇုန်ပုံစံနှင့် ဆက်စပ်နေသော ဝန်ဆောင်မှုများ၊ ဆောက်လုပ်ရေး နည်းလမ်းများ၊ နှင့် အသေးစိတ်အချက်များကို လိုက်နာခြင်းဖြင့် လျော့ပါးစေရေး နည်းလမ်းများအားလုံးကို လိုက်နာဆောင်ရွက်ပါမည်။

၁.၇.၂.၂ လုပ်ငန်းလည်ပတ်ခြင်း

လုပ်ငန်းလည်ပတ်ဆဲ ကာလအတောအတွင်း စီမံကိန်းပိုင်ရှင်အဖြစ် DRCသည် စက်မှုဇုန်တစ်ခုလုံး၏ ပတ်ဝန်းကျင်ဆိုင်ရာ ဆောင်ရွက်မှုများ ဆောင်ရွက်ရမည့် ပတ်ဝန်းကျင်ဆိုင်ရာ မူဝါဒနှင့် ဥပဒေများကို အကောင်အထည်ဖော်ရပါမည်။ ထိုအချက်ကို အကောင်အထည်ဖော် ဆောင်ရွက်ရန် ဒေသပတ်ဝန်းကျင်ဆိုင်ရာ စည်းမျဉ်းစည်းကမ်းများ မရှိခြင်းမှာ အရေးအကြီးဆုံးဖြစ်ပြီး မြန်မာနိုင်ငံ ပတ်ဝန်းကျင်နှင့် ညစ်ညမ်းမှု ထိန်းချုပ်ခြင်းအတွက် အာဏာပိုင်များတွင် အပြည့်အဝ တာဝန်ရှိပါသည်။ တစ်ကြိမ် ပြဌာန်းပြီးပါက DRC သည် ထိုမူဝါဒနှင့် စည်းကမ်းများကို လိုက်နာဆောင်ရွက်ပါမည်။ သို့သော်လည်း အနာဂတ်တွင် ပတ်ဝန်းကျင်ဆိုင်ရာ ကာကွယ်ခြင်း ဥပဒေကို မြန်မာနိုင်ငံ အစိုးရအားက ကြေငြာ ထုတ်ဝေပြီး DRC သည် မူဝါဒတွင် ပြဌာန်းထားသော လိုအပ်ချက်အတိုင်း ဥပဒေကို လိုက်နာ ဆောင်ရွက်ပါမည်။

အကောင်အထည်ဖော် ဆောင်ရွက်မှုအတွက် CEMP အကျဉ်းချုပ်နှင့် သဘောတူညီမှုများ

၁.၇.၃.၁ ဆောက်လုပ်ရေးအဆင့်

DRC သည် အထက်တွင် ဖော်ပြထားသော နည်းလမ်းများအတိုင်း CC သည် လိုက်နာခြင်းရှိမရှိ စောင့်ကြည့်ခြင်းအတွက် တာဝန်ရှိပါသည်။ စောင့်ကြည့်မှုအစီအစဉ်သည်-

- CC၏ အရည်အသွေးမြင့် စက်များအားလုံးသည် အနည်းဆုံး ခြောက်လ အာမခံရှိပြီး စက်တစ်ခုခြင်းစီ၏ ထိန်းသိမ်းမှုမှတ်တမ်း စစ်ဆေးခြင်း

- ဖုန်မှုန့်လျော့နည်းစေရေး နည်းလမ်းများကို လျော့ပါးစေရေး နည်းလမ်းများအတိုင်း အကောင်အထည်ဖော်ထားမှုကို စစ်ဆေးခြင်း

– စွန့်ပစ်ပစ္စည်းများ မီးရှို့ခြင်းကို လျော့ပါးစေရေး နည်းလမ်းများအတိုင်း ဆောင်ရွက်ခြင်းကို စစ်ဆေးခြင်း

– ဖုန်မှုန့်နှင့် ဆူညံသံကြောင့် လူထုနစ်နာစေသည့် အကြောင်းအရာများကို စစ်ဆေးပြီး လျော့ပါးစေရေး နည်းလမ်းများအတိုင်း လိုက်နာဆောင်ရွက်မှု တုန့်ပြန်မှုများကို သေချာစေခြင်း

- ထပ်၍ နွေရာသီနှင့် မိုးရာသီများတွင် ခြောက်လတိုင်း စက်မှုဇုန် ဧရိယာနှင့် အနီးအနားရှိ ရွာများတွင် လေထု အရည်အသွေး နမူနာကောက်ယူခြင်းကို ဆက်လက်လုပ်ကိုင်ရန် အကြံပြုထားပါသည်။

၁.၇.၃.၂ လုပ်ငန်းလည်ပတ်ဆဲအဆင့်

လုပ်ငန်းလည်ပတ်ဆဲအဆင့်တွင် သက်ရောက်နိုင်ခြေ ခြောက်ခုရှိပါသည်။ လုပ်ငန်းလည်ပတ်ဆဲ ကာလအတွင်း ရေမျက်နှာပြင် အရေအသွေးအပေါ် သက်ရောက်နိုင်မှုများထဲမှ တစ်ခုမှာ စွန့်ပစ်ရေသန့်စင်မှုနှင့် အစိုင်အခဲအမှိုက် စွန့်ပစ်မှုများဖြစ်ပါသည်။ ညစ်ညမ်းမှုများကို လျော့ချရန် DRC သည် CCနှင့် အောက်ပါနည်းလမ်းများကို လိုက်နာရန် ကြေငြာပါမည်။ CCသည် အထက်ပါနည်းလမ်းများနှင့်အညီ ဆောင်ရွက်ထားကြောင်း DRC တွင် တာဝန်ရှိပါသည်။ စောင့်ကြည့်မှု အစီအစဉ်သည်-

- အမှိုက်စွန့်ပစ်မှု ပုံစံနှင့် တည်ဆောက်မှုကို အစိုင်အခဲ စွန့်ပစ်ပစ္စည်းစွန့်ပစ်မှု စံနှုန်း - U.S. EPA (1993) မှ ထုတ်ဝေသော နည်းပညာပိုင်းဆိုင်ရာ လက်စွဲ (သို့) အခြားသင့်တော်သော စံနှုန်း များအရ ဆောင်ရွက်ပါမည်။

- အဆိုပြု စွန့်ပစ်ဧရိယာတွင် ရေနှင့်ပတ်သက်သော အသေးစိတ်အခြေအနေကို လေ့လာသင့်ပါသည်။

- မြေအောက်ရေစောင့်ကြည့်တွင်းများ ထားရှိပါမည်။ စွန့်ပစ်ဧရိယာ အပေါ်ယံမြေသားတွင် အနည်းဆုံး တစ်တွင်း၊ မြေအောက်လွှာတွင် သုံးတွင်း ထားရှိပါမည်။ အနက်နှင့် တွင်းဆောက်လုပ်မှုသည် ရေအခြေအနေ လေ့လာမှု ရလဒ်အပေါ် အခြေခံပြီး ဆောင်ရွက်ပါမည်။

- စွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲမှု (ဥပမာ- မိလ္လာစွန့်ပစ်မှု၊ လုံခြုံစိတ်ချရသော စွန့်ပစ်မှုနှင့် မီးရှို့စက်များကို အပြည်ပြည်ဆိုင်ရာ လက်ခံထားသော စံချိန်စံညွှန်းများအရ ဒီဇိုင်းရေးဆွဲ ဆောက်လုပ်သွားပါမည်။

- ဝန်ဆောင်မှုများသည် စွန့်ပစ်ပစ္စည်း၊ ဓါတ်ခွဲခန်းစမ်းသပ်မှု၊ ယာယီသိုလှောင်မှု၊ မီးရှို့ခြင်းနှင့် စွန့်ပစ်မှု အဆင့်များကို ၄င်း၏ စံနှုန်းများအရ လည်ပတ်ပါမည်။ တတိယအဖွဲ့အစည်းမှ စစ်ဆေးရန် လိုအပ်ပါသည်။

- ပမာဏနှင့် အနံ့အသက်များကို ကာကွယ်ရန် စွန့်ပစ်မှုကို နေ့စဉ် ကန့်သတ်ထားပါမည်။

- စွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲမှု အစီအစဉ်တွင် ပါဝင်သော သတ်မှတ်ချက်များအရ အန္တရာယ်ရှိသော စွန့်ပစ်ပစ္စည်းနှင့် အန္တရာယ်မရှိသော စွန့်ပစ်ပစ္စည်းကို ခွဲခြားပါမည်။

- အလုပ်သမားများကို စွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲမှု အစီအစဉ်ကို လေ့ကျင့်ပေးထားရန် လိုအပ်ပါသည်။
- ထွက်ရှိလာသော အန္တရာယ်ရှိသော စွန့်ပစ်ပစ္စည်းနှင့် အန္တရာယ်မရှိသော စွန့်ပစ်ပစ္စည်းအားလုံးကို စွန့်ပစ်ရန် ပြောင်းရွှေ့ရပါမည်။
- စွန့်ပစ်ပစ္စည်းခွဲခြားသည့်စနစ်ကို အကောင်အထည်ဖော်ဆောင်ရွက်ရပါမည်။
- စွန့်ပစ်ပစ္စည်းများ၏ အမျိုးအစားနှင့် ၎င်း၏ စံနှုန်းများကို DRC တွင် မှတ်တမ်းတင်ထားပါမည်။
- စွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲမှု ဆောင်ရွက်ချက် (စွန့်ပစ်နေရာတွင် တည်ဆောက်ထားပါက)

သို့သော်လည်း ဤအစီရင်ခံစာအခန်း (၈) နှင့် EMP အစီရင်ခံစာထဲတွင် ဆောက်လုပ်ရေးနှင့် လည်ပတ်ဆဲအဆင့်နှစ်ခုစလုံးရှိ အဓိကသက်ရောက်နိုင်ခြေများကို လျော့ချရန် လျော့ပါးစေရေးနည်းလမ်းများကို ဆွေးနွေးတင်ပြထားပါသည်။

၁.၈ လူထုညှိနှိုင်းဆွေးနွေးခြင်းနှင့် အများပြည်သူအား ထုတ်ဖော်ခြင်း

EIA အစီရင်ခံစာ ပြင်ဆင်ချိန်အတွင်း ညှိနှိုင်းဆွေးနွေးခြင်း ရည်ရွယ်ချက်

၂၀၁၅ တွင် လူထုပါဝင်ခြင်းနှင့် ပြည်သူများချပြခြင်း၏ ရည်ရွယ်ချက်မှာ

- စီမံကိန်းအကြောင်း သက်ဆိုင်သူများကို အကြောင်းကြားရန်။
- လူထု၏ အမြင်၊ စိုးရိမ်မှုနှင့် သဘောထားများ ရရှိရန်။
- လူထုယုံကြည်မှု တိုးလာစေရန် နှင့်
- ဆုံးဖြတ်ချက် ဆောင်ရွက်ခြင်း ကိစ္စများတွင် ပွင့်လင်းမြင်သာမှုနှင့် တာဝန်ယူမှုတို့ကို တိုးမြင့်စေရန်။

၁.၈.၁ ပြည်သူလူထု တွေ့ဆုံ ဆွေးနွေးခြင်း

စီမံကိန်းသည် ပြည်သူလူထု တွေ့ဆုံဆွေးနွေးပွဲ ၃ ကြိမ်ပြုလုပ်ပြီး ပထမတစ်ကြိမ်ကို ၂၀၁၃ ခုနှစ် (နောက်ဆက်တွဲ ၉-၁ တွင်ကြည့်ပါ) တွင် ဆောင်ရွက်ခဲ့ပါသည်။ ဒုတိယတစ်ကြိမ်ကို ၂၀၁၅ ခုနှစ် မတ်လ ၂၁-၂၂ ရက်တွင် ဆောင်ရွက်ခဲ့ပြီး တတိယတစ်ကြိမ်ကို ၂၀၁၈ ခုနှစ် မတ်လ ၂၈ ရက်တွင် ဆောင်ရွက်ခဲ့ပါသည်။ ဆွေးနွေးပွဲများအားလုံးကို ထားဝယ် SEZ ရှိ သက်ရောက်ခံ ရွာများတွင် ကျင်းပခဲ့ပါသည်။

သက်ဆိုင်ရာ အာဏာပိုင်များ၊ ပညာရှင်ပုဂ္ဂိုလ်များ၊ NGOs/ CSOs များနှင့် ထားဝယ် SEZ ရှိ ဒေသခံလူများက အစည်းအဝေး တက်ရောက်ခဲ့ပါသည်။ အဓိကသက်ရောက်သော ရွာများ (မင်းတပ်၊ ပဂေါရုံ) များတွင် ကွင်းဆင်းလေ့လာ ဆောင်ရွက်ခဲ့ပါသည်။ ရှင်းလင်းတင်ပြခြင်း၊ စာရွက်စာတမ်းများနှင့် မြန်မာဘာသာဖြင့် ကွင်းဆင်းလေ့လာခြင်းများကို ဒေသခံ လူကြီးများနှင့် ပူးပေါင်း၍ REM ကုမ္ပဏီဝန်ထမ်းများက ဆောင်ရွက်ခဲ့ပါသည်။

စိုးရိမ်ပူပန်မှု၊ သဘောထားနှင့် မှတ်ချက်များသည် ဆွေးနွေးပွဲတစ်ခုနှင့်တစ်ခု ကွဲပြားပါသည်။ ၂၀၁၈ မတ်လတွင် မကြာသေးမီက စီမံကိန်းအဆိုပြုသူ၊ DSEZ စီမံခန့်ခွဲမှုကော်မတီနှင့် MONRECရှိ ECD ဌာနများဖြင့် တွေ့ဆုံ ဆွေးနွေးပွဲ ကျင်းပခဲ့ပါသည်။

အစည်းအဝေးပွဲကို တနင်္သာရီဒေသ ထားဝယ် SEZ တွင် ကျင်းပခဲ့ပါသည်။ စီမံကိန်းနှင့် သက်ဆိုင်များအစုတွင် ဒေသဆိုင်ရာ အစိုးရ၊ အစိုးရအရာရှိများ၊ ဒေသခံနှင့် NGOs များ ပါဝင်ပါသည်။ အစည်းအဝေးတွင် တင်ပြကြသော အဓိကပြဿနာများမှာ မြေယာပိုင်ဆိုင်မှု၊ အလုပ်အကိုင်အခွင့်အလမ်းနှင့် အသက်မွေးဝမ်းကျောင်း ပြန်လည်ရရှိရေးတို့ ဖြစ်ပါသည်။ စီမံကိန်း ကတိကဝတ်နှင့် ပတ်ဝန်းကျင်ဆိုင်ရာ စီမံခန့်ခွဲမှု အစီအစဉ်များနှင့် ပတ်သက်၍လည်း မေးမြန်းထားပါသည်။

ပြည်သူလူထု တွေ့ဆုံဆွေးနွေးပွဲတိုင်း၏ ရလဒ်များကို စီမံကိန်း အဆိုပြုသူက ထည့်သွင်းစဉ်းစားပြီး အလုပ်အကိုင်နှင့် သင်တန်းပေးခြင်း ကဲ့သို့ အဓိက လူမှုရေးဆိုင်ရာ သက်ရောက်မှုများ၊ အကြံပြုချက်များကို စီမံကိန်း၏ ကတိကဝတ်နှင့် EMP တွင် လူမှုရေးဆိုင်ရာ သက်ရောက်မှု လျော့ပါးစေရေးတွင် ထည့်သွင်းသွားပါမည်။ ဆောက်လုပ်ရေး ကာလအတွင်း ပြည်သူလူထု လျော့ပါးစေရေး နည်းလမ်းများ ဥပမာကို ဇယား ၁.၈-၁ တွင် ဖော်ပြထားပါသည်။

ဇယား ၁.၈-၁ ဆောက်လုပ်ရေးကာလအတွက် လျော့ပါးစေရေး နည်းလမ်းများ

လျော့ပါးစေရေးနည်းလမ်းများ	နေရာ	ကာလ	တာဝန်ရှိအဖွဲ့အစည်းများ
၁။ လုပ်ငန်းခွင်သင်တန်းများ နှင့် မြန်မာနိုင်ငံ အလုပ်သမား ဥပဒေ အတိုင်း လုပ်အားခများ ပေးချေရန်	• ဆောက်လုပ်ရေး လုပ်ငန်းခွင်အတွင်း	• လုပ်ငန်းခွင်သင်တန်	MIE
၂။ ကျေးရွာ အုပ်ချုပ်ရေးမှူးထံသို့ တည်ဆောက်မည့် အစီအစဉ်နှင့် ဆောင်ရွက်မည့် လုပ်ငန်းစဉ်	• ၂ ရွာ	• တည်ဆောက်ရေး ကာလမတိုင်မီ ၂ ပတ်အလို	MIE
၃။ ရပ်မိရပ်ဖများအနေဖြင့် ကန့်ကွက်တိုင်ကြားမှုများကို ကန့်ကွက်တိုင်ကြားရန်ဖွဲ့စည်းထားသော အဖွဲ့အစည်း (သို့) ရပ်ကွက်/ ကျေးရွာ အုပ်ချုပ်ရေးမှူးများထံ ကန့်ကွက် တိုင်ကြားနိုင်ပါသည်။	• ရပ်ကွက်/ကျေးရွာ အုပ်ချုပ်ရေးမှူး အိမ်မှတစ်ဆင့် • ကန့်ကွက်တိုင်ကြားရန် ပုံး • နှုတ်အားဖြင့် ကန့်ကွက်တိုင်	• တည်ဆောက်ရေး ကာလအပြီး	MIE

နှစ်ဦးနှစ်ဖက် ညှိနှိုင်းမှု အဆင်ပြေပါက သင့်လျော် မှန်ကန်သော ကြေငြာချက်ကို ချက်ချင်း (သို့) တစ်လအတွင်းထုတ်ပြန်ပေးရမည်။	ကြားရန် ဖွဲ့စည်းထားသော အဖွဲ့အစည်း သို့ တိုင်ကြားရန်		
၄။ ဒေသခံများအတွက် သင်တန်းနှင့် စက်ရုံကျွမ်းကျင်မှု ဆိုင်ရာ သင်တန်းပေးခြင်း	• သွားလာရခက်ခဲမှုကို ရှောင်ရှားရန်	• လုပ်ငန်းခွင်သင်တန်း	MIE
၅။ ဒေသခံများကို ဦးစားပေး အလုပ်အကိုင်ပေးရန်		• လုပ်ငန်းလည်ပတ်ဆဲ ကာလတွင်	MIE

Source: EIA Study Team

၁.၈.၂ အချက်အလက်များ ထုတ်ဖော်ပြောကြားခြင်း

မြန်းထားဝယ် စက်မှုဇုန် ဝက်ဘ်ဆိုက်တွင် စီမံကိန်းသတင်းအချက်အလက်များကို တင်ပြထားပါသည်။ ၎င်းတွင် စီမံကိန်း အဆိုပြုသူ၏ အချက်အလက်များ၊ ဝန်ဆောင်မှုနှင့် အဆောက်အဦးများ ပါဝင်ပြီး ဆက်သွယ်ရန် လိပ်စာများ ပါဝင်သော EIA/ SIA အစီရင်ခံစာများကို download ရယူနိုင်ပါသည်။

၁.၈.၃ အနာဂတ်တွင် ဆောင်ရွက်မည့် ညှိနှိုင်းဆွေးနွေးခြင်းအတွက် အကြံပြုချက်များ

လူထုညှိနှိုင်းဆွေးနွေးခြင်းမှ ရရှိသော အဓိက အကြောင်းအရာများမှာ စီမံကိန်းကြောင့် ပတ်ဝန်းကျင်ညစ်ညမ်းမှုနှင့် စီမံကိန်းအကောင်အထည်ဖော်ပြီးနောက် အသက်ရှင်နေထိုင်မှုပုံစံတို့ ပါဝင်ပါသည်။ ပတ်ဝန်းကျင်ညစ်ညမ်းမှုတွင် စီမံကိန်းသည် လက်ရှိ သူတို့အသုံးပြုနေသော ရေအရင်းအမြစ်များကို အသုံးမပြုနိုင်လောက်အောင် ညစ်ညမ်းစေမည်ဟု ဒေသခံများက စိုးရိမ်လျက်ရှိပါသည်။ ထို့ပြင် စီမံကိန်းအကောင်အထည်ပေါ်ပါက ၎င်းတို့၏ အလုပ်အကိုင်များအတွက် စိုးရိမ်ကြပါသည်။ ထို့ကြောင့် ဒေသခံများကို စက်ရုံကဏ္ဍတွင် အလုပ်လုပ်နိုင်စေရန် သင်တန်းအစီအစဉ်များ လိုအပ်ပါသည်။ စီမံကိန်းအချိန်ဇယားနှင့် စီမံကိန်း ဖော်ပြချက်များကို ဒေသခံများ သိရှိရန် လိုအပ်ပါသည်။ ထို့ကြောင့် သတင်းအချက်အလက်များသည် အချိန်နှင့်အညီ ပြောင်းလဲနေသောကြောင့် ဒေသခံများသည် သူတို့၏ အနာဂတ်အတွက် မသေချာမရေရာမှုများ ခံစားနေရပါသည်။ လူထုညှိနှိုင်းဆွေးနွေးပွဲမှ အဓိကအကြံပြုချက်များမှာ စီမံကိန်းအချိန်ဇယားကို ဒေသခံများအားအသိပေးရန်၊ သက်ရောက်မှုများနှင့် ကနဦးမြို့မှ သက်ရောက်မှုများကို လျော့ချရန် လျော့ပါးစေရေးနည်းလမ်းများ၊ ဒေသခံများအား သင့်တော်သော သင်တန်းများ ပေးရန်တို့ ဖြစ်ပါသည်။

၁.၉ ပြန်လည်နေရာချထားမှုနှင့် လျော်ကြေး

စီမံကိန်းဧရိယာအများစုသည် အစိုးရပိုင် ဆီအုန်းစိုက်ခင်းများ ဖြစ်ပါသည်။ မြေယာပိုင်ဆိုင်မှုအတွက် ဆောင်ရွက်ရန် မလိုအပ်ပါ။ ထို့ကြောင့် ပြန်လည်နေရာချထားမှုနှင့် လျော်ကြေးအစီအစဉ်များ မလိုအပ်ပါ။

CHAPTER 1

EXECUTIVE SUMMARY

1.1 CONTEXT OF THE PROJECT

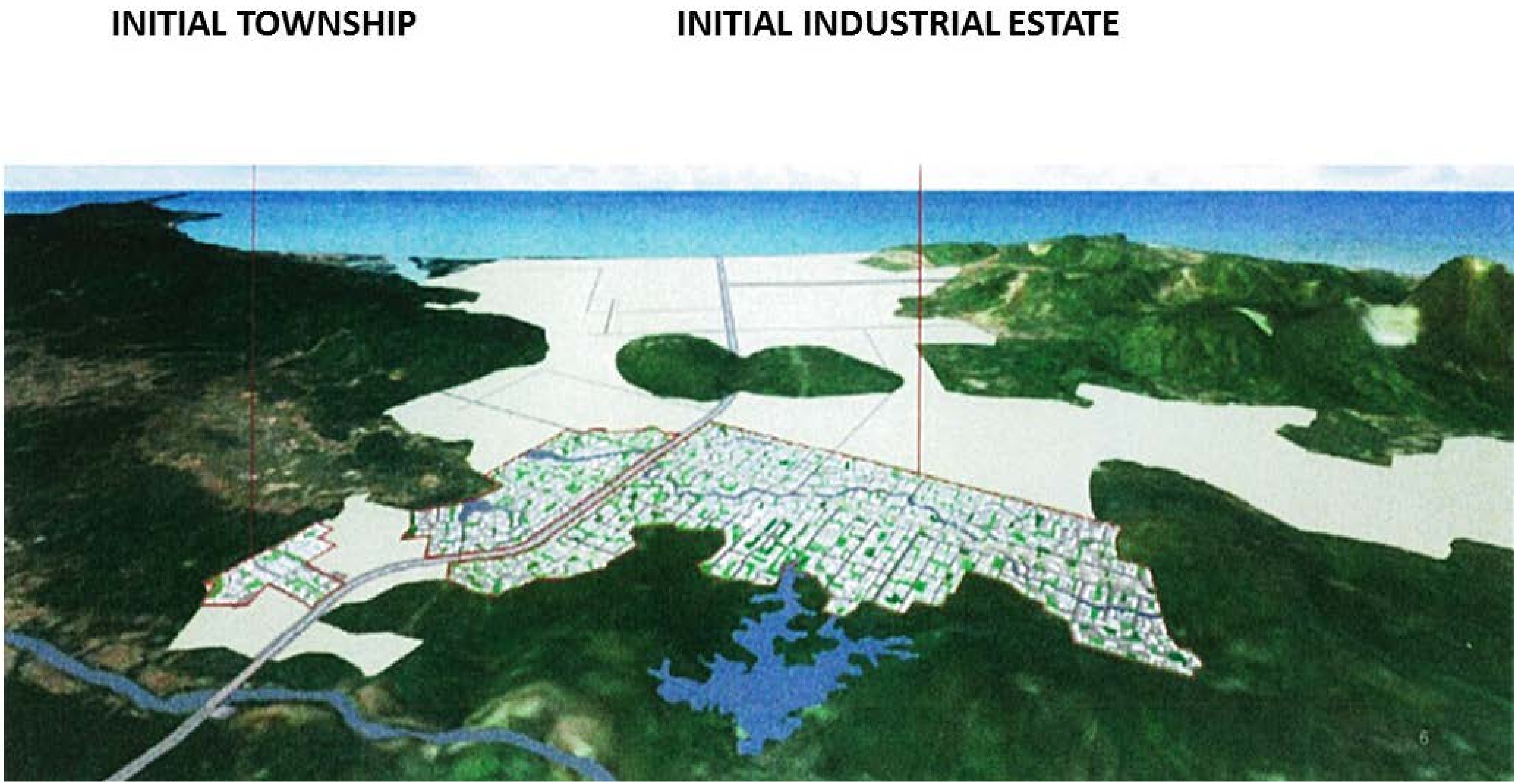
1.1.1 Propose of the Study

Objective of the Environmental and Social Impact Assessment (EIA) is to assess the environmental and social impacts caused by development of the "*Initial Township*" (hereinafter referred to as "*the Project*") in Dawei Special Economic Zone by Dawei Residence Company Limited (DRC) and consider the Environmental Management Plan (EMP) including mitigation measures to reduce and minimize the negative impacts caused by the Project.

Approximately, 1.365 square kilometers in DSEZ (Figure 1.1-1) will be developed a quality residence (Figure 1.1-2) with a range of commercial facilities and recreations that will raise living standard of workers both Myanmar citizen and foreigners who will live and work in in DSEZ. The Project is designed for maximum capacity of 135,080 peoples for the initial phase and will be able to expand up to 5.58 square kilometer or 370,116 peoples in the final phase. These will be achieved through construction and operation of the following components:

- Multi-stories Apartments
- Retails Shops
- Commercial venue
- Facilities Center
- Fire prevention and emergency response system
- Communication system
- Security system
- Transportation hub and
- Recreation.

According to the Environmental Conservation Law (2013) and the Environmental Impact Assessment Procedure (No.616/2015) issued by the Ministry of Natural Resource and Environmental Conservation (MONREC), the EIA study is required for the Project as "*Tourism and Hospitality Development*". To implement the legal compliance, DRC delegates United Analyst and Engineering Consultant Co., Ltd. (UAE) in conducting the EIA for the Project. In this report, UAE is referred to "*The EIA Study Team*".



Source: DRC (2015)

Figure 1.1-1 Project location in Dawei SEZ

Source: DRC (2015)

Figure 1.1-2 Project Overview

1.1.2 Related Projects

The DSEZ project had been developing since 2010, started from the framework agreement of deep sea port and industrial estate. In late 2015, the Initial Phase of DSEZ was concreted with the recent features, more substantial and attractive for foreign investors. The recent projects (Figure 1.1-2) were emerged with the following components:

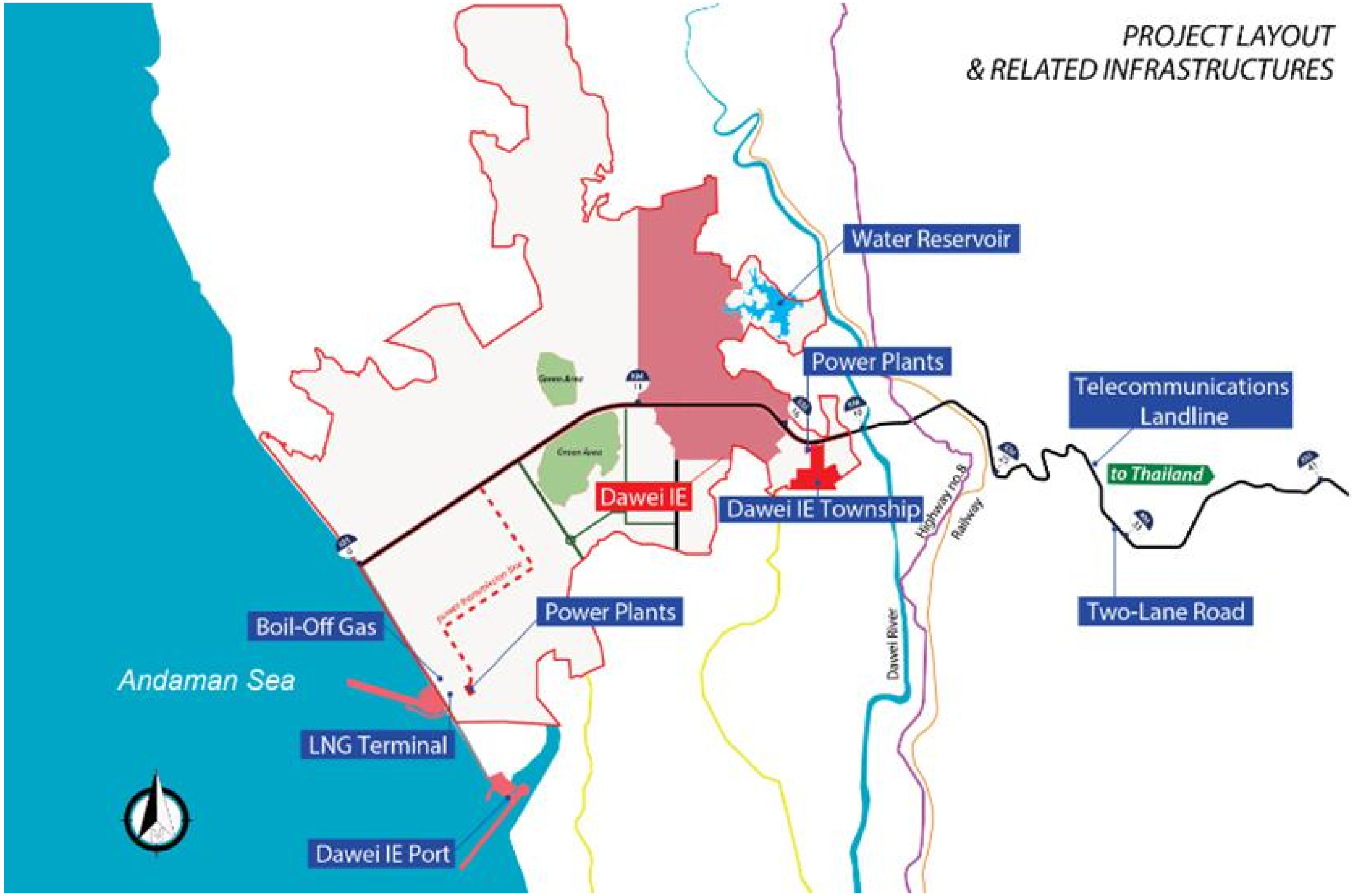
- Road linked to Thailand
- Ports and LNG terminal
- Initial power plants
- Reservoir and weir
- Initial Industrial Estate
- Telecommunication lines

Two-lane road is a key connection between the DSEZ and Thailand, and the other regions in South East Asia. The road is a major linked land transport from coast of The Andaman Sea through the Gulf of Thailand and The South China Sea. The project is 138 kilometers in length starting from Km.18+500 main road in DSEZ crossing through Thai-Myanmar border and finishing at Hti Hkee. The road linked to Thailand at Ban Phu Nam Ron district in Kanchanabuiri. Most of sections are in Myanmar and only 5 kilometers of section 3 is in Thailand. Once, the road operates, toll pass, tax and custom will be applied.

Dawei port consisting of 100-m long jetty berth for multi-purpose vessels (Approx. 400 TEU or 13,000 DWT) with estimated capacity of 330,000 ton per year has been recently completed. In order to enlarge the port capability, this commercial berth is planned to improve for Panamax vessel, 60,000 DWT with approximate capability of 14 million ton per year. The berth is now under construction and planned to operate in 2020. LNG terminals located in vicinity of Dawei port will supply economical and clean energy for the region. Total capacity of the LNG terminals are 6 million ton per year and majority of this gas will supply gas fire power plants. A 450 MW Power plant is major electricity supply for Dawei SEZ industries e.g. Initial Industrial Estate, Township and Heavy Petrochemical industry. The power plant features conclude switch yards, emergency diesel generators, diesel loading storage tanks and 115-kV transmission lines.

Pa Yain Byu Reservoir and Ta Laing Gya Weir are main water supply serving as water consumption for early industries construction and Initial Industrial uses. The reservoir has 7.14 square kilometers of catchment with maximum capacity of 8.54 million cubic meter. Centralized conventional water treatment plant located in vicinity of the reservoir has capacity of 36,000 m^3 consumable per day. Landline and high-speed internet with speed up to 10 Gbps including the basic telephone (IP Phone), CCTV, Virtual Private Network (VPN), video conference, etc; Mobile Services is to be provided by the existing operators of the country.

Initial Industrial Estate is manufacturing and factories area opening for investment. It is developing by phase, starting from zone A, B, C and D respectively or upon demand of the market. The industrial estate will consist of facilities i.e. central wastewater treatment system, solid waste management system, flood controlling system etc.



Source: DRC (2015)

Figure 1.1-3 Related projects in Dawei SEZ

1.2 ENVIRONMENTAL AND SOCIAL CONSIDERATIONS

Environmental legislation is superior key in operation and management of the project. Therein, the principle for environmental management are formulated based on consideration of related national Policies, Laws and Regulations. Most of the legislation listed here are recent and still implement in the Union while some Acts are enacted since the union was under administration of the British India. The considerations in this chapter will be deliberately implemented and mandated through various stages of the Project development, from pre-construction, construction, operation and decommissioning.

1.2.1 Myanmar Regulatory Framework

1.2.1.1 Institutional Setting of National Level

Myanmar has 21 ministries under the Office of the president as of May 2017. The leading ministries in-charge for environmental and social considerations are the Environmental Conservation Department of the Ministry of Natural Resources and Environmental Conservation (MONREC), is derived from the Ministry of Environmental Conservation and Forestry (MONREC).

1.2.1.2 Legislation Related to Environmental Social and Health Considerations

The fundamental laws and regulations related to the environmental social and health considerations are show in Table 1.2-1 and Table 1.2-2. Also, major international agreement and treaties that Myanmar government has ratified are show in Table 1.2-3.

Table 1.2-1 Legislation Related to Environmental Social Considerations in the Project

No.	Laws and Regulations as of May 2017
Environmental Framework	
1	The National Environmental Policy (1994)
2	The Environmental Conservation Law (2012)
3	The Environmental Conservation Rule (2014)
EIA / Environmental Standards	
4	Environmental Impact Assessment Procedure (2015)
5	National Environmental Quality (Emission) Guidelines (2015)
Natural Resources and Utilization	
6	The Land Acquisition Act (1894)
7	The Embankment Act (1909)
8	The Farmland Law (2012)
9	The Farmland Rules (2012)
10	The Vacant, Fallow and Virgin Lands Management Law (2012)
11	The Vacant, Fallow and Virgin Lands Management Rules (2012)
12	The Forest Policy (1995)
13	The Forest Law (1992)
14	The Protection of Wildlife and Wild Plants and Conservation of Natural Areas Law (1994)
15	The Conservation of Water Resources and Rivers Law (2006)
16	The Conservation of Water Resources and Rivers Rules (2013)
17	The Territorial Sea and Maritime Zone Law (1977)

Table 1.2-1 Legislation Related to Environmental Social Considerations in the Project

No.	Laws and Regulations as of May 2017
Waste Management	
18	The Underground Water Act (1930)
19	The Water Power Act (1927)
20	The City of Rangoon Municipal Act (1922)
21	The City of Rangoon Development (1922)
22	The Development Committee (1993)
Social and Cultural	
24	The Protection and Preservation of Cultural Heritage Regions Law (1998)
25	The Protection and Preservation of Ancient Monuments Law (2015)
26	The Protection and Preservation of Antique Objects Law (2015)
27	The Rights of National Races Law (2015)
Public Health and Safety	
28	The Public Health Law (1972)
29	The National Health Policy (1993)
30	The Prevention and Control of Communicable Diseases Law (1995)
31	The Control of Smoking and Consumption of Tobacco Product Law (2006)
32	The National Drug Law (1992)
33	The National Food Law (1997)
34	The Motor Vehicles Law (2015)
35	The Motor Vehicles Rules (1987)
36	The Myanmar Fire Brigades Law (2015)
Employment and Working Environment	
37	The Factory Act (1951)
38	The Worker's Compensation Act (1923)
39	The Payment of Wages Act (2016)
40	The Employment and Skill Development Law (2013)
41	The Minimum Wage Law / Rules (2013)
42	The Leave and Holiday Act (1951, partially revised in 2014)
43	The Labor Organization Law (2011)
44	The Labor Organization Rule (2012)
45	The Labor Dispute Settlement Law (2012)
46	The Social Security Law (2012)
47	The Shops and Establishment Act (1951)
Industrial Law	
48	The Marine Fisheries Law (1990)
49	The Freshwater Fisheries Law (1991)
51	The Petroleum Act (1934)
52	The Petroleum Rules (1937)
54	The Myanmar Investment Law (2016)
55	The Foreign Investment Law (2012)
56	The Myanmar Citizen Investment Law (2013)
57	The Myanmar Insurance Law (1993)
59	The Essential Supplies and Services Law (2015)
60	The Law on Standardization (2014)
61	The Electricity Law (2014)

Table 1.2-1 Legislation Related to Environmental Social Considerations in the Project

No.	Laws and Regulations as of May 2017
63	The Myanmar Engineering Council Law (2013)
64	The Export and Import Law (2012)
65	The Myanmar Port Authority Law (2015)
Special Economic Zone Law	
66	The Myanmar Special Economic Zone Law (2014)
67	The Myanmar Special Economic Zone Rule (2015)
68	Dawei Special Economic Zone Law (2012) 2011

Table 1.2-2 Legislation Related to Environmental and Social Considerations in Myanmar

No.	Notifications as of May 2017
1	Notification No. 1/2013 and No.50/2014: Economic activities which require environmental impact assessment by Myanmar Investment Commission
2	Notification No. 81/2014: For the issuance of permit on the application to invest in the Dawei Special Economic Zone by Ministry of National Planning and Economic Development
3	The Business for Ozone Depleting Substances: Notification No. 37/2014
No.	**Codes of Practice as of May 2017**
1	The Myanmar National Building Code, Part 1, 2 and 5 (2012)

Source: EIA Study Team

Table 1.2-3 Ratified Major International Agreements related to Environmental Social Considerations.

No.	International Agreements and Treaties	Date Ratified
1	Basel Convention (1989)	2015
2	Ramsar Convention (1971)	2005
3	Stockholm Convention on Persistent Organic Pollutants (2001)	2004
4	Convention on International Trade in Endangered Species of Wild Fauna and Flora (1979)	1997
5	United Nations Framework Convention on Climate Change (1992)	1994
6	Convention on Biological Diversity (1992)	1994
7	Montreal Protocol on Substances that Deplete the Ozone Layer (1989)	1993
8	London Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer (1990)	1993

Source: EIA Study Team

1.2.2 Guidelines and Standards

The Myanmar National Environmental Quality (Emissions) Guidelines was enacted in 2015. This emission (or discharge) guideline applied for air and water quality, noise and vibration is core standard for target values or tentative values in this study. Where some parameters i.e. NO_2, CO or ambient water quality are absence from the Myanmar NEQG, the strictest standard among Japan, Indonesia, Thailand and Vietnam will be adopted. IFC EHS Guidelines is applied for Social and Health standard containing water quality and availability, structural and infrastructure, life and fire and traffic safety.

1.2.3 Corporate Environmental and Social Policies

The Project proponent will formulate a corporate environmental and social management policy to guide its environmental and social management during the construction phase and the operation phase of the Project. In this regard, the project Proponent will manage environmental aspects of the Project in accordance with the ISO 14001 Environmental Management System. Consequently, the Project Proponent will establish an Environmental Management System (EMS) for the project and will operate the EMS to meet the requirement of ISO14001. The EHS Management will be activated starting from the commencement date of the construction.

1.2.4 MONREC's Comments on Scoping and Draft Report

The draft report was last commented by the MONREC on 17th July 2017. The Environmental Conservation Department (ECD) suggested to revise and re-consider various sections i.e. resettlement plan and compensation, emergency response plan to natural disaster, environmental, health and safety plan and legal commitments, training and CSR program. The comments were summarized in *Section 2.6*.

1.3 PRESENTATION OF THE PROJECT

1.3.1 Project Location

The Project is located in Dawei province (Tavoy) in the Tanintaryi region and in Dawei Special Economic Zone, which is bounded by the Andaman Sea in the west and the Dawei River in the east. The Project is approximately 30 kilometers north of the Dawei airport and the Dawei city center. The Project can be accessed by the Yangon-Mandalay highway and then the highway no. 8 from the north.

1.3.2 Project Development

Development of the Initial Township will be by phases. To begin with phase 9+1 and then phase A, B, C and D will be developed, respectively. Development plan is presented in Table 1.3-1.

1.3.2.1 9 plus 1 Phase

Development of the Initial Township will begin with phase 9 plus 1. Nine buildings of Workforce apartment and one Service apartment will be built at this stage. Basic need infrastructure e.g. Township main road, water and power supply will also be constructed. Location of phase 9 plus 1 is in Figure 1.3-1.

Table 1.3-1 Project Development Phasing

Year	Phase	Construction Plan					
		5-Floor Workforce Apartment (700 Pers./Bldg.)	Capacity (Pers.)	8-Floor Serviced Apartment (222Pers./Bldg.)	Capacity (Pers.)	3-Floor Retail Shops (120 Pers./Bldg.)	Capacity (Pers.)
Year 1	Start Construction 9+1	9	6,300	1	167	0	0
Year 3	A	26	18,200	Upon Market Demand Maximum 20 buildings		Upon Market Demand Maximum 62 buildings	
Year 5		23	16,100				
Year 6	B	23	16,100				
Year 7		23	16,100				
Year 8	C	23	16,100				
Year 9		23	16,100				
Year 10	D	17	11,900				
SUM		**167**	**116,900**	**20**	**4,440**	**62**	**7,440**

Source: DRC (2015)

Source: DRC (2017)

Figure 1.3-1 Location of Phase 9 Plus 1 (in square) and the other phases.

1.3.2.2 Other Phases

Initial Township will be entitled with residential buildings, infrastructure and facilities in full phase. Infrastructure are Road Network, water and power supply and Flood Protection System. Facilities are recreation; public area and green area, commercial venue, transportation hub, fire station and police station. These facilities will be developed by phases in accordance with the mentioned plan until completion. Supporting facilities are such as health center or hospital and school will be built at the time that adequate number of population has been reached.

1.3.3 Project Time Schedule

The Project schedule begins with period of the EIA. The Project has 50 years of the concession agreement for the entire project. Construction of Phase 9+1 will start around 2017 or as soon as the EIA approval. Phase A is planning to start in year 3 (See in Table 1.3-1). However, extension of the other phases will depend on market demand. Operation of the Phase 9+1 will probably start in 2020. Decommissioning will take a few years before the concession agreement is end.

1.3.4 Project Components

The Project constitutes residence, commercial venue, facility center and infrastructure. These features has been designed to serve up to 135,080 people and they are as follow:

1.3.4.1 Land and Landscape

Initial Township has been designed base on it nature and primitive topography with the aimed concept that topography will be minimal altered and sustain with the environmental setting of the township. In this study, topographic analysis and land grading technique are integrated in layout of the township, to resolve a number and type of buildings in accordance with life style of residents and the buildings concepts as shown in Figure 1.3-2.

Source: DRC (2017)

Figure 1.3-2 Topography Analysis

(a) *Zoning and Grid Network*

The township will consist of three main areas, residential, commercial, recreational and green area. To harmonize these areas together with life style of the communities, road connection and grid network have been designed, not only to accommodate the residents in relation to their environment but also energy efficiency as shown in Figure 1.3-4. Commercial and retails areas will be located in between the apartments to reduce separation and enhance relationship between the residents as shown in Figure 1.3-3.

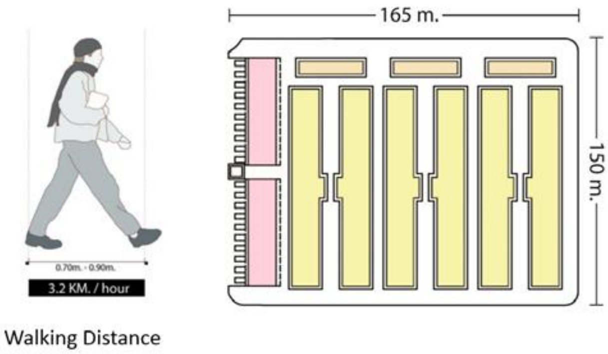
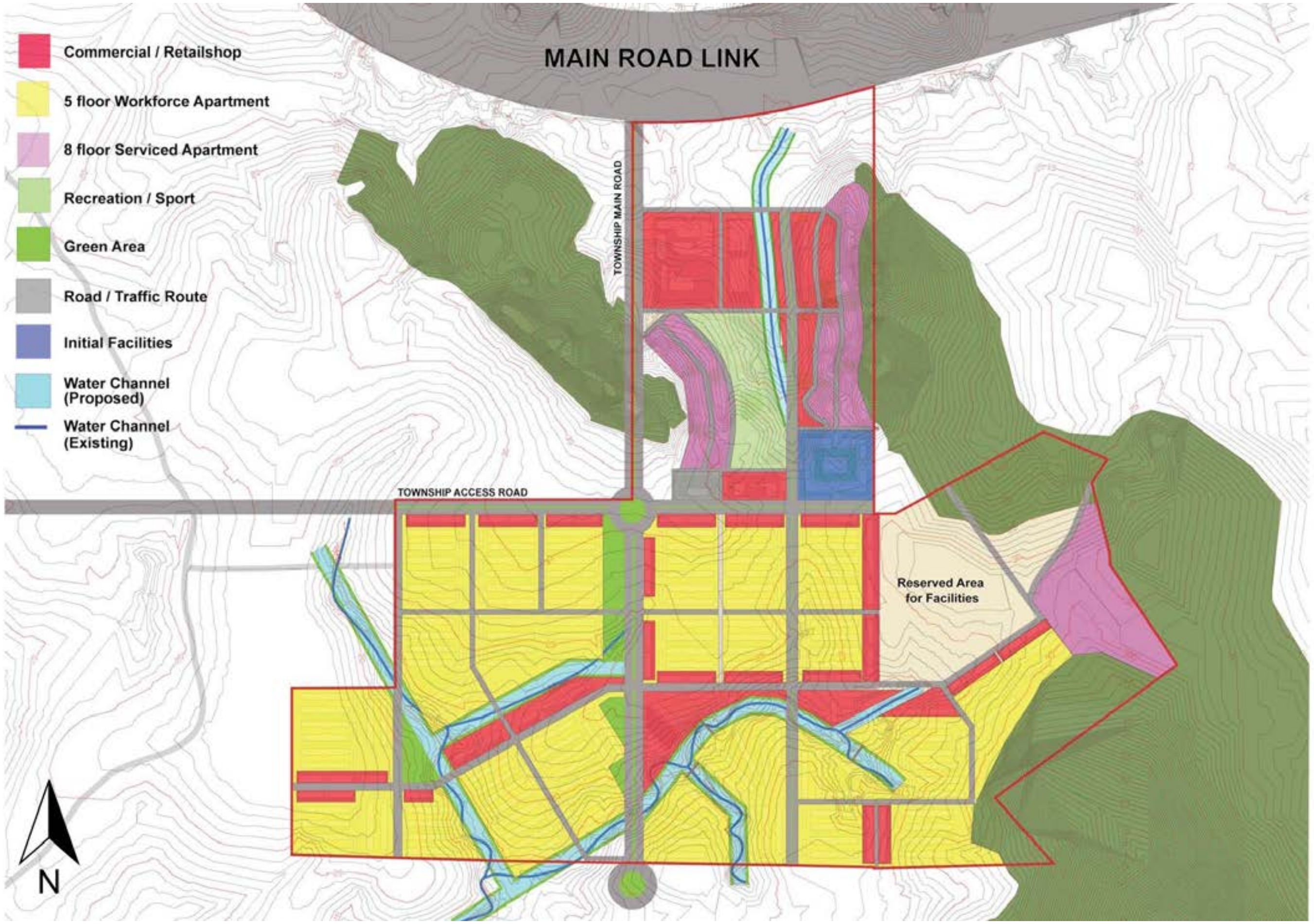


Figure 1.3-3 Typical Block Concept

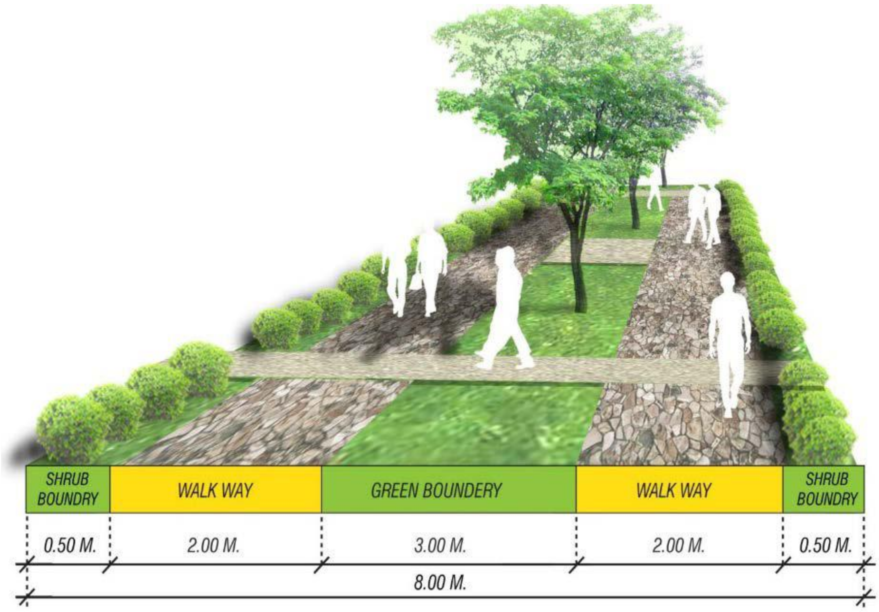


Source: DRC (2015)

Figure 1.3-4 Zoning of Initial Township

(b) ***Recreational and Green Areas***

In order to provide sustainable community lifestyle for the residents, various types and scales of public parks are employed to create continuous green area all over the town. The smallest scale of recreational areas will start from the space between 2 buildings and continue the connection into scale of blocks, districts and town as shown in Figure 1.3-5.



Source: DRC (2017)

Figure 1.3-5 Walk ways and Green Boundaries

Total green area is about 0.7 square kilometers. Green areas will be developed by phases per extension units of the Project, to support increasing of population in each area such as outdoor, indoor, jogging areas, sport and picnic.

Source: DRC (2017)

Figure 1.3-6 Development of Park and Recreational Areas.

(c) ***Public Areas***

Public areas are parking, areas between building (both front and back) and common cafeteria. Every 3-floor retail shops have their own parking port in the front. Motorcycles parking ports are shared and in between the blocks as shown in Figure 1.3-6.

1.3.4.2 Residential Buildings

Residential buildings are 5-floor workforce apartments, 8-floor serviced apartments (Managerial Class) and 3-floor retail shops at international living standard for its residents.

(a) ***5-floor apartment***

The 5-floor apartment is an accommodation design for workforce. The main propose is for labor or employee who will regularly work in the plants or factories in the Initial Industrial Estate. The room is typical shared accommodation with bathroom, lavatory, laundry, kitchen and common area etc. Inside a room is approximately 20 square meter and consists of 4 beds (Figure 1.3-7).

(b) ***8-floor apartment***

The 8-floor apartment is an accommodation designed for executive who also work in the plants or factories of the Initial Industrial Estate or in DSEZ vicinity. The room is typical private accommodation or "*Condominium*" style. The apartment consists of approximately 100 units. The 1-bed room units ranging from 34 to 54.5 square meters and there are three different types of the room, Studio, Deluxe type 1 and Deluxe type 2 (Figure 1.3-8 and Figure 1.3-9).

(c) ***3-floor retails shop***

The 3-floor apartment or 3-storey retail shop is a combined feature of building for commercial and residence. First floor is designed for commercial purpose as retails and the 2nd and the 3rd floor may be used for residence of the other business purposes. Up to 4 meters wide and over 10 meter in length of useful space for each floor with parking area in the front (Figure 1.3-10).

1.3.4.3 Commercial Buildings

Commercial areas consist of shops and restaurants. The venue is designed for commercial purpose including public area e.g. canteen for public activities. Pavement in this area will be ground blocks for multi-purpose in case emergency (Figure 1.3-11).

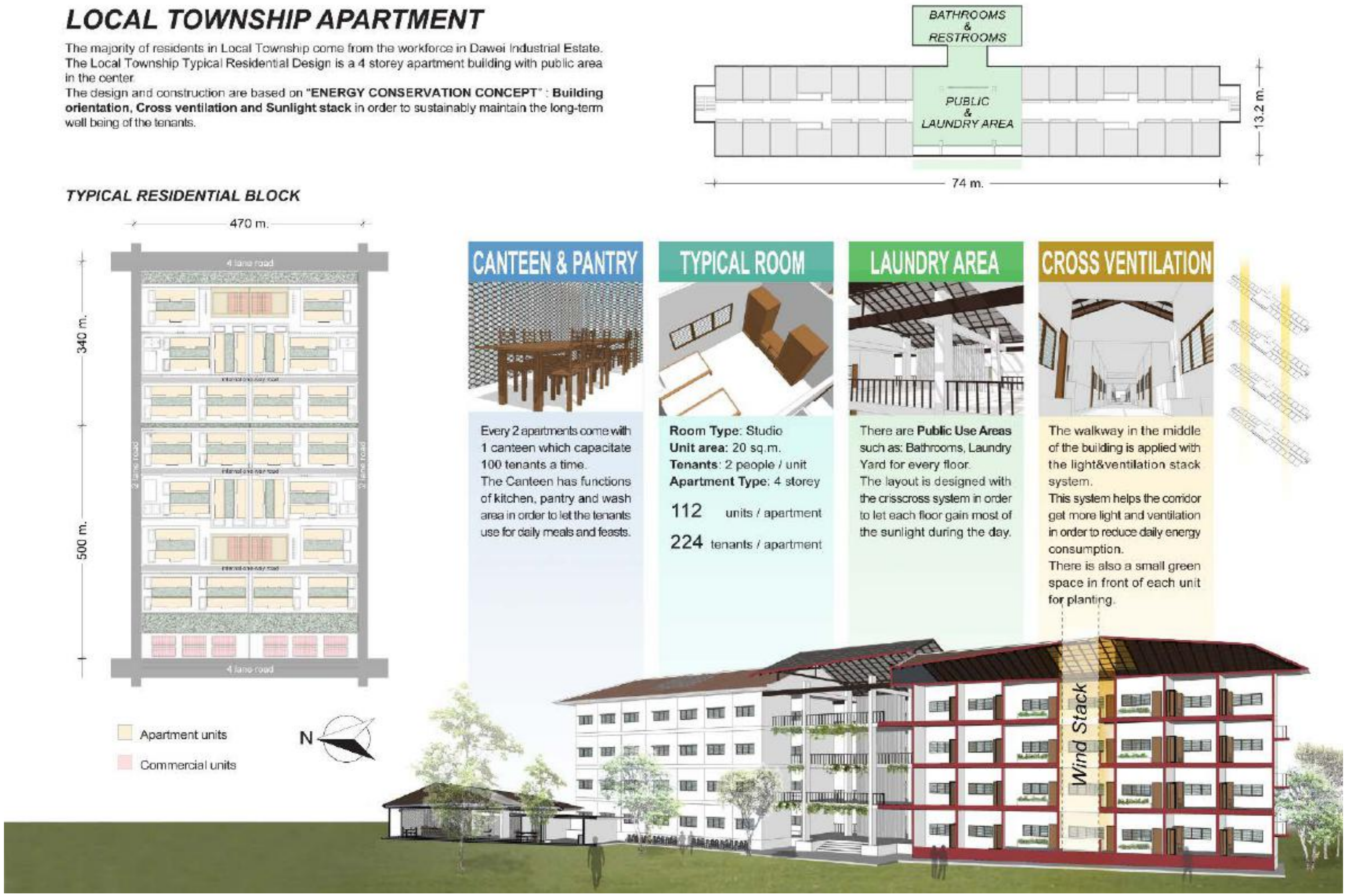


Figure 1.3-7 Features of 5-floor workforce apartment

STUDIO TYPE
area 34 sq.m.
(79 unit/building)

DELUXE TYPE 1
area 49 sq.m.
(16 unit/building)

DELUXE TYPE 2
area 54.5 sq.m.
(16 unit/building)

Source: DRC (2017)

Figure 1.3-8 Floor plans for different types of room in the 8-Floor Service Apartment

Source: DRC (2017)

Figure 1.3-9 Conceptual design of the deluxe type 1 in the 8-Floor Service Apartment

Source: DRC (2017)

Figure 1.3-10 Design of 3-Floor Retails Shop

Source: DRC (2017)

Figure 1.3-11 Conceptual design of Commercial Area

Table 1.3-2 Design and ratio of accommodation space

Land and Surrounding areas in Percentage						
Function	3 FL. Retail Shops		5 FL. Workforce Apartment		8 FL. Serviced Apartment	
	Land Area (1 Building and Surrounding)	%	Land Area (1 Building and Surrounding)	%	Land Area (1 Building and Surrounding)	%
Building (Footing)	652.00	27.6	1,796.00	55.0	1,530.00	29.1
Road	426.27	18.0	366.54	11.2	928.69	17.7
Parking Lot	228.75	9.7	196.70	6.0	498.38	9.5
Landscape						
- Hard scape	426.01	18.0	366.32	11.2	928.13	17.6
- Soft scape	631.01	26.7	542.60	16.6	1,374.75	26.1
Total	**2,364.04**	**100.0**	**3,268.16**	**100.0**	**5,259.94**	**100.0**

Land and Surrounding areas in Ratio								
Building Type	Land Area (sq.m.)	Building Area (sq.m.)	Footing Area (sq.m.)	Road /Traffic (sq.m.)	Parking Lot (sq.m.)	Non-Building Space (sq.m.)	FAR/1	OSR/2	BCR/3
3 Fl. Retail Shops	2,364	2,400	652	426	229	1,057	1.02	44.04	27.58
5 Fl. Local Apartment	3,268	5,810	1,796	367	197	909	1.78	15.64	54.95
8 Fl. Serviced Apartment	5,260	6,137	918	929	498	2,915	1.17	47.50	17.45

Remark /1 FAR = Floor Area Ratio
/2 OSR = Open Space Ratio
/3 BCR = Building Coverage Ratio

Source: DRC (2017)

1.3.4.4 Facilities Center

(a) *Hospital*

Location of the hospital or health center will be in public facility area (See Figure 1.3-12). The hospital will be 60 beds covering 25 Rai or 40,000 square meter and can serve up to 50,000-100,000 people within 15 kilometers. The hospital will be designed in accordance with international standard and built, once population of the Township has reached certain number. Initially, the Township residents will rely on the Dawei Hospital (local hospital).

(b) *Police Station*

Location of police station will be in public facility area. The police station can service over 5,000 to 10,000 Rai in radius of 15 kilometers.

(c) *School*

Location of school will be in public facility area. The school type, primary school, secondary school and high school will rely on size of population in demands. The school is expect to have 600 to 1,000 students and to service in 1.5 kilometers in radius.

(d) *Fire Station*

Location of fire station will be in public facility area. Fire station will includes with fire equipment, fire trucks, fire apparatus including fire brigade staff. Detail of fire station is in *Section 4.1.14*, Fire and Emergency Response System.

(e) *Telecommunication Center*

Location of telecommunication center will be in public facility area. The center will cover only 0.5 Rai in service.

(f) *Transportation Hub*

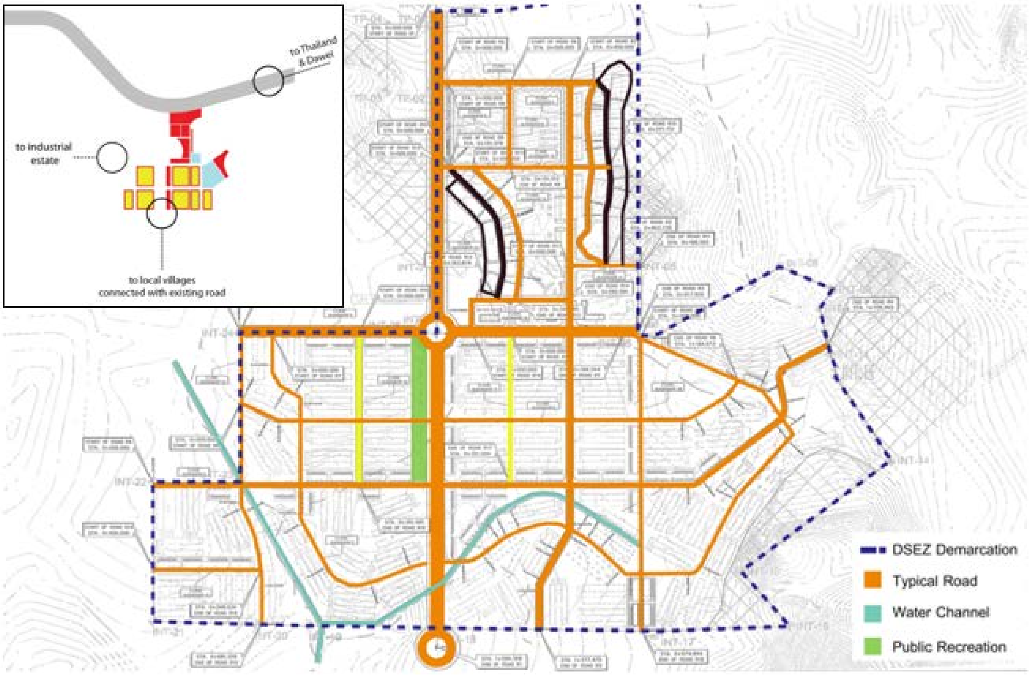
Location of transportation Hub will be in residence area in between service apartment zone 1 and workforce apartment zone 1. It will cover 16,000 square meters.

1.3.4.5 Road Network

Due to shape of the Project land, is fan-shape, grid system is applied to the Project with multiple accesses, to facilitate residents and prevention of traffic congestion. Grid system is also applied in areas of workforce apartment that are equally divided into blocks and size of these blocks are all in walking distance, to ensure that residents can get off the bus and continue walking to their accommodation. For gated type of community such as serviced apartments, there will be only one or two accesses. This is due to increasing level of privacy and safety. Road and grid network are 3 types as follows;

- Tertiary road is 2-lane,
- Secondary road is 4-lane,
- Main road is 6-lane.

Typical cross-sections of the secondary and tertiary roads are shown in Figure 1.3-12



Source: DRC (2015)

Figure 1.3-12 Road and Grid Network within Initial Township

1.3.4.6 Flood Control and Drainage System

The Initial Township is situated in upstream area of the Kun Chuang River, which is in sub-basin of the Dawei basin. The Project is not in the area of seasonal flooding but downstream area of the Kun Chuang River is. From a field investigation revealed that flood marks in 2006 was up to 13 meters above Chart Datum (CD).

Owning to area of the Project is situated in quite altitude. Only retention ponds are designed to hold a certain volume of water from rain in case of periodically flood. One retention pond is for area north in the initial township and the others, two retention ponds are designed for the full phase. Volume of each retention ponds is presented in Table 1.3-3.

Table 1.3-3 Design of Retention Ponds in Township

DESIGN RETENTION POND			
duration	6 HR	Rainfall collection	46.45 mm

Zone	Area of Zone	Volum for Retention pond
	m^2	m^3
Retention pond TW 1	381,437.960	12,720
Retention pond TW 2	582,473.227	19,590
Retention pond TW 3	639,139.803	21,310

Source: SEATEC (2012)

Design of the retention ponds is based on retaining time (Tc). The retention ponds are designed for holding rainwater for 6 hours. Rainfall intensity and the return period of flooding can be determined by the IDF curve. Maximum rainfall collected within 6 hours in the 50 years cycle of the returning period is 46.5 mm.

1.3.4.7 Power and Electricity Distribution System

The electricity demand for 8-floor serviced apartment and 5-floor workforce apartments is 9,036 and 37,800 VA respectively.

1.3.4.8 Water Treatment and Distribution System

Raw water source for Initial Township is from the small reservoir, Pa Yain Byu. The reservoir is established to supply water to both Initial Township and the initial Industrial Estate. Amount of water supply is estimated and predicted to be sufficient enough and stable for future consumption, with maximum capacity of 8.54 million cubic meters. Details of the Pa Yain Byu is in Annex 4-2.

The raw water will be treated at water treatment plant which is located near the reservoir and is a part of Initial Industrial Estate facility. Treated water will be distributed via the steel pipeline underneath the access road to the distribution station in Zone A2 of the Initial Industrial Estate and then distributed along the main road until at km. 17 and km 18, it is diverted to the Initial Township as shown in Figure 4.1 36.

Alternatively, groundwater resource may be used; however, groundwater quality are quite not good in its quality. Analysis from the existing wells, groundwater are slightly brackish and water is quite acidic. Most of wells have pH ranging between 4.7 and 6.2 and some wells have cadmium and zinc over the standard. Use of groundwater as raw water may be needed extra treatment from routine surface water treatment.

1.3.4.9 Wastewater Treatment System

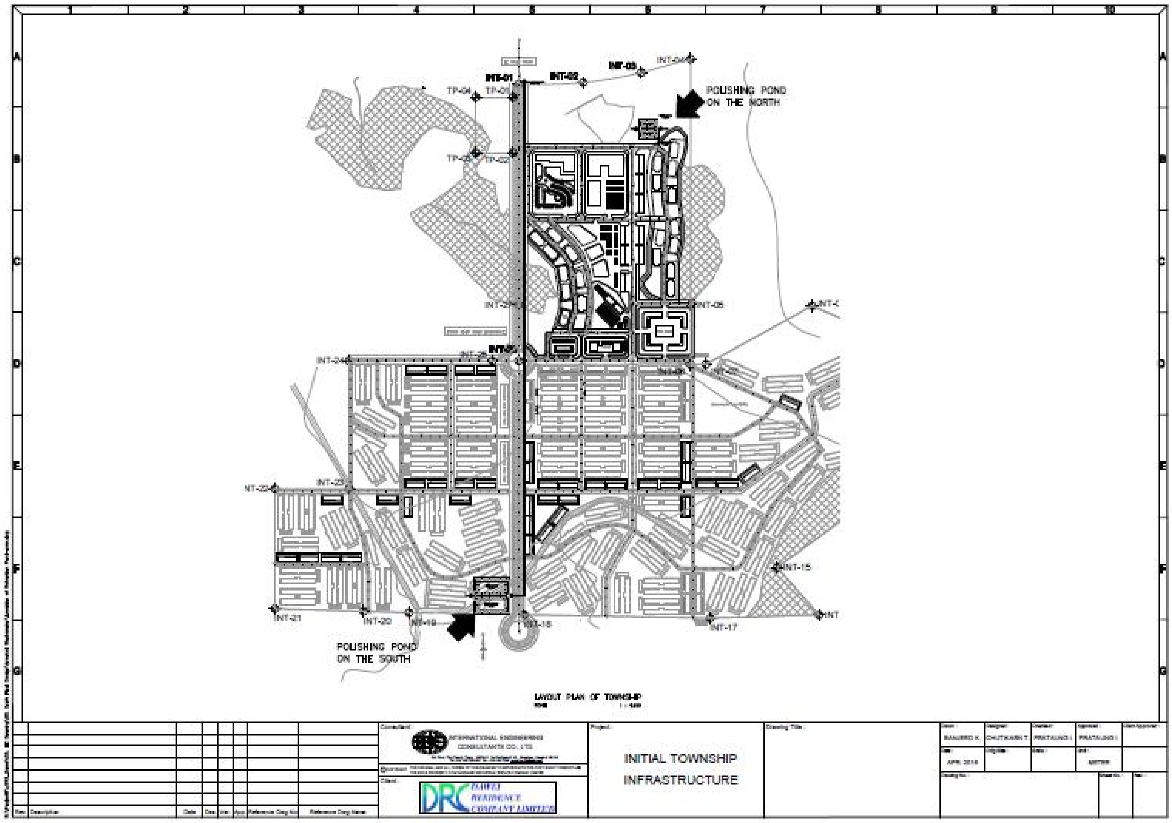
Septic tank (Onsite Treatment Unit) with the capacity of 90 m^3/d is prepared to treat wastewater from 5-floor workforce apartment and the capacity of 54 m^3/d is prepared to treat

wastewater from 8-floor serviced apartment. Location of Wastewater Treatment Plant is presented in Figure 1.3-13. Wastewater from the septic tanks will then be treated in polishing ponds before draining to public wastewater drainage. Effluent from polishing ponds in initial phase (area for North WWTP) will be discharged into Dawei River.

The wastewater in the polishing pond will be aerated to achieve the standard guideline for effluent at 20 mg/L of the BOD. In case emergency, all the polishing ponds can hold the wastewater for 12 hours. In full phase of development of the Township, wastewater from southern area (Figure 4.1 37) will be treated and then discharged in Kun Chuang River with the required effluent level of BOD 20 mg/L.

1.3.4.10 Solid Waste Management System

Waste generated from Project's activities, workers and sub-contractors will be managed according to the Dawei Waste Management Plan in Annex 4-3 which is the standard of municipal and industrial waste management, and concordance with the Pollution Control and Cleaning Department (PCCD) waste management policy and procedures.



Source: DRC (2015)

Figure 1.3-13 Location of Wastewater Treatment System of the Township

The Project will implement mitigation measures that will conserve energy and the efficient uses about waste management in sequences such as Remove source, Reduce at source, Reuse, Recycle, Recover, Treat and Disposal. Besides, waste will be segregated or separated according to their characteristics. Basically, there are non-hazardous waste and hazardous waste, details are in Chapter 4, Solid Waste Management System and summarized below:

(a) ***Segregation and/or separation***

All types of waste needs to be segregated/separated at source before disposal (Figure 1.3-15). The Project will provide segregation bins in color according to their characteristics (Figure 1.3-14)

Source: EIA Study Team

Figure 1.3-14 Segregating or Separating color bins for waste

Non-hazardous waste and recycling

Are aluminum can, plastic bottles and paper etc. will be initially stored in the labeled yellow bins and will then be collected and managed further for recycling. Duration of the storage will be around a week.

Non-hazardous waste and non-recycling

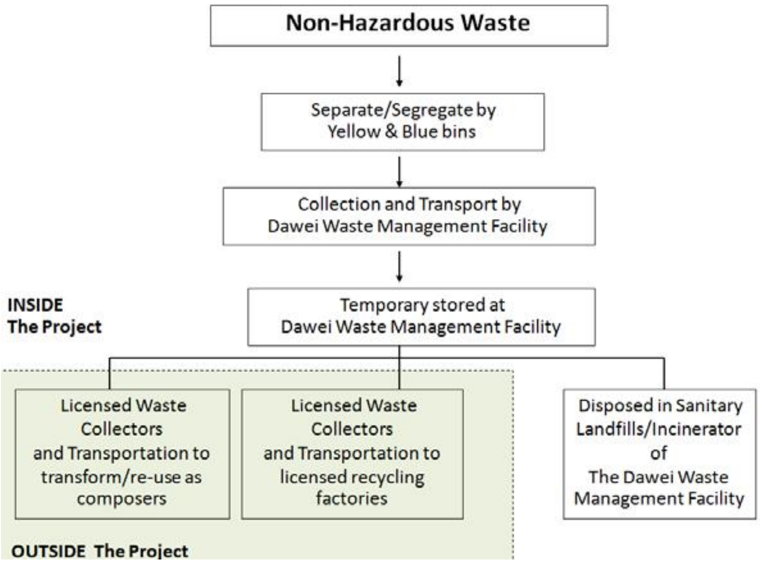
Are such as food waste or plastic for food containers. The waste will be stored in the labeled blue bins before further management such as transformed the waste into compose or disposal. The waste will be collected daily and will be delivered to the Waste Management System (see details in Chapter 4) by licensed third party or Dawei Waste Management Center for disposal or transformation to the other materials.

Hazardous waste

Will be initially stored in red containers. Hazardous waste will be collected on bi-weekly basis and delivered to the Dawei Waste Management Facility. Handling of hazardous waste will require manifest and will be managed by licensed third party or the Dawei Waste Management Center itself.

(b) Waste storage

The waste will be stored in 200 liters of drums/ or appropriate containers according their hazardous characteristics at the center facility. Storage of hazardous waste will be complied by the relevant laws. Basically, the waste will be stored under confined and roof buildings that lay on concrete floor, which having good sum pit to collect wastewater, and in good ventilated condition. The waste will be stored no more than 6 months before treatment and/or disposal in the hazardous waste landfills or incinerator of the Dawei Waste Management Facility.

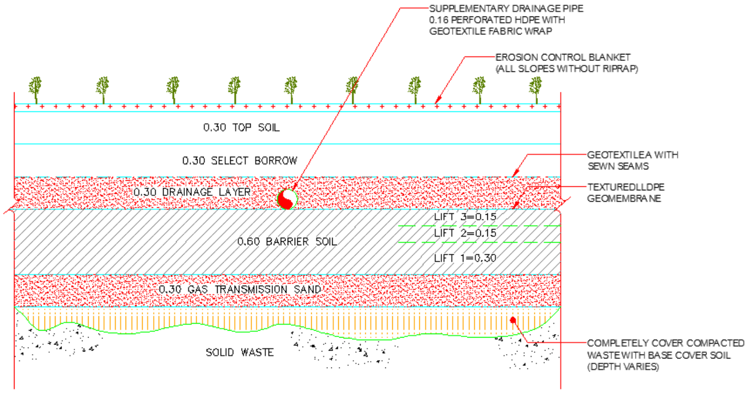


Source: EIA Study Team

Figure 1.3-15 Management of Non-Hazardous Waste generated in the Project

(b) *Disposal Facilities*

Solid waste management facilities are located in Zone A1 of the Initial Industrial Estate. The Project has undertaken the feasibility study of waste management e.g. landfills capacity in such long-term up to 50 years of the Project development. The research reveals that disposal in landfills will enable up to only 14-15 years due to space limitation of the Project disposal system. The total number of the landfills is only 10 and they will serve both from industry and township. Waste management and design of the disposal facilities are presented in Annex 4-2. The details include i.e. analysis of type and source of waste, rate of generation both township and Township, landfills capacity and their life span, landfill liners (Figure 4.1-44), waste transportation, landfill gases and management system and leachate generation and management system.



Source: IEC (2016)

Figure 1.3-16 Final cover for non-hazardous waste and hazardous waste landfills

Infectious waste generated from hospital and health care facility in the Initial Township supposes to managed and dispose within the township by incinerator; however, upon demand of health care service, the infectious waste will be disposed at the Dawei hospital or alternatively in Yangon dumping sites, initially. Transportation of the infectious waste will require manifest as regular. Rate of infectious waste generation from the township is shown in Table 4.1-11 in Chapter 4.

1.3.4.11 Fire Prevention System

The Project has designed fire prevention system in accord with Myanmar laws and regulation in Section 3.2.3.4 (f) and Annex 4-4), Thai Building Control Act, 1979 and NFPA standard. The Fire Prevention System for the apartments including 5-floor workforce apartments and 8-floor service apartments constitutes of components as follow:

(a) Fire Alarm System

Fire Alarm System constitutes of 7 components; Alarm Control Panel, Graphic Annunciator, Fire Alarm Manual Station, Fire Phone Jack, Fire Alarm Speaker with Strobe Light, Fixed Temperature Heat Detector and Smoke Detector.

(b) *Lightning Protection System*

The system is convention that consists of lighting arrester rod, conductor, downward conductor and ground pike lung. The downward conductor is made of copper and charges distributor for electrical constant. The Project will install Lighting Arrester System and ground spike system on ground floor of each buildings and lightning rod on roof of each building.

(c) *Fire Fighting System*

The Project has planned to establish Fire Fighting System (FFS) that enables to cope with fire incidents and emergency for a level. The Project has itself FFS such as installation of FFS for each residential buildings and supporting firefighting facilities from nearby towns in case severe fire.

<u>Residential Buildings Fire Fighting System</u>

Fire Fighting System constitutes of 6 components, Standing Pipe System, Fire Hose Cabinet, Fire Department Connection, Fire Extinguisher, Fire Exit, Fire Escape Sign and Emergency Light and Fire Escape Route Map and Extinguisher Location.

<u>Township Fire Station</u>

The Project has a plan to establish the fire station, which will be a share facility between the Initial Industrial Estate and the Project. Also, the Project plans to form reserve fire brigade team in accordance with the said law that is not only to operate and manage the fire station/fire work, but also to co-ordinate with the Fire Service Department and relevant agencies in preparation for fire incidents i.e standardized fire apparatus (See Annex 4-4: Guideline of Fire Training and Equipment) and training program for involving brigades and staff and residents. Location of the Fire Station will be in public facility of the initial township, as shown in Figure 1.3-17.

Source: DRC (2017)

Figure 1.3-17 Illustration of Fire Station

Number of fire trucks, pumper trucks, fire equipment are planned to develop in concordance with phases of the Township and number of population growth in the initial township (Table 4.1 14, Chapter 4). These amounts of the Project's resource is evaluated to be sufficient in controlling Tier 1 level of emergency (Controllable case with in the plant or the factory) and Tier 2 level of emergency (Controllable within the Township). However if a severe emergency occurs (Tier 3 level), which is unable to control by the Project resource and potentially extend and impact beyond the Project area (See Section 4.1.10.1), the Project will need support from local facilities or agencies, such as Fire Station and Fire Brigade team from the nearest town such as Yebyu Fire station.

Supporting Fire Stations

Yebyu Fire Station is located in the Yebyu Township, approximately 6 km from the Project. It is linked with the Township by good roads. The Yebyu Fire Station consists of medium fire brigade team (7 fireman) on shift 7/24 and 4 Fire trucks, 1 Fire tank truck, 1 Fire tank tractor, as show in Figure 4.1 48 to Figure 4.1 51. The Fire tanks can supply 30 liters per second and the tank trucks contains approximately 4,000 liters and the tank tractors contains 1,000 liters.

(d) ***Assembly points***

The Project will provide enough assembly points to check number of residents before remove them out of the Township to safety areas. Ratio of the assembly point area must not be less than 0.25 sq. meter.

1.3.5 Emergency Response Plans

According IFC EHS Guidelines standard for community health and safety, the Project Proponent has prepared the Emergency Response Plans (ERPs) for cases of fires hazards both anthropogenic and fire vegetation or bush fire, natural disasters; earthquakes, tsunamis, flooding and landslides. As promulgated in the related laws and regulations, each plants / factories including the Project Proponent must form the reserve fire brigade team (Emergency Response Team) in order to manage emergency and co-ordinate in with several parties including preparation of fire apparatus and emergency equipment. Financial supporting for impacted communities during emergency is planned. Details in CSR of the Project.

1.3.5.1 Emergency Level

General emergency response plan of the Dawei Initial Industrial Estate can be categorized into 3 levels; Tier 1, Tier 2 and Tier 3 levels.

- Tier 1 level is a small scale of emergency that will occur in limited in area of residential or commercial buildings and incident can be controlled by supporting facility and team of the factory or the plant itself. The plants/factories have to perform the best in order to control and mitigate the impact. The incidents must be reported to the Initial Industrial Estate Emergency Response Center/Team.
- Tier 2 level is a medium scale of emergency that likely to extend to the other residential buildings in the Initial Township. However, the emergency trends to be controllable by supporting facility or facility of the Initial Township itself or nearby township facilities. The Initial Township commit to perform the best in order to control and mitigate the impact. The incidents must also be reported to executive of the Initial Industrial Estate or PIC for this level.
- Tier 3 level is a large-scale of emergency that likely to extend to the nearby community and surrounding environment. There need outsource supporting facilities and cooperation of nearby agencies in order to control and mitigate the impact. The incidents must also be reported to the Village or Township Administration or in charged Myanmar Departments.

1.3.5.2 Fire and Explosive Plan

Firefighting / Explosive plan consists of 3 stages; prevention, evacuation and recovery plans. Establishment of the buildings must comply code of practices which define in Myanmar legislation i.e. Building Codes and/or Notifications. The Initial Township shall have annual fire rehearsal, fire prevention system as defined in the said laws. In case emergency, fire and explosive plan must be proceeded accordingly level of the fire emergency.

1.3.5.3 Strom and Flooding Plan

Strom and Flooding plan consists of 3 stages; prevention, warning and evacuation and recovery plans. Drainage and flood retention system shall be prepared before storms and rainy season. In addition, follow up the meteoric condition and emergency announcement during flooding or rainy period shall be on action.

1.3.6 Occupational Health and Safety Administration

The Project has formulated Safety Health Environment Master Plan in order to manage the Project, effectively under standards i.e. ISO14001, ISO9001 and OHSA 18001. The safety plans are Permit to Work System (PTW), Personnel Protective Equipment (PPE), land transportation system, safety system during construction, preventive maintenance including health policy and measures; annual health checkup, drug check, smoking area, standard working condition and food. Standard for environment and waste management e.g. 3 Rs, waste separation and chemical handling. Details of the SHE master plan achievement in period of 10 years is in Annex 4-4.

1.3.7 Project Activities

1.3.7.1 Construction Phase

(a) ***Construction of Infrastructure***

Preparation of the Initial Township area and infrastructure involves large quantity of earth moving and clearing of existing vegetation in the area. All the existing vegetation in the township area, except those within the green areas, will be cleared. Construction of utility systems and infrastructure is another major activity for the development of Initial Township. The construction will include necessary earthwork, concrete work, commissioning, and procurement of necessary equipment and machines for the following infrastructure and utility systems.

(b) ***Construction Work Camp and Workshop***

A main construction work camp which is used for accommodation of workers involved in the construction of Initial Township, is located at KM18 south of the main road. The accommodation is expected to support a maximum of 371 workers employed by Italian-Thai Development PLC., the main construction contractor of Initial Township. Area of 256,000 square meters is also used for facilities supporting the construction activities. In order to respond massive demand for housing, some precast raw materials, which are steel, cement and architectural materials (doors and windows), will be transported from Thailand by barges and trucks. The other construction raw materials e.g. sand and graded rocks will be supplied from local quarry in vicinity of the DSEZ.

(c) ***Transportation of Construction Materials***

Construction materials will be supplied from Thailand and will be transported through Myanmar-Thailand border at Kanchanaburi Province. The Main Road inside the township area will be improved and widened to accommodate the transportation of materials and machineries, which will be done mainly by dump trucks and trailers.

(d) ***Sanitation of Campsite***

Workers camp shall be constructed in accordance with Standard of the Engineering Institute of Thailand. Sanitary management for worker camp shall be in accordance with Standard and Layout for Temporary Construction Worker Camp issued by the Engineering Institute of Thailand Under H.M. the King's Patronage (Wor Sor Tor. 1010-34 Standard).

1.3.7.2 Operation Phase

Operation of the Project will be by phases as described in Section 4.1.1.4. Activities during operation phases are following

(a) *Residential Activities*

As the Project will develop by phase, many activities related to living and playing in Township residential area will begin in small area of zone 9 plus 1 including public and green area within this zone. Afterwards, the residential activities will expand up to size of population that will move in to reside in the Township by phases; A, B, C and D, respectively.

(b) *Commercial Activities*

Commercial activities may start when some retail shops start operating their businesses. This is including establishment and operation of the commercial venue in commercial area that will start when suitable time arrive.

(c) *Traffic and Transportation*

Major transportation during operation will relate to routine travelling from residents' accommodation to their workplace e.g. the Initial Industrial Estate, plants and factories in DSEZ etc. Transportation of residents may be via private motor vehicles e.g. cars and motorcycles. Alternatively, public cars or buses may operate between Township and some spots in DSEZ including inside the Township and the Township and nearby towns.

Once commercial in Township expands, transportation of goods will start. Initially, traffic may not too congest due to design of road network system are still enough for loads of vehicles. However, due to construction of the other zone of Township will be developed in parallel of the operation, transportation of construction materials and equipment will share in some routes in Township.

(d) *Flood Protection*

The Project has designed Flood Protection System that can prevent the Project from flooding approximately for 6 hours (See details in Section 4.1.4). Rain water will be collected through drainages and canals underneath the Township. Operation of the system consisting of pumps and salute gates to hold and drain flooded water into Dawei River for the northern retention pond and into Kun Chung River for the southeast retention ponds.

(e) *Solid Waste*

As the population in the beginning phase is still small; thus, small volume of waste will be generated. The waste will be managed accordingly procedure described in Section 4.1.8.1 by the Initial Township staff and facilities. The non-hazardous waste will be collected, stored, delivered and disposed at the nearest disposal site and standard facility in Dawei. Hazardous waste and infectious waste will be stored in 200 drums or appropriate containers and will be transported to Yangon for suitable disposal at this stage.

Once the Waste Management System of Dawei Initial Industrial Estate starts operating, the waste will be disposed in these facilities according to procedure prescribed in Section 4.1.8 and Annex 4-3.

(f) *Wastewater Management*

Wastewater is preliminary treated by Onsite Treatment Units, which are installed in every buildings before draining to the Project wastewater treatment facility, resting ponds. The ponds will be operated when BOD of wastewater is excess 20 mg/L, over the effluent standard by NEQG (see Section 4.1.7). Pumps shall always be ready on duty and spare pumps shall be prepared for emergency and maintenance. Wastewater from northern resting ponds will be discharged into the Dawei River and wastewater from southern resting ponds will be discharged into the Kun Chuang River.

(g) *Fire Prevention and Emergency*

The Project will have an annual rehearsal of Fire Evacuation and Emergency for residents and related staff. This is an active safety, practicing activity for fire and emergency cases according to procedure prescribed in Section 4.1.10, Fire and Emergency Prevention Plan, which includes prevention, roles and responsibility of each parties and persons during the incidents, recovery and inspection.

(h) *Employment*

The Project will start employ local staff e.g. electricians, plumbers, gardeners and cleaners etc. for buildings and green areas management and operation and maintenance of the Township. Employment standard will follow the prescribed law and regulation in Section 3.2.3.3 of the said laws and standard of Occupational Health and Safety Administration in Annex 4-4.

1.3.8 Description of Project Alternatives

1.3.8.1 The Project Site Selection

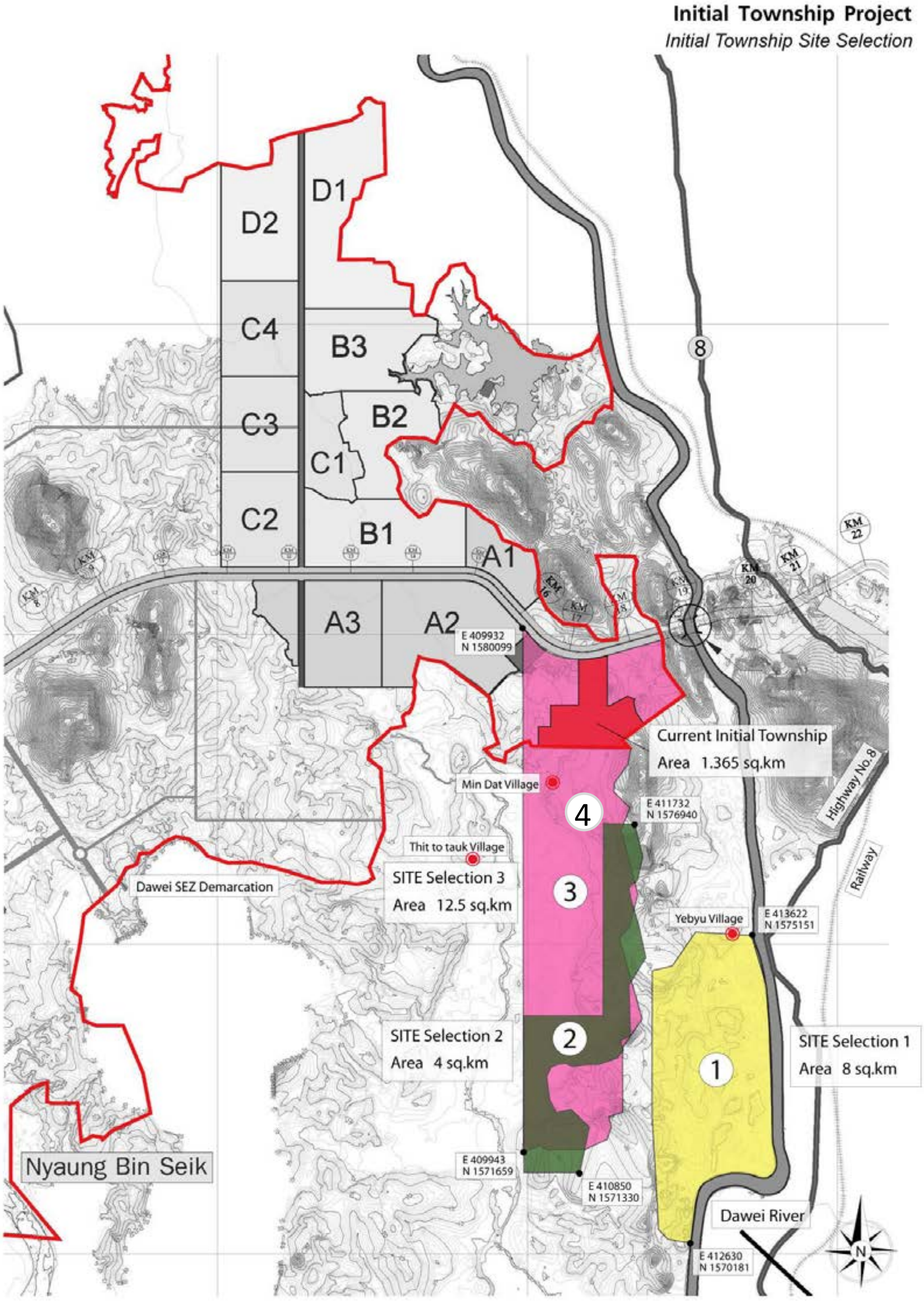
Four sites in DSEZ were selected for the Project alternatives.

(a) *Site No.1*

Total area of 8 square kilometers is flat and has two hill ranges surrounded along Dawei river. The site is potentially developed a nice-river side town and recreational park communities. However, three existing villages, Yebyu, Kyuak Htuak and Sin Pu Nit Villages will have to be relocated before the development including sub-sequential impact on the existing cultural and religious places on the hill. Nevertheless, the site is regularly flooded by Dawei River, up to 10 meters of the present level (From the Interviews, 2015). Lastly, to construct the Township, the site need to be upgraded for a distance of the accessed road, from the Main Road of DSEZ. The site can possible cost for transportation and life style and traffic congestion can possibly a problem.

(b) *Site No.2*

The total of 4 square kilometers has similar features as the previous site no. 1 but it does only have a distance from the Dawei river. Thus, the site will have lower impact from flooding.



Source: DRC (2015)

Figure 1.3-18 Site section and Alternatives

(c) *Site No.3*

The total of 12.5 square kilometers has similar feature as the previous site no. 2.The site is al bounded by three hills, KaNyin Gauk, Tha Pye Zun and Ga Nan Taung and the demarcation line of the Dawei Industrial Estate in the south. The site is potentially developed as a nice mountainous community. However has one existing village, Min Dat village.

(d) *Site No.4*

The total of 1.365 square kilometers with maximum expansion up to 5.58 square kilometers is located in high terrain of the Dawei River. The site is bounded by the hill next to Dawei river in the northeast and agriculture area in the south. The site is connected to the Main Road of the DSEZ. The site has fan-shaped which can be design into multiple accesses in reducing traffic congestion at one access. The four alternatives had been evaluated by associated feasibility, several points of consideration and criteria by ITD; for example, impact on social and economy from relocation of villages and cultural places, location and accessibility, size and shape of the prospected Township, topography and aesthetic landform, flooding risk, incentive for land selling, transportation and traffic congestion, construction cost for infrastructure and obstacles for the development. Considering all of the above criteria, alternative No.4 has many advantages in size and shape area, location as accessibility, less impacts on cultural, social and economic impacts and construction cost than the others. Therefore, site no. 4 is selected as the most appropriate location of the Initial Township.

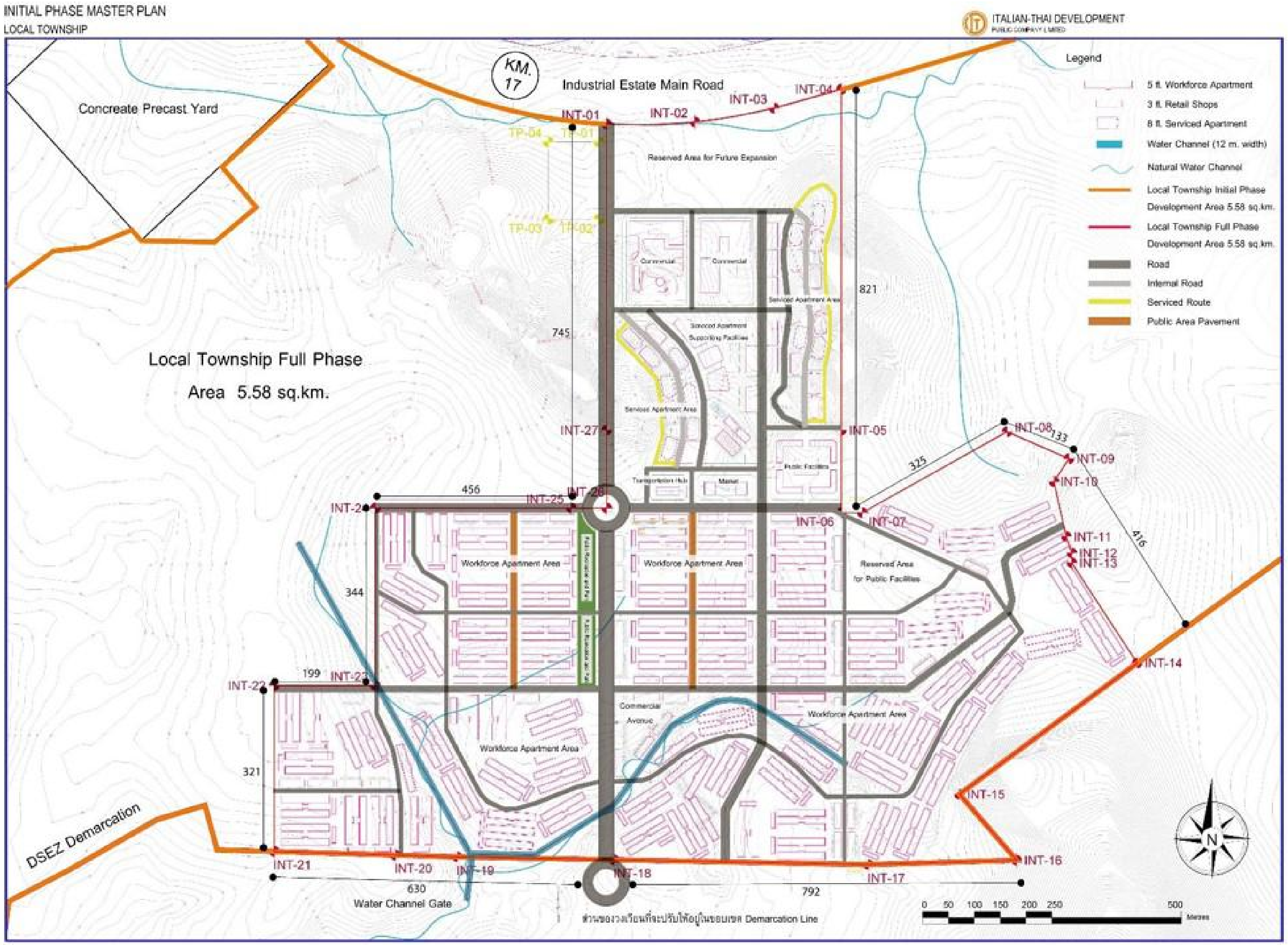
1.3.8.2 The Project Final Layout (Master Plan)

Upon selection of the appropriate site provides master plan of the township for the Site No.4 (Figure 1.3-19). The estimated project area in full phase of 5.58 square kilometers and area of the initial township is 1.365 square kilometers (Table 1.3-4). The original master plan was revised to the recent development and fitting in the recent concept of the Project with further designs in details on infrastructure and utility. The Final master plan is presented in Figure 1.3 3. The selected site and the final master plan was the one selected for the assessment of potential impacts in this EIA report.

Table 1.3-4 Features of the Township final master plan.

Description	Updated Master Plan Area (km^2)
Commercial / Retail Shop	47,234 sq.m (0.047 sq.km)
5-floor Workforce Apartment	284,175 sq.m (0.284 sq.km)
8-floor Serviced Apartment	67,500 sq.m (0.068 sq.km)
3-floor Retail Shops	103,275 sq.m (0.103 sq.km)
Recreation / Sport	36,354 sq.m (0.036 sq.km)
Green Area	557,121 sq.m (0.557 sq.km)
Road / Traffic Route	222,885 sq.m (0.223 sq.km)
Initial Facilities	46,546 sq.m (0.047 sq.km)
Total	1,365,000 sq.m (1.365 sq.km)

Source: DRC (2015)



Source: DRC (2015)

Figure 0-19 Project Layout and Final Master Plan

1.4 DESCRIPTION OF THE ENVIRONMENT

1.4.1 SETTING AND STUDY LIMITS

1.4.1.1 Geographical Study Limit

The geographical study limits is defined as an area surrounding the project site from which the baseline information collection should be collected. In this Scoping Study, the geographical study limit is about 5 km extending from the center of the project site. This geographical study limit covers 78.57 km^2 of circular area around the project site as shown in a map in Figure 1.4 1.

1.4.1.2 Contextual Study Limit

The EIA guideline defines the contextual study limit to consist of four groups of components: (i) physical components; (ii) biological components; (iii) socio-economic components; (iv) cultural components.

1.4.2 PHYSICAL COMPONENTS

1.4.2.1 Topography

The project area is comprised almost entirely of flat plains. There are 4 rivers running from the North to the South of the project area. The 4 rivers are: Nabule River; Dawei River; Kunchaung River; and Pan Din In Chaung River.

1.4.2.2 Geology

The project area is located in Q2-alluvial (Holocene), with reference to the Geological map of the Socialist Republic of the Union of Burma (USACE, 1977). There is fine to coarse gravel and sand, silt, and light-to medium-gray and yellowish-gray clay.

1.4.2.3 Seismology

The project area located in Zone I (Zone of minor damage). A range of ground acceleration less than 0.075 g.

1.4.2.4 Tsunamis

There was no observed major shoreline damage along the Dawei coast in terms of large areas of sediment loss or accretion.

1.4.2.5 Hydrology

There are four main rivers near and within the project area Dawei River, Nabule River , Kunchaung River and Pan Din In Chaung River.

1.4.2.6 Air Quality

There are 4 stations (near project area) for air quality measurement from the previous studies:

- The concentration of TSP and PM_{10} average 24 hours were quite high, especially during the dry season.
- The concentration of SO_2, NO_2 and CO were within the World Bank Group, U.S.EPA and WHO standards.
- The THC, MHC and NMHC were measured in preparation of baseline data, even though there were no standards given.

1.4.2.7 Noise and Vibration

The L_{Aeq} 24 hours and L_{Amax} data, both dry and wet seasons, are within the U.S.EPA.and Thai standards; The results of vibration found that the Peak Particle Velocity did not affect any building more than 2.0 mm/s.

1.4.2.8 Groundwater Quality

Sampling on 2 and 14 March 2015 in 2 sampling stations near project area.All complied with standard excepting lead. Lead is one of the elements in nature. It can be found in water as well as in soil, rock.

1.4.2.9 Surface water quality

Sampling on February 2015 in 5 sampling stations near project area (3 stations in water resources near the project area and 2 stations in Dawei River). Most of parameters complied with the proposed surface water standard. At SW1 in Ekani River that be located in the north part of the project has 5.8 mg/l of DO, low quantity of solids, 0.0002 mg/l of total mercury. While water sample at SW2 in Yalai Chuang creek, that be located in the south part of the project, found that yellow color and clear in physical characteristic, chemical characteristic analysis results are 4.2 mg/l of DO and low BOD and COD. In Dawei River, had high DO concentration (nearly 6 mg/l) and suspended solids ranged in 1,417 – 1,836 mg/l. whereas coliform bacteria and E. coli were found in both samples.

1.4.2.10 Sediment quality

Most of parameters complied with the proposed surface water sediment standard; excepting mercury in every sampling station. Sediments of SW1 and SW2 were mostly sand (54.9 and 44%, respectively) and some heavy metals quantity were found. For SW3 station, the sediment was mostly clay (58.39%) and high concentration of mercury and iron (0.719 and 26,078 mg/kg, respectively). Physical characteristics of sediments in Dawei River from SW4 and SW5 indicated that the sediments of both stations were mostly clay (47 and 63.7%, respectively). Noted that most of heavy metal concentrations detected in sediment were arsenic, zinc, copper, iron, lead, nickel and total chromium.

1.4.3 BIOLOGICAL COMPONENTS

1.4.3.1 Aquatic Ecology and Fisheries

- Green Algae and Diatom was the dominant taxa of phytoplankton, As indicated by Wilhm and Dorris (1968), the diversity index (H') is related to surface water quality. Diversity index results imply that the

water quality of water resource near the project area was at moderate conditions and acceptable for aquatic organisms.

- Nauplius of Copepod and Arcella protozoan were the most abundantly found.
- Segmented worms were dominant benthos in all stations. Littoral Fauna
- Freshwater shrimp was dominant of littoral fauna in all stattions.
- .*Actinoscirpus grossus* (coarse bulrush) were dominant in freshwater zone station, *Acanthus ebracteatus* (sea holly) and *Nypa fructicans* (nipa palm) were dominant in tidal zone station (Dawei River).
- Cyprinid fishes (Cyprinidae: Barb and Minnow) and Gobiidae (Goby) were dominant. Total density of fishes ranged 1,400 to 4,400 individuals/hectar and total abundance of fishes ranged 6.795 to 8.510 kg/hectare.
- Fisheries Activities: Pushnet boats,gillnet ,fish trap, dip net, fish net and hook are small fishing gear that used by fishermen.

1.4.3.2 Forests

The types of forest around the project area can be divided into 3 forest types: mangrove forest, reserved forest, and natural forest. In mangrove forest, one species is in the IUCN Red list: *Ceriops decandra* in reserved forest, none of the species in the study area are assessed in the IUCN Red list and in natural forest, one endangered tree species is *Diospyros crumentata*. Two critically endangered species are *Dipterocarpus kerrii* and *Dipterocarpus turbinatus* and one valuable species is *Hopea odorata*.

1.4.3.3 Wildlife

Around the study area can be described in 4 types: reptile; amphibian; avis (birds); and mammal. For reptile, the burmese python (*Python molurus bivittatus*) is an endangered species listed in the UCN Red-list. For Mammals the east asian porcupine (*Hystrix brachyuran*) and long-tail goat (*Naemorhedus caudatus*) were listed under vulnerable species in the IUCN Red-list.

1.4.4 SOCIO – ECONOMIC COMPONENTS

- Number of population, there are 5,834 households in 18 villages and number of population is 35,443 that divided into 16,628 males and 18,805 females. The highest population is at Pagaw Zoon village (7,700) while the lowest population is at Nyaung Bin Seik village (328).
- No data about ethnic group in 18 affected villages due to REM's village survey in 2013.
- The education system in Myanmar is divided into 4 levels; pre-school education, primary education, secondary education, and higher

education According to field survey.each village has one school excepting Kya Khat Tabin in village which has two schools.

- Land use in Yebyu,, the area is still mostly unoccupied as only about 12 percent are active agricultural land while about two-third are forest land and in Laung Lone, one-third of total area is utilized for agricultural purposes while nearly two-third of the area is not utilized .
- 2 rural health centers with health assistance and a senior blue nurse (LHV Lady Health Assistance) in Lae Shaung and Pan Din In village.
- 70.8% of people have smoke tobacco and 12% of people drink alcohol regularly.
- Main source of food of the respondents was from the self-plantation (84.72%) followed by buying from market (9.94%) and natural resources/fishery/forest/river (5.56%).
- Water supply in the study area, is the shallow well. Other sources of water, for local villages, are from artesian wells and rain fall. Most households, in the affected villages, have good water source from shallow wells and streams in the Bawah village.
- Drinking water quality is in good condition around the project area More than 50% of the villagers use the filter treatment and 26.5% boil water before consumption.
- No electricity supply system. Only some households generate electricity from small generators.
- In the project area, the main generators are used for electricity generation during construction.
- In the Dawei area, does not have proper management on solid waste and sanitation. The results of field survey also indicate that public health services in local communities are quite limited. For household wastewater management, most of the respondents discharge wastewater to the ground (82.2%), followed by discharge to public drainage system (5.9%), discharge into the garden (5.1%) and discharge to the public river (4%).
- Solid waste disposal, most of the respondents manage by open burn (93.8%), followed by pile up outside the house (2.7%), landfill (2.2%) and throw away to pubic area (0.8%).
- The roads in the project site and local villages are unpaved surface about 4 m width.
- Transportation: for land transportation, only one main road within a five km. radius from the complex zone: Highway no.8; which is a two lane, for air transportation, there is a local airport at Dawei. All international flights are operated by Myanmar Airways International. Air Mandalay, Air Kanbawza, Asian Winds, Air Bagan and Yangon Airways are for domestic passengers. Flight time from Yangon to Dawei is about one

hour. For railways, Dawei-Yay railroad is running through Yebyu Township in the North-South direction parallel to the Dawei – Yay Highway. For water transportation only cargo boats utilize the Dawei jetty.

- Landuse: from landuse survey provided by the survey team of Italian Thai Development Plc. On site, there are three major types of land use on and around the project area.
- Agricultural Land: Flat plains are, for the most part, extensively cultivated with crops and paddy fields. Plantations are found on the higher ground, the lower parts of the ridges. Major types of plantations are oil palm, cashew nut, rubber, and some are coconut and betel palm.
- Forest Land: Deciduous forest still covers the mountainous area where they are not easily accessible or with steep slope.
- Rural Settlements: There are 16 villages in the project area.

1.4.5 CULTURAL COMPONENTS

The village profile survey by REM (2013) found "Foot Print of Buffalo Pagoda" in Payadat Village and "*Nabule Settawyar* or *Buddha Foot Print*" in Lae Shaung Village. Moreover, there is one monastery in Mudu Village and two pagodas (one in Min Dut and the other in Pan Din In Village).

1.5 IMPACT ASSESSMET METHODOLOGY AND APPROACH

1.5.1 Impact Assessment Methodology

This topic provides assessment of potential impacts to the environment due to project activities. The assessment of potential impacts is conducted on key physical resources, ecological resources, economic development and social and cultural resources, using quantitative approach wherever possible.

1.5.1.1 Impact Assessment During Construction Phase

(a) ***Physical Components***

Air Quality

Potential impacts to the air quality during construction activities are dust generally from unpaved transportation routes, construction site and cleared land. Impacts caused by the above activities are commonly localized to the area close to the source during construction period. This is moderate adverse impact.

Noise and Vibration

Some construction processes generate noise i.e. impact pile driving or pavement breaking. For noise assessment, construction equipment can be considered to operate in two

modes, stationary and mobile. The predicted noise levels in the distance of 100 ft. (33 m.) to 3300 ft. (1000 m.) from construction equipment sources found that the selected noise source emission levels range from 85 to 101 dB(A) which covers all the noise emission. The highest noise source is 101 dB(A) from pile-driver (impact type) and the estimated noise level is 70.6 dB (A) at 1650 ft. (500m.)

Therefore any noise source lower than 101 dB(A) will result in noise level lower than 70 dB(A) at 500 m. However the community in the distance of less the 500 m may be affected from noise when comparing to the measured Leq 24-hr (45.9 – 55.4 dB(A)) of station A2 and A6 .Construction within 500 m from the any sensitive receptors have to be controlled either by restricting the construction to day-time only, or an agreement has to be made with the nearby villagers should extended working hours are needed. This is low adverse impact.

The result of construction activities is various degrees of ground vibration depending on the equipment and methods employed. Ground vibrations from construction activities do not often reach the levels that can damage structures, but they can achieve the audible and feelable ranges in buildings very close to the site. Construction vibration may be generated from blasting, pile-driving, vibratory compaction, demolition, and drilling or excavation in close proximity to sensitive structures. Overall impacts due to vibration from construction equipment are expected to be negligible.

Topography and Soil

Changes and impacts to the topography during the construction are expected to be quite small. Soil piling on the project area will be careful about soil erosion and collapse. This is low adverse impact.

Surface Water and Sediment

The land development of the Initial Township area, may result in increased sedimentation in surface water from surface runoff in rainy season. Control of sedimentation from the construction sites will be required during the period to reduce release of sediment to the waterways. Vegetation clearing will only be conducted to the area that is needed for construction activities. Control measures such as sedimentation pond and silt fence will need to be constructed to reduce sediment loading to the natural waterways. Potential impacts due to sediment during construction will be limited in the construction period only. Local villagers rely on surface water for agricultural purpose, and water for consumption is sourced from shallow groundwater well. Therefore, impacts to the use of water are expected to be quite limited and short-term.

Domestic wastewater generated from the construction work camps are another source of pollutants to the waterways. Approximately 29.68 m^3/day of domestic wastewater from the main construction camp is estimated, based on an assumption that the wastewater is generated at the rate of 80 liter/person (The accommodation is expected to support a

maximum of 371 worker employed by Italian-Thai Development Plc., the main construction contractor of Initial Township). Toilets in these camps will be provided with septic and seepage tanks. The location of these tanks will need to be at least 100 m from natural waterways and above expected flood level in the area. This is moderate adverse impact.

Groundwater

The project activity that may result in impact to groundwater quality is the waste management facilities where sanitary and secured landfills are located. Groundwater monitoring program will be required particularly for the waste management facilities. Considering that the project location is a low-lying land surrounded by mountain ranges and that the hydrogeological gradient is likely to be drained into the coastal area and is unlikely to be connected with groundwater system of the resettled communities, when the project is fully developed, the impact to groundwater use is considered limited. This is low adverse impact.

Solid Waste

Approximately 371 kg/day of non-hazardous waste from the main construction camp is estimated, based on an assumption that the non-hazardous waste is generated at the rate of 1 kg/person/day with a total numbers of workers at 371 persons in the camp. While the amount of hazardous wastes such as used oil, waste paints, machinery lubricants and other items could be estimated at 3% of municipal waste, was estimated at about 11.13 kg/day. The disposal of non-hazardous and hazardous waste is to use the service of Initial Industrial Estate landfill. There is suitable management system and no discharge through Dawei River. This is low adverse impact.

Geology and Seismology

According to the review of baseline information (Chapter 4), the project area located in Zone 1, minor damage, which is the range of ground acceleration less than 0.075 g, which is equivalent to MMI class V and less. Also, the seismic records indicated that none of earthquake situation in Dawei and project area. Although the risk is considered low, the project may consider cooperating with the local authority in updating and exchange of the seismological information. This is low adverse impact.

(b) ***Biological Components***

Surface Water Biology

The surface runoff will increase sediment into the surface water resources increasing levels of turbidity and suspended solids affecting photosynthesis of phytoplankton and productivity of water resources. Mitigation measures controlling release of sediment from construction sites need to be implemented to limit the amount of sediment being released to the environment.

Wastewater from construction work camps may result in degradation of water quality and dissolved oxygen. Use of seepage tanks and selection of location of the tanks away from the natural waterways will help reduce the potential impacts.

Used oil from equipment maintenance and workshops may be effected to aquatic organism. It is recommended that the used oil are kept temporarily on site in a proper storage area will help reduce the potential impacts to aquatic life. These are low adverse impact.

Terrestrial Ecology

The natural forests in the area designated for Initial Township have long been encroached by local population and used as farmlands and villages but it still exist in many parts of the area. Wildlife found in the project area in the previous studies is mostly common. It is mostly disturbed by human activities and does not offer good feeding ground and habitats.

During construction phase, clearing of vegetation is unavoidable, but impacts can be reduced through mitigation measures. These are low adverse impact.

(c) *Economic Development*

Infrastructure Facilities

Since groundwater and diesel generators or the LNG power plant will be the source of water and electricity in the camps; therefore, there is no impact on existing water use and electricity generation of the local villagers. And appropriate management facilities are identified, hazardous waste needs to be stored temporarily until the waste management facilities are operational. Disposal site for non-hazardous waste to be used during construction phase needs to be established. It is beneficial impact.

Traffic and Transportation

The volume of traffic from smaller vehicles, such as pick-up trucks, is expected to be higher than the period before the project, thus increased risk of accident between the vehicles used in the project and motorcycles, which is the most common transportation mean of the local villagers. However, the project will install sign boards along the roads that most frequently used by the project's vehicles to reduce the risk of accidents. It is low adverse impact.

Land Use

Major concerns related to high adverse impact on land use during construction period, it is important such temporary service activities and structures set up for workers' needs be planned out monitored regularly. Relocation may be needed in intervals as appropriate so that eventually most or all services for project personnel will not be allowed to scatter outside the designated township zone.

(d) *Social and Cultural Components*

Socio-Economic Conditions

Lack of knowledge of project activity and planning is one of the key concerns received from the public consultation activities. This may lead to negative rumors and misconception of the project. Concerns of the public can also be collected and addressed during this routine engagement. The Dawei Special Economic Zone Law requires that the factories employ Myanmese at a certain percentage of all workforces every year (a beneficial impact). Despite this requirement, if the knowledge and skills of local villagers do not meet the requirements of the industries, the industries will have to employ Myanmese from other regions such as from Yangon resulting in lost opportunity for the local populations. Career training and workshop aiming to improve skills of local populations need to be established to prepare them for future employment in the industrial estate since the construction phase.

Sites of Historical and Cultural Importance

There are three sites of high historical and cultural values i.e. NabuleSettawyar or Buddha Foot Print (Laeshaung Village), the monastery (Mudu Village), and Pagodas (Min Dut). These sites are within the project area and will require careful planning as to how they are maintained or relocated. Religious places are highly important in Myanmar and potential impacts due to mishandling of these sites and insufficient engagement and acceptance with local villagers and authorities are considered high. Therefore, this is moderate adverse impact.

(e) *Public and Occupational Health*

Potential sources of impact to public and occupational health conditions during construction phase are discussed below:

Occupational Health and Safety

Accidents and Injuries:

Accidents and injuries will be notable for workers, especially among untrained ones. The wide range of injuries may be found from minor or medical aid required only to serious cases, disabling injuries and/or death. Faulty electrical devices, blunt injuries, cut wounds, falling, as well as eye irritation and burns are common, however, broken limbs, trauma and or serious injuries can also occur. Besides, increased number of traffic accidents can be expected. Therefore, the prevention and mitigation measures need to be provided.

Occupational, Sexual Transmission and Communicable Diseases:

Potential respiratory diseases may be aggravated, due to pollutants exposure in the workplace, such as dust, exhaust gas, chemicals or solvents. Underlying chronic diseases: asthma, allergy, peptic ulcer, or mental disorder, can be exacerbated by the exposure of hazardous/chemical wastes. Moreover, unhygienic habits, poor personal hygiene and environmental sanitation, may possibly increase diarrhea, hepatitis and communicable diseases. Malaria and dengue fever and local disease from the affected area, can be easily

spread. Sexually transmitted disease and HIVs are also expected and needed to be seriously concerned to designate prevention and control measures.

Emergency Response and First-Aid:

Fire may occur from ignition of flammable materials or other reactive chemicals which can lead to accident and injuries as well as loss of properties. Thus, emergency response plan dealing with fire, explosion and chemicals leaks should be established. Dawei Residence (Myanmar), as the project owner, has provided the first-aid unit in the campsite at all times. The qualified first-aid units should also be established to ensure that can properly handle with serious or trauma cases. Patients should be taken care and transferred to appropriate medical facilities in time.

Community Health

The project activities during the construction phase possibly have certain impacts beyond the project boundaries. Communities around the project area may be affected in various issues.

Housing and Sanitation:

This will create pressure on public health services, public health facilities, and sanitation. Currently the public health services provided by local authorities are rather limited. Improper management of sewage, wastewater and solid waste may generate sources of diseases. Therefore, the sufficient infrastructure amenities and services should be provided, e.g. solid waste disposal, to mitigate the impact.

Environmental/Communicable Diseases:

According to construction activities and transportations, communities will be exposed to excessive dust and noise that can lead to increase of respiratory diseases and nuisances.

Due to mobility of workforce, sexually transmitted diseases, such as HIV/AIDS, will be the most concerned communicable diseases. These diseases can be spread widely. Increasing of malaria, dengue fever, dysentery, hepatitis, pneumonia, and tuberculosis is also expected due to the poor sanitation.

The migrated workers may bring emerging diseases to the project area. If this happens, local villagers will be likely exposed to new strains of diseases. Common cold and flu as well as respiratory tract infection caused by probably new strains are also possible. An increase of alcoholic drinking, smoking and substance abuse and increasing of migrated labors, violence and social disturbance are expected as well. Appropriate mitigation measures should be implemented to reduce these impacts that may occur.

Accident/Fire/Chemical Leaks:

Accidents may occur while transporting construction materials and supplies including chemicals such as gasoline, solvents or lubricants. These accidents will lead to

releases of hazardous materials that may result in fire, explosion and/or toxic chemical leaks into the environment. Thus, the emergency response plan should be established.

Adequacy and Readiness of Healthcare Services:

Local healthcare services and healthcare personnel, in quantitative and potentiality dimension are quite limited at present. However, the injuries and illness will be increased in term of quantity and complexity. The mitigation measures should be, therefore, provided to reduce pressure on the healthcare facilities.

1.5.1.2 Impact Assessment During Operation Phase

(a) ***Physical Components***

Air Quality

During operation period, the activity that may create air pollution is exhaust from vehicles. Air pollutant suppression methods, such as planting trees around the boundary at ground floor, will be required to increase shady area and reduce heat including the CO_2 absorption to reduce pollutants from exhaust. This is low adverse impact.

Noise and Vibration

The operation has no noise and vibration impacts on nearby area.

Topography and Soil

After construction finished, it has no impact in operation phase.

Surface Water and Sediment

Estimated wastewater volume in onsite wastewater treatment plant at each building and polishing ponds is followed. Wastewater treatment plant is separated into 2 zones i.e. north zone and south zone. At the north zone, wastewater per building generated from building with capacity as 15 m^3/day (150 m^3/day from 10 buildings) is prepared for treated wastewater from 3-floor workforce apartment, 84 m^3/day (1,512 m^3/day from 18 buildings) is prepared for treated wastewater from 5-floor workforce apartment and 27 m^3/day (162 m^3/day from 6 buildings) is prepared for treated wastewater from 8-floor serviced apartment. Total wastewater volume from north zone is 1,824 m^3/day.

At the south zone, wastewater per building generated from building with capacity as 15 m^3/day (780 m^3/day from 52 buildings) is prepared for treated wastewater from 3-floor workforce apartment and 84 m^3/day (13,272 m^3/day from 158 buildings) is prepared for treated wastewater from 5-floor workforce apartment. Total wastewater volume from south zone is 14,052 m^3/day. BOD of effluent will be not exceed 20 mg/l complied with the notification of the Ministry of Natural Resources and Environment in the topic of wastewater standard from wastewater treatment of community. Effluent will be discharged to public drain and through Dawei River. Therefore, the project operation phase will not generate the pollutant to impact on surface water quality. This is moderate adverse impact.

However, before starting the initial phase of Initial Township, there will be construction of nine 5-storey buildings and one 5-storey building for project's workers and officials; impact on surface water is also less than impact of full phase operation due to less capacity or less population (maximum 700 persons/ building in 5-storey building and maximum 222 persons in 8-storey building). Discharge point is Kunchang River only.

Solid Waste

Solid waste generated during the operation period can be divided into 3 parts i.e. non-hazardous waste, hazardous waste and infectious waste. Non-hazardous waste and hazardous waste will be appropriated with disposal. For infectious waste is transferred to incinerator for disposal. There is suitable management system and no discharge through Dawei River. Therefore, it has no solid waste impact.

(b) *Biological Resources*

Surface Water Biology

Treated wastewater will be discharged through public drainage system without discharge through public water resource. Therefore, the project operation will not create impact on surface water quality and freshwater aquatic organisms.

Terrestrial Ecology

Direct impacts to terrestrial ecology during operation phase are expected to be small as the environment would have been altered since the construction phase due to influx of workers to the industrial area and live in Initial Township, demand of wildlife meat and parts may be increased resulting escalation of wildlife poaching and hunting in more futile reserved forests elsewhere. Education and discouragement of consumption and domestication of wildlife need to be conducted all through the project life.

(c) *Economic Development*

Infrastructure Facilities

During operation phase, sources of raw water will be from small water reservoir (Pa YainByu and TalaingGya Weir). The raw water will be delivered to the water treatment plant located near the reservoir before delivered to Initial Township. Electricity will be generated by the power plants inside the industrial estate. Waste from Initial Township will disposal at waste management facility in Township.

Overall, it is expected that there will be no impacts from the project to the existing infrastructure facilities of the local communities.

Traffic and Transportation

The Initial Township grid system has been designed into fan-shaped grids with multiple town accesses which will prevent traffic congestion at one access. For the workforce areas, the grids are equally divided the blocks into walking distance to make sure the workers can get off the bus and continue walking to their homes conveniently. In the gated type community such serviced apartments, there will be only one or two accesses to increase both privacy and safety to residents. Public lighting and drainage system will be applied along the grid.

Land Use

Potential negative impacts on land use are predicted to affect the town of Dawei also. As the project is in operation, there will be needs for services other than those day-to-day services that can be provided within the township zone of the project. Naturally, it can be predicted that the town of Dawei, with certain level of infrastructure and social services, will grow rapidly to accommodate requirements of project personals such as, residences for the supervisors or consultants who prefer not to stay within the estate, business clients and guests who visit the project estate shortly for specific purposes, or other workers who perform services to the project personnel but are not allowed to stay in the township zone. Dawei will also provide entertainment activities for the workforces when off-duty on the weekend. These sometimes undesirable uses are not allowed in the township zone of the project but will find their places in the town. Zoning and control for such entertainment district should be laid out ahead of time for the town of Dawei.

(d) ***Social and Cultural Components***

Socio-Economic Conditions

Issues related to the socio-economic and social issues during operation phase are similar to the construction phase.

Sites of Historical and Cultural Importance

If the handling and relocation of historical and cultural places during construction phase is performed properly, potential impacts during operation phase is not expected.

Public and Occupational Health

Potential sources of impact to public and occupational health conditions during construction phase are discussed below:

(e) *Occupational Health and Safety*

Sexual Transmission and Communicable Diseases:

Sexual transmission diseases and vector-borne infection are mostly related to poor personal hygiene and poor sanitation. Foreign or migrated workers who live in Initial Township are possibly exposed to local diseases, malaria and dengue fever. Strict prevention and control measures as well as health care promote for living.

Adequacy and Readiness of Healthcare Services:

Regarding the significant numbers of workers in the project area, a hospital/ healthcare facility located in the project township will be established. This newly established healthcare facility should be the comprehensive one, in term of adequacy, capability, and accessibility since at present public health facilities and services provided by local authorities are quite limited.

(f) *Community Health*

Sanitation:

Increasing of supporting industries and surrounding areas will have pressure on adequacy of infrastructure amenities and services, as well as public health facilities. Improper management of sewage, wastewater and solid waste may lead to poor sanitation and environmental health stresses. Currently, public health services of the local authorities are limited therefore the project owner should closely collaborate with the local authorities to create the mitigation measures to prevent the consequences that may occur.

Environmental, Communicable/Non-Communicable Diseases:

Spread to the local residents, especially in the area with poor hygiene practices. Sexual transmission diseases, HIV/AIDs, and communicable diseases are associated with mobility of workers.

Higher public incomes may result in unhealthy habits e.g., low nutritious food, alcohol drinking and less exercise, which may cause chronic health problems: hypertension, diabetes, heart disease, stroke and cancers. More alcohol consumptions and smoking will be normally found. In fact, these non-communicable diseases will be serious problems, and need a sophisticated approach for the solution.

Adequacy and Readiness of Healthcare Services:

Qualified healthcare services are needed due to an increase of illness, injuries, accidents and fatalities. The wide range of injuries and disabilities will create an excessive burden of health services. Consequently, the effective health surveillance system is needed.

1.5.2 Risk Assessment

Risk mitigation measures need to address the identified causes of the risk. Mitigation measures for the identified risks correspond to the identified causes are presented in Table 1.5-1. The measures will be implemented through contractual arrangement.

Table 1.5-1 Mitigation Measures for Environmental Risk Management during Construction Phase

Cause	Mitigation Measures
The ITD contractor and subcontractor have inadequate understanding of the environmental performance requirements of the project.	Require the ITD contractor to: - Prepare a Construction Phase Environmental Management Plan (CEMP) base on the EIA report and associated CEMP, detailed design and construction plan and schedule. The CEMP must clear define. - The project's environmental requirements and obligation - Physical measures that are needed to comply with the requirements and obligation. - Construction measures that are needed to comply with the requirements and obligation. - Assignment of responsibilities to each subcontractors.
The ITD contractor and subcontractor unintentionally omit the environmental requirements due to ambiguity of the environmental requirements in the contract.	1. TOR for procurement of the ITD contract must clearly state the project's environmental requirements during the construction phase that the ITD contractor must ensure that the project construction will meet the requirements. 2. The ITD contract must clearly prescribes environmental management responsibility of the ITD contractor.
Inadequate supervision and monitoring of environmental mitigation activities of the ITD contractor and subcontractors.	1. The supervision consultant will be required to submit a supervision and monitoring plan that clearly indicates the environmental tasks to be supervised and monitored. This supervision and monitoring plan for the implementation of the environmental mitigation measures. 2. Monthly reviews of the ITD contractor environmental performance. 3. Close supervision of truck operations especially during the site filling period.
Changes in designs or construction methods without revising the originally proposed mitigation measures.	Changes in designs or construction methods may be initiated by the ITD contractor or the project proponent. The request for changes must be subject to the change procedure in project management. The request for changes must be accommodated by an analysis of environmental implications and revised mitigation measures.
Change in the environmental requirements during the construction without the revision of the originally proposed mitigation measures.	Change in the environmental requirements may be initiated by DRC or the project proponent with approval of DRC. The change must be subject to the change procedure in project management. The ITD contractor will analyze environmental implications of the changes and revise the originally proposed mitigation measures accordingly.

The operation phase of residential building has no risk activities. Therefore, the operation of Initial Township has no risk impacts on nearby area.

1.6 CUMULATIVE IMPACT ASSESSMENT

For the cumulative impact assessment is assessed in overall of Dawei Initial Industrial Estate in case of opening the all operation phase. A simple matrix can be used to identify and evaluate cumulative impacts. The levels of potential impacts are assessed qualitatively as in Table 1.6-1 that is shown the results of the evaluation.

Table 1.6-1 Cumulative Impact Evaluation Matrix

Potential Impacts Area	Proposed Action	Past Actions	Other Present Actions	Future Actions	Cumulative Impacts
Physical Resources					
Air Quality	**			*	**
Noise and Vibration	*				*
Surface Water and Sediment	**	*	*	**	**
Groundwater	*	*	*	*	*
Geology and Seismology					
Solid Waste	*				*
Biological Resources					
Surface Water Biology	*				
Terrestrial Ecology	*	**	**	**	***
Economic Development					
Infrastructure Facilities	+				+
Traffic and Transportation	*			**	**
Land Use	***			**	***
Social and Cultural Resources					
Socio-Economic Conditions	+			+	+
Sites of Historical and Cultural Importance	**				**
Public and Occupational Health	*	*	*	**	**
Risk Assessment					
Environmental Risk Assessment	*				*

Note: * low adverse impact ** moderate adverse impact *** high adverse impact
+ beneficial impacts

Source: EIA Study Team

1.7 ENVIRONMENTAL MANAGEMENT PLANS

1.7.1 Scope of Environmental Management Plans

The key organizations responsible for implementation of the mitigation measures include: the Governing Bodies of the Government of Myanmar, the Project Owner, the Construction Contractor and sub-contractors during construction phase, and the Investors. However, it should be noted that the planning and development of the Project has been dynamic throughout the study period. This includes also the organization of the project and other relevant agencies. The information used as the based scenario is considered the most valid one at the time of the report preparation. Changes to the project information may occur

overtime and, therefore, readers and project implementers are advised to check and confirm the project details at the time of review and implementation.

1.7.2 Application of the Owner-EMPs

The Project Owner for this project refers to Dawei Residence Company Ltd. (DRC), which falls under the category of 'Developer' according to Myanmar Special Economic Zone Law (2014). DRC roles in the project include design, construction, and operation of infrastructure and amenities in the Dawei Initial Industrial Estate. DRC will be responsible for technical planning, enforcing, and monitoring of all environmental mitigation measures as stipulated in the EMP. The Project Owner reports to the Governing Body.

Construction Contractor and sub-contractors (CC) refer to the Contractor and sub-contractors for the development of Initial Townships, which include constructions of utility systems (i.e. water treatment and distribution system, wastewater collection and treatment system, irrigation system, solid and hazardous waste management facilities etc.), internal roads, and basic infrastructure for the industrial estate. CC must operate in accordance with the mitigation measures stipulated in this EIA report. CC must report to the Project Owner.

1.7.3 Project's EHS Policy and Commitments, and Legal Requirements

1.7.3.1 Construction Phase

During construction period, the Project is not expected to have major environmental impacts apart from environmental disturbances Nevertheless, the Project Proponent will ensue that the Contractor will make best efforts to minimize the impacts during the construction phase despite their insignificant levels. In this regard, the Project Proponent will ensure that the Contractor-CEMP will incorporate all mitigation measures as prescribed in the Owner-CEMP in preparing detailed designs of the Initial Townships and its associated facilities, construction methods, and specifications.

1.7.3.2 Operation Phase

During operation period, DRC as the project owner has to establish the environmental policy and rules that will govern environmental practices and performance of the industrial estate as a whole. The establishment and implementation of this component is of almost important absence of local environmental regulations and authorities fully responsible for environment and pollution control in Myanmar. Once established, DRC shall adhere to these policy and rules. However, in the future, when the environmental protection laws may be announced and published by the Government of Myanmar, DRC shall ensure that the requirements as set in the policy and rules are fully in compliance with the laws.

1.7.4 Summary of CEMP and Arrangements for the Implementation

1.7.4.1 Construction Phase

DRC is responsible for monitoring that the CC is complying with the measures mentioned above. The monitoring program can be

- each construction machineries are inspected at least every 6 months with a written certificate / maintenance records of each machinery provided by qualified mechanics of the CC,
- Inspect that the dust suppression measures are implemented according to the mitigation measures,
- Inspect that the burning of waste materials are conducted according to the relevant mitigation measures,
- Monitor the Community Grievance Record related to dust and noise and ensure that the complaints are responded to and closed appropriately according to the relevant mitigation measures.
- Additionally, it is recommended that the project continue sampling of ambient air quality in industrial area and nearby villages every 6 months, dry and rainy season.

1.7.4.2 Operation Phase

There are 6 main potential impacts in operation phase. One of the main potential impacts to surface water quality during operation activities is wastewater and solid waste from the wastewater treatment and landfill. DRC shall formally notify CC and enforce the following measures to reduce the pollutants DRC is responsible for monitoring that the CC is complying with the measures mentioned above. The monitoring program can be

- Design and construction of the landfill shall be in accordance with Solid Waste Disposal Facility Criteria – Technical Manual published by U.S. EPA (1993) or other applicable standards.
- Detailed hydrogeological condition of the proposed landfill area has to be studied in the design of landfill.
- Groundwater monitoring wells will be installed. As a minimum, 1 well is to be installed up-gradient of the landfill and at least 3 wells is to be installed down-gradient of the landfill. Depth of screens and well construction depends on the results from the hydrogeological condition study.
- The components of the waste management facility i.e. sanitary landfill, secured landfill and incinerator shall be designed and constructed according to the internationally accepted standards.
- The facility shall create its Standard Operating Procedure covering steps from receiving waste, laboratory analysis, stabilization, temporary storage, incineration and disposal. Audit by third party is necessary.
- The landfill shall be closed daily to prevent vectors and odors.
- Classify hazardous and non-hazardous waste according to the definitions in the Waste Management Plan prepared.
- Workers need to be trained of Waste Management Plan.
- All hazardous and non-hazardous waste generated shall be transferred to the facility for disposal.

- Waste manifest system has to be created and implemented.
- Record of type of waste including its quantity shall be kept in the database of DRC.
- Waste Management Facility (if constructed in the landfill).

However, the mitigation for reducing the effects from main potential impacts both of construction and operation phase are discussed in **Chapter 8** in this report and in EMP Report.

1.8 PUBLIC CONSULATION AND DISCLOSURE

1.8.1 Purposes of Consultation

The objectives of public participation and disclosure are

- to inform the stakeholders about the Initial Township project,
- to gain public views, concerns and values,
- to increase public confidence, and
- to improve transparency and accountability in decision-making process.

1.8.2 Public consultation

The Project carried out 3 public consultation, the first one was conducted in 2013 (See Annex 9-1). The second consultation was conducted during 21th-22th March 2015 and the Third consultation was on 28th March 2018. All the consultation were held in Dawei SEZ and the impacted villages.

Key stakeholders such as regulatory authorities, private sectors, NGOs/CSOs and local people in Dawei SEZ were participated in consultation meeting. Main affected villages, Mindut and Pagaw Yun were also participated in attitude survey. Media and communication used i.e. presentation, handouts and attitude survey were conducted in Myanmese and by cooperation of local partner consultant, Resource Environmental Management Myanmar Staff.

Concerns, opinions and recommendations for the Project were different for each consultations. For the recent consultation on 28th March 2018, which was hosted by the Project Proponent, DSEZ Management Committee and Environmental Conservation Department, MONREC. The meeting was held in Dawei SEZ auditorium, in Dawei, Tanintayi region. Stakeholder groups in this meeting consisted of regional government, government officers, villagers and NGOs. Issues raised in the meeting were concerning land acquisition, job opportunities and likelihood restoration issues. Inquiries regarding project commitments and environmental management plan were also mentioned.

The result from every phases of the public consultation meeting were considered by the Project proponent and the significant social impacts/recommendation i.e. employment and training and public information etc. were embedded in the social mitigation measures, the Environmental Management Plan and the project’s commitments. Example of public mitigation measure in construction phase is shown in Table 1.8-1.

Table 1.8-1 Mitigation measures for construction phase

Mitigation Measures	Place	Period	Responsible Agency
1. Inform head of villagers about construction plan and activities	• 2 Villages	• At least 2 weeks prior to the construction	MIE
2. Local people can complain about the project activities directly to the complaint handling unit or via the community leader. The corrective actions of each complaint must be done within a month or at the period of time that developer and local people mutually agree	• Via community leader house • Putting complaint in the comment boxes • Oral inform at complaint handling unit	• Over construction phase	MIE
3. Provide on-site construction skill training for local people and give them wages at least those indicated by Myanmese labor law	• At the construction site	• On-site training	MIE
4. Inform head of villagers about the operation plan and activities in the operation phase	• 2 Villages	• At least once a month over operation phase	MIE
5. Local people can complain about the project activities directly to the complaint handling unit or via the community leader. The corrective actions of each complaint must be done within a month or at the period of time that developer and local people mutually agree	• Via community leader house • Putting complaint in the comment boxes • Oral inform at complaint handling unit	• Over operation phase	MIE
6. Provide industrial skill training for local people	• In the community to avoid difficulty of travelling	• On-site training	MIE
7. Contract all tenants to give the first priority for local employment		• Over operation phase	MIE

Source: EIA Study Team

1.8.3 Information Disclosure

The project disclose information on the Myandawei Industrial website, which consists of project proponent information, facilities and infrastructure, download of the EIA/ESIA report including contact information.

1.8.4 Recommendations for Future Consultations

The major concerns obtained from the public consultation meetings included environmental pollutions from the project and their way of life after the project is implemented. Regarding environmental pollutions, the villagers are worried that the project might generate water pollutions and they cannot use water in the natural water sources. In additions, they villagers are worried about their occupations after the project is implemented. Thus, they need a train program that can help them work in the industrial sector. The villagers also need to know about the actual project schedule and project description. Since the information has been changed all the time, they feel uncertain about their future. The key recommendations from public consultations are to inform the villagers about project schedule, impacts, and mitigation measures to minimize the impacts from Initial Township as well as to provide appropriate training to the local people.

1.9 RESETTLEMENT AND COMPENSATION

Most of the Project area is palm plantation for agriculture belong to government. No land acquisition for the Township is required. Thus, none resettlement and compensation plan are required.

CHAPTER 2
CONTEXT OF THE PROJECT

2.1 PROPOSE OF THE EIA STUDY

This proposed project entitled "*Initial Township*" (herein referred to as "*the Project*") will be developed by Dawei Residence Company Limited (DRC). A 1.365 square kilometers of land in Dawei Special Economic Zone (DSEZ) will be developed a township that will accommodate workforce from industrial estate, growth of businesses and logistics trading in the DSEZ.

The Environmental Impact Assessment Procedure (No.616/2015) (hereinafter referred to as "*EIA Procedure*"), which was issued by the Ministry of Environmental Conservation and Forestry (MOECAF) (predecessor of Ministry of Natural Resources and Environmental Conservation (MONREC)) on 29th December 2015 defines the detailed legal process regarding EIA procedures including preparation of EIA/IEE report, environmental management plan (EMP), public involvement, approval of EIA/IEE report by MONREC, and monitoring process in accordance with the EIA report.

In this EIA Procedure, "*Tourism and Hospitality Development*" that is having a total area of accommodation more than 10,000 square meters or having more than 80 rooms are requested to conduct full EIA study. Therefore, the Project Proponent has to conduct the EIA study based on the EIA procedure.

2.2 RESENTATION OF THE PROJECT DEVELOPER

Development of the project aims to accommodate a high quality of residence with a range of facilities and recreations in order to raise living standard of workers both Myanmar citizen and foreigners. The Initial Township (Figure 2.2-1) is designed for maximum capacity of 135,080 peoples for the initial phase and planned to expand up to 370,116 peoples in full phase.

Several multi-stories of apartments including workforce apartment, service apartment, retails shops and commercial venues will be built including school, police station, health care center e.g. hospital. The project will be supported by shared facilities, between the project and the initial industrial estate, such as Solid Waste Management System e.g. waste collection, storage units and disposal landfills / incinerator and fire services.

2.2.1 Project Background

The DSEZ is bounded by the Andaman Sea in the west and Dawei River in the east. It is located approximately 28 kilometers north of the Dawei province and can be accessed via both land vehicles and sea vessels. The DSEZ is planned to develop as a pivotal place for trading and transportation of South East Asia. The feature of DSEZ integrated standard infrastructure, light, medium and heavy industrial parks, port and logistics, water reservoir,

power and fuels e.g. LNG are aimed to boost national economy especially development in the Taninthary region, southern Myanmar, and employment opportunities for locals.

In 2010, the Italian- Thai Development Public Company Limited (ITD) signed a Framework Agreement with the Myanmar Port Authority for "*The Dawei Sea Port and Industrial Estate Development Project*". The Framework Agreement granted the concession for the Project including the others several projects, which were a cross border road and rail link with connecting transmission line; and a township for residential and commercial.

In July, 2012, Government of the Kingdom of Thailand and Government of the Republic of the Union of Myanmar signed a Memorandum Of Understanding (MOU) on the comprehensive development of "*The Dawei Special Economic Zone (DSEZ) and its related project areas*", in order to enhance cooperation of the two governments in development of the Dawei Projects; however, the Dawei Projects were suspended during 2013.

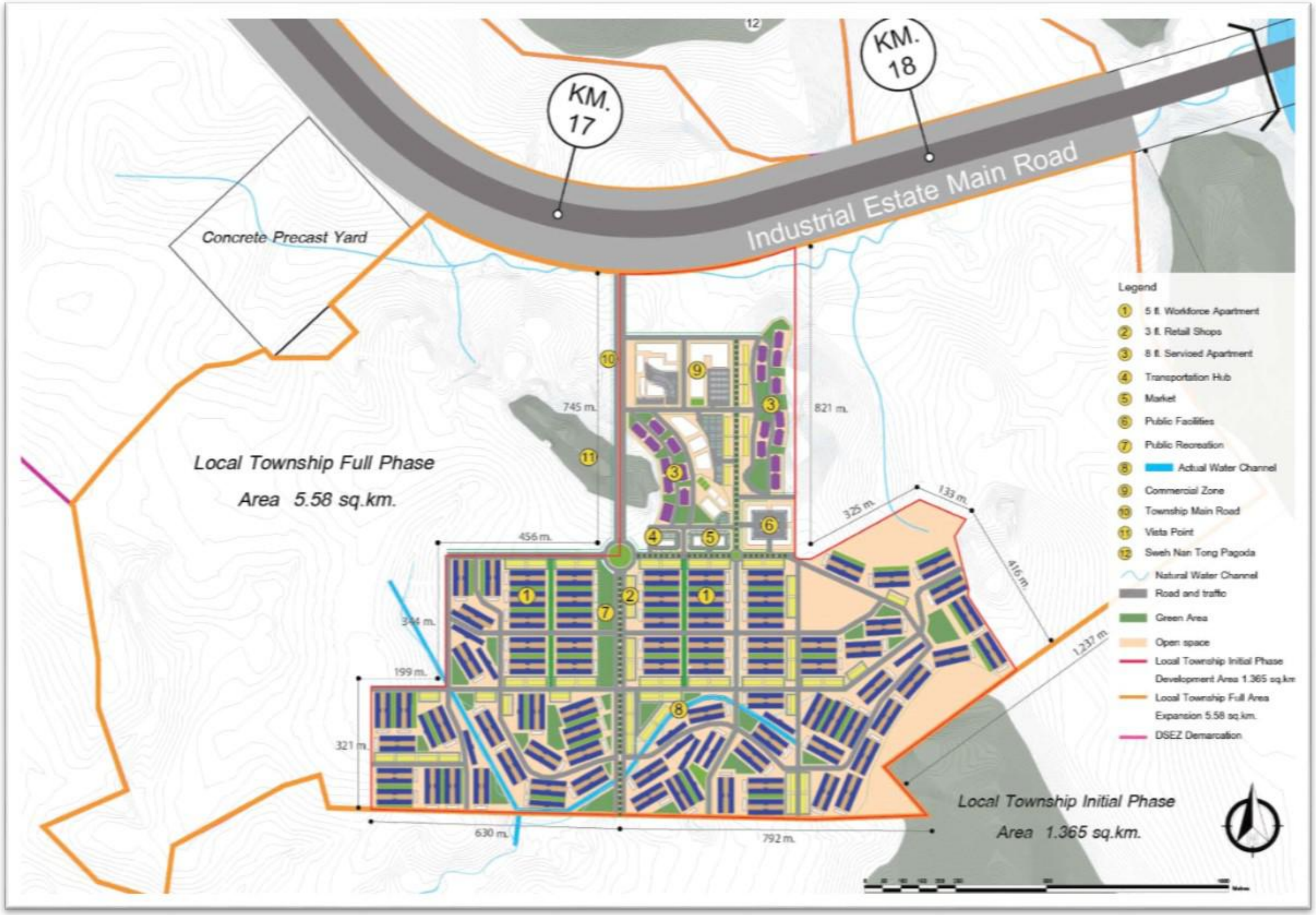
Later year in 2015, ITD had been granted the concessionaire contract to develop "*the entire DSEZ Industrial Estate-Initial Phase*" from the Myanmar Government. Due to the fact that scale of the new development was large and too complex. Thus, each component was spited into separated Environmental and Social Impact Assessment (EIA/ESIA) and Initial Environmental Examination (IEE). The environmental studies were assigned for the following projects:

- Two-Lane Road that connects between the DSEZ in Dawei and Thailand. The road is 138 kilometers starting from Phu Nam Ron in Kanchanabuiri divided into 3 sections. Section 1 is 50.9 kilometers and section 2 is 42.9 kilometers and section 3 is 44.2 kilometers, respectively. Most of the road sections are in Myanmar, only 5 kilometers in Thailand.
- Small Ports with 2 platforms that length in size are 100 and 150 meters and 25 meters of width.
- Small Water Reservoirs will supply water treatment plant consisting of Pa Yain Byu Reservoir and Ta Laing Gya Weir (Approved IEE).
- Initial Phase Power Plant will generate electricity supply from gas-engine power plant, gas-turbine power plants and combined cycle power plants.
- Telecommunication Landline for Information Technology (IT) including fixed line and high-speed internet with fiber optic cable from the Myanmar-Thailand Border will be installed.
- LNG Terminal once when complete will provide sufficient clean and economical price of natural gas to the power plants in the industrial estates.
- Initial Township that will not only build for commercial and residential accommodation to support the Initial Industrial Estate, but to establish an actual Initial Township which has all needed functions and facilities in order to create good environment and livelihood.

Prior to conduct the Project EIA, a number of environmental studies have been conducted in the DSEZ, in accordance with the stage of the entire industrial estate – initial phase development. The literatures are reviewed and incorporated into this EIA study. They are following:

- The Initial Environmental Examination (IEE) for Dawei Sea Port and Industrial Estate Development (TEAM, 2012a);
- The Social Impact Assessment (SIA) for Dawei Sea Port and Industrial Estate Development (TEAM, 2012c);
- The Environmental Impact Assessment (ESIA) for Main Road (SEATEC, 2012c).
- Environmental Impact Assessment for Dawei Industrial Estate-Initial Phase Project (SEATEC in association with UAE, 2012)
- The Social Impact Assessment (SIA) for Medium and Light Industrials for Dawei Development (TEAM, 2013)
- The Environmental and Health Impact Assessment (EHIA) for the Dawei Sea Port (TEAM, 2013).

However, the Project information used in this EIA report bases on the current scenario and is considered the most valid at the time of the report preparation. Changes in the Project information may occur overtime and, therefore, readers and project developers are advised to check and confirm the update details at the time of review and implementation.



Source: DRC (2016)

Figure 2.2-1 Location of Initial Township in the Dawei Special Economic Zone

2.2.2 Status of Project Preparation

The existing infrastructure are unpaved road. The road is linked between Dawei SEZ and Thailand. The Project can be accessed by this road from Ban Phu Num Ron, Kanchanaburi by 4-WD type car. Land plot within the Project boundary has almost been clear of vegetation and some area are leveled grade. Water is supplied by the Pa Yain Byu Reservoir and Ta Laing Gya Weir. Power will be soon supplied by the power plants but at the present electricity still relies on diesel generator. The prototype of 8-floor service apartment was constructed in 2015.

DRC plans to build the Township in accordance with demand of residence in DSEZ. This will be achieved through construction of multi-stories of apartments, hospitality and commercial buildings, hospital and schools and others facilities. Development of basic infrastructures, Main Roads (MR), Secondary Roads (SR), Tertiary Roads (TR) and steel bridge, Flood Controlling System and the share facilities with the industrial estate such as Waste Management System and Fire station. This construction will be gradually developed in in parallel with phases of the industrial estate.

Details on design concept and project description are presented *Chapter 4 Project Description and Alternatives*. Some detailed design has been submitted to Dawei Special Economic Zone Management Committee (DSEZMC) since 2nd November 2015 in compliance with the requirement under the Concession Agreement. The EIA study has been conducted in accordance with such submitted technical information. The EIA study has made use of the technical study. Especially the detailed design of the waste management system (See Annex 4-2).

2.2.3 Related Projects

The Dawei Special Economic Zone is located in northern part of Maungmagan Bay, Andaman coastline. Since the Italian-Thai Development signed the Concession Agreement (CA) with the DSEZMC, development of the entire DSEZ consists of the other 9 related projects following:

1. Two-Lane Linked Road;
2. Small Port;
3. Initial Industrial Estate;
4. Initial Phase Power Plant;
5. Initial Township;
6. Small Water Reservoir;
7. Telecommunications Landline;
8. LNG Terminal; and
9. Boil-off Gas and Temporary Power Plants.

2.3 PRESENTATION OF THE PROJECT PROPONENT

Dawei Residence Company Limited (DRC) is a Myanmar company established by Dawei Residence Holding Limited (DRHL) to develop, invest, own any permits and licenses, operate and provide the services in relation to residence business and relevant activities in the DSEZ. Herein this EIA report is referred as "*The Project Proponent*" (see Annex 2-1, brief information on the Project Proponent). DRC is awarded by the Dawei Special Economic Zone Management Committee (DSEZME) in developing "*The Initial Township*" (The Project). The Project Proponent is founded on April 9th, 2015 in the Republic of the Union of Myanmar and is subsidiary of the Italian Thai Development Public Company Limited (ITD). The Project Proponent has following registered address:

- Yangon Head Office is at 6th Floor, Salomon Business Center, 224/A, U Wisara Road, Bahan Township, Yangon, Myanmar. Telephone number is +951-535-421. Fax number is + 951-535-421. Company website is http://www.daweiindustrialestate.com. Google GPS coordinate is 16.804441, 96.142993.

2.4 PRESENTATION OF THE EIA STUDY TEAM

DRC as the Project Proponent delegates United Analyst and Engineering Consultant Co., Ltd. (UAE) to conduct the Environmental Impact Assessment (EIA) of the project. In this report, UAE is referred to "*the EIA Study Team*".

UAE is formed by environmental professionals (in Annex 2-2). UAE provides complete loop of environmental services from project conception through project planning and feasibility study, environmental samplings, analytical laboratory, environmental assessments, auditing and monitoring and public participation. The service experiences various physical and utility infrastructures including urban mass transit system, ports, power plants, oil and gas and industrial estate. Consequently, UAE can provide comprehensive services covering all aspects of development projects and business management. UAE has completed assignments not only in Thailand but also in neighboring countries in AEC, particularly Lao PDR, Viet Nam, Cambodia and Myanmar. The EIA Consultant has following registered address:

- 81 Udomsuk 41, Bangchak, Phrakhanong, Bangkok, Thailand 10260 Telephone number is +66-2763-2835. Fax number is +66-2763-2830. Company website is www.uaeconsultant.com

2.4.1 Implementation Organization for the EIA

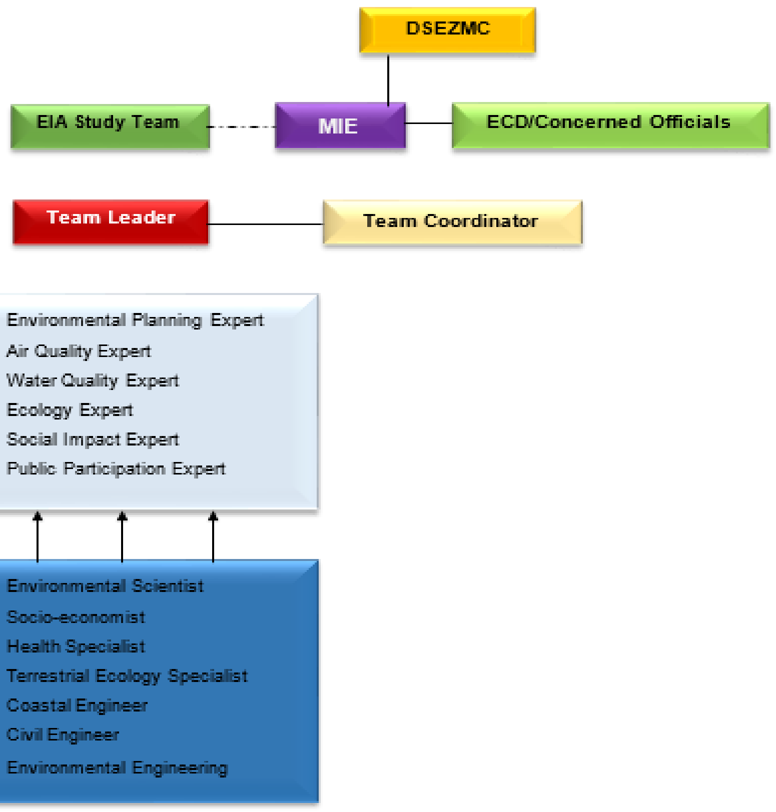
Organization in charge of the implementation of the EIA is presented in Table 2.4-1. The members of EIA Study Team are listed in Table 2.4-2 and Table 2.4-3.

Table 2.4-1 Implementation Organization of EIA

Consultant	Organization	Responsibility
International Lead Consultant	United Analyst and Engineering Consultant Ltd. (UAE)	Overall management and technical aspect of EIA
Local Consultant	Resource and Environmental Myanmar Ltd. (REM)	Public Consultation Meeting

Source: EIA Study Team

The EIA study is conducted by a multidisciplinary team consisting of professionals in various related disciplines. The EIA study team consists of a core study and planning group and a technical support group. A simple organizational structure for conducting and managing the EIA study is shown in Figure 2.4-1. The Team Leader manages technical aspect of the EIA study. The Team Coordinator assists the Team Leader in coordinating among members of the EIA team and among the EIA team, Project Proponent, and the Myanmar Environmental Conservation Department (ECD).



Source: EIA Study Team

Figure 2.4-1 Organization of the EIA Study Teams

The core study and planning group of the EIA study team consists of qualified and experienced professionals in various technical areas relevant to major environmental and social impacts of the Project, including (i) air pollution; (ii) water pollution; (iii) terrestrial ecology forest and wildlife; (iv) waste management; (v) public participation; (vi) social impact assessment; (vii) occupational health and safety; and (viii) environmental management planning. The environmental management planning expert will assist the Team Leader to ensure that

scoping and final EIA report will meet all requirements prescribed in the administrative instruction of EIA, EIA Procedure and the EIA Guidelines, and ECD comments and recommendation including a practical environmental management plans and mitigation measures are enable to implement. The core study and planning group will be supported by a technical support group consisting of professionals in various disciplines relevant to the environmental and social contexts, including; (a) environmental sciences; (b) socio-economics; (c) public health; (d) terrestrial ecology; and (e) civil engineering and environmental engineering.

The members of EIA Core Specialist Team are listed in Table 2.4-2 and Technical Expert Team are listed in Table 2.4-3. The profile of each organization and the curriculum vitae of the key experts of the EIA Study Team are attached in Annex 2-3.

Table 2.4-2 Members of the EIA Specialist Team

Name of Organization	Name	Position	Background	Years of Experiences
United Analyst and Engineering Consultant Ltd. (UAE)	Mrs. Suparatana Jotisakulratana	EIA & Public Consultation Specialist (EIA Registered)	M.Sc. (Environmental Biology) B.Sc. (Sanitation)	36 years
	Ms. Wilasinee Anomasiri	Socio-Economic and Indigenous Specialist	Ph.D. (Environmental Management) M.A. (Social Science) B.A. (Geography)	30 years
	Ms. Pensri Watchalayan	Occupational Health and Safety Specialist	Ph.D. (Environmental Management) M.Sc. (Toxicology) B.Sc. (Occupational Health & Safety)	27 years
	Ms. Nathinee Srinate	Environmental and Waste Management Specialist	Ph.D. (Chemical Engineering) M.Eng. (Chemical Engineering) B.Sc. (Chemical Technology)	11 years
	Ms. Rujiroj Anambutr	Land Use Specialist	Ph.D. (Urban & Environmental Planning) M.Sc. (Urban Planning) M.Sc. (Landscape Architecture) B. Arch.	27 years
	Ms. Ratata Timmanee	Air and Noise Specialist	M.Sc. (Industrial Public Health) B.Econ. (Economy)	23 years
	Mr. Watana Sukasem	Water Resources Specialist	M.Sc. (Oceanography) B.Sc. (Oceanography)	27 years
	Mr. Kanchit Womgsaengchan	Wastewater and Water quality Management Specialist	M.Sc. (Environmental Management & Technology) B.Sc. (Sanitary Science)	28 years
Resource and Environmental Myanmar Ltd. (REM)	Mrs. Khin Ohnmar Htwe	Social Specialist	M.A. (Geography) B.A. (Geography) Diploma in English	23 years

Source: EIA Study Team

Table 2.4-3 Members of the EIA Expert Team

Name of Organization	Name	Position	Background	Years of Experiences
United Analyst and Engineering Consultant Ltd. (UAE)	Ms. Pornwipa Klangsin	Team Leader, Project Manager Environmental, Health and Water Expert	Ph.D. (Environmental Health Science) M.Sc. (Environmental Health Management) B.Sc. (Medical Technology)	27 years
	Ms. Nawarat Kieomat	EIA & Public Consultation Expert (Thai EIA Registered Expert)	M.Sc. (Tech. Information Sys. Management) B.Sc. (Marine Science)	19 years
	Ms. Krittika Bunyachatphisuth	EIA Expert (Air, Noise and Vibration)	M.Sc. (Environmental Science) B.Sc. (Marine Science)	24 years
	Mr. Pat Thepasit	Public Consultation Expert (Socio-Economy)	M.Sc. (Environmental Management) B.A. (Forestry and Environmental Extension) B.Sc. (Resource & Agricultural Economics)	14 years
	Mr. Somchai Suravit	Project Coordinator EIA Expert (Natural Environment)	M.Sc. (Fisheries Science) B.Sc. (Fisheries Science)	24 years
	Ms. Nannapat Natchakunlasap	Sub-Project Coordinator EIA Expert (Natural Environment)	M.Sc. (Environmental Management) B.Sc. (Geology)	9 years
	Mr. Weerawat Thongkeatcharoen	Sub-Project Coordinator Public Consultation Expert	B.Sc. (Environmental Resource Studies)	3 years
	Ms. Orapan Shumnanrum	EIA Expert (Soil Expert)	B.Sc. (Soil Resource & Environmental Management)	3 years
	Mr. Mongkol Mirutanaphai	EIA Expert (Natural Environment)	B.Sc. (Environmental Resource Studies)	3 years
Resource and Environmental Myanmar Ltd. (REM)	Ms. Phyu Phyu Thein	Social Expert (Social Science)	M.Sc. (Social Science) B.Sc. (Physics) Diploma in Business	11 years

Source: EIA Study Team

2.5 SCOPE OF THE EIA

Most of project activities during construction and operation phases will be restricted in the proposed area of 1.375 square kilometers of the Initial Township. Therefore, evaluation of impacts on environment will be emphasized in the Project and adjacent areas. Impacted area assessed in this EIA study are vary depending on the environmental and social aspects.

In principal the impact area is assessed within 5 kilometers in radius from the Project boundary. Primary data (2012-2015) are gathered from the project sites and secondary data are gathered from previous studies and the other related EIA and IEE projects in DSEZ. Size of data or area of samplings are confirmed to cover scope of the EIA study in all aspects.

4 types of resources are conducted environmental and social impact assessment; physical, ecological, economic development and social and cultural resources. Table 2.5-1 presents the resources that may be relevantly impacted or benefited from the Project activities. Twenty of concerned aspects are assessed both during construction phase and operation phases. Materials and methodology in this EIA assessment are presented in Table 2.5-2.

Table 2.5-1 Scope of Environmental Impact Assessment for the Initial Township

Physical Resources	Ecological Resources
1.Climate and Air Quality	1.Surface water
2. Noise and Vibration	2.Biology and Forest
3. Topography and Soil	3.Wildlife
4. Hydrology	
5. Surface water and Sediment	
6. Groundwater	
7. Geology and Seismology	
Economic Development	**Social and Cultural Resources**
1.Initial Industrial Estate Development	1.Communitites and population
2.Infrastructure Facilities	2.Health Facilities
3.Traffic and Transportation	3.Education Facilities
4.Land Use	4.Facilities and Infrastructure
	5.Land Use and Land Holding
	6.Historical and Archeological Sites

Source: EIA Study Team

Table 2.5-2 Study methods of EIA for the Initial Township

Environmental Issues	Study Methods	
	Existing Environment	**Impact Assessment**
1. Physical Resources		
1.1 Air Quality and Climate	• Review climate record from The Geology of Burma (Myanmar): An Annotated Bibliography of Burma's Geology, Geography and Earth Science, US Army Corps of Engineers, September, 2008. • Review air quality measurements from relevant environmental studies.	• Indicate the study boundaries; • Assess the types of pollutants and emission concentrations released after during the construction and operation periods, and compare them with the combined impacts from the proposed project and other existing sources in the vicinity;.
1.2 Noise and Vibration	• Review noise and vibration measurement from relevant environmental studies.	Noise • Identify the potential noise sources, and levels, during the construction and operation periods; • Evaluate change in the noise level in the project area and surrounding communities; • Use of internationally recognized methods or models to evaluate potential noise impacts. Vibration • Identify the potential vibration sources and levels during the construction and operation periods; • Assess the vibration impacts on nearby communities and buildings.
1.3 Topography and Soil	• Review topography from relevant environmental studies; • Review topographical map of Tavoy Burma 1:250,000 Series U542, Sheet ND 47-6, Edition 1-AMS, 1957. • Review Myanmar Dominant Soils (*http://www.tec.army.mil/Burma/maps/SoilMap_Myanmar_300dpi.jpg*).	• Evaluate the impacts from project's activities; e.g., changes in topography, land subsidence, changes in slope, and soil erosion.

Table 2.5-3 Study methods of EIA for the Initial Township (Cont.)

Environmental Issues	Study Methods	
	Existing Environment	**Impact Assessment**
1.4 Hydrology and surface water and sediment quality	• Review the main rivers near, and within, the project area from Port of Map Sheet No.1497_15, 1498_03 & 04, Vertical Datum: MSL at Kyaikkami. • Conduct surface water quality and sediment sampling during February, 2015 (before monsoon season). The surface water and sediment quality are collected and analyzed at 11 sampling stations. The water quality parameters analyzed: Temperature; pH; Salinity; Electrical Conductivity; DO; BOD; Turbidity; COD; TSS; TDS; TS; Nitrate-Nitrogen; Ammonia-Nitrogen; Phosphate-Phosphorus; TKN; Oil&Grease; Phenol; TPH; Iron, Manganese; Cadmium; Hexavalent Chromium; Lead; Zinc; Nickel; Copper; Cyanide; Arsenic; Total Mercury; TCB; FCB; and E.Coli. The sediment quality parameters analyzed: Oil&Grease; Iron; Arsenic; Cadmium; Total Chromium; Copper; Mercury; Nickel; Lead; and Zinc.	• Evaluate potential change in the hydrology of the surface water quality due to land excavation and/or reclamation, during project site preparation and construction; • Describe the impact of the treated wastewater on the receiving water quality, with respect to possible change in the water and sediment quality, along the course of the receiving water, at and below the point of discharge due to BOD loading; • Assess the change in the receiving water quality for different seasons of the year in Dawei River, through evaluation of DO sag curve; • Identify potentially affected communities, in case the receiving water is polluted.
1.5 Groundwater	• Review groundwater quality from relevant environmental studies. • Conduct groundwater quality sampling during December 2012 (after monsoon season) and March 2013 (before monsoon season).The groundwater quality is collected and analyzed at the two sampling stations. The parameters analyzed: pH; Turbidity; Electrical Conductivity; TS; TDS; TSS; Fluoride; Iron; Cyanide; Total Hardness; Non-carbonate hardness; Selenium; Sulfate; Nitrate-Nitrogen; Manganese; Cadmium; Hexavalent Chromium; Arsenic; Lead; Zinc; Mercury; Nickel; Copper; TCB; and E.Coli.	• Evaluate potential changes in groundwater quality due to project activities; e.g., contamination from landfill leachate.

Table 2.5-3 Study methods of EIA for the Initial Township (Cont.)

Environmental Issues	Study Methods	
	Existing Environment	**Impact Assessment**
1.6 Geology and Seismology	• Review the geological map of the Socialist Republic of the Union of Burma (scale 1:1,000,000), prepared under the auspices of the earth sciences research division, 1977; • Review Burma Rock Types, accessed from (http://www.tec.army.mil/Burma/maps/RockTypes1990.jpg accessed on 8 November, 2012); • Review report on Regional Geology of Myanmar conducted by Department of Geological Engineering, Faculty of Engineering, Gadjah Mada University, April, 2010 (*http://kyawlinnzaw.weebly.com/uploads/4/5/1/3/4513060/regional_geology_of_myanmar.pdf* accessed on 22 November, 2012); • Review the volcanic occurrences in relation to tectonics in Central Myanmar Basin, posted on December 5, 2011 (*http://www.hlahlaaung.com/?p=42*accessed on 22 November, 2012); and • Review the Seismic and Tsunami Activities in Myanmar, Kyaw Kyaw Lin, Department of Meteorology and Hydrology, Ministry of Transport (*http://www.seis.nagoya-u.ac.jp/kimata/jica/kyawkyaw.pdf* accessed on 22 November, 2012).	• Assess the potential of seismic effects on the project site and adjacent areas. • Recommend a solution, in case significantly adverse impact is found.
2. Ecological Resources		
2.1 Fisheries	• Review fisheries data from other environmental studies. • Conduct fish sampling in Dawei River in February, 2015 to estimate capability to catch fish by the fishing gear used in the sampling.	• Assess the potential impacts on fisheries during construction and operation periods from discharging wastewater (if any); e.g., reduced productivity due to an increase in turbidity during construction.

Table 2.5-3 Study methods of EIA for the Initial Township (Cont.)

Environmental Issues	Study Methods	
	Existing Environment	**Impact Assessment**
2.2 Aquatic Biology	• Review aquatic biological data from other environmental studies. • Conduct plankton and fish sampling in Dawei River in February, 2015 to estimate fish capability to catch fish by the fishing gear used in the sampling.	• Assess the potential impacts on aquatic biology during construction and operation periods from discharging wastewater, which may affect aquatic biology.
2.3 Terrestrial Biology and Protected Area	• Review terrestrial biological information from other environmental studies.	• Assess the potential impacts on wildlife habitats, forest resources, endangered species, and protected areas from project activities.
3. Economic Development		
3.1 Industries and Mineral Development	• Review economic activity and land use map (http://www.mapcruzin.com/free-maps-burma-myanmar/burma_econ_1972.jpg accessed on 8 November 2012).	• Evaluate potential positive impacts on industries and mineral developments in terms of transportation system.
3.2 Infrastructure Facilities	• Site visit in March, 2015, and. • Collect information regarding existing infrastructure facilities from relevant environmental studies	Water Supply • Evaluate any change in the water quality and in the availability that may prevent the surrounding communities from normal use of the water. • Focus on the adequacy and appropriateness of the proposed water supply for the project, and how it might affect the availability of water for the adjacent communities.

Table 2.5-3 Study methods of EIA for the Initial Township (Cont.)

Environmental Issues	Study Methods	
	Existing Environment	**Impact Assessment**
		• Include any potential conflict between the project, and other concerned parties when utilizing the common water resources. Electricity • Evaluate potential effect of local electrical power supply. • Identify the planned area, and capacity, of the high-voltage power generation facilities; and possible methods of resolving adverse impacts, due to facility activity.
3.3 Transportation	• Review transportation network in Myanmar, from Burma (Myanmar) – Infrastructure, power, and communications (*http://www.nationsencyclopedia.com/economies/Asia-and-the-Pacific/Burma-Myanmar-INFRASTRUCTURE-POWER-AND-COMMUNICATIONS.html* accessed on 22 November, 2012). • Collect transportation information from relevant environmental studies.	• Evaluate the effects of the project's transportation activities on adjacent communities. • Investigate capacity, traffic volume, and accident rates of the existing transportation systems, in the study area. • Propose measures to accommodate an increase in traffic volumes, due to project activities, during the construction and operation phases of the project.

Table 2.5-3 Study methods of EIA for the Initial Township (Cont.)

Environmental Issues	Study Methods	
	Existing Environment	**Impact Assessment**
3.4 Land Use	• Review land use information from other environmental studies. • Review land use information collected by the Project. • Review land use information, collected from the existing maps, prepared by local authorities.	• Assess any potential changes in land use patterns surrounding the project location, and ensure compliance to any relevant law or government policy on land use allocations. • Summarize the actions needed for fair and just compensation, and relocation, for any parties resettled due to the project.
3.5 Agricultural Development	• Review agricultural development, from the Geology of Burma (Myanmar): An Annotated Bibliography of Burma's Geology, Geography and Earth Science, Topographic Engineering Center, US Army Corps of Engineers, September, 2008. • Site visit in March, 2015. • Review the agricultural area within the project area using the land use survey map from Italian Thai Development.	• Evaluate potential impact on agricultural development; e.g., agricultural area, or the potential positive impact on transporting agricultural products.
3.6 Drainage System	• Review the existing drainage systems in the project, and the surrounding area, from relevant environmental studies. • Review the designed flood prevention measures and capacity of the drainage system; evaluate the potential impacts to the project and surrounding areas.	• Evaluate the potential of floods in the project area.

Table 2.5-3 Study methods of EIA for the Initial Township (Cont.)

Environmental Issues	Study Methods	
	Existing Environment	Impact Assessment
4. Social and Cultural Resources		
4.1 Population and Communities	• Review secondary information from local authorities. • Collect information related to population and communities, from the potentially affected villages in the project area via site surveys and questionnaires.	• Evaluate the potential impacts due to the project's development and its activities on the population density and friction between labor and the native population.
4.2 Health Facilities	• Review public health information; i.e., the number of hospitals, common diseases, mortality, etc., from local authorities.	• Evaluate the potential impacts due to the project's development, and its activities on the status of public health services and occurrence of illnesses in the adjacent communities.
4.3 Socio-economic Conditions	• Review secondary information from local authorities. • Collect information related to socio-economic conditions, from the potentially affected villages in the project area, by utilizing site surveys and questionnaires.	• Assess the potential impacts on local socio-economic conditions, including job employment and generated income.
4.4 Physical and Cultural Heritage	• Review secondary information from other environmental studies. • Review secondary information from local authorities.	• Evaluate the potential impact from project activities of recreational, or tourist, value.

Source: EIA Study Team

2.6 MONREC'S COMMENTS ON SCOPING AND DRAFT EIA REPORT

As required in the EIA process, DRC submitted the scoping EIA Report to the Environmental Conservation Department (ECD) of the Ministry of Natural Resources and Environmental Conservation (MONREC). ECD commented on the scoping reports for 2 times, in February 2016 (the 1st comments) and the 10th March 2016 (the 2nd comments). The comments and recommendations were added and corrected, as presented in Table 2.6-1 and Table 2.6-2, respectively.

Later on, DRC submitted draft final EIA Report and ECD commented on 3rd February 2017 (the 3rd comments) and responses to the comments were summarized in Table 2.6-3. Then, DRC re-submitted the draft final EIA Report and replied by MONREC on 17th July 2017 (the 4th comments), points to be supplemented to remarks and opinions on the project to be implemented in the Township were following Table 2.6-5.

Table 2.6-1 Comments from MONREC on 1st draft of scoping EIA report and responses.

Comments	Responses
• Executive Summary in the EIA report either in Thai and Myanmar languages	Chapter 1
• The draft EIA Procedures has to be described in the chapter titled Registration and Institution. It is necessary to amend EIA procedure (2015 December)	Annex 3-1 and Annex 3-2
• The Environmental Management Plan should be made in accordance with EIA procedure.	Chapter 8 Entire chapter
• It is necessary to add Ramsar convention in International Agreement.	Chapter 3, Section 3.1.3 Page 3-20
• It is necessary to add National Environmental Quality (Emission) Guideline (2015), law for the conservation of antique materials, law for the conservation of ancient infrastructures and other necessary laws, rules and regulations which are related to the project.	Chapter 3, Section 3.4 Page 3-27 to 3-33 Chapter 3, Section 3.5 Page 3-34 to 3-42
• It is necessary to add commitments on following the laws while implementing the project.	Chapter 3, Section 3.5
• It is necessary to add Disaster Risk Reduction Plan	Chapter 4, Section 4.1-10 Page 4-67 to 4-80 Annex 6-1
• It is necessary to state the organizations involved and the budgets for Environment Management Plan precisely.	Chapter 8, Section 8.4 Page 8-56 to 8-61 Table 8.4-1, Section 8.6 Page 8-61 to 8-63.
• On page 4 of chapter 9 Public consultation and Disclosure, the suggestions and opinions by the villagers of Mindut Village and Pagaw Yun Village have been described.	Chapter 9, Section 9.3.1 Page 9-3 to 9-6

Table 2.6-1 Comments from MONREC on 1st draft of scoping EIA report and responses.

Comments	Responses
• It is necessary to attain concerns of the affected people by the project described on page 129 of chapter 4	Chapter 9, Section 9.3.1.2 Page 9-5 to 9-6
• It is necessary to add Resettlement Action Plan (RAP)	None of resettlement
• 5 samples of acquiring public concerns have been described in the Annex.	Chapter 9, Entire Section 9.3 Annex 9-1, Annex 9-2, Annex 9-3, Annex 9-4, Annex 9-5
• It is needed to attach the concerns and opinions of local people in the samples described	
• General Suggestions • According to EIA Procedure, the summary of report should be added	Executive Summary is added in Chapter 1
• It is needed to state the Certificate and license by the Governments of the respective foreign countries involved as third -party organizations in implementing the environment impact report as evidence	Certificate of the registration of EIA consultant is added

Source: EIA Study Team

Table 2.6-2 Comments from MONREC on 2nd draft of scoping EIA report and responses.

Comments	Responses
• Executive summary in the EIA report with a final design information either in Thai and Myanmar languages	Chapter 1.
• Provide such details in design, layout and system.	Chapter 1, Section 1.3.2 Page 1-16 to 1-18
• Laws related to labor and indigenous people and proportion of labor in local people;	Chapter 3, Section 3.1.1, 3.1.1.6 Page 3-7 to 3-8, Table 3.1.1
• Provide source of materials in pre-construction phase; for example, for land graded and leveled	Chapter 4, Section 4.1.2 Page 4-8 to 4-13
• Water treatment system, which is in the EIA report of initial industrial estate project.	Chapter 4, Section 4.1.6 Page 4-40 to 4-12
• Summarize on activities need to utilize water, WHO standard and length of water pipe system etc.	Chapter 4, Section 4.1ๅ Page 4-40 to 4.42, Figure 4.1-36
• Solid waste management system such as location and impacts on Dawei river	Chapter 4, Section 4.1.8 Page 4-48 to 4-56 Chapter 6, Section 6.3.1.4 Page 6-18 to 6-19, ESIA IE
• Firefighting system such as provider, operator and installation. Commitment to act and follow by Law	Chapter 4, Section 4.1.10 Page 4-67 to 4-76 Annex 4-5, Chapter 3, Section3.5

Table 2.6-2 Comments from MONREC on 2nd draft of scoping EIA report and responses.

Comments	Responses
• Evaluation of risk and impacts on natural disaster and emergency plan in case of (Bush) fire and storm such as cyclone	Chapter 6, Section 6.3.6 Page 6-23 to 6-26
• Review on impact area, if one kilometer is enough	Chapter 5, Section 5.1.1 Page 5-1
• Evaluate dispersion of dust and air quality	Chapter 6, Section 6.2.1.1 Chapter 6, Section 6.3.1.1 Page 6-1, 6-16 to 6-18
• Project name should be excluded "Initial"	Remain include Initial
• Presentation of project components and details with figures or illustration and formatting contents of the EIA report	Presented
• Submit Environmental Management Plan (EMP) Report	Summited
• Conclude the previous comments and explicate location of corrections in the EIA report	Concluded

Source: EIA Study Team

Table 2.6-3 3rd Comments (3rd February 2017) from MONREC on draft of final EIA report and responses.

Comments	Responses
• Executive Summary in Myanmar language	Executive Summary in Myanmar language
• To describe member list of the consulting team of EIA including resume	Chapter 2, Section 2.4 Page 2-6 to 2-9
• To add the Project commitments and sign of endorsement commitments	Chapter 2, Section 2.3 page 2-8 Chapter 3, Section 3.5 Page 3-34 to 3-46
• To describe laws and regulation related to labor	Chapter 3, Section 3.1.1, Section3.1.1.6, Table 3.1.1 Page 3-7 to 3-8
• To describe complying for environmental management plan and commitments	Chapter 3, Section 3.5 Page 3-34 to 3-46. Chapter 8 Entire chapter
• To describe job opportunities for local people	Chapter 9, Section 9.7 Page 9-12, Annex 9-4
• To describe details of Commercial/Retail shop, 5-floor workforce apartment, 8-floor workforce apartment, 3-floor retail ships, recreation / sport / green area, road and traffic route and initial facilities that will construct in the township.	Chapter 4, Section 4.1.2.2 to Section 4.1.2.3 Page 4-14 to 4-33

Table 2.6-2 Comments from MONREC on 2nd draft of scoping EIA report and responses.

Comments	Responses
• To describe information about infrastructure such incinerator and hospital, impact assessment and management.	Chapter 4, Section 4.1.2.4 Page 4-33, Section 4.1.3 to 4.1.8 Page 4-35 to 4-56
• To describe details of solid waste management and demonstration of feasibility studies in term of landfills space.	Chapter 4, Section 4.1.8 Page 4-48 to 4-56 and Annex 4-3
• To describe disaster risk reduction plan, Emergency Response Plan and Fire Fighting System.	Chapter 4, Section 4.1.9 to Section 4.1.10 Page 4-56 to 4-76
• To describe water supply is enough and alternate use of groundwater	Chapter 4, Section 4.1.6 Page 4-4 to 4-6 and 4-43
• To describe impact on natural disaster	Chapter 6, Section 6.3.6 Page 23 to 26
• To describe each Environmental Management Plan (separate each aspects)	Chapter 8, Section 8.2 to Section 8.5 Page 8-1 to 8-61
• To describe resettlement action plan and social and cultural protection	Chapter 9, Section 9.6 Page 9-12, Section 9.7 Page 9-12 Section 9.8, Page 9-13 to 9-14 Annex 3-2
• To describe job training for local people	Chapter 9, Section 9.7 Page 9-12
• To submit responsible organization for Environmental Monitoring Pan (EMP) and budget to Review team	Summited to EMP Review Team
• To correct and describe Environmental Conservation Department as it is described as Department of Forestry in Form of Confirmation and Letter of Under taking for EIA/ESMMP which is express at the beginning of the Report	Corrected
• To correct and describe as MONREC in place of MONREC	Corrected
• To delete EIA Guideline (2014)	Deleted

Source: EIA Study Team

Table 2.6-4 4th Comments (17th July 2017) from MONREC on draft of final EIA report and responses.

Comments	Responses
• It is found that although the undertaking of the project proponent is stated, it has not been signed thereon.	Signed

Table 2.6-2 Comments from MONREC on 2nd draft of scoping EIA report and responses.

Comments	Responses
• Although the remark is made that the project report be posted on the company's website, as it is not found thereon, the web link to the report shall be provided in the Environmental Impact Assessment Report (to provide pursuant to EIA Procedure paragraph 65)	Chapter 9, Section 9.4 Page 9-10 to 9-11
• Although the remark is made that the public consultation process shall be conducted once in 2017, there is no statement regarding the implementation thereof.	Chapter 9, Section 9.3.2 Page 9-7 to 9-9

Source: EIA Study Team

2.7 STRUCTURE OF THE EIA REPORT

The EIA report is outlined with 10 Chapters in accordance with The Environmental Impact Assessment Guidelines of The Republic of the Union of Myanmar (MONREC, 2015).

Table 2.7-1 Proposed EIA Report Structure

Chapter Number	Chapter Title	Contents
1	Executive Summary	• Summary of significant findings both in English and Myanmar languages. The section will provide concise essence for executives.
2	Context of The Project	• Background and Project justification are prescribed and Presentation of Project Proponent (DRC) and the EIA Experts. • Scope of the EIA, the Project's timelines, ECD's comments and endorsement of the EIA report.
3	Overview of Policy and Institutional Framework	• Compilation of relevant environmental policies, laws and regulations that implementing in the Project and consolidation of institutional framework. • Key international and national guidelines applicable to the Project and detailed legal commitments.
4	Project Description and Alternatives	• Description of the Project setting location, phase development and management of construction and operation. • Details and designs of Project components; infrastructure and facilities including; calculation and simulation, engineering designs, layouts; and drawings. • Emergency response plans for fire and incidents. Plans and prevention for natural disaster. Implementation of SHE Policy and Master Plans. • Comparisons of the Projects' alternatives.
5	Description of Environment	• Study limit of the EIA. Baselines and existing condition of each environmental components; physical, biological, socio-economic and cultural. • Research methodologies and the results of studies.
6	Impact and Risk Assessment and Mitigation Measures	• Assessment of the impacts for each components. Determination and prediction of such significant impacts according to their phases, construction and operation. • Mitigation measures and recommended solutions for residual impacts. • Risks assessment.
7	Cumulative Impact Assessment	• Evaluation of incremental and combined impacts for entire project's life span.

Table 2.7-1 Proposed EIA Report Structure

Chapter Number	Chapter Title	Contents
8	Environmental Management Plans	• Summary for each phase EMPs i.e. proposed mitigation measures, EMoPs and their methodology. • Budgets and institutional arrangement. • Implementation on mitigation measures' policies and commitments.
9	Public Consultation and Disclosure	• Summary for consultation activities, public opinions and recommendations. • Information Disclosure
10	Conclusions and Recommendations	• Major conclusions and recommendations for future actions.

Source: EIA Study Team

2.8 SCHEDULE OF EIA

Activities during scoping and draft final reports are presented in Table 2.8-1 and Table 2.8-2, respectively.

Table 2.8-1 Schedule of activities in EIA Study for Final Report in 2017 and 2018

Activities in Draft Report	2016	2017												2018				
		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY
Public consultation 2nd																		
Approval of Final Scoping Report by DSMC																		
Preparation of the 1st Draft EIA Report																		
Submission of Draft EIA Report																		
EIA Review Committee																		
Presentation to ECD																		
Comments Letter of 1st Draft EIA Report																		
Preparation of the 2nd Draft EIA Report																		
Public Disclosure																		
Submission of Final EIA Report																		
EIA Review Committee																		
Comments Letter of Final EIA Report																		
Preparation of the Final EIA Report																		
EIA Review Committee																		
Approval of EIA Report																		
Public Disclosure																		
Final Public Consultation 3rd																		
Final Submission of EIA Report																		

Source: EIA Study Team

Table 2.8-2 Schedule of activities in EIA Report Preparation

	Activities	2016																																			
		JAN				FEB				MAR				APR				MAY				JUN				JUL				AUG				SEP			
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
	Methodology																																				
1.	Review relate environmental impact studies	■	■	■	■	■	■	■	■																												
2.	Develop guideline for performing EIA					■	■	■	■																												
3.	Study the existing environment					■	■	■	■	■	■	■	■																								
4.	Initial examination of environmental (IEE) report									■	■	■	■																								
5.	Impact assessment						■	■																													
6.	Mitigation measures & Monitoring programs								■	■																											
7.	Study final development plan of the project													■	■	■	■																				
8.	Preparing EIA report													■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■				
9.	Public consultation									■	■	■	■																								
10.	Meeting/Presentation in Myanmar								■		■																									■	■
	Report Delivery																																				
1.	Progress report (40 days)					●																															
3.	Draft EIA report (120 days)													●																							
4.	Final EIA report (180 days)																																●				

Source: EIA Study Team

2.9 PROJECT DEVELOPER'S ENDORSEMENT OF THE EIA REPORT

DRC on behalf of the Project consortium gives full endorsement of this EIA report and is fully committed to the implementation of all measures, including the provision of the necessary funds and human resources.

DRC will at all times comply fully with the commitments, mitigation measures, and plans that have been presented in this EIA Report.

DRC shall fully implement the EMP, all Project commitments, and conditions, and is liable to ensure that all contractors and subcontractors of the Project comply fully with all applicable Laws, including the Environmental Conservation Law (2012), Environmental Conservation Rules and Environmental Impact Assessment Procedure (2015), as well as the EMP, Project commitments and conditions.

List of commitments are prescribed in *Chapter 3, Section 3.5* and EMP and mitigation measures commitments are prescribed in *Chapter 8, Section 8.8*.

CHAPTER 3

OVERVIEW OF THE POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

3.1 MYANMAR REGULATORY FRAMEWORK

Environmental legislation is superior key in operation and management of the project. Therein, the principle for environmental management are formulated based on consideration of related national Policies, Laws and Regulations. Most of the legislation listed here are recent and still implement in the Union while some Acts are enacted since the union was under administration of the British India. The considerations in this chapter will be deliberately implemented and mandated through various stages of the Project development, from pre-construction, construction, operation and decommissioning.

The National Commissions for Environmental Affairs (NCEA) formed in February 1990 outlined the *Myanmar Agenda 21*, which contains social, economic, institutional and infrastructural including environmental conservation program. 56 environmental policies and regulations related with environmental conservation and protection and sustainable development were formulated under the National Environmental Conservation Committee (NECC), in April 2011.

As of May 2017, Myanmar has 21 ministries under the Office of the president. The leading ministry, as the focal and coordinating agency, for overall environmental management are the Environmental Conservation Department (ECD) of the Ministry of Natural Resources and Environmental Conservation (MONREC), is derived from the Ministry of Environmental Conservation and Forestry (MOECAF).

3.1.1 Legislation Related to Environmental Social and Health Considerations

The implementing agencies are required to make efforts to mitigate impacts to physical and biological environment, social and cultural environment including to enhance human quality in sustainable environment in concurrent with the Project development. The fundamental laws and regulations related to the environmental social and health considerations in the Project are summarized in Table 3.1-1.

Table 3.1-1 Legislation Related to Environmental Social Considerations

No.	Laws and Regulations as of May 2017
Environmental Foundation	
1	The National Environmental Policy (1994)

Table 3.1-1 Legislation Related to Environmental Social Considerations

No.	Laws and Regulations as of May 2017
2	The Environmental Conservation Law (2012)
3	The Environmental Conservation Rule (2014)
EIA / Environmental Standards	
4	Environmental Impact Assessment Procedure (2015)
5	National Environmental Quality (Emission) Guidelines (2015)
Natural Resources and Utilization	
6	The Land Acquisition Act (1894)
7	The Embankment Act (1909)
8	The Farmland Law (2012)
9	The Farmland Rules (2012)
10	The Vacant, Fallow and Virgin Lands Management Law (2012)
11	The Vacant, Fallow and Virgin Lands Management Rules (2012)
12	The Forest Policy (1995)
13	The Forest Law (1992)
14	The Protection of Wildlife and Wild Plants and Conservation of Natural Areas Law (1994)
15	The Conservation of Water Resources and Rivers Law (2006)
16	The Conservation of Water Resources and Rivers Rules (2013)
17	The Territorial Sea and Maritime Zone Law (1977)
Waste Management	
18	The Underground Water Act (1930)
19	The Water Power Act (1927)
20	The City of Rangoon Municipal Act (1922)
21	The City of Rangoon Development (1922)
22	The Development Committee (1993)
23	The Myanmar Mines Law (2014)
Social and Cultural	
24	The Protection and Preservation of Cultural Heritage Regions Law (1998)
25	The Protection and Preservation of Ancient Monuments Law (2015)
26	The Protection and Preservation of Antique Objects Law (2015)
27	The Rights of National Races Law (2015)
Public Health and Safety	
28	The Public Health Law (1972)
29	The National Health Policy (1993)
30	The Prevention and Control of Communicable Diseases Law (1995)

Table 3.1-1 Legislation Related to Environmental Social Considerations

No.	Laws and Regulations as of May 2017
31	The Control of Smoking and Consumption of Tobacco Product Law (2006)
32	The Motor Vehicles Law (2015)
33	The Motor Vehicles Rules (1987)
34	The Myanmar Fire Brigades Law (2015)
35	The National Drug Law (1992)
36	The National Food Law (1997)
Employment and Working Environment	
37	The Factory Act (1951)
38	The Worker's Compensation Act (1923)
39	The Payment of Wages Act (2016)
40	The Employment and Skill Development Law (2013)
41	The Minimum Wage Law / Rules (2013)
42	The Leave and Holiday Act (1951, partially revised in 2014)
43	The Labor Organization Law (2011)
44	The Labor Organization Rule (2012)
45	The Labor Dispute Settlement Law (2012)
46	The Social Security Law (2012)
47	The Shops and Establishment Act (1951)
Industrial Law	
48	The Marine Fisheries Law (1990)
49	The Freshwater Fisheries Law (1991)
51	The Petroleum Act (1934)
52	The Petroleum Rules (1937)
53	The Fertilizer Law (2002)
54	The Myanmar Investment Law (2016)
55	The Foreign Investment Law (2012)
56	The Myanmar Citizen Investment Law (2013)
57	The Myanmar Insurance Law (1993)
58	The Essential Supplies and Services Law (2015)
59	The Law on Standardization (2014)
60	The Electricity Law (2014)
61	The Myanmar Engineering Council Law (2013)
63	The Export and Import Law (2012)
64	The Myanmar Port Authority Law (2015)

Table 3.1-1 Legislation Related to Environmental Social Considerations

No.	Laws and Regulations as of May 2017
Special Economic Zone Law	
65	The Myanmar Special Economic Zone Law (2014)
66	The Myanmar Special Economic Zone Rule (2015)
67	Dawei Special Economic Zone Law (2012)

Source: EIA Study Team

Principle for the legislation listed above in relation to the project is fully prescribed in details in Annex 3-2. Overall, the legislation related to environmental social and health considerations are grouped and summarized in the following:

3.1.1.1 Environmental Foundation

The National Environmental Policy (1994), the Environmental Conservation Law (2012) and the Environmental Conservation Rules (2014) are foundation of environmental management and considerations. The National Environmental Policy aimed to establish a sound of environmental policies in the utilization of water, land, forests, mineral, marine, and other natural resources, in order to conserve the environment and prevent its degradation. The Policy calls for the integration of environmental development and to achieve sustainable development within the country, as well as giving environmental protection a priority in promoting economic development.

Followed by The Environmental Conservation Law (ECL) enacted in March 2012. This law is a fundamental law of environmental management and conservation in Myanmar. The law was prepared by MOECAF (MONREC) and deliberately mandated to the Environmental Conservation Rules (ECRs), as details enforcement regulations. Besides, ECL stipulates MONREC's responsibility for environmental policy, administration, management plan and implementation of environmental monitoring, setting of environmental standards, management of hazardous waste, and EIA procedures.

3.1.1.2 EIA and Environmental Standard

Environmental Impact Assessment (EIA) is mandated by the Environmental Conservation Law 2012 in No.9/2012 Section 42 (b). It is legal requirement for all projects that may pose significant adverse impacts on the environment and social. The EIA Procedure formulated by MONREC in coordination with Asian Development Bank (ADB) was enact in December 2015.

This Procedure covers the following contents: screening of project, qualification for conducting the Initial Environmental Examination (IEE) or EIA Environmental Management Plan (EMP), preparation of report, Environmental Monitoring Plan (EMP), public involvement,

and approval procedure from ECD under MONREC, Environmental Compliance Certificate (ECC) including monitoring process after the IEE/EIA approval (See Annex 3-1).

MONREC formulated the National Environmental Quality (Emission) Guidelines (NEQG) in coordination with ADB in December 2015. The NEQG determines the guideline values for general emission such as air emissions, wastewater, noise levels, odor specific to sector of the Project activities i.e. food production, chemicals, infrastructure, manufacturing and power. The NEQG is prescribed in *Section 3.4.1* of this Chapter.

3.1.1.3 Natural Resources and Utilization

(a) Land Use

The Land Acquisition Act (1894) serves as the principle law for land acquisition in Myanmar in order to formulate procedure for land acquisition and compensation. The act further outlines relevant procedures, including notice periods, procedures for objections to acquisition (Article 5), method of valuation of land, process for taking possession of land (Article 16 and 17), court processes and appeals (Article 18 and 24), procedures for the temporary occupation of land (Article 35), and the acquisition of land for companies (Articles 38). The act requires that compensation "*at market value*" is provided to those from whom the land is acquired (Article 23).

The Farmland Law and Rules (2012) determines the land use rights of farmland and the granting of land use rights to eligible farmers. It allows the right to sell, mortgage, lease exchange, and give either whole or part of the right to use the farmland. The law determines the formation as well as the roles/responsibilities of farmland administrative bodies at various levels. The Farmland Law and Rules determine procedures such as the application for farmland registration and obtaining land use certificates, application of transfer of farmlands for other purposes, and indemnities and compensation.

(b) Water Environment

The Conservation of Water Resources and River Law (2006). The aims of this law are to conserve and protect the water resources and river system for the beneficial utilization of public, enabling smooth and safe waterways navigation along rivers and creeks, contributing the development of the state economy through improving water resources and protecting river system from environmental impact.

(c) Forestry / Biodiversity

Objectives of the Protection of Wildlife and Wild Plants and Conservation of Natural Areas Law (1994) are to implement the government policy for wildlife protection and natural areas conservation and to carry out in accordance with the relevant International Conventions and to protect endangered species of wildlife and their natural habitats, to contribute for the

development of research on natural science, and to protect wildlife by the establishment of zoological/botanical gardens. It prescribes the formation of the committee for protection of wildlife and natural areas with its function and duties and the determination of natural areas and endangered species of wild animal which are to be protected.

The Forest Law (1992) supports conservation, sustainable forestry and socio-economic benefits while also partially decentralizing and encouraging the private sector and community participation in forest management.

3.1.1.4 Social and Cultural

The Protection and Preservation of Cultural Heritage Region Law (1994) prescribes the determination of cultural heritage regions for protection and preservation so as not to deteriorate due to natural disaster or man-made destruction. The Protection and Preservation of Ancient Monuments Law (2015) and the Protection and Preservation of Antique Objects Law (2015) are enacted to protect the antique objects, monuments and their information. The Protection of Rights of National Races Law (2015) promulgates to protect human right and equity of national race in such obtaining information and treatment.

3.1.1.5 Public Health and Safety

The Public Health Law (1972) is concerned with protection of people health by controlling the quality and cleanliness of food, drugs environment sanitation, epidemic diseases and regulation of private clinics. The Prevention and Control of Communicable Diseases Law (1995, revised in 2011) describes functions and responsibilities of health personnel and citizens in relation to prevention and control of communicable disease. It also describes measures to be taken in relation to environmental sanitation, reporting and control out breaks of epidemics and penalties for those failing to comply. The law also authorized the Ministry of Health to issue rules and procedures when necessary with approval of government.

The Control of Smoking and Consumption of Tobacco Product Law (2006) enacted to convince the public that smoking and consumption of tobacco product can adversely affect health in order to make them refrain from the use and to protect the public by creating tobacco smoke free environment including to protect public, children and youth from smoking and consuming tobacco product.

The Motor Vehicle Law (2015) and the Motor Vehicle Rules (1987). The Project Proponent has to promise to abide by the nearly all provisions of said law and rules, especially the provisions related to air pollution, noise pollution and life safety.

3.1.1.6 Employment and Working Environment

The Worker's Compensation Act (1923) stipulates that employer is required to make payments to employees who become injured or who die in any accidents arising during and

in consequence of their employment. Such compensation also must be made for disease which arise as a direct consequence of employment, such as carpal tunnel syndrome.

The Payment of Wage Act (1936) defines the payment obligation to the workers employed in the factories or railway administration. In stipulates the method of payment stating that the payment should be made in cash on a regular payday, and allows legal action against delayed payment or un-agreeable deduction.

The Factory Act stipulates the work condition of the workers in the factory such as working hours, worksite safety and health measures. According to the act, worker at age 18 or over shall not work exceed 8 working hours per day or 44 hours per week, and the working days shall not exceed 6 days per week. As for worksite safety, the factory shall be kept clean with proper ventilation, light and heat and the workspace shall be situated away from drains, latrines or other things which create a bad or unhealthy smell.

The Leave and Holidays Act (1951, partially revised in 2014) has been used as the basic framework for leaves and holidays for workers with minor amendment in 2006 and 2014. This defines the public holidays that every employees shall be granted with full payment. It also defines the rules of leaves for workers including medical leave, earned leave and maternity leave.

The Labor Organization Law (2011) replaced the Trade Union Act enacted in 1927 for protecting the right of the workers, having good relations among the workers or between the employer and the worker, and for forming and carrying out the labour organization systematically and independently. Under the law, the labour organization has the right to carry out freely in drawing up their constitution and rules. It has the right to negotiate and settle with the employer if the workers are unable to obtain the right of the workers contained in the labour laws. On the other hand, the employer shall recognize the labour organizations and assist as much as possible if the labour organizations request for help for the interest of his workers.

The Social Security Law (2012) enacted in 2012, was amended the Social Security Act in 1954. It stipulates the formation and implementation of social security system. The Labour Dispute Settlement Law (2012) was enacted for safeguarding the right of workers or having good relationship between employer and workers and making peaceful workplace or obtaining the rights fairly, rightfully and quickly by settling the dispute of employer and work justly. It stipulates that employer in which more than 30 workers are employed shall form the workplace coordinating committee consisting of the representatives of workers and the representative of employer.

The Minimum Wage Law (2013) passed in March 2013, was replaced the 1949 Minimum Wage Act. The law provides a framework for minimum wage determination: the presidential office establishing a tripartite minimum wage committee shall decide minimum

wage with industrial variation based on a survey on living costs of workers possibly every two years. This also stipulates equal payment.

3.1.1.7 Industrial Laws

The Foreign Investment Law (2012) is set up to delineate the statutory characteristics of investment into Myanmar. There are specific requirements in the law that stipulate the protection of the environment.

The Export and Import Law (2012) was enacted and the Control of Imports and Exports Act (1947) was abolished. It aims to implement the economic principles of the State successfully, to lay down the policies to export and import that support the development of the State, and that are to be in conformity with the international trade standards.

The Electricity Law (2014) was replaced by the new Electricity Law, a comprehensive piece of legislation covering licensing, a new regulatory commission, standards, inspection, tariff, and restrictions. The electricity law divides projects into "*small*" (up to 10 MW), "medium (between 10 MW to 30 MW) and large (up to 30 MW); the states and regions can issue permits for small and medium power plants. In case these plants are not connected to the nation grid, the Union Government Ministry is not the primary authority involved. The authorities have a legal right to use land for purpose of power plants under the Electricity Law, and have the right to expand and maintain their facilities. The law also provides that the authorities can build transmission lines in accordance with existing laws.

3.1.1.8 Special Economic Zone Laws

The Myanmar Special Economic Zone Law (2014), which was enacted in 2013 and revised in January 2014, provides the basis for the governments' establishment to SEZs to encourage economic growth and foreign investment through several incentives such as a five-year tax exemption and 50% income tax relief on items exported overseas for five years. Article 35 of this law stipulates that investors shall abide by the environmental standards described in the Myanmar Environmental Conservation Law and International Standards.

3.1.2 The Application of Laws and Legal Commitments

The necessity for the Project Proponent in application of permissions prior executing the development is to ensure that the Project will be effectively managed, with facilities and mitigation measures and be sufficient and sustain the union environment. Application of the following policy, laws, rules procedure and guideline that relates to the DSEZ Initial Industrial Estate are suggested in Table 3.1-2.

Table 3.1-2 Application of relevant environmental social and health laws and to be implemented legal commitments

No.	Legislation	Proposes	To be implemented commitments
1.	The Environmental Conservation Law (2012)	To construct a healthy and clean environment and to conserve natural and cultural heritage for the benefit of present and future generations and to maintain the sustainable development through effective management of natural resources and to enable to promote international, regional and bilateral cooperation in the matters of environmental conservation.	• The Project Proponent has to pay the compensation for damages if the project will causes injuries to environment under the sub-section (O) of section 7 of said law. • The Project Proponent has to purify, emit, dispose and keep the polluted materials in line with the stipulated standards, under section 14 of said law • The Project Proponent has to install or use the apparatus which can control or help to reduce, manage, control or monitor the impacts on the environment, under section 15 of said law. • The Project Proponent has to allow relevant governmental organization or department to inspect whether performing is conformity with the terms and condition included in prior permission, stipulated by the ministry, or not, under section 24 of said law. • The Project Proponent has to comply with the terms and conditions included in prior permission, under section 25 of said law. • The Project Proponent has to abide by the stipulations included in the rules, regulation, by-law, order, notification and procedure issued by said law, under section 29.
2.	The Environmental Conservation Rules (2014)		• The Project Proponent has to avoid emit, discharge or dispose the materials which can pollute to environment, or hazardous waste or hazardous material prescribed by notification in the place where directly or indirectly injure to public under sub- rule (a) of rule 68. • The Project Proponent has to avoid performing to damage to ecosystem and the environment generated by said ecosystem under sub-rule (b) of rule 68.
3.	Environment Impact Assessment Procedure (2015)		• The Project Proponent has to be liable for all adverse impacts caused by doing or omitting of project owner or contractor, sub-contractor, officer, employee, representative or consultant who is appointed or hired to perform on behalf of project owner, under sub-paragraph (a) of paragraph 102. • The Project Proponent has to support, after consultation with effected persons by project, relevant government organization, government department and other related persons, to resettlement and rehabilitation for livelihood until the effected persons by the project receiving the stable socio-economy which is not lower than the status in pre-project, under sub-paragraph (b) of paragraph 102. • The Project Proponent has to fully implement all commitments of project and conditions included in EMP. Moreover the Project Proponent has to be liable for contractor and sub-contractor who perform on behalf of him/her have to fully abide by the relevant laws, rules, this procedure, EMP and all conditions, under paragraph 103. • The Project Proponent has to be liable and fully & effectively implement all requirements included in ECC, relevant laws and rules, this procedure and standards under rule 104. • The Project Proponent has to inform the completed information, after specifying the adverse impacts caused by the project, from time to time, under paragraph 105.

Table 3.1-2 Application of relevant environmental social and health laws and to be implemented legal commitments

No.	Legislation	Proposes	To be implemented commitments
			• The Project Proponent has to continuously monitor all adverse impacts in the pre-construction phrase, construction phrase, operation phrase, suspension phrase, closure phrase and post-closure phrase, moreover has to implement the EMP with abiding the all conditions included in ECC, relevant laws & rules and this procedure, under paragraph 106. • The Project Proponent has to submit, as soon as possible, the failures of his or her responsibility, other implementation, ECC or EMP. If dangerous impact caused by this failure or failure should be known by the Ministry the Project Proponent has to submit within 24 hours and other than this situation has to submit within 7 days from knowing it, under paragraph 107. • The Project Proponent has to submit the monitoring report dually or prescribed time by Ministry in line with the schedule of EMP, under paragraph 108. • The Project Proponent has to prepare the monitoring report in accord with the rule 109. • The Project Proponent has to show this monitoring report in public place such as library, hall and website and office of project for the purpose to know this report by public within 10 days from the date which the report is submitted to the Ministry. Moreover has to give the copy of this report, by email or other way which way agreed with the asked person, to any asked person or organization, under paragraph 110. • The Project Proponent has to allow inspector to enter and inspect in working time and if it is needed by Ministry has to allow inspector to enter and inspect in the office and work-place of project and other work-place related to this project in any time, under paragraph 113. • The Project Proponent has to allow inspector to immediately enter and inspect in any time if it is emergency or failure to implement the requirements related to social or environment or caused to it, under paragraph 115. • The Project Proponent has to allow inspector to inspect the contractor and sub-contractor who implement on behalf of project, under paragraph 117.
4.	Emission Quality Standards Guideline (2015)		• The Project Proponent has to emit, discharge or dispose in line with the standards stipulated in said guideline.
5.	The Myanmar Investment Law (2016)	To ensure the appointing of employees, fulfilling the rights of employees, avoiding any injury to environment, social and cultural heritage, insure the prescribed insurance in line with the above law.	• The Project Proponent has to lease the land or building owned by government or private with lease agreement and register it by the registration of deeps law under sub- section (a) and (d) of section 50 of said law. • The Project Proponent has to appoint the nationalities in the various levels of administrative, technical and expert work by the arrangement to develop their expertise, in line with the sub-section (b) of section 51 of said law. • The Project Proponent has to appoint the nationalities only in normal work without expertise, in line with the sub-section (c) of section 51 of said law.

Table 3.1-2 Application of relevant environmental social and health laws and to be implemented legal commitments

No.	Legislation	Proposes	To be implemented commitments
			• The Project Proponent has to appoint either foreigner or nationality with the appointment agreement in accord with the law, in line with the sub-section (d) of section 51 of said law. • The Project Proponent has to comply with the international best practices, existing laws, rules and procedures to not damage, pollute, and injure to environment, cultural heritage and social, in line with the sub-section (g) of section 65 of said law. • The Project Proponent has to close the project after paying the compensation to the employees in accord with the existing laws if violates the appointment agreement or terminate, transfer or suspend the investment or reduce the number of employees , in line with the sub-section (i) of section 65 of said law. • The Project Proponent has to pay the wages or salary to the employees in accord with the laws, rules, order and procedures in the suspension period, in line with the sub-section (j) of section 65 of said law. • The Project Proponent has to pay the compensation or injured fees to the respected employees or their inheritors if injury in or loss of part of body or death caused by work, in line with the sub-section (k) of section 65 of said law. • The Project Proponent has to stipulate the foreign employees to respect the culture and custom and abide by the existing laws, rules, orders, directives, in line with the sub-section (l) of section 65 of said law. • The Project Proponent has to abide by labour laws, in line with the sub-section (m) of section 65 of said law. • The Project Proponent has to pay the compensation to the injured person for damages if damages of environment or socio-economy is occurred by misuse of project, in line with the sub-section (o) of section 65 of said law. • The Project Proponent has to allow to inspect in anywhere of project if Myanmar Investment Commission inform to inspect the project, in line with the sub-section (p) of section 65 of said law. • The Project Proponent has to obtain the permission of MIC before EIA process and report back this process to MIC, in line with the sub-section (q) of section 65 of said law. • The Project Proponent has to insure the prescribed insurance by rules, under section 73 of said law.
6.	Protection the Rights of National Races Law (2015)	To ensure to disclose to residents ethnic nationalities about the project fully, moreover to ensure to cooperate with them.	• The Project Proponent has to disclose to the residents national races all about the project fully, under section 5 of said law. • The Project Proponent has to cooperate with the residents national races.
7.	The Public Health Law (1972)	To ensure the public health include not only employees but also resident people and cooperation with the	• The project owner will cooperate with the authorized person or organization in line with the section 3 and section 5 of said law.

Table 3.1-2 Application of relevant environmental social and health laws and to be implemented legal commitments

No.	Legislation	Proposes	To be implemented commitments
		authorized person or organization of health department.	• The Project Proponent has to abide by any instruction or stipulation for public health, under section 3 of said law. • The Project Proponent has to allow any inspection, anytime, anywhere if it is needed, under section 5 of said law.
8.	Prevention and Control of Communicable Diseases Law (1995)	To ensure the healthy work environment and prevention the communicable diseases by the cooperation with the relevant health department.	• The Project Proponent has to build the housing in line with the health standards, distribute the healthful drinking water & using water and arrange to systematically discharge the garbage & sewage, under clause (9) of sub-section (a) of section 3 of said law. • The Project Proponent has to abide by any instruction or stipulation by Department of health and Ministry of Health, under section 4 of said law. • The Project Proponent has to inform promptly to the nearest health department or hospital if the following are occurred: (section 9) (a) Mass death of animals included in birds or chicken; (b) Mass death of mouse; (c) Suspense of occurring of communicable disease or occurring of communicable disease; (d) Occurring of communicable disease which must be informed. • The Project Proponent has to allow any inspection, anytime, anywhere if it is need to inspect by health officer, under section 11 of said law.
9.	The Control of Smoking and Consumption of Tobacco Product Law (2006)	To ensure the creation of smoking area and non-smoking area in the power plant area for health and control of smoking.	• The Project Proponent has to keep the caption and mark referring that is non- smoking area in the project area, under sub-section (a) of section 9 of said law. • The Project Proponent has to arrange the specific place for smoking in the project area and keep the caption and mark in accordance with the stipulations, under sub-section (b) of section 9 of said law. • The Project Proponent has to supervise and carry out the measures so that no one shall smoke at the non-smoking area, under sub-section (c) of section 9 of said law. • The Project Proponent has to allow the inspection of supervisory body in the township area, under sub-section (d) of section 9 of said law.
10.	The Myanmar Fire Force Law (2015)	To ensure to prevent the fire, to provide the precautionary material and apparatuses, if the fire caused in the project area to be defeated because the project is business in which electricity and any inflammable materials such as petroleum are used. So, the project owner has to institute	• The Project Proponent has to institute the specific fire services, under sub-section (a) of section 25 of said law. • The project owner has to provide materials and apparatuses for fire precaution and prevention, under Sub-section (b) of section 25 of said law.

Table 3.1-2 Application of relevant environmental social and health laws and to be implemented legal commitments

No.	Legislation	Proposes	To be implemented commitments
		the specific fire service in line with the above law.	
11.	The Motor Vehicles law (2015) and Rules (1987)	When the construction period and if it is needed in operation and production period for the all vehicles.	• The Project Proponent has to promise to abide by the nearly all provisions of said law and rules, especially the provisions related to air pollution, noise pollution and life safety.
12.	The Myanmar Insurance Law	The project can cause the damages to the environment and injuries to public so to ensure the needed insurances are insured at Myanmar Insurance.	• If the Project Proponent uses the owned vehicles the project owner has to insure the insurance for injured person, under section 15 of said law. • The Project Proponent has to insure the insurance to compensate for general damages because the project may cause the damages to the environment and injury to public, under section 16 of said law.
13.	Labour Organization Law (2011)	To ensure protection the rights of the employees, having the good relationships between the employees and employer and enabling to form and carry out the labour organizations systematically and independently.	• The project owner has to allow the labour organization to negotiate and settle with the employer if the workers are unable to obtain and enjoy the rights of the workers contained in the labour laws and to summit demands to the employer and claim in accord with the relevant law if the agreement cannot be reached, under section 17 of said law. • The Project Proponent has to allow the demand for the re-appointment of worker who is dismissed by the employer without the conformity with the labour laws, under section 18. • The Project Proponent has to send the representatives to the Conciliation Body in settling a dispute between the employer and the worker, under section 19 of said law. • The Project Proponent has to allow the labour organization to participate and discuss in discussing with the government, the employer and the complaining employees in respect of employee's rights or interest contained in the labour laws, under section 20 of said law. • The Project Proponent has to allow the labour organization to participate in solving the collective bargains of the employees in accord with the labour laws, under section 21 of said law. • The Project Proponent has to allow the labour organization to carry out the holding the meetings, going on strike and other collective activities in line with the procedure, regulation ,by-law and directive of relevant Chief Labour Organization, under section 22 of said law.
14.	The Settlement of Labour Dispute Law,2012	To ensure negotiation and discussion between employees and Project Proponent, abiding the decision of Tribunal.	• The Project Proponent has to not absent to negotiation within the stipulated time for complaint, under section 38 of said law. • The Project Proponent has to not change the existing stipulations for employees within conducting period before Tribunal, under section 39 of said law. • The Project Proponent has to not close the work without negotiation, discussion on dispute in accord with this law, decision by Tribunal, under section 40 of said law.

Table 3.1-2 Application of relevant environmental social and health laws and to be implemented legal commitments

No.	Legislation	Proposes	To be implemented commitments
			• The Project Proponent has to pay the compensation decided by Tribunal if violates any act or any omission to damage the interest of labour by reducing of product without efficient cause, under section 51 of said Law.
15.	Employment and Skill Development Law (2013)	To ensure the job security and to develop the employee's skill with the fund of project owner.	• The Project Proponent has to appoint employees with the contract in line with the provision of section 5 of said law. • The Project Proponent has to carry out the training programs with the policy of Skill Development Body to develop the employment skill of employees who is appointed or will be appointed, under section 14 of said law. • The Project Proponent has to monthly pay to the fund, which is fund for development of skill of employees, not less below 0.5 percentage of the total payment to the level of worker supervisor and the workers below such level, under sub-section (a) of section 30 of said law. • The Project Proponent has to deduct from the payment of employees for above mentioned fund, under sub-section (b) of section 30 of said law.
16.	The Minimum Wages Law (2013)	To ensure the project owner pay the wages not less than prescribed wages and notify obviously this wages in work place, moreover to be inspected.	• The Project Proponent has to pay the wages in line with section 12 of said law. • The Project Proponent has to notify the prescribed wages obviously in work place, under sub-section (a) of section 13 of said law. • The Project Proponent has to correctly record the lists, schedules, documents and wages and report these to the relevant department and give if these are asked while inspecting, in accord with the stipulations, under sub-section (b) (c) (d) of section 13 of said law. • The Project Proponent has to allow to be inspected by the inspector, under sub-section (d) and (e) of section 13 and section 18 of said law. • The Project Proponent has to allow holiday for medical treatment if the employee' health is not fit to work, under sub-section (f) of section 13 of said law. • The Project Proponent has to allow holidays without deducting from the wages if one of parents or one of family dies, under sub-section (g) of section 13 of said law.
17.	Payment of Wages Law (2016)	To ensure the way of payment and avoiding delay payment to the employees.	• The Project Proponent has to pay the wages in accord with the section 3 and 4 of said law, under section 3 & 4 of said law. • The Project Proponent has to submit with the agreements of employees & reasonable ground to department if it is difficult to pay because of force majeure included in natural disaster, under section 5 of said law. • The Project Proponent has to abide by the provisions of section 7 to 13 in chapter (3) in respect of deduction from wages.

Table 3.1-2 Application of relevant environmental social and health laws and to be implemented legal commitments

No.	Legislation	Proposes	To be implemented commitments
			• The Project Proponent has to pay the overtime fees, prescribed by law, to the employees who work over working hours, under section 14 of said law.
18.	Workmen's Compensation Act (1923)	To ensure the compensations to injured employee while implementing in line with the above law. To pay the prescribed compensations in various kinds of injury.	• The Project Proponent has to pay the compensation in line with the provisions of said law base on kind of injury and case by case.
19.	The Leaves and Holiday Act (1951)	The employees can take the leaves and get the holidays legally and to ensure the right to get the holidays and leaves.	• The Project Proponent has to allow the leaves and holidays in line with the law.
20.	Social Security Law	The Project Proponent has to create the social security for the employees because the project is the business under the Myanmar Citizen Investment Law. To ensure the social security for employees of the project, the project owner has to register to the social security offices and to pay the prescribed fund.	• The Project Proponent has to register to the respected social security office, under sub-section (a) of section 11 of said law • The Project Proponent has to pay the social security fund for at least four types of social security included in sub-section (a) of section 15, under section 15 of said law. • The Project Proponent has to pay the fund which has to be paid itself and together with the fund which has to be paid from their salary by the employees. Moreover the project owner will pay the cost for paying the above mentioned fund only itself under sub-section (b) of section 18 of said law. • The Project Proponent has to pay the fund for accidence, under sub-section (b) of section 48 of said law. (But this fund is not related to workmen compensation) • The Project Proponent has to make correctly and submit the list and record provided in section 75 to respected social security office, under section 75 of said law.
21.	Petroleum Act (1934)	The project will carry the oil in any phase and may import it. So, to ensure to take the license for importation and storage and abide by the stipulations in the license.	• The Project Proponent has to obtain the license for importation, transportation and storage of the fuel under section 3 of said law and abide by the stipulations in the license.
22.	The Petroleum Rules (1937)	To ensure the project owner has to abide by the stipulations for transportation of oil.	• The Project Proponent will abide by the provision of chapter (3) of the Petroleum Rules for transportation and the provisions of chapter (4) of said rules for storage.
23.	The Underground Water Act (1930)	To ensure to obtain the license before sinking the groundwater if it is needed to sink the ground water.	• The Project Proponent has to obtain the license granted by the water officer for sinking the underground water before sinking water, under section 3 of said law

Table 3.1-2 Application of relevant environmental social and health laws and to be implemented legal commitments

No.	Legislation	Proposes	To be implemented commitments
24.	Conservation of Water Resources and Rivers Law (2006)	The Project Proponent will avoid the disposal of stipulated materials into river-creek.	• The Project Proponent has to avoid any performing to damage to the river, creek and water resource, under sub-section (a) of section 8 of said law. • The Project Proponent has to avoid the violation of conditions stipulated by the directorate for prevention of water pollution, under sub-section (b) of section 24 of said law.
25.	Freshwater Fisheries Law (1991)	According to the sub-section (e) of section 2 of said law, the freshwater area includes any river, creek, pond and water area so the project will be near by the river or creek which is freshwater area the safety of freshwater and aquatics.	• The Project Proponent has to avoid any water pollution and disturbing to fish &other aquatic lives in any fresh-water such as river or creek, under section 40 of said law.
26.	Myanmar Marine Fishery Law (1990)	According to the sub-section (f) of section 2 of said law, the Myanmar marine fishery water area includes the water area along the sea cost of Myanmar from the high tide mark toward the open sea and on the seaside of the straight line drawn from one extreme end of one bank to the extreme end of the other bank of the river and creek mouths so the project will be nearby Myanmar marine water area, river or creek which is freshwater area.	• The Project Proponent has to avoid any water pollution and disturbing to fish &other aquatic lives in any Myanmar marine-water under section 39 of said law.
27.	The Protection and Preservation of Cultural Heritage Regions Law (1998)	To ensure the protection of cultural heritages and the cultural heritage area from the damage by the natural disaster or man-made.	• The Project Proponent has to apply to get the prior permission of Directorate of Ancient-Research to build the road, bridge or dam in the cultural heritage area, under section 13 of said law. • The Project Proponent promises not to build the building which is not in line with the stipulations prescribed by the Ministry of Culture in the cultural heritage area.
28.	The Protection and Preservation of Antique Objective Law (2015)	To ensure the protection of ancient monument and information about it if it was in the project area.	• The Project Proponent has to inform to the village-tract or ward administrator if any antique objective is found in project area under section 12 of said law.
29.	The Protection and Preservation of Ancient Monument Law (2015)	To ensure the protection of ancient monument and information about it if it is in the project area.	• The Project Proponent has to report to the village-tract or ward administrators if the Project Proponent will find any ancient monument under the ground or on the ground or under the water under section 12 of said law.

Table 3.1-2 Application of relevant environmental social and health laws and to be implemented legal commitments

No.	Legislation	Proposes	To be implemented commitments
			• The Project Proponent has to obtain the prior permission of Department of Ancient Research Museum if the project area is in the prescribed area of Ancient monument under section 15 of said law. • The Project Proponent has to obtain the prior permission, by written, of Department of Ancient Research and National Museum if the Project Proponent dispose the chemical and solid waste in the Ancient Monument area under sub-section of section 20 of said law.
30.	The Forest Law (1992)	To sustain forest resources and ensure perpetual supply of benefits from forest for next generation and to protect soil, water, wildlife, biodiversity and environment	• Under sub-section (a) of section 12, the Project Proponent has to obtain the approval of Ministry if the project area is included in the forest land or the land administrated by the government which covers the forest under section 1 of said law.
31.	The Special Economic Zone Law (2014)	The project locates in Dawei special economic zone. According to section 89 of said law the project has to abide by said law so to ensure the responsibilities of Project Proponent.	• The Project Proponent has to abide by the any stipulation included in the notification, order, directive and procedure issued by special economic zone administrative committee, under sub-section (f) of section 11 of said law. • The Project Proponent has to comply with the stipulations of SEZ administrative committee, under sub-section (p) of section 11 of said law. • The Project Proponent has to abide by the standards included in the environmental conservation law and international standards, moreover has to abide by the existing laws to not injure to social and health, under section 35 of said law. • The Project Proponent has to appoint the nationalities only for normal work without expertise, under section 27 of said law. • The Project Proponent has to appoint the nationalities in the high- technical work and expert work at least 25 % in first two years later the date which is commencement of project, and at least 50% in second two years later, and at least 75% in third two years later, under section 75 of said law. • The Project Proponent has to abide by the negotiation by the administrative committee if the dispute, between employees and me, is occurred, under sub-section (a) of section 76 of said law. • The Project Proponent has to obtain the work permit for foreign employees issued by representative office of labour department before starting to work, under section 77 of said law. • The Project Proponent has to obtain the approval of administrative committee before appointment if it is needed to appoint the foreign employees in administrative and technical work over the limited numbers, under section 78 of said law. • The Project Proponent has to pay the cost for compensation and resettlement for project land if housing, buildings, farm, garden, fruit trees or other plantation is in the project area, in accord with the agreement, under sub-section (a) of section 80.

Table 3.1-2 Application of relevant environmental social and health laws and to be implemented legal commitments

No.	Legislation	Proposes	To be implemented commitments
			• The Project Proponent has to coordinate with the administrative committee to facilitate in resettlement process for to not low the original living standards and fulfill their basic needs, under sub-section (b) of section 80 of said law. • The Project Proponent has to use the project land in accord with the stipulations under sub-section (c) of section 80 of said law. • The Project Proponent do not change the physical features of land without the approval of administrative committee, under sub-section (d) of section 80 of said law. • The Project Proponent has to inform to the administrative committee if any antique objective or any natural resource or treasure trove is found on or under the land in project area, moreover has to move to the replaced land for project if the original land cannot be allowed to continue the project, under sub-section (e) of section 80 of said law.
32.	The Engineering Council Law (2013)	To ensure the safety in technical and engineering work in the project.	• The Project Proponent has to appoint the employees, who obtained the registration certificate issued by the Myanmar Engineering Council, in the technical and engineering work, under section 37 of said law. • The Project Proponent has to ensure the employees who are engineers abide to the provisions of Myanmar Engineering Council law, prohibitions included in the rules, order and directive issued under said law, conditions included in the registration certificate issued by the Myanmar engineering council, under section 34 of said law.
33.	Myanmar Port Authority Law (2015)	To abide by the conditions included in permit if it is needed to import the material for project and export products from the project.	• The Project Proponent has to abide by the conditions included in permit, under section 7 of said law.

Source: EIA Study Team

3.1.3 International Agreements and Treaties

Myanmar has signed and been a member of several international conventions, treaties and agreements related to environment is shown in Table 3.1-3.

Table 3.1-3 Ratified recent international agreements related to environmental and social considerations.

No.	International Agreements and Treaties	Date Ratified
1	Basel Convention, 1989	2015
2	Ramsar Convention, 1971	2005
3	Stockholm Convention on Persistent Organic Pollutants, 2001	2004
4	Convention on International Trade in Endangered Species of Wild Fauna and Flora, 1979	1997
5	United Nations Framework Convention on Climate Change, 1992	1994
6	Convention on Biological Diversity, 1992	1994
7	Montreal Protocol on Substances that Deplete the Ozone Layer, 1989	1993
8	London Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer, 1990	1993

Source: EIA Study Team

3.2 MYANMAR INSTITUTIONAL FRAMEWORK

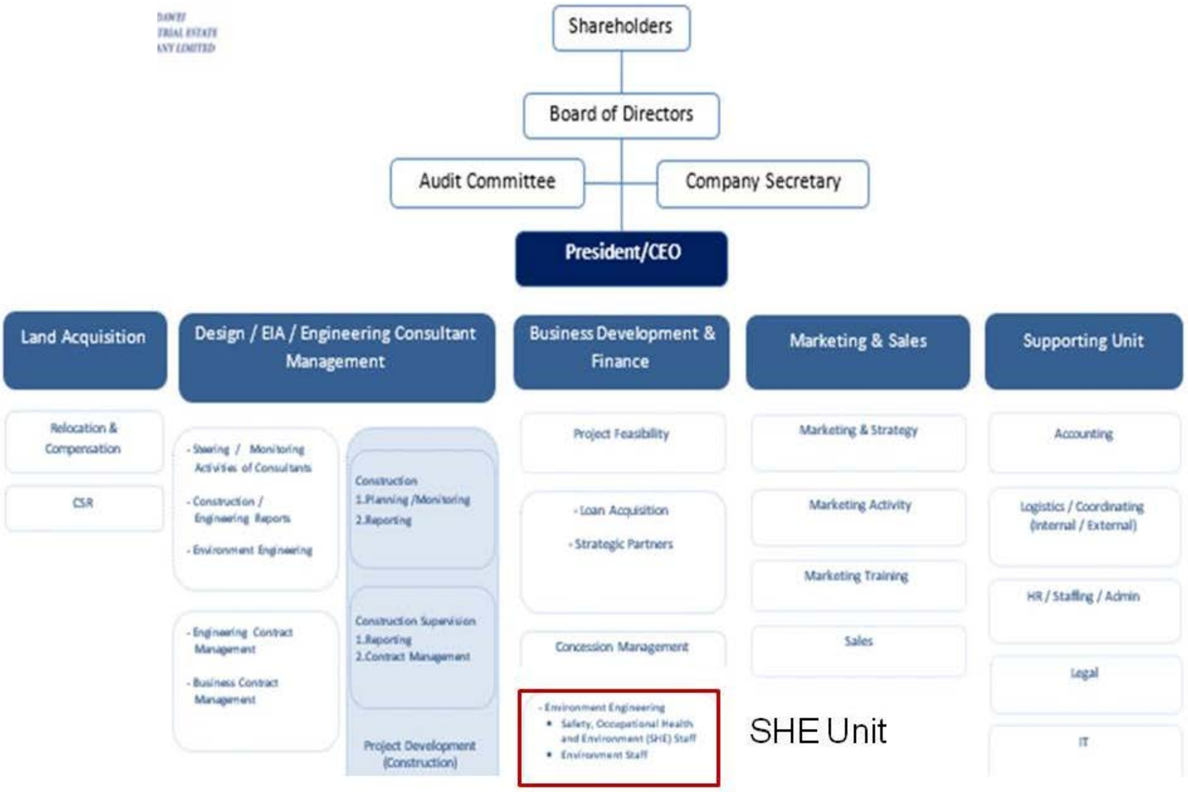
Dawei Resident Company Limited (DRC) is an organization that govern Initial Township in the DSEZ as shown in Figure 3.2-1. It consists of five divisions that are managed under the MIE president. Generally, the president is supervising the investment and one of his prominent roles and duties is implementation the legislations, by supervising, inspecting and managing the other matters in land use, environmental conservation, health, education, finance and taxation, development, transport, communication, security, electricity, energy and water supply including coordinating with the relevant government departments and organizations.

It should be noted that the planning and development of the Project is dynamic. During the time of this EIA report preparation, the governments of Thailand and Myanmar are evaluating an establishment of Special Purpose Vehicles (SPV) as a major driver for the project development. Should the SPV is established, significant changes to the organization and responsibilities of the parties involved in the Project may be changed.

3.2.1 Arrangement at the National and Sector Level

At the national level, the Environmental Conservation Committee (ENCC) serves as mechanism for inter-ministerial coordination. Authorities and functions of ENGG are prescribed in Articles 7 to 13 of the Environmental Conservation Rules.

One of ENCC's main functions related to this Project is to oversee the management of the EIA process by MONREC through ECD. ECD will serve as coordinator among various concerned sector departments to ensure that the EIA and implementation of EMP will address environmental and social issues of concerns of relevant sector departments.



Source: DRC (2015)

Figure 3.2-1 Organization Structure of MIE

The EIA process for this Project will be administered by the central ECD in coordination with the regional ECD and various government to organizations at the regional, township, and district levels.

3.2.2 Arrangements at the Project Area

In Dawei Special Economic Zone Management Committee (DSEZMC), the Project will be implemented as a Public-Private Participation (PPP) project under a concessional arrangement between the Project Proponent and the DSEZ Management Committee. The organizational structure for the development of DSEZ is prescribed by the DSEZ Law (2011). The development of the DSEZ is carried out under the framework set by the DSEZ Law. Under this law, two bodies were established the DSEZ Management Committee and the DSEZ Working body to take charge of DSEZ management and general administration affairs.

The DSEZMC is essentially responsible for facilitating resolving issues between the Government, the Central Body and developers/investors. The Committee's wide-ranging and

important responsibilities include, but are not limited to: supervising and inspecting matters regarding implementation of investment and establishment plans, land- use, environmental conservation, waste control, health, education, finance and taxation, development, communication, security, infrastructure and coordinating with the relevant governmental departments. Other relevant agencies are 14 representatives of government agencies and organizations from respective ministries involved in development activities of the Supporting Working Body (SWB) in the project area. Their key responsibilities are summarized in Table 3.2-1.

Table 3.2-1 Roles and responsibilities of relevant departments functioning in DSEZ

No.	Department	Roles and Responsibilities
1.	Department of General Administration	Management and monitoring to cooperate and negotiate with local peoples.
2.	Department of Human Settlement and Housing	The Department of Human Settlement & Housing Development is upgrading the living standard of the people by promoting the urban and regional development, by establishing industrial zones at the new satellite towns.
3.	Department of Immigration and National Registration	Responsible for checking and permission for immigrant staffs, workers and visitors to the project area.
4.	Myanmar Police Force	Establish civil jurisdictions in the project area.
5.	Department of Labor	Workers' legal rights and privileges and encourage fair labour practices with a view to establishing cordial relations between employers and workers according to the existing Laws in Myanmar. Registering foreign workers in Myanmar according to directive of the Myanmar Foreign Investment Commission.
6.	Directorate of Trade	Responsible for the formulation of trade policies and plans with the aim to regulate the smooth flow of internal and external trade.
7.	Department of Development Affairs	Responsible for the urban development.
8.	Department of Road Transportation	Passenger transportation service for inter-city transportation and intra-city transportation, to carry out the transportation services of local goods and export items. The Directorate of Road Transport carries out registration of motor vehicles and driving licenses.
9.	Department of Investment and Company Administration	Responsible for register the incorporation and administration of companies, in accordance with the provisions of the Myanmar Companies Act, 1914.
10.	Department of Custom	Responsible for levy duty on imported goods in accordance with the existing laws, rules and regulations, to oversee the imports and exports whether they are complied with the existing laws and regulations or not and to investigate and prevent illegal imports and exports.
11.	Department of Law, Court and Justice	For giving legal advice on matters relating to international conventions and regional agreements, and also on matters of bilateral or multilateral treaties, memorandums of understanding, memorandums of agreement, local and foreign investments and other instruments that are to be ratified by the Union of Myanmar.
12.	Department of Municipality	Dealing with locally affairs, to the close contact with the daily life of the citizens.
13.	Representative from Tanintharyi Division	To communicate with Local Government.

Source: DRC (2015)

3.3 INTERNATIONAL POLICIES, GUIDELINES AND STANDARDS

The relevant international policies, guidelines and standards for environmental and social impacts of project referred by most countries are those issued by the World Health Organization (WHO), the U.S. Environmental Protection Agency (EPA), the World Bank, and the International Finance Corporation (IFC). The policies, guidelines and standards of the World Bank and IFC are cross referenced and complementary as the IFC, is an organization of the World Bank Group. There are also adopted by most development organizations such as the Asian Development Bank. It should be noted that the guidelines and standards recommended by the World Bank and IFC, especially those related to environmental pollution, also gave due consideration to the guidelines and standards of the EPA and WHO.

Only those international policies, guidelines and standards relevant to this Project are discussed here in 3.4.1 IFC's Standard and Guidelines IFC's standards. The guidelines relevant to this Project are described in two documents: The Performance Standards on Environmental and Social Sustainability 1st January, 2012 and Environmental, Health, and Safety-General Guidelines 30th April, 2007, respectively. The former document describes eight performance standards on environmental and social sustainability which IFC requires its clients to apply throughout the project life cycle. The later document provides general guidelines for environmental, health and safety (EHS) for development projects. Essential requirements in the three IFC documents pertaining to this Project are summarized below:

3.3.1 Performance Standards on Environmental and Social Sustainability, 1st January, 2012

IFC prescribes eight Performance Standards to which the Project Proponent will need to comply throughout the investment life. The eight performance standards (PS) are:

- **PS1-Assessment and Management of Environmental and Social Risks and Impacts** requires the Project Proponent, in coordination with other responsible government agencies and third parties as appropriate; to conduct a process of environmental and social management system (ESMS) "*appropriate to the nature and scale of the project and commensurate with the level of its environmental and social risks and impacts*". The ESMS will incorporate the following elements: (i) policy; (ii) identification of risks and impacts; (iii) management programs; (iv) organizational capacity and competency; (v) emergency preparedness and response; (vi) stakeholder engagement; and (vii) monitoring and review. These requirements are explained in details in the PS document and associated guidelines.

- **PS2-Labor and Working Conditions** requires the Project Proponent to : (i) formulate and implement human resources policies and procedures appropriate to its size and workforce that set out its approach to manage workers consistent with the requirements of this Performance Standard and National Law; (ii) provide

reasonable working conditions and terms of employment; (iii) treat migrant workers on substantially equivalent terms and conditions to non-migrant workers carrying out similar work; (iv) establish grievance mechanism; (v) refrain from using child labor and forced labor; and (v) provide a safe and healthy work environment, taking into account inherent risks in its particular sector and specific classes of hazards in the clients work areas, including physical, chemical;, biological, and radiological hazards, and specific threats to women. These requirements will also be applied to workers of the contactors through effective contractual agreements between the client and the contactors.

- **PS3-Resource Efficiency and Pollution Prevention** requires the Project Proponent to: (i) efficiently uses energy and water; and (ii) uses Best Available Techniques (BAT) in pollution control.
- **PS4-Community Health, Safety, and Security** requires the Project Proponent to: (i) evaluate the risks and impacts to the health and safety of the affected communities during the project lifecycle; and (ii) establishes preventive and control measures in consistent with good international industry practice (GIIP), such as in the World Bank Group Environmental, Environmental, health and Safety Guidelines (EHS Guidelines) or other internationally recognized sources. The requirements are elaborated in the PS document. Some of the requirements, such as hazardous materials management, are similar to those in PS3. In essence, safety aspects to construction and operations of all Project facilities, including support facilities or infrastructure. Health risks will also be included.
- **PS5-Land Acquisition and Involuntary Resettlement** requires the Project Proponent to avoid land expropriation, physical displacement, and adverse impacts on livelihoods and ways of life of people in the project are. The process of land acquisition has to ensure community engagement, fair compensation for loss of land, properties, and livelihood; grievance mechanism, and appropriate resettlement and livelihood restoration planning and implementation.
- **PS6-Biodiversity Conservation and Sustainable Management of Living Natural Resource** requires the EIA to consider direct and indirect project related impacts on biodiversity and ecosystem services and identify any significant residual impacts. As matter of priority, the Project Proponent should seek to avoid impacts on biodiversity and ecosystem services. When avoidance of impacts is not possible, measures to minimize impacts and restore biodiversity and ecosystem services should be implemented. Given the complexity in predicting project impact on biodiversity and ecosystem services over the long term the Project Proponent should adopt practice of adaptive management in which the implementation of mitigations measures are responsive to changing conditions and the results of monitoring throughout the projects life cycle.

- **PS7-Indigenous Peoples** requires the EIA to identify all communities of indigenous people within the project area of influence who may be affected by the project, as well as the nature and degree of the expected direct and indirect economic, social, cultural (including cultural heritage), and environmental impact on them. Adverse impacts on affected communities of Indigenous Peoples should be avoided where possible. Where alternatives have been explored and adverse impacts are unavoidable, the Project Proponent will minimize, restore, and/or compensate for these impacts in a culturally appropriate manner commensurate with the nature and scale of such impacts and the vulnerability of the affected communities of indigenous people.

- **PS8-Cultural Heritage** requires the Project Proponent to: (i) protect cultural heritage from the adverse impacts of project activities and support its preservation; and (ii) promote the equitable sharing of benefits from the use of cultural heritage. The EIA will need to identify sites of heritage and assess their value or importance at the community, provincial and national levels. It should be noted that all the eight PS are in line with the Government's policy and regulations.

3.3.2 Environmental, Health, and Safety-General Guidelines, 30th April, 2006. This publication provides general EHS guidelines covering the following subjects:

- **Environment** covering: (i) air emissions and ambient air quality; (ii) energy conversation; (iii) wastewater and ambient water quality; (iv) water conservation; (v) hazardous materials management; (vi) waste management; (vii) noise; and (viii) contaminated land.

- **Occupational Health and Safety** covering: (i) general facility design and operation; (ii) communication and training; (iii) physical hazard; (iv) chemical hazards; (v) biological hazards; (vi) radiological hazards; (vii) personal protective equipment; (viii) special hazard environments; and (ix) monitoring.

- **Community Health and Safety** covering; (i) water quality and availability; (ii) structural safety of project infrastructure; (iii) life and fire safety (L&FS); (iv) traffic safety; (v) transport of hazardous materials; (vi) disease prevention; and (vii) emergency preparedness and response. Construction and Decommissioning covering; (i) environment; (ii) occupational health and safety; and (iii) community health and safety.

- **Construction and Decommissioning** coving: (i) environment; (ii) occupational health and safety; and (iii) community health and safety.

3.3.3 World Bank's Pollution Prevention and Abatement Handbook 1998 Toward Cleaner Product

The World Bank's Pollution Prevention and Abatement Handbook (PPAH) is a comprehensive document providing guidelines for industrial pollution control and recommends emission and ambient standard to be applied in environmental management. The recommended standards have taken into account the standards enforced by the EPA and recommended by WHO. They are referred to in the IFC's EHS Guidelines.

3.4 GUIDELINES AND STANDARDS APPLICABLE TO THIS PROJECT

The country has recently established the environmental quality standards. The latest version announced on December 2015, "*The National Environmental Quality (Emission) Guidelines 2015*" is mainly used in this report and in assessing environmental impacts of the project. In case, where the national quality standard of some subjects such as groundwater and sediments are absent, the international standard is applied.

3.4.1 National Environmental Quality (Emission) Guidelines

The National Environmental Quality (Emission) Guidelines 2015 had specification for purposes and activities. In the Project, values for air emission and effluent levels depend on type of facilities. Herein, the project has 2 different types of facilities, residential and commercial and health care. The levels of emissions regarding to these facilities will concordance the guidelines. However, the guidelines for "*general purpose*" is applied in overall area of the project, "*besides the facility areas*" such as on drainage canals or water ways or in non-contaminated run-off areas, the guidelines for general purpose is presented in Table 3.4-1 These levels of parameters are subjected to both construction and operation phases.

Table 3.4-1 General Purpose Guidelines of the National Environmental Quality (Emission) Standards 2015 during construction and operation phases.

Parameters		Guideline Values		References
		Value	Unit	
Air Emissions				a/ Air quality guidelines global update. 2005. World Health Organization. b/ Air quality guidelines for Europe. 1997 WHO regional publications, European series No. 23. World Health Organization.
Particulate matter, PM_{10}[a]	1-year 24-hour	20 50	µg/m³ µg/m³	
Particulate matter, $PM_{2.5}$[b]	1-year 24-hour	10 25	µg/m³ µg/m³	
SO_x	24-hour10-minute	20 500	µg/m³ µg/m³	
NO_x	1-year1-hour	40 200	µg/m³ µg/m³	
Ozone	8-hour daily maximum	100	µg/m³	
Site Runoff and Wastewater Discharges (Construction Phase)				a/ Pollution prevention and abatement handbook. 1998. Toward cleaner production. World Bank Group in collaboration with United Nations Environment Programme and the United Nations Industrial Development Organization. b/ Environmental, health, and safety guideline for health care facilities.2007. International Finance Corporation, World Bank Group.
Biological Oxygen Demand		30	mg/L	
Chemical Oxygen Demand		125	mg/L	
Wastewater, Strom Water Runoff, Effluent and Sanitary Discharge (Operation Phase)				
5-day Biochemical Oxygen Demand		50	mg/L	
Chemical Oxygen Demand		250	mg/L	
Ammonia		10	mg/L	
Arsenic		0.1	mg/L	
Cadmium		0.1	mg/L	
Chlorine (Total residual)		0.2	mg/L	
Chromium (Hexavalent)		0.1	mg/L	
Chromium (Total)		0.5	mg/L	
Copper		0.5	mg/L	
Cyanide (Free)		0.1	mg/L	
Cyanide (Total)		1	mg/L	
Fluoride		20	mg/L	
Heavy metals (Total)		10	mg/L	
Iron		3.5	mg/L	
Lead		0.1	mg/L	
Mercury		0.01	mg/L	
Nickel		10	mg/L	
Oil and grease		10	mg/L	

Table 3.4-1 General Purpose Guidelines of the National Environmental Quality (Emission) Standards 2015 during construction and operation phases.

Parameters	Guideline Values		References
	Value	Unit	
pH	6-9	-	
Phenols	0.5	mg/L	
Selenium	0.1	mg/L	
Silver	0.5	mg/L	
Sulphide	1	mg/L	
Temperature increase		°C	
Total Coliform Bacteria	400	MPN/100 ml	
Total phosphorus	2	mg/L	
Total Suspended Solids	50	mg/L	
Zinc	2	mg/L	
Noise Levels - Leq (1hr)			
Residential, Institutional and Educational Areas	55 45	dB(A) Daytime a/ dB(A) Nighttime a/	a/ Environmental, Health, and Safety Guidelines: General EHS GUIDELINES: ENVIRONMENTAL NOISE

Source: MONREC (2016)

Emissions are needed to follow the guidelines in Section 2.6.8 for Road that has all parameters for effluent levels in accordance with the guideline for general purpose Table 3.4-2.

In operation phase, the project will relate to management of accommodation, hospitality and health care facilities. Therefore, The National Environmental Quality (Emission) Guidelines that are specific to the project falls into 2 Sections; Section 2.6.3 for "*Health Care Facilities*" and 2.6.4 "*Tourism and Hospitality Development*". Overall, the effluent levels including wastewater, storm water runoff, effluent and sanitary discharge from these two facilities are the same as in the guideline for the "general purpose" in Table 3.4-2 except the following parameters:

Table 3.4-2 Additional parameters for effluent levels for Health Care Facilities and Residential and Commercial

Parameters	Guideline Values	
	Value	Unit
Wastewater, Strom Water Runoff, Effluent and Sanitary Discharge (Operation Phase)		
Cadmium		
- Residential and Commercial	0.10	mg/L
- Health Care Facilities	0.05	mg/L
Polychlorinated Dibenzodioxin and Dibenzofuran		
- Health Care Facilities	0.1	mg/L
Total Nitrogen		
- Residential and Commercial	0.10	mg/L

Level of air emission is excluded for management of the hospital waste in incineration. The hospital waste shall be managed, delivered and disposed in incineration at the waste management facility in the initial industrial estate. On the contrary, if the hospital or health care centre requested itself to have the incineration, level of air emission is prescribed below in Table 3.4-3.

Table 3.4-3 Air Emission Levels (for hospital waste incineration facilities)

Parameters	Unit	Value
Antimony, Arsenic, Lead, Chromium, Cobalt, Copper, Manganese, Nickel, Vanadium	mg/Nm^3 [a]	0.5
Cadmium + Thallium	mg/Nm^3	0.05
Carbon monoxide	mg/Nm^3	50
Hydrogen chloride	mg/Nm^3	10
Hydrogen fluoride	mg/Nm^3	1
Mercury	mg/Nm^3	0.05
Nitrogen oxides	mg/Nm^3	200-400[b]
Polychlorinated dibenzodioxin and dibenzofuran	ng/Nm^3 [c]TEQ[d]	0.1
Sulfur dioxide	mg/Nm^3	50
Total organic carbon	mg/Nm^3	10
Total particulate matter	mg/Nm^3	10

[a] Milligrams per normal cubic meter at specified temperature and pressure

[b] 200 mg/m^3 for new plants or for existing plants with a nominal capacity exceeding 6 tons per hour, 400 mg/m^3 for existing incinerators with a nominal capacity of 6 tons per hour or less

[c] Nanograms per normal cubic meter at specified temperature and pressure. [d] Toxicity equivalence factor

3.4.2 International Ambient Environmental Quality Standards

Table 3.4-4 presents the International Ambient Environmental Quality Standards which is guided by the International organizations, WHO, USEPA and IFC etc.

Table 3.4-4 INTERNATIONAL AMBIENT ENVIRONMENTAL QUALITY STANDARDS

Subjects	Parameters	Guideline Values		References
		Value	Unit	
Ambient Air Quality				
24-hour average	TSP	230	µg/m³	Environmental, Health, and Safety Guidelines: Environment Air Emissions and Ambient Air Quality of International Finance Corporation, 2007.
	NO_2	150	µg/m³	
	PM_{10}	150	µg/m³	
	SO_2	150	µg/m³	
	NO_2	125	µg/m³	
		200	µg/m³	
Ambient Noise Levels				[a/] Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety, U.S. EPA (U.S. Environmental Protection Agency), 1974. [b/] Notification of Guidelines for Community Noise, World Health Organization (WHO), 1999. [c/] Environmental, Health, and Safety Guidelines: General EHS GUIDELINES: ENVIRONMENTAL NOISE MANAGEMENT of International Finance
-Industrial and commercial area	Leg (24 hrs)	70	dB(A)[a,b/]	
-Residential areas	Leq (1hr)	55	dB(A)[c/]	
		45	dB(A)[c/]	
	L_{max}	110	dB(A)[b/]	
Vibration				
-For industrial buildings and residential building	Peak Particle Velocity	5	mm/s	DIN4150
Sediment Quality		Maximum limit		International association for Impact Assessment (IAIA) NOAA Screen Quick Reference Table, 2004
	Total Chromium	81	mg/kg	
	Total Arsenic	8.2	mg/kg	
	Total Lead	46.7	mg/kg	
	Total Cadmium	1.2	mg/kg	
	Total Zinc	150	mg/kg	
	Total Copper	34	mg/kg	
	Total Mercury	0.15	mg/kg	

Surface Water Quality		Maximum limit		Thai Surface Water Quality Standard, 1992
-Class 3 for consumption and agriculture	pH	5-9	-	
	Temperature	<3	°C	
	BOD	2	mg/L	
	Ammonia-Nitrogen	0.5	mg/L	
	Cyanide	0.005	mg/L	
	Nitrate-Nitrogen	5	mg/L	
	Phenols	0.005	mg/L	
	Arsenic	0.1	mg/L	
	Manganese	1	mg/L	
	Mercury	0.002	mg/L	
	Zinc	0.005	mg/L	
	Cadmium	0.05	mg/L	
	Copper	0.1	mg/L	
	Chromium (VI)	0.5	mg/L	
	Lead	0.5	mg/L	
	Nickel	0.1	mg/L	
	TCB	20,000	MPN/100 ml	
	FCB	4,000	MPN/100 ml	
	DO	4	mg/L	
Groundwater Quality	pH at 25 °C	6.5-8.5	-	WHO's Guidelines for Drinking Water Quality, 2011
	Nitrate	50	mg/L	
	Nitrite	3	mg/L	
	Cadmium	0.003	mg/L	
	Lead	0.01	mg/L	
	Arsenic	0.01	mg/L	
	Cyanide	0.17	mg/L	
	Chloride	250	mg/L	
Thermal Heat Flux	Safe level of exposure at the property line of LNG storage facility	5	kW/m^2 (1,600 $Btu/hr\ ft^2$)	NFPA 59A (Standards for the production facility)

Source: EIA Study Team

3.5 KEY COMMITMENTS

3.5.1 List of Commitments

A consolidated summary list of environmental and social impacts and mitigation measures commitments that the Dawei Residence Company will be expected to stipulate in order to manage and mitigate potential impacts associated with the project development is provided below in Table 3.5-1 and summary of the legal commitments is presented in Table 3.5-2.

Table 3.5-1 Dawei Residence Company's Commitments

No.	Management	Commitments
1.	Overall Project Management	The Project commits itself to conserve and protect natural environment, development of human resource and preservation of public property, as stated in *The Constitution of the Union of Myanmar No.1/2008 Section 45 and Section 390*.
		The Project commits itself to get permission for investment, as the Project is capital intensive and strategic to the region according to *The Investment Law 2016, Section 35*.
2.	EIA Study	EIA study is conducted, as mandated by *the Environmental Conservation Law (2012), in No.9/2012 Section 42 (b) and the Investment Law Section 72*. The Project commits itself that the ESIA study is undergone in concordant with *the Guidelines (2014) and Procedure (2015) for Environmental Impact Assessment*.
3.	Emission Compliance	The Project commits itself to prevent pollution, through the implementation of processes, practices and techniques that will minimize, avoid or reduce the pollution and comply with the enacted Myanmar Environmental Quality Standards or the International Standards, as prescribed in *The Special Economic Zone Law, Section 35*.
4.	Land Acquisition	The Project commits itself in receivable authorization and has right to obtain a long-term lease of land in according with the relevant laws and may lease land up to an initial period of 50 years after approval of the permit, as enacted in *The Investment Law 2016, Section 51 (a) and (b)*.
5.	Relocation of assets and Resettlement	The Project commits itself to bear the expenses of relocating and paying compensation in accordance with the agreements of the assets those are required to relocate and shall relocate the persons so as not to lower their original standard of living, to fulfill the fundamental needs as promulgated in *The Special Economic Zone Law 2011, Section 80*.
6.	Land clearing and Pre-Construction	The Project commits itself to get permission from the relevant agency before establishing any desirous activities to/in reserve forest or all type of forests that in affiliate of *The Forest Law 1992, Section 12 and Section 23*.
		The Project commits itself to get permission from the relevant agency before establishing any desirous activities to wild life/endanger species or threatening their natural habit and ecosystem as promulgated in *The Protection of Wildlife and Conservation of Natural Area 1994*.

Table 3.5-1 Dawei Residence Company's Commitments

No.	Management	Commitments
		The Project commits itself to get permission from the relevant agency before relocating, modifying or excavating or extending any parts of ancient monuments in according with *The Protection and Preservation of Ancient Monuments Law 2015, Section 15*
		The Project commits itself to obtain approval of Fire precaution and prevention (and/or Emergency Plan) prior construction of the township buildings as enacted in *The Fire Brigade Law 2015 Section 17*.
7.	Overall Construction	The Project commits itself to inform the relevant agency that if any antique objects or ancient monuments as defined in *the Protection and Preservation of Ancient Monuments Law 2015 and The Protection and Preservation of Antique Objects 2015* are found within the Project area.
		The Project commits itself to report immediately to the relevant agency, if natural mineral resources or antiques or treasure or mine are found above or under the land which the Project is entitled to lease or use, according to *The Special Economic Zone Law Section 80 (e)* and may continue the work on such land if the relevant agency allow. If not, the Project shall move the substituted arranged area.
		The Project commits itself to not make any significant alteration of topography or elevation of the land prior receiving the approval, according to *The Investment Law 2016, Section 66* and *The Special Economic Zone Law Section 80 (d)*.
8.	Polder dike and Retention Ponds construction	The Project commits itself to not carry out any acts or channel shifting or disturbance as prescribed in *Section 12* and construction of such the structures as defined in *Section 15*, in the river-creek boundary, bank boundary and waterfront boundary without permission of the relevant agency, as prescribed in *The Conservation of Rivers, Creeks and Water Resources Law 2006, Section 8, Section 12 and Section 15*.
9.	Operation of the Township	The Project commits itself to not dispose of engine oil, chemicals, materials or substances which may cause water way/course and environmental damages into the river-creek, as prescribed in *The Conservation of Rivers, Creeks and Water Resources Law 2006, Section 11 (a) and Section 19*.
		The Project commits itself to not dispose living aquatic creatures or any materials in marine water courses as prescribed *in Section 39 of the Myanmar Marine Fishery Law 1990*.
		The Project commits itself to not cause pollution or harassment of aquatic organisms in a freshwater courses as prescribed *in Section 40* or alter water quality and volume as prescribed *in Section 41* in *the Freshwater Fishery Law 1991*.
		The Project commits itself to operate and provide services in accordance with *The Labor Organization Law 2011, Section 41 (a) and (d), Section 43, Section 44 (a) to (d) and Section 51*. Also, The Project commits itself to aware of the formation of labor organization and its activities.
		The Project commits itself to settle any disputes between the project and labor organization or employee or workers in accordance with *the Settlement of*

Table 3.5-1 Dawei Residence Company's Commitments

No.	Management	Commitments
		Labor Dispute Law 2012 and The Special Economic Zone Law 2011, Section 76 (a) and (b).
10.	Employment	The Project commits itself to employ citizen skilled workers, technicians and staff at least 25 percent in the first two years from the commencing year of operation and at least 50 percent in the second two years and at least 75 percent in the third two years, as prescribed in *The Special Economic Zone Law, Section 75*.
		The Project commits itself to employ, pay wages, and grant leaves and holidays in fairness and equity manners to the workers and/or employee in accordance with the stipulated laws: *The Minimum Wages Laws 2013, The Payment of Wages Act 2016, The Employment and Skill Development Law 2013*, *The Law Amending the Leave and Holidays Act 2006*.
		The Project commits itself to comply requirements and establish benefits for the employee and/or workers by the Project in accordance with *The Social Security Law 2012*.
11	Training Program	The Project commit itself to establish training program and the center for training for industries and may include the Project Affected Persons (PAPs) from the relocation and resettlement program in accordance with *the Employment and Skill Development Law 2013 Section 16 to Section 23*.
12	Occupational Health and Safety	The Project commits itself to comply the IFC EHS General guideline 2007 for workers
13	Commercial Area	The Project commits itself to establish and manage the commercial area which include retail shops, drug store and food services in accordance with *the Nation Drug Law 1992 and the Nation Food Law 1997*
14	Foundation of Hospital or Health Center	The Project commits itself to establish hospital or health center when appropriate number of residents in the Township have reached requirement that promulgated in the relevant law.
15	Prevention and Control of Communicable Diseases	The Project commits itself to follow the guidance and co-operate with health officers in prevention of the outbreak and effective control of the communicable disease as prescribed *in Section 8 of The Prevention and Control of Communicable Diseases Law 1995*. The Project will report immediately to the nearest health department or hospitals if the defined epidemics *in Section 9* occur.
16	Smoke/Non-Smoking Areas	The Project commits itself to arrange the smoking and non-smoking area as prescribed *in Section 6 and Section 7 of The Control of Smoking and Consumption of Tobacco Product Law 2006* including carry measures and accepting the inspection in *Section 9 (c) and (d)*.
17	Uses of Vehicles	The Project commits itself to comply *The Motor Vehicle Law 2015* in obtaining ownership of all purposes and liabilities. The Project shall educate and campaign the vehicles' drivers in such manners as prescribed by the Law.
18	Conservation of Water Resources	The Project commits itself to manage water resources wisely and control the impacts to water courses as following:

Table 3.5-1 Dawei Residence Company's Commitments

No.	Management	Commitments
		Reuse and Recycling of water, Water conservation program, minimization of contaminated water and wastewater effluent.
19	Sanitation and waste management	The Project commits itself to manage domestic waste in sustainable manners i.e. reduce, reuse and recycling (3Rs) in order to diminish quantity of waste and the spaces for disposal. The Project commits itself to manage the waste in accordance with *The Public Health Law 1972 and The National Health Policy 1993*.
20	Storage and Transport of Petroleum	The Project commits itself to store and transport of Petroleum fuels in accordance with *the Petroleum Act 1934 and the Petroleum Rules 1937*.
21	Green House Gases Emission	The Project commits itself to promote reduction of the Green House Gases by the Project activities and the establishment in accordance with the current Myanmar Green House Gases Policy
22	CSR Program	The Project commits itself to reserve and conduct Cooperate Social Responsibility (CSR) program base on the yearly profit. The project will donated for education such as scholarships donation for young people who live in villages nearby the Township and to support the nearby villages in Emergency such as Fire or Natural disasters.
23	Insurance	The Project commits itself to effect compulsory general liability insurance with the Myanmar Insurance, if the Project may cause damage to the life and property of public or cause pollution to the environment, in accordance with *The Myanmar Insurance Law 1993, Section 16*.
24.	Compensation	The Project commits itself to pay effective compensation for loss incurred, if the Project causes damage to the natural environment and causes socioeconomic losses, according to *The Environmental Conservation Law, Section 7(o)* and *The Investment Law 2016, Section 66*.
25.	ISO 14001	The Project commits itself to develop ISO 14001 for better compliance with environmental protection and conservation for sustainable environment.
26	Environmental Management and Monitoring Plans	The Project commits itself to develop and implement all the updated EMPs and EMoPs during construction phase, operation phase and decommissioning phase.

Source: EIA Study Team

Table 3.5-2 Summary of legal commitments by the Project during Pre-Construction, Construction and Operation phases.

No.	Laws, Regulations and Policy	Commitment Sections / Articles
1.	**Environmental Conservation Law, 2012**	Environmental Conservation Law, Section 7 (o) Environmental Conservation Law, Section 14 Environmental Conservation Law, Section 15 Environmental Conservation Law, Section 29
2.	**Environmental Impact Assessment Procedure, 2015**	Environmental Impact Assessment Procedure, Articles 102 Environmental Impact Assessment Procedure, Articles 110 Environmental Impact Assessment Procedure, Articles 113 Environmental Impact Assessment Procedure, Articles 115 Environmental Impact Assessment Procedure, Articles 117
3.	**The Investment Law,**	The Investment Law, Section 50 (a) and (d) The Investment Law, Section 51 (b), (c) and (d) The Investment Law, Section 65 (g), (i), (j), (k), (l), (m), (o), (p) and (q)
4.	**The Special Economic Zone Law, 2014**	The Special Economic Zone Law, Section 11 (f) The Special Economic Zone Law, Section 35 The Special Economic Zone Law, Section 75 The Special Economic Zone Law, Section 76 The Special Economic Zone Law, Section 77 The Special Economic Zone Law, Section 78 The Special Economic Zone Law, Section 80 (a), (b), (c), (d) and (e)
5.	**The Myanmar Insurance Law, 1993**	The Myanmar Insurance Law, Section 16

Table 3.5-2 Summary of legal commitments by the Project during Pre-Construction, Construction and Operation phases. (Cont.)

No.	Laws, Regulations and Policy	Commitment Sections / Articles
6.	**The Protection and Preservation of Ancient Monuments Law, 2015**	The Protection and Preservation of Ancient Monuments Law, Section 12
7.	**The Protection and Preservation of Antique Objects Monuments Law, 2015**	The Protection and Preservation of Antique Objects Monuments Law, Section 12
8.	**The Protection of National Race Law, 2015**	The Protection of National Race Law, Section 5
9.	**Conservation of Water Resources and River Law, 2008**	Conservation of Water Resources and River Law, Section 8 Conservation of Water Resources and River Law, Section 11 (a) Conservation of Water Resources and River Law, Section 19
10.	**Freshwater Fishery Law, 1991**	Freshwater Fishery Law, Section 40
11.	**Myanmar Marine Fishery Law, 1990**	Myanmar Marine Fishery Law, Section 39
12.	**The Myanmar Insurance Law, 1993**	The Myanmar Insurance Law, Section 16
13.	**Factories Act, 1951**	Factories Act, All Sections (Chapters)
14.	**Employment and Skill Development Law, 2013**	Employment and Skill Development Law, Section 5 Employment and Skill Development Law, Section 14 Employment and Skill Development Law, Section 30
15.	**The Minimum Wage Law, 2013**	The Minimum Wage Law, Section 12 (a), (b), (c) and (d) The Minimum Wage Law, Section 13 (a), (b), (c), (d) and (e) The Minimum Wage Law, Section 18
16.	**The Payment of Wages Act, 2006**	The Payment of Wages Act, Section 4

Table 3.5-2 Summary of legal commitments by the Project during Pre-Construction, Construction and Operation phases. (Cont.)

No.	Laws, Regulations and Policy	Commitment Sections / Articles
		The Payment of Wages Act, Section 7 The Payment of Wages Act, Section 8 The Payment of Wages Act, Section 9 The Payment of Wages Act, Section 10 The Payment of Wages Act, Section 11
17.	**The Law Amending the Leave and Holidays Act, 2006**	The Law Amending the Leave and Holidays Act, Section 3 The Law Amending the Leave and Holidays Act, Section 4 The Law Amending the Leave and Holidays Act, Section 7 The Law Amending the Leave and Holidays Act, Section 11
18.	**Labor organization Law, 2011**	Labor organization Law, Section 3 Labor organization Law, Section 4 Labor organization Law, Section 29 Labor organization Law, Section 30 Labor organization Law, Section 31 Labor organization Law, Section 38 (b) Labor organization Law, Section 41 (a), (b), (c), (d) and (e) Labor organization Law, Section 43, Labor organization Law, Section 44 (a), (b), (c) and (d).
19.	**The Settlement of Labor Dispute Law, 2012**	The Settlement of Labor Dispute Law, 3 The Settlement of Labor Dispute Law, 4 The Settlement of Labor Dispute Law, 5 The Settlement of Labor Dispute Law, 6

Table 3.5-2 Summary of legal commitments by the Project during Pre-Construction, Construction and Operation phases. (Cont.)

No.	Laws, Regulations and Policy	Commitment Sections / Articles
		The Settlement of Labor Dispute Law, 7 The Settlement of Labor Dispute Law, 8 The Settlement of Labor Dispute Law, 9 The Settlement of Labor Dispute Law, 23 The Settlement of Labor Dispute Law, 24 The Settlement of Labor Dispute Law, 25 The Settlement of Labor Dispute Law, 26 The Settlement of Labor Dispute Law, 27 The Settlement of Labor Dispute Law, 28 The Settlement of Labor Dispute Law, 29 The Settlement of Labor Dispute Law, 30 The Settlement of Labor Dispute Law, 31 The Settlement of Labor Dispute Law, 32 The Settlement of Labor Dispute Law, 33 The Settlement of Labor Dispute Law, 38 The Settlement of Labor Dispute Law, 39 The Settlement of Labor Dispute Law, 41
20.	**The Workman Compensation Act, 1951**	-
21.	**Social Security Law, 2012**	Social Security Law, Section 11 (a) Social Security Law, Section 15 Social Security Law, Section 16 Social Security Law, Section 18 (a) and (b) Social Security Law, Section 48 (a)

Table 3.5-2 Summary of legal commitments by the Project during Pre-Construction, Construction and Operation phases. (Cont.)

No.	Laws, Regulations and Policy	Commitment Sections / Articles
		Social Security Law, Section 51 Social Security Law, Section 53 Social Security Law, Section 54 Social Security Law, Section 75 (a) and (b) * Correction Section 75 not 74
22.	**The Prevention and Control of communicable Diseases Law, 1995**	The Prevention and Control of communicable Diseases Law, Section 5 The Prevention and Control of communicable Diseases Law, Section 8 The Prevention and Control of communicable Diseases Law, Section 9 (a) to (c)
23.	**The Control of Smoking and Consumption of Tobacco Product Law, 2006**	The Control of Smoking and Consumption of Tobacco Product Law, Section 9
24.	**The Motor Vehicles Law, 2015**	The Motor Vehicles Law, Section 4 The Motor Vehicles Law, Section 5 The Motor Vehicles Law, Section 35 The Motor Vehicles Law, Section 45 The Motor Vehicles Law, Section 46 The Motor Vehicles Law, Section 47 The Motor Vehicles Law, Section 49 The Motor Vehicles Law, Section 50 The Motor Vehicles Law, Section 51 The Motor Vehicles Law, Section 52 The Motor Vehicles Law, Section 54
25.	**The Myanmar Fire Brigade Law, 2015**	The Myanmar Fire Brigade Law, Section 25
26.	**Petroleum Act, 1934, Petroleum Rule,1937**	-

3.5.2 Environmental and Social Management Commitments

The Project Proponent is committed to develop the project in the sustainable principles and will be managed in accordance with the international standard, ISO 14001 Environmental Management System (EMS). The ISO 14001 EMS will be integrated in parts of the project and all environmental aspects will be managed in manner to accomplish the requirement of the system.

In first step, the project will formulate an environmental and social policy as guidance for project management, either during the construction and operation phases. The policy will sustain by the following activities:

- Develop a comprehensive Environmental, Health, and Safety (EHS) Management Plan and implement in the Environmental Management Plan (EMP);
- Implement of the EMP as a part of the project and manage the operation with due diligence. Environmental auditing will have to be conducted in an appropriate interval;
- In construction phase, the nominated EPC contractors are required to perform the Environmental Management Plan (EMP) in the contract that specify EHS measures;
- In operation phase, the EHS management will be integrated as a part of the operational management of the project;
- Establish adequate environmental and social safeguards and capabilities;
- Encourage public participation in the EHS management and related to the surrounding communities; and
- Maintain information in the EHS management and performance of the EHS reports required by the corporate management, Government and the concerned authorities.

The EHS Management will be activated starting from the commencement date of the construction.

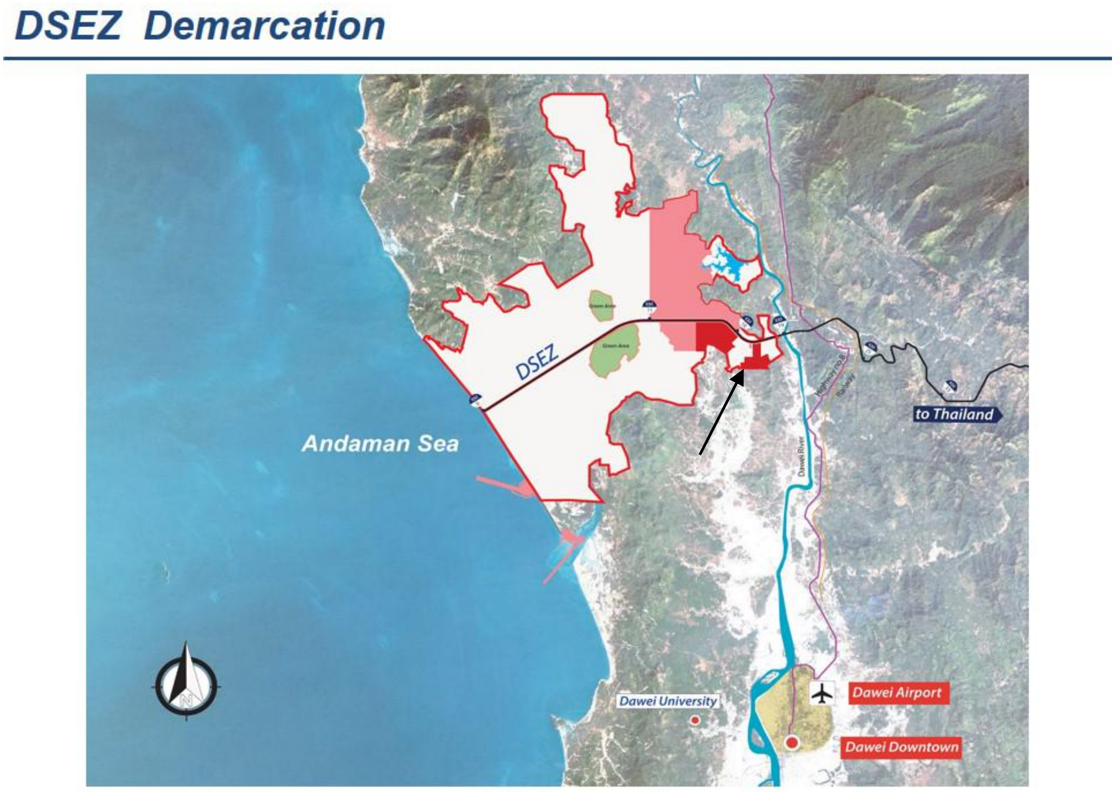
CHAPTER 4
PROJECT DESCRIPTION AND ALTERNATIVES

4.1 PRESENTATION OF THE PROJECT

4.1.1 Project Description

4.1.1.1 Project Location

Initial Township is located in Dawei Special Economic Zone (DSEZ) (Figure 4.1-1 and Figure 4.1-2). It is approximately 28 kilometers north of Dawei Province in the southern part of Myanmar.

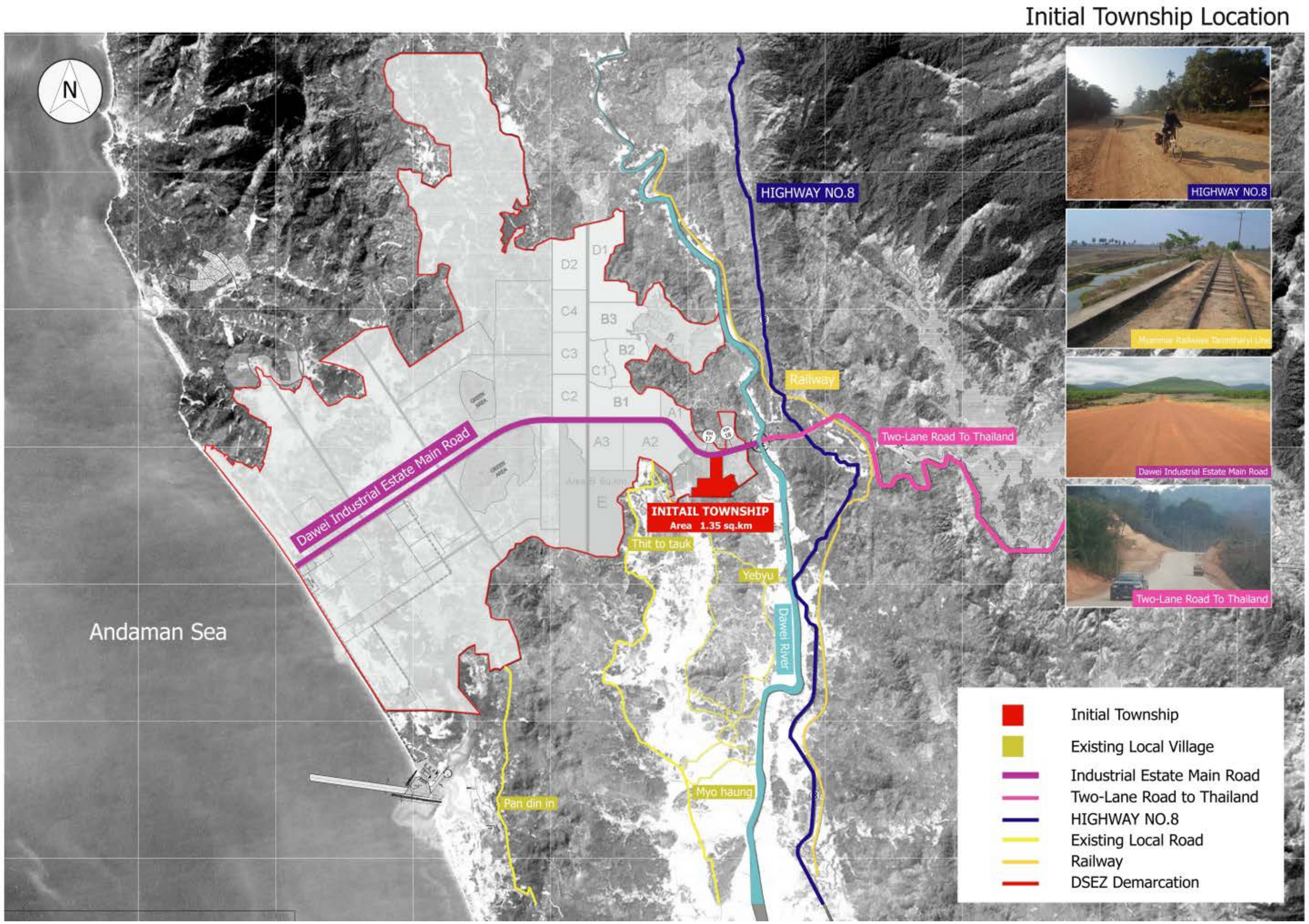


Source: DRC (2015)

Figure 4.1-1 Location of Dawei Special Economic Zone and the Township Project

4.1.1.2 Project Accessibility

Highway no.8 and two-lane road to Thailand are the nearest accessibility (Figure 4.1-2). The highway no.8 is a national highway of Tanintharyi Region that connects northern and southern parts of Myanmar together, between Myaik, Dawei, Mawlamyaing and Yangon. The Two-lane road to Thailand linked with main road of the DSEZ and Kanchanaburi, Thailand. The Project entrance can be accessed by this road at KM 17.



Source: DRC (2015)

Figure 4.1-2 Initial Township Location and Accessibility

4.1.1.3 Project Background

Development of the project was officially commenced in 2008, when the Memorandum Of Understanding (MOU) was signed between two governments, Thailand and the Union of Myanmar, agreeing to develop the deep sea port in Dawei. In 2010, ITD was granted right from the Myanmar Port Authority to develop and operate Dawei Project over a 75-year land lease period. Key milestones of the project development history are summarized in Table 4.1-1.

Table 4.1-1 Summary of Development History of the Project

Date	Description
May 19, 2008	Government of the Kingdom of Thailand and the Government of the Union of Myanmar signed an MOU to develop a deep sea port in Dawei.
June 12, 2008	Myanmar Port Authority as authorized implementing agency and ITD signed an MOU relating to the implementation of a feasibility study and comprehensive project site for the Dawei Deep Sea Port and Industrial Estates Development Project.
November 2, 2010	The Framework Agreement was signed by Myanmar Port Authority and ITD granting ITD rights to develop and operate. The Dawei Project cover 75 years land lease period.
June 25, 2012	The Ministry of Finance of Thailand authorized a working group in order to provide financial support for the Development of Dawei Deep Sea Port and Industrial Estate Project. The Chairman of the working group is the Director of the Fiscal Policy Office. The working group consists of representatives of the Office of the National Economic and Social Development Board (NESDB), the Export-Import Bank of Thailand (EXIM Thailand), the Office of the State Enterprise Policy Committee and other government representatives.
July 23, 2012	The Government of the Kingdom of Thailand and the Government of the Republic of the Union of Myanmar signed an MOU on the Comprehensive Development of the Dawei Special Economic Zone (DSEZ) and its related project areas in order to further enhance the two government’s support and cooperation of the Dawei Project.
November, 2012	The Thailand-Myanmar Joint Committee for the Comprehensive Development in the Dawei Special Economic Zone and its related Project Area was established into 3 levels in order to manage and enhance the Dawei Project development namely: Thailand-Myanmar Joint High-level Committee (JHC), Thailand-Myanmar Joint Coordinating Committee (JCC) and Thailand-Myanmar Joint Sub-Committee (JSC) which has 6 infrastructure sectors for development including: Infrastructure and Construction, Focuses Industry and Business Development, Power, Community Development and Relocation, Rules and Regulations and Finance.

Table 4.1-2 Summary of Development History of the Project

Date	Description
Year 2013	The concession of Dawei Project had been suspended following by Terminal and Tripartite agreement, Thailand and Myanmar have agreed to revise all development projects in Dawei to make them more realistic and attractive for foreign investment and become to the present Dawei Special Economic Zone Initial Phase Development Plan in order to manage the port, road and rail links, power plants, waterworks, industrial estates, telecommunications and a township. Developer has awarded from the Dawei Special Economic Zone Management Committee (DSEZMC).
June 17, 2013	The Special Purpose Vehicle (SPV) was established by the 2 governments primarily holding 50% shareholding each in the SPV. The SPV will be a concessionaire to develop, manage and promote the Dawei Project. The Myanmar and Thai governments are represented be the Foreign Economic Relations Development (FERD) and the Neighboring Countries Economic Development Cooperation Agency (NEDA) respectively. Both governments plan to invite other countries to join the SPV to develop and manage the Dawei Project accordingly
August 2014	DSEZMC released TOR of Dawei SEZ Initial Phase Development. The 4th JCC Meeting held at the Centara Grand Hotel Bangkok, the New Framework Agreement between the DSEZ Management Committee and Dawei SEZ Development Co., Ltd ("SPV") was signed. This agreement gives the right to the SPV to be the promoter and facilitator of the Dawei Project and grants the right to the SPV to invite and select the investment groups for the Special Purpose Companies (SPCs) for the relevant infrastructure as well as the concessionaire for the Initial Phase of the Dawei Project.

Source: DRC (2015)

4.1.1.4 Phase Development

Initial phase of Township covers an area of 1.365 sq. km in DSEZ. It is designed for maximum capacity of 135,080 persons in order to accommodate workforce from Initial Industrial Estate. At the present, the Township will be developed on demand basis; however, the Township can be further expanded up to 5.58 sq.km in final phase.

Development of the Initial Township will be by phases. To begin with phase 9+1 and then phase A, B, C and D will be developed, respectively. Development plan is presented in Table 4.1-2.

(a) ***9 plus 1 Phase***

Development of the Initial Township will begin with phase 9 plus 1. Nine buildings of Workforce apartment and one Service apartment will be built at this stage. Basic need infrastructure e.g. Township main road, water and power supply will also be constructed. Location of phase 9 plus 1 is in Figure 4.1-3.

Table 4.1-3 Project Development Phasing

Year	Phase	Construction Plan					
		5-Floor Workforce Apartment (700 Pers./Bldg.)	Capacity (Pers.)	8-Floor Serviced Apartment (222Pers./Bldg.)	Capacity (Pers.)	3-Floor Retail Shops (120 Pers./Bldg.)	Capacity (Pers.)
2015	9 + 1	9	6,300	1	-	0	0
2016							
2017	A	35	24,500	0	167	8	960
		23	16,100				
2018	B	23	16,100				
2019		23	16,100				
2020	C	23	16,100				
2021		23	16,100				
2022	D	17	11,900				
SUM		**176**	**123,200**	**20**	**4,440**	**62**	**7,440**

Figure 4.1-3 Location of Phase 9 Plus 1 and Layout of Full Phase.

(b) ***Full Phase***

Initial Township will be entitled with residential buildings, infrastructure and facilities in full phase. Infrastructure are Road Network, water and power supply and Flood Protection System. Facilities are recreation; public and green area, commercial venue, transportation hub, fire station and police station. These facilities will be developed by phases in accordance with the mentioned plan until completion. Supporting facilities are such as health center or hospital and school will be built at the time that adequate number of population has been reached.

4.1.1.5 Project Schedule

Construction and development of infrastructure are scheduled to start in 2015 or as soon as possible after the EIA approval and finish in 2023. Overall project schedule is shown in Table 4.1-3.

Table 4.1-4 Overall Schedule for Development of Initial Township

ITALIAN - THAI DEVELOMENT PUBLIC COMPANY LIMITED

Tentative Schedule For Initial Township (9+1 Bldg)

Rev.10.1D Date: 15 April 2015

Item/Description		Unit	Quantity		2015										2016												2017							
						-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
					Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
(A) 3 -Storey (Retail shop) 10 Unit/Bldg.	Foundation Work	Bldg	0	Plan																														
				Acc.																														
	Precast Concrete & Erection Work	Bldg	0	Plan																														
				Acc.																														
	Structure Work	Bldg	0	Plan														On Actual Demand																
				Acc.																														
	M&E Work	Bldg	0	Plan																														
				Acc.																														
Area= 2,637 m2/Bldg.	Architect (Finish) Work	Bldg	0	Plan																														
				Acc.																														
Total Building		Bldg	0	Acc.													0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Person	12 pers./Unit (120 pers./Bldg)	Person	0	Acc.													0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(B) 5- Storey (Workforce Apartment) 175 Unit/Bldg.	Foundation Work	Bldg	9	Plan	1		1					1	1	1	1	1	1		1															
				Acc.	1	1	2				2	3	4	5	6	7	8	8	9															
	Precast Concrete & Erection Work	Bldg	9	Plan				1			1		1		1		1		1		1		1		1									
				Acc.				1		1	2	2	3	3	4	4	5	5	6	6	7	7	8	8	9									
	Structure Work	Bldg	9	Plan					1			1		1		1		1		1		1		1		1								
				Acc.					1			2	2	3	3	4	4	5	5	6	6	7	7	8	8	9								
	M&E Work	Bldg	9	Plan						1			1		1		1		1		1		1		1		1							
				Acc.						1	1	1	2	2	3	3	4	4	5	5	6	6	7	7	8	8	9							
Area=5,810 m2/Bldg.	Architect (Finish) Work	Bldg	9	Plan							1			1		1		1		1		1		1		1		1						
				Acc.							1	1	1	2	2	3	3	4	4	5	5	6	6	7	7	8	8	9						
Total Building		Bldg	9	Acc.							1	1	1	2	2	3	3	4	4	5	5	6	6	7	7	8	8	9	9	9	9	9	9	9
Total Person	4 pers./Unit (700 pers./Bldg)	Person	6,300	Acc.							700	700	700	1,400	1,400	2,100	2,100	2,800	2,800	3,500	3,500	4,200	4,200	4,900	4,900	5,600	5,600	6,300	6,300	6,300	6,300	6,300	6,300	6,300
(C) 8-Storey (Service Apartment) 111 Unit/Bldg.	Foundation Work(Have Piles)	Bldg	1	Plan									1																					
				Acc.									1																					
	Precast Concrete & Erection Work	Bldg	1	Plan												1																		
				Acc.												1																		
	Structure Work	Bldg	1	Plan													1																	
				Acc.													1																	
	M&E Work	Bldg	1	Plan																1														
				Acc.																1														
Area=6,137 m2/Bldg.	Architect (Finish) Work	Bldg	1	Plan																	1													
				Acc.																	1													
Total Building		Bldg	1	Acc.							0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Total Person	2 pers./Unit (222 pers./Bldg)	Person	222	Acc.							0	0	0	0	0	0	0	0	0	0	222	222	222	222	222	222	222	222	222	222	222	222	222	222
Total Population	in 3-Storey (Retail Shop)			Acc.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	in 5-Storey (Workforce Apt.)			Acc.	-	-	-	-	-	-	700	700	700	1,400	1,400	2,100	2,100	2,800	2,800	3,500	3,500	4,200	4,200	4,900	4,900	5,600	5,600	6,300	6,300	6,300	6,300	6,300	6,300	6,300
	in 8-Storey (Service Apt.)			Acc.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	222	222	222	222	222	222	222	222	222	222	222	222	222	222
	Sum			Acc.	-	-	-	-	-	-	700	700	700	1,400	1,400	2,100	2,100	2,800	2,800	3,500	3,722	4,422	4,422	5,122	5,122	5,822	5,822	6,522	6,522	6,522	6,522	6,522	6,522	6,522
Total Building	3-Storey (Retail Shop)			Yearly										-								-				-								-
				Acc.										-								-				-								-
	5-Storey (Workforce Apt.)			Yearly										2								6				6								3
				Acc.										2								6				8								9
	8-Storey (Service Apt.)			Yearly										-								1				1								-
				Acc.										-								1				1								1
	Sum			Yearly										2								7				7								3
				Acc.										2								7				9								10

Source: Italian-Thai Development PLC., 2015

4.1.2 Project Components

The Project constitutes residence, commercial venue, facility center and infrastructure. These features has been designed to serve up to 135,080 people and they are as follow:

4.1.2.1 Land and Landscape

Initial Township has been designed base on it nature and primitive topography with the aimed concept that topography will be minimal altered and sustain with the environmental setting of the township. In this study, topographic analysis and land grading technique are integrated in layout of the township, to resolve a number and type of buildings in accordance with life style of residents and the buildings themselves concepts along with the topography and landscape as shown in Figure 4.1-4 to Figure 4.1-5.

Figure 4.1-4 Topography Analysis

Figure 4.1-5 Conceptual Land Grading

(a) ***Zoning and Grid Network***

The township will consist of three main areas, residential, commercial, recreational and green area. To harmonize these areas together with life style of the communities, road connection and grid network have been designed, not only to accommodate the residents in relation to their environment but also energy efficiency as shown in Figure 4.1-7.

Commercial and retails areas will be located in between the Service Apartments and the Workforce Apartment to reduce separation and enhance relationship between the residents. In addition, the building blocks are designed base on walking distance. A Typical Block, 165 meter x 150 meter will be able to walk with rate of 3.2 kilometer per hours (estimate 0.7 meter per step of walking) as shown in Table 4.1-6.

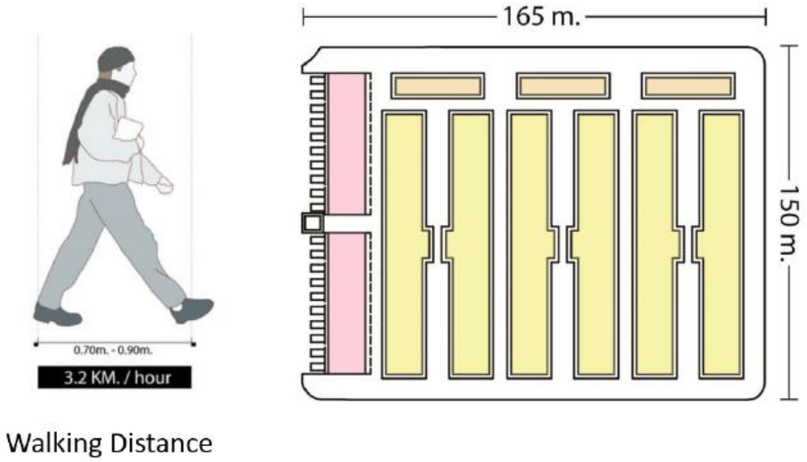


Figure 4.1-6 Typical Block Concept

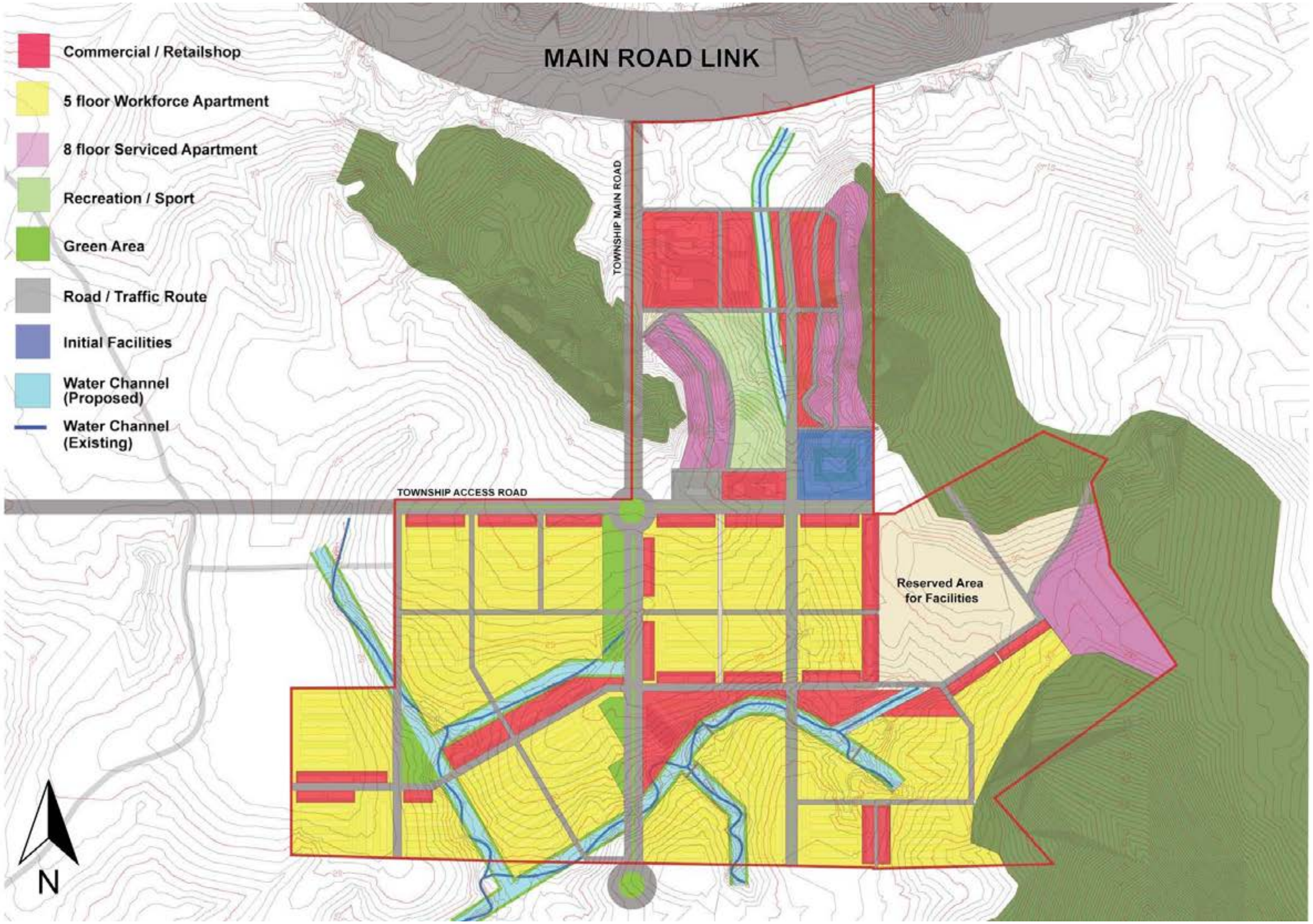


Figure 4.1-7 Zoning of Initial Township

(b) *Recreational and Green Areas*

In order to provide sustainable community lifestyle for the residents, various types and scales of public parks are employed to create continuous green area all over the town. The smallest scale of recreational areas will start from the space between 2 buildings and continue the connection into scale of blocks, districts and town as shown in Figure 4.1-8 and Figure 4.1-9.

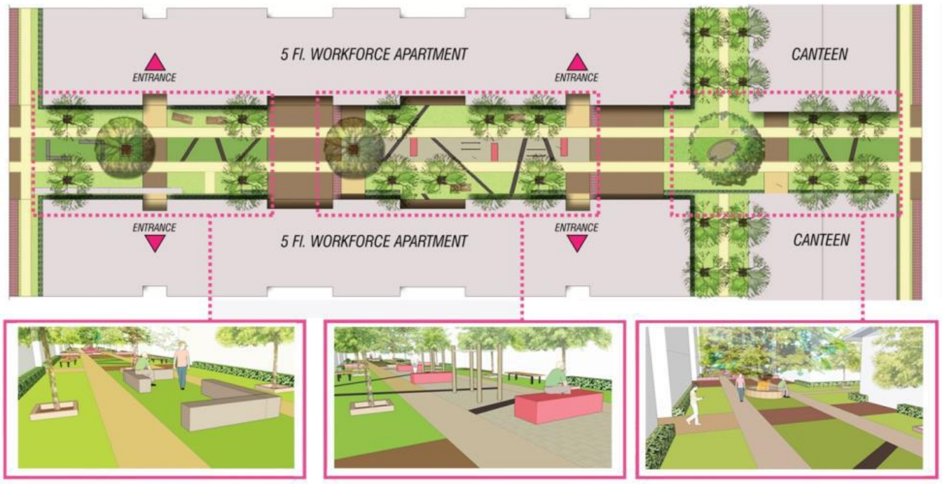


Figure 4.1-8 Green Area Between Walk Ways

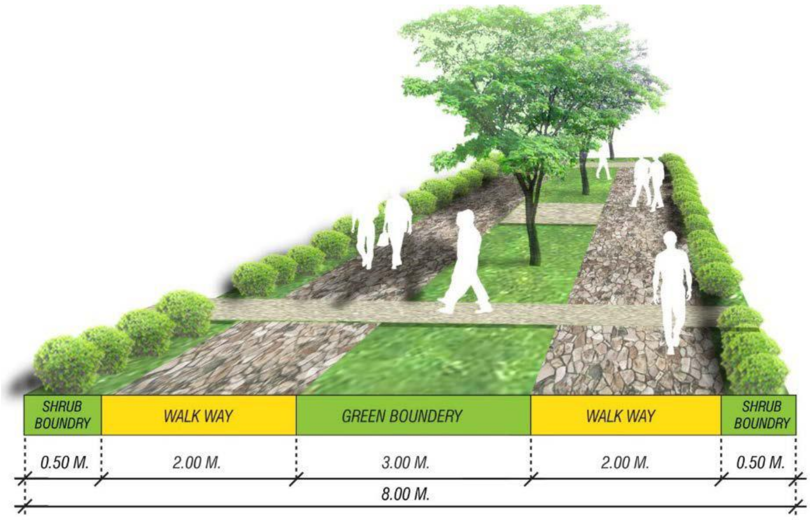


Figure 4.1-9 Walk ways and Green Boundaries

Total green area is about 0.7 square kilometers. Green areas location (in Figure 4.1-10) will be developed by phases per extension units of the Project, to support increasing of population in each area such as outdoor, indoor, jogging areas, sport and picnic Figure 4.1-11 .

Figure 4.1-10 Green Areas

Figure 4.1-11 Development of Park and Recreational Areas.

(c) *Public Areas*

Public areas are parking, areas between building (both front and back) and common cafeteria. Every 3-floor retail shops have their own parking port in the front. Motorcycles parking ports are shared and in between the blocks as shown in Figure 4.1-12.

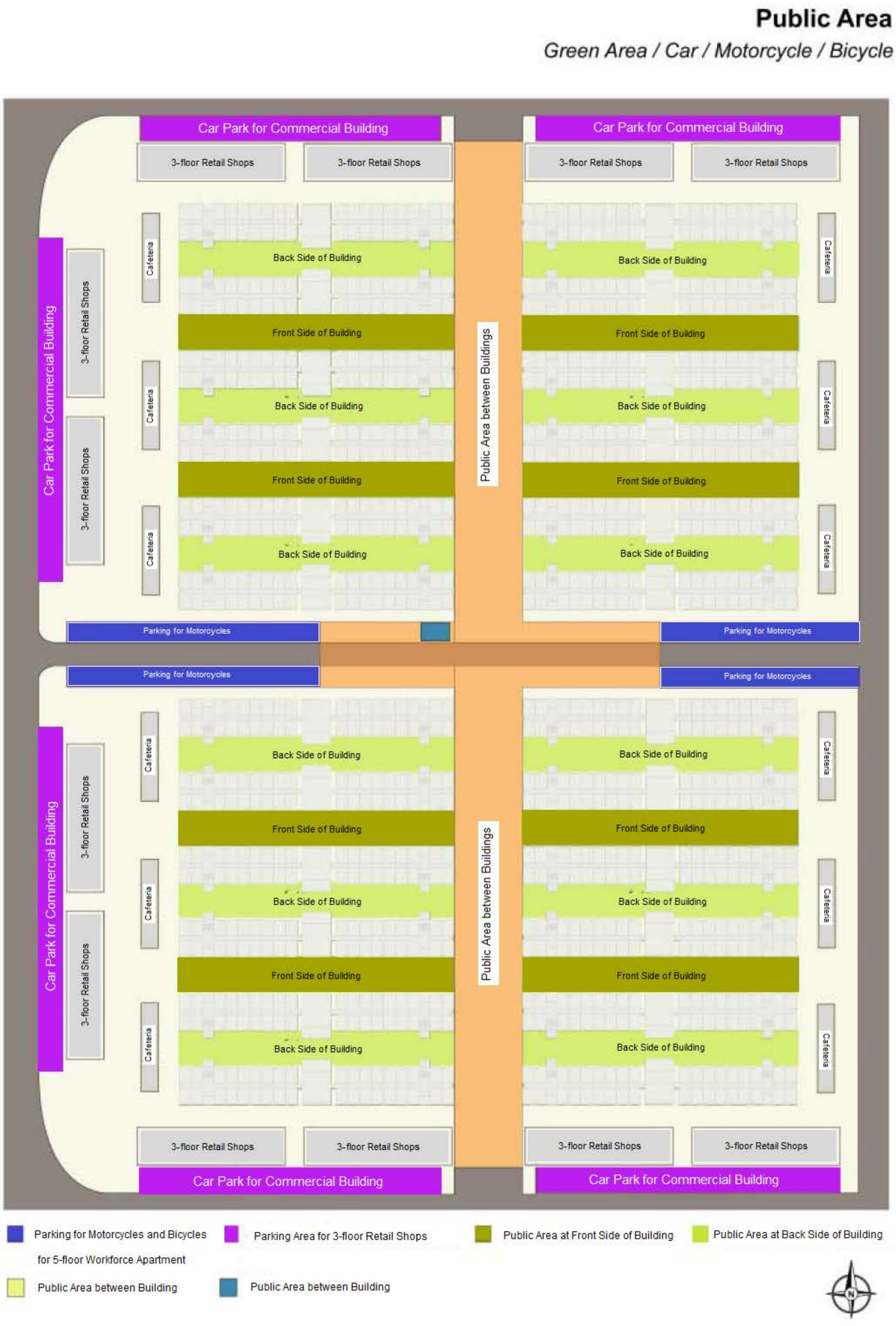


Figure 4.1-12 Public Areas

4.1.2.2 Residential Buildings

Residential buildings are 5-floor workforce apartments, 8-floor serviced apartments (Managerial Class) and 3-floor retail shops at international living standard for its residents. Details of building are shown in Table 4.1-4.

(a) ***5-floor apartment***

The 5-floor apartment or 5-storey workforce apartment is an accommodation design for workforce. The main propose is for labor or employee who will regularly work in the plants or factories in the Initial Industrial Estate. The room is typical shared accommodation or dormitory type, which the residents have to share bathroom, lavatory, laundry, kitchen and common area etc. Inside a room is approximately 20 square meter and consists of 4 beds (Figure 4.1-13 to Figure 4.1-18).

(b) ***8-floor apartment***

The 8-floor apartment or 8-storey service apartment is an accommodation designed for executive and his/her family who also work in the plants or factories of the initial Industrial Estate or in DSEZ vicinity. The room is typical private accommodation or “Condominium” style. The apartment consists of approximately 100 units. The 1-bed room units ranging from 34 to 54.5 square meters and there are three different types of the room, Studio, Deluxe type 1 and Deluxe type 2 (Figure 4.1-19 to Figure 4.1-22).

(c) ***3-floor retails shop***

The 3-floor apartment or 3-storey retail shop is a combined feature of building for commercial and residence. First floor is designed for commercial purpose as retails and the 2nd and the 3rd floor may be used for residence of the other business purposes. Up to 4 meters wide and over 10 meter in length of useful space for each floor with parking area in the front (Figure 4.1-23 to Figure 4.1-27).

4.1.2.3 Commercial Buildings

Commercial areas consist of shops and restaurants. The venue is designed for commercial purpose including public area e.g. canteen for public activities. Pavement in this area will be ground blocks for multi-purpose in case emergency (Figure 4.1-28 to Figure 4.1-29)

Figure 4.1-13 Layout of 5-Floor workforce apartment

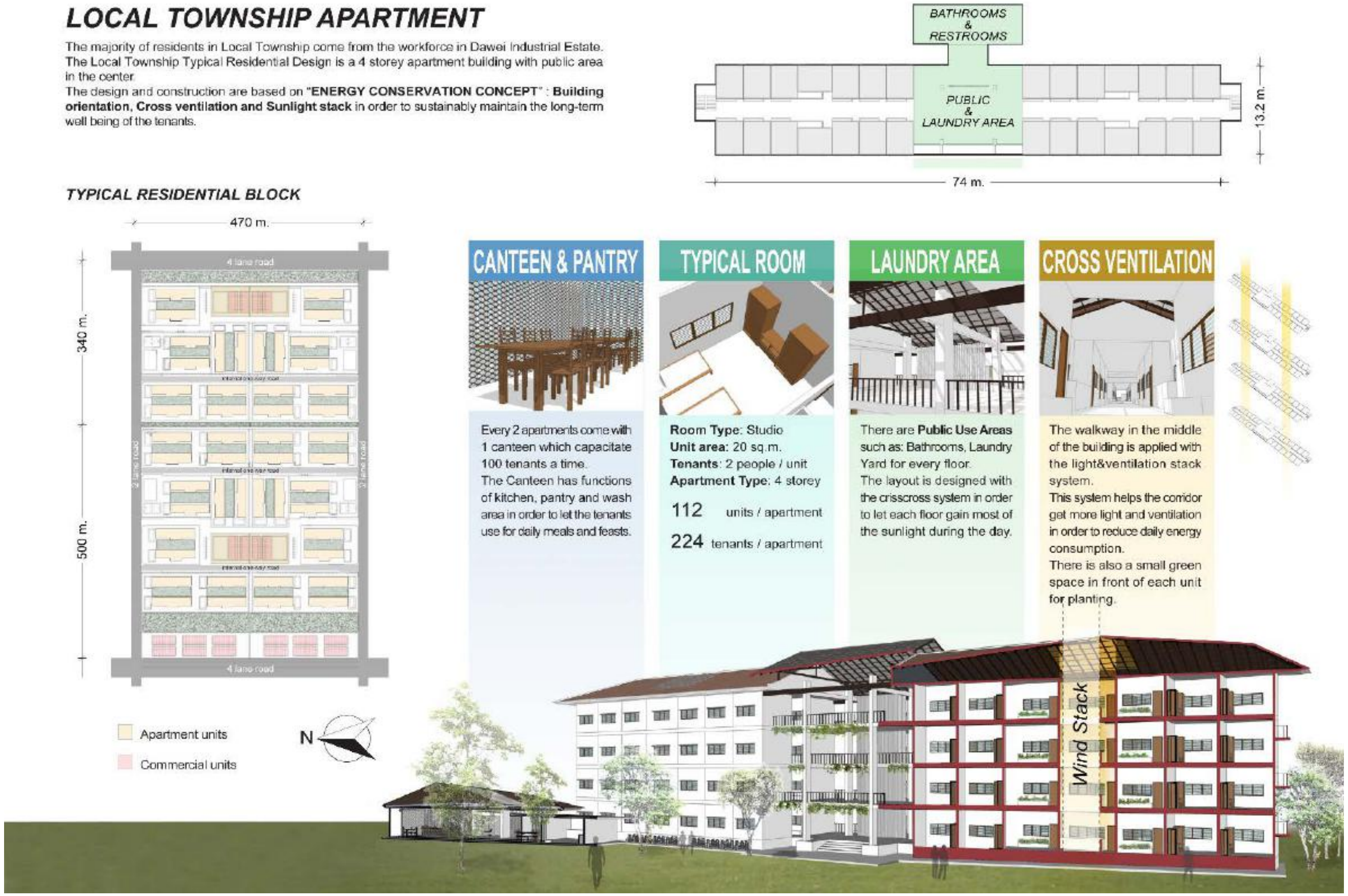


Figure 4.1-14 Features of 5-floor workforce apartment

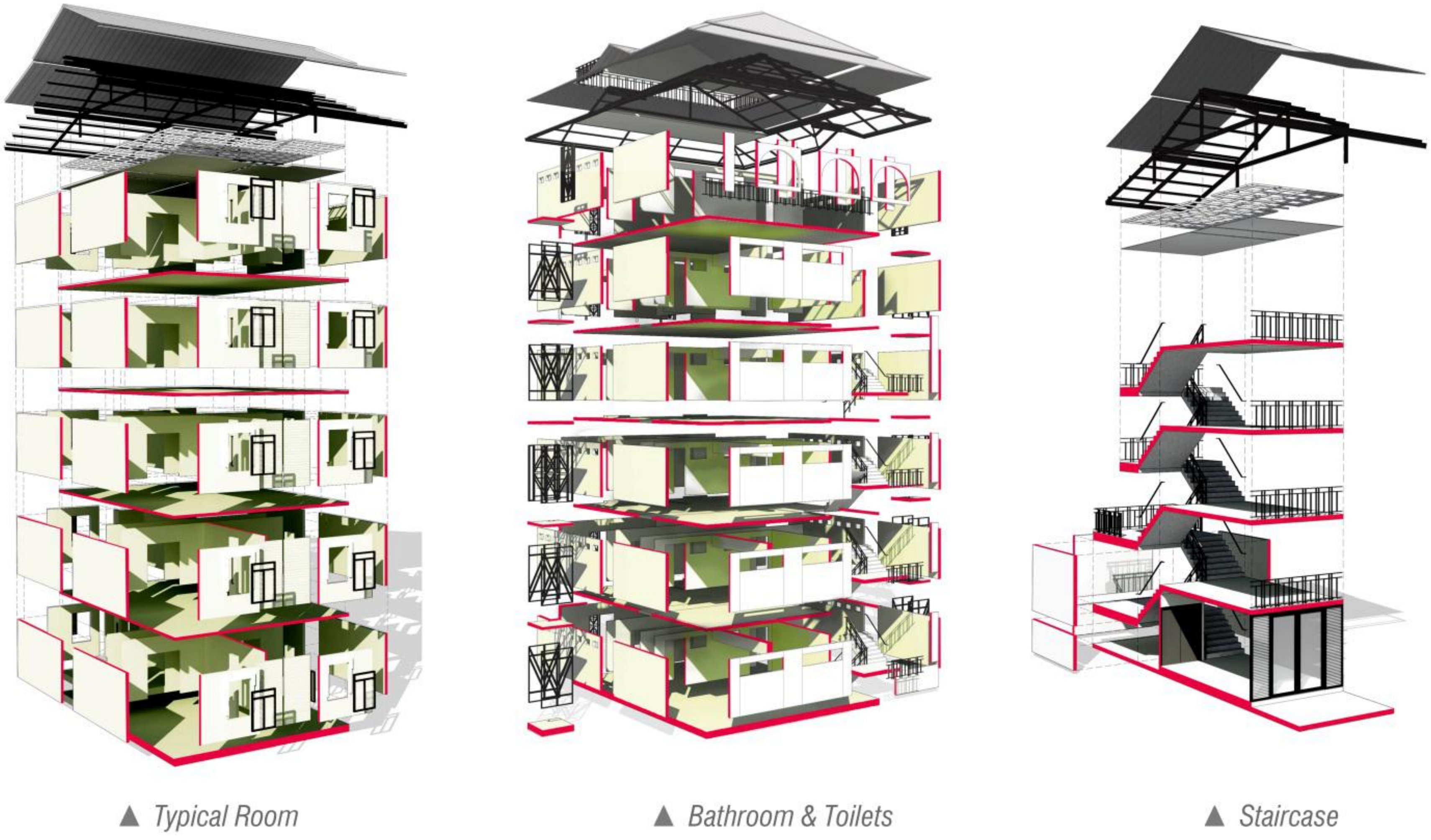


Figure 4.1-15 Design of 5-Floor workforce apartment

Figure 4.1-16 Conceptual Design of room in 5-Floor workforce apartment

Figure 4.1-17 Floor plan and side views for room in 5-Floor workforce apartment

Figure 4.1-18 Public areas and shared areas in 5-Floor workforce apartment

Figure 4.1-19 Design of 8-Floor Service Apartment

STUDIO TYPE
area 34 sq.m.
(79 unit/building)

DELUXE TYPE 1
area 49 sq.m.
(16 unit/building)

DELUXE TYPE 2
area 54.5 sq.m.
(16 unit/building)

Figure 4.1-20 Floor plans for different types of room in the 8-Floor Service Apartment

Figure 4.1-21 Conceptual design of the deluxe type 1 in the 8-Floor Service Apartment

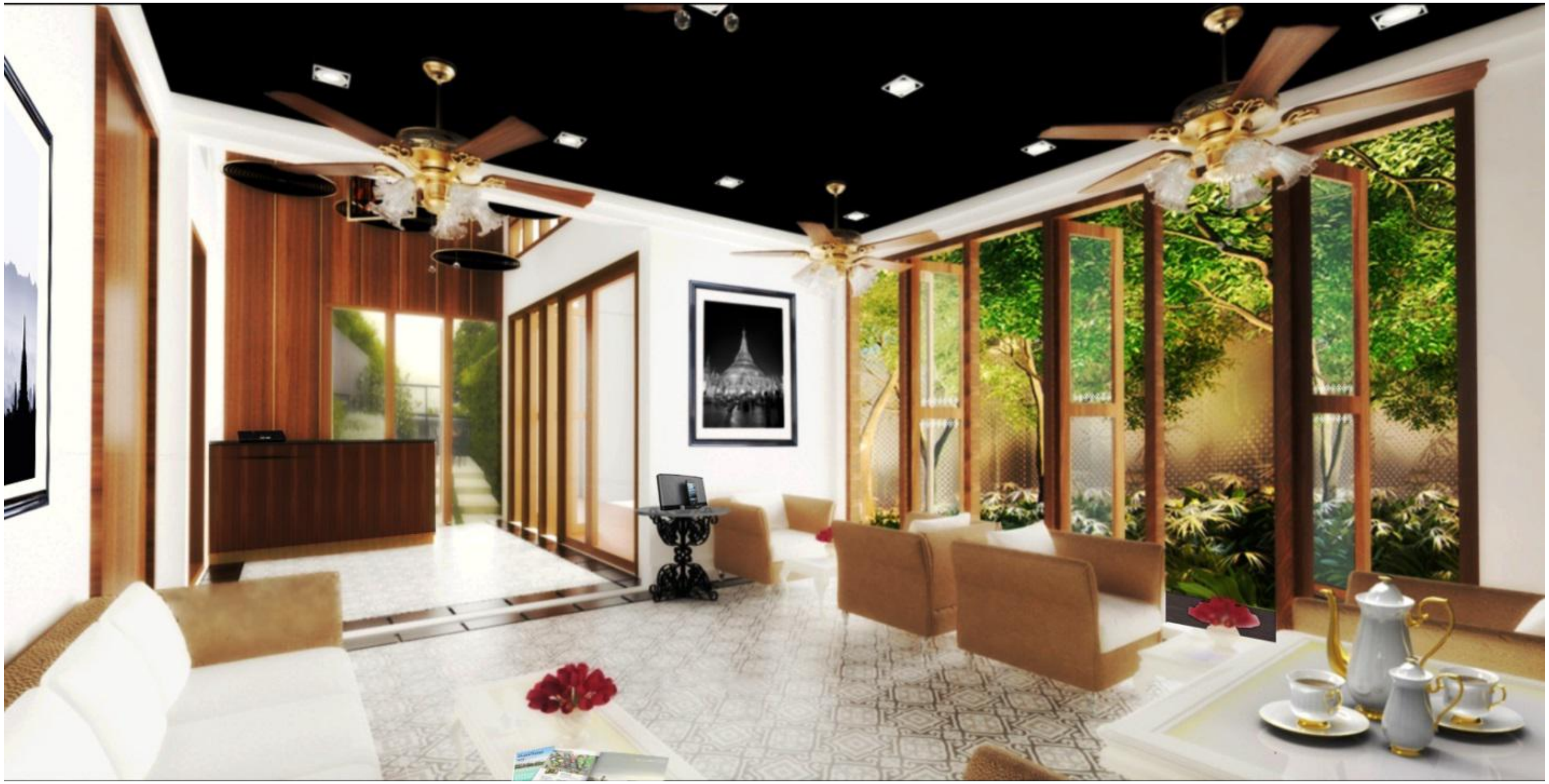


Figure 4.1-22 Conceptual design of common area in 8-Floor Service Apartment

Figure 4.1-23 Design of 3-Floor Retails Shop

Figure 4.1-24 Floor plan of 3-Floor Retails shop

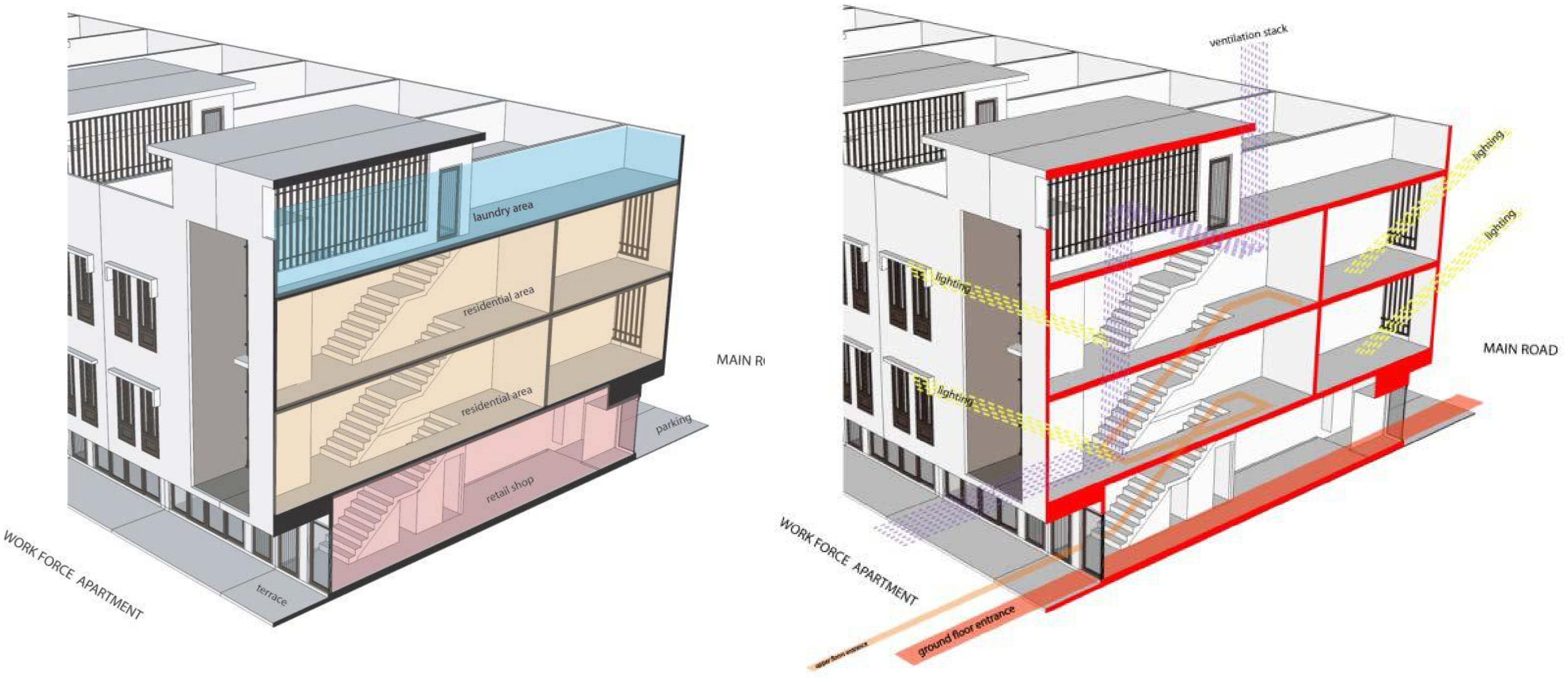


Figure 4.1-25 Side view of 3-Floor Retails Shop

Figure 4.1-26 Design of Public Areas Concept

Figure 4.1-27 Design and layout of canteen in residential area

Figure 4.1-28 Conceptual design of Commercial Area

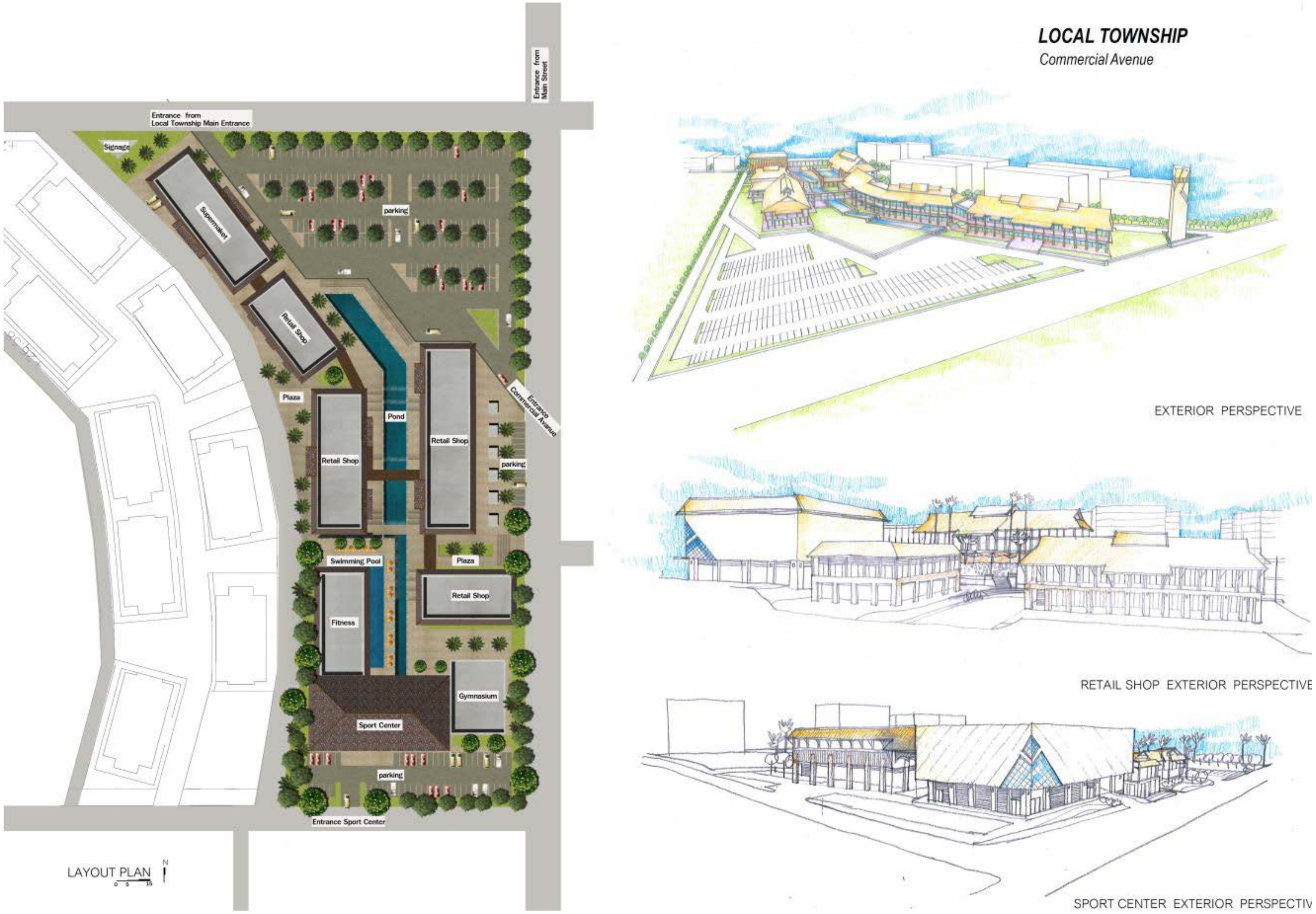


Figure 4.1-29 Design and Layout of Commercial Avenue

Table 4.1-5 Design and ratio of accommodation space

Land and Surrounding areas in Percentage						
Function	3 FL. Retail Shops		5 FL. Workforce Apartment		8 FL. Serviced Apartment	
	Land Area (1 Building and Surrounding)	%	Land Area (1 Building and Surrounding)	%	Land Area (1 Building and Surrounding)	%
Building (Footing)	652.00	27.6	1,796.00	55.0	1,530.00	29.1
Road	426.27	18.0	366.54	11.2	928.69	17.7
Parking Lot	228.75	9.7	196.70	6.0	498.38	9.5
Landscape						
- Hard scape	426.01	18.0	366.32	11.2	928.13	17.6
- Soft scape	631.01	26.7	542.60	16.6	1,374.75	26.1
Total	**2,364.04**	**100.0**	**3,268.16**	**100.0**	**5,259.94**	**100.0**

Land and Surrounding areas in Ratio									
Building Type	Land Area (sq.m.)	Building Area (sq.m.)	Footing Area (sq.m.)	Road / Traffic (sq.m.)	Parking Lot (sq.m.)	Non-Building Space (sq.m.)	FAR/1	OSR/2	BCR/3
3 Fl. Retail Shops	2,364	2,400	652	426	229	1,057	1.02	44.04	27.58
5 Fl. Local Apartment	3,268	5,810	1,796	367	197	909	1.78	15.64	54.95
8 Fl. Serviced Apartment	5,260	6,137	918	929	498	2,915	1.17	47.50	17.45

Remark /1 FAR = Floor Area Ratio
/2 OSR = Open Space Ratio
/3 BCR = Building Coverage Ratio

4.1.2.4 Facilities Center

(a) ***Hospital***

Location of the hospital or health center will be in public facility area (See Figure 4.1-30). The hospital will be 60 beds covering 25 Rai or 40,000 square meter and can serve up to 50,000-100,000 people within 15 kilometers. The hospital will consists of treatments, cares and examination area, administration, technical and storage zones, waste discharge or management and external areas: park and parking, will be design in accordance with international standard. The hospital will be built, once population of the Township has reached certain number. Initially, the Township residents will rely on the Dawei Hospital (local hospital).

(b) ***Police Station***

Location of police station will be in public facility area. The police station can service over 5,000 to 10,000 Rai in radius of 15 kilometers.

(c) ***School***

Location of school will be in public facility area. The school type, primary school, secondary school and high school will rely on size of population in demands. The school is expect to have 600 to 1,000 students and to service in 1.5 kilometers in radius.

(d) ***Fire Station***

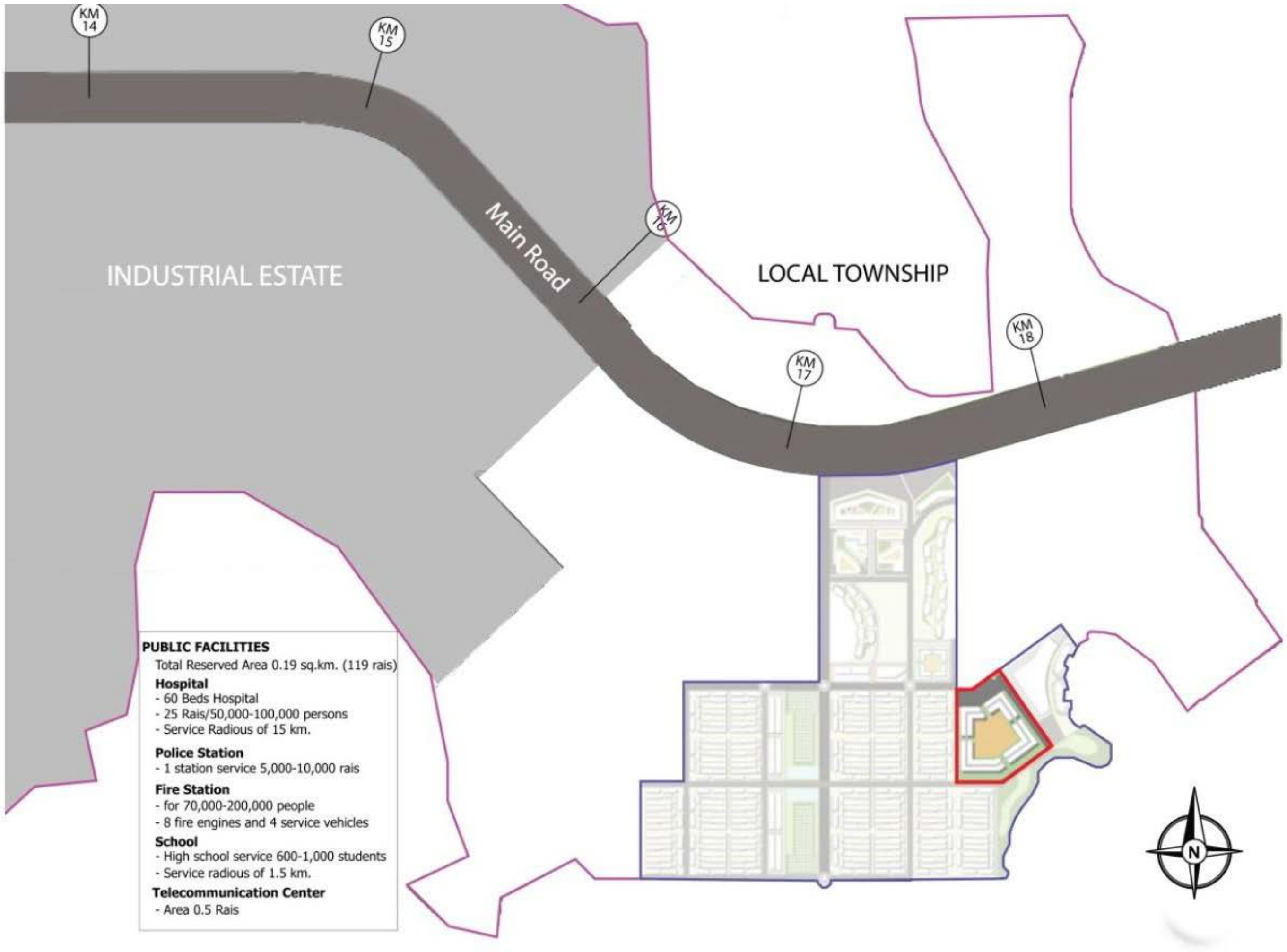
Location of fire station will be in public facility area. Fire station will includes with fire equipment, fire trucks, fire apparatus including fire brigade staff. Details of fire station are in *Section 4.1.14*, Fire and Emergency Response System.

(e) ***Telecommunication Center***

Location of telecommunication center will be in public facility area. The center will cover only 0.5 Rai in service.

(f) ***Transportation Hub***

Location of transportation Hub will be in residence area in between service apartment zone 1 and workforce apartment zone 1. It will cover 16,000 square meters.



Source: DRC, 2015

Figure 4.1-30 Location of Public Facility in Initial Township

4.1.3 Road Network

Due to shape of the Project land, is fan-shape, grid system (Figure 4.1-31) is applied to the Project with multiple accesses, to facilitate residents and prevention of traffic congestion. Grid system is also applied in areas of workforce apartment that are equally divided into blocks and size of these blocks are all in walking distance, to ensure that residents can get off the bus and continue walking to their accommodation. For gated type of community such as serviced apartments, there will be only one or two accesses. This is due to increasing level of privacy and safety.

Road and grid network are 3 types as follows;

- tertiary road is 2-lane,
- secondary road is 4-lane,
- main road is 6-lane.

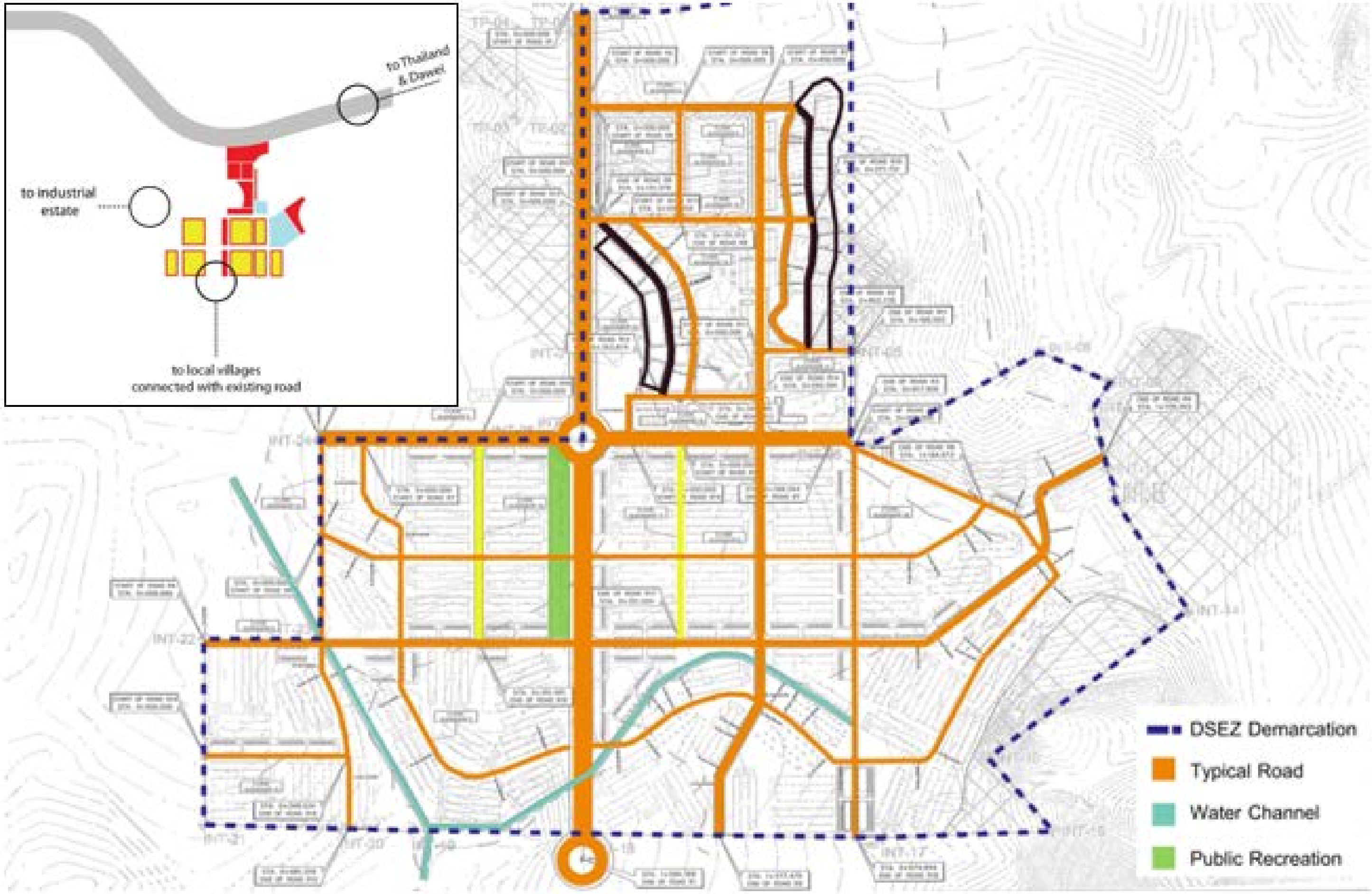
Typical cross- sections of the secondary and tertiary roads are shown in Figure 4.1-32.

4.1.4 Flood Control and Drainage System

The existing topographic condition of the Dawei SEZ consists of 2 drainage basins The Andaman basin is on the west and the Dawei basin is on the east (Figure 4.1-33). The Initial Township is situated in upstream area of the Kun Chuang River, which is in sub-basin of the Dawei basin. The Project is not in the area of seasonal flooding but downstream area of the Kun Chuang River is. From a field investigation revealed that flood marks in 2006 was up to 13 meters above Chart Datum (CD). The extent of the flood is shown in Figure 4.1-33.

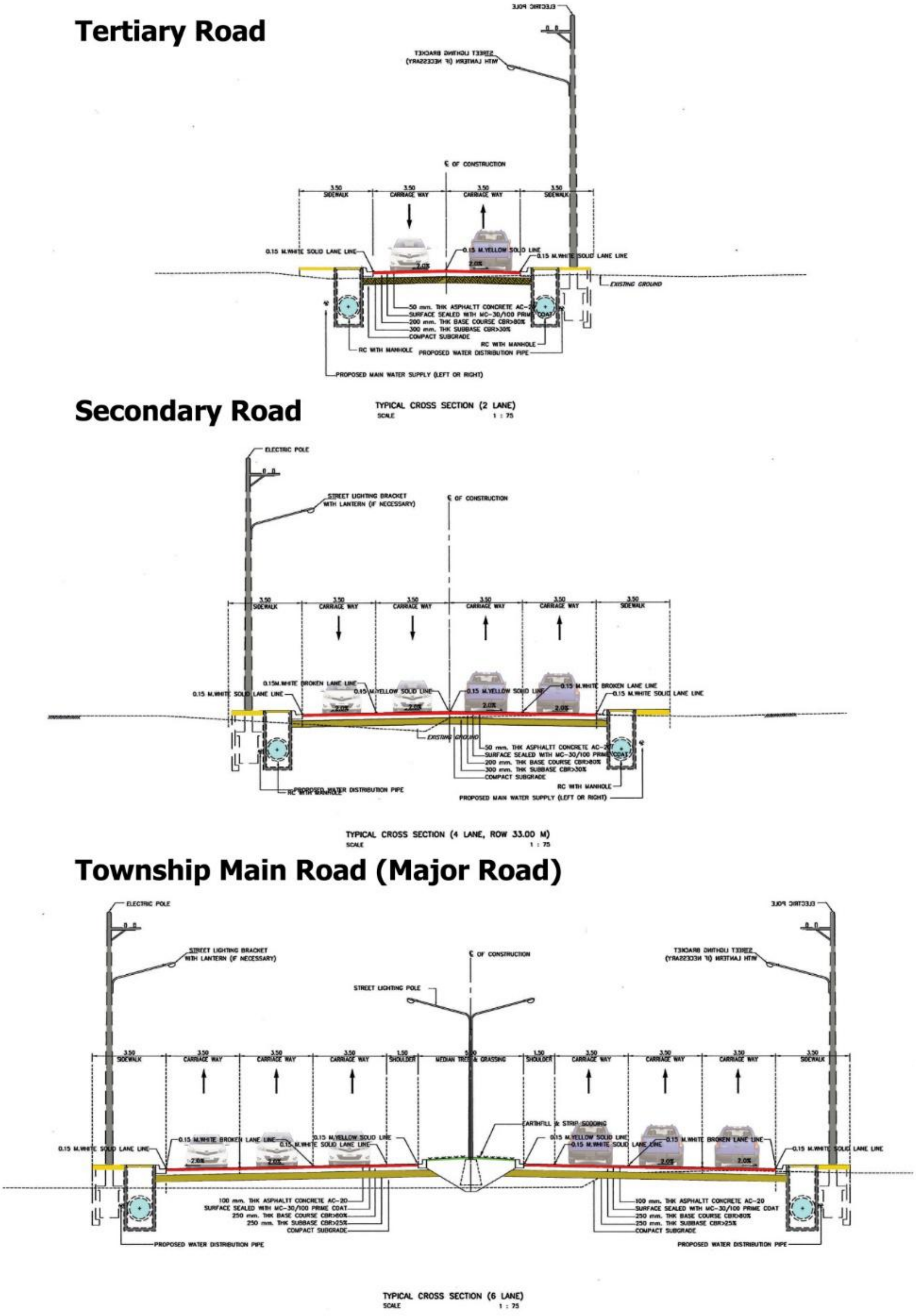
According to the site characteristic and heavy monsoon season at the site, the adjusted terrain and drainage are designed by marking steps upon natural terrain in order to gain the most benefit from its context. Each slop area will be adjusted into steps will circa 1 m. height difference, to create smoother walkable topographic scene all over the site. It will focus on how the building would be on actual topographic condition and how the new shaped terrain would drain the rainwater effectively.

Roads are attached with sized sewers that will drain rainwater into drain cannels. For every mountainous area, an adequate size of green stripe will be grown in order to retain the Dawei heavy rainfall. These stripes will help to absorb and transfer rainwater as shown in Figure 4.1-34.



Source: DRC, 2015

Figure 4.1-31 Road and Grid Network within Initial Township



Source: DRC, 2015

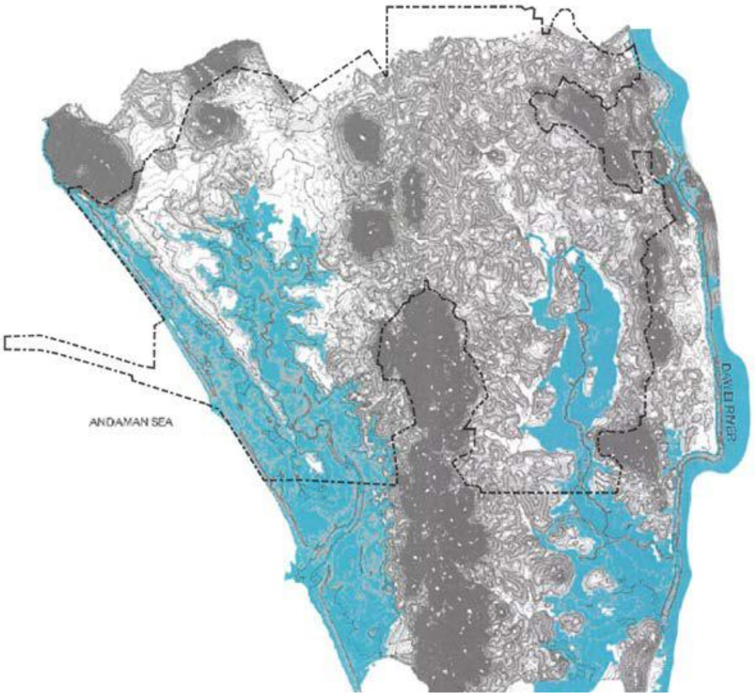
Figure 4.1-32 Typical Cross-sections of Tertiary Road, Secondary Road and Main Road in Township

Owning to area of the Project is situated in quite altitude. Only retention ponds are designed to hold a certain volume of water from rain in case of periodically flood. One retention pond is for area north in the initial township and the others, two retention ponds are designed for the full phase. Location of the retention ponds are presented in Figure 4.1-35. Volume of each retention ponds is presented in Table 4.1-5

Table 4.1-6 Volume of the retention ponds for the Initial Township

	Township Phase	Location	Volume of retained water (m^3)
Retention pond TW1	Initial phase	North	12, 720
Retention pond TW2	Full phase	Southwest	21,310
Retention pond TW 3	Full phase	Southeast	19,590

Design of the retention ponds is based on retaining time (Tc). The retention ponds are designed for holding rainwater for 6 hours. Rainfall intensity and the return period of flooding can be determined by the IDF curve. Maximum rainfall collected within 6 hours in the 50 years cycle of the returning period is 46.5 mm. Design of the three retention can be summarized in Table 4.1-6.



Source: SEATEC (2012)

Figure 4.1-33 Historical Flood Extent in Dawei Special Economic Zone in 2006

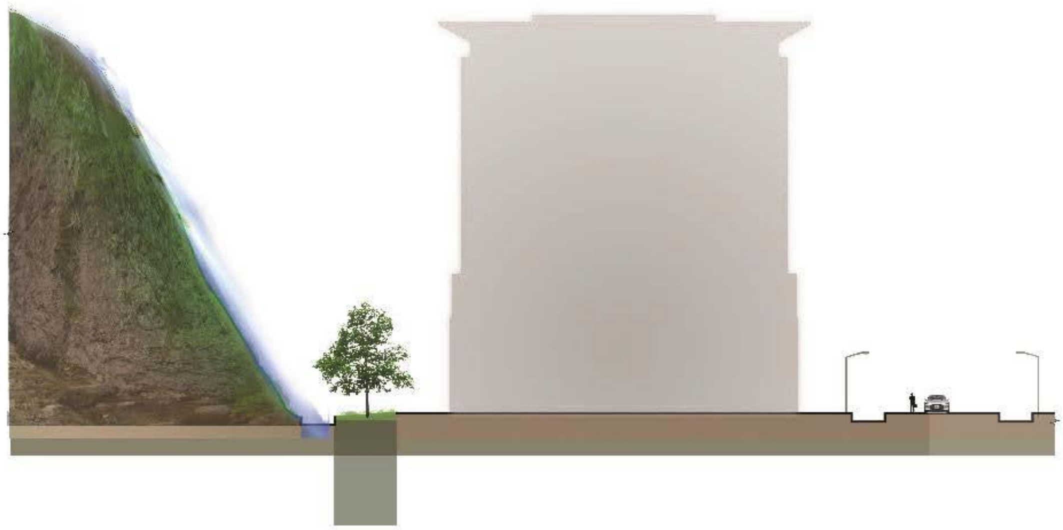


Figure 4.1-34 Cross Section of Flood Control Area

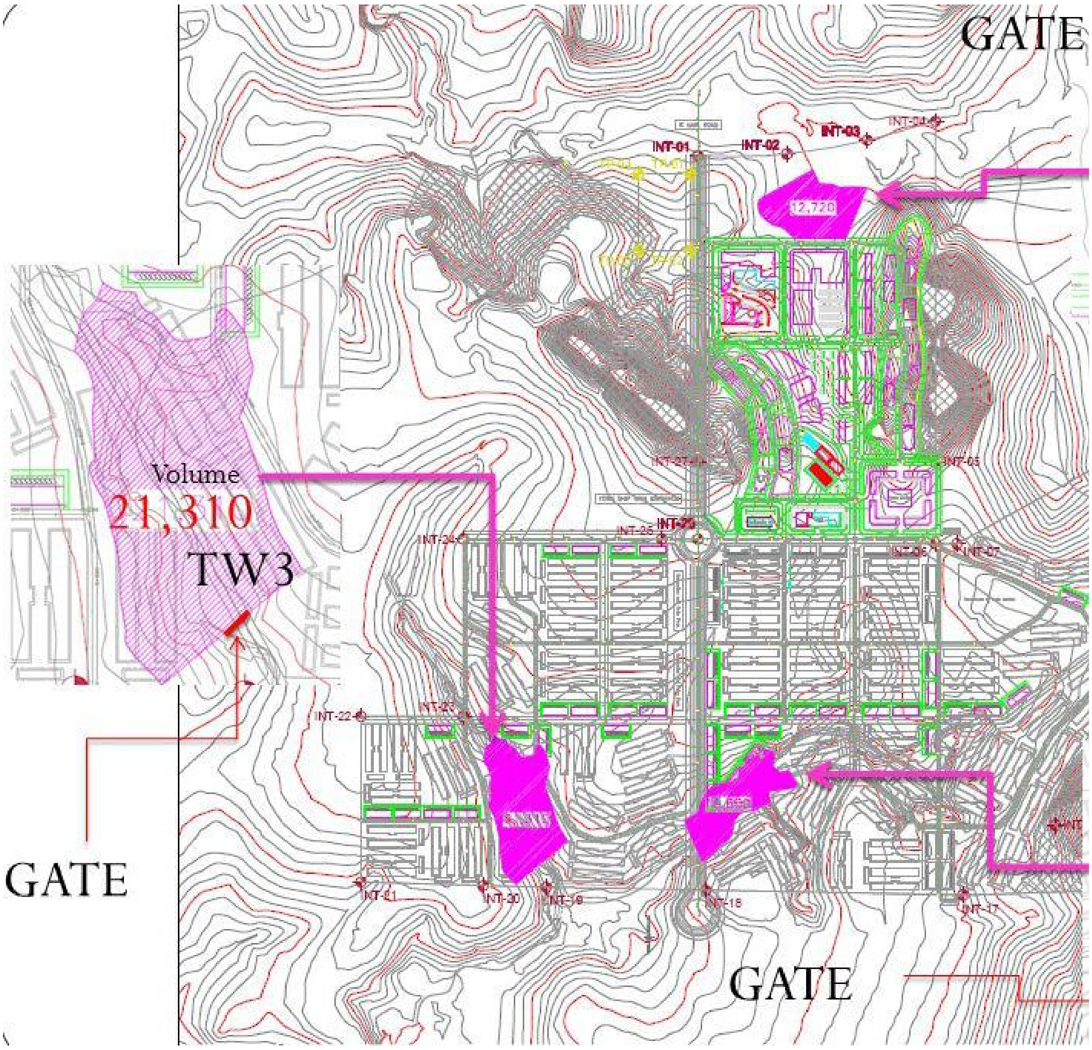
Table 4.1-7 Design of Retention Ponds in Township

DESIGN RETENTION POND				
duration	6 HR	Rainfall collection	46.45	mm

Zone	Area of Zone	Volum for Retention pond
	m^2	m^3
Retention pond TW 1	381,437.960	12,720
Retention pond TW 2	582,473.227	19,590
Retention pond TW 3	639,139.803	21,310

Source: SEATEC (2012)

As presented in Figure 4.1-35, each retention pond will consist of one control building area, one pump station and intake structure with sluice gate. Submersible axial pumps are 3,200 CMH at 6.5 M. TDH with 75 KW of motor.



Source: DRC (2015)

Figure 4.1-35 Location of Retention ponds of Township

4.1.5 Power and Electricity Distribution System

The electricity demand for 8-floor serviced apartment and 5-floor workforce apartments is 9,036 and 37,800 VA respectively.

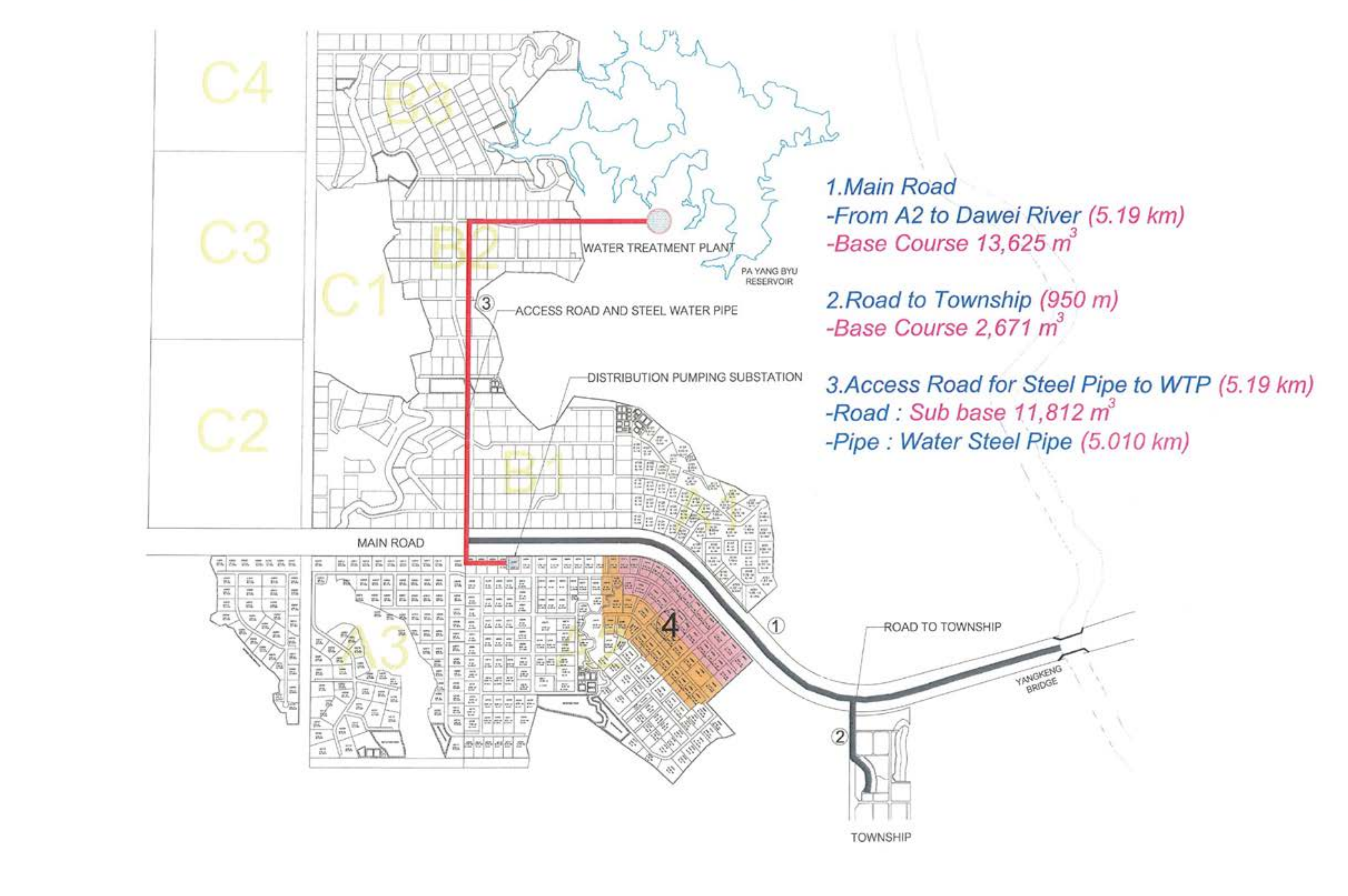
4.1.6 Water Treatment and Distribution System

Raw water source for Initial Township is from the small reservoir, Pa Yain Byu. The reservoir is established to supply water to both Initial Township and the initial Industrial Estate. Amount of water supply is estimated and predicted to be sufficient enough and stable for future consumption, with maximum capacity of 8.54 million cubic meters. Details of the Pa Yain Byu is in Annex 4-1.

The raw water will be treated at water treatment plant which is located near the reservoir and is a part of Initial Industrial Estate facility.Treated water will be distributed via the

steel pipeline underneath the access road to the distribution station in Zone A2 of the Initial Industrial Estate and then distributed along the main road until at km. 17 and km 18, it is diverted to the Initial Township as shown in Figure 4.1-36.

Alternatively, groundwater resource may be used; however, groundwater quality are quite not good in its quality. Analysis from the existing wells, groundwater are slightly brackish and water is quite acidic. Most of wells have pH ranging between 4.7 and 6.2 and some wells have cadmium and zinc over the standard. Use of groundwater as raw water may be needed extra treatment from routine surface water treatment.



Source: DRC (2015)

Figure 4.1-36 Water Treatment and Distribution System in Initial Township

4.1.7 Wastewater Treatment System

Septic tank (Onsite Treatment Unit) with the capacity of 90 m^3/d is prepared to treat wastewater from 5-floor workforce apartment and the capacity of 54 m^3/d is prepared to treat wastewater from 8-floor serviced apartment. Required levels for effluent for different types and sizes of the buildings are summarized in Table 4.1-7 and Table 4.1-8.

Table 4.1-8 Required Quality of Wastewater from Septic Tank Initial Township Wastewater Treatment Systems

Parameter	Unit	Range or Maximum Permitted Values for These Categories					Method for Examination
		A	B	C	D	E	
1. pH	-	5-9	5-9	5-9	5-9	5-9	pH Meter
2. BOD	mg/l	20	30	40	50	200	Azide Modification at 20 °C , 5 days
3. Soilds							
- Suspended Soilds	mg/l	30	40	50	50	60	Glass Fibre Filter Disc
- Settleable Solids	ml/l	0.5	0.5	0.5	0.5	-	Imhoff Cone 1,000 cm^3 1hour
- Total Dissolved Solid (TDS)*	mg/l	500*	500*	500*	500*	-	Dry Evaporation 103-105 °C, 1 hour
4. Sulfide	mg/l	1	1	3.0 -	4	-	Titration
5. Nitrogen as TKN	mg/l	35	35	40	40	-	Kjeldah
6. Fat, oil and grease (FOG)	mg/l	20	20	20	20	100	Solvent Extraction by Weight

Remarks:
1. Base on: Standard Methods for the Examination of Water and Wastewater recommended by APHA : American Public Health Association, AWWA : American Water Works Association and WPCF : Water Pollution Control Federation

*= These values are in addition to the TDS of the water used.

2. Notification of the Ministry of Science, Technology and Environment : Building Effluents Standards dated January 10, B.E.2537 was revoked by a)
3. Notification of the Ministry of Science, Technology and Environment issued under the Enhancement and Conservation of the National Environmental Quality Act, B.E.2535 (1992) and Notification of the Ministry of Science, Technology and Environment issued under the Enhancement and Conservation of the National Environmental Quality Act, No. 2 B.E.2538 (1995) dated January 10, B.E.2537 was revoked by b)

Sources:
a) Notification of the Ministry of Natural Resources and Environment : Building Effluents Standards dated November 7, B.E. 2548 (2005) published in the Royal Government Gazette, Vol. 122 Part 125 D, dated December 29, B.E. 2548 (2005)
b) Notification of the Ministry of Natural Resources and Environment issued under the Enhancement and Conservation of the National Environmental Quality Act, dated November 7, B.E. 2548 (2005) published in the Royal Government Gazette, Vol. 122 Part 125 D, dated December 29, B.E. 2548 (2005)

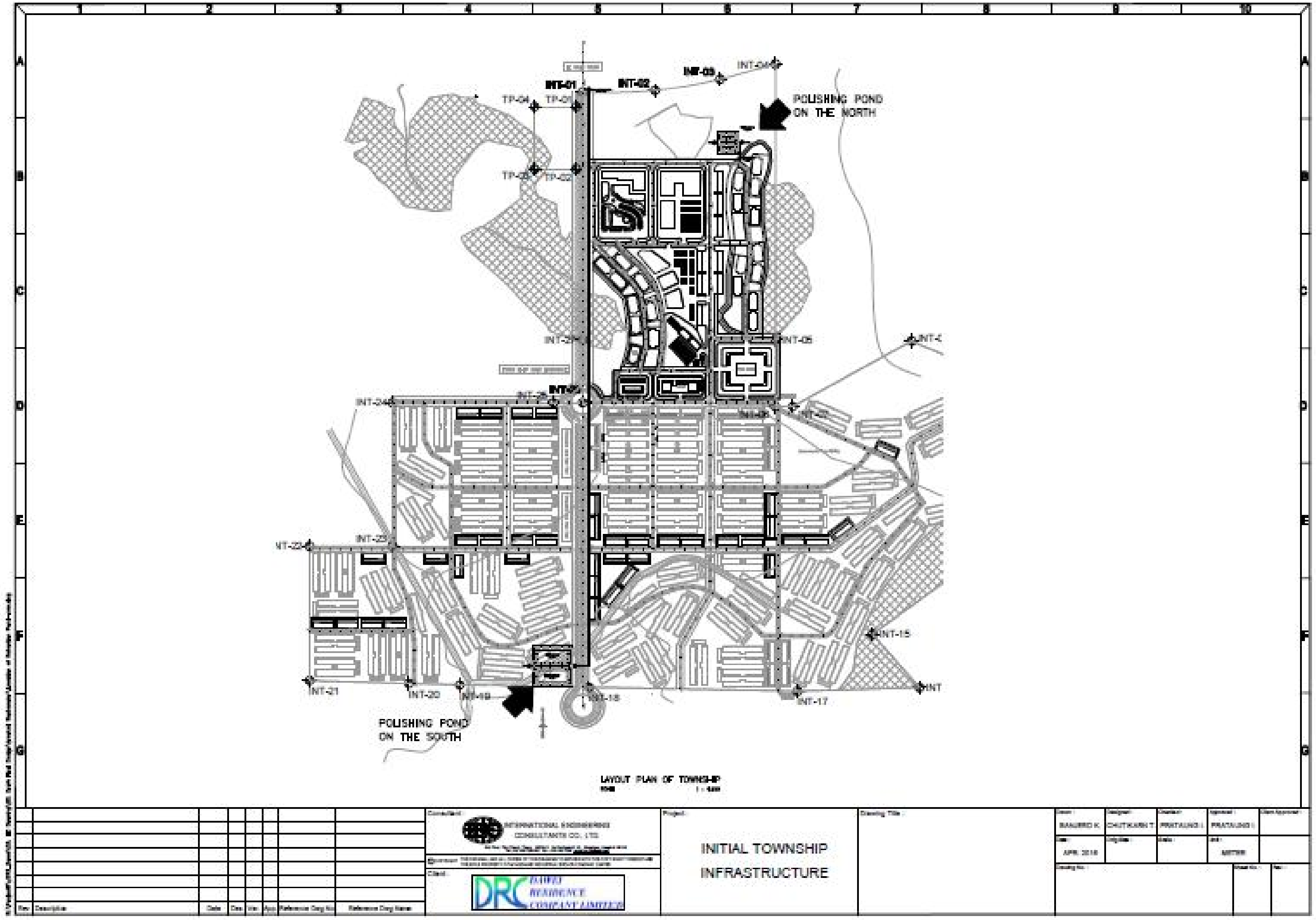
Table 4.1-9 Summary of Type and Sizes of Buildings Subject to the Effluent Control

Building Type	Size				
	A	B	C	D	E
1. Condominium	500 units or more	From 100 to not greater than 500 units	Less than 100 units	-	-
2. Hotels	200 rooms or more	From 60 to not greater than 200 rooms	Less than 60 rooms	-	-
3. Dormitories	-	250 rooms or more	From 50 to not greater than 250 rooms	From 10 to not greater than 50 rooms	-
4. Massage parlors (or equivalent)	-	5,000 m^2 or more	From 1,000 to not greater than 5,000 m^2	-	-
5. Hospitals	30 beds or more	From 10 to not greater than 30 beds	-	-	-
6. Schools, Colleges, Universities, or Institutes	25,000 m^2 or more	From 5,000 to not greater than 25,000 m^2	-	-	-
7. Government offices, State enterprises, International agencies, Banks, and Office Buildings	55,000 m^2 or more	From 10,000 to not greater than 55,000 m^2	From 5,000 to not greater than 10,000 m^2	-	-
8. Department stores	25,000 m^2 or more	From 5,000 to not greater than 25,000 m^2	-	-	-
9. Fresh food markets	2,500 m^2 or more	From 1,500 to not greater than 2,500 m^2	From 1,000 to not greater than 1,500 m^2	From 500 to not greater than 1,000 m^2	-
10. Restaurants and food shops or food centers	2,500 m^2 or more	From 500 to not greater than 2,500 m^2	From 250 to not more than 500 m^2	From 100 to not more than 250 m^2	Less than 100 m^2

Remarks: Level of standard refers to the 6 parameters listed in the Building Effluent: Standard Values table
Source: Notification of the Ministry of Science, Technology and Environment issued under the Enhancement and Conservation of the National Environmental Quality Act, B.E.2535, published in the Royal Government Gazette,Vol. 111 special part 9, dated February 4, B.E.2537 (1994).

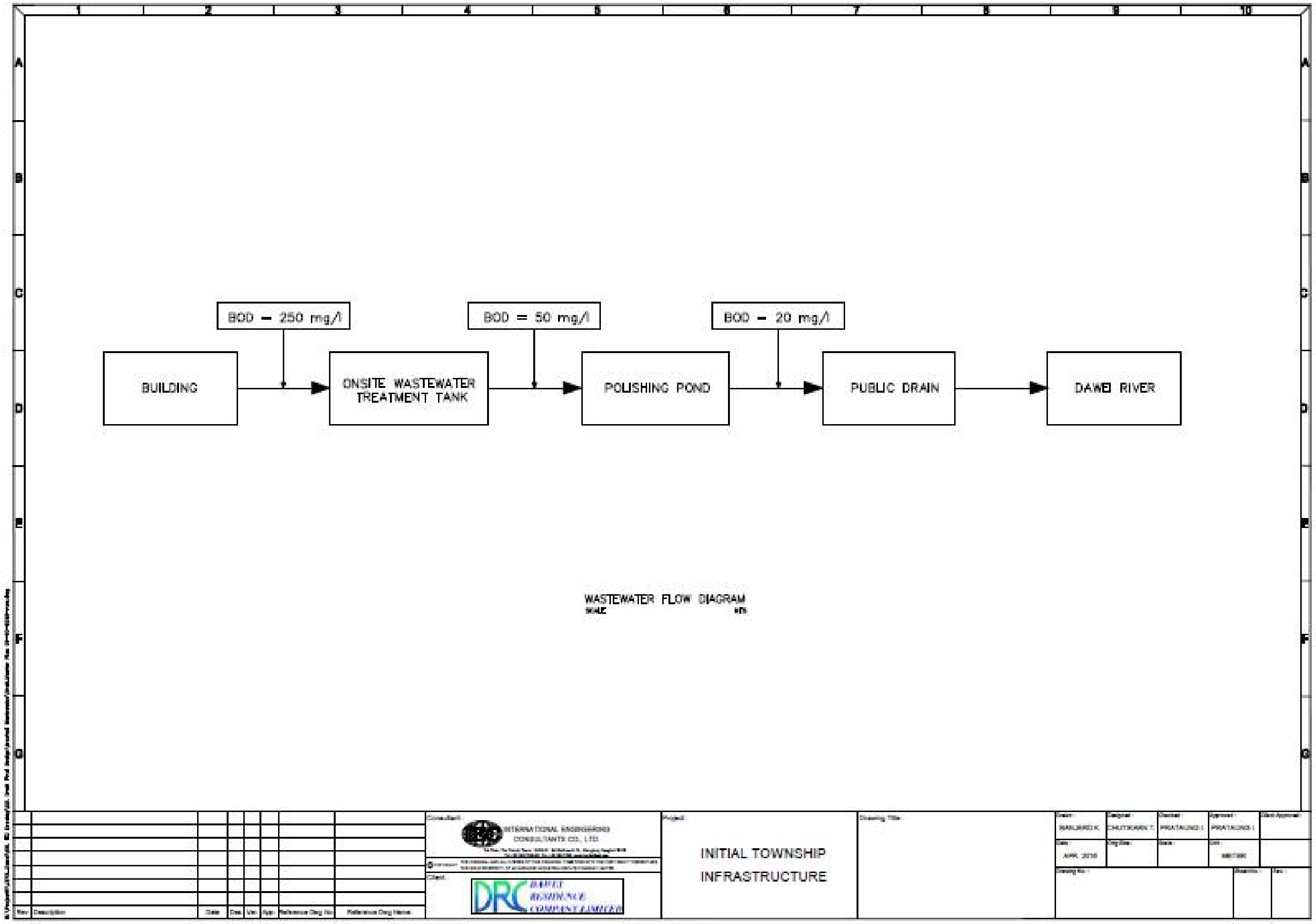
Location of Wastewater Treatment Plant is presented in Figure 4.1-37. Wastewater from the septic tanks will then be treated in polishing ponds before draining to public wastewater drainage. Effluent from polishing ponds in initial phase (area for North WWTP) will be discharged into Dawei river.

The wastewater in the polishing pond will be aerated to achieve the standard guideline for effluent at 20 mg/ L of the BOD (Figure 4.1-38 to Figure 4.1-39). In case emergency, all the polishing ponds can hold the wastewater for 12 hours. In full phase of development of the Township, wastewater from southern area will be treated and then discharged in Kun Chuang River with the required effluent level of BOD 20 mg/L.



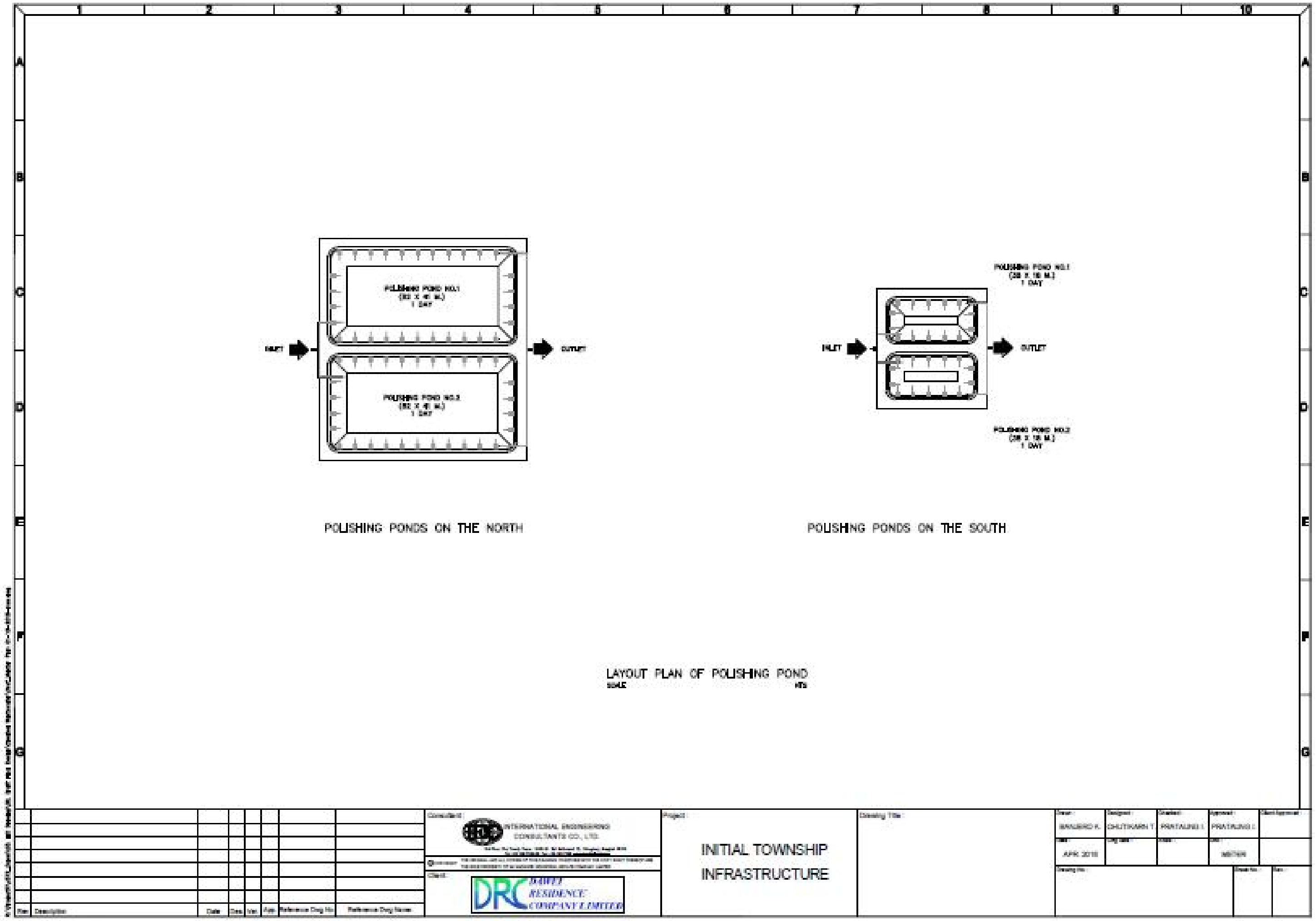
Source: DRC (2015)

Figure 4.1-37 Location of Wastewater Treatment System of the Township



Source: DRC (2015)

Figure 4.1-38 Flow diagram of wastewater treatment system for the Township



Source: DRC (2015)

Figure 4.1-39 Design of polishing ponds for the Township

4.1.8 Solid Waste Management System

4.1.8.1 Waste Management

Waste generated from Project's activities, workers and sub-contractors will be managed according to the Dawei Waste Management Plan in Annex 4-2 which is the standard of municipal and industrial waste management, and concordance with the Pollution Control and Cleaning Department (PCCD) waste management policy and procedures.

The Project will implement mitigation measures that will conserve energy and the efficient uses about waste management in sequences such as Remove source, Reduce at source, Reuse, Recycle, Recover, Treat and Disposal. Besides, waste will be segregated or separated according to their characteristics. Basically, there are non-hazardous waste and hazardous waste, details are in Chapter 4, Solid Waste Management System and summarized below:

(a) ***Segregation and/or separation***

All types of waste needs to be segregated/separated at source before disposal. The Project will provide segregation bins in color according to their characteristics follows

- Yellow bin is for non-hazardous (and dry waste) for recycling
- Blue bin is for non-hazardous (and wet waste) for non-recycling
- Red bin is for hazardous waste

Figure 4.1-40 Segregating or Separating color bins for waste

Non-hazardous waste and recycling

are aluminum can, plastic bottles and paper etc. will be initially stored in the labeled yellow bins (Figure 4.1-40) and will then be collected and managed further for recycling. Duration of the storage will be around a week.

Non-hazardous waste and non-recycling

are such as food waste or plastic for food containers. The waste will be stored in the labeled blue bins before further management such as transformed the waste into compose or disposal. The waste will be collected daily and will be delivered to the Waste Management System (see details in Chapter 4) by licensed third party or Dawei Waste Management Center for disposal or transformation to the other materials (Figure 4.1-41).

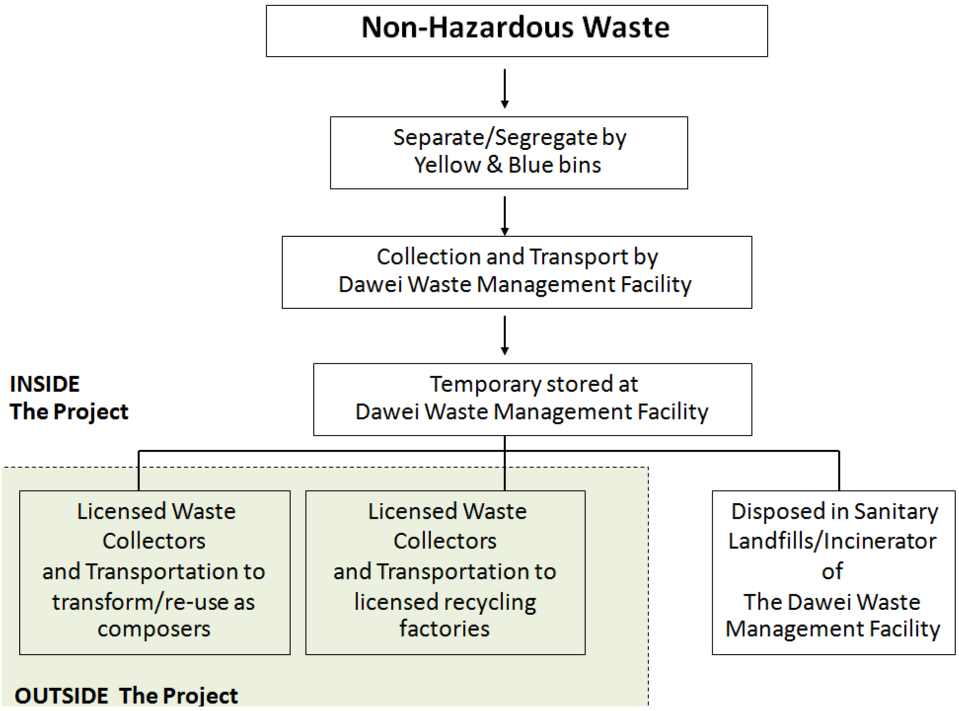


Figure 4.1-41 Management of Non-Hazardous Waste generated in the Project

Hazardous waste

will be initially stored in red containers. Hazardous waste will be collected on bi-weekly basis and delivered to the Dawei Waste Management Facility. Handling of hazardous waste will require manifest and will be managed by licensed third party or the Dawei Waste Management Center itself (Figure 4.1-42).

(b) *Waste storage*

The waste will be stored in 200 liters of drums/ or appropriate containers according their hazardous characteristics at the center facility. Storage of hazardous waste will be complied by the relevant laws. Basically, the waste will be stored under confined and roof

buildings that lay on concrete floor, which having good sum pit to collect wastewater, and in good ventilated condition. The waste will be stored no more than 6 months before treatment and/or disposal in the hazardous waste landfills or incinerator of the Dawei Waste Management Facility.

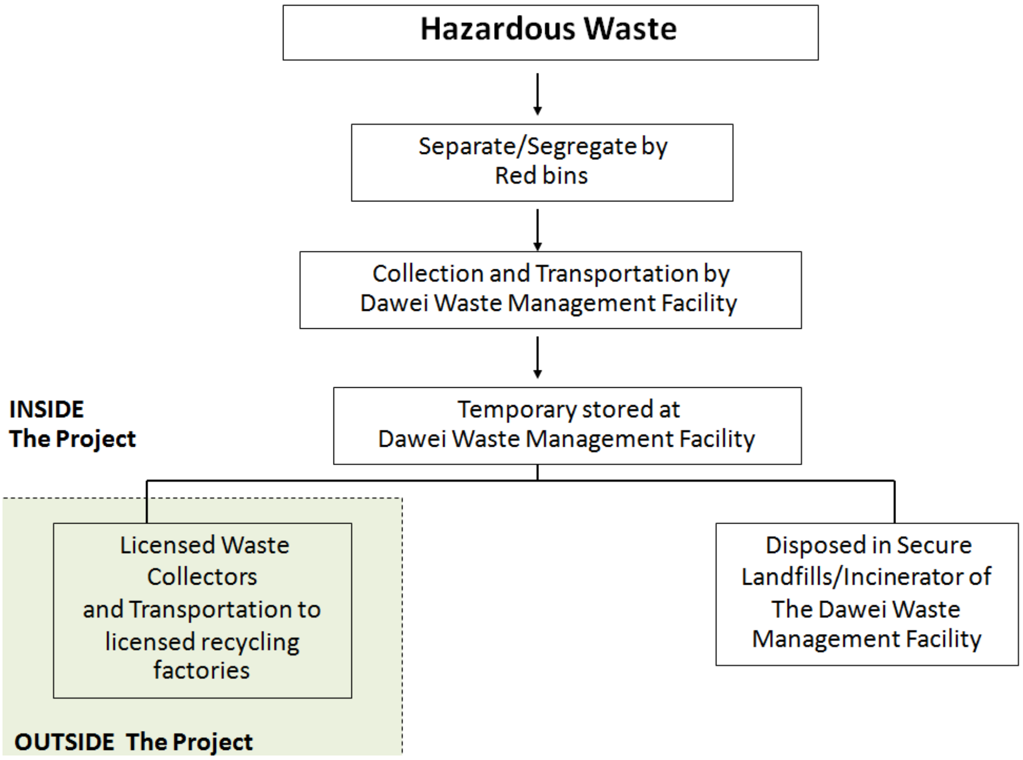


Figure 4.1-42 Management of Hazardous Waste generated in the Project

4.1.8.2 Disposal Facilities

Solid waste management facilities are located in Zone A1 of the Initial Industrial Estate. The Project has undertaken the feasibility study of waste management e.g. landfills capacity in such long-term up to 50 years of the Project development. The research reveals that disposal in landfills will enable up to only 14-15 years due to space limitation of the Project disposal system. The total number of the landfills is only 10 and they will serve both from industry and township as presented in Figure 4.1-43. Afterwards, the Solid Waste Management Facilities will dispose all waste in the incinerators, which depends on their types, non-hazardous waste incinerator and hazardous waste incinerator.

Waste management and design of the disposal facilities are presented in Annex 4-2. The details include i.e. analysis of type and source of waste, rate of generation both township and Township, landfills capacity and their life span, landfill liners (Figure 4.1-44), waste transportation, landfill gases and management system and leachate generation and management system.

Figure 4.1-43 Layout of facilities in Solid Waste Management System located in the Township

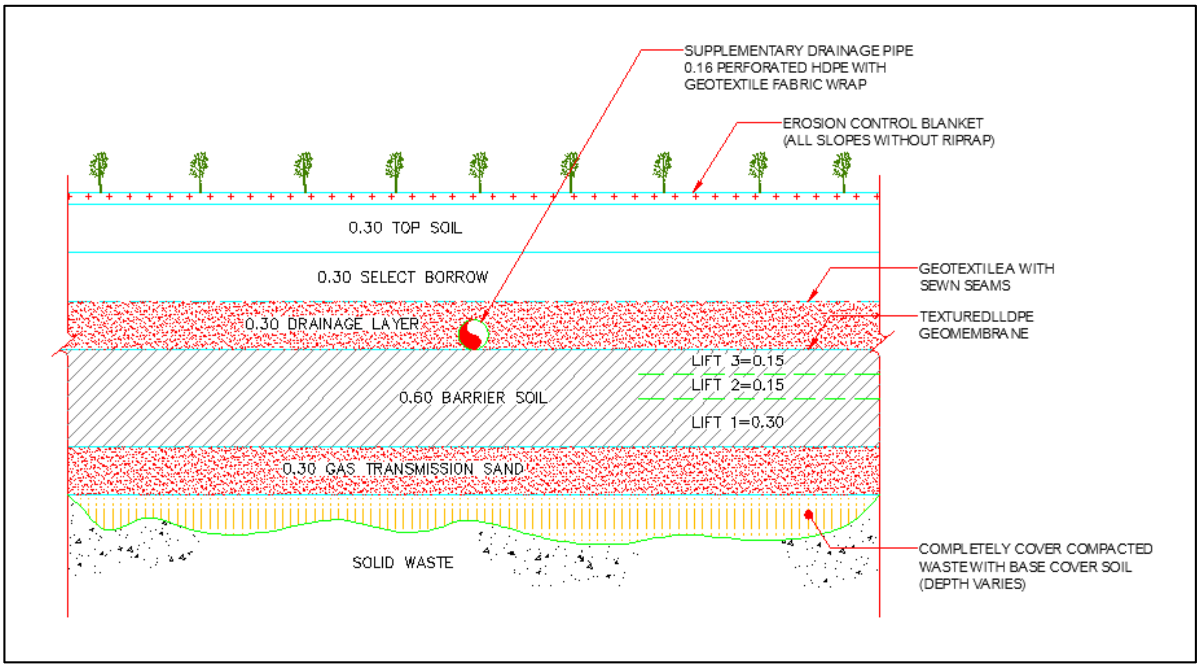


Figure 4.1-44 Final cover for non-hazardous waste and hazardous waste landfills

For example: the hazardous waste will be stabilized and finally disposed in the hazardous waste landfills during the intial phase. For the later phases, the non-hazardous and hazardous waste will be disposed in the incinerators accordingly to their types. Rate of non-hazardous waste generation from the Initial Township is presented in Table 4.1-9 is shown rate of non- hazardous waste generation from the township in 50 years and Table 4.1-10 is shown rate of hazardous waste generation from township in 50 years.

Infectious waste generated from hospital and health care facility in the Initial Township supposes to managed and dispose within the township by incinerator; however, upon demand of health care service, the infectious waste will be disposed at the Dawei hospital or alternatively in Yangon dumping sites, initially. Transportation of the infectious waste will require manifest as regular. Rate of infectious waste generation from the township is shown in Table 4.1-11. Air emission guideline for hospitalized incinerator is presented in Table 3.4-3.

Table 4.1-10 Rate of Non-Hazardous Waste Generation for the Township (for 50 years)

year	Population (Person)	Waste Generate (1kg/person/d)	Waste		Non-Hz 97% By Weight (T/d)	Operation (day)	Total Industrial Waste (T/A)	Ash 10% by weight (waste)		Cumulative Non-Hz Waste (T)
			(kg/day)	(T/d)				Bottom ash 80% by weight (T/A)	Fly ash 20% by weight (T/A)	
1	13,550	1.00	13,550	13.55	13.14	365	4,797.38			4,797.38
2	32,730	1.00	32,730	32.73	31.75	365	11,588.06			16,385.43
3	49,780	1.00	49,780	49.78	48.29	365	17,624.61			34,010.04
4	66,830	1.00	66,830	66.83	64.83	365	23,661.16			57,671.20
5	83,880	1.00	83,880	83.88	81.36	365	29,697.71			87,368.92
6	100,930	1.00	100,930	100.93	97.90	365	35,734.27			123,103.19
7	117,860	1.00	117,860	117.86	114.32	365	41,728.33			164,831.52
8	130,590	1.00	130,590	130.59	126.67	365	46,235.39			211,066.91
9	130,590	1.00	130,590	130.59	126.67	365	46,235.39			257,302.30
10	130,590	1.00	130,590	130.59	126.67	365	46,235.39			303,537.69
11	130,590	1.00	130,590	130.59	126.67	365	46,235.39			349,773.08
12	130,590	1.00	130,590	130.59	126.67	365	46,235.39			396,008.47
13	130,590	1.00	130,590	130.59	126.67	365	46,235.39			442,243.86
14	130,590	1.00	130,590	130.59	126.67	365	46,235.39			488,479.24
15	130,590	1.00	130,590	130.59	126.67	365		3,698.83	924.71	493,102.78
16	130,590	1.00	130,590	130.59	126.67	365		3,698.83	924.71	497,726.32
17	130,590	1.00	130,590	130.59	126.67	365		3,698.83	924.71	502,349.86
18	130,590	1.00	130,590	130.59	126.67	365		3,698.83	924.71	506,973.40
19	130,590	1.00	130,590	130.59	126.67	365		3,698.83	924.71	511,596.94
20	130,590	1.00	130,590	130.59	126.67	365		3,698.83	924.71	516,220.48
21	130,590	1.00	130,590	130.59	126.67	365		3,698.83	924.71	520,844.02
22	130,590	1.00	130,590	130.59	126.67	365		3,698.83	924.71	525,467.56
23	130,590	1.00	130,590	130.59	126.67	365		3,698.83	924.71	530,091.10
24	130,590	1.00	130,590	130.59	126.67	365		3,698.83	924.71	534,714.63
25	130,590	1.00	130,590	130.59	126.67	365		3,698.83	924.71	539,338.17
26	130,590	1.00	130,590	130.59	126.67	365		3,698.83	924.71	543,961.71
27	130,590	1.00	130,590	130.59	126.67	365		3,698.83	924.71	548,585.25
28	130,590	1.00	130,590	130.59	126.67	365		3,698.83	924.71	553,208.79
29	130,590	1.00	130,590	130.59	126.67	365		3,698.83	924.71	557,832.33
30	130,590	1.00	130,590	130.59	126.67	365		3,698.83	924.71	562,455.87
31	130,590	1.00	130,590	130.59	126.67	365		3,698.83	924.71	567,079.41
32	130,590	1.00	130,590	130.59	126.67	365		3,698.83	924.71	571,702.95
33	130,590	1.00	130,590	130.59	126.67	365		3,698.83	924.71	576,326.48
34	130,590	1.00	130,590	130.59	126.67	365		3,698.83	924.71	580,950.02
35	130,590	1.00	130,590	130.59	126.67	365		3,698.83	924.71	585,573.56
36	130,590	1.00	130,590	130.59	126.67	365		3,698.83	924.71	590,197.10
37	130,590	1.00	130,590	130.59	126.67	365		3,698.83	924.71	594,820.64
38	130,590	1.00	130,590	130.59	126.67	365		3,698.83	924.71	599,444.18
39	130,590	1.00	130,590	130.59	126.67	365		3,698.83	924.71	604,067.72
40	130,590	1.00	130,590	130.59	126.67	365		3,698.83	924.71	608,691.26
41	130,590	1.00	130,590	130.59	126.67	365		3,698.83	924.71	613,314.80
42	130,590	1.00	130,590	130.59	126.67	365		3,698.83	924.71	617,938.34
43	130,590	1.00	130,590	130.59	126.67	365		3,698.83	924.71	622,561.87
44	130,590	1.00	130,590	130.59	126.67	365		3,698.83	924.71	627,185.41
45	130,590	1.00	130,590	130.59	126.67	365		3,698.83	924.71	631,808.95
46	130,590	1.00	130,590	130.59	126.67	365		3,698.83	924.71	636,432.49
47	130,590	1.00	130,590	130.59	126.67	365		3,698.83	924.71	641,056.03
48	130,590	1.00	130,590	130.59	126.67	365		3,698.83	924.71	645,679.57
49	130,590	1.00	130,590	130.59	126.67	365		3,698.83	924.71	650,303.11
50	130,590	1.00	130,590	130.59	126.67	365		3,698.83	924.71	654,926.65

Table 4.1-11 Rate of Hazardous Waste Generation for the Township (for 50 years)

year	area (m2)	Waste Generate (1kg/person/d)	Waste		Hazardous Waste 3% By Weight (T/d)	Operation (day)	Total Industrial Waste (T/A)	Ash 10% by weight (waste)		Cumulative Non-Hz Waste (T)
			(kg/day)	(T/d)				Bottom ash 80% by weight (T/A)	Fly ash 20% by weight (T/A)	
1	13,550	1.00	13,550	13.55	0.41	365	148.37			148.37
2	32,730	1.00	32,730	32.73	0.98	365	358.39			506.77
3	49,780	1.00	49,780	49.78	1.49	365	545.09			1,051.86
4	66,830	1.00	66,830	66.83	2.00	365	731.79			1,783.65
5	83,880	1.00	83,880	83.88	2.52	365	918.49			2,702.13
6	100,930	1.00	100,930	100.93	3.03	365	1,105.18			3,807.32
7	117,860	1.00	117,860	117.86	3.54	365	1,290.57			5,097.88
8	130,590	1.00	130,590	130.59	3.92	365	1,429.96			6,527.84
9	130,590	1.00	130,590	130.59	3.92	365	1,429.96			7,957.80
10	130,590	1.00	130,590	130.59	3.92	365	1,429.96			9,387.76
11	130,590	1.00	130,590	130.59	3.92	365	1,429.96			10,817.72
12	130,590	1.00	130,590	130.59	3.92	365	1,429.96			12,247.68
13	130,590	1.00	130,590	130.59	3.92	365	1,429.96			13,677.65
14	130,590	1.00	130,590	130.59	3.92	365	1,429.96			15,107.61
15	130,590	1.00	130,590	130.59	3.92	365		114.40	28.60	15,250.60
16	130,590	1.00	130,590	130.59	3.92	365		114.40	28.60	15,393.60
17	130,590	1.00	130,590	130.59	3.92	365		114.40	28.60	15,536.59
18	130,590	1.00	130,590	130.59	3.92	365		114.40	28.60	15,679.59
19	130,590	1.00	130,590	130.59	3.92	365		114.40	28.60	15,822.59
20	130,590	1.00	130,590	130.59	3.92	365		114.40	28.60	15,965.58
21	130,590	1.00	130,590	130.59	3.92	365		114.40	28.60	16,108.58
22	130,590	1.00	130,590	130.59	3.92	365		114.40	28.60	16,251.57
23	130,590	1.00	130,590	130.59	3.92	365		114.40	28.60	16,394.57
24	130,590	1.00	130,590	130.59	3.92	365		114.40	28.60	16,537.57
25	130,590	1.00	130,590	130.59	3.92	365		114.40	28.60	16,680.56
26	130,590	1.00	130,590	130.59	3.92	365		114.40	28.60	16,823.56
27	130,590	1.00	130,590	130.59	3.92	365		114.40	28.60	16,966.55
28	130,590	1.00	130,590	130.59	3.92	365		114.40	28.60	17,109.55
29	130,590	1.00	130,590	130.59	3.92	365		114.40	28.60	17,252.55
30	130,590	1.00	130,590	130.59	3.92	365		114.40	28.60	17,395.54
31	130,590	1.00	130,590	130.59	3.92	365		114.40	28.60	17,538.54
32	130,590	1.00	130,590	130.59	3.92	365		114.40	28.60	17,681.53
33	130,590	1.00	130,590	130.59	3.92	365		114.40	28.60	17,824.53
34	130,590	1.00	130,590	130.59	3.92	365		114.40	28.60	17,967.53
35	130,590	1.00	130,590	130.59	3.92	365		114.40	28.60	18,110.52
36	130,590	1.00	130,590	130.59	3.92	365		114.40	28.60	18,253.52
37	130,590	1.00	130,590	130.59	3.92	365		114.40	28.60	18,396.51
38	130,590	1.00	130,590	130.59	3.92	365		114.40	28.60	18,539.51
39	130,590	1.00	130,590	130.59	3.92	365		114.40	28.60	18,682.51
40	130,590	1.00	130,590	130.59	3.92	365		114.40	28.60	18,825.50
41	130,590	1.00	130,590	130.59	3.92	365		114.40	28.60	18,968.50
42	130,590	1.00	130,590	130.59	3.92	365		114.40	28.60	19,111.49
43	130,590	1.00	130,590	130.59	3.92	365		114.40	28.60	19,254.49
44	130,590	1.00	130,590	130.59	3.92	365		114.40	28.60	19,397.49
45	130,590	1.00	130,590	130.59	3.92	365		114.40	28.60	19,540.48
46	130,590	1.00	130,590	130.59	3.92	365		114.40	28.60	19,683.48
47	130,590	1.00	130,590	130.59	3.92	365		114.40	28.60	19,826.48
48	130,590	1.00	130,590	130.59	3.92	365		114.40	28.60	19,969.47
49	130,590	1.00	130,590	130.59	3.92	365		114.40	28.60	20,112.47
50	130,590	1.00	130,590	130.59	3.92	365		114.40	28.60	20,255.46

Source: IEC (2017)

Table 4.1-12 Rate of Hazardous Waste Generation for the Township

Year	Population (person)	Beds	Infectious waste			
			(kg/d)	(T/d)	(kg/y)	(T/y)
1	13,550	8	4.39	0.004	1,602.42	1.60
2	32,730	20	10.60	0.011	3,870.65	3.87
3	79,780	48	25.85	0.026	9,434.78	9.43
4	66,830	40	21.65	0.022	7,903.32	7.90
5	83,880	50	27.18	0.027	9,919.65	9.92
6	100,930	61	32.70	0.033	11,935.98	11.94
7	117,860	71	38.19	0.038	13,938.12	13.94
8	130,590	78	42.31	0.042	15,443.57	15.44
9	130,590	78	42.31	0.042	15,443.57	15.44
10	130,590	78	42.31	0.042	15,443.57	15.44
11	130,590	78	42.31	0.042	15,443.57	15.44
12	130,590	78	42.31	0.042	15,443.57	15.44
13	130,590	78	42.31	0.042	15,443.57	15.44
14	130,590	78	42.31	0.042	15,443.57	15.44
15	130,590	78	42.31	0.042	15,443.57	15.44
16	130,590	78	42.31	0.042	15,443.57	15.44
17	130,590	78	42.31	0.042	15,443.57	15.44
18	130,590	78	42.31	0.042	15,443.57	15.44
19	130,590	78	42.31	0.042	15,443.57	15.44
20	130,590	78	42.31	0.042	15,443.57	15.44
21	130,590	78	42.31	0.042	15,443.57	15.44
22	130,590	78	42.31	0.042	15,443.57	15.44
23	130,590	78	42.31	0.042	15,443.57	15.44
24	130,590	78	42.31	0.042	15,443.57	15.44
25	130,590	78	42.31	0.042	15,443.57	15.44
26	130,590	78	42.31	0.042	15,443.57	15.44
27	130590	78	42.31	0.042	15,443.57	15.44
28	130590	78	42.31	0.042	15,443.57	15.44
29	130590	78	42.31	0.042	15,443.57	15.44
30	130590	78	42.31	0.042	15,443.57	15.44
31	130590	78	42.31	0.042	15,443.57	15.44
32	130590	78	42.31	0.042	15,443.57	15.44
33	130590	78	42.31	0.042	15,443.57	15.44
34	130590	78	42.31	0.042	15,443.57	15.44
35	130590	78	42.31	0.042	15,443.57	15.44
36	130590	78	42.31	0.042	15,443.57	15.44
37	130590	78	42.31	0.042	15,443.57	15.44
38	130590	78	42.31	0.042	15,443.57	15.44
39	130590	78	42.31	0.042	15,443.57	15.44
40	130590	78	42.31	0.042	15,443.57	15.44

Table 4.1-11 Rate of Hazardous Waste Generation for the Township (Cont)

Year	Population (person)	Beds	Infectious waste			
			(kg/d)	(T/d)	(kg/y)	(T/y)
41	130590	78	42.31	0.042	15,443.57	15.44
42	130590	78	42.31	0.042	15,443.57	15.44
43	130590	78	42.31	0.042	15,443.57	15.44
44	130590	78	42.31	0.042	15,443.57	15.44
45	130590	78	42.31	0.042	15,443.57	15.44
46	130590	78	42.31	0.042	15,443.57	15.44
47	130590	78	42.31	0.042	15,443.57	15.44
48	130590	78	42.31	0.042	15,443.57	15.44
49	130590	78	42.31	0.042	15,443.57	15.44
50	130590	78	42.31	0.042	15,443.57	15.44

Source: IEC (2017)

4.1.9 Fire Prevention System

The Project has designed fire prevention system in accord with Myanmar laws and regulation (in *Section 3.2.3.4* (f) and Annex 4-4), Thai Building Control Act, 1979 and NFPA standard. The Fire Prevention System for the apartments including 5-floor workforce apartments and 8-floor service apartments constitutes of components as follow

- Fire Alarm System
- Lightning Protection System
- Fire Fighting System
- Assembly points

4.1.9.1 Fire Alarm System

Fire Alarm System constitutes of 7 components; Alarm Control Panel, Graphic Annunciator, Fire Alarm Manual Station, Fire Phone Jack, Fire Alarm Speaker with Strobe Light, Fixed Temperature Heat Detector and Smoke Detector. Their description and installation are summarized in Table 4.1-12.

Table 4.1-13 Fire Alarm System

Fire Alarm System	Details
1. Fire Alarm Control Panel (FCP)	Detect and receive signal from fire detector devices or sub-panel and send signal to fire alarm system, electricity system and emergency light system.
2. Graphic Annunciator (ANN)	Detect and receive signal from fire detector devices or sub-panel and define location of fire incident.
3. Fire Alarm Manual Station (F)	Manual alarm switch by pulling and inserting key (W/Key Operated Switch)
5. Fire Alarm Bell (B)	Send sound and light warnings to residents. Alarm Bell shall be a Fire Alarm Speaker with Strobe Light or Conventional Alarm Bell, which shall be 6 inches in diameter at least and loud enough, not less than 85 dB(A).

Source: EIA Study Team

4.1.9.2 Lighting Arrester System

The system is convention that consists of lighting arrester rod, conductor, downward conductor and ground pike lung. The downward conductor is made of copper and charges distributor for electrical constant. The Project will install Lighting Arrester System and ground spike system on ground floor of each buildings and lightning rod on roof of each building.

4.1.9.3 Fire Fighting System

The Project has planned to establish Fire Fighting System (FFS) that enables to cope with fire incidents and emergency for a level. The Project has itself FFS such as installation of FFS for each residential buildings and supporting firefighting facilities from nearby towns in case severe fire.

(a) Residential Buildings Fire Fighting System

Fire Fighting System constitutes such as Standing Pipe System, Fire Hose Cabinet, Fire Department Connection, Fire Extinguisher, Fire Exit, Fire Escape Sign and Emergency Light and Fire Escape Route Map and Extinguisher Location. Their description and installation are summarized in Table 4.1-13.

Table 4.1-14 Residential Buildings Fire Fighting System

Fire Prevention System	Details
1. Stanpipe	Supply water to Fire Hose Cabinet. The pipe is about 4 inches and connects to Fire Department Connection on ground floor in front of each building. Alternatively, in case Emergency, the pipes shall be able to connect with water supply tank on roof of each building.
2. Fire Hose Cabinet (FHC)	Standard Fire Hose Cabinet consists of handy fire extinguisher and hose reel. Hose reel must be at least 1 inch in diameter and 30 meter in length and made of textile. Hose reel consists of aluminum alloy nozzle and auto jet/fog/spray.

Table 4.1-14 Residential Buildings Fire Fighting System

Fire Prevention System	Details
3. Fire Department Connection (FDC)	Connection point for supply water to Fire Trucks in order to supplement fire water protection. The FDC must be instantaneous screw inlet that is 2 ½ inches (65 cm.) in diameter.
4. Fire Extinguisher	Type ABC (10 pounds / 4.5 kg.) Chemical Fire Extinguisher-Handy type, with blue panel. Type CO_2 (10 pounds / 4.5 kg.) Fire Extinguisher-Handy type, with black panel (See **Annex 4-4**)
5. Fire Exit	Main stairs inside of the apartments are used as Fire Exits. The stairs have to be more than 1.2 meters with slope less than 45 degree and have stair platforms. Wall of the stairs have to be fire resistant and made of reinforce concrete wall.
6. Fire Escape Sign Luminary and Emergency Light	One-way or Two-way luminous and visible signs must be provided including emergency light for 2 hours. The signs shall be prescribed in both English and Myanmar languages. Characters size in the signs must not be less than 10 cm.
7. Fire Escape Route Map and Fire Extinguisher Location	Inform about fire escape route map that lead the residents out of buildings through fire exits and location of fire extinguishers.

(b) Township Fire Station

The Project has a plan to establish the fire station, which will be a share facility between the Initial Industrial Estate and the Project. Also, the Project plans to form reserve fire brigade team in accordance with the said law that is not only to operate and manage the fire station / fire work, but also to co-ordinate with the Fire Service Department and relevant agencies in preparation for fire incidents i.e standardized fire apparatus (See Annex 4-4**:** Guideline of Fire Training and Equipment) and training program for involving brigades and staff and residents.

Location of the Fire Station will be in public facility of the initial township, as shown in Figure 4.1-45. Illustration of the Fire Station is shown in Figure 4.1-46. The fire station is planned to equip with fire apparatus and features following:

- Hydraulic platform for rescuing in the elevated levels;
- Major pumpers from water sources;
- Special pumpers consisting of fire extinguishing agents such as foam, chemicals;
- Water tanks for transporting large volume of water;
- Foam tanks ;
- High-pressure hoses;
- Rescue equipment
- Fire trucks

Number of fire trucks, pumper trucks, fire equipment are planned to develop in concordance with phases of the Township and number of population growth in the initial township (Table 4.1-14). These amounts of the Project's resource is evaluated to be sufficient in controlling Tier 1 level of emergency (Controllable case with in the plant or the factory) and Tier 2 level of emergency (Controllable within the Township). However if a severe emergency occurs (Tier 3 level), which is unable to control by the Project resource and potentially extend and impact beyond the Project area (See *Section 4.1.10.1*), the Project will need support from local facilities or agencies, such as Fire Station and Fire Brigade team from the nearest town such as Yebyu Fire station.

Table 4.1-15 Expected Number of Fire Station Supporting Vehicles

Year	Phase	Fire Truck (No.)	Pumper Truck (No.)
2016 -2017	A	1	1
2018 -2019	B	1	-
2019-2021	C	1	-
2022-2023	D	1	4
Total		**4**	**5**

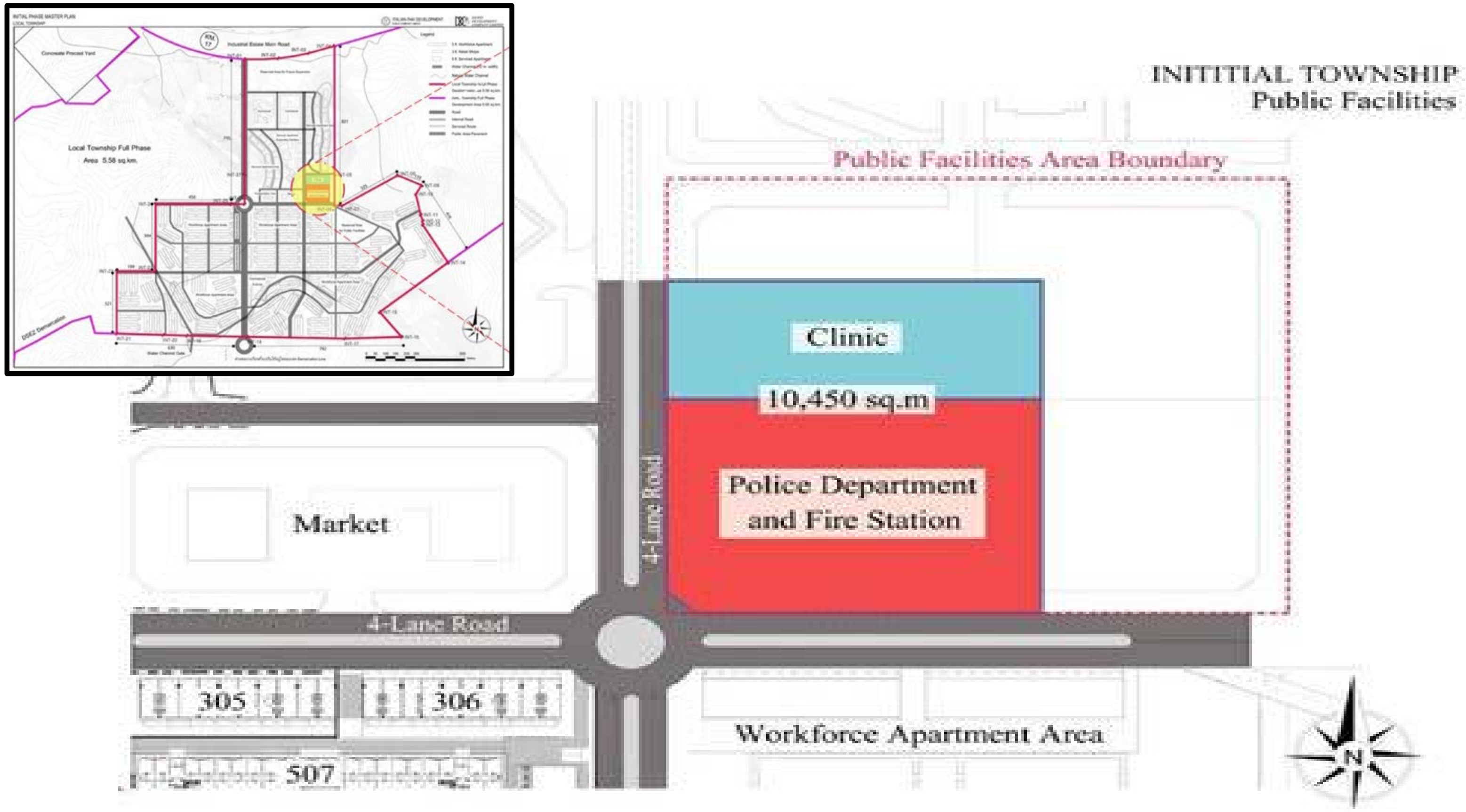


Figure 4.1-45 Location of the Fire Station (Share facility) in the Initial Township

Figure 4.1-46 Illustration of Fire Station

(c) Supporting Fire Stations

Yebyu Fire Station is located in the Yebyu Township, approximately 6 km from the Project (Figure 4.1-47). It is linked with the Township by good roads. The Yebyu Fire Station consists of medium fire brigade team (7 fireman) on shift 7/24 and 4 Fire trucks, 1 Fire tank truck, 1 Fire tank tractor, as show in Figure 4.1-48 to Figure 4.1-51. The Fire tanks can supply 30 liters per second and the tank trucks contains approximately 4,000 liters and the tank tractors contains 1,000 liters.

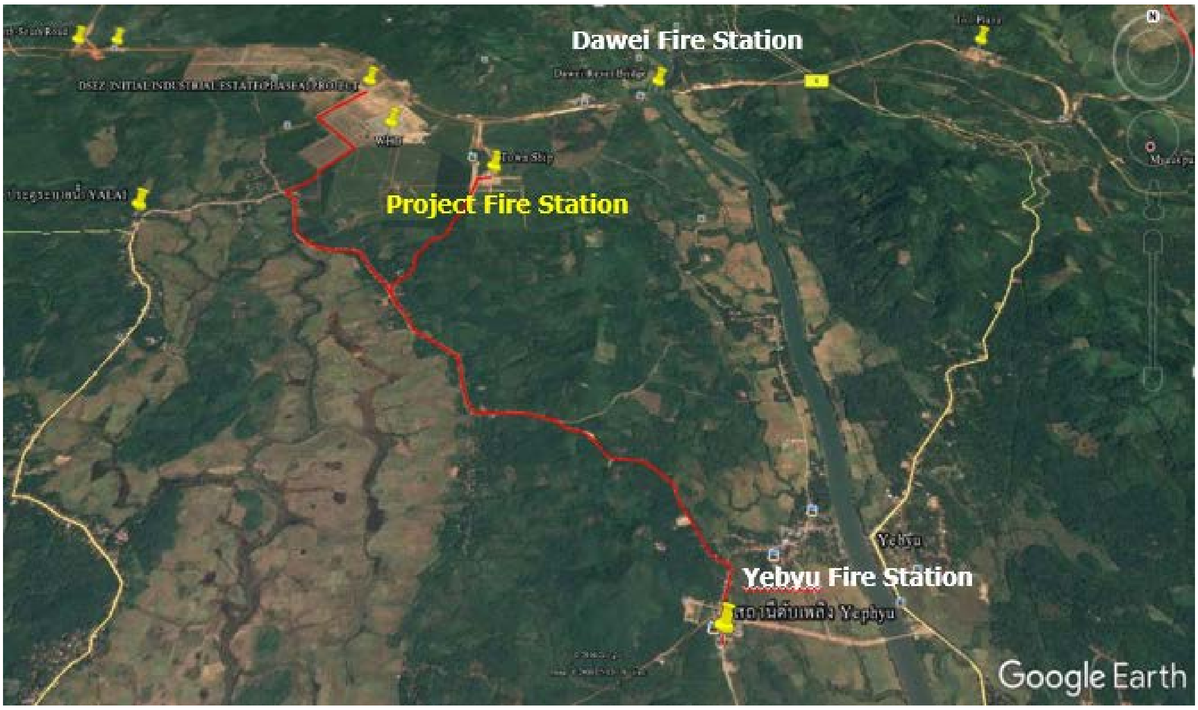


Figure 4.1-47 Location of Yebyu Fire Station from the Project Facility

4.1.9.4 Assembly Points

The Project will provide enough assembly points to check number of residents before remove them out of the Township to safety areas. Ratio of the assembly point area must not be less than 0.25 sq. meter.

Figure 4.1-48 Yebyu Fire Station and facility in Yebu Township

Figure 4.1-49   Yebyu Fire Trucks (No.1 and No.2)

Figure 4.1-50 Yebyu Fire Trucks (No.3 and No.4)

Figure 4.1-51 Yebyu Fire Tank Truck and Fire Tank Tractor (No5 and No.6)

4.1.10 Emergency Response Plans

As enacted in the Fire Brigade Law 2015, Fire station, Fire brigades and the Emergency Response System are needed for safety and security of people and properties in case of natural disasters, epidemics and fire. To prevent and minimize damages that may incur in many cases including recovery and remedy, Emergency Response Plans are required as part of EIA.

4.1.10.1 Emergency Levels and Action Plans

(a) ***Emergency Level***

Emergency response plan of the Dawei Township can be categorized into 3 levels

- *Tier 1 level* is a small scale of emergency that will occur in room/building and potentially limited within the room of resident or building. The incident can be controlled by the Project facilities in each building, as prescribed in *Section 4.1.9.1* and *Section 4.1.9.3*.
- *Tier 2 level* is a medium scale of emergency that is likely to extend to the other apartment or outside of the cause building. The building trends to be unable to cope with itself and may need supporting facility. However, the level of emergency trends to be controllable by facility of the Township and restricted within Township.
- *Tier 3 level* is a large-scale of emergency that likely to extend to the nearby community and environment surrounding the Township. The emergency trends to cause large scale of impact, which will be beyond control of the Township. This level will certainly need supporting facilities and cooperation from outside the Township or nearby districts/provinces or agencies.

(b) ***Emergency Action Plan***

For each level of emergency, the action plans are following:

<u>Tier 1 Emergency Action Plan</u>

Responsibility of Resident/Shop

- In case emergency, it is responsibility of resident/shop in capable and controlling fire incident or emergency as much as possible to mitigate damages that may incur to properties or the other people.
- The Resident/Shop must activate warning system e.g. turn on the fire alarm or alarm bell to warn the other residents.
- The incident shall be initially reported to the Dawei Township Management Team (Each building staff or security) or Dawei Township Emergency Response Center as soon as possible.

Responsibility of the Project

- The incident shall be reported to Emergency Response Center or the Township Reserve Brigade team within 10 minutes.
- Once, the Dawei Township Emergency Response Center received emergency information. The Dawei ER center shall record and immediately inform the on-site shift ER staff or manager to investigate the incident, follow up and monitor environmental impacts including be prepared or stand by to inform the other related emergency agencies, outside the Project.
- The on-site ER manager has to evaluate the situation/incident and be prepared to coordinate with the emergency supporting team. Also, the on-site ER manager must keep reporting to the Dawei Township Emergency Commander/ Director (Dawei TS-EC/ED).
- In case the incident is severe and potentially extend. The Dawei TS Emergency Commander/Director must evaluate environmental impacts. Also to coordinate and communicate related people for further next step.

Tier 2 Emergency Action Plan

Responsibility of Resident/Shop

- The Resident/Shop must activate warning system e.g. turn on the fire alarm or alarm bell to warn the other residents.
- If the residents/shop evaluates that the incident / emergency is unable to control, they must evacuate off the building to assembly point or safety area as soon as possible.
- The residents/shop, who cause the incident, must be with or coordinate with or join Fire Brigade Team of the Dawei Township Emergency Center, in order to provide useful information for the fire incident.

Responsibility of the Project

- After receiving report, the ER Center must follow steps as mentioned in Tier 1.
- If the Dawei TS-EC/ED evaluates that the impacts is intensify, beyond the capability and control of the Township facilities, he/she will announce the Tier 2 Emergency Level. At this stage, he/she must be on duty to manage the incident/emergency with his/her best effort, effective command, facilitate and support in controlling the incident/emergency.
- Dawei TS-EC/ED must directly report to Dawei Township Director or Executive or the Person In Charge.

Tier 3 Emergency Action Plan

Responsibility of Residents/Shop

- The same actions as in Tier 2

Responsibility of the Project

- After receiving report from residents/shop, the ER Center must follow steps as mentioned in Tier 2
- The Onsite ER manager must analyze and evaluate environmental impacts that may incur the Township itself and nearby community. Also he/she must keep reporting the Dawei TS EC/ED.
- Once the Dawei TS EC/ED evaluate that the impact is seriously intensify and extending to local or nearby community, he/she will announce Tier 3 Emergency level and he/she must be on duty to manage the incident/emergency with his/her best effort, effective command, facilitate and support in controlling the incident/emergency.

  In addition, to coordinate with the local community leader, township or district administrators/agencies to obtain supports and to consider about announcement of the emergence in the district or provincial level.
- Dawei TS-EC/ED must directly report to Dawei Township Director or Executive or the Person In Charge.
- Dawei TS-EC/ED must go to the Dawei Emergency Center to control the Township emergency, in order to to conduct and cooperate and providing information to related agencies such as Township/District/ Provincial Administrative.

Flow charts of the Dawei Township Emergency Procedure is presented in Figure 4.1-52 and flow chart of the Dawei Township Emergency Responsibility is presented in Figure 4.1-53.

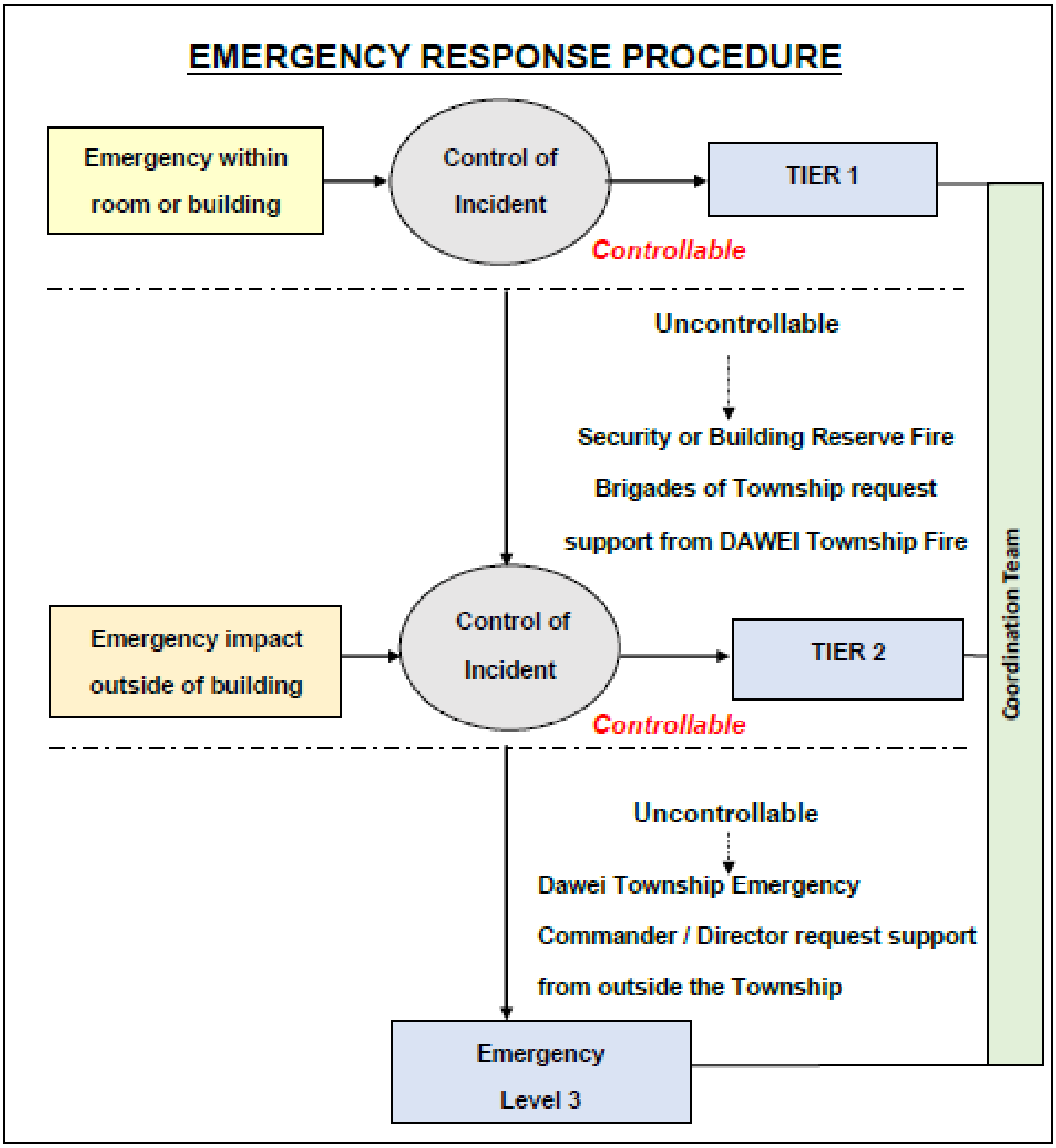


Figure 4.1-52 Flow chart of Emergency Response Procedure

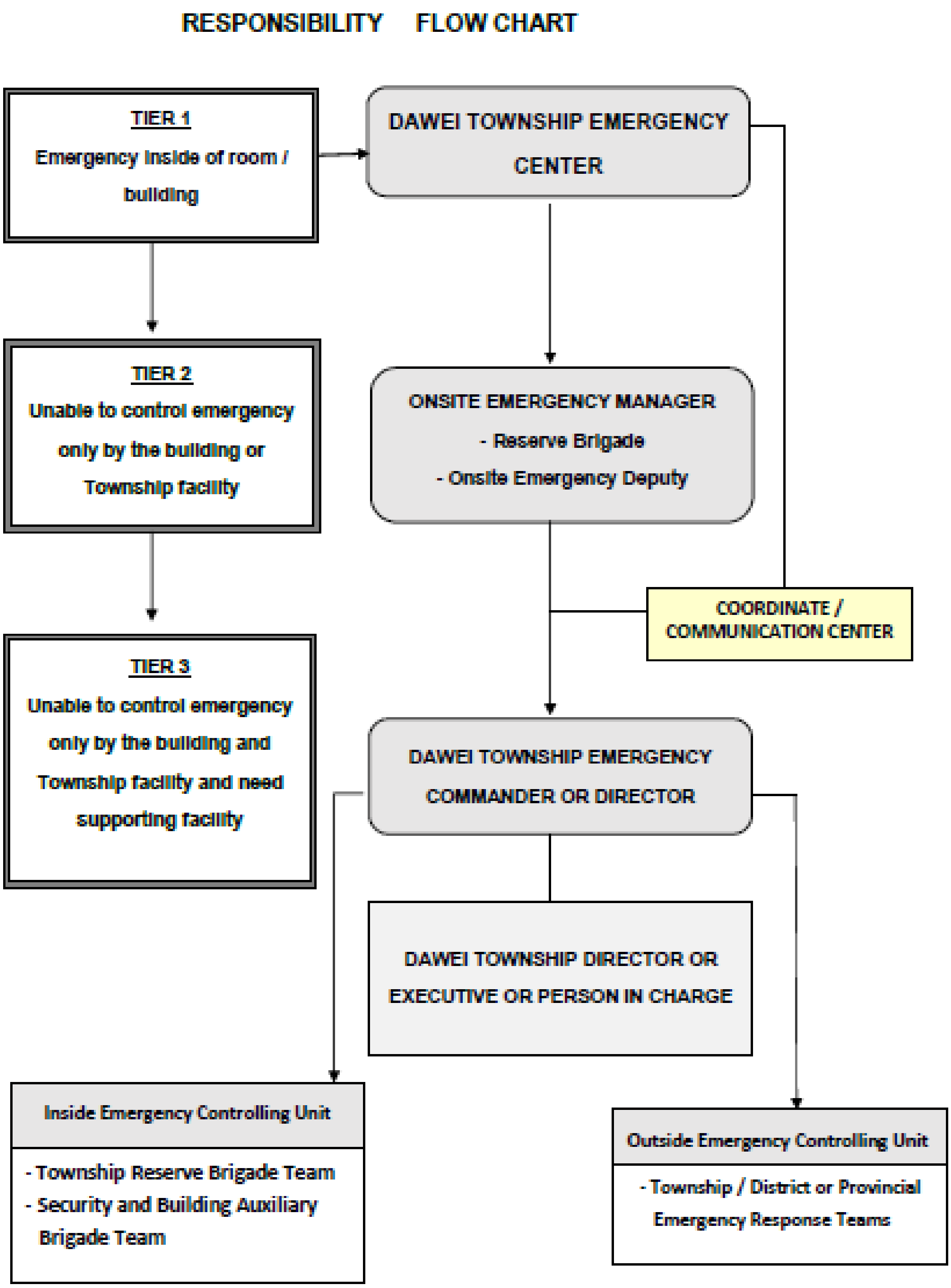


Figure 4.1-53 Emergency Response Responsibility

4.1.10.2 Fire Emergency Response Plan

❖ **Construction Phase**

Fire can cause by fuels and chemicals that are used during construction or from some construction activities e.g. welding or electrical instruments / equipment. The Project will

- Implement safety plan to sub-contractor including emergency and evacuation plan during construction.
- Manage electricity supply by experienced and skilled electricians.
- Store construction materials in safety or appropriate containers or places, especially flammable materials or fuels.
- Implement OHSA, brief or train construction workers.
- Have head of construction or duty manager to control the work.
- No smoking in working area.
- No over load of uses of electricity.
- Always check equipment or instrument are ready to use.
- Welding must be done at least 35 feet from flammable or fuels.
- Prepare enough fire extinguisher or apparatus.
- Provide 24 hrs security staff for safety and emergency.

❖ **Operation Phase**

(a) ***Preparation and prevention plan***

- Prepare reserve or secondary water source for fire extinguishing
- Prepare at least 1 fire truck
- Prepare different type of fire extinguishers/apparatus in many spots in the building.
- Install fire alarm for emergency including testing the fire alarm and emergency plan in workplace.
- Annual check and inspection of fire apparatus are always ready to work
- Annual Fire Campaign especially in hot and dry season
- Inform and communicate through residents and people by effective channels
- Annual rehearsal fire emergency response plan
- Cooperate supporting agencies outside the Township e.g. Township/District Fire Brigade team.

(b) ***Fire Fighting and Evacuation Plan***

The fire fighting and evacuation plans are classified into 3 levels.

Level 1 Fire Emergency Plan: small fire within room or building

- Fire watcher or witness shall turn on fire alarm to warn the other residents.
- Fire watcher or witness shall request help to fire off by using the existing fire apparatus or fire extinguisher.
- The witness or security or building fire reserve brigade shall evaluates fire incident. If the fire is uncontrollable, he/she needs to announce “Evacuation”
- Proceed the evacuation in safety area or the assembly point, check missing persons and cut off the electricity.
- If the fire incident potentially extends or uncontrollable, the apartment manager/security/On-site Fire Emergency staff have to inform the Dawei Township Emergency Response Team.
- Report to Onsite Dawei TS-Emergency Manager and Dawei TS Emergency Commander / Director, respectively.
- Coordinate with the other apartment’s manager or administrator in order to control or manage situation in the Township by many effective channels.

Level 2 Fire Emergency Plan: medium fire potentially extend outside the apartment

- Once, Dawei TS-Emergency Commander /Director announces Level 2 Emergency. Every residents in the apartment or related teams or persons must follow the Tier 2 Fire Emergency Plan in order to control or stop the fire incident as much as possible.
- If the fire is controllable, separate the incident site from the other area for inspection and investigation of causes and damages and report to the Dawei IE-Emergency Commander/Director to waive the Tier 2 Fire Emergency
- If the fire is uncontrollable, and trends to be extended and impacts nearby apartment and/or local community, the Dawei Emergency Center must obtain support from the local emergency agencies e.g Township/District Fire Service and brigades team.
- The Onsite Emergency manager must report to the Dawei IE-Emergency Commander/Director
- Coordinate and inform residents, the other apartment’s manager or administrator in the Township by many effective channels.

Level 3 Fire Emergency Plan: severe fire potential extend outside the Township

- Once, Dawei TS-Emergency Commander /Director announces Level 3 Emergency. Every residents and related teams or persons must follow the Tier 3 Fire Emergency Plan in order to control or stop the fire incident as much as possible.
- The Onsite Emergency Fire manager must report to the Dawei TS-Emergency Commander/Director, Executive/Director of the Dawei Township/Person In Charge and the director of Myanmar Housing.
- Coordinate and inform residents, the other apartment's manager or administrator in the Township by many effective channels.

Role and Responsibility of the Emergency Response Center and Team

- Dawei Township Emergency Commander / Director
- Emergency Coordination Team
- Dawei Emergency Center
- Communication and coordination Team
- Support and Evacuation Team
- Utility Team

Inspection

Room or building that causes the fire must be inspected by the expert from relevant agency and will be committed a fraud and penalty by the Township.

(c) ***Recovery Plan***

After fire disaster, the Dawei Township has to coordinate with the supporting agencies both government or private to remediate and recovery from the damages as soon as possible:

- Provide support for medical treatment and provide temporary accommodation and sanitary for victims that have to be evacuated from the fire site, see Cooperate Social and Responsibility (CSR) in Section 9.9.4.
- Remove victims and their belongs to safety area
- Remediate and support victims who cannot support their life
- Control the areas in security and safety manners.
- Check that if any victims needs or require support.
- Inform victims and people about cause of fire, prevention plan in the future and recovery plan.
- Resident or room or shop who causes a fire must commit the fraud, penalty and compensation according to the laws.

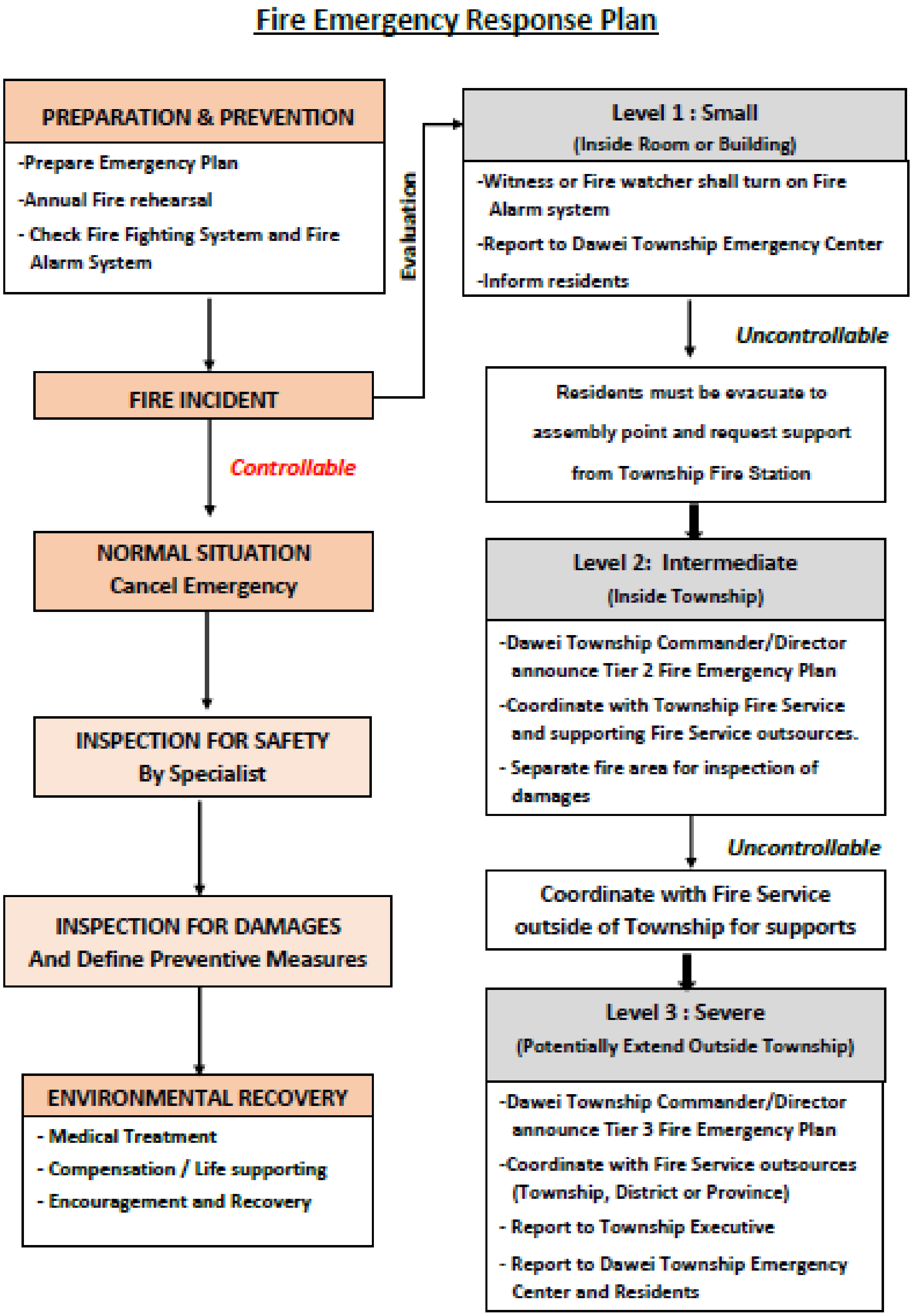


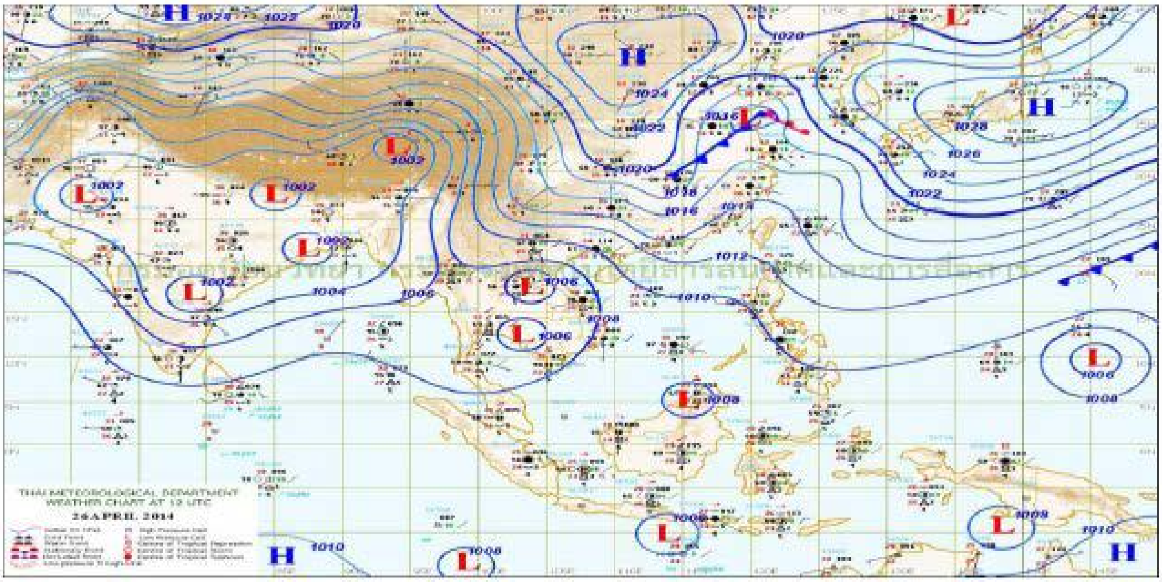
Figure 4.1-54 Emergency Response Procedure for Fire and Explosion

4.1.10.3 Storm and Flooding Emergency Response Plan

The Project has designed Flood Controlling System (FCS) (see *Section 4.1.4*) due to the Project is located near Dawei River and Kun Chuang River. The Project will be able to manage flood for a level; however, in case of natural disaster e.g. extra-ordinary heavy rains or cyclone or typhoon that may impact to the Township. Thus, the Storm and Flooding Emergency Response Plan and Procedure (Figure 4.1-57) is required and it consists of

(a) ***Preparation and prevention plan***

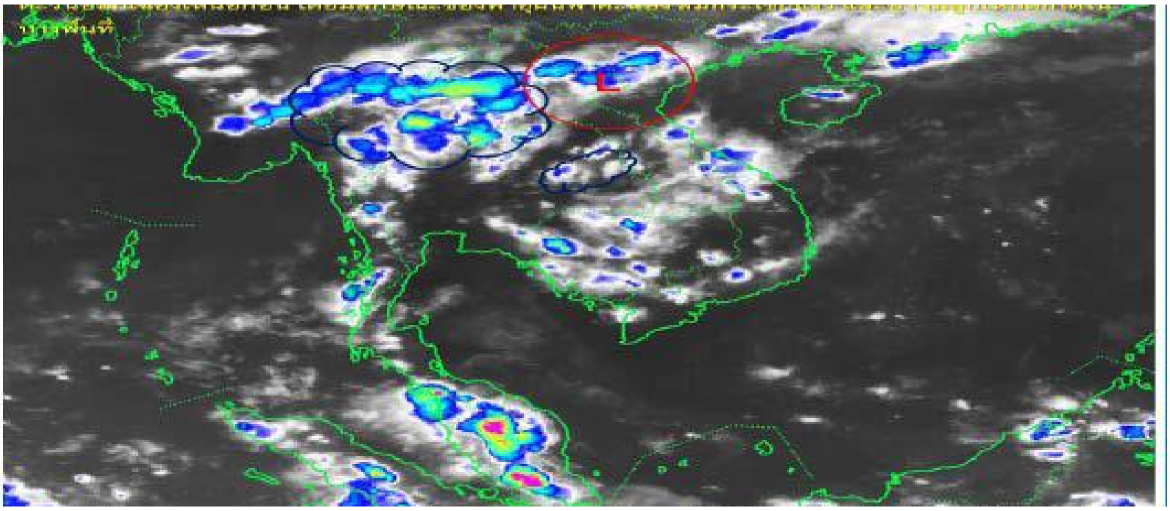
- Checking drainage / cannels or creeks in the Township
- Dredging drainage and cannels
- Keep low level in drainage / cannels or creeks
- Monitor level of water in drainage / cannels or creeks
- Inspect and maintenance retention ponds
- Checking and maintenance pumps and equipment
- Prepare sand bags, back holes, mobile pumps including vehicles and communicable equipment for emergency case
- Be aware and follow up weather condition or forecast (Figure 4.1-55) and flooding announcements from relevant government agencies such as Metrological Department



http://www.tmd.go.th/weather_map.php

Figure 4.1-55 Weather forecast and meteorological condition

- Analysis of satellite images / maps about flooding hazard



http://www.tmd.go.th/weather_map.php

Figure 4.1-56 Satellite images - Flooding

- Follow up levels of water in Kun Chuang River and Dawei River including intrusion of salt water stage, route and condition and draining of these rivers.
- Follow up and check risk spots, salute gates or drainage of the Township
- Establish "*WAR Room*" to co-ordinate, prevent and solve the flooding problem in the Township for 24 hrs. Director of the Dawei Township will be commander and co-ordinate with the other agencies.

(b) ***Warning and Evacuation Plan***

Four levels of emergency and evacuation plan

<u>Level 1 : Follow up and stand by</u>

- o Evaluate the situation and follow up
- o Survey and check readiness of prevention plan
- o Emergency commander / related director must be on duty
- o Co-operate with the Township Emergency Response Team
- o Inform the residents for situation

<u>Level 2: Move belongs / objects to prevent damages</u>

- o Emergency commander announces and commands the plan
- o Conduct and follow the plan and coordinate with the other agencies.
- o Report and evaluate the situation to the emergency commander in controlling the emergency
- o Communicate and inform residents in the other apartments by channels.

<u>Level 3: Evacuation preparation</u>

- o Emergency commander announces emergency plan
- o Conduct and follow the plan and coordinate with the other agencies
- o Evaluate and report to emergency commander
- o Communicate and inform residents in Township by many channels.

<u>Level 4: Evacuation</u>

- o Announcement and command the plan
- o Follow the prevention plan and evacuation plan
- o Evacuate to provided location or safety area
- o Provide vehicles; car, truck and facility for evacuation
- o Report and evaluate situation to emergency commander
- o Coordinate and inform relevant agencies by channels.

Evacuation team consists of emergency commander, emergency coordinator, flood controlling unit, emergency communicator, safety and traffic and evacuation team.

(c) ***Recovery plan***

After flooding events, the Project has prepare the recovery plan as follow:

- Inspection of the flooding area by expert for safety and damages
- Storage and collect waste by flooding
- Renovation and fix damages such as road, facilities, painting, planting and construction of retention ponds.

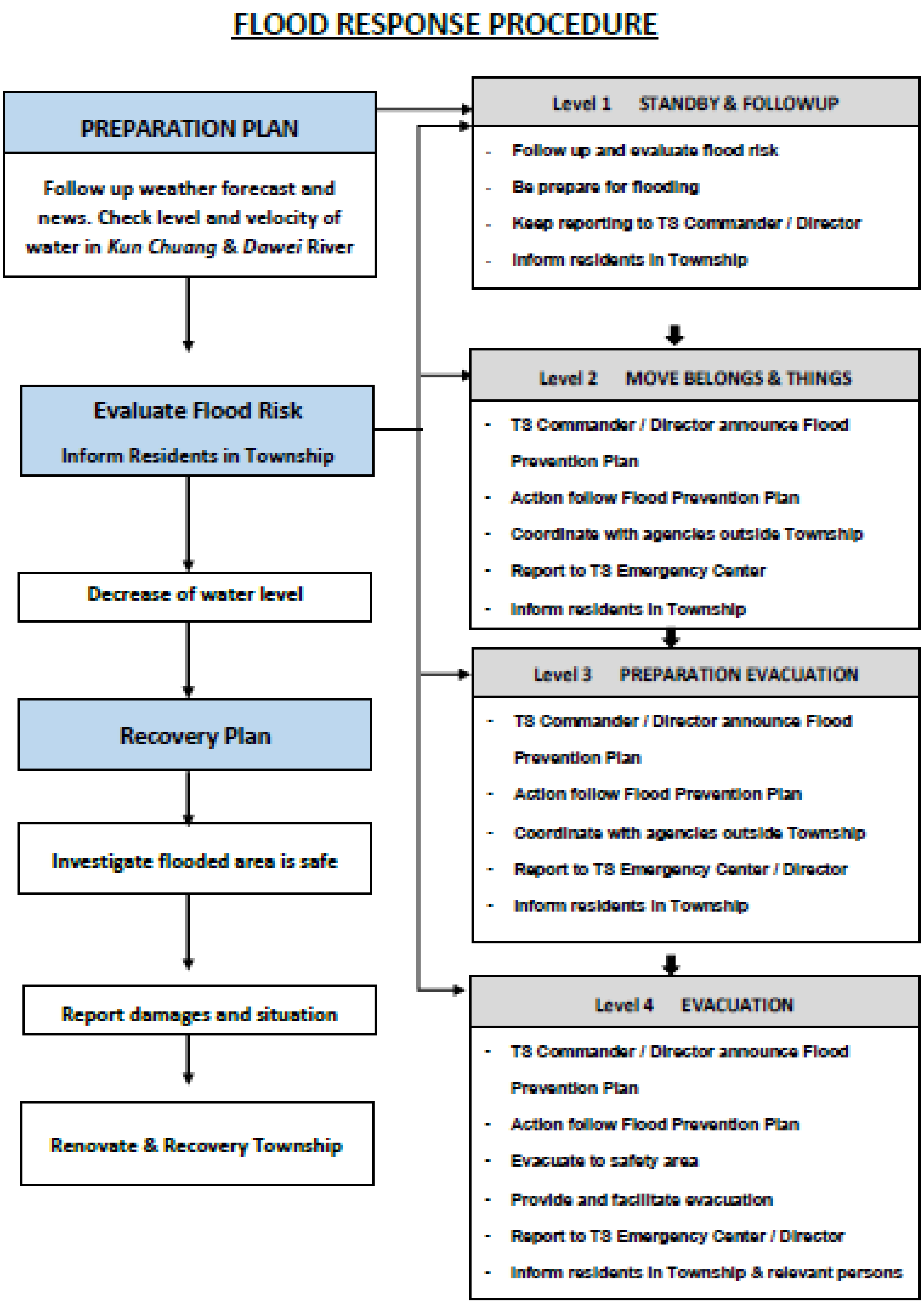


Figure 4.1-57 Flow chart of Strom and Flooding Procedure in Emergency

4.2 PROJECT ACTIVITIES

4.2.1 Construction Phase

4.2.1.1 Construction of Infrastructure

Preparation of the Initial Township area and infrastructure involves large quantity of earth moving and clearing of existing vegetation in the area. All the existing vegetation in the township area, except those within the green areas, will be cleared.

Construction of utility systems and infrastructure is another major activity for the development of Initial Township. The construction will include necessary earthwork, concrete work, commissioning, and procurement of necessary equipment and machines for the following infrastructure and utility systems.

- Main road, secondary road, and tertiary road networks;
- Flood protection and drainage system;
- Wastewater collection and treatment system;
- Firefighting and emergency response system; and
- Construction of Initial Township

Further descriptions of the above infrastructure and utility systems are discussed in Section 3.5.

4.2.1.2 Construction Work Camp and Workshop

A main construction work camp (Figure 4.2-1 to Figure 4.2-3), which is used for accommodation of workers involved in the construction of Initial Township, is located at KM18 south of the main road. The accommodation is expected to support a maximum of 371 workers employed by Italian-Thai Development PLC., the main construction contractor of Initial Township.

In addition, area of 256,000 square meters is also used for facilities supporting the construction activities including concrete batching plants, mechanic workshop, warehouse, precast and reinforced concrete yard, and site office.

In order to respond massive demand for housing, the construction process must be completed in short time while quality and cost control must be complied. Thus, some precast raw materials, which are steel, cement and architectural materials (doors and windows), will be transported from Thailand by barges and trucks. The other construction raw materials e.g. sand and graded rocks will be supplied from local quarry in vicinity of the DSEZ. The following are the benefits of using precast system.

- Better quality control
- Shorter period of construction
- Less sound pollution and air pollution

- Lower material loss ratio

ITD has already started setting up for precast yard since 2013 in order to ensure on-time construction of Initial Township project.

Figure 4.2-1 Batching Plant and Cement Tower Setting up at Precast Yard Area at KM. 16.5

Figure 4.2-2 Precast Construction Equipment

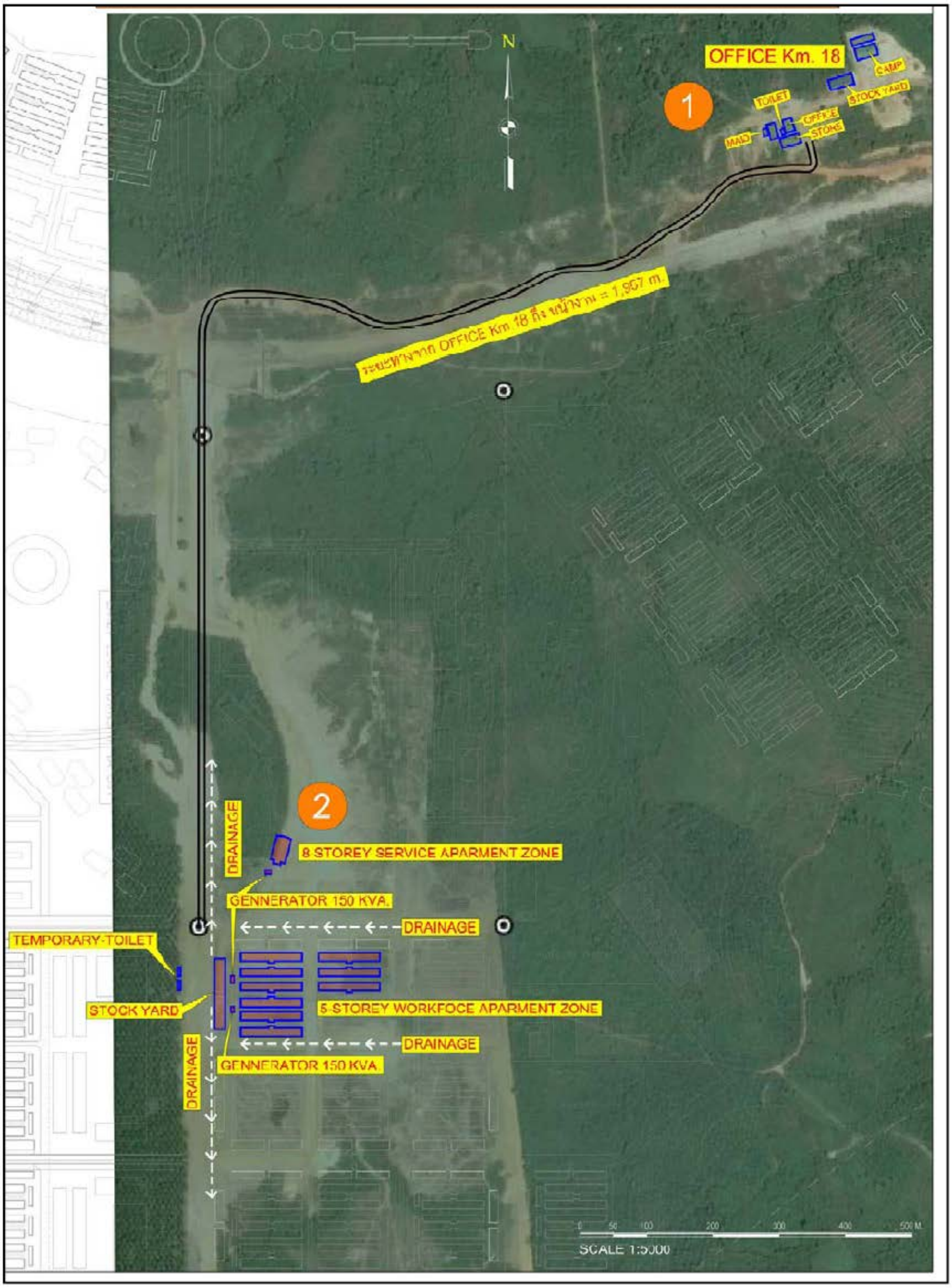


Figure 4.2-3 Layout of Main Construction Camp, Workshop and Yards

4.2.1.3 Transportation of Construction Materials

Construction materials will be supplied from Thailand and will be transported by through Myanmar-Thailand border at Kanchanaburi Province. The Main Road inside the township area will be improved and widened to accommodate the transportation of materials and machineries, which will be done mainly by dump trucks and trailers.

During construction period, the roads will likely be shared between the local communities and the construction activities. Improvement of the road including installation of traffic signs, improvement of line of sights and curvatures, and road widening will be conducted. Road sections that pass through existing villages will be water sprayed to reduce dust that is resulted from the transportation. With progressive resettlement of the existing villages in the industrial estate area and construction of permanent secondary roads, it is expected that traffic conditions in due to transportation of construction materials will be improved over time.

4.2.1.4 Sanitation of Campsite

Workers camp shall be constructed in accordance with Standard of the Engineering Institute of Thailand. Sanitary management for worker camp shall be in accordance with Standard and Layout for Temporary Construction Worker Camp issued by the Engineering Institute of Thailand Under H.M. the King’s Patronage (Wor Sor Tor. 1010-34 Standard). Worker camp shall be constructed sufficiently for number of workers. Materials used for worker camp construction refers to Local Temporary Building Regulation, and electrical cable and device refer to Metropolitan Electricity Authority Standard. The following obligations shall be written in the contractor contract. Construction shall be in accordance with sanitary practices as described following:

(a) *Location*

- Worker camp shall be 100 m away from waterway to prevent sedimentation and contamination
- Worker camp shall be surrounded with 2 m high fence.

(b) *Design*

- Room area at least 3.0 sq. meter per person. Width or length inside of each room shall not be lower than 2.4 x 2.4 m. Height from ground to lowest top-wall shall not be lower than 3.0 m. At least one set of door and window shall be equipped, including at least 1 lamp and 1 electrical plug in the room.
- Shared bathing room and washing room shall be provided by contractor in ratio of 7.0 sq. m per 20 persons. Water tank and water tap shall be sufficiently provided for bathing and washing, including sufficient light.
- Toilet shall be sufficiently provided by contractor in ratio of 1 toilet room per 20 persons. Area of toilet shall not be less than 0.90 sq. m and internal width is not less than 0.90 m. Lamp and light also shall be sufficiently provided. Toilet shall be at least 30 m away from natural waterway.
- Worker camp shall be surrounded with fence with only one gate for access control. Security guard shall be provided with guard house at gate.

- At least one set of fire extinguisher shall be provided per building or in every 45.0 m. Fire extinguishers are specific purposes as presented in Table 4.2-1.

Table 4.2-1 Type and purposes of Fire Extinguishers in Worker Camps

No.	Areas	Type	Number (Set)
1	Store	Halotron, 5kg	1
2	Welding shop	Halotron, 5kg	1
3	Laydown	Halotron, 5kg	4
4	Guard house	Dry Chemical ABC, 5 kg	1
5	Canteen	Dry Chemical ABC, 5 kg	1

- Shared cooking area shall be sufficiently provided by contractor. It should be away from worker camp or around 2-3 m to prevent firing from cooking. Area to put on cooking stove (gas/wood), cooking space, washing sink, drainage ditch, garbage bins and lids shall be sufficiently provided.

4.2.2 Operation Phase

Operation of the Project will be by phases as described in *Section 4.1.1.4*. Activities during operation phases are following

4.2.2.1 Residential Activities

As the Project will develop by phase, many activities related to living and playing in Township residential area will begin in small area of zone 9 plus 1 including public and green area within this zone. Afterwards, the residential activities will expand up to size of population that will move in to reside in the Township by phases; A, B, C and D, respectively.

4.2.2.2 Commercial Activities

Commercial activities may start when some retail shops start operating their businesses. This is including establishment and operation of the commercial venue in commercial area that will start when suitable time arrive.

4.2.2.3 Traffic and Transportation

Major transportation during operation will relate to routine travelling from residents' accommodation to their workplace e.g. the Initial Industrial Estate, plants and factories in DSEZ etc. Transportation of residents may be via private motor vehicles e.g. cars and motorcycles. Alternatively, public cars or buses may operate between Township and some spots in DSEZ including inside the Township and the Township and nearby towns.

Once commercial in Township expands, transportation of goods will start. Initially, traffic may not too congest due to design of road network system are still enough for loads of vehicles. However, due to construction of the other zone of Township will be developed in parallel of the operation, transportation of construction materials and equipment will share in some routes in Township.

4.2.2.4 Flood Protection Management

The Project has designed Flood Protection System that can prevent the Project from flooding approximately for 6 hours (See details in Section 4.1.4). Rain water will be collected through drainages and canals underneath the Township. Operation of the system consisting of pumps and salute gates to hold and drain flooded water into Dawei River for the northern retention pond and into Kun Chung River for the southeast retention ponds.

4.2.2.5 Solid Waste Management

As the population in the beginning phase is still small; thus, small volume of waste will be generated. The waste will be managed accordingly procedure described in *Section 4.1.8.1* by the Initial Township staff and facilities. The non-hazardous waste will be collected, stored, delivered and disposed at the nearest disposal site and standard facility in Dawei. Hazardous waste and infectious waste will be stored in 200 drums or appropriate containers and will be transported to Yangon for suitable disposal at this stage.

Once the Waste Management System of Dawei Initial Industrial Estate starts operating, the waste will be disposed in these facilities according to procedure prescribed in *Section 4.1.8* and Annex 4-2.

4.2.2.6 Wastewater Management

Wastewater is preliminary treated by Onsite Treatment Units, which are installed in every buildings before draining to the Project wastewater treatment facility, resting ponds. The ponds will be operated when BOD of wastewater is excess 20 mg/L, over the effluent standard by NEQG (see *Section 4.1.7*). Pumps shall always be ready on duty and spare pumps shall be prepared for emergency and maintenance. Wastewater from northern resting ponds will be discharged into the Dawei River and wastewater from southern resting ponds will be discharged into the Kun Chuang River.

4.2.2.7 Fire Prevention and Emergency

The Project will have an annual rehearsal of Fire Evacuation and Emergency for residents and related staff. This is an active safety, practicing activity for fire and emergency cases according to procedure prescribed in *Section 4.1.10*, Fire and Emergency Prevention Plan, which includes prevention, roles and responsibility of each parties and persons during the incidents, recovery and inspection.

4.2.2.8 Employment

The Project will start employ local staff e.g. electricians, plumbers, gardeners and cleaners etc. for buildings and green areas management and operation and maintenance of the Township. Employment standard will follow the prescribed law and regulation in *Section 3.2.3.3* of the said laws and standard of Occupational Health and Safety Administration in Annex 4-3.

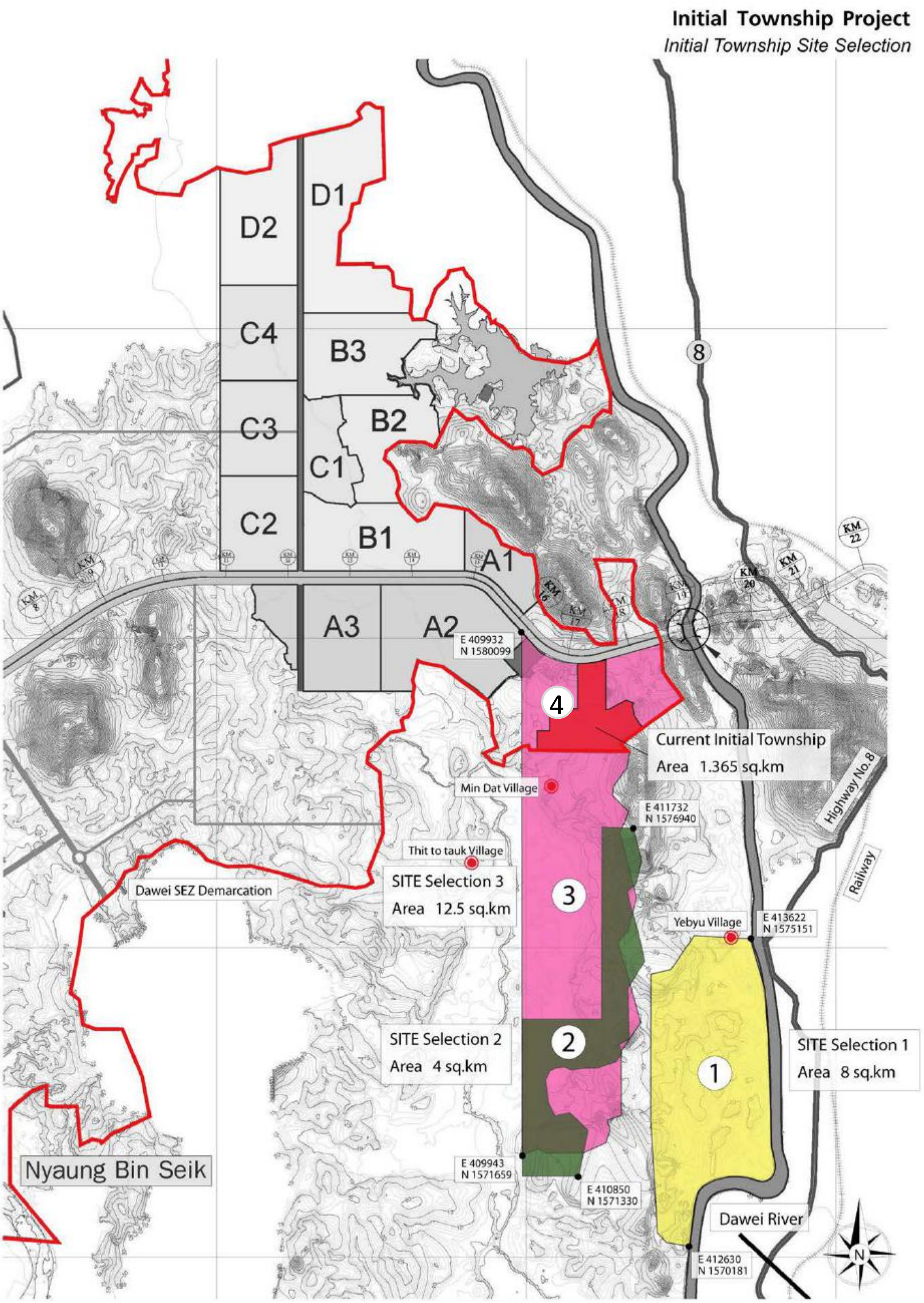
4.3 PROJECT ALTERNATIVES

This section described the important alternatives to the project that have been evaluated in the associated feasibility studies. Key alternatives that have been considered in the previous studies include:

4.3.1 Project Site Selection

Four alternative sites were considered. The locations of the four sites are shown in Figure 4.3-1. Details of each site, summarized from the feasibility study, can be described as follow:

- **Site No.1:** The total area is 8 square kilometers located on the east side of medium and light industrial zone with potential to become a nice riverside town. This area is flat and has two mountain as buffer from the heavy industrial and the Dawei River can be developed for both transportation and recreation purpose. However, there are three existing villages in the township zone i.e. Yebyu, Kyuak Htuak and Sin Pu Nit Villages. The interview from villagers living in Yebyu Village said that the flood came up 10 meters from the Dawei River Edge. Furthermore, there are mountains on the west side which located temples and monarchies. According to not closer with the main road, this site will be upgraded access road.
- **Site No.2:** The total area is 4 square kilometers located on the east side of medium and light industrial zone. This area has two mountain as buffer from the heavy industrial and the Dawei River can be developed for both transportation and recreation purpose. However, there are mountains on the east side which located temples and monarchies. According to not closer with the main road, this site will be also upgraded access road.
- **Site No.3:** The total area is 12.5 square kilometers Local township area boundary; the north is connected with medium industrial zone, the east is connected with 3 mountains (KaNyin Gauk, Tha Pye Zun and Ga Nan Taung) having monastery on top at each mountain, the west is connected with the light industrial zone and the south is at the demarcation line of Dawei Industrial Estate. However, there is the Min Dat Village existing in the township zone.



Source: DRC (2015)

Figure 4.3-1 Site Selection Alternatives

- **Site No.4:** The total area is 5.58 square kilometers while the initial township covers an area of 1.365 square kilometers. Local township area boundary; the north is connected with the main road of the industrial estate, the east is near the high terrain and the Dawei River along the eastern boundary of DSEZ, the west is connected with the light industrial zone and the south is connected with an agricultural plain area. This site consumes less area to support the Dawei Industrial Estate and fewer disturbances to nearby sensitive areas. And according to the shape of project area, the Initial Township grid system has been designed into fan-shaped grids with multiple town accesses which will prevent traffic congestion at one access. And the location of project area is also closed with the main road of the industrial estate; it can approach the township easier.

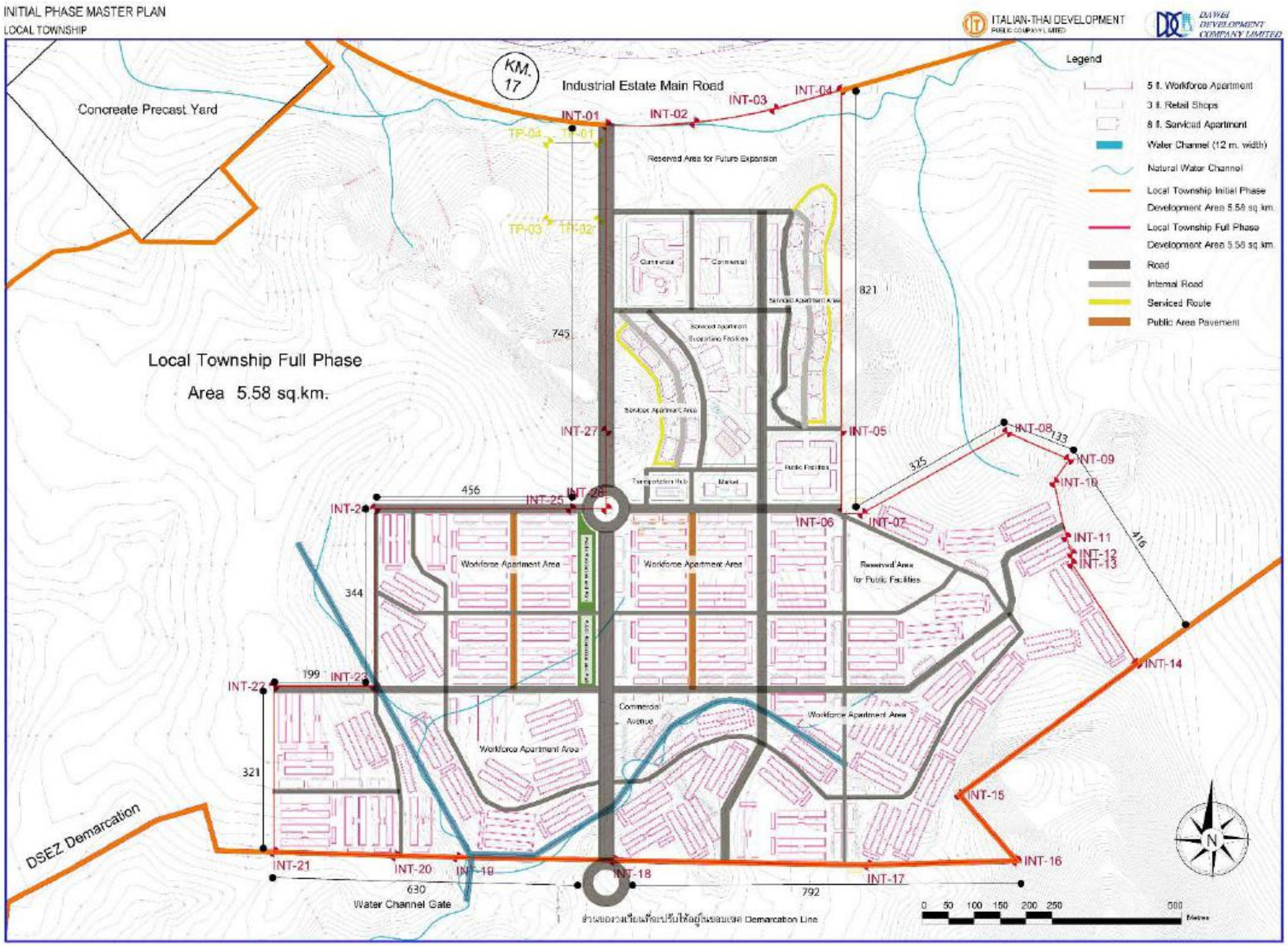
The following evaluation main criteria are used in considering the appropriate site location (DRC, 2015):

- The site should have no impact on nearby villages both economic and social sides;
- Preliminary, land ownership of the site will be preferred the government;
- The site should be at plain area to be convenience for development and water discharge;
- The site should have good access to the main roads for transportation in terms of distance and road alignment, both vertical and horizontal.

Considering all of the above criteria, Site No.4 was selected as the most appropriate site for the construction of township.

4.3.2 Project Master Plan

Upon selection (Site No.4) of the appropriate size master plan for the township (Figure 4.3-2), the estimated project area in final phase is 5.58 square kilometers and 1.365 square kilometers in initial phase. The township is divided into 7 areas namely: commercial/ retail shop, 5- floor workforce apartment, 8- floor serviced apartment, recreation/sport, green area, road/traffic route and initial facilities as presented in Table 4.3-1.



a) Updated Project Layout and Master Plan

Source: ITD (2015)

Figure 4.3-2 Project Layout and Master Plan Alternatives

ITD revised master plan to further develop the concept of the project with further details on infrastructure and utility design. Major components that are developed during the master plan preparation include (ITD, 2012):

- Relocation of township area closer to the entrance of the area to make it more convenient to access,
- Increase the size of the green area,
- Conceptual layout of township, and
- Conceptual design of infrastructure and utility systems.

Table 4.3-1 Summary of Area in Master Plan for the Initial Township

Description	Updated Master Plan Area	
	(m^2)	**(km^2)**
Commercial / Retail Shop	47,234 sq.m	0.047 sq.km
5-floor Workforce Apartment	284,175 sq.m	0.284 sq.km
8-floor Serviced Apartment	67,500 sq.m	0.068 sq.km
3-floor Retail Shops	103,275 sq.m	0.103 sq.km
Recreation / Sport	36,354 sq.m	0.036 sq.km
Green Area	557,121 sq.m	0.557 sq.km
Road / Traffic Route	222,885 sq.m	0.223 sq.km
Initial Facilities	46,546 sq.m	0.047 sq.km
Total	**1,365,000 sq.m**	**1.365 sq.km**

Source: DRC (2015)

The alternative in the revised master plan was the one selected for the assessment of potential impact in this EIA report.

4.3.3 Comparison and selection of the project alternatives

Criteria for site selection such as area, location and accessibility, topography and landform, social, culture and economics and construction cost is summarized in Table 4.3-2.

Considering by area and shape, alternative 2 and 4 are smaller in size than alternative 1 and 3. Alternative 4 has the most preferred shape, in fan-shaped, while the others are almost rectangular

Considering by location and accessibility, alternative 4 is located in the best position which is easily to access by the main road of Dawei SEZ and is the nearest alternative to the Township and its utilities.

Considering by topography and landform, all alternatives except alternative 1 are in quite elevated area whereas, alternative 1 is just next to the Dawei River that area along the river in alternative 1 is potentially flooded. However, alternative 1 will so gain benefit from river recreation and alternative 1, 2 and 3 will so gain visual benefit from hilly terrain.

Considering by social, culture and economics, alternative 1, 2 and 3 will have severe impacts from traffic congestion because there have such long accessed roads from the Township before diverting to Main road and later then in the Township. Next, many villages will be relocated, if alternative 1 and 4 are selected.

Considering by construction cost, alternative 4 is the most economical because of its location in nearby the Township and good access to main road. Flat topography with less slopes will reduce cost for construction of water drainage supply and discharge system; whereas, the other alternatives are in hilly terrain and with slops and the extra-long access roads need to be constructed.

Table 4.3-2 Comparison of the project alternatives

Issues	Alternative			
	1	2	3	4
1. Area of Township				
• Size	-	+	-	+
• Shape	-	-	-	+
2. Location and Accessibility				
• Main road	-	-	-	+
• Township	+	-	-	+
• Shared utilities	+	-	-	+
3. Topography and Landform				
• Flood event	-	+	+	+
• Hilly terrain	+	+	+	-
• River recreation	+	-	-	-
4. Social, Culture and Economics				
• Relocation of villagers	-	+	+	-
• Incentive for land selling	-	-	-	+
• Traditional believe	-	-	-	+
• Traffic congestion	-	-	-	+
• Aesthetics	+	+	+	-
5. Construction Cost				
• Discharge facility	-	-	-	+
• Accessibility from main road	-	-	-	+
TOTAL	**5 +**	**5 +**	**4 +**	**11 +**
	10 -	**10 -**	**11 -**	**5 -**

Source: The EIA Study Team

CHAPTER 5
DESCRIPTION OF THE ENVIRONMENT

5.1 SETTING AND STUDY LIMITS

In the Environmental Impact Assessment (EIA) study, it is necessary to establish baseline information on the environment and socio-economic settings of an area which could receive and indirectly impacts from the Project construction and operation. The baseline information serves two purposes. Firstly, it is used in conjunction with the information on the project for identification of potential impacts of the Project and assessment of their significance. Secondly, it serves as the benchmark for evaluating environmental and social management performance of the Project construction and operation.

For the purpose of establishing baseline information on the environmental, the study limits are to consist of geographical limit and contextual to guide the baseline information collection.

5.1.1 Geographical Study Limit

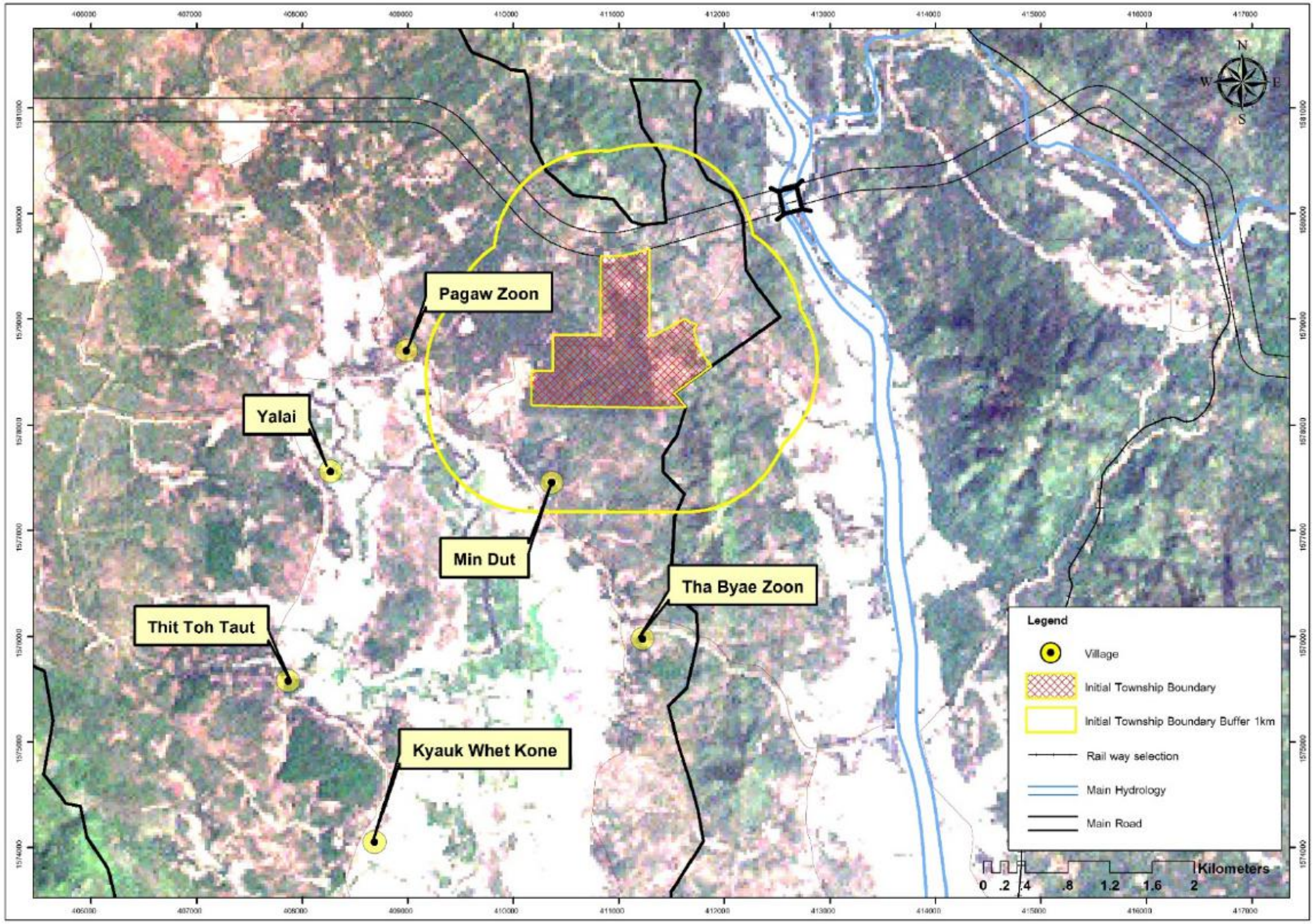
The geographical study limits is defined as an area surrounding the project site from which the baseline information collection should be collected. In this study, the geographical study limit is about 5 km extending from the center of the project site. This geographical study limit covers 78.57 km^2 of circular area around the project site as shown in a map in Figure 5.1-1. This area is referred to in subsequent sections of this report as "the study area" The study area should cover sensitive receptors of environmental impacts of the Project during project construction and operations.

5.1.2 Contextual Study Limit

The EIA guideline defines the contextual study limit to consist of four groups of components: (i) physical components; (ii) biological components; (iii) socio-economic components; (iv) cultural components. Considering the nature of this Project and its potential environmental issues, the composition of each main component is presented below:

(1) Physical components

- Topography and soils
- Geology and seismology
- Hydrology
- Climate and air quality
- Noise and vibration
- Groundwater Quality
- Surface Water and Sediment



Source: SEATEC, 2012b

Figure 5.1-1 The geographical study limits

(2) Biological components

- Surface water biology and fisheries activities
- Forestry
- Wildlife

(3) Socio-economics components

- Initial township development
- Health profile
- Infrastructure facilities
- Traffic and transportation
- Land use

(4) Cultural components

- Historical and archeological sites

5.2 PHYSICAL COMPONENTS

5.2.1 Topography and Soil

5.2.1.1 Study Area

The proposed project activities comprised of land leveling, excavation, and others may cause alteration to the topographic condition. Initial Township Project is bounded by Dawei River in the East and the Andaman Sea in the West. The study area will be divided into two levels including topography of Dawei city and topography within Initial Township Project.

5.2.1.2 Baseline Topography and Soil Conditions

Topography and soil conditions Information from the following relevant environmental studies were reviewed:

- Final Report for consultancy services for the Main Road, Flood Control, Infrastructure & Utilities, Task 2 Industrial Estate Flood Control & Drainage Study and Conceptual Design (SEATEC, 2012b).
- Topographical Map of Tavoy Burma 1:250,000 Series U542, Sheet ND 47-6, Edition 1-AMS, 1957 (USACE, 1957).
- Initial Environmental Examination (IEE) for Dawei Sea Port & Industrial Estate Development (TEAM, 2012a).
- Final Report of Environmental Impact Assessment (EIA) for the Dawei Deep Sea Port (TEAM, 2013).
- Environmental Impact Assessment (EIA) for Main (SEATEC, 2012c).

- Draft Environmental Impact Assessment for Dawei Industrial Estate Project (SEATEC in association with UAE, 2012).

The following sections are summarised the information from the above documents.

Topography

Terrain Regions in Myanmar are divided into 5 zones which are: 1) Central Myanmar; 2) Western Mountains and Arakan Coast; 3) Northern Myanmar; 4) Shan Highlands; and 5) Tenasserim. Dawei is classified into Tenasserim or Burmese Tanintharyi, which refers to the narrow coastal region in Southeastern Myanmar, bordered to the East by Thailand and to the West by the Andaman Sea (Figure 5.2-1).

Dawei is a city in Southeastern Myanmar, situated about 614.3 km (381.7 miles) South of Yangon on the Northern bank of the Dawei River.

The general topographic condition of Dawei River Basin is characterized by a plain alternating with hills in the valley with high mountains surrounding the area. There are a number of natural streams flowing from mountains to the central of the area, forming the main river, Dawei. The Dawei River flows through the project site which situates in Myanmar, close to Kanchanaburi Province of Thailand (Figure 5.2-2).

The project area is comprised almost entirely of flat plains. There are four rivers running from the North to the South of the project area. The four rivers are: Nabule River; Dawei River; Kunchaung River; and Pan Din In Chaung River (Figure 5.2-3).

Soil

There are nine soil types in Myanmar (Figure 5.2-4) Major soil types of the project area are occupied by the Saline Swampy Meadow Gley (GL-Gleysol). These soils occur in the Ayeyarwady Delta, along the river bands of the Gulf of Motama, and the marine flat lowlands influenced by the tidal sea water; which is always salty. Due to high salinity and constant tidal sea water, the land can only by utilized for prawn breeding and mangrove firewood forests. The adjacent soil type of GL-Gleysal is Light Forest Soils (Cinnamon), or NT-Nitisol. These soils mostly occur on the very gently sloping alluvial-deluvial under the mountainous plains of the Dry zone area and are also found on the lowest parts of the Shan Plateau. The physical properties of these soils are very favorable and, in spite of being sandy, they are pervious and not heavy in which to work. The soils are generally fertile, which is related to their position in the mountainous plains. There is a constant supply of nutrients from the surrounding mountains because of the surface run-off. These soils are suitable for the cultivation of Yard crops (dry cropping on uplands).

5.2.2 Geology and Seismology

5.2.2.1 Study Area

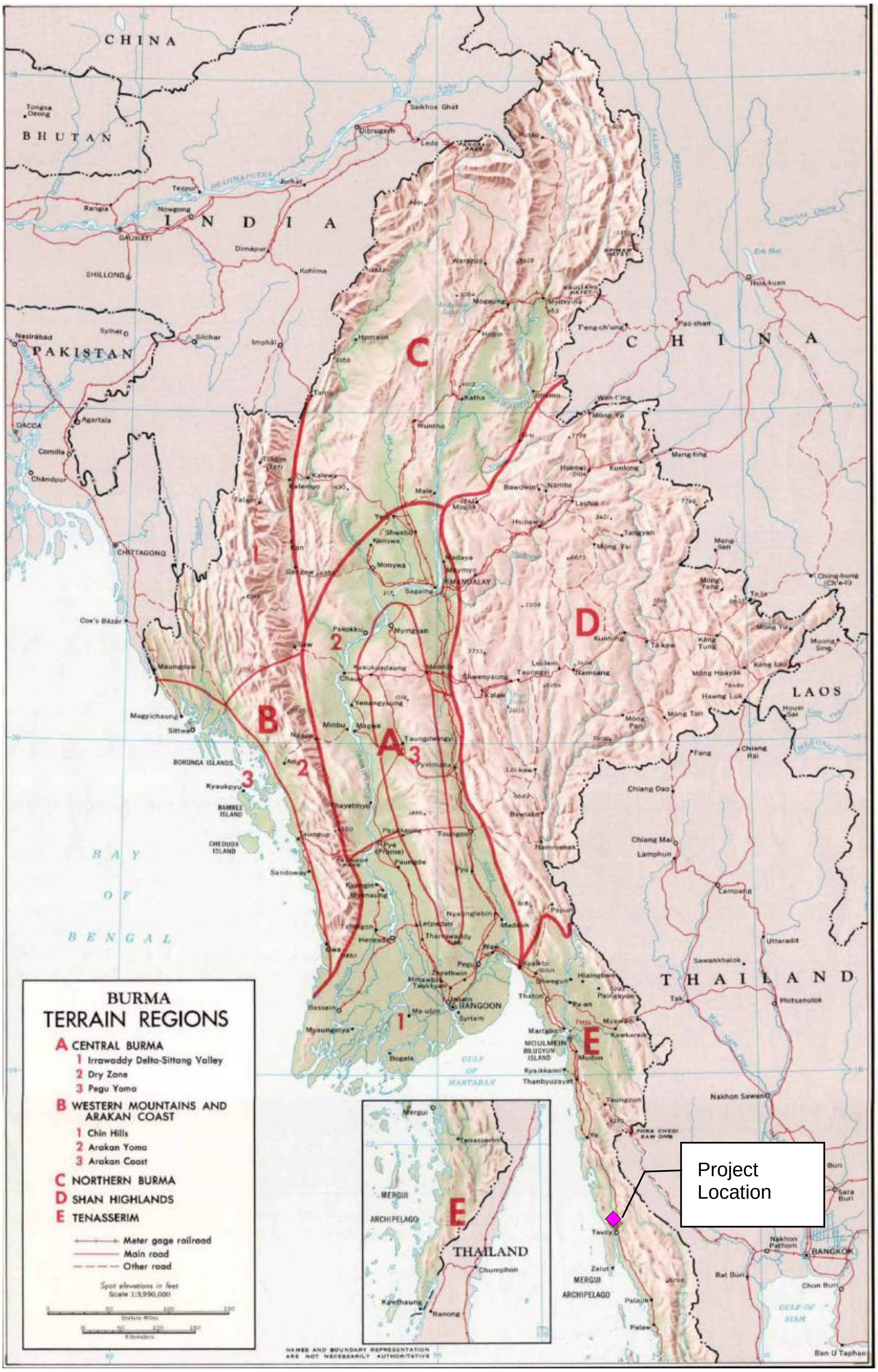
Geological information can be used to indicate potentials of earthquakes and mapping of any potential mineral deposit. Seismology has been a serious concern for construction design because of its potential to cause threats to the project. The geological map of the project area and the area within a 5 km. radius of the project boundary will be considered while the seismologic study will provide the seismic record of the country.

Baseline Geological Conditions

Information on geological conditions of Myanmar is rather limited and most of the information available on public domains is on regional level. The following documents are reviewed in this section:

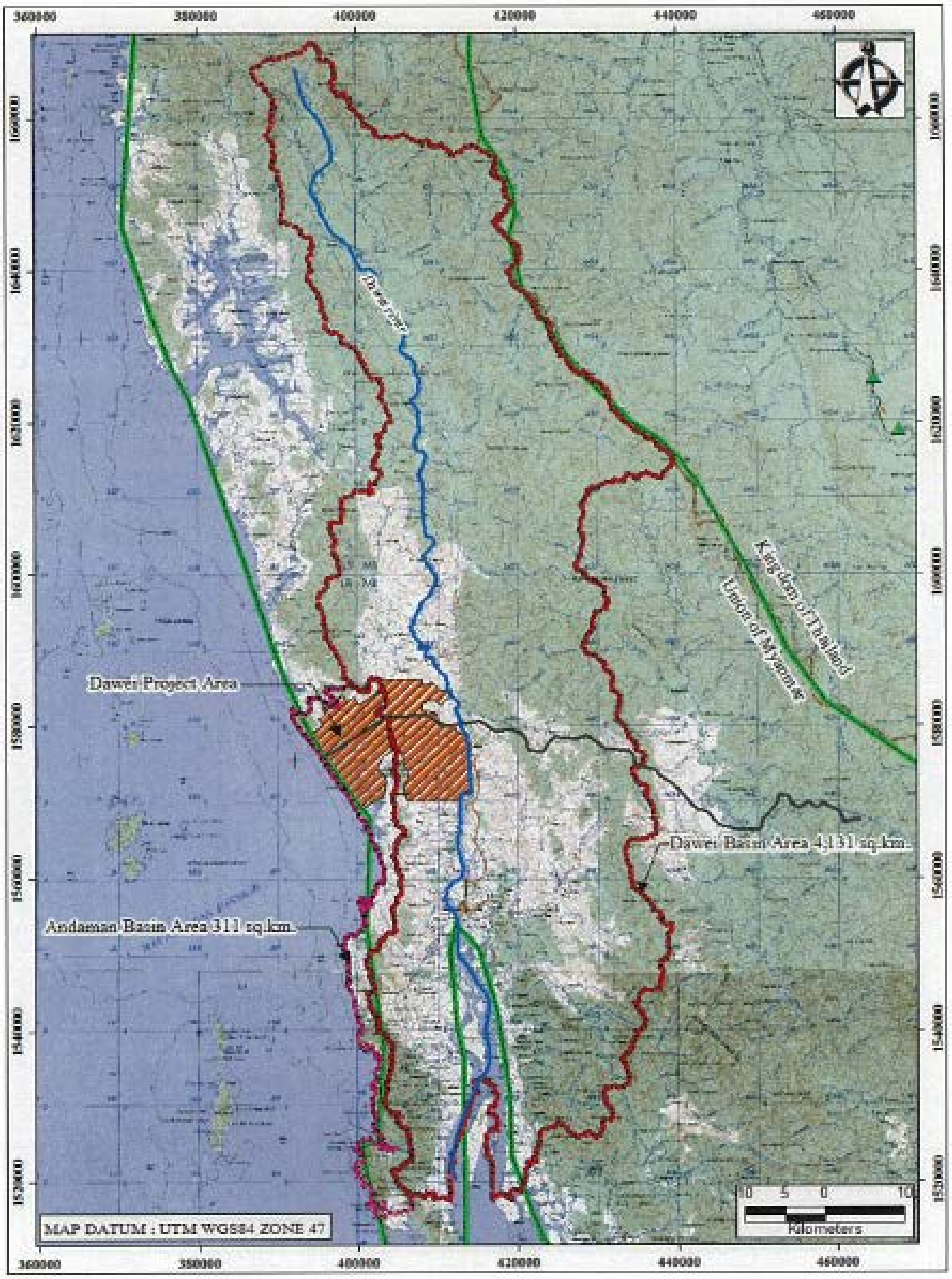
- Geological Map of the Socialist Republic of the Union of Burma (USACE, 1977).
- Burma Rock Types (USACE, 1990)
- Regional Geology of Myanmar (Pramumijoyo et al., 2010)
- Draft Environmental Impact Assessment for Dawei Industrial Estate Project (SEATEC in association with UAE, 2012)

The description below discusses the regional geological settings of the area.



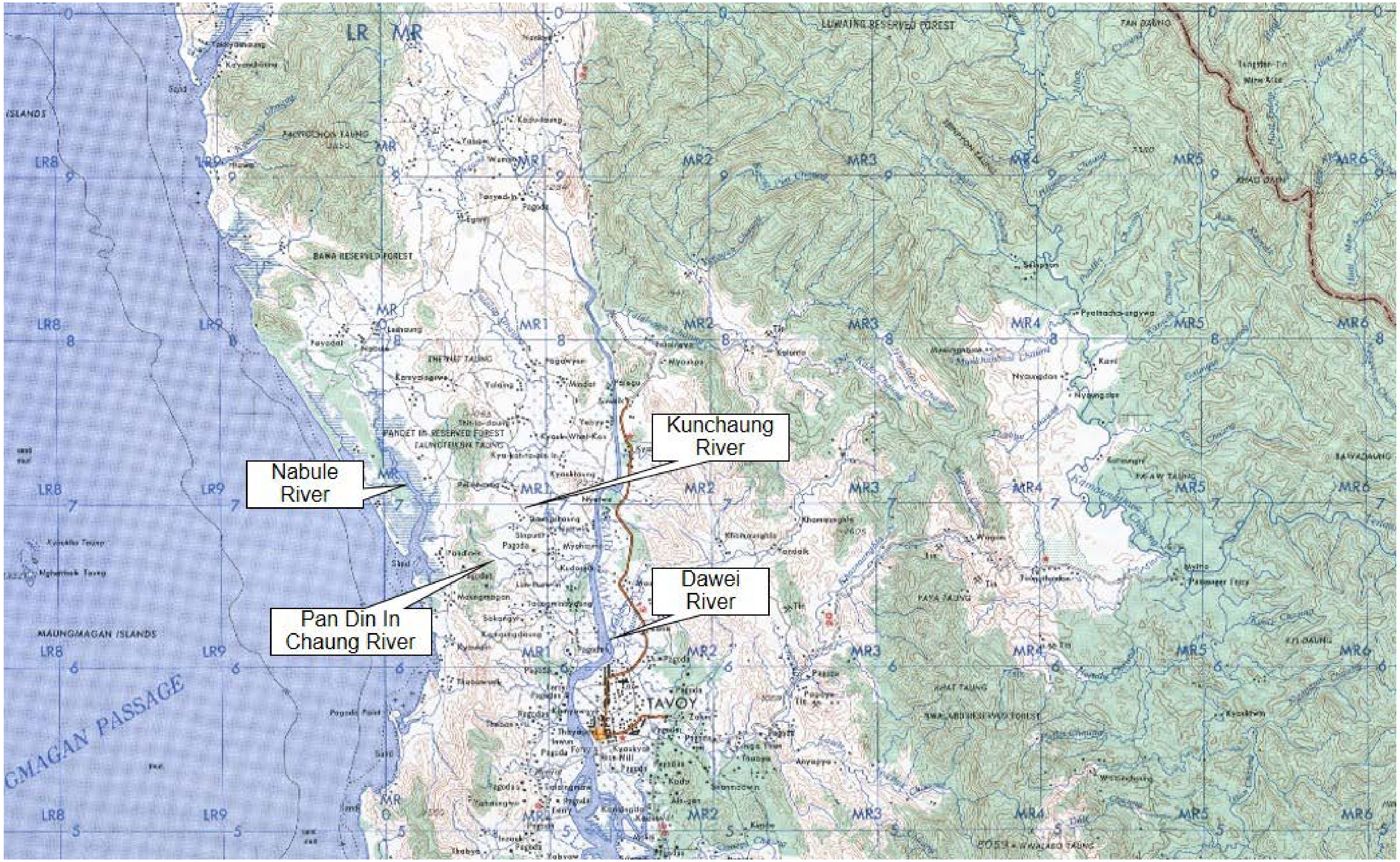
Source: http://www.tec.army.mil/Burma/maps/TerrainRegions1968.jpg accessed on 15 Nov 12

Figure 5.2-1 Myanmar Terrain Regions



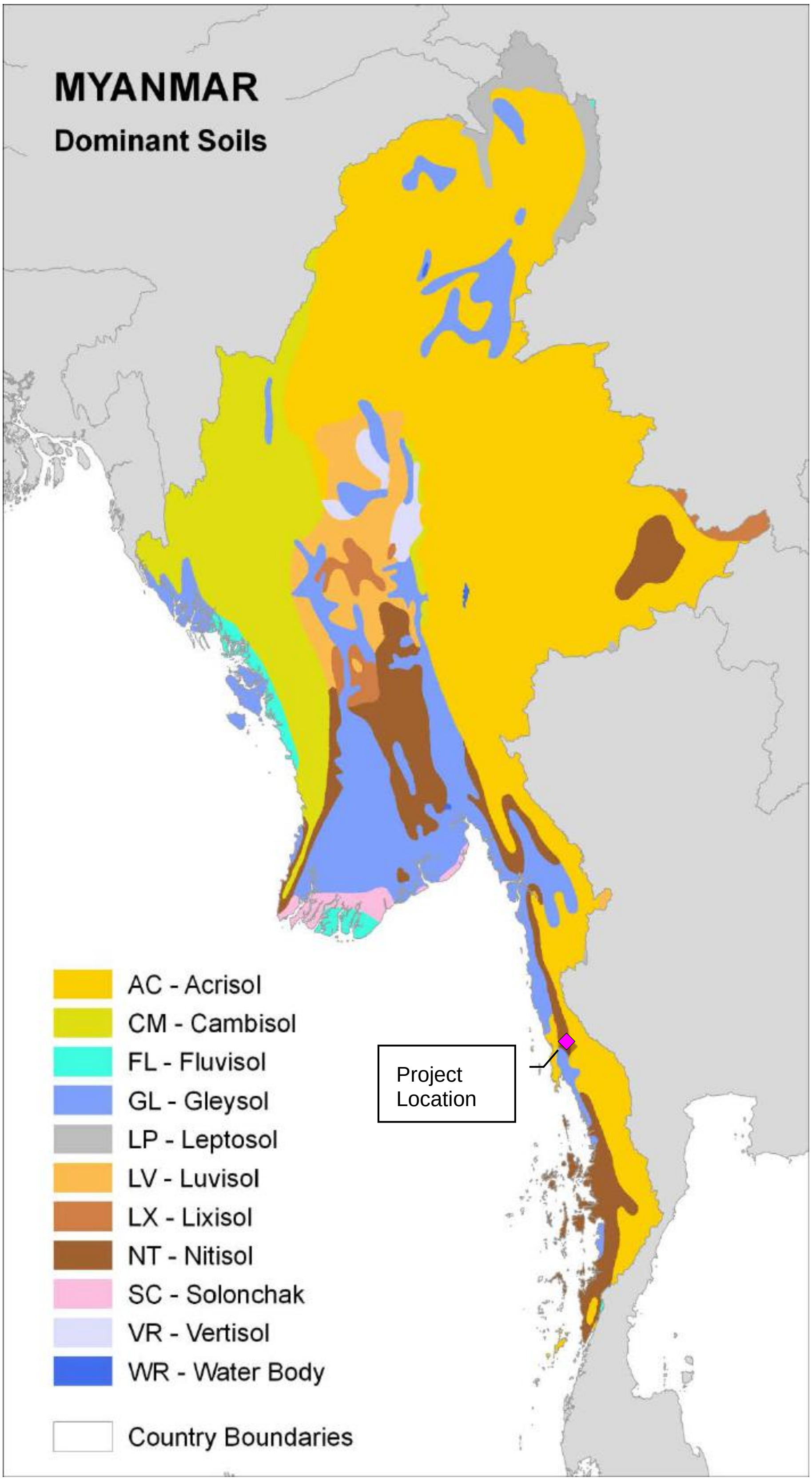
Source: SEATEC, 2012b

Figure 5.2-2 Topography and Important Basins



Source: SEATEC, 2012b

Figure 5.2-3 Location of River in the Project Area



Source: http://www.tec.army.mil/Burma/maps/SoilMap_Myanmar_300dpi.jpg accessed on 15 Nov 12

Figure 5.2-4 Myanmar Soil Types

Results of the Studies

The Western part of Myanmar, called "Western Fold Belt", mostly consists of very thick sequences of flysch type sedimentary rocks and tectonic mélange of basic and ultrabasic rocks and exotic limestone in the form of ophiolite. This is a result of the subduction of the Indian Tectonic Plate underneath the Burmese Tectonic Plate along the Bengal tectonic boundary. Continued collision between these two plates leads to a high mountain arc in the West and Northwestern parts of Myanmar (Pramumijoyo et al., 2010)

The project area is located in Q2-alluvial (Holocene), with reference to the Geological map of the Socialist Republic of the Union of Burma (USACE, 1977) (Figure 5.2-5). There is fine to coarse gravel and sand, silt, and light-to medium-gray and yellowish-gray clay.

The predominant rock types of the project area are hard and soft rocks which are mainly Basalt, rhyolite, tuff and volcanic ash. (see in Figure 5.2-6) Central Myanmar Basin and Central Andaman Basin records an active extensional process that varies laterally from continental rifting in the North and sea-floor spreading in the South. The majority of these volcanic rocks are volcanic ash, volcanic tuff, lava flow, different types of basalt, andesite, dolerite, and rhyolite. Bimodal basalt-rhyolite with the presence of intermediate composition and compositional variations of volcanic rocks indicate that the volcanic rocks were formed by assimilation and the fractional crystallization of the crustal components and magma mixing. Associated host rocks of the volcanic material are sedimentary rocks of the Peguan (Miocene) and Irrawaddian (Pliocene-Pleistocene). Volcanic occurrences are mostly in the Central Myanmar Basin and in the Andaman Sea.

5.2.2.2 Baseline Seismological Conditions

The key information referred to in this study related to seismological conditions include:

- The Volcanic Occurrences in relation to Tectonics in Central Myanmar Basin (Unknown Author, 2010)
- Seismic and Tsunami Activities in Myanmar (Lin, n.d.),

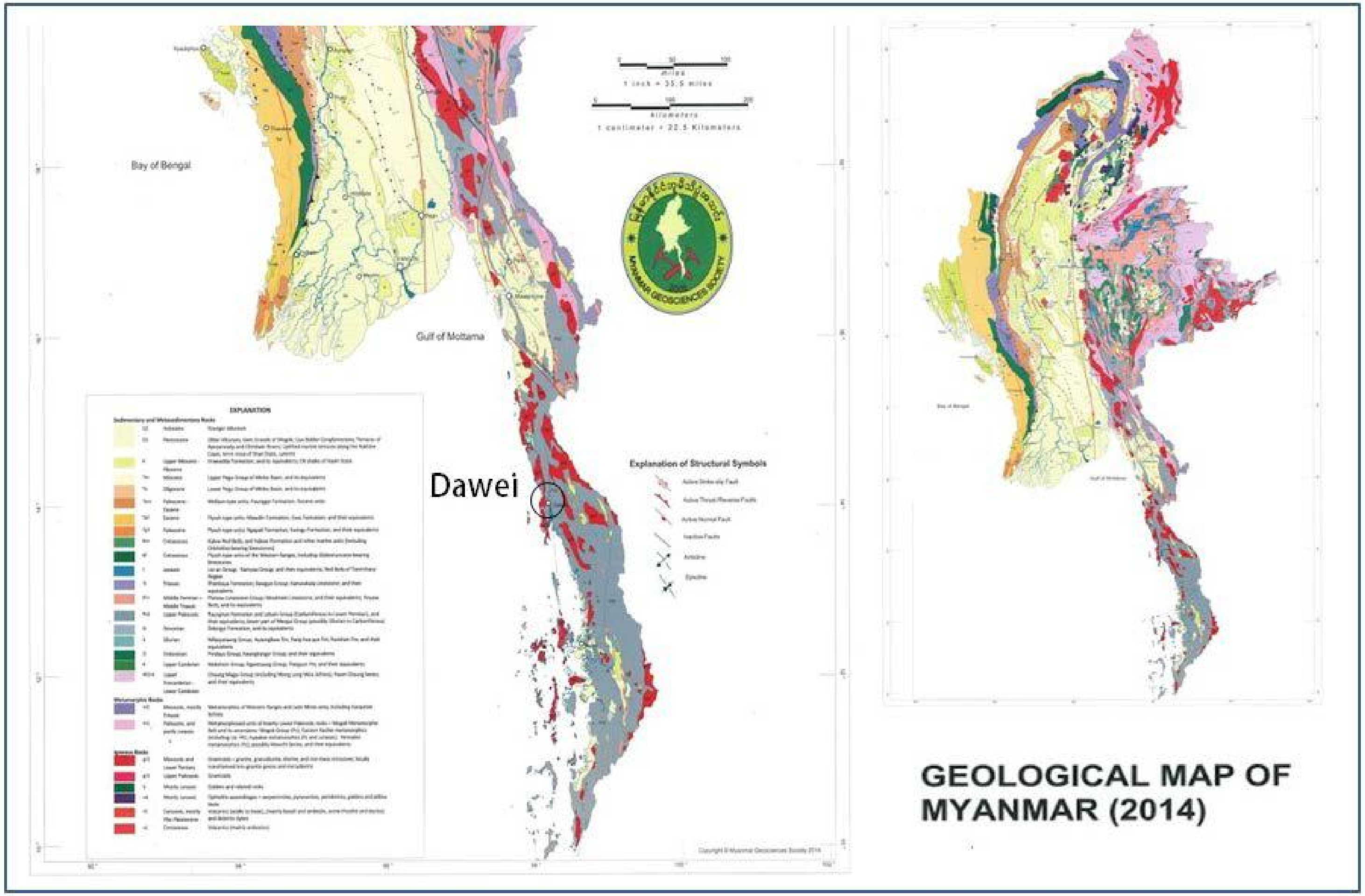


Figure 5.2-5 Geological Map of the Project Area

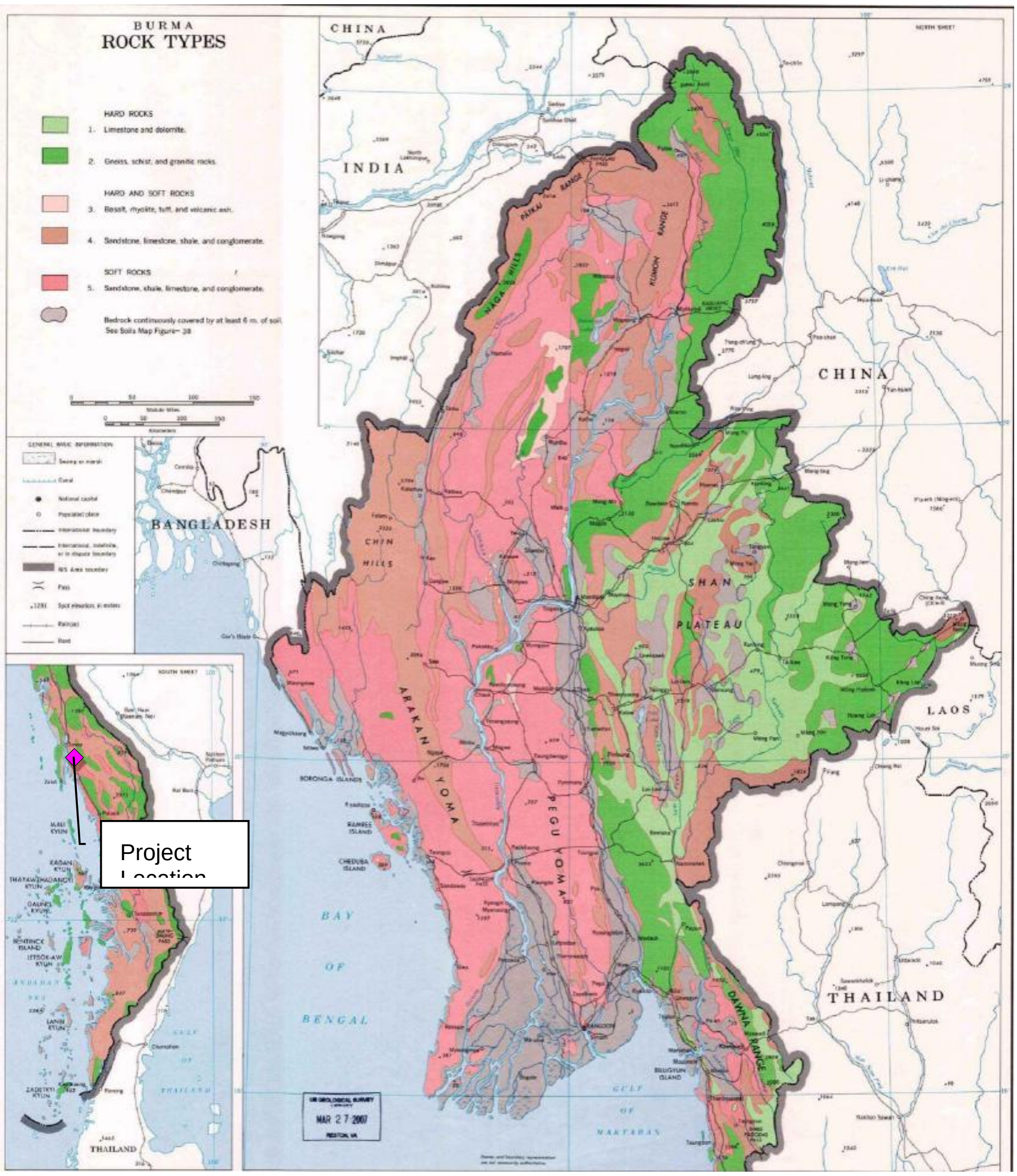


Figure 5.2-6 Rock types in project Area

<u>Results of the Studies</u>

Seismic Zone Map

The seismic zone map of Myanmar is shown in Figure 5.2-7 (The In and Swe, 2006). Five seismic zones are leveled from low to high risk zone, a probable maximum range of ground acceleration in (g) values and equivalent Modified Mercalli Scale classes are given for each zone. The descriptions of each zone are described:

- Zone V (Zone of very severe damage) - A range of ground acceleration more than 0.3 g, which is equivalent to Modified Mercalli Intensity (MMI) class IX.
- Zone IV (Zone of severe damage) – A range of ground acceleration 0.2-0.3 g, which is equivalent to MMI class VIII.

- Zone III (Zone of highly damage) – A range of ground acceleration 0.1-0.2 g, which is equivalent to MMI class VII
- Zone II (Zone of moderate damage) – A range of ground acceleration 0.075-0.1 g, which is equivalent to MMI class V/VI
- Zone I (Zone of minor damage) - A range of ground acceleration less than 0.075 g, which is equivalent to MMI class V and less.

The project area located in Zone I, which is of minor damage, can be seen in Figure 5.2-7.

Seismic History

Myanmar lies on the earthquake belt of the Himalayan range. The Northeastern part of the Indian plate subcontinent is seismically active. It comprises of East-West extending the Eastern Himalayan belt, which marks the collision boundary between the under thrusting Indian plate and the Eurasia plate; approximately N-S extending Indo-Burmese Arc (IBA), which extends further Southward to join the Andaman Arc and Eastern Himalayan Syntaxes (EHS). Subduction occurs along the Andaman arc. The Indian (IN) plate moves with respect to the Eurasian plate (EU), and is highly oblique to the margin on the subduction zone. The right-lateral Sagaing shear fault, shown in Figure 5.2-8, is delineated in the West by the Andaman-Nicobar Trench.

The Department of Meteorology and Hydrology (DMH) started to observe the sea level after the Great Sumatra Earthquake of 2004. The seismic record shows that there have been at least 15 major earthquakes bearing magnitude M ≥7.0 within the territory of Myanmar for the past 100 years. The seismicity in Myanmar is attributable to the following two reasons:

- The continued subduction (with collision only in the North) of the Northward-moving Indian Plate underneath the Burmese Platelet (which is a part of the Eurasian Plate) at an average rate of 5.5 cm/yr.
- The Northward movement of the Burmese Platelet from a spreading centre in the Andaman Sea at an average rate of 2.5-3.0 cm/yr. Very large over thrusts along the Western Fold Belt resulted from the former movement, and the Sagaing and related faults from the latter movement. Intermittent jerks along these major active faults resulted in the majority of earthquakes in Myanmar.

According to the information from Myanmar Earthquake Committee (MEC), the seismic records indicated that during 1912-2011 there were at least 14 major earthquakes (Richter Scale ≥7.0) in Myanmar and nearby regions, however, no earthquakes occurred in Dawei and the project area. The frequency with respect to time is summarized in Table 5.2-1.and Table 5.2-2.

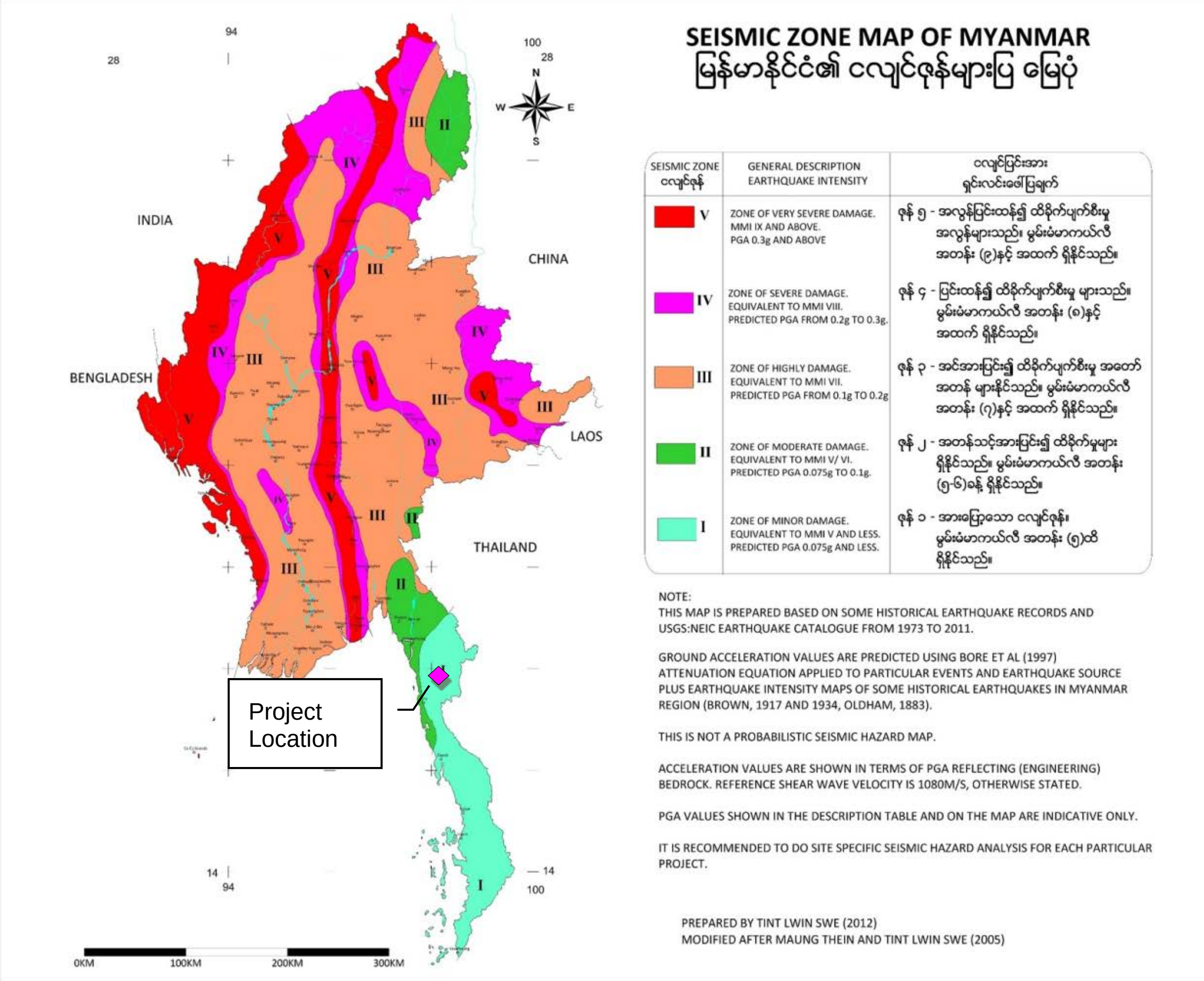
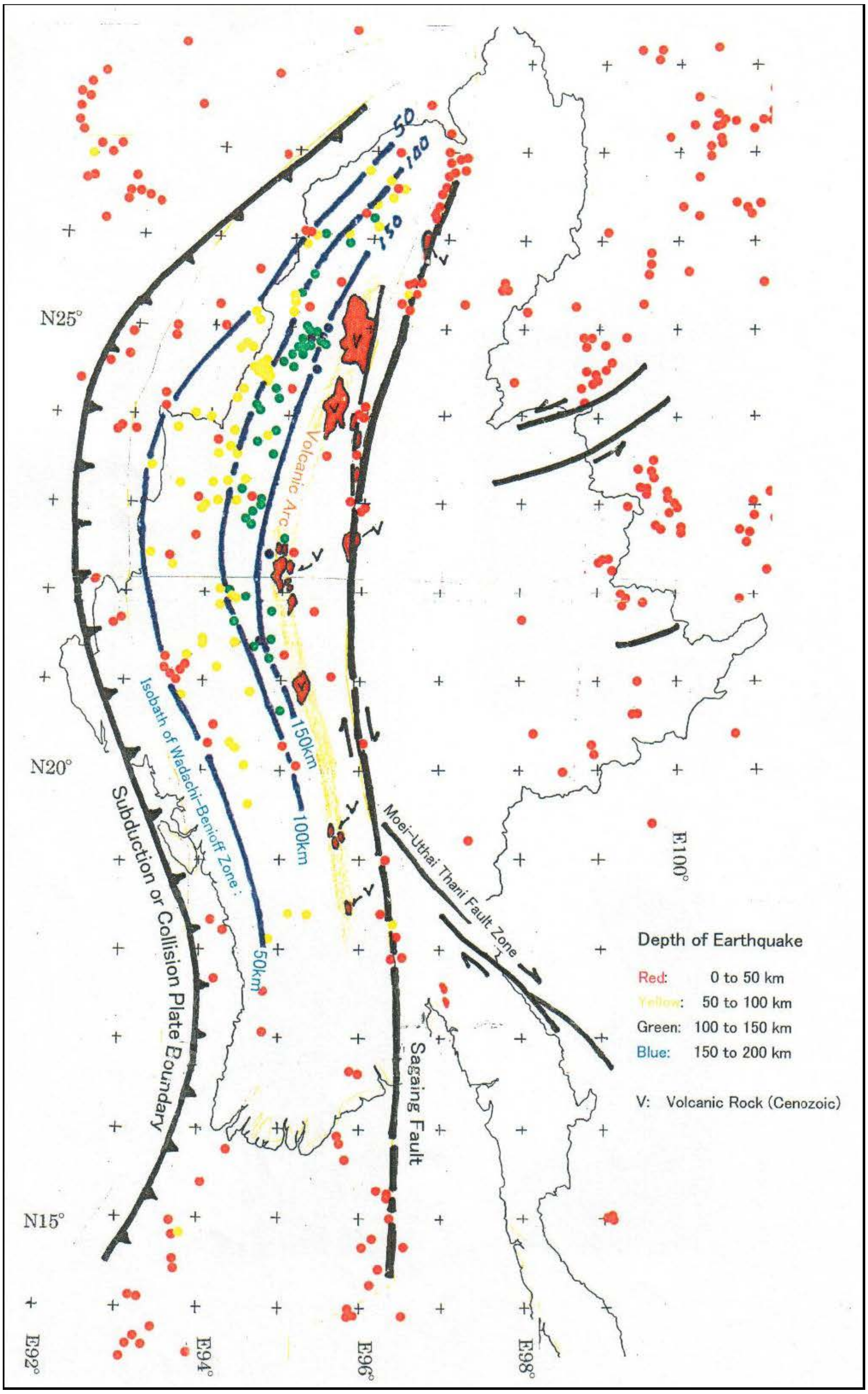


Figure 5.2-7 Seismic Zone of Myanmar



Source: http://www.seis.nagoya-u.ac.jp/kimata/jica/kyawkyaw.pdf

Figure 5.2-8 Tectonics and Depths of Earthquakes in Myanmar

Table 5.2-1 List of Some Major Earthquakes in Myanmar within the Myanmar and Nearby Regions during the period 1839-2014

Date	Epicenter		Magnitude (Richter Scale)	Remarks
	Latitude	Longitude		
1) 23 May 1912	21.00	97.00	8.0	North of Taunggyi serious landslides
2) 6 March 1913	17.00	96.50	7.0	“Golden umbrella at the peak” of shwe-maw-daw Pagoda grounded
3) 5 July 1917	17.00	98.50	7.0	“Golden umbrella at the peak” of Shwe-maw-daw Pagoda grounded
4) 19 January 1929	25.90	96.25	7.0	Brick building destroyed at Htaw-Gaw
5) 8 August 1929	19.25	98.50	7.0	Brick building destroyed at Swa
6) 16 December 1929	25.90	96.25	7.0	Landslide
7) 5 May 1930	17.00	95.50	7.3	Many houses destroyed, 500 killed in Bago. Some houses destroyed, 50 killed in Yangon.
8) 3 December 1930	18.00	96.50	7.3	Some houses destroyed, about 30 killed
9) 27 January 1930	25.60	96.80	7.3	Brick building collapse, Landslide
10) 12 September 1946	23.50	96.00	7.5	Pagodas collapse
11) 15 August 1950	28.50	96.50	8.6	Under the influence of Assam earthquake, Chindwin river at Mawlaik and Kalewa, Ayeyarwady river at Aunglan flow upstream
12) 16 July 1956	22.00	96.00	7.0	Pagoda&building at Sagaing destroyed, about 40 killed Sagaing bridge, moved slightly
13) 8 July 1975	21.50	94.70	6.8	Many historical pagodas at Bagan destroyed, 2 killed
14) 5 January 1991	23.48	95.98	7.1	Landslide & some buildings destroyed at Tagaung and surrounding area, 2 killed
15) 6 August 1988	24.15	95.13	7.3	Myanmar-India border, no casualty reported
16) 22 September 2003	19.94	95.72	6.7	Landslide, liquefaction and sand Eruption. Pagodas, some bridges, houses and schools destroyed at Taungdwingyi and surrounding areas, 7 killed.
17) 24 March 2011	20.71	99.95	6.8	East of Shan State (Tachileik town), Serious land slide and two after shock, 74 killed and 111 injured.
18) 11 November 2012	22.93	95.99	6.6	Myanmar (445 km at Northwest from Pang Mapa district, Mae Hong Son province, Thailand)
19) 17 November 2014	21.30	92.82	6.2	Myanmar (581 km at Northwest from Muang Mae Hong Son district, Mae Hong Son province, Thailand)

Source: Referred to Environmental and Health Impact Assessment (EHIA) for Dawei Sea Port Project, August 2012 and http://www.seismology.tmd.go.th accessed on 4 June 2015

Table 5.2-2 Summary of Earthquake Frequency in Myanmar (1839-2008)

Type of Earthquake	Richter Scale	Frequency	Time Range	Data Source
Great	> 8	1	1839-2008	Historical record and NEIC
Major	7-7.39	15	1839-2008	Historical record and NEIC
Strong	6.6.9	25	1950-2008	ANSS Catalogue
Moderate	5-5.9	549	1950-2008	ANSS Catalogue

Source: Referred to Environmental and Health Impact Assessment (EHIA) for Dawei Sea Port Project, August 2012

Tsunami

Tsunamis were caused by earthquakes at sea. A notable incident occurred due to an earthquake west of North Sumatra, on 26 December, 2004. An earthquake, with a magnitude of 9.0 on the Richter scale, jolted at the bottom of the sea about 155 miles Southeast of Banda Ache in North Sumatra. The epicenter of the earthquake was between 3°31' North and 95°97' East, off the West coast of North Sumatra. This Tsunami arrived in Myanmar only with a height of three to seven feet. The Tsunami disaster left 31 people dead, 41 injured, 517 homes destroyed, and 2,145 persons homeless in Ayeyawady Division; 8 dead, 1 injured, 83 homes destroyed, and 447 persons homeless in Taninthayi Division; 22 dead but without damages to homes in Rakhin State; and 1 home damaged in Yangon Division. Historically, a tsunami recorded at the Myanmar coast showed that a strong earthquake, with associated ground movements, along the Arakan coast were recorded during a survey in 1841 by the British ship Childers18, commanded by Captain E. Halsted. Halsted recorded evidence of 3-7 m. of uplift along the coasts of Ramree, Cheduba, and Foul islands, which lie offshore of and parallel to the Arakan coast of Myanmar. Another earthquake, with a magnitude of 7.9 on the Richter scale, took place at Nicobar Islands on 31 December 1881 and another earthquake with magnitude of 8.7 Richter scale occurred at Andaman Islands on 26 June 1941 (Lin, n.d.).

The recent recorded effect of the tsunami to the Myanmar coast was relatively small. Based on post-tsunami site reconnaissance surveys after the earthquake on 26 December 2004 (Satake et al., 2005), the wave height along the Myanmar coast was generally in the range of 1 to 3 m., and are estimated to be in the range of 2 m. at the project site. The maximum water level recorded (based on observations) was 0.5 m. lower than the highest tide during that particular rainy season (Satake et al., 2005). There was no observed major shoreline damage along the Dawei coast in terms of large areas of sediment loss or accretion.

5.2.3 Hydrology

5.2.3.1 Study Area

There are four rivers within the project site: Nabule River; Dawei River; Kunchaung River; and Pan Din In Chaung River. In the case of project development, all fours rivers and their tributaries may be adversely affected by project construction activities. The effects might include an increase of sediments, or a change in river velocity or direction.

5.2.3.2 Baseline Hydrological Conditions

Hydrological conditions of the project areas in the previous studies can be found in the following documents.

- Final Report: Task 2: Industrial Estate Flood Control & Drainage Study and Conceptual Design (SEATEC, 2012b)
- Final Report of Environmental Impact Assessment (EIA) for the Dawei Deep Sea Port (TEAM, 2013)
- Draft Environmental Impact Assessment for Dawei Industrial Estate Project (SEATEC in association with UAE, 2012)

Summary of the key hydrological conditions of the project area is as follow.

<u>Results of the Studies</u>

Referring to flood study in the project area, there are four main rivers near and within the project area including:

- Dawei River – Dawei River or Tavoy River is a river of Myanmar and is the primary river in this area, flowing from North to South at the foothills of the Taninthayi mountain range and enters into the Andaman Sea at the Taninthayi Coast Region. The river is located at the project boundary in the East. There are many tributaries flowing into Dawei River from East and West. The river delta is brackish.
- Nabule River – this river originates from Hincha Chang and Madu Chang at the Northeastern part of the project area near the Htein gyi village. It flows from North to South, parallel with the coast, and ends in the Andaman Sea, around 1.5 kilometers outside the project area. The river delta is brackish.
- Kunchaung River (Kyaing Chaung) – this river is a combination of many canals in the North: Sin Pu Nit Chaung; Pein Shaung Chaung and Ya Laing Chaung. It flows from North to Northeast and empties into the Dawei River.
- Pan Din In Chaung River – this river flows from East to West and ends in the Andaman Sea. The river originates from the hills to the South of the project area. This river delta is brackish.

The natural drainage system of the project area is composed of two sub basins. On the Eastern sub basin, water is flowing to the Dawei River through a natural stream which carries the water along the main slope of the terrain in a North- South direction, and the accumulated water from the hills along the left side and the right side of the bank. The hillside water flows along the minor slope in the direction perpendicular to the main slope from East to West and West to East. These two sources of water are then drained to the Dawei River at the Yebyu community (Figure 5.2-9). The sub basin in the Western is similar to the Dawei river sub basin; i.e., the water flow from upstream along the main slope in North-South direction combines with the accumulated flow from the hills along the left side and right side of the bank. The hillside water flows along the minor slope in the direction perpendicular to the main slope from East to West and West to East. These will be drained to the Andaman Sea around the Pan Din-in community.

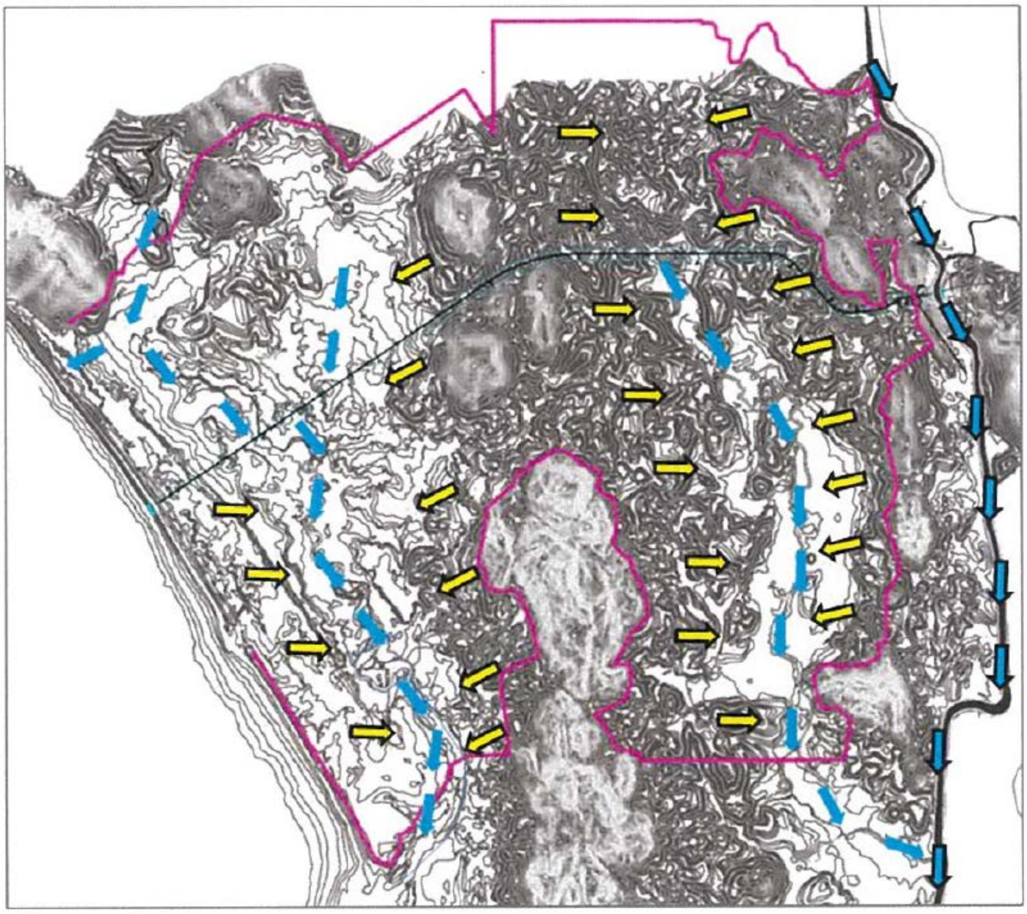


Figure 5.2-9 Topographic Condition and the Main Slope of the Project Area

The watershed in the project area is in Dawei basin. Natural water course flows from North to South and joins the Dawei River (Figure 5.2-10).

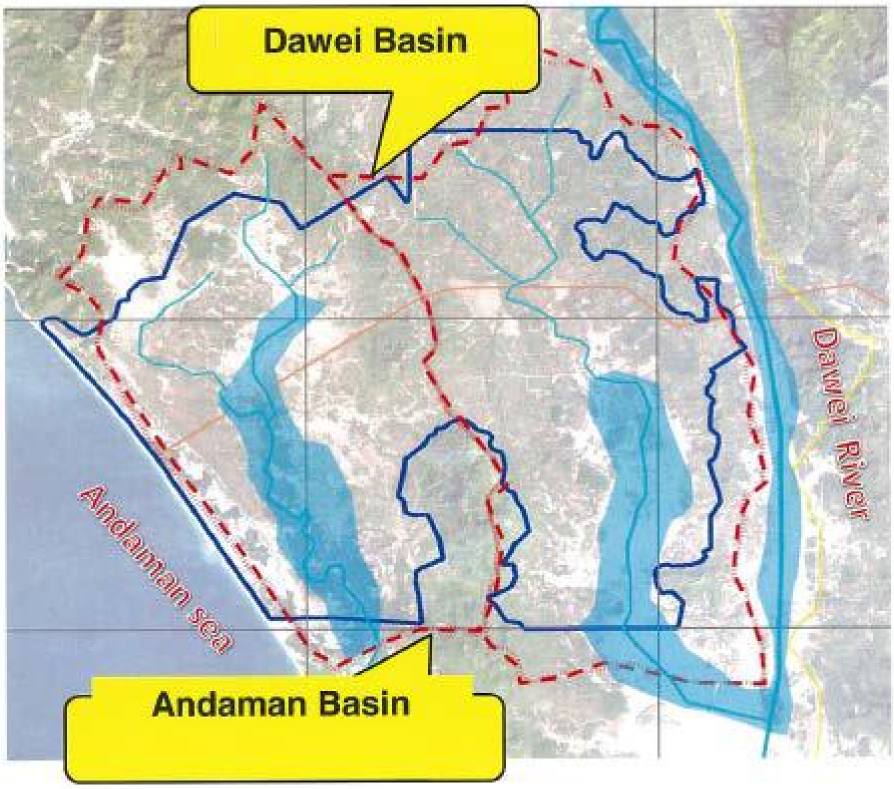


Figure 5.2-10 Basins in Dawei Project Area

Referring to the information from site reconnaissance by SEATEC (2012b), the maximum flood occurred on 10 August 2006 with the highest water level at +13.0 m. due to the overflow of Dawei River into the Dawei basin of the project. The Andaman basin inundates throughout the year, especially downstream of the basin, because the lowland nature of the area. The flood map of the historical events is depicted in Figure 5.2-11.

5.2.4 Climate and Air Quality

5.2.4.1 Study Area

The study area will cover the project boundary and the area potentially impacted by the project activities. For the study of climate, the secondary data from the local government in the adjacent area will be considered. For the study of air quality, the area both up and downwind of the study area will be covered. Also, the nearest sensitive area and permanent area of impact will be considered for ambient air quality.

Figure 5.2-11 Historical Flood Map of Dawei Basin in August 2006

5.2.4.2 Baseline Climate Conditions

The following previous studies in the area of Initial Township project are reviewed:

- The Geology of Myanmar: An Annotated Bibliography of Vurma's Geology, Geograhpy and Earth Science (USACE, 2008).
- Initial Environmental Examination (IEE) for Dawei Sea Port & Industrial Estate Development (TEAM, 2012a).
- Draft Environmental Impact Assessment for Dawei Industrial Estate Project (SEATEC in association with UAE, 2012)

Details of the methodology and results of the previous surveys and studies are summarized below.

<u>Precipitation</u>

The coastal region of Myanmar normally receives more than 200 inches (5,000 mm) of precipitation, annually (USACE, 2008). The average annual rainfall from 1961-1990 in Dawei was in the range of 5,500-6,000 mm/year which was the zone with the highest rainfall in Myanmar. The highest rainfall recorded was 1,342 mm, occurring in August while the lowest rainfall recorded was 5 mm. occurring in December (Figure 5.2-12).

Considering the thirty year record from the Meteorological and Hydrological Department of Myanmar (TEAM, 2012a), the highest rainfall recorded from 1979-2008 was 7,208.27 mm. in 1999, and the lowest was 4,027.17 mm. in 1988 (Table 5.2-3). From 1999-2010, the highest amount of rainfall was 6,818 mm. in 2006 and lowest was 3,068 mm. in 2010. The maximum average monthly rainfall generally occurred in August/July and the minimum average monthly rainfall generally occurred in December/January (Table 5.2-4).

Monsoons

The monsoonal climate of the area along the coast of Andaman Sea is generally hot and humid. From December to March, the temperature, humidity, and rainfall tend to be lower; therefore, it is known as the dry season. Violent thunderstorms occur during the wet season, mid-May to the end of September, forming from the South-West; while typhoons or hurricanes usually form to the South, West, and North of the Andaman Sea (Figure 5.2-13). The frequency of tropical cyclonic storms in the Bay of Bengal during 1891-1960 is shown in Figure 5.2-14.

Myanmar has a monsoon climate with three main seasons: the hot season; the rainy season and the cool season. The hottest season is between February and May, with little or no rain. At the end of this season, generally from March to April, the average monthly temperature reaches the upper 30'soC in many parts of Myanmar. The monsoon, or rainy, season occurs from May to October. During this rainy season, rain falls nearly every day, and sometimes all day long. Almost all of Burma's annual rainfall occurs during rainy season. Rainfall during the monsoon season totals more than 250 cm. (100 in.) in lower Myanmar. The annual precipitation in most of lower Myanmar averages about 5,080 mm. (about 200 inch.). The climate is tropical; with wet, hot, and humid summers during the height of the monsoon season, from June to September. The cool season runs from late October to mid-February. The temperature for January averages 25°C in Lower Myanmar. The average daily temperatures in Yangon range from 18°C to 32°C in January (USACE, 2008).

Temperature

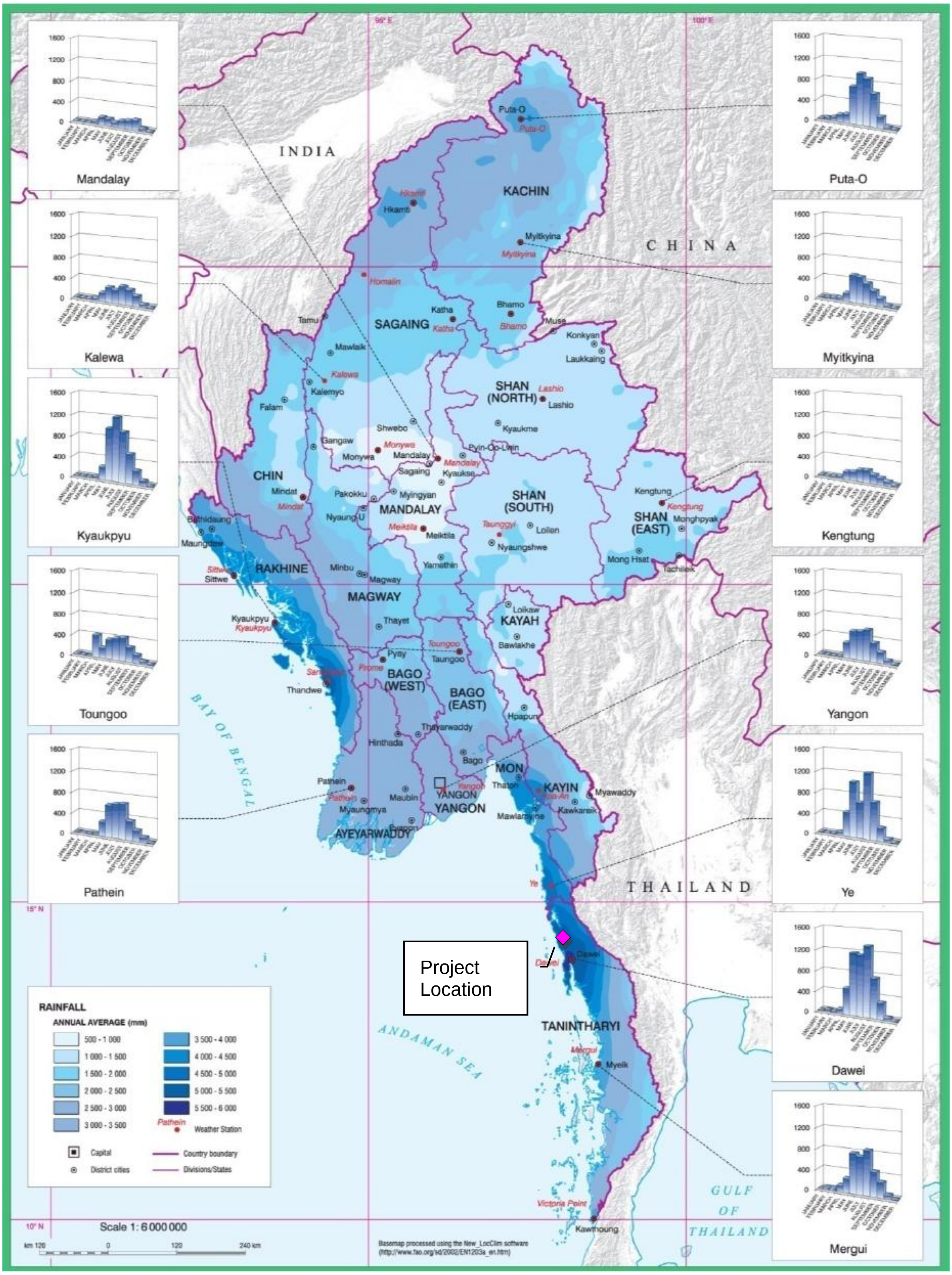
The mean annual temperature is 27°C. Although Myanmar is a tropical country, temperatures are not uniformly high throughout the year. The average daily temperatures in lower Myanmar, especially in the river delta and along the coastal regions, are the most humid. The coastal and delta regions have a mean annual temperature of 32°C (USACE, 2008).

According to the TEAM (2012a), the recorded average temperature of Dawei Meteorological Station from 1991-2005 is ranged from 32°C in December to 34°C in April. Annual Average temperature in the Yebyu Township, Dawei area, from 1991 to 2005, is presented in Table 5.2-5.

Table 5.2-3 Annual Rainfall of Dawei Area (1979-2008)

Year	Annual Rainfall (mm)	Year	Annual Rainfall (mm)	Year	Annual Rainfall (mm)
1979	5017.22	1989	4536.95	1999	7208.27
1980	6443.47	1990	5570.22	2000	5867.15
1981	5433.31	1991	5487.42	2001	5922.01
1982	2711.45	1992	4588.51	2002	5849.62
1983	4842.76	1993	4794.00	2003	5377.18
1984	6500.37	1994	6017.51	2004	5487.92
1985	5373.88	1995	5486.15	2005	5857.24
1986	4381.50	1996	5227.32	2006	6831.84
1987	5161.03	1997	6732.27	2007	5385.31
1988	4027.17	1998	4035.55	2008	5507.74

Source: Department of Geography, University of Yangon, Myanmar referred to in the IEE for Dawai Sea Port & Industrial Estate Development Project, February 2012 (TEAM, 2012a)



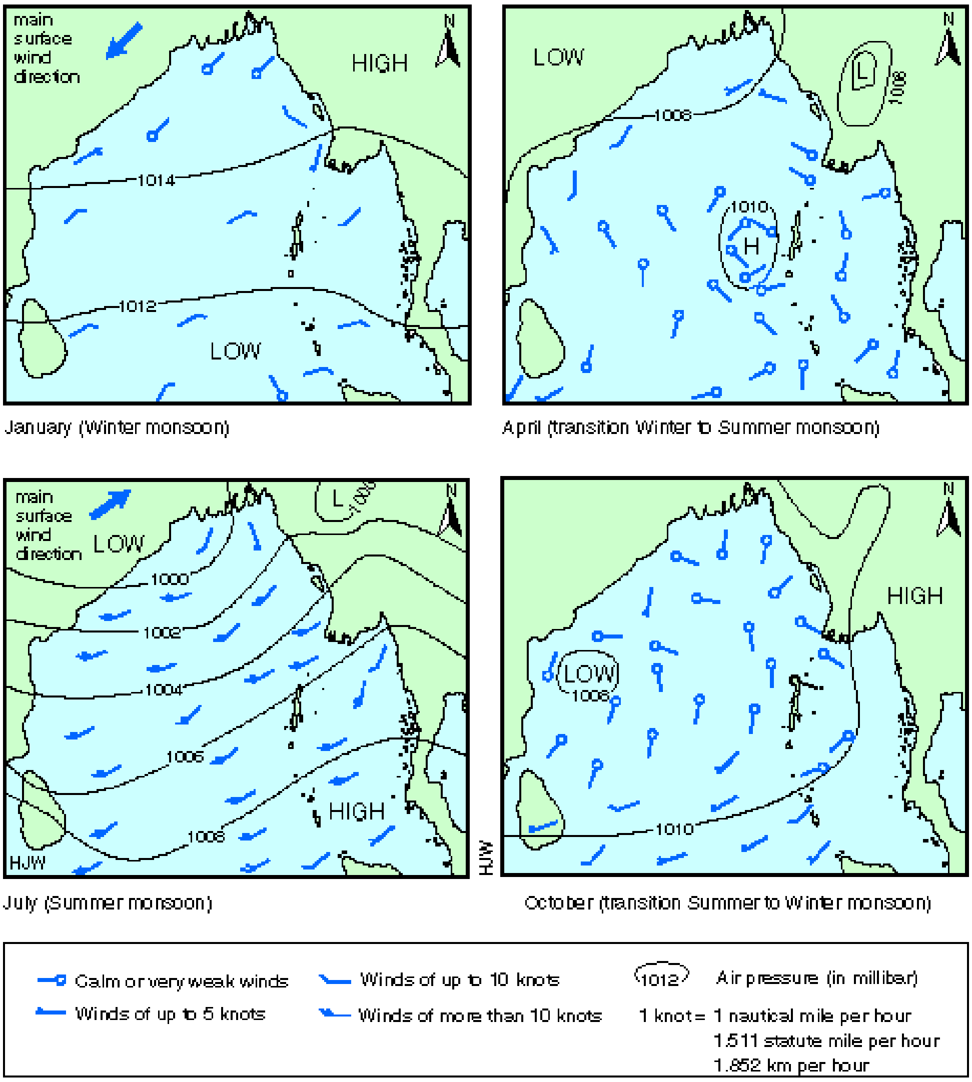
Source: http://dwms.fao.org/atlases/myanmar/downs/atlas/p031_rainfall_map.pdf accessed on 3 June 2015

Figure 5.2-12 Average Rainfall in Myanmar

Table 5.2-4 Average Rainfall at Dawei Station (LAT:14o 16'N LONG: 98o 13'E) between 1999 - 2010

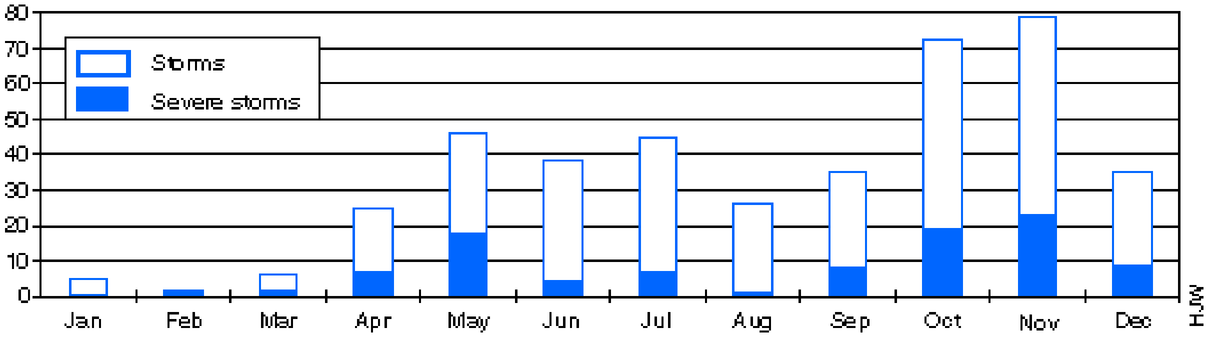
Year	Average Rainfall (mm.)												Annual
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	
1999	52	7	120	916	747	1145	525	1341	755	410	176	1	6195
2000	12	25	49	267	815	1131	1377	1247	927	285	6	0	6141
2001	7	6	113	6	980	1311	986	1974	323	184	21	9	5920
2002	0	0	13	47	972	959	1278	1471	1346	116	114	15	6331
2003	1	1	189	68	566	904	1431	1205	706	256	0	0	5327
2004	3	11	57	8	931	1030	665	1370	268	109	0	0	4452
2005	0	8	8	20	419	1234	1664	1011	857	186	120	6	5533
2006	0	24	67	215	759	738	2081	1880	604	448	0	0	6816
2007	1	0	0	117	610	620	1460	1228	815	454	7	0	5312
2008	0	52	47	188	975	1026	1038	766	1149	259	51	0	551
2009	0	0	47	283	416	1223	1825	903	1107	440	6	0	6250
2010	31	0	0	0	411	478	478	832	417	381	0	40	3068
SUM	107	134	710	2135	8601	11799	14808	15228	9274	3528	501	71	66896
Average	9	11	59	178	717	983	1234	1269	773	294	42	6	5575
Distribution Ratio %	0.16	0.20	1.06	3.19	12.86	17.64	22.14	22.76	13.86	5.27	0.75	0.11	100

Source: Meteorological and Hydrological Department, Yangon, Myanmar, 2010 referred to in IEE for Dawai Sea Port & Industrial Estate Development Project, February 2012 (TEAM, 2012a)



Source: http://www.andaman.org/maps/textmaps.htm accessed on 19 November 2012

Figure 5.2-13 Seasonal Winds and the Monsoon in the Bay of Bengal



Source: http://www.andaman.org/maps/textmaps.htm accessed on 19 November 2012

Figure 5.2-14 Frequency of Tropical Cyclonic Storms in the Bay of Bengal during 1891-1960

Table 5.2-5 Temperature Condition of Dawei Meteorological Station between 1991 - 2005

Year	Temperature (degree Celsius)												Average
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	
1991	24	26.11	27.78	29.72	29.72	28.1	26.38	25.55	27.2	25.83	24	25	26.68
1992	23	23	25.55	27.2	29.72	27.5	26.11	26.67	27.5	26.94	25	22.78	25.93
1993	23	26.67	27.78	28.61	30	27.5	26.11	26.11	26.94	26.94	26.3	24	27.3
1994	25.27	26.38	26.67	29.16	28.33	27.5	27.2	26.67	28.61	27.2	26.38	27.5	27.3
1995	23.33	25.83	27.78	29.16	29.16	28	27.2	26.94	27.5	27.78	26.11	22.5	26.78
1996	22.5	25	28.61	29.16	27.2	28.3	26.94	26.94	26.11	27.2	26.67	22.78	26.46
1997	22.78	23.61	28.33	28.88	29.16	28	27.27	26.38	26.38	28.3	28.61	26.67	26.87
1998	27.5	27.27	27.5	28.83	19.72	26.38	26.38	25.55	27.5	26.11	25.83	25.56	26.62
1999	23.61	26.11	24	29.16	26.94	27.2	27.2	25	28	27.2	25.83	20.83	25.83
2000	24.16	25	26.94	27.78	28.88	28	27.5	29.16	27.78	29.44	27.2	25	27.24
2001	26.94	25.78	28.78	29.5	27	27.78	26.3	24.6	27.27	28.1	24.22	26.61	26.56
2002	24.78	24.78	29.44	28.78	30	27.1	32	26.33	26.78	26.38	27	26.2	27.95
2003	24.16	26.38	27.61	27.72	29	25.83	26.11	26.5	26.16	27.38	26	24.3	26.35
2004	25.5	25	26.62	30.67	31	27.38	26.88	26.3	27.89	26.5	29.5	32.22	29.95
2005	25	26.22	27.8	28.4	27.88	26.38	26	25.9	32.1	27	26.61	25.2	26.88
Average	24.26	25.41	27.44	28.82	28.91	26.92	26.8	26.25	27.08	27.16	26.5	25.1	-

Source: Meteorological and Hydrological Department, Yangon, Myanmar, 2010 referred to in IEE for Dawai Sea Port & Industrial Estate Development Project, February 2012 (TEAM, 2012a)

5.2.4.3 Baseline Air Quality Conditions

(a) Results from Previous Surveys and Studies

The following previous studies in the area of Initial Township Project are reviewed:

- Initial Environmental Examination (IEE) for Dawei Sea Port & Industrial Estate Development (TEAM, 2012a).
- Final Report of Environmental Impact Assessment (EIA) for the Dawei Deep Sea Port (TEAM, 2013).
- Environmental Impact Assessment (EIA) for Main Road (SEATEC, 2012a)
- Draft Environmental Impact Assessment for Dawei Industrial Estate Project (SEATEC in association with UAE, 2012)

Details of the methodology and results of the previous surveys and studies are summarized below.

<u>Methodology</u>

- There are 4 stations for air quality measurement from the previous studies:
  - Station A3: The Construction Area (396,389 E, 1,577,260 N)
  - Station A4: The Guard House (399,444 E, 1,578,143 N)
  - Station A5: Km. 4+500 of Main Road (399,211 E, 1,578,342 N)
  - Station A6: Km. 18+900 of Main Road (412,483 E, 1,580,131 N)
- The sampling stations are shown in Figure 5.2-15.
- The analysis methods and sampling period of each parameter are concluded in Table 5.2-6.

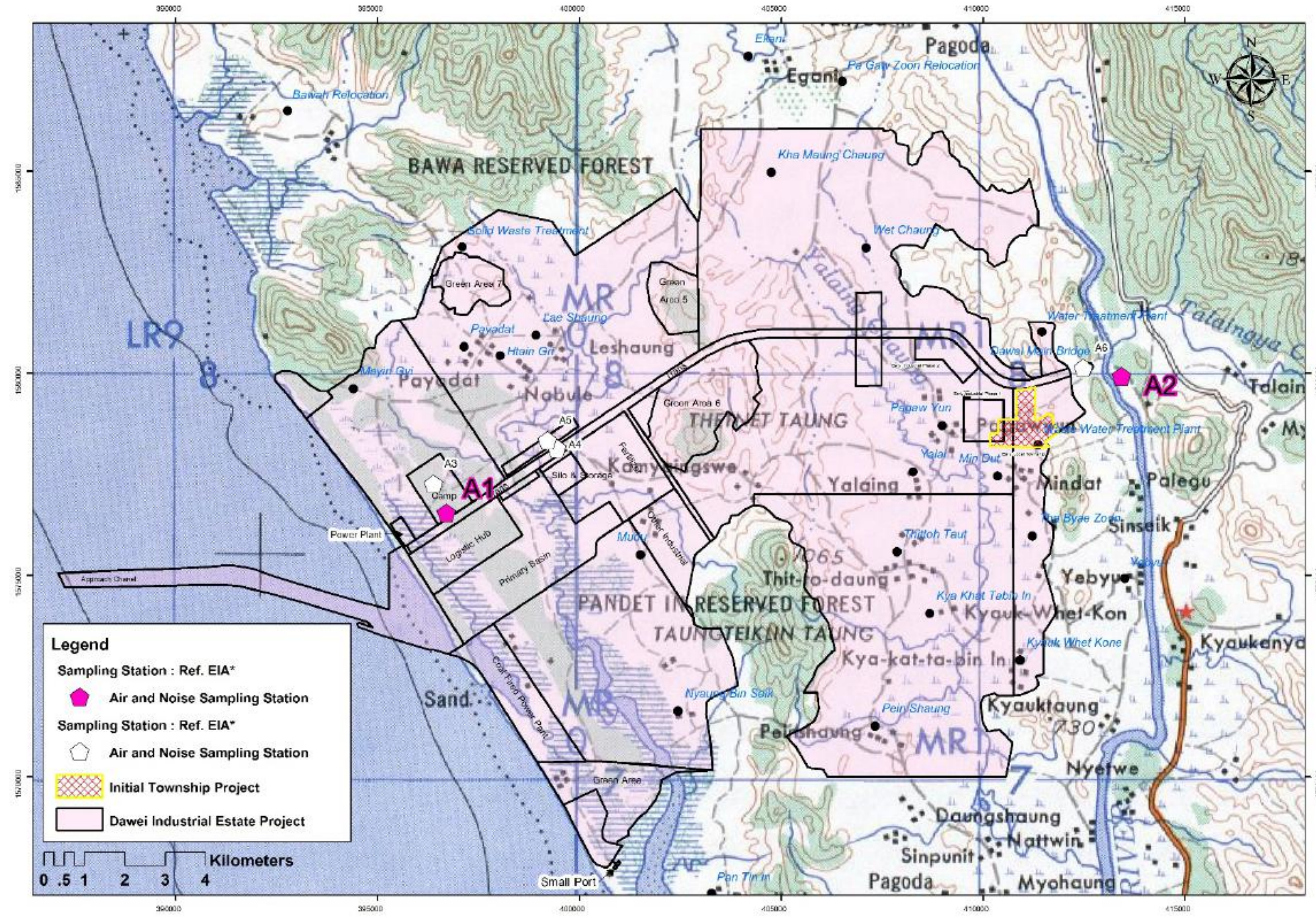


Figure 5.2-15 Air Quality and Noise Measurement Stations Compared with Stations of This EIA Study

Table 5.2-6 Analysis Methods and Sampling Period of the Collected Air Quality Data

Parameter	Analysis method	Sampling period	Sampling date	Station
TSP-Avg 24 hrs	Gravimetric	72-hour	17-23 Oct 11/ 1-5 Apr and 24-27 May 12	A3, A4, A5, A6
SO_2-Avg 24 hrs	Pararosaniline	72-hour	17-23 Oct 11	A3, A4
NOx-Avg 24 hrs	Sodium Arsenite	72-hour	17-23 Oct 11	A3, A4
NO- Avg 1 hr	NOx Chemilumine scence Analyzer	72-hour	1-5 Apr 12	A5
NO_2-Avg 1 hr			24-27 May 12	A5, A6
NOx-Avg 1 hr				
PM_{10}-Avg 24 hrs	PM_{10} Dichotomous Sampler, Gravimetric Method	72-hour	1-5 Apr and 24-27 May 12	A5, A6
CO-Avg 1 hr	CO NDIR Analyzer	72-hour	1-5 Apr 12	A5
			24-27 May 12	A5, A6
THC	Flame Ionization Detection Method	72-hour	3-5 Apr 12	A5, A6
MHC	Flame Ionization Detection Method	72-hour	3-5 Apr 12	A5, A6
NMHC	Flame Ionization Detection Method	72-hour	3-5 Apr 12	A5, A6

<u>Results of the Studies (A3-A6)</u>

From the previous studies (Table 5.2-7), the concentration of Total Suspended Particulate (TSP) concentration average 24 hours and Particulate Matter less than 10 micron (PM_{10}) average 24 hours were quite high compared to the other pollutants, especially during the dry season. The maximum concentration of PM_{10} during the dry season, for station A5 and A6, exceeded WHO ambient air quality guidelines, but there were well within the U.S.EPA National Ambient Air Quality Standards. The concentration of gas pollutants: Sulfur Dioxide (SO_2), Nitrogen Dioxide (NO_2) and Carbon Monoxide (CO) were within the World Bank Group, U.S.EPA and WHO standards. The Total Hydrocarbon (THC), Methane Hydrocarbon (MHC) and Non-Methane Hydrocarbon (NMHC) were measured in preparation of baseline data, even though there were no standards given.

Table 5.2-7 Result of the Reviewed Air Quality Data from Previous Studies

Parameter	Unit	Dry Season		Wet Season				Standard
		A5	A6	A3	A4	A5	A6	
TSP- 24 hrs	µg/m^3	163-198	116-212	16.74-36.60	42.60-64.89	18-27	13-19	230[1/]
PM_{10}-24 hrs	µg/m^3	85-106	46-72	-	-	12-16	4-9	150[2/],50[3/]
SO_2-24 hrs	µg/m^3	-	-	<50	<50	-	-	150[1],125[3//]
NO_x-1 hr	ppm.	0.0102-0.0218	-	-	-	0.0068-0.0109	0.0036-0.0047	-
NO-1 hr	ppm.	0.0031-0.0081	-	-	-	0.0031-0.0055	0.0016-0.0022	-
NO_2-1 hr	ppm.	0.0076-0.0103	-	-	-	0.0040-0.0054	0.0020-0.0025	0.11[3/]
NO_2-24 hrs	ppm.	-	-	<18.0	<18.0	-	-	150[1/]
CO-1 hr	ppm.	0.5-0.7	-	-	-	0.3-0.4	0.3	35[2/], 25[3/]
THC	ppm.	2.60-3.38	2.33-2.88	-	-	-	-	-
MHC	ppm.	2.33-3.22	2.16-2.84	-	-	-	-	-
NMHC	ppm.	0.16-0.27	0.04-0.19	-	-	-	-	-

Remark: [1/] Ambient Air Quality in Power Plant “Thermal Power: Guidelines for New Plant”, Pollution Prevention and Abatement Handbook (World Bank, 1999).

[2/] U.S.EPA National Ambient Air Quality Standards (U.S.EPA, 2011)

[3/] WHO Ambient Air Quality Guidelines (WHO, 2006)

(b) Results from Baseline Monitoring

- There are two stations for air quality measurement:
  - Station A1: VIP Resident at ITD Camp (396,821 E, 1,576,646 N)
  - Station A2: Doot Loot Temple (413,446 E, 1,579,929 N)

- The sampling stations are shown in Figure 5.2-15
- The analysis methods and sampling period of each parameter are concluded in Table 5.2-8.

Table 5.2-8 Ambient Air Quality Parameters

Parameters	Method[1/]	Sampling period	Sampling date	Sampling Station
Total Suspended Particulate (TSP) average 24 hours	Gravimetric High Volume (pre and post weight)	72-hour	2-5 December 2012 and 4-7 March 2013	A1: behind VIP Resident at ITD Camp A2: Doot Loot Temple
Particulate Matter less than 10 µm (PM_{10}) average 24 hours	Gravimetric High Volume (pre and post weight)	72-hour	2-5 December 2012 and 4-7 March 2013	
Sulphur Dioxide (SO_2) average 1, 24 hours	UV Fluoresence	72-hour	2-5 December 2012 and 4-7 March 2013	
Nitrogen Dioxide (NO_2) average 1 hour	Chemiluminescence	72-hour	2-5 December 2012 and 4-7 March 2013	
Carbon Monoxide	Non-Dispersive Infrared (NDIR)	72-hour	2-5 December 2012 and 4-7 March 2013	
THC/MHC/NMHC	FID Method (Sampling Bag 24 hours)	72-hour	2-5 December 2012 and 4-7 March 2013	
Wind speed and direction	Instrument for wind speed and wind direction (Cup Anemometer and Wind Vane)	72-hour	2-5 December 2012 and 4-7 March 2013	

Remark: [1/] U.S.EPA, Code of Federal Regulation

<u>Results of the Studies (A1-A2)</u>

Total Suspended Particulate, 24 hours Average

The measurement methodology performed for TSP sampling and measurement is Gravimetric High Volume Method. TSP was sampling by using a High Volume Air Sampler model GL2000H- 1, Thermo Andersen, product of Thermo Electron Corporation, Environmental Instruments, USA, with flow rate of 1.13-1.70 m^3/minute continuously for 24 hours by pumping air sample passing through a weighted 8x10 inches glass fibre filter. The sample filter was taken back to the laboratory for analysis by Pre and Post Weight Different Method as the recommendation of U.S. Environmental Protection Agency (U.S.EPA, 2011) followings are performed procedures for TSP measurement.

- Prepared and performance checking the High Volume Air Sampler before field measurement.
- Desiccated glass filter paper size 8x10 inches for 24 hours in order to control humidity at 30-50 %R.H., weighted the filter with calibrated 4 decimals electrical balance, stamp number on each filter paper and record weight and number in logbook. Prepared flow chart papers for flow recording.
- Moved sampler to sampling station, site is not obstructed in 10 metres radius and no point source is close to the sampler as recommended by U.S.EPA. Filter holder was equipped at 1.5-6.0 metres from ground. Recorded environmental condition in field logbook.
- Calibrated High Volume Air Sampler with Standard Certified Orifice at sampling site for 5 times before the sampling and record in Field Data Sheet.
- Pumped air sample with flow rate of 1.13-1.70 m^3/minute continuously for 24 hours through glass fibre filter, take sample filter, flow chart paper and field data sheet to the laboratory for analysis.
- Laboratory analysis was performed by putting sample filter in desiccators for 24 hours to control humidity at 30-50 %R.H., weigh sample filter with calibrated 4 decimal electrical balances. Calculate TSP weight by Pre and Post Weight Different method.
- Calculated flow rate from Flow Chart Paper at 25 °C temperature and 760 mm Hg pressure.
- Calculated and reported TSP result average for 24 hours as mg/m^3 by gravimetric method. Determined the monitoring results with Ambient Air Quality Standards.

Particulate Matter Less Than 10 Microns, 24 hours Average

The measurement methodology performed for particulate which size is less than 10 microns (PM_{10}) is gravimetric method. PM_{10} was sampling by High Volume Air Sampler model IP10, Thermo Andersen, product of Thermo Electron Corporation, Environmental Instruments, USA, and taken sample filter from the field to the laboratory for analysis by Pre and Post Weight Different Method as the recommendation of US. EPA. (2011). The measurement procedures were complied with ISO/IEC 17025 as followings;

- Prepared and performance checking the High Volume Air Sampler and size selective head before field measurement.
- Desiccated quartz filter paper size 8x10 inches for 24 hours in order to control humidity at 30-50 %R.H., weigh the filter with calibrated 4 decimal electrical balances, and stamp number on each filter paper and record weight and number in logbook. Prepared flow chart papers for flow recording.
- Moved sampler to sampling station, site is not obstructed in 10 metres radius and no any point sources is close to the sampler as recommended by U.S.EPA. Filter holder was equipped at 1.5-6.0 metres from ground. Recorded environmental condition in field logbook.
- Calibrated High Volume Air Sampler with Standard Certified Orifice at sampling site for 5 times before the sampling and recorded in Field Data Sheet. Sprayed Silicone Grease on Impactor of size selective head for sampling of particulate size less than 10 microns.

- Pumped air sample with flow rate of 1.13 m^3/minute continuously for 24 hours through glass fibre filter, take sample filter, flow chart paper and field data sheet to the laboratory for analysis.
- 24 hours through quartz fibre filter, took sample filter, flow chart paper and field data sheet to the laboratory for analysis.
- Calculated flow rate from Flow Chart Paper at 25 °C temperature and 760 mm Hg pressure.
- Reported PM_{10} result average for 24 hours as mg/m^3 by gravimetric method.

Sulphur Dioxide Average 1 and 24 hours

Measurement of 1 and 24 hours average ambient sulphur dioxide was conducted by UV Fluorescence method as recommended by the National Environment Board and compliance with U.S.EPA (2011) recommendation procedure as follows;

- Checked SO_2 gas analyzer and associate instruments such as sampling probe, sampling pump, mass flow meter and controller, etc.
- Moved a mobile laboratory to a selected measuring site at open wide area which no obstruction in a perimeter of 10 meters, far away from another gas source, etc and sampling probe must be installed at 3.00-6.00 meters height. Recorded surrounding condition of selected site in a Field Data Sheet.
- Supplied electricity to the station and then warming up the analyzer of about 1-2 hours. Tested analyzer condition, reaction chamber and photo-multiplier tube are recommended in operation manual. If the condition is functioned then starting calibration.
- Supplied zero gas (SO_2 Free) from Zero Gas Generator for zero calibration. Then supplied Span gas from a Certified Standard SO_2 (N_2 Balanced) through Standard Gas Generator. The generator is a dynamic diluter that can generate specified span gas. Span calibration was done at 80-85%, full scale of measuring range.
- Measured sulphur dioxide consecutively throughout the period. Re-calibration was done every 24 hour for good performance.
- Start up procedure and calibration when relocate the mobile unit.
- Measuring results were recording by a Data Logger and a strip chart recorder, reported by comparing sulphur dioxide level with Ambient Air Quality Standards.

Nitrogen Dioxide Average 1 hour

Nitrogen Dioxide in Ambient Air monitoring was conducted by Nitrogen Dioxide in ambient air analyzer with Chemiluminescense system as recommended by the National Environment Board compliance with U.S.EPA (2011). The analyzer installed in temperature controller room at the mobile laboratory to prevent the impact from the outside temperature. This analyzer was inspected and calibrated with Multipoint Calibration, Then can use the analyzer to monitoring.The details as follows;

- Checked NO/NO_2 gas analyzer and associate instruments such as sampling probe, sampling pump, mass flow meter and controller, etc.
- Moved a mobile laboratory to a selected measuring site at open wide area which no obstruction in a perimeter of 10 meters, far away from another gas source, etc.

Sampling probe must be installed at 3.00-6.00 meters height. Recorded surrounding condition of the selected site in a Field Data Sheet.

- Supplied electricity to the station and warmed up the analyzer for 1-2 hours. Tested analyzer condition, reaction chamber and photo-multiplier tube are recommended in operation manual.
- Supplied zero gas (NO/NO_2 Free) from zero gas generator for zero calibration and supplied Span gas from a certified standard NO (N_2 Balanced) through standard gas generator. The generator is a dynamic diluterthat can generate specified span gas. Span calibration was done at 80-85%, full scale of measuring range.
- Measured ambient nitrogen dioxide consecutively throughout the period. Re-calibration was done every 24 hour for good performance.
- Relocated of the mobile and started up procedure and calibration.
- Measuring results were recorded by a data logger and a strip chart recorder, reported by comparing nitrogen dioxide level with ambient air quality standards.

Carbon Monoxide, 1 hour Average

Measuring of ambient carbon monoxide was done by Non-dispersive Infrared (NDIR) method as recommended by the National Environment Board (NEB). CO analyzer was operated under QA/QC during the 3-day measurement complying with U.S.EPA. (2011) method as follows:

- Moved mobile unit that equipped with CO analyzer into monitoring station.
- Supplied electricity to the analyzer and then warming up the analyzer of about 1-2 hours. Then testing analyzer condition as recommended in operation manual, starting calibration when analyzer condition is functioned.
- Supplied zero gas (CO Free) from Zero Gas Generator for zero calibration. Then supply Span gas from a Certified Standard CO (N_2 Balanced). Span calibration will be done at 80-85% full scale of measuring range.
- Measured ambient carbon monoxide (CO) that sampling will be done every hour for 3 consecutive days.

THC/MHC/NMHC

Measurement of total hydrocarbons (THC), methane and non-methane hydrocarbon, was done by THC analyzer. An analyzer was installed in a mobile laboratory that could be easily moved to the measuring site. The measurement procedures were complied with U.S.EPA. (2011) recommendation as follows:

- Checked THC analyzer and associate instruments such as sampling probe, sampling pump, mass flow meter and controller, etc.
- Moved a mobile laboratory to the selected measuring site at open-wide area which has no obstruction in a perimeter of 10 meters and is far away from another gas source, etc., installed sampling probe at 3.0-6.0 meters height and recorded surrounding conditions of the selected site in a field data sheet.
- Supplied electricity to the station, then warmed up the analyzer for 1-2 hours and tested analyzer condition as recommendation in operation manual.

- Supplied zero gas (hydrocarbon free) from zero gas generator for zero calibration and span gas from a certified standard methane/propane (air balanced) through standard gas generator.
- The generator is a dynamic diluter that can generate specified span gas. Span calibration was done at 80-85%, full scale of measuring range.
- Measured THC, MHC and NMHC, consecutively throughout the period. Re-calibration was done every 24 hours for good performance. Sample was taking by tedlar sampling bag during Re-calibration time.
- Relocated the mobile and started up procedure and calibration.
- Measuring results were recorded by a data logger and a strip chart recorder.

Wind speed and direction

Recorded wind speed and wind direction while sampling air pollutants at site. Cup anemometer and a wind vane, met one, model 034, product of Met One Instrument Inc. USA was installed at 10 meters above ground with open ground no building, construction or tree higher than 10 m. around the meter. The results were transformed to electric signal to collecting in data logger. The data in data logger was transferred to personal computer with MET-1's software and the measurement results were calculated and presented in wind rose diagrams.

<u>Ambient Air Quality Baseline Monitoring Results</u>

Station A1: VIP Resident at ITD Camp

Air Ambient Quality was sampled between 2-5 December 2012 and 4-7 March 2013, the result of Total Suspended Particulate (TSP) concentration average 24 hours were between 122-142 µg/m^3 and 120-210 µg/m^3, Particulate Matter Less than 10 micron (PM_{10}) average 24 hours were between 63-90 µg/m^3 and 84-104 µg/m^3, respectively. Most of particulate matter results were not over standard except PM_{10} which complied with the recommendations of the World Bank (World Bank, 1999) and U.S.EPA (U.S.EPA., 2011) but did not comply with the recommendation of WHO (WHO, 2006).

The major activities, which may cause high concentrations of PM_{10}, may include: dust dispersion from road transportation near sampling station, and emission from diesel-engine vehicles, such as trucks and heavy equipments, or machines. Dry weather could also be another factor for high levels of TSP and PM_{10}. Additionally, higher PM_{10} in the second survey may be constituted by nearby construction activities. The concentrations of NO_2 (1 hour) from both sampling events were between 0.0006-0.0072 ppm and 0.0019-0.0096 ppm, respectively. CO concentrations (1 hour) were between 0.29-1.57 ppm and 0.53-1.97 ppm, respectively. The concentrations of SO_2 (1 hour) from both sampling periods were between 0.0008-0.0053 ppm and 0.0035-0.0245 ppm and the concentration of SO_2 (24 hours) were between 3.93-6.02 µg/m^3 and 4.45-5.76 µg/m^3 respectively. The results of these parameters are within standards (Table 5.2-9). THC, MHC and NMHC were measured as baseline data despite of no standard requirements (Table 5.2-10).

As can be seen from the Table 5.2-11 and Figure 5.2-16, the wind direction at Station A1 from both sampling periods were predominantly came from North North East (NNE) and West South West (WSW). The air quality results of A1 station are not much different from the results collected during the dry season from previous studies. This is mainly because the activities in the study area are quite similar, construction of the access road, and clearing the land.

Table 5.2-9 Result of Particulate Matters, SO_2, NO_2, and CO Analysis in December 2012 and March 2013

Parameter	Unit	December 2012						March 2013						Standards			
		Station A1			Station A2			Station A1			Station A2						
		2-3 Dec 12	3-4 Dec 12	4-5 Dec 12	2-3 Dec 12	3-4 Dec 12	4-5 Dec 12	4-5 Mar 13	5-6 Mar 13	6-7 Mar 13	4-5 Mar 13	5-6 Mar 13	6-7 Mar 13	a	b	c	d
TSP (24 hours)	$\mu g/m^3$	122	142	142	48	55	52	179	210	120	77	91	194	230	-	-	330
PM_{10} (24 hours)	$\mu g/m^3$	63*	86*	90*	36	42	42	84*	104*	90*	54*	64*	106*	150	150	50	120
SO_2 (24 hours)	ppm.	0.0015	0.0018	0.0023	0.0018	0.0012	0.0014	0.0017	0.0019	0.0022	0.0041	0.0033	0.0030	-	-	-	-
	$\mu g/m^3$	3.93	4.71	6.02	4.71	3.14	3.66	4.45	4.97	5.76	10.73	8.64	7.85	150	-	125	300
SO_2 (1 hour)	ppm.	0.0009 -0.0022	0.0008- 0.0050	0.0010 -0.0053	0.0007 -0.0035	0.0007 -0.0017	0.0007 -0.0027	0.0035 -0.0078	0.0040 -0.0245	0.0036 -0.0196	0.0030 -0.0218	0.0010 -0.0250	0.0033 -0.0268	-	-	-	0.30
NO_2 (1 hour)	ppm.	0.0006 -0.0039	0.0008- 0.0066	0.0008 -0.0072	0.0013 -0.0052	0.0010 -0.0066	0.0009 -0.0068	0.0019 -0.0038	0.0026 -0.0096	0.0019 -0.0065	0.0013 -0.0180	0.0004 -0.0233	0.0016 -0.0248	-	-	0.11	0.17
CO (1 hour)	ppm.	0.29-1.33	0.74-1.54	0.34-1.57	0.75-1.48	0.74-1.35	0.92-1.94	0.64-1.69	0.59-1.97	0.53-1.77	0.56-1.78	0.45-2.86	0.81-3.66	-	35	25	30

Remark:

a : Ambient Air Quality in Power Plant “Thermal Power: Guidelines for New Plant”, Pollution Prevention and Abatement Handbook (World Bank, 1999)

b : U.S.EPA National Ambient Air Quality Standards (U.S.EPA , 2011)

c : WHO Ambient Air Quality Guidelines: Global Update 2005 (WHO, 2006)

d: Thailand Ambient Air Quality Standards

TSP, PM_{10} and SO_2 average 24 hours - No.24, B.E 2547 (2004)

SO_2 average 1 hour - No.21, B.E.2544 (2001)

NO_2 average 1 hour - No.33 , B.E.2552 (2009)

CO average 1 hour - No. 10, B.E.2538 (1995)

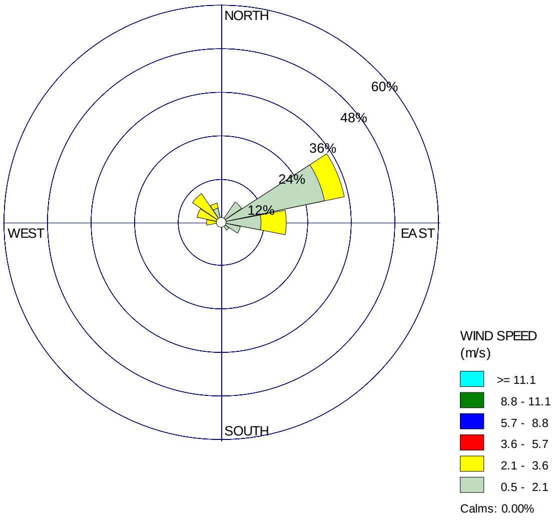
* The result did not comply with WHO Ambient Air Quality Guidelines, Global update 2005

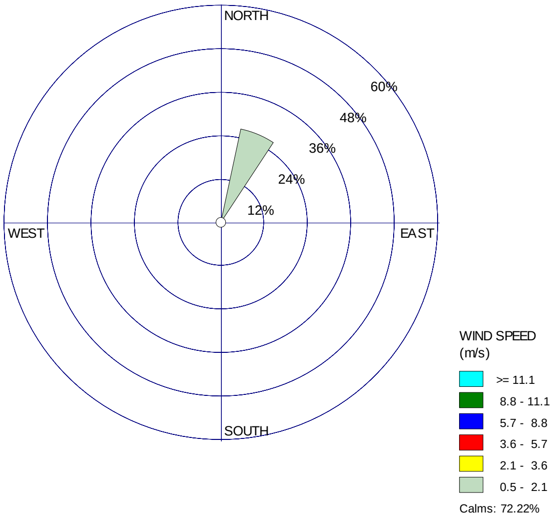
Table 5.2-10 Result of Hydrocarbon Analysis in December 2012 and March 2013

Parameter	Unit	December 2012						March 2013					
		Station A1			Station A2			Station A1			Station A2		
		2-3 Dec	3-4 Dec	4-5 Dec	2-3 Dec	3-4 Dec	4-5 Dec	4-5 Mar	5-6 Mar	6-7 Mar	4-5 Mar	5-6 Mar	6-7 Mar
Total Hydrocarbons	ppm.	2.45	2.89	3.22	2.28	7.99	4.02	2.58	2.77	2.74	2.94	2.67	2.73
Methane Hydrocarbon	ppm.	2.45	2.89	3.22	2.28	2.56	2.28	2.26	2.77	2.74	2.43	2.57	2.73
Non-Methane Hydrocarbon	ppm.	<0.05	<0.05	<0.05	<0.05	5.43	1.74	0.32	<0.05	<0.05	0.51	0.10	<0.05

Table 5.2-11 Result of Wind Speed and Wind Direction in December 2012 and March 2013

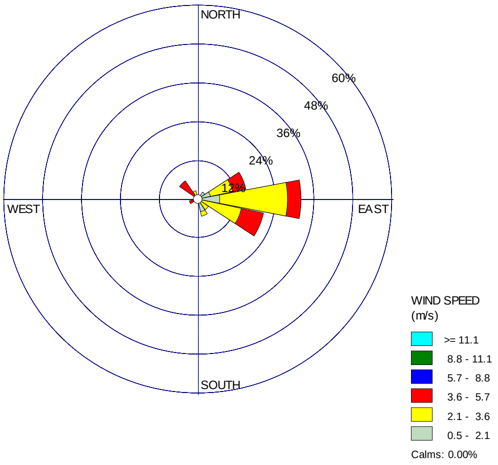
Parameter	Unit	December 2012						March 2013					
		Station A1			Station A2			Station A1			Station A2		
		2-3 Dec	3-4 Dec	4-5 Dec	2-3 Dec	3-4 Dec	4-5 Dec	4-5 Mar	5-6 Mar	6-7 Mar	4-5 Mar	5-6 Mar	6-7 Mar
Wind Speed	m/sec	0.7-2.8	0.7-3.3	0.8-3.5	0.3-0.6	0.3-0.8	0.3-0.7	1.7-5.6	1.2-4.0	0.7-5.5	0.3-1.6	0.3-1.3	0.3-1.4
Wind Direction	-	ENE	E	ENE	NNE	NNE	NNE	ENE	E	E	W	WSW	NNW

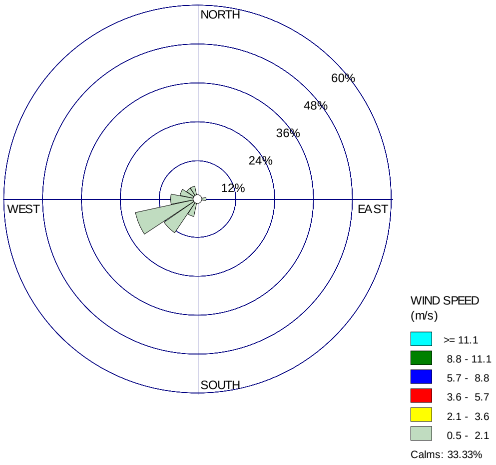




Station A1: VIP Resident at ITD Camp **Station A2: Doot Loot Temple**

1) Wind Direction on 2-5 December 2012





Station A1: VIP Resident at ITD Camp **Station A2: Doot Loot Temple**

2) Wind Direction on 4-7 March 2013

Figure 5.2-16 Wind Direction on 2-5 December 2012 and 4-7 March 2013

Station A2: Doot Loot Temple (UTM (WGS84) 47P 413,446 E, 1,579,923 N)

The air quality samplings were conducted on 2-5 December 2012 and 4-7 March 2013. Sampling locations of both sampling periods were slightly different. Due to construction activities with the wood shaving machine placed at the sampling area (Figure 5.2-17).

The concentrations of TSP (average 24 hours) were between 48-55 µg/m^3 and 77-194 µg/m^3, particulate size less than 10 micron (PM_{10}) (average 24 hour) were between 36-42 µg/m^3 and 54-106 µg/m^3, for the first and second sampling respectively. Most results of particulate matter were not over standard except for PM_{10} from the second sampling which complied with the recommendations of the World Bank (World Bank, 1999) and U.S.EPA (U.S.EPA , 2011) but did not the recommendation of WHO (WHO, 2006). The major activity that may cause high PM_{10} during the second sampling was burning dry leaves and construction activities about 10-20 m nearby the sampling station. Also, wood shaving was observed during daytime of sampling period

The concentrations of NO_2 (1 hour) from both sampling periods were between 0.0009-0.0068 ppm. and 0.0004-0.248 ppm., and the concentrations of CO (1 hour) were between 0.74-1.94 ppm. and 0.45-3.66 ppm., respectively. The concentration of SO_2 (1 hour) from both sampling periods were between 0.0007-0.0035 ppm. and 0.0010-0.0248 ppm. and the respectively. The results of these parameters were within standards (Table 5.2-9). However, high levels of TSP, PM_{10}, NO_2 and CO were observed on the third day of second sampling period. These high levels may be caused by burning dry leaves in the garden closed to the sampling station on that day (Figure 5.2-18).

THC, MHC and NMHC were measured for preparation of baseline data even though no standards have been established (Table 5.2-10). However, the higher levels of THC and NMHC on the second sampling day of first sampling period could be caused by burning wooden charcoal in the kitchen nearby area.

As can be seen from the Table 5.2-11, the wind direction at station A2 from both sampling periods were predominantly came from North North East (NNE) and West South West (WSW), respectively. It is obvious that sampling area at station A2 is surrounded by very high betel trees, mostly much higher than the wind speed and direction pole.

Comparisons of air quality results between parameters measured in the previous studies and current study during the dry season indicated not much differences levels of TSP and PM_{10} (average 24 hours), NO_2 (1 hour), and CO (1 hour). Several high levels observed during the current study were caused by specific activities at each location occurring only at the sampling period, not the usual activity in the area.

Station A1: VIP Resident at ITD Camp

Station A2: Doot Loot Temple

Figure 5.2-17 Ambient Air Quality Sampling

Construction Activities

Dried Leaves Burning

Figure 5.2-18 Observed Activities during the Second Sampling

5.2.5 Noise and Vibration

5.2.5.1 Study Area

The study area covers the areas that may be affected the potential impact from project construction and operation. The nearest sensitive areas were selected to represent the existing condition of the study area

5.2.5.2 Baseline Noise and Vibration Conditions

(a) Results from the Previous Surveys and Studies

Noise and vibration measurements from relevant environmental studies are reviewed:

- Initial Environmental Examination (IEE) for Dawei Sea Port & Industrial Estate Development (TEAM, 2012a).
- Final Report of Environmental Impact Assessment (EIA) for the Dawei Deep Sea Port (TEAM, 2013).
- Environmental Impact Assessment (EIA) for Main Road (SEATEC, 2012c).
- Draft Environmental Impact Assessment for Dawei Industrial Estate Project (SEATEC in association with UAE, 2012)

Summary of methods and results from the previous studies are presented below.

Methodology

- There are four stations for noise measurement from the previous studies which are the same location as the air quality stations:
  - Station A3: The Construction Area (396,389 E, 1,577,260 N)
  - Station A4: The Guard House (399,444 E, 1,578,143 N)
  - Station A5: Km. 4+500 of Main Road (399,211 E, 1,578,342 N)
  - Station A6: Km. 18+900 of Main Road (412,483 E, 1,580,131 N)
- There are two stations for vibration measurement from the previous studies:
  - Station A5: Km. 4+500 of the Main Road (399,211 E, 1,578,342 N)
  - Station A6: Km. 18+900 of the Main Road (412,483 E, 1,580,131 N)
- The sampling stations are shown in Figure 5.2-19 .and the analysis methods and sampling period of each parameter are concluded in Table 5.2-12

Result of Studies

The collected noise measurements (Table 5.2-13) show that all of L_{Aeq} 24 hours. and L_{Amax} data, both dry and wet seasons, are within the U.S.EPA.and Thai standards; however, the L_{Aeq} 24 hours. In the Construction of Township and Km 18+900 of the Main Road (A6) were higher than the other stations because these areas have many construction activities.The primary noise sources were from mobilization of the construction equipment.

The results of the study of vibration (Table 5.2-14) found that the Peak Particle Velocity of both stations, A5 and A6 did not affect any building more than 2.0 mm/s. The major sources of vibration were from trucks on the existing road.

Table 5.2-12 Analysis Methods and Sampling Period of the Reviewed Noise and Vibration Level

Parameter	Analysis method	Sampling period	Sampling date	Station
Noise Level				
$L_{Aeq\ 24\ hr}$, L_{Adn}, L_{Amax}, L_{A90}	-	72- hour	17-20 Oct 11	A3
			20-23 Oct 11	A4
$L_{Aeq\ 24\ hr}$, L_{Adn}, L_{Amax}, L_{A90}	Noise meter- SOUND 2000 Model	Hourly basis 72- hour	1-3 Apr 12	A5
			5-7 Apr 12	A6
			25-27 May 12	A5,A6
Vibration	-	72- hour	1-3 Apr 12 and 24-27 May 12	A5
			5-8 Apr 12 and 27-30 May 12	A6

Remark: - No analysis method was stated

Table 5.2-13 Result of the Reviewed Noise Level from Previous Studies

Parameter	Dry Season (dB(A))				Wet Season (dB(A))		Standard
	A3	A4	A5	A6	A5	A6	
$L_{Aeq\ 24\ hr}$	59.5-61.8	54.9-57.8	49.3-49.8	45.9-46.5	51.2-53.1	52.1-55.4	70[1/]
L_{Amax}	94.5-96.5	90.9-96.4	81.8-86.7	78.0-85.7	91.6-97.1	90.2-106.4	115[2/]
L_{Adn},	62.1-63.3	59.5-62.8	53.6-56.6	50.8-51.4	55.7-60.9	56.1-58.9	-
L_{A90}	50.5-55.5	51.0-52.9	37.6-43.3	39.3-41.5	44.3-48.0	40.6-42.2	-

Remark: [1/] U.S.EPA , Noise Effects Handbook (U.S.EPA , 1981)
[2/] Ambient Noise Standards, Notification of the National Environment Board, No.15, B.E.2540 (1997)

Table 5.2-14 Result of the Reviewed Vibration Level from Previous Studies

Measured Date	Result			Standard[2/]	Effects of vibration on structure[3/]
	Time	Peak particle velocity[1/] (mm/s)	Frequency (Hz)	Peak particle velocity; (mm/s)	
Station A5 (KM 4+500) – Dry Season					
April 1, 2012	15:08:41	0.410 (Vert)	27	9.25	No effects to building
April 2, 2012	07:19:22	0.347 (Vert)	8.8	5	No effects to building
April 3, 2012	15:57:15	0.292 (Long)	37	11.75	No effects to building
April 4, 2012	07:49:24	0.236 (Long)	39	12.25	No effects to building
Station A6 (KM 18+900) – Dry Season					
April 5, 2012	11:02:32	0.229 (Tran)	3.5	5	No effects to building
April 6, 2012	08:04:27	0.213 (Tran)	6.5	5	No effects to building
April 7, 2012	16:41:20	0.224 (Tran)	5.2	5	No effects to building
April 8, 2012	-	<0.200	N/A	5	No effects to building
Station A5 (KM 4+500) – Wet Season					
May 24, 2012	18:38:02	0.426 (Long)	17	6.75	No effects to building
May 24, 2012	20:16:17	1.80 (Long)	>100	20	No effects to building
May 26, 2012	16:51:59	0.615 (Long)	>100	20	No effects to building
May 27, 2012	08:13:27	0.599 (Long)	30	10	No effects to building
Station A6 (KM 18+900) – Wet Season					
May 27, 2012	-	<0.200	N/A	5	No effects to building
May 28, 2012	16:20:06	0.489 (Tran)	15	6.25	No effects to building
May 29, 2012	10:28:55	0.835 (Tran)	16	6.5	No effects to building
May 30, 2012	16:26:36	0.497 (Tran)	18	7	No effects to building

Remark: 1/ Peak Particle Velocity; Vert = Vertical, Long = Longitudinal, Tran = Transverse
2/ Thailand Standard of Protection against Vibration in Building Construction.
3/ DIN 4150-3 1999; Structural Vibration, part 3 effects of vibration on structure
N/A = Not Available

Source: EIA for Main Road, August 2012 (SEATEC, 2012c)

(b) Results from Baseline Monitoring

Baseline Monitoring Methodology

- Conduct noise level measurements during December 2012 (after monsoon season) and March 2013 (before monsoon season), which is the same period of air quality sampling. Two sampling stations are located at the same location as the air quality sampling stations (Figure 5.2-19):
    - Station A1: VIP Resident at ITD Camp (396,821 E, 1,576,646 N)
    - Station A2: Doot Loot Temple (413,446 E, 1,579,923N)
- Noise level parameters will include: $L_{Aeq\ 1\ hour}$, $L_{Aeq\ 24\ hours}$, L_{A90}, L_{Amax}, L_{Adn}, L_{A5min}, and L_{A90} for nuisance noise. The sampling and analysis methods of those parameters are presented in Table 5.2-15.

Table 5.2-15 The Sampling and Analysis Methods of Noise Level

Parameters	Method	Sampling Station
$L_{Aeq\ 1\ hour,\ 24\ hours}$, L_{A90},L_{max}, L_{Adn} L_{A5min}, L_{A90} for nuisance noise	Integrated Sound Level (International Electrotechnical Commission ; IEC 61672-1, 61672-2)	N5-N6

Measuring procedures were performed to comply with IEC 61672-1 Standard. The measurement of 1 hour noise average level is an average noise level generating from noise sources both natural and other activities, continuously for 1 hour. L_{Amax} is the highest noise level in 1 hour occurring by natural such as thunder and thunderbolt or other activities such as gun-shooting and metal cracking or explosive sounds. Measured L_{Aeq} 1 hour can be computed for L_{Aeq} 24 hours and can be compared to the Community Noise Standard of 70 dB(A) and 115 dB(A) for L_{Amax}. All raw data of L_{Aeq} 1 hour can be computed for L_{Adn}. Nuisance noise level as L_{An} (n = 5, 10, 50, 90 and 95) can be recorded by sound level meter for characteristic noise consideration such as L_{A5} or L_{A10} is nuisance noise while L_{A90} or L_{A95} is background noise.

Noise measurement for L_{Aeq} 24 hours was conducted by using an integrated sound level meter with 0.5 inch diameter condenser microphone and weighting network. Specifications of the meters are complied with the IEC 651 and IEC 804 (IEC 61672-1) standards. The meters are made in RION, model NL-21, product of Japan. Calibration will be done on site by tuning with a RION, NC-73, standard sound level generator. The calibrator generates 1000 Hz, 94 dB as a standard noise source. The meters were installed on a tripod of about 1.2-1.5 meter height above ground.

For annoyance noise level, it was measured by using an integrated sound level meter Model NL-21 of RION Co., Ltd., Japan. This meter is complied with IEC 651 and 804 (IEC 61672) standards. The noise level measuring is an integrated sound level meter with a 0.5 inch diameter condenser microphone and weighting network. The meters were installed on a tripod of about 1.2-1.5 meter height above ground and radius within 3.5 meter that was calibrated at site with sound level calibrator at standard noise level of 94 dB(A) and frequency of 1,000 Hz.

Annoyance noise level monitoring was conducted according to Thailand Annoyance Noise Level Standard by measuring noise level while annoyance occurred at the meter installation area in 1 hr, measuring background noise level (not less than 5 minutes), and recording L_{A90}. After that, the annoyance noise level was calculated following the notification of the Pollution Control Board, 2007.

Ambient Noise Baseline Monitoring Results

Station A1: VIP Resident at ITD Camp (UTM (WGS84) 47P 396,821 E, 1,576,646 N)

As the result of ambient noise monitoring during 2-5 December 2012 and 4-7 March 2013 found that L_{Aeq} 1 hour were between 49.5-61.7 dB(A) and 45.1-54.9 dB(A), $L_{Aeq\ 24\ hours}$ were between and 53.2-54.9 and 50.4-50.5 dB(A), L_{Amax} were between 65.5-91.4 and 59.4-80.7 dB(A), and L_{Adn}, were between 58.6-58.8 and 55.1-55.7 dB(A), respectively. In additional LA90 were between 45.4-54.2 and 40.0-47.1 dB(A). All the noise levels were within the U.S.EPA. standard (Table 5.2-16). The ambient noise levels from the second sampling are slightly lower than the first sampling.

Comparing the results with the previous measurement at station A3, the ambient noise levels from the baseline monitorings are lower than the previous studies, possibly due to completion of construction activities surrounding the stations.

The annoyance noise measured on 3 March 2013 was 10.6 dB(A) exceeding the proposed standard (Table 5.2-17). Primary noise sources at this station were from road transportation nearby the sampling station and from the construction activity closed to the sampling area.

Station A1: VIP Resident at ITD Camp

Figure 5.2-19 Ambient Noise Level Measuring in December 2012 and March 2013

Station A2: Doot Loot Temple

Figure 5.2-19 Ambient Noise Level Measuring in December 2012 and March 2013 (Cont.)

Station A2: Doot Loot Temple (UTM (WGS84) 47P 413,446 E, 1,579,923 N)

As the result of ambient noise monitoring during 2-5 December 2012 and 4-7 March 2013 found that $L_{Aeq\ 1\ hour}$ were between 44.4-53.5 and 44.6-61.8 dB(A), $L_{Aeq\ 24\ hours}$ were between 47.9-49.1 and 54.1-55.4 dB(A), L_{Amax} were between 54.5-78.3 and 55.0-89.3 dB(A), L_{Adn}, were between 52.4-53.1 and 56.4-59.0 dB(A), respectively. In additional L_{A90} were between 40.0-46.1 and 41.5-53.0 dB(A). The noise level was within the US.EPA. standard. The ambient noise levels from the second sampling period are higher than the first sampling period possibly due to wood shaving activity occurred during daytime near the sampling station (Table 5.2-16).

Baseline noise level at station A2 was higher than the previous studies at the nearby station A6 due to the ongoing construction activities near the station.

The annoyance noise measured on 3 March 2013 was 10.2 dB(A) exceeding the proposed standard (Table 5.2-17) most likely due to the said construction activities in the vicinity.

Table 5.2-16 Result of Ambient Noise Level in December 2012

Parameter	December 2012						March 2013						Standard
	Station A1			Station A2			Station A1			Station A2			
	2-3 Dec	3-4 Dec	4-5 Dec	2-3 Dec	3-4 Dec	4-5 Dec	4-5 Mar	5-6 Mar	6-7 Mar	4-5 Mar	5-6 Mar	6-7 Mar	
$L_{Aeq\ 1\ hour}$	49.9-59.2	49.6-61.4	49.5-61.7	44.4-52.5	44.4-51.7	44.9-53.5	46.5-53.6	45.2-53.6	45.1-54.9	44.6-61.8	44.8-59.4	45.6-59.4	
$L_{Aeq\ 24\ hours}$	53.2	54.4	54.9	47.9	48.8	49.1	50.5	50.4	50.5	55.4	55.1	54.1	70[1/]
L_{Amax}	65.8-86.3	66.2-86.9	65.5-91.4	54.5-77.2	55.3-73.9	55.1-78.3	59.4-80.7	59.9-77.2	60.5-80.0	55.0-89.3	59.0-86.2	59.5-86.2	115[2/]
L_{A90}	45.5-50.8	45.5-54.1	45.4-54.2	40.0-44.9	40.0-45.7	40.2-46.1	41.6-47.1	40.0-43.7	40.6-46.9	41.5-53.0	42.5-50.0	42.9-50.0	
L_{Adn}	58.8	58.6	58.6	52.4	53.1	53.1	55.3	55.7	55.1	59.0	57.3	56.4	

Remark: [1/] U.S.EPA, Noise Effects Handbook (U.S.EPA., 1981)
[2/] Ambient Noise Standards, Notification of the National Environment Board, No.15, B.E.2540 (1997)

Table 5.2-17 Result of Annoyance Noise Level on 1 December 2012

Monitoring Station	December 2012					March 2013				
	Specific Noise Level	Residual Noise Level	Specific Noise Level (Improve Noise Level)	Background Noise Level[1/]	Annoyance Noise Level	Specific Noise Level	Residual Noise Level	Specific Noise Level (Improve Noise Level)	Background Noise Level[1/]	Annoyance Noise Level
1. Station A1: VIP Resident at ITD Camp	52.8	48.9	50.8	42.7	8.1	55.3	49.5	53.8	43.2	10.6*
2. Station A2: Doot Loot Temple	49.9	47.9	45.4	43.6	1.8	54.9	51.7	51.9	41.7	10.2*
Standard[2/]	-	-	-	-	10	-	-	-	-	10
Unit	dB(A)									

Remark: [1/] Background noise level, the median of L90 of 5 times
[2/] TheAnnoyanceNoiseLevelStandard (NotificationofTheNationalEnvironmentalBoardNo.29, B.E.2550 (2007))
* The result did not comply with standard

5.2.6 Groundwater Quality

5.2.6.1 Study Area

Groundwater is a major source of water supply in the adjacent area as well as project construction activities. The study area of groundwater will cover the area potentially affected by project development to the proposed solid waste storage area and other nearby locations.

5.2.6.2 Baseline Groundwater Conditions

(a) Results from the Previous Surveys and Studies

Sources of Information

Groundwater quality measurements from relevant environmental studies:

- Initial Environmental Examination (IEE) for Dawei Sea Port & Industrial Estate Development (TEAM, 2012a).
- Environmental Impact Assessment (EIA) for Main Road (SEATEC, 2012c).
- Draft Environmental Impact Assessment for Dawei Industrial Estate Project (SEATEC in association with UAE, 2012)

(b) Methodology

- There are nine stations of ground water quality measurement from the previous studies: (Figure 5.2-20)
    - Station GW1: Mudu Village (401,595 E, 1,576,398 N)
    - Station GW2: Tha Byae (403,463 E, 1,570,628 N)
    - Station GW3: Lae Shaung (398,172 E, 1,580,028 N)
    - Station GW4: Mayin Gyi (394,283 E, 1,579,704 N)
    - Station GW5: Pan Tin In (403,332 E, 1,565,791 N)
    - Station GW6: Twain Gyi (398,821 E, 1,579,916 N)
    - Station GW7: Mudu Village (401,551 E, 1,576,749 N)
    - Station GW8: Pa Ya Dat Village (396,794 E, 1,581,009 N)
    - Station GW9: Pan Din In Village (403,329 E, 1,566,970 N)
- The sampling stations are shown in Figure 5.2-20.The analysis methods and sampling period of each parameter are concluded in Table 5.2-18.

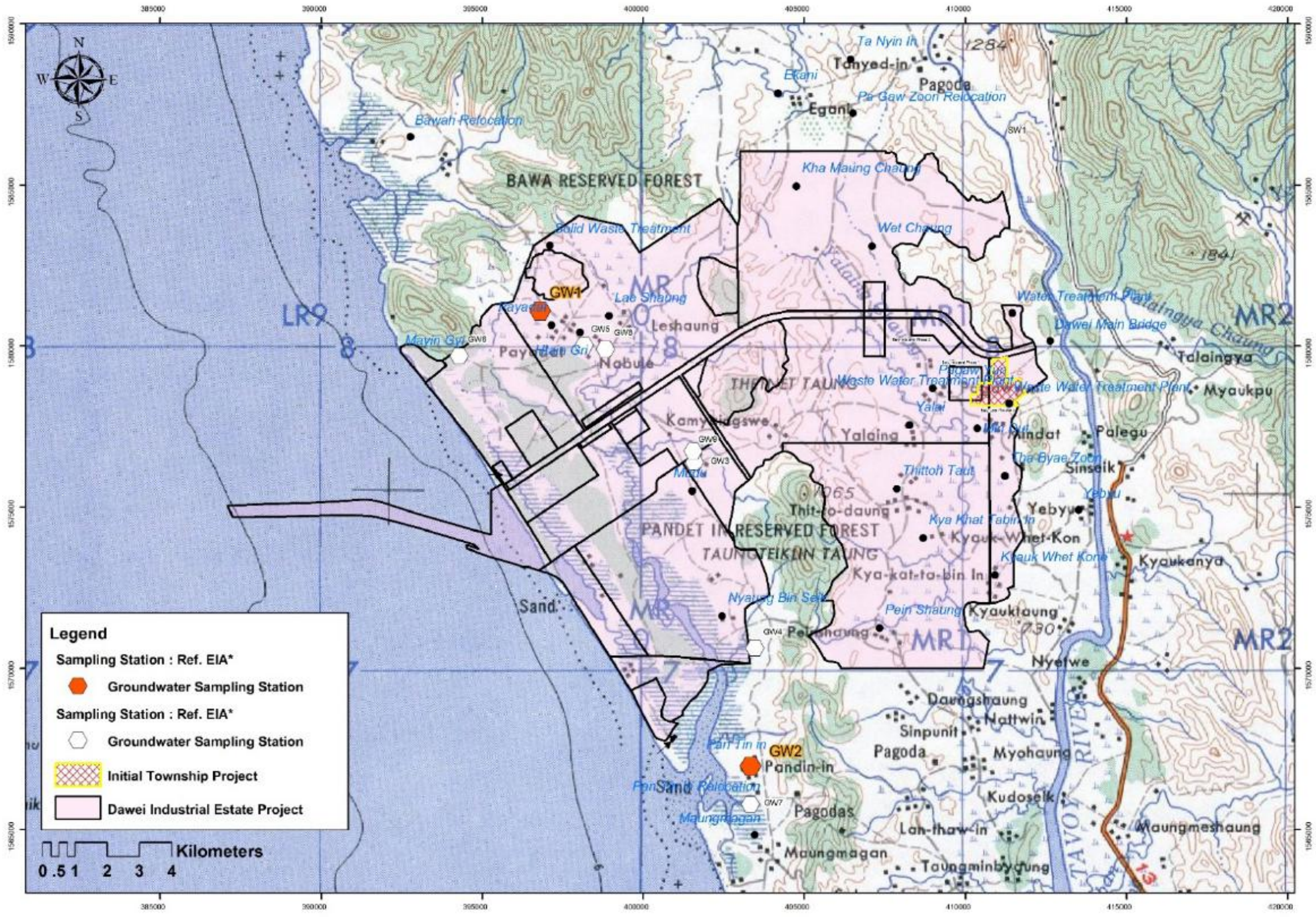


Figure 5.2-20 Reviewed Groundwater Quality Measurement Stations Compared with Stations of this EIA Study

Table 5.2-18 Analytical Method for Groundwater Quality

Parameter	Analytical Methodology	Sampling date	Station
Conductivity	Conductivity Meter	• 14,15,19 Oct 11 • Mar 12 • May 12 • Dec 12 • Mar 13	GW1-GW9
Turbidity	Nephelometric Method	• 14,15,19 Oct 11 • Mar 12 • May 12 • Dec 12 • Mar 13	GW1-GW9
pH	pH Meter	• 14,15,19 Oct 11 • Mar 12 • May 12 • Dec 12 • Mar 13	GW1-GW9
Cadmium (Cd)	AAS Flame Method or Nitric Acid Digestion and Direct Air Acetylene Flame Method	• 14,15,19 Oct 11 • Mar 12 • May 12 • Dec 12 • Mar 13	GW1-GW9
Mercury (Hg)	Cold Vapour AAS Method	• 14,15,19 Oct 11 • Mar 12 • May 12 • Dec 12 • Mar 13	GW1-GW9
Copper (Cu)	AAS Flame Method or Nitric Acid Digestion and Direct Air Acetylene Flame Method	• 14,15,19 Oct 11 • Mar 12 • May 12 • Dec 12 • Mar 13	GW1-GW9
Iron (Fe)	AAS Flame Method or Nitric Acid Digestion and Direct Air Acetylene Flame Method	• 14,15,19 Oct 11 • Mar 12 • May 12 • Dec 12 • Mar 13	GW1-GW9
Lead (Pb)	AAS Flame Method or Nitric Acid Digestion and Direct Air Acetylene Flame Method	• 14,15,19 Oct 11 • Mar 12 • May 12 • Dec 12 • Mar 13	GW1-GW9
Total Hardness as $CaCO_3$ (TH)	EDTA Titrimetric Method	• 14,15,19 Oct 11 • Mar 12 • May 12 • Dec 12 • Mar 13	GW1-GW9
Dissolved Oxygen (DO)	Dissolved Oxygen Meter	14,15,19 Oct 11	GW1-GW5
Biochemical Oxygen Demand (BOD)	5-day BOD Test Method	14,15,19 Oct 11	GW1-GW5
Total Dissolved Solids (TDS)	Dried at 103-105 ^oC	• 14,15,19 Oct 11 • Dec 12 • Mar 13	GW1-GW5, GW8-GW9
Temperature	Thermometer	14,15,19 Oct 11	GW1-GW5

Table 5.2-18 Analytical Method for Groundwater Quality (Cont.)

Parameter	Analytical Methodology	Sampling date	Station
Sulfate	Turbidimetric Method	• 14,15,19 Oct 11 • Dec 12 • Mar 13	GW1-GW5, GW8-GW9
Bicarbonate	Titration Method	14,15,19 Oct 11	GW1-GW5
Free Carbonate	Mercuric Nitrate Method DPD Colorimetric Method	14,15,19 Oct 11	GW1-GW5
Non Carbonate Hardness	Titrimetric Method	• Dec 12 • Mar 13	GW8-GW9
Calcium (Ca)	Titration	14,15,19 Oct 11	GW1-GW5
Arsenic (As)	Hybride Generation AAS Method	• 14,15,19 Oct 11 • Dec 12 • Mar 13	GW1-GW5, GW8-GW9
Salinity	Salinometer	14,15,19 Oct 11	GW1-GW5
Nitrate-Nitrogen	Cadmium Reduction Method	• 14,15,19 Oct 11 • Dec 12 • Mar 13	GW1-GW5, GW8-GW9
Manganese (Mn)	Nitric Acid Digestion and Direct Air Acetylene Flame Method	• Mar 12 • May 12 • Dec 12 • Mar 13	GW6-GW9
Zinc (Zn)	Nitric Acid Digestion and Direct Air Acetylene Flame Method	• Mar 12 • May 12 • Dec 12 • Mar 13	GW6-GW9
Total Solids (TS)	Total Solids Dried at 103-105 ºC	• Mar 12 • May 12 • Dec 12 • Mar 13	GW6-GW9
Total Coliform Bacteria (TCB)	Multiple Tube Fermentation Technique	• Mar 12 • May 12 • Dec 12 • Mar 13	GW6-GW9
E.Coli	Multiple Tube Fermentation Technique	• Mar 12 • May 12 • Dec 12 • Mar 13	GW6-GW9
Total Suspended Solids (TSS)	Total Suspended Solids Dried At 103-105 ºC	• Dec 12 • Mar 13	GW8-GW9
Fluoride	SPADNS Method	• Dec 12 • Mar 13	GW8-GW9
Cyanide	Distillation, Pyridine-Barbituric Acid Method	• Dec 12 • Mar 13	GW8-GW9
Selenium (Se)	Hydride Generation AAS Method	• Dec 12 • Mar 13	GW8-GW9
Chromium Hexavalent (Cr^{6+})	Nitric Acid Digestion and Direct Air Acetylene Flame Method	• Dec 12 • Mar 13	GW8-GW9
Nickel (Ni)	Nitric Acid Digestion and Direct Air Acetylene Flame Method	• Dec 12 • Mar 13	GW8-GW9

Result of Studies

All pH results showed that groundwater in this area are acidic, (Table 5.3-19) which were below the standard and not comply with it. Acidity occurs from carbon dioxide dissolved in water. The pH is 4 - 8.5. Normally, water in nature consists of carbon dioxide. High carbon dioxide may be in groundwater because of biodegradable (data from the Water Reuse Center from http: / / www. softwarethai. co. th/ waterreusecenter/ index. php?option= com_content &view=article&id=99%3A2013-06-17-06-18-44&catid=14%3Agis&Itemid=21).

Manganese can be found in groundwater or deep water in lakes or reservoirs as well as in soil and rock. It is usually found in combination with the other elements to form different minerals (http://www.stou.ac.th/).

Cadmium results at GW1-GW5 were exceeding the standard. Cadmium is a natural, usually minor constituent of surface and groundwater. It may exist in water as the hydrated ion, as inorganic complexes such as carbonates, hydroxides, chlorides or sulphates, or as organic complexes with humic acids (http://www.cadmium.org/pg_n.php?id_ menu=6).

Total Coliform Bacteria of some sampling stations were also detected high. Nevertheless, local people normally use well water for consumption but they will boil before drinking.

Table 5.2-19 Results of Groundwater Quality from the Previous Study

Parameter	Unit	14 Oct 11		15 Oct 11		19 Oct 11	Mar 12		May 12		Dec 12		Mar 13		Standard[1/]
		GW1	GW2	GW3	GW4	GW5	GW6	GW7	GW6	GW7	GW8	GW9	GW8	GW9	
pH	-	5.5*	5.39*	4.74*	5.57*	5.91*	6.0*	5.5*	6.2*	5.9*	4.7*	5.0*	4.8*	5.2*	6.5-8.5
TH as $CaCO_3$	mg/l	20	220	80	40	40	8.0	2.0	7.0	2.0	-	-	-	-	-
BOD	mg/l	1	1.5	1.5	1	1	-	-	-	-	<2.0	5.0	<2.0	6.0	-
Turbidity	FTU	1.64	0.8	0.77	0.01	0.43	1.0	0.9	1.0	0.8	0.5 NTU	<1.0 NTU	1.6 NTU	0.5 NTU	-
TDS	mg/l	2,720	1,720	1,970	1,010	1,240	-	-	-	-	<25	<25	<25	56	-
Suspended Solids	mg/l	NA	370	40	60	NA	-	-	-	-	<5.0	<5.0	<5.0	<5.0	50
Bicarbonate	mg/l	20	20	24	40	40	-	-	-	-	-	-	-	-	-
Sulphate	mg/l	0.48	3.92	2.88	2	1.168	-	-	-	-	0.4	<0.3	0.9	1.8	-
Free Carbonate	mg/l	Nil	Nil	Nil	Nil	Nil	-	-	-	-	-	-	-	-	-
Non-Carbonate Hardness	mg/l	-	-	-	-	-	-	-	-	-	<0	<0	<0	<0	-
Iron	mg/l	0.634	0.14	0.0145	0.049	0.728	0.049	0.03	0.068	0.029	0.068	<0.043	<0.010	0.160	-
DO	ppm.	7.7	7.3	7.5	7.3	7.2	-	-	-	-	-	-	-	-	-
Temperature	ºC	26.1	26.3	26.4	25.5	26.1	-	-	-	-	-	-	-	-	-
Conductivity	µS/cm	21.5	26.2	47.2	16.3	40.3	232	175	216	168	26 µmho/cm	75 µmho/cm	31 µmho/cm	50 µmho/cm	-
Salinity	ppt	Nil	Nil	Nil	Nil	Nil	-	-	-	-	-	-	-	-	-
Nitrate Nitrogen	mg/l	Nil	Nil	0.007	0.1	0.0009	-	-	-	-	0.04	<0.02	0.13	0.09	50 (Total Nitrogen)
Manganese	mg/l	0.3	0.1	Nil	0.3	0.8*	0.018	0.018	0.004	0.018	<0.005	<0.005	<0.005	<0.018	0.5
Zinc	mg/l	0.49	0.95	1	1.25	1.01	<0.001	<0.001	<0.001	<0.001	<0.020	<0.020	<0.005	<0.005	3
Cyanide	mg/l	Nil	Nil	Nil	Nil	Nil	-	-	-	-	-	-	-	-	0.07

Table 5.2-19 Results of Groundwater Quality from the Previous Study (Cont.)

Parameter	Unit	14 Oct 11		15 Oct 11		19 Oct 11	Mar 12		May 12		Dec 12		Mar 13		Standard[1/]
		GW1	GW2	GW3	GW4	GW5	GW6	GW7	GW6	GW7	GW8	GW9	GW8	GW9	
Arsenic	mg/l	ND	ND	ND	ND	ND	-	-	-	-	<0.0003	<0.0003	0.0024	<0.0003	0.01
Cadmium	mg/l	0.004*	0.005*	0.004*	0.004*	0.005*	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.003
Copper	mg/l	ND	ND	ND	ND	ND	0.031	0.005	0.038	0.007	<0.003	<0.003	<0.003	<0.003	2
Lead	mg/l	ND	ND	ND	ND	ND	<0.001	<0.001	<0.001	<0.001	<0.008	<0.008	<0.008	<0.008	0.01
Mercury	mg/l	ND	ND	ND	ND	ND	<0.0001	<0.0001	<0.0001	<0.0001	0.0009	0.0007	<0.0002	<0.0002	0.001
Selenium	mg/l	-	-	-	-	-	-	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	-
Chromium Hexavalent	mg/l	-	-	-	-	-	-	-	-	-	<0.001	<0.001	<0.001	<0.001	-
Nickel	mg/l	-	-	-	-	-	-	-	-	-	<0.005	<0.005	<0.005	<0.005	-
Calcium	mg/l	3.18	4.29	4.54	4.61	4.35	-	-	-	-	-	-	-	-	-
Total Solids	mg/l	-	-	-	-	-	136	101	125	94	<25	27	30	57	1,000
Cyanide	mg/l	-	-	-	-	-	-	-	-	-	<0.005	<0.005	<0.005	<0.005	0.07
Fluoride	mg/l	-	-	-	-	-	-	-	-	-	0.10	0.12	0.28	0.09	-
Total Coliform Bacteria	MPN/ 100 ml	-	-	-	-	-	2,100	400	390	430	2.0	33	<1.8	<1.8	-
E.Coli	CFU/ml	-	-	-	-	-	<2	<2	<2	<2	2.0	11	ND	ND	-

Remark: [1/] WHO' Drinking Water Standard, 1993

* The result did not comply with standard

Nil = No Quantity

ND = Not Detected

NA = No Analysis

\- = No Data or No Standard

(c) Results from Baseline Monitoring

Baseline Monitoring Methodology

- Conduct groundwater quality sampling on 2 and 14 March 2015. The surface water quality was collected and analyzed at two sampling stations:
  - GW1: IE-BH01 (409068 E, 1581846 N)
  - GW2: IE-BH02 (408996 E, 1581827 N)
- The sampling locations are shown in Figure 5.2-21.
- The groundwater quality parameters and analysis methods of those parameters are presented in Table 5.2-20.

Table 5.2-20 Groundwater Quality Parameters in March 2015

Parameters	Analysis Method
1. pH	Electrometric Method at Site
2. Turbidity	Nephelometric Method
3. Electrical Conductivity	Electrical Conductivity Method
4. Total Solids (TS)	Dried at 103-105 ^{o}C
5. Suspended Solids (SS)	Dried at 103-105 ^{o}C
6. Total Dissolved Solids (TDS)	Dried at 180 ^{o}C
7. Cyanide	Distillation, Pyridine-Barbituric Acid Method
8. Nitrate-Nitrogen	Cadmium Reduction Method
9. Total Hardness	EDTA Titrimetric Method
10. Fluoride	SPADNS Method
11. Sulfate	Turbidimetric Method
12. Non-Carbonate Hardness	Titrimetric Method
13. Arsenic	Hydride Generation AAS Method
14. Manganese	Nitric Acid Digestion and Direct Air Acetylene Flame Method
15. Mercury	Cold Vapour AAS Method
16. Selenium	Hydride Generation AAS Method
17. Zinc	Nitric Acid Digestion and Direct Air Acetylene Flame Method
18. Cadmium	Nitric Acid Digestion and Direct Air Acetylene Flame Method
19. Copper	Nitric Acid Digestion and Direct Air Acetylene Flame Method
20. Chromium Hexavalent	Nitric Acid Digestion and Direct Air Acetylene Flame Method
21. Lead	Nitric Acid Digestion and Direct Air Acetylene Flame Method
22. Nickel	Nitric Acid Digestion and Direct Air Acetylene Flame Method
23. Iron	Nitric Acid Digestion and Direct Air Acetylene Flame Method
24. Total Coliform Bacteria (TCB)	Multiple Tube Fermentation Technique

Table 5.2-20 Groundwater Quality Parameters in March 2015 (Cont..)

Parameters	Analysis Method
25. E.Coli	Multiple Tube Fermentation Technique
26. Volatile Organic Compound	
- Benzene	Purge and Trap Gas Chromatographic (FID) Method (U.S. EPA 2003:5030 C and 8015 D)
- Carbon Tetrachloride	Purge and Trap Gas Chromatographic (FID) Method (U.S. EPA 2003:5030 C and 8015 D)
- 1,2 Dichloroethane	Purge and Trap Gas Chromatographic (FID) Method (U.S. EPA 2003:5030 C and 8015 D)
- 1,1 Dichloroethane	Purge and Trap Gas Chromatographic (FID) Method (U.S. EPA 2003:5030 C and 8015 D)
- cis-1,2 Dichloroethane	Purge and Trap Gas Chromatographic (FID) Method (U.S. EPA 2003:5030 C and 8015 D)
- trans-1,2 Dichloroethane	Purge and Trap Gas Chromatographic (FID) Method (U.S. EPA 2003:5030 C and 8015 D)
- Dichloromethane	Purge and Trap Gas Chromatographic (FID) Method (U.S. EPA 2003:5030 C and 8015 D)
- Ethylbenzene	Purge and Trap Gas Chromatographic (FID) Method (U.S. EPA 2003:5030 C and 8015 D)
- Styrene	Purge and Trap Gas Chromatographic (FID) Method (U.S. EPA 2003:5030 C and 8015 D)
- Tetrachloroethylene	Purge and Trap Gas Chromatographic (FID) Method (U.S. EPA 2003:5030 C and 8015 D)
- Toluene	Purge and Trap Gas Chromatographic (FID) Method (U.S. EPA 2003:5030 C and 8015 D)
- Tetrachloroethylene	Purge and Trap Gas Chromatographic (FID) Method (U.S. EPA 2003:5030 C and 8015 D)
- 1,1,1-Trichloroethane	Purge and Trap Gas Chromatographic (FID) Method (U.S. EPA 2003:5030 C and 8015 D)
- 1,1,2-Trichloroethane	Purge and Trap Gas Chromatographic (FID) Method (U.S. EPA 2003:5030 C and 8015 D)
- Total Xylenes	Purge and Trap Gas Chromatographic (FID) Method (U.S. EPA 2003:5030 C and 8015 D)

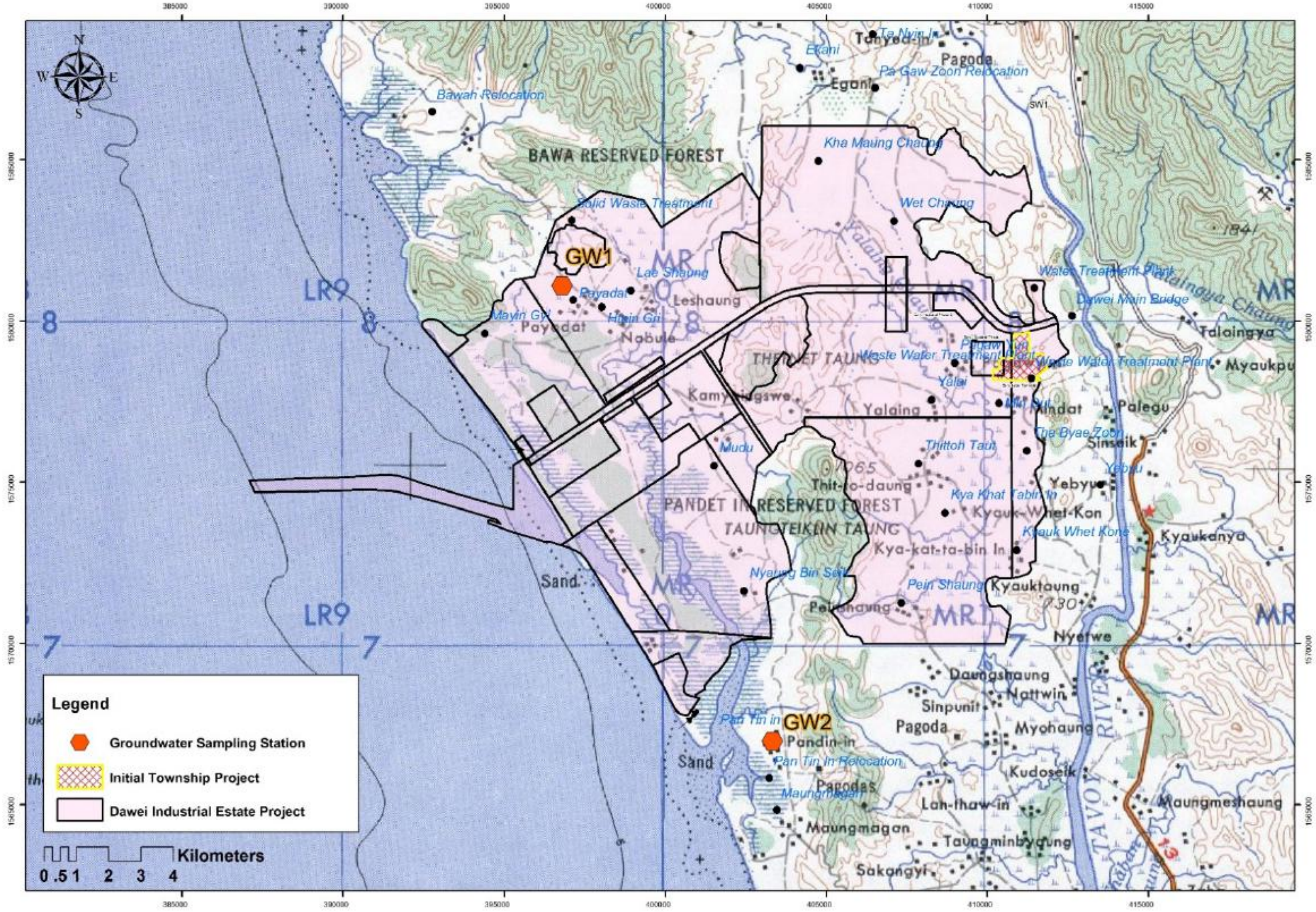


Figure 5.2-21 Groundwater Sampling Stations

Groundwater samples were grabbed by bailer (Figure 5.2-22) and kept in the sampler before being transferred in each bottle. Some physical parameters such as pH, conductivity and water color were measured and observed on site. To protect any contamination during sampling, sampling sequence began from E. coli bacteria sampling by sterile technique, followed by heavy metals sampling for mercury (Hg) and other heavy metals, total hardness and non-carbonate hardness. All collected sample bottles were labeled and information was recorded in a chain of custody. All samples were kept in cooling box and shipped back to UAE laboratory within recommended holding time.

GW1 : IE – BH 01

GW2 : IE – BH 02

Figure 5.2-22 Groundwater Sampling

<u>Groundwater Baseline Monitoring Results</u>

Groundwater sampling was conducted on 2 and 14 March 2015 from 2 sampling stations (Table 5.2-21 and **Annex 5-1** Groundwater Analysis Report). From both sampling results, all complied with standard excepting lead. Lead is one of the elements in nature. It can be found in water as well as in soil, rock and air. It is usually found in combination with the other elements to form different minerals (http://www.yale.edu and http://webdb.dmsc.moph.go.th). TCB and E. Coli were also detected low. Nevertheless, local people normally use well water for consumption but they will boil before drinking.

Comparison of previous and monitoring studies indicated that groundwater quality were quite similar.

Table 5.2-21 Result of Groundwater Sampling in March 2013

Parameter	Unit	Result		Standard [1/]
		GW1: IE – BH 01	GW2: IE – BH 02	
pH	-	8.3	6.5	6.5-8.5
Turbidity	NTU	650	80.0	-
Electrical Conductivity	umho/cm	42.2	26.8	-
Total Solids	mg/L	416	259	1,000
Suspended Solids	mg/L	376	165	50
Total Dissolved Solids	mg/L	40	67	-
Cyanide	mg/L CN^-	ND	ND	0.07
Nitrate-Nitrogen	mg/L NO_3-N	ND	0.02	50 (Total Nitrogen)
Total Hardness	mg/L $CaCO_3$	21.9	41.6	-
Fluoride	mg/L F^-	0.14	0.02	-
Sulphate	mg/L SO_4^{2-}	2.8	2.8	-
Non-Carbonate Hardness	mg/L $CaCO_3$	0.2	1.40	-
Arsenic	mg/L As	0.0034	0.0020	0.01
Manganese	mg/L Mn	0.114	0.244	0.5
Mercury	mg/L Hg	0.0022	0.0005	0.001
Selenium	mg/L Se	ND	ND	-
Zinc	mg/L Zn	0.088	0.074	3
Cadmium	mg/L Cd	ND	ND	0.003
Copper	mg/L Cu	<0.003	<0.003	2
Hexavalent Chromium	mg/L Cr^{6+}	ND	ND	-
Lead	mg/L Pb	0.115*	0.180*	0.01
Nickel	mg/L Ni	ND	<0.005	-
Iron	mg/L Fe	12.8	8.95	-
Total Coliform Bacteria	MPN/100 mL	490	<1.8	-
E.Coli	MPN/100 mL	None	None	-
Volatile Organic Compound -Benzene	µg/L	ND	ND	-
-Carbon Tetrachloride	µg/L	ND	ND	-
-1,2 Dichloroethane	µg/L	ND	ND	-
-1,1 Dichloroethane	µg/L	ND	ND	-
-cis-1,2 Dichloroethane	µg/L	ND	ND	-
-trans-1,2 Dichloroethane	µg/L	ND	ND	-

Table 5.2-21 Result of Groundwater Sampling in March 2013 (Con't.)

Parameter	Unit	Result		Standard [1/]
		GW1	GW2	
-Dichloromethane	µg/L	ND	ND	-
-Ethylbenzene	µg/L	ND	ND	-
-Styrene	µg/L	ND	ND	-
-Tetrachloroethylene	µg/L	ND	ND	-
-Toluene	µg/L	ND	ND	-
-Tetrachloroethylene	µg/L	ND	ND	-
-1,1,1-Trichloroethane	µg/L	ND	ND	-
-1,1,2-Trichloroethane	µg/L	ND	ND	-
-Total Xylenes	µg/L	ND	ND	-
Sample Condition	-	Brown / Brown Turbid	Yellow / Brown Turbid	-

Remark: [1/] WHO Drinking Water Standard, 1993
ND = Not Detected
- = No Unit or No Standard

5.2.7 Surface Water and Sediment

5.2.7.1 Study Area

The possible adverse effects that a developing project may have on the quality of the surface water need to be determined prior to the implementation of the project. After reviewing the master plan, the project will discharge treated wastewater from wastewater treatment plants to Dawei and Kunchuang River. Therefore, the study area will cover both upstream and downstream of the proposed discharge points as well as the proposed discharge points.

5.2.7.2 Baseline Surface Water and Sediment Conditions

(a) Results from the Previous Surveys and Studies

The main source of Information relevant to surface water and sediment quality relevant to the Initial Township is:

- Draft Environmental Impact Assessment for Dawei Industrial Estate Project (SEATEC in association with UAE, 2012)

Summary of the results of the previous study is summarized below.

Methodology

- There are fifteen stations for surface water and sediment quality measurement during March 2012 (dry season) and May 2012 (wet season) and during December 2012 (after monsoon season) and March 2013 (before monsoon season):

1) During March 2012 (dry season) and May 2012 (wet season);

- Station SW1: Dawei River (412,709 E, 1,582,539 N)
- Station SW2: Dawei River (412,715 E, 1,579,831 N)
- Station SW3: Canal at KM 3+000 (398,804 E, 1,577,888 N)
- Station SW4: Canal at KM 12+000 (406,344 E, 1,581,074 N)

2) During December 2012 (after monsoon season) and March 2013 (before monsoon season);

- Station SW5: Dawei River (411,076 E, 1,586,240 N)
- Station SW6: Dawei River at Yebru (413,746 E, 1,575,083 N)
- Station SW7: Canal (412,629 E, 1,568,345 N)
- Station SW8: Canal (412,646 E, 1,567,332 N)
- Station SW9: Dawei River about 500 m downstream from SW8 (412,605 E, 1,566,856 N)
- Station SW10: Dawei River, about 1,000 m downstream from SW9 (412,272 E, 1,565,906 N)
- Station SW11: Dawei River, about 1,000 m downstream from SW10 (412,418 E, 1,564,897 N)
- Station SW12: Dawei River, about 1,000 m downstream from SW11 (412,514 E, 1,563,905 N)
- Station SW13: Dawei River, about 2,000 m downstream from the bridge crossing Dawei River at Dawei City (412,213 E, 1,553,337 N)
- Station SW14: Kunchuang River (409,524 E, 1,570,309 N)
- Station SW15: Kunchuang River, about 500 m before flowing to Dawei River (412,064 E, 1,568,062 N)

- The surface water sampling of those stations was conducted duringMarch 2012 (dry season) and May 2012 (wet season) and during December 2012 (after monsoon season) and March 2013 (before monsoon season). Surface water was collected via the grab sampling method. Water sample preservation methods are conducted to the Standard Methods for the Examination of Water and Wastewater by American Public Health Association. The sampling stations are shown in Figure 5.2-23.
- The sediment sampling of those stations was conducted during March 2012 (dry season) and SW5-SW13 was conducted only. The sediment was collected by a sediment grab. The sampling stations are shown in Figure 5.2-23.
- The analysis methods of each parameter are concluded in Table 5.2-22.

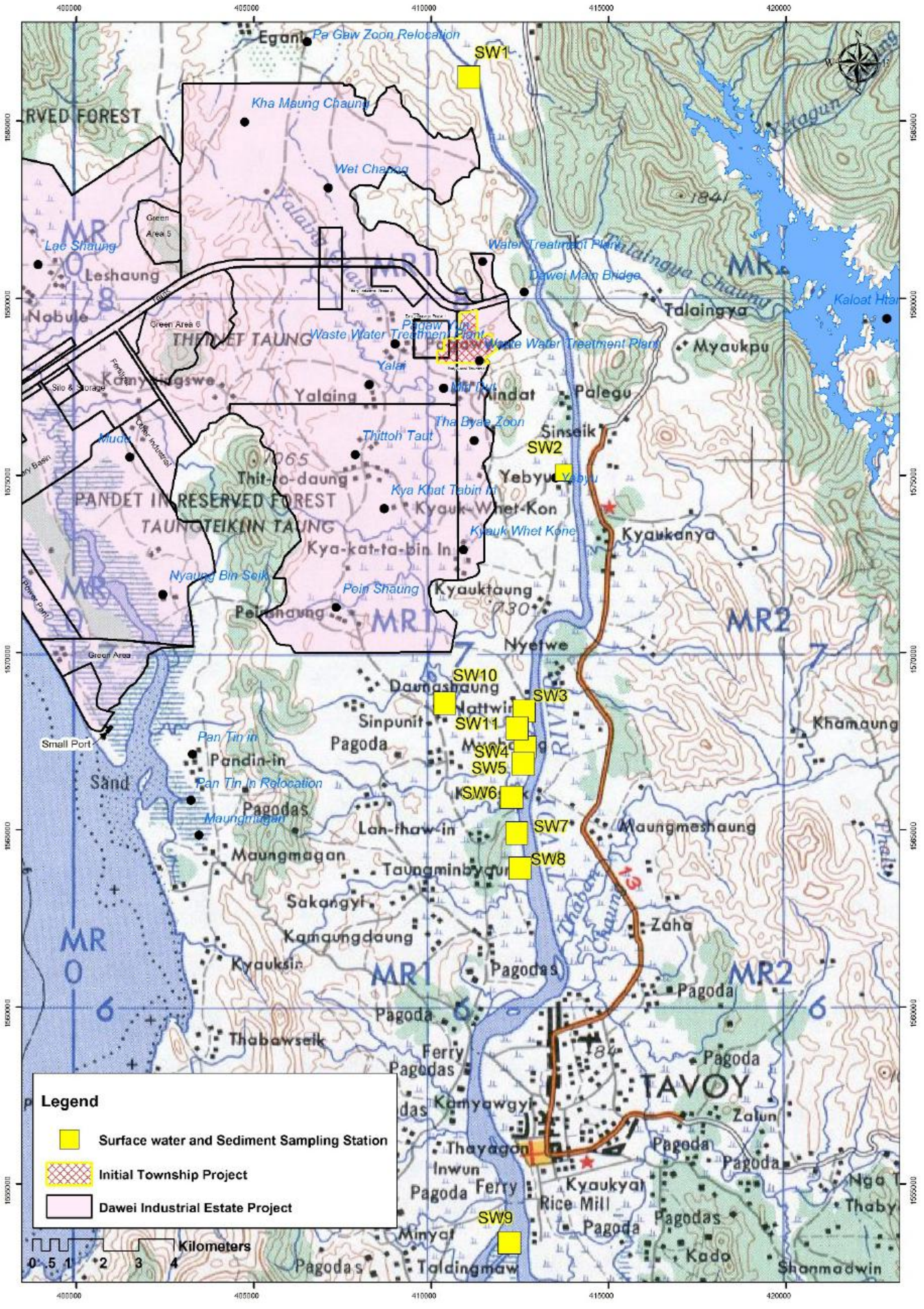


Figure 5.2-23 Reviewed Surface Water and Sediment Quality Sampling Stations

Table 5.2-22 Reviewed Method of Examination of Surface Water and Sediment Quality

Parameter	Method of Examination	Sampling Station
Surface Water		
pH	pH meter	S1-S15
Temperature	Thermometer	
DO	Azide modification or membrane electrode method	
Conductivity	Conductivity meter	
Turbidity	Turbidimeter or nephelometric method	
Salinity	Electrical conductivity method	S5-S15
Total Hardness	-	S1-S4
TS	Drive at 103-105 ^{o}C	S1-S15
Total Suspended Solids	Total suspended solids dried at 103-105 ^{o}C	S5-S15
Total Dissolved Solids	Total dissolved solids dried at 180 ^{o}C	
BOD_5	Azide modification or membrane electrode method	S1-S15
COD	Potassium dichromate digestion or open reflux method	
PO_4^{3-}	Ascorbic acid	
TKN	Kjeldahl method	
NO^{3-}	Kjeldahl or cadmium reduction method	
NH3-N	Cadmium reduction or phenate method	
Oil and Grease	Soxhlet extraction method	
Phenol	Distillation, 4-aminoantipyrine Method	S5-S15
TPH	Soxhlet Method	
Fe	Nitric acid digestion and direct air acetylene flame method	
Cd	AA or ICP or nitric acid digestion and direct air acetylene flame method	S1-S15
Hg	AA or ICP	
Mn	AA or ICP or nitric acid digestion and direct air acetylene flame method	
Ni	AA or ICP or nitric acid digestion and direct air acetylene flame method	
Pb	AA or ICP or nitric acid digestion and direct air acetylene flame method	
Zn	AA or ICP	S1-S4
Cr^{+6}	Extraction and direct air acetylene flame method	S5-S15
Cu	Nitric acid digestion and direct air acetylene flame method	
As	Hydride generation AAS method	
Cyanide	Distillation, pyridine-barbituric acid method	

Table 5.2-22 Reviewed Method of Examination of Surface Water and Sediment Quality (Cont.)

Parameter	Method of Examination	Sampling Station
Surface Water (Cont.)		
Total Coliform Bacteria	Multiple tube fermentation technique	S1-S15
Faecal Coliform Bacteria	Multiple tube fermentation technique	S5-S15
E. coli	Multiple tube fermentation technique	S1-S15
Water Level/Depth/ Width	Depth meter	S5-S15
Flow rate	Flow meter	
Sediment		
Texture (% Sand, %Silt, %Clay)	Hydrometer	S1-S4
Particle size	Sieve analysis and hydrometer test	S5-S15
Oil & Grease	Soxhlet extraction method	S1-S15
Iron	AAS	
Arsenic	AAS	
Lead	AAS	
Zinc	AAS	
Nickel	AAS	
Cadmium	AAS	S5-S15
Total Chromium	AAS	
Copper	AAS	
Mercury	AAS	

Source: EIA for Main Road (SEATEC 2012c) and draft EIA for Dawei Industrial Estate Project (SEATEC in association with UAE, 2012)

Results of the Previous Studies

Overall results of surface water quality measurement during the dry season (SW1-SW4) were not significantly different from the wet season excepting turbidity, total solids, and COD that were a bit different between the seasons. The concentration of water quality for the two stations in Dawei River were almost always higher than the canal, especially considering total solids, COD, and TKN (Table 5.2-23). The results of COD in some stations were unusually high (5,929 and 96,595 mg./L.), while the BOD at the same stations were not escalated compared with other stations. This was most likely a result of high turbidity and solids in samples rather than contamination of organic pollutions in the water.

Sampling stations of surface water (SW1 and SW2 in Table 5.2-23) covered a more extended reach of Dawei River as the representative of upstream sampling. Moreover, two sampling stations (SW3 and SW4) in Kunchaung River of which wastewater from the project area might be disposed were included in the baseline monitoring.

The surface water sampling was conducted in December 2012 Table 5.2-23 along Dawei River (SW5-SW13) and Kunchaung River (SW14-SW15). In Dawei River, most of parameters complied with the proposed surface water standard excepting phenol at SW5-SW12 and manganese at SW13. In Kunchaung River, most of the parameters complied with the proposed standard excepting phenol at both SW14 and SW15.

At SW13, the manganese concentration (2.08 mg/L) was Higher than the standard limit (<1.0 mg/L). The manganese level is commonly low in natural surface water but the source of manganese in the area is possibly from domestic wastewater discharge, industrial waste (iron, steel, acid mine drainage), as well as use of pesticides in the vicinity of Dawei City.

Most of phenol monitoring results in Table 5.2-24 excepting station SW13 was greater than the standard limit (≤0.005 mg/L). Causes may be from a property of phenol and phenol use in various industries. A claimed property of phenol is that phenol can be dissolved in water as well (http://www.siamchemi.com/).

Upstream of the project along Dawei River at SW5, total solids content was rather low, which increased towards downstream especially at SW13 which was close to Dawei City. A similar changes were observed in other parameters such as coliform (TCB, FCB and E.Coli), nitrate-nitrogen, TKN, zinc, cadmium and iron. However, these parameters were still in compliance with the proposed standard (Table 5.2-24).

The surface water sampling was conducted in March 2013 at the same stations along Dawei River (SW1-SW9) and Kunchaung River (SW14-SW15). Water appeared to be very turbid with much higher level of total solids (about 5 to 20 times higher) than that of the sampling in December 2012. Salinity levels were noticeable in most sampling stations excepting SW5 and SW6. For both Dawei River and Kunchaung River, several parameters were not in compliance with the proposed standard, namely: BOD, ammonia-nitrogen, phenols, manganese, and some heavy metals in certain stations (Table 5.2-25). Phenols were also detected in many stations but at lower levels than the sampling in December 2012. Moreover, at SW6, the highest total solids and turbidity were observed with some heavy metals (zinc, copper, lead and nickel) were slightly higher than the standard, possibly due to turbidity of water and/or associated resuspended sediments. Heavy metals were often influenced by sediment.

The results of sediment monitoring show that the physical character of the sediment at SW1 and SW3 was mostly sand, while the sediment at SW2 and SW4 was mixed with equal portions of sand, silt, and clay. The quality of the sediment samples found that almost all samples in Dawei River had less concentration of sediment than the samples in the canal within the project area in this previous measurement, especially heavy metal; however, all analyzed data were well within sediment quality guidelines.

Table 5.2-23 Reviewed Result of Surface Water Sampling in March 2012 and May 2012

Parameter	Unit	Dry Season (March 2012)				Wet Season (May 2012)			
		SW1	SW2	SW3	SW4	SW1	SW2	SW3	SW4
pH	-	6.0	6.0	5.3	6.3	5.6	5.8	5.3	5.9
Temperature	ºC	28.6	28.5	28.6	28.3	27.7	27.1	27.6	27.0
DO	mg/l	5.5	6.5	5.9	6.2	6.1	5.7	5.1	5.4
Conductivity	µS/cm. at 25ºC	1,771	1,608	4,762	134	1,721	1,598	4,570	172
Turbidity	NTU	31,125	6,200	8.5	2.8	680	576	18.75	6.25
Total Hardness	ppm. as $CaCO_3$	439	159	351	5	417	117	333	5
Total Solids	mg/l	51,293	10,900	3,524	75	1,607	1,515	3,168	77
BOD_5	mg/l	6.0	5.0	1.0	1.0	5	4	1	1
COD	mg/l	96,595	5,929	19	11	18	16	8	6
PO_4^{3-}	ppm. as PO_4	0.067	0.094	0.008	0.005	0.065	0.058	0.006	0.004
TKN	mg/l	28	30.24	1.16	1.04	19.68	19.21	1.13	1.08
NO_3^-	mg/l	0.502	0.414	<0.001	0.049	0.310	0.300	<0.001	0.001
NH_4-N	mg/l	<0.005	<0.005	0.056	<0.005	0.010	0.009	0.002	0.002
Oil and Grease	mg/l	N/D	N/D	N/D	N/D	N/D	N/D	N/D	N/D
Cd	mg/l	0.083	0.034	0.015	<0.002	3.110	3.032	0.013	0.094
Hg	mg/l	0.102	0.0052	<0.0001	<0.0001	0.0019	0.0050	<0.0001	<0.0001
Mn	mg/l	3.591	0.782	0.018	0.018	1.320	0.998	0.198	0.040
Ni	mg/l	0.827	0.178	0.076	0.025	0.014	<0.01	<0.01	<0.01
Pb	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Zn	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total Coliform Bacteria	MPN/100 ml	2,100	<2	900	1000	640	93	230	280
E. coli	CFU/ml	7	<2	<2	<2	<2	<2	<2	<2

Source: EIA for Main Road (SEATEC 2012c)

Table 5.2-24 Reviewed Result of Surface Water Sampling in December 2012

Parameter	Unit	SW5	SW6	SW7	SW8	SW9	SW10	SW11	SW12	SW13	SW14	SW15	Standard [1/]
pH	-	6.2 (at 28 ^{o}C)	6.8 (at 28 ^{o}C)	6.7 (at 28 ^{o}C)	6.7 (at 28 ^{o}C)	6.7 (at 28 ^{o}C)	6.8 (at 28 ^{o}C)	6.6 (at 28 ^{o}C)	6.7 (at 28 ^{o}C)	6.9 (at 29 ^{o}C)	6.2 (at 30 ^{o}C)	6.1 (at 28 ^{o}C)	5.0-9.0
Temperature	^{o}C	28	28	28	28	28	28	28	28	29	30	28	change not over 3°C
Turbidity	NTU	2.1	195	200	200	220	170	220	340	3,200	65	80	-
Electrical Conductivity	umho/cm	40 (AT 28 ^{o}C)	36 (AT 28 ^{o}C)	42 (AT 28 ^{o}C)	40 (AT 28 ^{o}C)	40 (AT 28 ^{o}C)	40 (AT 28 ^{o}C)	41 (AT 28 ^{o}C)	42 (AT 28 ^{o}C)	213 (AT 29 ^{o}C)	29 (AT 30 ^{o}C)	48 (AT 28 ^{o}C)	-
Salinity	ppt	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-
DO	mg/L	6.2	6.1	6.0	6.0	6.1	6.1	6.2	6.1	6.6	5.6	4.6	≥ 4
BOD	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	≤ 2
COD	mg/L	<5.0	27.3	15.4	20.0	18.4	16.8	21.3	24.3	152	15.4	12.6	-
Total Solids	mg/L	61.8	625	403	511	522	468	626	680	4,538	359	198	-
TSS	mg/L	8.0	538	319	416	423	361	511	604	4,203	284	132	-
TDS	mg/L	43	73	27	33	35	34	33	55	175	68	44	-
Ammonia-Nitrogen	mg/L NH_3-N	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	≤ 0.5
Cyanide	mg/L CN^-	<0.001	0.003	<0.001	<0.001	<0.001	<0.001	<0.001	0.003	<0.001	0.004	<0.001	≤ 0.005
Nitrate-Nitrogen	mg/L NO_3-N	0.04	0.05	0.05	0.06	0.03	0.03	0.06	0.07	0.16	<0.02	0.03	≤ 5
Phenols	mg/L	0.026*	0.012*	0.019*	0.021*	0.006*	0.016*	0.015*	0.015*	<0.005	0.019*	0.006*	≤ 0.005
Total Kjeldahl Nitrogen	mg/L	<1	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ	2	9	<1	2	-
Fat, Oil And Grease	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-
Arsenic	mg/L As	0.0013	0.002	0.0007	0.0017	0.0013	<0.0003	0.0011	0.0017	0.0005	0.0017	<0.0003	≤ 0.1
Manganese	mg/L Mn	0.026	0.346	0.262	0.313	0.297	0.26	0.336	0.516	2.08*	0.18	0.152	≤ 1
Mercury	mg/L Hg	0.0008	0.0008	0.0005	<0.0002	<0.0002	0.0003	0.0004	0.0006	0.0009	0.0008	0.0005	≤ 0.002
Zinc	mg/L Zn	0.07	0.052	0.047	0.050	0.052	0.073	0.06	0.062	0.282	0.038	0.030	≤ 1

Table 5.2-24 Reviewed Result of Surface Water Sampling in December 2012 (Cont.)

Parameter	Unit	SW5	SW6	SW7	SW8	SW9	SW10	SW11	SW12	SW13	SW14	SW15	Standard [1/]
Cadmium	mg/L Cd	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.038	<0.003	<0.003	≤ 0.005- ≤ 0.05
Copper	mg/L Cu	<0.003	<LOQ (0.006)	<LOQ (0.008)	0.010	<LOQ (0.008)	<LOQ (0.008)	<LOQ (0.008)	<LOQ (0.006)	<0.003	<0.003	<0.003	≤ 0.1
Hexavalent Chromium	mg/L Cr^{6+}	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	≤ 0.5
Lead	mg/L Pb	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	≤ 0.5
Nickel	mg/L Ni	<LOQ (0.010)	<LOQ (0.016)	<0.005	<LOQ (0.014)	<LOQ (0.014)	<LOQ (0.016)	<LOQ (0.016)	<LOQ (0.014)	<LOQ (0.015)	<LOQ (0.011)	<LOQ (0.008)	≤ 0.1
Iron	mg/L Fe	0.508	13.4	9.87	13.4	13.6	9.11	7.6	20.3	99.6	8.88	5.45	-
TCB	MPN/ 100 mL	330	79	110	230	490	230	330	700	3,300	790	230	≤ 20,000
FCB	MPN/ 100 mL	33	49	79	130	26	230	22	460	1,700	490	4.0	≤ 4,000
E.Coli	MPN/ 100 mL	33	17	None	27	4.0	230	4.0	49	1,700	490	4.0	-
Phosphate-Phosphorus	mg/L PO_4 -P	<0.03	0.03	0.04	0.04	0.18	0.05	0.08	0.06	0.12	0.06	0.03	-
TPH	mg/L	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-
Flow Rate	m^3/s	22.903	46.069	57.581	58.329	60.932	76.056	87.801	101.359	92.956	1.042	2.044	-
Depth	m	5.6	5.0	3.8	4.2	3.2	3.3	3.4	2.0	2.1	7.0	1.6	-
Width	m	7.5	150	196	180	184	209	230	395	386	7	23	-
Sample condition													
Water Colour/ Turbid	-	Colourless/ Clear	Brown / Turbid	Brown/ Turbid	Brown/ Turbid	Brown/ Turbid	Brown/ Turbid	Brown/ Turbid	Brown/ Turbid	Brown/ Turbid	Yellow/ Clear	Brown/ Turbid	-
sediment	-	Brown	Brown	Brown	Brown	Brown	Brown	Brown	Brown	Brown	Yellow	Brown	-

Remark [1/] Thailand Surface Water Quality Standard, Class 3
* The result did not comply with standard

Another previous sediment measurement in Dawei River was also sampled in December 2012 and March 2013. Physical characteristics of sediment in Dawei River from SW5 to SW11 indicated that the sediments of both sampling period were mostly clay (52.1-66.4% and 55.3-68.9%, respectively). But the sediments of SW12 from the both samplings were different: mostly clay (58.9%) and sand (38.4%) during the sampling in December 2012 and combination of sand (43.8%), clay (32.2%) and silt (20.0%) during the sampling in March 2013. For SW13, the sediment was mostly sand from both sampling periods (58.3, and 74.9%, respectively), with a composition of more sand and hardly any clay (0%) from the sampling in March 2013. The different physical compositions of sediment from SW13 were probably due to river bank erosion and port activities as observed in the area (Figure 5.2-24)

Figure 5.2-24 SW13: River Bank Erosion and Small Port Activity

Chemical characteristics of sediments from both sampling events in December 2012 and March 2013 from upstream to downstream are variable. The levels of each parameter tended to be lower at downstream location. Noted that most of heavy metal concentrations detected in sediment were arsenic, zinc, copper, iron, lead, nickel and total chromium, but all results were far below the proposed sediment quality guideline (Table 5.2-26 and Table 5.2-28).

In comparison with Dawei River sediments results from the previous study excepting SW13, the physical characteristics were similar. Heavy metals have been found in previous and current studies with similar variations for iron, nickel, lead levels. However, in this study the levels of arsenic (0.139-3.01 mg/kg) and zinc (5.51-62.4 mg/kg) were much higher than the concentrations found in previous study (<0.005 mg/kg for arsenic and 8.46-8.51 mg/kg for zinc).

(b) Results from Baseline Monitoring

<u>Baseline Monitoring Methodology</u>

- Conduct surface water quality and sediment sampling during 27 February 2015 and 23 March 2015. The surface water and sediment quality will be collected and analyzed at 6 sampling stations. The sampling locations are shown in Table 5.2-29 and Figure 5.2-25.

The surface water quality parameters and analysis methods of those parameters are presented in Table 5.2-30.

Surface Water Sampling Method

Surface water sampling method is complied with the Standard Methods for the Examination of Water and Wastewater (APHA, AWWA, and WEF, 2012) (Figure 5.2-26). Surface water sampling was performed by grab sampling method at mid-depth level of the middle width of river excepting fat, oil and grease samples, using surface grab sampling, and TCB and FCB which were collected at 30 cm under water surface. Some physical parameters including water depth, pH, water temperature, electrical conductivity and salinity and flow rate were measured at site by depth meter, electric pH meter, thermometer, conductivity meter and flow meter, respectively. All portable meters were calibrated at the sampling site before measuring.

To protect any contamination at site during sampling, scientists has to wear flour free rubber gloves. Mercury (Hg) samples were collected in Pyrex glass (Teflon Cap) and samples for other heavy metals were collected in polyethylene bottle. Samples for suspended solids and biochemical oxygen demand were collected in the same polyethylene bottle. Fat, oil and grease samples were separately collected at surface level by glass bottle.

All samples were specifically preserved. Labels were attached, all sample information were recorded in field log book and chain of custody and all bottles were kept in cool conditions before shipping to UAE Laboratory for analysis within recommended holding times.

Sediment Sampling Method

Sediment samples were collected by using Peterson Dredge Sampler (Figure 5.2-27).The position of all sampling locations determined at the time the grab sampler contacts the bottom using handheld GPS. All locations recorded as latitude and longitude based on the World Geodetic System (WGS) Datum of 1984.

Samples for chemical and physical analyses were collected from the top 2 cm. of each sediment sample. Sediment samples were then kept cool immediately after collection, and shipped to the UAE laboratory for analysis.

Table 5.2-25 Reviewed Result of Sediment Sampling in March 2013

Parameter	Unit	SW5	SW6	SW7	SW8	SW9	SW10	SW11	SW12	SW13	SW14	SW15	Standard 1/
pH	-	7.3 (AT 31 ºC)	7.3 (AT 31 ºC)	7.1 (AT 30 ºC)	7.4 (AT 30 ºC)	7.3 (AT 30 ºC)	7.3 (AT 30 ºC)	7.3 (AT 30 ºC)	7.4 (AT 30 ºC)	7.2 (AT 31 ºC)	7.5 (AT 25 ºC)	7.4 (AT 28 ºC)	5.0-9.0
Temperature	ºC	31	31	30	30	30	30	30	30	31	35	28	change not over 3ºC
Turbidity	NTU	2,900	16,500	50.0	70.0	130	110	140	85.0	55.0	2,300	95.0	-
Electrical Conductivity	umho/cm	66 (AT 31 ºC)	294 (AT 31 ºC)	2,536 (AT 30 ºC)	2,258 (AT 30 ºC)	2,368 (AT 30 ºC)	2,607 (AT 30 ºC)	2,378 (AT 30 ºC)	2,343 (AT 30 ºC)	20,210 (AT 31 ºC)	462 (AT 35 ºC)	1,398 (AT 28 ºC)	-
Salinity	ppt	0.0	0.0	1.2	1.0	1.1	0.9	1.1	1.1	10.6	0.2	0.7	-
Depth	m	3.0	.2.0	2.5	2.0	2.5	2.0	2.5	1.0	2.0	0.3	0.7	-
DO	mg/L	6.2	4.9	5.2	5.2	4.7	5.1	5.2	5.3	5.7	6.2	5.5	4
BOD	mg/L	4.9*	3.7*	1.1	2.1*	1.6	1.2	2.1*	<1.0	<1.0	2.9*	1.9	2
COD	mg/L	169	590	73.7	97.6	75.7	122	285	201	75.7	131	135	-
Total Solids	mg/L	5,627	25,454	2,220	2,535	3,588	4,260	9,660	5,265	14,143	3,310	5,661	-
TSS	mg/L	5,346	24,715	674	1,035	2,512	3,706	8,118	4,578	1,089	3,152	5,149	-
TDS	mg/L	206	264	1,473	1,335	1,328	1,135	1,394	1,416	13,640	320	733	-
Ammonia-Nitrogen	mg/L NH_3-N	1.12*	1.16*	0.55*	<0.5	0.57*	0.89*	0.78*	0.79*	0.62*	0.79*	0.65*	0.5
Cyanide	mg/L CN^-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.006*	0.004	0.007*	0.008*	0.005
Nitrate-Nitrogen	mg/L NO_3-N	0.15	0.41	0.66	0.70	0.71	0.68	0.76	0.70	0.32	0.02	0.29	5
Phenols	mg/L	0.023*	0.010*	<0.005	<0.005	0.006*	0.007*	<0.005	0.010*	<0.005	0.006*	0.009*	0.005
Total Kjeldahl Nitrogen	mg/L	15	57	2	4	5	5	12	8	2	11	11	-
Fat, Oil And Grease	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	<1.0	-
Arsenic	mg/L As	0.0293	<0.0003	0.0048	0.0032	<0.0003	<0.0003	<0.0003	0.0030	0.0022	0.0032	0.0026	0.1
Manganese	mg/L Mn	4.51*	11.3*	0.356	0.468	0.915	1.66*	4.60*	2.04*	0.581	1.32*	2.31*	1

Table 5.2-25 Reviewed Result of Sediment Sampling in March 2013 (Cont.)

Parameter	Unit	SW5	SW6	SW7	SW8	SW9	SW10	SW11	SW12	SW13	SW14	SW15	Standard [1/]
Mercury	mg/L Hg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0006	<0.0002	<0.0002	0.002
Zinc	mg/L Zn	0.376	1.29*	0.058	0.092	0.175	0.254	0.433	0.260	0.056	0.230	0.344	1
Cadmium	mg/L Cd	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.005-0.05
Copper	mg/L Cu	0.052	0.149*	<LOQ (0.006)	<LOQ (0.010)	<LOQ (0.023)	0.032	0.054	0.034	<LOQ (0.008)	0.030	0.044	0.1
Hexavalent Chromium	mg/L Cr^{6+}	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.5
Lead	mg/L Pb	0.250	0.575*	<0.010	<LOQ (0.024)	<LOQ (0.072)	0.116	0.202	0.122	0.114	0.111	0.146	0.5
Nickel	mg/L Ni	0.078	0.293*	<0.005	<LOQ (0.016)	<LOQ (0.036)	<LOQ (0.049)	0.084	<LOQ (0.054)	<LOQ (0.009)	<LOQ (0.012)	0.070	0.1
Iron	mg/L Fe	146	488	21.8	34.0	0.151	133	203	149	24.6	6.58	200	-
TCB	MPN/ 100 mL	1,300	1,300	2,300	490	790	490	490	490	1,300	4,600	140	20,000
FCB	MPN/ 100 mL	490	1,300	790	330	490	490	130	330	1,300	2,300	140	4,000
E.Coli	MPN/ 100 mL	490	220	280	230	230	490	130	330	79	2,300	140	-
Flow Rate	m^3/s	14.448	14.999	62.728	57.394	68.921	63.702	59.130	55.026	74.370	0.500	0.650	-
Phosphate-Phosphorus	mg/L PO_4 -P	0.24	0.62	0.03	0.04	0.04	0.05	0.04	<0.03	<0.03	0.08	0.06	-
TPH	mg/L	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-
Width	m	75	150	196	180	184	209	230	395	386	2.5	23	-
Sample condition													
Water Colour/ Turbid	-	Brown / Turbid	Brown / Turbid	Brown / Turbid	Brown / Turbid	Brown / Turbid	Brown / Turbid	Brown / Turbid	Brown / Turbid	Brown / Turbid	Yellow / Turbid	Brown / Turbid	-
sediment	-	Brown	Brown	Brown	Brown	Brown	Brown	Brown	Brown	Brown	Yellow	Brown	-

Remark [1/] Thailand Surface Water Quality Standard, Class 3
* The result did not comply with standard

Table 5.2-26 Secondary data of Surface Water Sampling in March 2013

Parameter	Unit	SW1	SW2	SW3	SW4	Sediment Quality Criteria for the Protection of Aquatic Life* (PEL)
1. Texture						
- Sand	%	95	36	95	28	
- Silt	%	4	38	4	38	
- Clay	%	1	26	1	34	
- Texture	-	S	L	S	CL	
2. Oil & Grease	mg/kg	868	657	747	677	-
3. Iron	mg/kg	40,724	41,226	4,615.2	59,327	-
4. Arsenic	mg/kg	<0.005	<0.005	<0.005	<0.005	17
5. Lead	mg/kg	32.52	32.27	2.12	12.84	91.3
6. Zinc	mg/kg	8.463	8.510	<0.05	0.344	315
7. Nickel	mg/kg	16.18	16.58	1.23	5.85	-

Source: EIA for Main Road (SEATEC 2012c)

* Canadian sediment quality guidelines for the protection of aquatic life: summary table, Canadian Council of Ministers of the Environment (CCME), http://www.ccme.ca/publications/ceqg_rcqe.html

Table 5.2-27 Reviewed Resultof Sediment Sampling in December 2012

Parameter	Unit	SW5	SW6	SW7	SW8	SW9	SW10	SW11	SW12	SW13	Standard [1/]
Particle size											
Gravel (>2.00mm.)	%	0	0.3	1	0.1	0.3	0	0	0.4	16	-
Sand (0.063-2.00 mm.)	%	0.9	5.4	3.9	0.8	0.3	1.3	3.9	2.3	58.3	-
Silt (0.002-0.063mm)	%	35.8	29.5	34.9	42.5	47.3	45.0	29.7	38.4	10.6	-
Clay (<0.002mm.)	%	63.3	64.8	60.2	56.6	52.1	53.7	66.4	58.9	15.1	-
Fat, Oil and Grease	mg/kg	345	103	243	286	184	268	589	743	366	-
Arsenic (As)	mg/kg	2.05	2.09	3.01	1.64	2.57	1.79	2.21	1.85	0.980	17.0
Mercury (Hg)	mg/kg	0.163	0.130	< 0.100	< 0.100	< 0.100	< 0.100	< 0.100	< 0.100	< 0.100	0.486
Zinc (Zn)	mg/kg	56.3	62.4	52.6	39.7	59.5	33.5	53.0	42.8	12.9	315
Cadmium (Cd)	mg/kg	< 0.600	< 0.600	< 0.600	< 0.600	< 0.600	< 0.600	< 0.600	< 0.600	< 0.600	3.53
Copper (Cu)	mg/kg	10.9	10.1	9.30	7.18	13.8	5.76	10.1	7.72	2.53	197
Iron (Fe)	mg/kg	30,424	34,500	28,363	20,500	28,589	16,263	19,523	21,063	8,253	-
Lead (Pb)	mg/kg	33.7	26.1	39.3	31.5	48.1	27.7	36.7	31.8	4.92	91.3
Nickel	mg/kg	16.9	19.7	14.1	11.8	17.4	9.44	15.1	11.5	5.00	36
Total Chromium (Cr)	mg/kg	18.3	16.1	14.4	10.9	17.8	10.6	12.4	9.18	2.92	90
Sample condition		Brown Sediment	Brown Sediment	Brown Sediment	Brown Sediment	Brown Sediment	Brown Sediment	Brown Sediment	Brown Sediment	Brown Sediment	

Remark [1/] NOAA Screening Quick Reference Table, 1999 accessed from http://archive.orr.noaa.gov on 15 December 2012

Table 5.2-28 Reviewed Result of Sediment Sampling in March 2013

Parameter	Unit	SW5	SW6	SW7	SW8	SW9	SW10	SW11	SW12	SW13	Standard [1/]
Particle size											
Gravel (>2.00mm.)	%	0	0	0.4	0	0	0	0	4	18.3	-
Sand (0.063-2.00 mm.)	%	1.7	8.2	2.5	13.0	0.9	2.4	2.5	43.8	74.9	-
Silt (0.002-0.063mm)	%	29.4	29.5	31.0	31.4	33.5	33.1	29.2	20.0	6.8	-
Clay (<0.002mm.)	%	68.9	62.3	66.1	55.6	65.6	64.5	68.3	32.2	0	-
Fat, Oil and Grease	mg/kg	291	288	33	196	91	518	263	144	46	-
Arsenic (As)	mg/kg	2.07	2.80	1.13	1.80	2.01	1.89	0.644	1.35	0.139	17.0
Mercury (Hg)	mg/kg	< 0.100	< 0.100	0.193	< 0.100	< 0.100	< 0.100	0.327	< 0.100	< 0.100	0.486
Zinc (Zn)	mg/kg	46.4	53.4	35.0	48.1	46.2	45.8	34.7	30.6	5.51	315
Cadmium (Cd)	mg/kg	< 0.600	< 0.600	< 0.600	< 0.600	< 0.600	< 0.600	< 0.600	< 0.600	< 0.600	3.53
Copper (Cu)	mg/kg	7.64	8.48	5.09	8.28	6.49	5.95	4.92	5.06	0.745	197
Iron (Fe)	mg/kg	23,038	27,562	15,673	23,957	23,108	24,622	16,858	13,724	3,583	-
Lead (Pb)	mg/kg	24.4	17.9	12.0	18.2	15.4	17.1	12.1	18.6	<3.10	91.3
Nickel	mg/kg	10.4	12.0	7.96	10.3	13.0	9.50	7.96	6.27	<2.0	36
Total Chromium (Cr)	mg/kg	13.3	16.0	11.6	16.7	12.4	17.2	10.0	8.35	2.28	90
Sample condition		Brown Sediment	Brown Sediment	Brown Sediment	Brown Sediment	Brown Sediment	Brown Sediment	Brown Sediment	Brown Sediment	Brown Sediment	

Remark : [1/] NOAA Screening Quick Reference Table, 1999 accessed from http://archive.orr.noaa.gov on 15 December 2012

Table 5.2-29 Summary Locations of Surface Water and Sediment Monitoring Stations

Environmental Monitoring	GPS		
	UTM WGS84	East (X)	North (Y)
1. TS-SW1 (discharge point at the north of the project at KM 18+500)	47P	412177	1579948
2. TS-SW2 (upstream at Yalai Chaung at meeting point of Yalai Chaung and canal (that receiving wastewater from discharge point at south of the project))	47P	409343	1571341
3. TS-SW3 (downstream at Yalai Chaung at meeting point of Yalai Chaung and canal (that receiving wastewater from discharge point at south of the project))	47P	409827	1568570
4. TS-SW4 (Dawei River at the boundary of the project area at Ta Nyin In village)	47P	408665	1589930
5. TS-SW5 (Dawei River (at about 500 meters upstream from the Yang Gaeng bridge))	47P	412694	1580700
6. TS-SW6 (Dawei River (at about 500 meters downstream from the Yang Gaeng bridge))	47P	412866	1579580

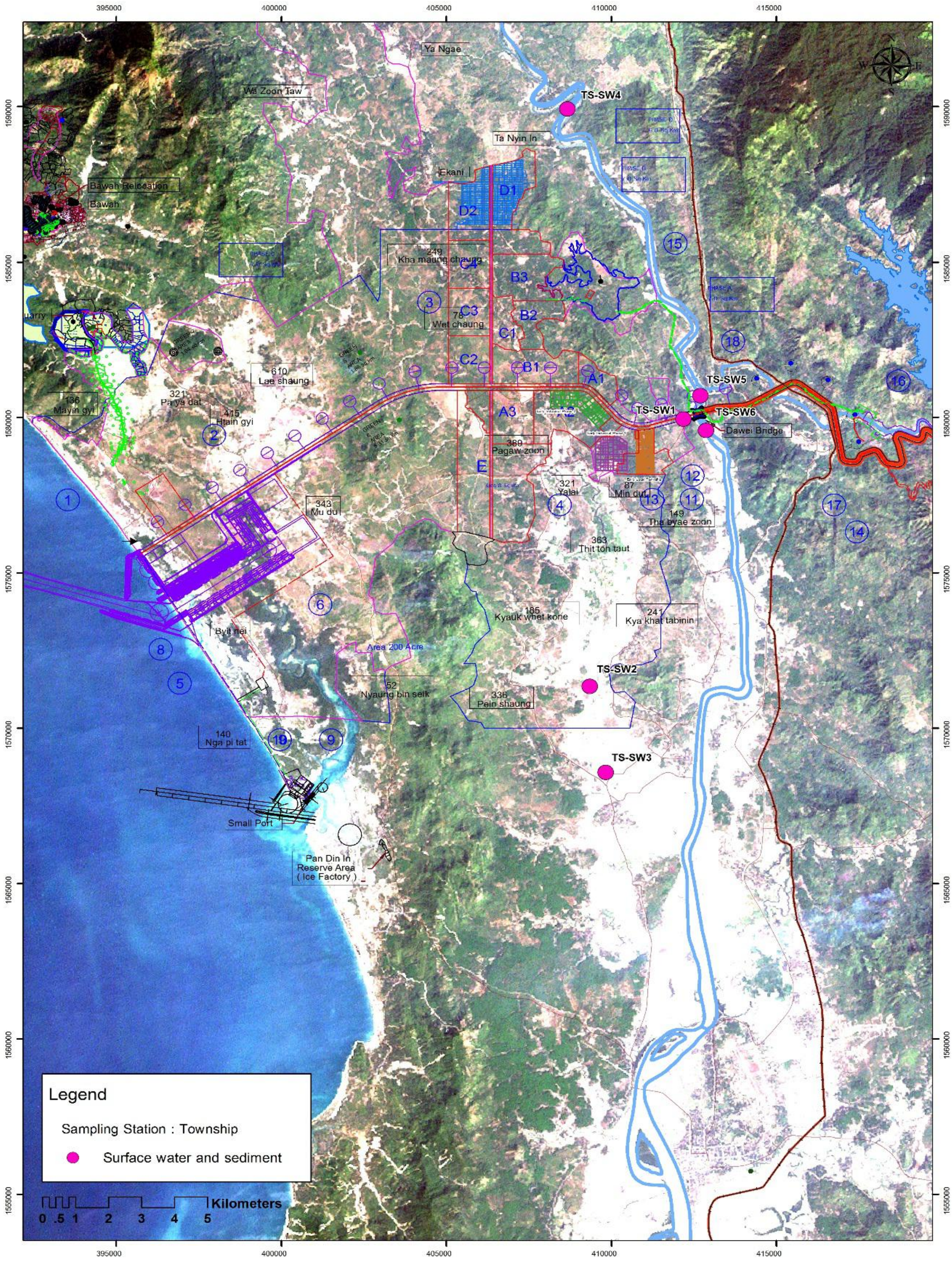


Figure 5.2-25 Surface Water and Sediment Quality Sampling Stations in this Report

Table 5.2-30 Analysis Method of Surface Water and Sediment Quality Parameters

Parameters	Analysis Method	Sampling Station
Surface Water		
Depth	Depth meter	TS-SW1 – TS-SW6
Width	Measuring tape	
Temperature	Thermometer	
Flow Rate	Flow meter	
pH	Electrometric method at site	
Salinity	Electrical conductivity method	
Electrical Conductivity	Electrical conductivity method	
Dissolved Oxygen (DO)	Azide modification method	
Biochemical Oxygen Demand (BOD)	Azide modification method	
Turbidity	Nephelometric method	
Chemical Oxygen Demand (COD)	Open reflux method	
Suspended Solids (SS)	Suspended solids dried at 103-105 ^{o}C	
Total Dissolved Solids (TDS)	Total dissolved solids dried at 180 ^{o}C	
Total Solids (TS)	Total solids dried at 103-105 ^{o}C	
Nitrate-Nitrogen	Cadmium reduction method	
Ammonia-Nitrogen	Phenate method	
Phosphate -Phosphorus	Ascorbic acid method	
Total Kjeldahl Nitrogen (TKN)	Kjeldahl method	
Fat, Oil and Grease	Soxhlet extraction method	
Phenol	Distillation, 4-aminoantipyrine method	
Total Petroleum Hydrocarbons (TPH)	Soxhlet extraction method	
Iron	Nitric acid digestion and direct air acetylene flame method	
Manganese	Nitric acid digestion and direct air acetylene flame method	
Cadmium	Nitric acid digestion and direct air acetylene flame method	
Hexavalent Chromium	Colourimetric method	
Lead	Nitric acid digestion and direct air acetylene flame method	
Nickel	Nitric acid digestion and direct air acetylene flame method	
Copper	Nitric acid digestion and direct air acetylene flame method	
Zinc	Nitric acid digestion and direct air acetylene flame method	
Cyanide	Distillation, pyridine-barbituric acid method	
Arsenic	Hydride generation AAS method	
Mercury	Cold vapour AAS method	
Total Coliform Bacteria (TCB)	Multiple tube fermentation technique	
Faecal Coliform Bacteria (FCB)	Multiple tube fermentation technique	
E.Coli	Multiple tube fermentation technique	
Sediment [2/]		
Arsenic	Acid digestion and hydride generation AAS method	TS-SW1 – TS-SW6
Mercury	Acid digestion and cold vapourAAS method	
Zinc	Acid digestion and direct air acetylene flame method	
Cadmium	Acid digestion and direct air acetylene flame method	
Copper	Acid digestion and direct air acetylene flame method	
Iron	Acid digestion and direct air acetylene flame method	
Lead	Acid digestion and direct air acetylene flame method	
Nickel	Acid digestion and direct air acetylene flame method	
Total Chromium	Acid digestion and direct air acetylene flame method	

Surface Water Sampling Method

Surface water sampling method is complied with the Standard Methods for the Examination of Water and Wastewater (APHA, AWWA, and WEF, 2012) (Figure 5.2-26). Surface water sampling was performed by grab sampling method at mid-depth level of the middle width of river excepting fat, oil and grease samples, using surface grab sampling, and TCB and FCB which were collected at 30 cm under water surface. Some physical parameters including water depth, pH, water temperature, electrical conductivity and salinity and flow rate were measured at site by depth meter, electric pH meter, thermometer, conductivity meter and flow meter, respectively. All portable meters were calibrated at the sampling site before measuring.

To protect any contamination at site during sampling, scientists has to wear flour free rubber gloves. Mercury (Hg) samples were collected in Pyrex glass (Teflon Cap) and samples for other heavy metals were collected in polyethylene bottle. Samples for suspended solids and biochemical oxygen demand were collected in the same polyethylene bottle. Fat, oil and grease samples were separately collected at surface level by glass bottle.

All samples were specifically preserved. Labels were attached, all sample information were recorded in field log book and chain of custody and all bottles were kept in cool conditions before shipping to UAE Laboratory for analysis within recommended holding times.

Sediment Sampling Method

Sediment samples were collected by using Petersen Dredge Sampler (Figure 5.2-27).The position of all sampling locations determined at the time the grab sampler contacts the bottom using handheld GPS. All locations recorded as latitude and longitude based on the World Geodetic System (WGS) Datum of 1984.

Samples for chemical and physical analyses were collected from the top 2 cm. of each sediment sample. Sediment samples were then kept cool immediately after collection, and shipped to the UAE laboratory for analysis.

TS-SW1 : Discharge Point at the North of the Project	TS-SW2 : Upstream at Yalai Chaung Conference of Yalai Chaung and Canal (that Receiving Wastewater From Discharge Point at the South of the Project)
TS-SW3: Downstream at Yalai Chaung Conference of Yalai Chaung and Canal (that Receiving Wastewater from Discharge Point at the South of the Project)	TS-SW4: Dawei River (at the Boundary of the Project Area, Ta Nyin In Village)
TS-SW5: Dawei River (about 500 m Upstream from the Yang Gaeng Bridge)	TS-SW6: Dawei River (about 500 m Downstream from the Yang Gaeng Bridge)

Figure 5.2-26 Surface Water Sampling

TS-SW1 : Discharge Point at the North of the Project

TS-SW2 : Upstream at Yalai Chaung Conference of Yalai Chaung and Canal (that Receiving Wastewater from Discharge Point at the South of the Project)

TS-SW3: Downstream at Yalai Chaung Conference of Yalai Chaung and Canal (that Receiving Wastewater from Discharge Point at the South of the Project)

Figure 5.2-27 Sediment Sampling

TS-SW4: Dawei River (at the Boundary of the Project Area, Ta Nyin In Village)

TS-SW5: Dawei River (about 500 m Upstream from the Yang Gaeng Bridge)

TS-SW6: Dawei River (about 500 m Downstream from the Yang Gaeng Bridge)

Figure 5.2-27 Sediment Sampling (Con't)

Surface Water and Sediment Baseline Monitoring Results

Sampling stations of surface water in this study covered the Dawei River from upstream to downstream of the project boundary. The surface water sampling was conducted on 27 February 2015 along Dawei River. Most of parameters complied with the proposed surface water standard; excepting DO at TS-SW1, BOD at TS-SW1 and TS-SW2, phenol at TS-SW1 and TS-SW5, arsenic, manganese and lead at TS-SW4 - TS-SW6, mercury at TS-SW1 and TS-SW4 - TS-SW5, nickel at TS-SW5 and TS-SW6 and TCB and FCB at TS-SW2 and TS-SW3 (Table 5.2-31) and **Annex 5-2** Surface water Quality and Sediment Analysis Report).

The DO and BOD at TS-SW1 and TS-SW2 did not comply with such standard which may be possibly from animal husbandry.

Various types of industries: oil, coal, metallurgic, chemical production, explosive, dyes, palm oil mill as well as textile, and also degradation of pesticides, and/or natural occurrence may cause phenol contaminations in the surface water (Michalowies and Duda, 2007). In side of heavy metal measurement such as manganese and nickel were higher than such standard; it may be possibly due to similar sampling season with previous sampling in dry season in 2012 and in 2015.

Majority of water contamination from bacteria in forms of total coliform and fecal coliform is from local activities such as domestic wastewater discharge and animal husbandry.

Sediment quality in Dawei River was also sampled on 27 February 2013. Chemical characteristic of sediment in Dawei River from TS-SW1 to TS-SW6 indicated that chemical characteristics from upstream and downstream were variable (Table 5.2-31). Most of parameters complied with the proposed surface water standard; excepting mercury in every sampling station. With the exception of mercury ore deposits, the amount of mercury that naturally exists in any one place is usually very low. In contrast, the amount of mercury that may be found in soil at a particular hazardous waste site because of human activity can be high (over 200,000 times natural levels) (Public Health Statement (MERCURY), Agency for Toxic Substances and Disease Registry, 1999) (Table 5.2-32).

Table 5.2-31 Result of Surface Water Sampling in February and March 2015

Parameter	Unit	TS-SW1	TS-SW2	TS-SW3	TS-SW4	TS-SW5	TS-SW6	Standard 1/
pH	-	6.6 (AT 25 ºC)	6.6 (AT 31 ºC)	6.2 (AT 29 ºC)	7.6 (AT 29 ºC)	7.7 (AT 30 ºC)	7.6 (AT 30 ºC)	5.0-9.0
Temperature	ºC	25	31	29	29	30	30	change not over 3ºC
Turbidity	NTU	19.0	3.7	4.7	6,000	7,900	7,900	-
Electrical Conductivity	umho/cm	29.5 (AT 25 ºC)	21.0 (AT 32 ºC)	38.8 (AT 29 ºC)	66.7 (AT 29 ºC)	594 (AT 25 ºC)	519 (AT 30 ºC)	-
Salinity	ppt	0	0	0	0	0.2	0.2	-
DO	mg/L	3.8*	5.5	4.8	5.2	5.1	4.9	4
BOD	mg/L	2.1*	2.3*	1.6	1.5	1.0	ND	2
COD	mg/L	12.9	16.7	9.5	174	164	154	-
Total Solids	mg/L	56	45	38.8	5,114	5,590	4,800	-
SS	mg/L	18.0	10.6	6.9	4,270	5,179	4,735	-
TDS	mg/L	<25	26	27	127	528	370	-
Ammonia-Nitrogen	mg/L NH_3-N	0.07	<0.04	0.05	<0.04	<0.04	0.05	≤ 0.04
Cyanide	mg/L CN^-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	≤ 0.005
Nitrate-Nitrogen	mg/L NO_3-N	<LOQ	0.02	ND	0.08	0.32	0.29	≤ 5
Phenols	mg/L	0.007*	<0.005	<0.005	<0.005	0.020*	<0.005	≤ 0.005
TKN	mg/L	<LOQ (1.5)	<LOQ (1.5)	<LOQ (1.5)	9.7	10.4	8.1	-
Fat, Oil And Grease	mg/L	2	2	2	3	2	2	-
Arsenic	mg/L As	0.0087	0.0009	0.0010	0.0268*	0.0155*	0.0200*	≤ 0.01
Manganese	mg/L Mn	0.160	<LOQ (0.0005)	0.070	4.08*	3.02*	3.00*	≤ 0.005
Mercury	mg/L Hg	0.0030*	0.0002	0.0004	0.0026*	0.0021*	0.0016	≤ 0.002
Zinc	mg/L Zn	0.111	<0.005	<0.005	0.384	0.508	0.594	≤ 1
Cadmium	mg/L Cd	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	≤ 0.005 , ≤ 0.05
Copper	mg/L Cu	<0.003	<0.003	<0.003	0.037	0.040	0.048	≤ 0.1
Hexavalent Chromium	mg/L Cr^{6+}	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	≤ 0.001
Lead	mg/L Pb	<0.010	<0.010	<0.010	0.168*	0.125*	0.129*	≤ 0.05
Nickel	mg/L Ni	<LOQ (0.005)	<LOQ (0.005)	<0.005	0.090	0.112*	0.132*	≤ 0.005
Iron	mg/L Fe	7.44	2.10	0.766	472	222	1,150	-
TCB	MPN/ 100 mL	49	160,000*	>160,000*	330	2,300	410	≤ 20,000
FCB	MPN/ 100 mL	49	160,000*	160,000*	330	2,300	350	≤ 4,000
E.Coli	MPN/ 100 mL	49	7,900	160,000	330	2,300	350	-
Phosphate-Phosphorus	mg/L PO_4 -P	<0.03	<0.03	<0.03	0.08	0.03	<0.03	-
TPH	mg/L	<1	1	<1	1	2	2	-

Table 5.2-31 Result of Surface Water Sampling in February and March 2015 (Cont.)

Parameter	Unit	TS-SW1	TS-SW2	TS-SW3	TS-SW4	TS-SW5	TS-SW6	Standard 1/
Flow Rate	m^3/s	0.252	0	0	23.044	40.503	27.867	-
Depth	m	1.6	2.0	1.6	2.0	6.0	3.0	-
Width	m	8.0	80.0	6.0	84	124	124	-
Sample condition								
Water colour/ Turbid sediment	-	Brown / Clear Brown	Yellow / Turbid Brown	Yellow / Turbid Brown	Yellow / Turbid Brown	Yellow / Turbid Brown	Yellow / Turbid Brown	-

Remark 1/ Thailand Surface Water Quality Standard, Class 3
ND = Not Detected
- No data / No standard
* The result did not comply with standard

Table 5.2-32 Result of Sediment Sampling in February and March 2015

Parameter	Unit	TS-SW1	TS-SW2	TS-SW3	TS-SW4	TS-SW5	TS-SW6	Standard 1/
Arsenic (As)	mg/kg	9.160	4.24	3.26	9.39	9.78	10.4	17.0
Mercury (Hg)	mg/kg	0.501*	1.23*	1.35*	1.11*	1.74*	1.27*	0.486
Zinc (Zn)	mg/kg	22.2	49.5	74.4	58.6	75.2	70.6	315
Cadmium (Cd)	mg/kg	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	3.53
Copper (Cu)	mg/kg	8.15	16.1	9.14	8.15	9.75	10.2	197
Iron (Fe)	mg/kg	12,811	17,022	25,072	26,597	32,243	32,558	-
Lead (Pb)	mg/kg	29.8	49.3	40.0	35.0	42.8	46.2	91.3
Nickel	mg/kg	8.15	18.1	19.4	18.2	22.3	21.7	36
Total Chromium (Cr)	mg/kg	9.84	10.2	11.8	16.0	15.2	13.9	90
Sample condition		Brown Sediment	Brown Sediment	Brown Sediment	Brown Sediment	Brown Sediment	Brown Sediment	

Remark 1/ NOAA Screening Quick Reference Table, 1999 accessed from http://archive.orr.noaa.gov on 15 December 2012
* The result did not comply with standard

5.3 BIOLOGICAL COMPONENTS

5.3.1 Surface Water Biology (Aquatic Ecology and Fisheries Activities)

5.3.1.1 Study Area

The possible adverse effects of a developing project on the surface water biology have to be determined prior to the implementation of the project. After reviewing the master plan, the project will discharge treated wastewater from wastewater treatment plant.

The wastewater treatment plant will discharge treated wastewater to small canal and will run through Dawei River. Therefore, the study area will cover the upstream and downstream of the proposed discharge point.

5.3.1.2 Baseline Surface Water Biology

Results from Previous Survey and Studies

The previous studies in the project area that can be referenced to include:

- Environmental Impact Assessment (EIA) for Main Road (SEATEC, 2012c).
- Draft Environmental Impact Assessment for Dawei Industrial Estate Project (SEATEC in association with UAE, 2012)

The baseline conditions of the surface water biology from the previous study are summarized below.

Plankton

In December 2012, 50 species of phytoplankton were found. Diatom was the dominant taxa, of which *Thalassiosira, Coscinodiscus, Synedra, Pleurosigma* and *Surirella* were the most abundant. The total abundance of phytoplankton ranged between 1,482,876 to 9,837,697 units/cu.m. and diversity index of phytoplankton ranged between 1.032 to 2.45.

Twenty- one species of zooplankton were identified. Tintinnopsis and Arcella (protozoan) were the most abundantly found in all stations. The total abundance of zooplankton ranged between 9,204 to 94,832 units/ cu. m. ,and diversity species index of zooplankton ranged between 0.849 to 2.017.

In March 2013, 36 species of phytoplankton were found. Diatom was the dominanttaxa, of which *Thalassiosira, Coscinodiscus, Synedra, Pleurosigma* and *Surirella* were the most abundant, similar to December 2012,the total abundance of phytoplankton were between 571,999 to 53,200,535 units/cu.m.,and diversity species index of phytoplankton were between 0.881 to 1.730.

9 species of zooplankton were identified. Nauplius of Copepod and Arcella (protozoan) were the most abundantly found. The total abundance of zooplankton was between 24,267 to 545,867 units/ cu. m. and diversity species index of zooplankton ranged between 0.000 to 1.565.

As indicated by Wilhm and Dorris (1968), the diversity index (H’) is related to surface water quality. In December 2012 the average diversity index was 1.918, while in March 2013, the average index was 1.255. Both diversity index results imply that during these two sampling

periods the water quality of Dawei River were at moderate conditions and acceptable for aquatic organisms.

Benthos

In December 2012, 8 species of benthos were found. of which segmented worms were dominant in all stations. The total density of benthos ranged between 0 to 45 individuals/sq.m.

In March 2013, 6 species of benthos were found of which segmented worms were dominant in all sampling stations, The total density of benthos were between 0 to 70 individuals/sq.m.

Littoral Fauna

In December 2012, 6 families of littoral fauna were found, of which freshwater shrimp was dominant. The total density of littoral fauna was between 3 to 12 individuals/sq.m.

In March 2013, 3 families of littoral fauna were found, of which freshwater shrimp was also dominant. The total density of littoral fauna was between 2 to 9 individuals/sq.m.

Aquatic Flora

Aquatic flora samples were collected during in December 2012 and March 2013. A total of 13 species of aquatic flora were found in both sampling periods. *Actinoscirpus grossus* (coarse bulrush) were dominant in freshwater zone station *Acanthus ebracteatus* (sea holly) and *Nypa fructicans* (nipa palm) were dominant in tidal zone station.

Fish

In December 2012, 25 fish species were found, of which Goby (Gobiidae) was dominant. The total density of fish were between 750 and 13,800 individuals/hectare, and the total abundance of fishes were between 4.036 and 58.6 kg./hectare.

In March 2013, total of 15 fish species were found, of which Goby (Gobiidae) was also dominant. The total density of fish were between 400 to 2,850 individuals/hectare, and the total abundance of fish were between 0.708 to 29.763 kg./hectare.

Total of 28 freshwater and brackish fish species were found, with more brackish species found in the second sampling survey. The heaviest fishes found in both sampling periods consist of Needle fish, Goby, Paradise fish, Croaker, Barramundi (White seabass) and Snakehead.

Fisheries Activities

Fisheries Activities in Dawei River

Two pushnet boats and two set bag nets were used as the fishing gear by the fishermen during both sampling survey. Moreover, gillnet and lined hook are small fishing gear also being used to catch fishes for household consumption.

Results from Baseline Monitoring

Baseline Monitoring Methodology

27 February 2015 and 23 March 2015. The phytoplankton, zooplankton, benthic fauna, littoral fauna, aquatic flora and fishes were collected and analyzed at 6 sampling stations. The sampling locations are shown in Table 5.3-1 and Figure 5.3-1 to Figure 5.3-2

The surface water biology parameters and analysis methods of those parameters are summarized in Table 5.3-2.

Table 5.3-1 Summary Locations of Surface Water Biology Monitoring Stations

Environmental Monitoring	GPS		
	UTM WGS 84	East (X)	North (Y)
TS-SW1 : Discharge Point at the North of the Project	47P	412177	1579948
TS-SW2 : Upstream At Yalai Chaung Conference of Yalai Chaung and Canal (that Receiving Wastewater from Discharge Point at the South of the Project)	47P	409343	1571341
TS-SW3: Downstream at Yalai Chaung Conference of Yalai Chaung and Canal (that Receiving Wastewater from Discharge Point at the South of the Project)	47P	409827	1568570
TS-SW4: Dawei River (at the Boundary of the Project Area, Ta Nyin In Village)	47P	408665	1589930
TS-SW5: Dawei River (about 500 m Upstream from the Yang Gaeng Bridge)	47P	412694	1580700
TS-SW6: Dawei River (about 500 m Downstream from the Yang Gaeng Bridge)	47P	412866	1579580

Table 5.3-2 Sampling Methodology of Surface Water Biology Parameters

Parameters	Method[1/]	Sampling Station
Fishes	Collected by Seining. All samples were separated and preserved in 10 % formation solution and brought back to UAE Laboratory for identification (Figure 5.3-1)	TS-SW1: Discharge Point at the North of the Project TS-SW2: Upstream at Yalai Chaung Conference of Yalai Chaung and Canal (that Receiving Wastewater from Discharge Point at the South of the Project) TS-SW3: Downstream at Yalai Chaung Conference of Yalai Chaung and Canal (that Receiving Wastewater from Discharge Point at the South of the Project) TS-SW4: Dawei River (at the Boundary of the Project Area, Ta Nyin In Village) TS-SW5: Dawei River (about 500 m Upstream from the Yang Gaeng Bridge)
Plankton	Both 21 and 70 micron mesh size. Plankton nets were used to collect phytoplankton and zooplankton samples respectively at each sampling location. In case the river is very shallow, 30 liters of water at about 30 cm. below the surface will be poured through the plankton net. Plankton sample remaining in the net was transferred and kept in a plastic bottle and preserved in 5% formalin solution and brought back to the UAE laboratory for species identification and abundance estimate (Figure 5.3-2)	
Benthos	A Petersen dredge of 0.25 sq.ft mouth opening was used to collect benthic fauna. Three grab samples were collected at each sampling station. Collected sediment was observed, then washed and sorted through a series of wire sieves. All samples collected were kept in plastic bottle and preserved in 5% formalin solution and brought back to the UAE laboratory for their group identification and number estimate (Figure 5.3-3)	
Littoral Fauna	A sweep-net method (D-frame net with 30 cm x 20 cm opening) was used to collect the aquatic fauna. The collector stood in the river about 1.5 m from the water's edge. Working in an upstream direction, the net was swept 10 times near the substratum surface (for one sample) while moving forward. Each sweep is about 1 m at right angles to the bank and in water between 1 and 1.5 m. depth. All substrata were collected. The net contents were washed to the bottom of the net, the net was inverted, and the contents were emptied into a bucket, rinsing off any material remaining on the net and empty the bucket to a 0.5 mm mesh sieve. The contents of the sieve were placed in a sorting tray, adhering material was rinsed off with clean water, and the sample was dispersed in the water. Any animals clinging to the net were picked off and added to the tray. All animals were removed from the sorting tray in the field using forceps and pipettes, and placed into plastic jars containing 70% alcohol. The sample jars were labeled with site name, location code, date, and replicate number then shipped back to the laboratory for specie identification. (Figure 5.3-4)	TS-SW6: Dawei River (about 500 m Downstream from the Yang Gaeng Bridge)
Aquatic Flora	Around each sampling station , aquatic flora were observed and recorded its density was roughly estimated as followed: Abundance (or xxx): occupies 66.67-100.00% in about 500 sq.m. area. Moderatee (or xx): occupies 33.34-66.66% in about 500 sq.m. area. Sparse (or x): occupies 00.00-33.33 % in about 500 sq.m. area.	

Remark: [1/] APHA, AWWA and WEF. Standard Methods For The Examination of Water And Wastewater. 22nd ed. Washington, DC: APHA. 2012.

Figure 5.3-1 Fishes Sampling

Figure 5.3-2 Plankton Sampling

Figure 5.3-3 Benthos Sampling

Figure 5.3-4 Littoral Fauna Sampling

Surface Water Biology Baseline Monitoring Results

During the first sampling period in February 2015, 35 species of phytoplankton were found in station TS-SW01 - ST-SW03. Range of species in TS-SW1 - TS-SW3 stations were 8- 25- five species. Green Algae and Diatom was the dominant taxa, of which *Phacus, Trachelomonas* and *Dinobryon* were the most abundant in TS-SW1. *Xanthidium, Micrasterias* and *Spondylomorum* were the most abundant in TS- SW2. *Mougeotia, Xanthidium* and *Micrasterias* were the most abundant in TS- SW3. The total abundance of phytoplankton ranged between 379,999 to 33,976,365 units/ cu. m. and diversity index of phytoplankton ranged between 1.730 to 2.270 (Table 5.3-3). and **Annex 5-3** Surface Water Biology Analysis Report

Phytoplankton samples collected in TS- SW1 - ST- SW3 in February 2015 were identified and tabulated in Table 5.3-3. Total of 6 classes were found, consisting of Cyanophyceae (blue green algae with 6 species), Chlorophyceae (green algae with 18 species) Euglenophyceae (euglenoids with 3 species) Bacillariophyceae (diatom with 6 species) Chrysophyceae (yellow brown algae with 1 species) and Dinophyceae (dinoflagellate with 1 species).

Table 5.3-3 The Results of Aquatic Organism in the Water Resource near the Project Area

Aquatic Organism	Result					
	TS-SW1	TS-SW2	TS-SW3	TS-SW4	TS-SW5	TS-SW6
Phytoplankton						
Total Abundance (Units/m^3)	379,999	3,812,168	33,976,365	9,876,900	8,370,000	10,214,400
Amount of Species	8	25	24	18	13	15
Diversity Index	1.73	2.27	2.10	1.17	1.44	1.31
Dominant Genera	*Euglena*	*Xanthidium*	*Mougeotia*	*Cyclotella*	*Cyclotella*	*Cyclotella*
Zooplankton						
Total Abundance (Units/m^3)	198,000	371,250	1,179,550	180,987	129,000	137,600
Amount of Species	9	16	16	2	3	2
Diversity Index	1.27	2.12	1.54	0.23	1.06	0.63
Dominant Genera/Group	*Anuraeopsis*	Nauplius of Copepod	Nauplius of Copepod	Nauplius of Copepod	Nauplius of Copepod	Nauplius of Copepod
Benthic Fauna						
Total Density (Individuals/m^2)	29	36	29	44	7	15
Amount of Species	3	4	3	3	1	1
Dominant Family/Group	Chiromonidae	Chiromonidae	Thiaridae	Corbiculidae	Cerithidae	Palaemonidae
Littoral Fauna						
Total Density (Individuals/m^2)	54	26	226	142	176	64
Amount of Species	4	4	2	3	3	3
Dominant Family/Group	Palaemonidae	Palaemonidae	Palaemonidae	Palaemonidae	Palaemonidae	Palaemonidae

25 species of phytoplankton were found in station TS-SW4 - TS-SW6 (Kunchaung and Dawei River). Range of species in TS-SW4 - TS-SW6 stations was 13 – 18 species. Green Algae and Diatom was the dominant taxa, of *which Cyclotella, Oscillatoria* and *Thalassioseira* were the most abundant in TS- SW4. *Cyclotella, Coscinodiscus* and *Thalassioseira* were the most abundant in TS-SW5. *Cyclotella, Coscinodiscus* and *Surirella* were the most abundant in TS-SW06. Total abundance of phytoplankton ranged between 8,370,000 to 10,214,400 units/cu.m. and diversity index of phytoplankton was 1.170 to 1.440 (Table 5.3-3).

Phytoplankton samples collected in TS-SW4 - TS-SW6 were identified and tabulated in Table 5.3-3. Total of 5 classes were found, consisting of Cyanophyceae (blue green algae with 1 species, Chlorophyceae (green algae with 5 species) Euglenophyceae (euglenoids with 1 species) Bacillariophyceae (diatom with seventeen species) and Dinophyceae (dinoflagellate with 1 species).

21 species of zooplankton were identified. Range of number of species per sample at TS-SW1 to TS-SW3 stations were 9-16 species. Protozoa and copepod were the most abundantly found in all stations. The total abundance of zooplankton ranged between 371,250 to 1,179,550 units/cu.m. and diversity index was 1.270 to 2.120 (Table 5.3-3).

Zooplankton samples collected in TS-SW1 - TS-SW3 were identified and tabulated in **Table 5.3-3.** Total of 5 phyla were found, consisting of Protozoa (protozoan with 4 species),

Nematoda (nematod with 1 species) Gastrotricha (gastrotrich with 1 species) Rotifera (rotifer with 8 species) and Arthropoda (crustaceans with 5 species).

Only 3 species in 3 phyla of zooplankton were found in station TS-SW4 – TS-SW6 (Kunchaung and Dawei River) and were identified and tabulated in Table 5.3-3 (Protozoa, Rotifera and Arthropoda). The total abundance of zooplankton ranged between 129,000 to 180,987units/cu.m. and diversity index was 0.230 to 1.440 (Table 5.3-3).

As indicated by Wilhm and Dorris (1968), the diversity index (H') is related to surface water quality1. The diversity index of phytoplankton of TS-SW1 - TS-SW3 was 1.730 to 2.270 while the index of phytoplankton of TS-SW4 - TS-SW6 was 1.170 to 1.440. The diversity index of zooplankton of TS-SW1 - TS-SW3 was 1.270 to 2.120 while the indexof zooplankton of TS-SW4 - TS-SW6 was 0.230 to 1.440. Diversity index results imply that the water quality of water resource near the project area was at moderate conditions and acceptable for aquatic organisms.

Benthic Fauna (Benthos)

5 families of benthos were found in station TS-SW1 - TS-SW3. Ranges of benthos families in TS-SW1-TS-SW3 stations were 3-4 families, of which blood worms was dominant in TS-SW1 and TS-SW2 stations. Snail was dominant in TS-SW3 stations. The total density of benthos ranged between 29 to 36 individuals/sq.m. (Table 5.3-3).

Benthos samples collected in TS-SW1 - TS-SW3 were identified and tabulated in Table 5.3-3. Total of 3 classes were found, consisting of Crustacea (shrimp with 1 family), Insecta (insect Larva with 3 families) and Gastropoda (snail with 1 family)

4 families of benthos were found in station TS-SW4 - TS-SW6 (Kunchaung and Dawei River). Ranges of benthos families in TS-SW4 - TS-SW6 stations were 1-3 families, of which calms (bivalves) was dominant in TS-SW4 station. Snail was dominant in TS-SW5 station. And shrimp was dominant in TS-SW6 station. The total density of benthos ranged between 7 - 44 individuals/sq.m. (Table 5.3-3).

Benthos samples collected in TS-SW4 - TS-SW6 were identified and tabulated in Table 5.3-3. Total of 3 classes were found consisting of Crustacea (shrimp with 2 families), Gastropoda (snail with 1 family) Pelecypoda (bivalve with 1 family).

Littoral Fauna

5 families of littoral fauna were found in station TS-SW1 – TS-SW3. Ranges of benthic families in TS-SW1 - TS-SW3 stations were 2-4 families, of which shrimp was dominant in all stations. The total density of littoral fauna ranged between 26- 226 individuals/ sq. m. (Table 5.3-3).

Littoral Fauna samples collected in TS-SW1 - TS-SW3 were identified and tabulated in Table 5.3-3. Total of 5 classes were found, consisting of Crustacea (Shrimp with 1 family), Insecta (Insect Larva with 3 families) and Gastropoda (Snail with 1 family).

4 families of littoral fauna were found in station TS-SW4 - TS-SW6 (Kunchaung and Dawei River). Ranges of benthic species in TS-SW4 - ST-SW6 stations were 3 families in all station, of which shrimp was dominant in all station. The total density of littoral fauna ranged between 64 to 176 individuals/sq.m. (Table 5.3-3).

Littoral fauna samples collected in TS-SW4 – TS-SW6 were identified and tabulated in **Table 5.3-3**. Total of 3 classes were found consisting of Crustacea (Shrimp with 2 families), Gastropoda (Snail with 1 family) and Pelecypoda (Bivalve with 1 family).

Aquatic Flora

Aquatic flora samples collected in February 2015, were identified and shown in Table 5.3-4 . A total of 15 species of aquatic flora found in all station, ranging from 2-6 species per sample in TS-SW1 to TS-SW6 stations, *Actinoscirpus grossus* (coarse bulrush) were dominant in station TS-SW4 to TS-SW6*. Uticularia aurea* (golden bladderwort) were dominant in TS-SW2 and TS-SW3, and *Brachiaria mutica* (signalgrass) were dominant in TS-SW2 the dominant species of aquatic flora were shown in Table 5.3-4 and Figure 5.3-5.

Table 5.3-4 The Results of Aquatic Flora in The Water Resource near The Project Area

Aquatic Flora	TS-SW1	TS-SW2	TS-SW3	TS-SW4	TS-SW5	TS-SW6
Family Poaceae						
Brachiaria mutica	-	+++	+	+	-	-
Leersia hexandra	+	-	-	++	-	-
Hygroryza aristata	-	-	+	-	-	-
Family Polygonidae						
Polygonum tomentosum	-	-	-	++	-	-
Family Menyanthaceae						
*Nymphoides*sp.	-	+	++	-	-	-
Family Cyperaceae						
Actinoscirpus grossus	-	-	-	+	+	+
Lepironia articulata	-	-	++	-	-	-
Family Acanthaceae						
Acanthus ebracteatus	-	-	-	-	+	+
Family Lentibulariaceae						
Uticularia aurea	-	++	++	-	-	-
Family Araceae						
Cryptocoryne ciliata	-	-	-	-	-	
Colocasia esculenta	-	-	-	-	-	
Lasia spinosa	+	-	-	-	-	
Family Rhizophoraceae						
Rhizophora apiculata	-	-	-	-	+	+
Family Pandanaceae						
Pandanus tectorius	-	+	+	-	+	+
Family Arecaceae						
Nypa fruticans	-	-	-	-	+	+
Amount of Species	**2**	**4**	**6**	**4**	**5**	**5**

TS-SW1 : Discharge Point at the North of the Project	TS-SW2 : Upstream at Yalai Chaung Conference of Yalai Chaung and Canal (that Receiving Wastewater from Discharge Point at the South of the Project)
TS-SW3: Downstream at Yalai Chaung Conference of Yalai Chaung and Canal (that Receiving Wastewater from Discharge Point at the South of the Project)	TS-SW4: Dawei River (at the Boundary of the Project Area, Ta Nyin In Village)
TS-SW5: Dawei River (about 500 m Upstream from the Yang Gaeng Bridge)	TS-SW6: Dawei River (about 500 m Downstream from the Yang Gaeng Bridge)

Figure 5.3-5 Aquatic Flora of the Water Resource

Fish

Total of 23 fish species were found, with the range of 2-13 species in TS-SW1 to TS-SW6 stations, of which cyprinid fishes (Cyprinidae: Barb and Minnow) was dominant. The total density of fish were between 900 and 88,200 individuals/hectare, and the total abundance of fishes were between 9.335 and 66.300 kg./hectare (Table 5.3-5 and Figure 5.3-6).

Fisheries Activities

In Dawei River

Two pushnet boats and two set bag net were used as the fishing gear by the fishermen during both sampling survey. Moreover, gillnet and hook and line are small fishing gear also being used to catch fishes for household consumption. The fisheries activities in the river were shown in Figure 5.3-7.

In Canal near project area

Gillnet, fish trap, dip net, fish net and hook are small fishing gear also being used to catch fishes for household consumption in water resource. The fisheries activities in the river were shown in Figure 5.3-7.

Table 5.3-5 The Results of Fishes in The Water Resource near the Project Area

Family	Species	Common Name	Result					
			TS-SW1	TS-SW2	TS-SW3	TS-SW4	TS-SW5	TS-SW6
Notopteridae	*Notopterus notopterus*	Bronze Featherback	-	800 (5.490)	50 (0.790)	200 (7.500)	-	-
Engraulidae	*Clupeichthys aesarnensis*	River Sprat	-	-	-	200 (0.200)	-	-
Cyprinidae	*Osteochilus vittatus*	Hard-lipped Barb	5,400 (12.240)	3,500 (13.460)	-	-	-	-
	Puntius binotatus	Spotted Barb	16,200 (38.920)	500 (0.290)	550 (0.355)	-	-	-
	Rasbora spp.	Rasbora	-	1,500 (1.500)	4,500 (8.610)	-	-	-
	Rasbora trilineata	Scissortail Rasbora	62,000 (38.920)	600 (0.300)	-	-	-	-
	Cyclocheilichthys armatus	River Barb	-	3,500 (7.940)	500 (2.420)	-	-	-
	Labiobarbus siamensis	Barb	400 (1.200)	-	-	-	-	-
	Paralaubuca harmandi	Harmandi Minnow	-	-	-	1,150 (0.795)	-	-
Nandidae	*Nandus nebulosus*	Bornean Leaffish	400 (0.120)	3,700 (1.180)	1,000 (0.310)	-	-	-
	Pristolepis fasciata	Malayan Leaffish	-	400 (2.770)	50 (0.585)	-	-	-
Osphronemidae	*Trichogaster chuna*	Honey Gourami	3,400 (1.840)	2,400 (5.340)	450 (1.045)	-	-	-
Hemiramphidae	*Dermogenys pusilla*	Needle Fish	-	-	-	300 (0.120)	500 (0.110)	1,000 (0.570)
Ambassidae	*Lates calcarifer*	Barramundi	-	-	-	-	-	200 (7.420)
	Parambassis siamensis	Siamese Glassfish	-	2,300 (7.980)	200 (0.315)	350 (0.285)	-	-
Sciaenidae	*Johnius (Johnius) coitor*	Coitor Croaker	-	-	-	-	200 (20.300)	-
Siluridae	*Ompok bimaculatus*	Butter Catfish	-	-	-	-	100 (0.720)	-
Eleotridae	*Oxyeleotris marmorata*	Marble Sand Goby	-	-	50 (0.025)	-	-	-
Gobiidae	*Glossogobius aureus*	Golden Tank Goby	-	-	-	100 (0.255)	-	-
	Periopthalmodon - schlosseri	Mudskipper	-	-	-	150 (0.180)	100 (0.020)	-
Channidae	*Channa lucius*	Splendid Snakehead	-	200 (0.198)	-	-	-	-
Cobitidae	*Acantopsis choirorhynchos*	Horseface Loach	-	2,000 (0.470)	50 (0.010)	-	-	-
Aplocheilidae	*Aplocheilus panchax*	Blue Panchax	-	200 (0.110)	7,750 (2.970)	-	-	-
Total 23 species			**6**	**13**	**11**	**7**	**4**	**2**
Total Density (Individual/Hectare)			**88,200**	**21,600**	**15,150**	**2,450**	**900**	**1,200**
Total Abundance (Kg/Hectare)			**66.300**	**47.028**	**17.435**	**9.335**	**21.150**	**7.990**

TS-SW1 : Discharge Point at the North of the Project	TS-SW2 : Upstream at Yalai Chaung Conference of Yalai Chaung and Canal (that Receiving Wastewater from Discharge Point at the South of the Project)
TS-SW3: Downstream at Yalai Chaung Conference of Yalai Chaung and Canal (that Receiving Wastewater from Discharge Point at the South of the Project)	TS-SW4: Dawei River (at the Boundary of the Project Area, Ta Nyin In Village)
TS-SW5: Dawei River (about 500 m Upstream from the Yang Gaeng Bridge)	TS-SW6: Dawei River (about 500 m Downstream from the Yang Gaeng Bridge)

Figure 5.3-6 Parts of Fishes Species in Water Resource

Fish Trap	**Fish Net**
Dip Net	**Gill Net**
Boat and Push Net	**Fish Hook**

Figure 5.3-7 Fisheries Activity near Water Resource

5.3.2 Forests

5.3.2.1 Study Area

The study area will cover the project boundary together with the area potentially impacted by the project activities. For the forest study, the secondary data from the final report of the Dawei Deep Sea Port and the draft EIA for Dawei Industrial Estate Project includes the study of the wildlife and the impact on wildlife resources caused by project implementation.

5.3.2.2 Baseline Forest Conditions

The following information is reviewed for the secondary data and description of the forest conditions in the project area:

- Topographical Map of Tavoy Burma 1:250,000 Series U542, Sheet ND 47-6, Edition 1-AMS, 1957 (USACE, 1957).
- Initial Environmental Examination (IEE) for Dawei Sea Port & Industrial Estate Development (TEAM, 2012a). (Figure 5.3-8)
- Draft Environmental Impact Assessment for Dawei Industrial Estate Project (SEATEC in association with UAE, 2012)

<u>Methodology</u>

A review of secondary data, regarding forest resources, was conducted at ten plots during 14-21 December 2011. These ten stations were selected to represent areas of natural reserved forestry, within 5 km. from the study of forest temporary sampling plots, forest ecology analysis of the important value index (IVI), and species diversity specific ecosystems.

<u>Result of the Studies</u>

The types of forest around the project area can be divided into three forest types: mangrove forest, reserved forest, and natural forest (TEAM, 2012a).

Forest characteristics in the project area are divided in to four forest types: beach forest, mangrove forest; dipterocarp forest; and dry evergreen forest. The situations of the forest vary depending on the level of disturbance from human.

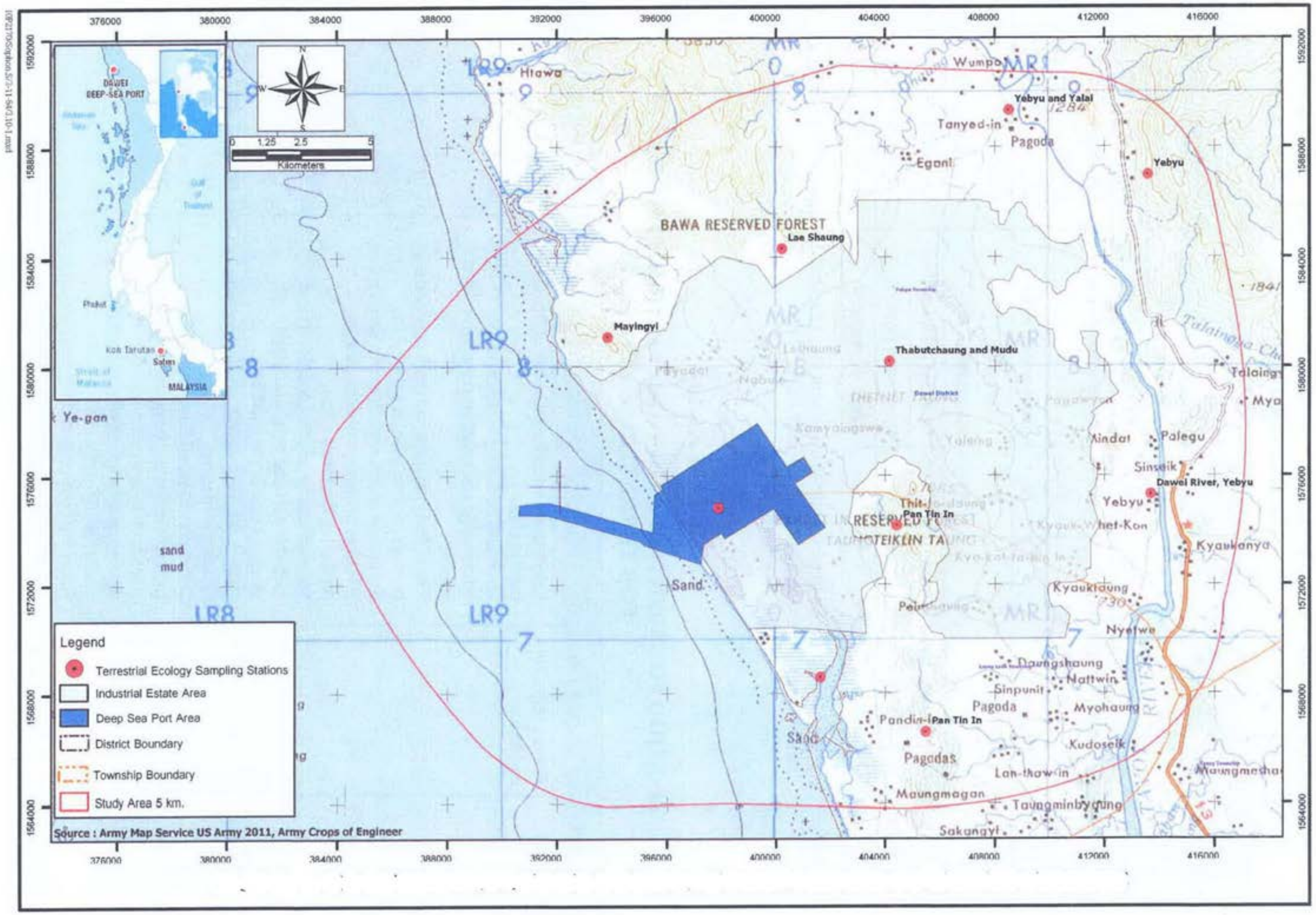


Figure 5.3-8 Forest Sampling Station from Initial Environmental Examination (IEE) for Dawei Sea Port & Industrial Estate Development (TEAM, 2012a).

Mangrove Forest

i) Forest composition

In 24 sampling plots (0.54 ha), the total number of species with GBH > 10 cm was thirteen. The dominant families of tree species were Avicenniaceae (three species), Rhizophoraceae (three species) and Fabaceae (two species). Combretaceae, Euphorbiaceae, Myrsinaceae, Plumbaginaceae and Verbenaceae have only one species respectively. The level of ecological significanceof the tree species in the area is ranked by IVI. The tree layer in the study area is dominated by *Avicennia marina* (Forssk.) Vierh., with the highest IVI of 76.09.The second most dominant species is *Excoecaria agallocha L*. (IVI = 57.14) and *Avicennia alba Blume* (IVI = 37.92) is third. The dominant mangrove species in this area were *Avicennia marina* (Forssk.) Vierh., *Excoecaria agallocha* L. and *Avicennia alba* Blume (Initial Environmental Examination (IEE) for Dawei Sea Port & Industrial Estate Development conducted).

The forest structure showed that *Rhizophora apiculata* Bl., *Heritiera littoralis* Dry., *Excoecaria gallocha* Linn. and *Olea maritima* Wall. was the dominant species. Other species such as *Bruguiera gymnorrhiza* (L.) Savigny, *Lumnitzera littorea* (Jack) Voigt and *Lumnitzera racemosa* Willd were sporadically distributed in path areas, particularly the area that saline water cannot easily reach.

The floristic structure showed that the average height of trees were about 3 – 12 m. Diameters at breast height of tree were ranged from 2 to 20 cm. Tree canopy layers were divided into upper and lower layers. The density of trees with diametersof breast height more than 60 cm. was, on average, about one tree/ha. The density of trees with diameters of breast height between 30 to 60 cm. was, on average, about 8 tree/ha. The density of trees with diametersof breast height between 10 to 30 cm. was, on average, about 72 tree/ha. Finally, the density of trees with diameters at breast height less than 10 cm. was on average, about 210 tree/ha. 14 species of tree from 12 different families were found. The dominant families of tree species were Rhizophoraceae and Combretaceae (two species). Euphorbiaceae, Labiatae, Leguminosae Caesal- pinioideae, Papilionoideae, Oleaceae, Pandanaceae, Periplocaceae, Pteridaceae, Rhamnaceae and Sterculiaceae have only one species respectively (Figure 5.3-9).

Figure 5.3-9 The Mangrove Forests

ii) Diversity indices and evenness

Among the different measurement of species diversity indices, the floristic diversity of the mangrove forest is 1.836.

iii) Status for conservation concern

One species found in the Mangrove forests is in the IUCN Red list: *Ceriops decandra* (Griff.) Ding Hou. However, the mangrove forest is far from the Township area.

iv) Forest composition

Reserved Forest

In five sampling plots, total number of species with GBH > 10 cm. was 21. The dominant families of tree species were Euphorbiaceae (five species), Annonaceae, Lauraceae, and Rubiaceae (2 species).

The ecological significance of the tree species within the study area is ranked by IVI. The tree study area is dominated by *Dipterocarpus obtusifolius* Teysm., with the highest IVI of 79.06. The second most dominant species is *Aporusa villosa* Bail. (IVI = 60.50) and *Croton joufra* Roxb. (IVI = 42.34) is third. Those species could be considered as the ecological indicator species of the reserved forest. The dominant tree species in this area were *Dipterocarpus obtusifolius* Teysm., *Aporusa villosa* Bail., *Croton joufra* Roxb., *Memecylon plebejum* Kurz and *Xylia xylocarpa* (Roxb.) Taub. The ground layer is dominated by seedlings and saplings of *Croton joufra* Roxb., *Memecylon plebejum* Kurz, *Spermacoce latifolia* Rubl. and *Kaempferia* sp.

ii) Diversity indices and evenness

According to the results, the diversity indices of individual sample plot and all sample indices are very low. Diversity value for all sample indices is 1.854.

iii) Status for conservation concern

According to the forest reserve's field survey, none of the species in the study area are assessed in the IUCN Red list:

Natural Forest

i) Forest composition

In the 19 sampling plots (0.43 ha), the total number of species with GBH > 10 cm. was 98 species. The dominant families of tree species were Euphorbiaceae (13 species), Rubiaceae (8 species), Lauraceae (6 species), Myrtaceae (5 species) and Combretaceae, Lecythidaceae, Lythraceae and Moraceae (4 species) respectively.

The ecological significance of the tree species within the study area was determined by IVI. The tree layer in the study area is dominated by *Cratoxylum ligustrinum* Blume with the highest IVI of 23.76, the second most dominant species is *Duabanga grandiflora* (Roxb. Ex DC.) Walp. (IVI = 17.86) and *Croton joufra* Roxb. (IVI = 16.48) is third. The dominant tree species in this area were *Cratoxylum ligustrinum* Blume, *Duaban gagrandiflora* (Roxb. Ex DC.) Walp. *Croton joufra* Roxb., *Aporusa villosa* Bail. and *Aporusa dioica* (Roxb) Muell. Arg. etc. The ground layer is dominated by *Lygodium* sp. (1),

Rhynchospora corymbosa (L.) Britt. *Spermacoce latifolia* Rubl. *Kaempferia* sp., *Chromolaena odorata* (L.) R.M. king & H. Robinson, Helicteres *hirtusa* Lour.*Oplismenus composites* (L.) P. Beauv. , *Panicum* sp. , *Memecylon plebejum* Kurz, *Helicteres angustifolia* L. , *Justicia procumbens* L., *Abrus precatirius* L., and *Curcuma* sp.

ii) Diversity indices and evenness

The values of diversity indices and evenness indices of the individual sample plots are relatively high. Diversity value for all samples is 3.4724.

iii) Status for conservation concern

According to the field survey of the reserved forest in the study area, one endangered tree species is *Diospyros crumentata* Thwaites. Two critically endangered species are *Dipterocarpus kerrii* King and *Dipterocarpus turbinatus* Gaertn.f, and one valuable species is *Hopea odorata* Roxb; all of which are found in the study area.

Beach Forest

Beach forest characteristics indicate that the flora has secondary growth patterns, and are disturbed by the presence of human beings. What was natural land has been turned into a Cashew Nut plantation. However, there are some natural trees species that still remain. The forest structure shows that *Casuarina equisetifolia* J.R. & G. Forst., *Syzygium grande* (Wight) Walp. var. grande and *Lannea coromandelica* Merr. are the dominant species. Other species such as *Macaranga tanarius* Muell. Arg., *Memecylon scutellatum* Naudin, *Phyllanthus emblica* Linn., *Suregada multiflorum* Baill. and *Zizyphus oenoplia* Mill. are scattered throughout the path.

The floristic structure showed an average height of trees to be about 2 – 12 m. Diameters at breast height of tree range from 3 to 25 cm. Canopy tree layers were divided into upper and lower layers. The density of trees having a diameter, at breast height, more than 60 cm. was on average about 1 tree/ha. The density of trees having a diameter, at breast height, between 30 to 60 cm. was on average about 5 trees/ha. The density of trees having a diameter, at breast height, between 10 to 30 cm. was on average about 60 trees/ha. Finally, the density of trees having a diameter, at breast height, less than 10 cm. was on average about 180 trees/ha. Tree species that were found: seventeen species from ten families including Euphorbiaceae (5 species); Anacardiaceae (1 species); Combretaceae (2 species); Melastomataceae (2 species); Casuarinaceae (1 species); Compositae (1 species); Ceguminosae-Papilionoideae (1 species); Moraceae (1 species) and Myrtaceae (1 species). The numbers of saplings and seedlings were about 280 and 320 trees/ha, respectively. There were few amounts of small trees. The data determined that the natural regeneration of the forest was rather low in quality. The main natural regeneration process of trees, after they have been disturbed or cut down, is to gain nutrients from coppice shoots. Almost all tree species have the ability to make a new shoot by coppicing.

Dry Dipterocarp Forest

Dry Dipterocarp forests in the project area (Figure 5.3-10) are unique because they are not usually distributed in zones of high precipitation, or close to the sea. It is quite uncommon to find dry dipterocarp forests in areas like the project area, simply because of the presence of moisture. We found that the reason why dry dipterocarp grew in the project area is because of the soil properties of the sand.

The lack of soil nutrition made it limiting for general tree species to grow in the area. These areas are not suitable for agriculture as they use this forest to for firewood. The dominant tree species in this area are: *Dipterovarpus obtusifolius* Teysm; *Aporusa villosa* Baill.; *Crolon joufra* Roxb.; *Memecylon plebejum* Kurz; and *Xylia xylocarpa* (Roxb.) Taub. The ground layer is dominated by seedlings and saplings of *Croton joufra* Roxb, *Memecylon plebejum* Kurz*, Spermacoce latifolia* Rubl. and *Kaempferia* sp.

The floristic structure showed that the height of trees, with Diameters at breast height of tree ranging from 3 to 22 cm. are about 3 – 11 m. Canopy tree layer were divided into upper and lower layers. The density of trees having a diameter, at breast height, more than 60 cm. were, on average, about 2 tree/ha. The density of trees having a diameter, at breast height, between 30 to 60 cm. were, on average, about 9 tree/ha. The density of trees, having a diameter at breast height between 10 to 30 cm., were on average about 69 tree/ha. Finally, the density of trees having a diameter at breast height less than 10 cm. were on average about 246 tree/ha. Fifteen different species from ten different families were found. The dominant families of tree species were: Euphorbiaceae (3 species); Dipterocarpaceae; Anacardiaceae and Myrtaceae (2 species) respectively. Rubiaceae, Barringtoniaceae, Combretaceae, Connaraceae, Leguminoceae-Mimosaceae and Sterculiaceae have only 1 species respectively. The natural regenerations by seed germination and seedling establishment were few and far between. The main process of natural regeneration was coppice from old stumps, particularly from the dominant species, Dipterovarpus obtusifolius Teysm.

Figure 5.3-10 The Characteristics of Dry Dipterocarp Forest

Dry Evergreen Forest

Dry evergreen forests are the main forest types within the project (Figure 5.3-11). However, the dry evergreen forests have been disturbed by oil palm plantations (Figure 5.3-12), rubber tree plantation (Figure 5.3-13), Cashew Nut plantations, paddy field and home gardens. The forests are within the same areas as agriculture land. Because of the agricultural land, the composition of the forests was already different from their natural composition. Almost none of the remaining tree species are pioneer species or coppice from the old stump of the mother tree. The remaining trees are small and dense coppicing trees because they were cut and utilized by the rural people. The dominant tree species in this area were *Cratoxylum ligustrinum* Blume, *Croton joufra* Roxb, *Barringtonia angusta* Kurz*, Aporusa villosa* Baill. and *Aporusa dioica* (Roxb.) Muell. Arg. The ground layer is dominated by *Lygodium* sp. (1), *Rhynchospora corymbosa* (L.) Britt. *Spermacoce latifolia* Rubl. ,*Kaempferia* sp. *Chromolaena odoraa* (L.) R.M. King & H. Robinson, *Helicteres hirsute* Lour. ,*Oplismenus composites* (L.) P. Beauv., *Panicum* sp. *Memecylon plebejum* Kurz, *Helicteres angustifolia* L., *Justicia procumbens* L., *Abrus precatorius* L. and *Curcuma* sp.

The floristic structure shows that the average height of trees range is between 3-15 m. with diameters, at breast height, ranging from 4 to 40 cm. Canopy tree layer were divided into layer as upper and lower layer. The density of trees having a diameter, at breast height, more than 60 cm. was about 3 trees/ha. The density of trees having a diameter, at breast height, between 30 to 60 cm. was about 15 trees/ha. The density of trees having a diameter, at breast height, between 10 to 30 cm. was about 85 trees/ha. Finally, the density of trees having a diameter, at breast height, less than 10 cm. was about 260 trees/ha. Twenty-eight different species of trees from 21 different families were found. The dominant families of tree species were: Euphorbiaceae (4 species); Anacardiaceae (2 species); Barringtoniaceae (2 species); Combretaceae (2 species); and Moraceae (2 species) respectively.

Figure 5.3-11 The Characteristics of Dry Evergreen Forest

Figure 5.3-12 The Characteristics of Oil Palm Plantation

Figure 5.3-13 The Characteristics of Rubber Tree Plantation

5.3.3 Wildlife

5.3.3.1 Study Area

The study area will cover the project boundary together with the area potentially impacted by the project activities. For the wildlife study, the secondary data of the wildlife and investigates the diversity, abundance, distribution, utilization, present day status of wildlife in the Project area, and the impact of project implementation are reviewed.

5.3.3.2 Baseline Wildlife Conditions

Source of Information

- Initial Environmental Examination (IEE) for Dawei Sea Port & Industrial Estate Development (TEAM, 2012a).
- Environmental Impact Assessment (EIA) for Main Road (SEATEC, 2012c).
- Draft Environmental Impact Assessment for Dawei Industrial Estate Project (SEATEC in association with UAE, 2012).

Result of the Studies

According to the study, the diversity of wildlife in and around the study area can be described in four types: reptile; amphibian; avis (birds); and mammal. Generally, the forest in project site was not fertile and a high population of people was present. Any human activity could affect the living wild animals, so the wildlife was not as diverse. Results of 2 studies are summarized in Table 5.3-6.

Table 5.3-6 Summary of Wildlife Survey Results from Previous Studies

Type	TEAM Study (2012a)	SEATEC Study (2012c)
Reptiles Species	A total of eight reptiles species were recorded during the surveyed period. Out of the recorded species, the Burmese python (*Python molurus bivittatus*) is an endangered species listed in the IUCN Red-list. The species *Python molurus bivittatus*, *Ptyas korros*, *Naja kaouthia* are listed under Annex II of the CITES list. The Burmese python (*Python molurus bivittatus*) and Green tree viper (*Trimeresurus gramineus*) were noted as forest dwellers and the remaining reptile species were recorded to inhabit other habitats. Garden fence lizard (*Calotes versicolor*) and Many-lined sun skink (*Mabuya multifasciata*) were found as common reptile species distributing in all habitats of the studied area.	A total of 20 reptile species were recorded during the survey period. The recorded species were not included in any lists. The species of reptile were classified to two orders consisting of Chelonia and Squamata, and ten families consisting of Testudinidae (one species), Gokkonidae (four species), Agamidae Scincidae (four species), Uromastycidae (three species), Varanidae (one species), Pythonidae (one species), Pythonidae (one species), Colubridae (three species), Elapidae (one species) and Viperidae (one species). Almost all reptiles that were found in the project area were living in a terrestrial forest, such as dry diptercarp forest and under growth of the dry evergreen forest, except the Water Monitor Lizard (*Varanus salvator*) which lives in the river bank area. All of reptiles that were found in the project area are known as common reptile species that are distributed in all habitats of the study area. The study area is only livable to adaptable species, because the project site has been constantly disturbed by people.
Amphibians Species	Seven amphibian species were recorded during the survey period. Among these recorded species, the Paddy frog (*Rana limnocharis*) is listed as an endemic species in Myanmar. The frogs and toads recorded are common in the study area, and large populations were observed in the paddy fields and grassland. The species *Rana limnocharis* and *Rana limnocharis* were observed in large population within the paddy field. The common toad *(Bufo melanostatus)* was observed particularly in human habitation areas. *Rana* species are more active during the monsoon season.	A total of thirteen other amphibian species were recorded during the surveyed period. Four families of amphibians, consisting of Bufonidae (four species), Ranidae (five species), Rhacophoridae (one species) and Microhylidae (three species) belong to the *Anura* family. Among these recorded species, the Common Black-Spinned Toad (*Bufo melanostictus*), Malayan Giant Toad *(Bufo asper*), Pearl-tripped Pustiled Puddle Frog, (*Occidozyga magnapustulosus*) Marten's Puddle Frog (*Occidozyga martensii*), Marsh Frog (*Fejervarya limnocharis*) and Malayan Giant Frog (*Rana blythii*) were observed within the riverbank area or paddy fields. Others species, including Flat-Headed Toad *(Bufo macrotis*), Dawf Toad (*Bufo parvis*), Common Tree frog (*Rhacophorus leucomystax*), Striped Spadefoot Frog (*Calluella guttulata*), Common Burrowing Frog (*Microhyla pulchra*), and Ornated Chorus Frog (*Microhyla ornate*) were normally found in the under growth of dry dipterocap forest and dry evergreen forest. The common toad (*Bufo melamostatus*) was observed particularly in human habitation areas. All amphibian species are more active during the monsoon season.

Table 5.3-6 Summary of Wildlife Survey Results from Previous Studies (Cont.)

Type	TEAM Study (2012a)	SEATEC Study (2012c)
Mammals Species	A total of fourteen mammal species were recorded during the survey period. Among the recorded species, the East Asian Porcupine (*Hystrix brachyuran*) and Long-tail Goat (*Naemorhedus caudatus*) were listed under vulnerable species in the IUCN Red-list. The Slow Loris (*Nycticebus coucang*). The Asiatic Black Bear (*Ursus thibetanus*), The Jungle Cat (*Felis chaus*) and The Sund Pangolin (*Manis javanica*) were listed under Annex II of the CITES list, while the Long-tail Goat (*Naemorhedus caudatus*) was listed under Annex I. The two squirrel species, Palla's Squirrel (*Callosciurus erythraeus*) and Variable Squirrel (*Callosciurus finlaysonii*) were observed as common species residing in orchards and human habitation areas. The Asiatic Black Bear (*Ursus thibetanus*) was recorded as relatively rare in the proposed project area.	A total of sixteen mammal species were recorded during the survey period; however, they were not recorded in any lists. The species of mammals were classified in to five orders: Insectivora; Chiroptera; Primates; Carnivora; and Rodentia. They were classified in to seven families: Tupaidae (one species); Pteropodidae (one species); Cercopithecidae (two species); Viverridae (two species); Herpestidae (one species); Sciuridae (three species); and Muridae (six species). Most of the mammals that were in the project area were living in a terrestrial forest such as the dry diptercarp forest and the under growth of the dry evergreen forest, except The Water Small Asian. Mongoose (*Herpestes javanicus*) which live in river bank area. The three squirrel species, Variable Squirrrel (*Callosciurus finlaysonii*), Indochinese Ground Squirrel (*Menetes berdmorei*) and Himalayan striped Squirrel (*Tamiops macclellandi*) were observed as common species living in orchards and human habitation areas. All of the mammals were found in the project area however, the common mammal species were adapting to all habitats in the study area. Because of all the destruction brought on by human activity, only small adaptable mammals remain.
Avis (Bird) Species	A total of thirty-seven bird species were recorded during the survey period. Members of the family Ardeidae, Little egret (*Egretta garzetta*) Cattle egret (*Bubulcus ibis*) Indian pond heron (*Ardeola grayii*) and Chinese pond heron (*Ardeola bacchus*) are found near the water and are listed as water bird species. Apart from the species Family Ardeidae, four other water bird species were also observed: Little grebe (*Tachybaptus ruficollis*); Red-watted lapwing (*Vanellus indicus*); and the common sand piper (*Actilis hypoleucos*) were also noted as water bird species. The bird of prey species were: Oriental Honey-buzzard (*Pernis ptilorhynchus*); Shikra (*Accipiter badius*) and the Black Kite (*Milvus migrans*). The Barn swallow (*Hirundo rustica*) and the common myna (*Acridotheres tristis*) were recorded as common species in the proposed project area. Threatened species were not observed in the area.	A total of sixty-seven bird species were recorded during the survey period. All of the bird species were common species that could be found in general areas. Threatened species were not observed in the area; however, the species of bird were very diverse in order, family, and species level. It may be caused by the project area consisting of various ecosystem types from mountainous to beach. The species of birds that were found in the project area were classified to tweleve different orders: Pelecaniformes (one family); Anseriformes (one family); Ciconiiformes (one family); Falconiformes (one family); Charadriiformes (one family); Columbiformes (one family); Cuculiformes (one family); Strigiformes (one family); Apodiformes (two families); Coraciiformes (four families); Piciformes (one family); and Passeriformes (fifteen families). The habitats of avis were different depending on bird species; however, it could be divided into three main zones: swamp and beach area; grassland and paddy field area; and under growth and forest area. Among the avis family, Phalacrocoracidae, Anatidae, Ardeidae, Charadriidae, and Aicedinidae preferred to use swamp and beach area in beach forest and mangrove forest. Family Accipitridae, Columbidae,

Table 5.3-6 Summary of Wildlife Survey Results from Previous Studies (Cont.)

Type	TEAM Study (2012a)	SEATEC Study (2012c)
		Cuculidae, Meropidae, Coraciidae, Bucerotidae, Megalaimldae, Megalaimldae, Pycnonotidae, Dicruridae, Oriolidae, Corvidae, Timaliidae, Turdidae, Muscicapidae, Dicaeidae, Sturnidae, and Estrildidae preferred to use under growth area of dry dipterocarp forest and dry evergreen forest. Additionally, Strigidae, Apodidae, Hemiprocnidae, Hirundinidae, Alaudidae, Motacillidae, and Sylviidae preferred to use grassland and paddy field areas.
Status for conservation concern	According to IUCN (2008), only one specie of the one hundred forty-three wildlife species on location is considered an endanger species. Two of the mammal species in the proposed project area are considered as valuable species. In addition, there are two species of mammals considered near threatened species.	The list of wildlife species shows that only the common species live in the undergrowth of the area that is disturbed by humans. The total amount of wildlife: one hundred sixty-seven species: fifty-one families; and twenty orders. All of the species found in the project area were not on any conservation lists. The species found were common species and could adapt to living general area.

5.4 SOCIO – ECONOMIC COMPONENTS

5.4.1 Initial Township Development

5.4.1.1 Study Area

Myanmar is still in the stage of developing the township sectors. Major industries in Myanmar are agriculture and mining. Initial Township Project will bring township complex that has not existed in the area near the city of Dawei.

5.4.1.2 Baseline Township Development Conditions

General information of industry types in Myanmar is extracted from the following document

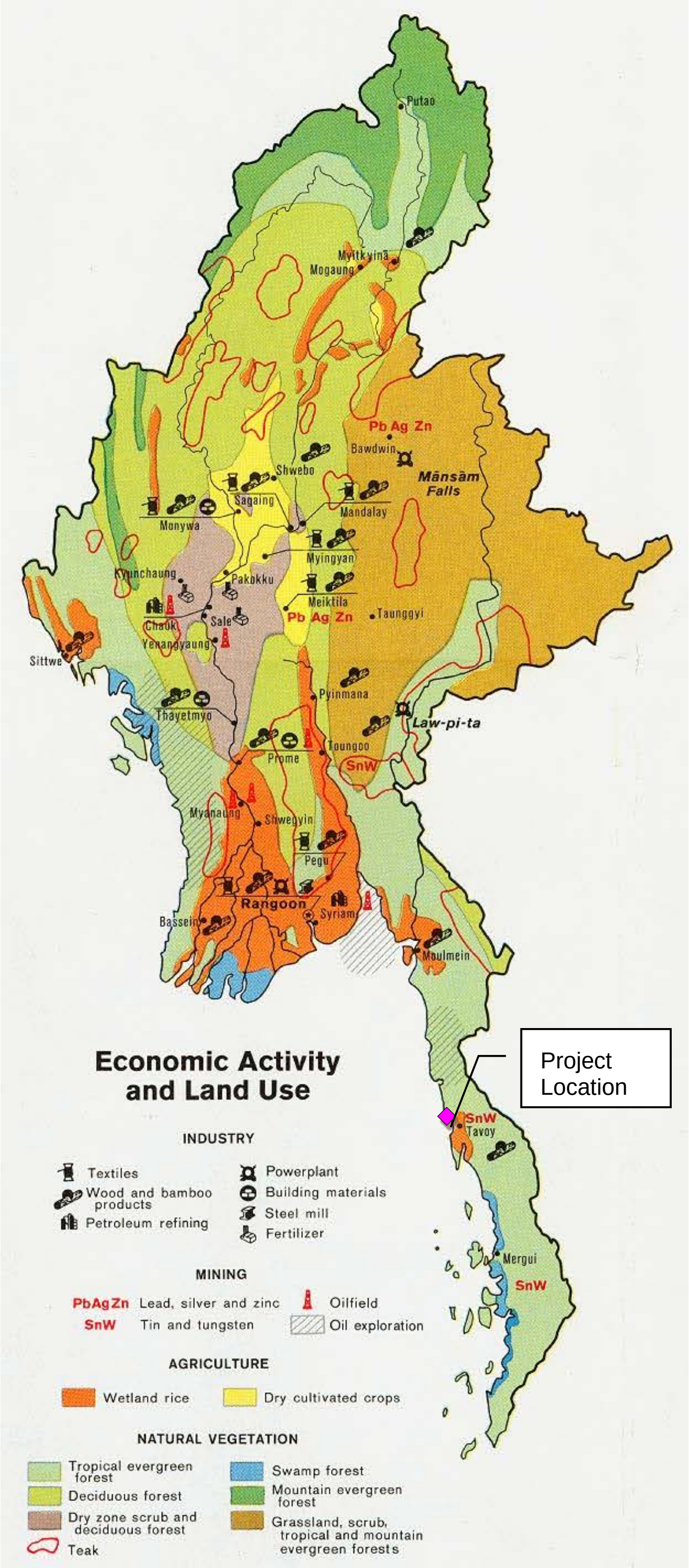
- Economic Activity and Land Use Map (U.S. CIA, 1972)

The broad information from the document above is reviewed together with the site observation.

Results of the Studies

There are seven types of major industries in Myanmar: textiles; power plants; wood and bamboo products; petroleum refining; building materials; steel mill; and fertilizer. Most of the industries are located in the central part of Myanmar (Figure 5.4-1).

For the area around Dawei city and the project vicinity, there are two types of industry: wood and bamboo product; and tin and tungsten mining. Site observation during baseline sampling did not indicate any major industries in and around the area.



Source: http://www.mapcruzin.com/free-maps-burma-myanmar/burma_econ_1972.jpg accessed on 8 November 2012

Figure 5.4-1 Type of Industries in Myanmar

5.4.1.3 Communities and Population

(a) Settlement Pattern and Age of Community

According to the village survey, the settlement pattern of most villages is lining along the road. Only three villages; Payadat, Lae Shaung and Kha Maung Chaung are settled in cluster form. The age of most of communities is 200 years and the average age of 18 villages is 177 years (Table 5.4-1).

(b) Community Administration

Most villages have the administrative structure, which mixes traditional customary laws with governmental attributes and structures. The village heads rule the villages according to existing laws regulated by the government authorities in the Township but at the same time the elderly persons are appointed as advisors or the judicial body according to the local traditions. The village committees are formed and are also involved in the village' s administrative body. Three to seven villages will belong to a village' s administrative tracts, and the combination of village tracts becomes a Township (Dawei Project Watch, 2012).

Table 5.4-1 Settlement Pattern and Age of Community of 18 Villages

Village	Settlement Pattern	Age of Community (years)
Mayin Gyi	Line along the road	200
Payadat	Cluster	200
Htain Gyi	Line along the road	200
Lae Shaung	Cluster	200
Kha Maung Chaung	Cluster	200
Yalai	Line along the road	200
Min Dut	Line along the road	200
Wet Chaung	Line along the road	200
Pagaw Zoon	Line along the road	200
Nyaung Bin Seik	Line along the river	150
Mudu	Line along the road	150
Thit Toh Taut	Line along the road	200
Kyauk Whet Kone	Line along the road	200
Pein Shaung	Line along the road	200
Tha Byae Zoon	Line along the road	150
Kya Khat Tabin In	Line along the road	200
Bawah existing	Line along the road	150
Pan Din In	Line along the road	180
Average		**177**

(c) Number of Population

The village survey found that there are 5,834 households in 18 villages. The total number of population is 35,443 that divided into 16,628 males and 18,805 females. The highest population is at Pagaw Zoon village (7,700) while the lowest population is at Nyaung Bin Seik village (328). Were shown in Table 5.4-2. In the number of households, populations, males, and females in affected villages.

Table 5.4-2 Number of households, populations, males, and females in affected villages

Village	Number of Households		Number of Population[2]	Number of Male[2]	Number of Female[2]
	ITD Data[1]	REM Survey[2]			
In the project area					
Mayin Gyi	136	193	821	425	396
Payadat	321	333	1,662	795	867
Htain Gyi	415	415	2,253	1,080	1,173
Lae Shaung	610	626	3,337	1,650	1,687
Kha Maung Chaung	249	341	1,450	725	725
Yalai	321	398	1,547	749	798
Min Dut	87	132	510	250	260
Wet Chaung	78	99	453	241	212
Pagaw Zoon	389	404	7,700	3,000	4,700
Nyaung Bin Seik	52	52	328	154	174
Mudu	343	347	2,029	986	1,043
Thit Toh Taut	363	411	2,199	1,107	1,092
Kyauk Whet Kone	185	205	838	410	428
Pein Shaung	336	378	2,097	1,022	1,075
Tha Byae Zoon	149	169	751	365	386
Kya Khat Tabin In	241	333	1,524	763	761
Host for resettlement					
Bawah existing	55	198	796	355	441
Pan Din In	799	800	5,138	2,551	2,587
TOTAL	**5,129**	**5,834**	**35,433**	**16,628**	**18,805**

Source: [1] Italian Thai Development (11-12-2012 Project Layout with Bawah)
[2] SEATEC in association with UAE (2013)

(d) Population Change

According to the community leaders' interview, in 2012 average number of birth is 15 people while average number of death is 6 people. Number of birth and death of each village during 2012 were shown in Table 5.4-3.

Table 5.4-3 Number of Birth and Death in 18 Villages in 2012

Village	Number of Birth (2012)	Number of Death (2012)
Mayin Gyi	8	2
Payadat	10	3
Htein Gyi	5	3
Lae Shaung	20	7
Kha Maung Chaung	6	3
Yalai	20	8
Min Dut	10	5
Wet Chaung	10	0
Pagaw Zoon	34	10
Nyaung Bin Seik	0	0
Mudu	30	10
Thit Toh Taut	22	10
Kyauk Whet Kone	8	10
Pein Shaung	14	2
Tha Byae Zoon	8	10
Kya Khat Tabin In	17	10
Bawah existing	6	2
Pan Din In	40	10
Average	15	6

Source: SEATEC in association with UAE (2013)

Regarding migration, the survey reveals that some people in all 18 villages work outside the village all year. This finding is consistent with TEAM report (2012b) which stated that large numbers of people in all affected villages have migrated regularly for employment in Thailand.

Both male and female emigrants are employee. The average wage/day of male emigrants is 8,556 Kyat while the average way/day of female emigrants is 6,778 Kyat. The emigrants from Thit Toh Taut and Kyauk Whet Kone Village obtain the highest wages (Table 5.4-4).

Table 5.4-4 Type of Emigrant's Work and Wage per Day

Village	Type of Emigrant's Work		Wage/Day (Kyat)	
	Male	Female	Male	Female
Mayin Gyi	Employee	Employee	8,000	6,000
Payadat	Employee	Employee	8,000	6,000
Htain Gyi	Employee	Employee	8,000	6,000
Lae Shaung	Employee	Employee	8,000	6,000
Kha Maung Chaung	Employee	Employee	8,000	6,000
Yalai	Employee	Employee	8,000	6,000
Min Dut	Employee	Employee	8,000	6,000
Wet Chaung	Employee	Employee	8,000	6,000
Pagaw Zoon	Employee	Employee	9,000	8,000
Nyaung Bin Seik	Employee	Employee	8,000	6,000
Mudu	Employee	Employee	9,000	8,000
Thit Toh Taut	Employee	Employee	10,000	9,000
Kyauk Whet Kone	Employee	Employee	10,000	8,000
Pein Shaung	Employee	Employee	9,000	9,000
Tha Byae Zoon	Employee	Employee	9,000	8,000
Kya Khat Tabin In	Employee	Employee	9,000	6,000
Bawah existing	Employee	Employee	8,000	6,000
Pan Din In	Employee	Employee	9,000	6,000
Average			**8,556**	**6,778**

Source: SEATEC in association with UAE (2013)

(e) Ethnic Group

According to the literature review, there are some ethic groups in Dawei. Few of them are Kayin. Karen communities have a slightly different administration from the majority of the Tavoyan and Mon people in coastal area. These areas are conflicted with opposing administration areas, some parts the government or local Burmese Army has taken hold, while in other areas the main Karen armed opposition, Karen National Union (KNU) has some influences with the Karen village heads (Dawei Project Watch, 2012).

However, there is no data about ethnic group in 18 affected villages due to REM's village survey in 2013.

5.4.1.4 Education

The education system in Myanmar is divided into 4 levels; pre-school education, primary education, secondary education, and higher education (UNESCO, 2011). The primary education is free and compulsory (Myanmar Ministry of Education, 2012).

Before 1886, the literacy rate of Myanmar was 85%. But the literacy rate dramatically fell to 35% in the colonial period. In 1973, the Ministry of Education introduced adult literacy program of 3Rs (Read, Write and Arithmetic) program for the illiterates throughout the nation. Since 1996, summer literacy programs and 3Rs classes have been opened. Every summer, literacy programs are undertaken in the Regions and States including border areas, and as a result, the literacy rate of Myanmar rose from 79.7 percent (in 1998) to 95.01 percent (in 2011) as shown in Table 5.4-11 (Myanmar Ministry of Education, 2012)

Table 5.4-5 Basic Education Indicator of Myanmar (1998 and 2011)

No.	Indicator	1998	2011	Increase (%)
1	Net Intake Rate (NIR) of age 5+ in kindergarten	67.13	98.37	31.24
2	Net Enrollment Rate (NER)			
	Primary level age (5-9)	74.70	84.61	9.91
	Middle school level age (10-13)	23.60	47.16	23.56
	High school level age (14-15)	10.10	30.01	19.91
3	Completion Rate by Level (2009 – 2010)			
	Primary level age (5-9)	24.80	81.20	56.40
	Middle school level age (10-13)	47.10	71.70	24.60
	High school level age (14-15)	29.32	30.83	1.51
4	Transition Rate (2009 – 2010)			
	Primary level to middle school level	45.60	80.18	34.58
	Middle school level to high school level	53.70	90.57	36.87
5	Teacher – Student Ratio	1.43	1.29	
6	Adult Literacy Rate (2011)	79.7	95.01	15.31

Source: Myanmar Ministry of Education (2012)

According to REM field survey (2013), each village has one school excepting Kya Khat Tabin in village which has two schools. The total number of schools in the project area is 19 as shown in Table 5.4-6

Table 5.4-6 Number of Schools in the Affected Villages

Village	Number of Schools
Mayin Gyi	1
Payadat	1
Htain Gyi	1
Lae Shaung	1
Kha Maung Chaung	1
Yalai	1
Min Dut	1
Wet Chaung	1
Pagaw Zoon	1
Nyaung Bin Seik	1
Mudu	1
Thit Toh Taut	1
Kyauk Whet Kone	1
Pein Shaung	1
Tha Byae Zoon	1
Kya Khat Tabin In	2
Bawah existing	1
Pan Din In	1
TOTAL	**19**

Source: SEATEC in association with UAE (2013)

5.4.1.5 Land Use and Land Holding

Dawei is a completely agrarian society. The region constitutes a long pristine coastline with the enrichment of marine and mineral resources. The towns of Kanpauk, Heinda and Hamyingi in Dawei District have long been home to several mines which produce tin and tungsten, essential metals useful in steel industry. Off the Dawei coastline, the region is close to a large natural gas reserve in the Andaman Sea. In the vast hinterland, the region is green with paddy fields and plantations of rubber, beetle nut, cashew nut and durian. Also, the local villagers rely on fishing in the Maungmagan coastline and Nipa palm (locally known as Dani) forests along Dawei River (Aung, 2011).

Regarding the land use of two townships that have been affected by the project, Yebyu and Laung Lone still have a large area unoccupied, which are mostly of forest, virgin land and uncultivated land. The majority of occupied area is agricultural land. Hence, agriculture is the primary occupation in this area. Rice is grown mostly for household consumption. The soil fertility can be indicated by cultivation of various types of plantations such as rubber, cashew nut, bamboo, oil palm, coconut, betel, and various fruit trees (TEAM, 2012b).

Land use in Yebyu and Laung Lone Townships is described as follows;

Yebyu Township

Yebyu township is bounded by Ye township to the north, Laung Lone township to the south, Kaleinaung township to the east, and Andaman Sea to the west. It covers an area of 604,663 acres (2,446.98 km2). According to the data from Land Records Department of Dawei District (2011), the area is still mostly unoccupied as only about 12 percent are active agricultural land while about two-third are forest land, and the remaining are not fully utilized (Table 5.4-7).

Table 5.4-7 Type of Land Utilization in Yebyu Township

No.	Type of Land Use	Area		Percentage
		Acres	Km^2	
1	Forest Land	201,012	813.5	33.24
2	Uncultivated Land	146,728.7	593.8	24.27
3	Cultivatable Waste Land	131,450.2	532	21.74
4	Agricultural Land	72,703.3	294.2	12.02
5	Virgin Land*	52,655.7	213	8.71
6	Fallow Land	113	0.5	0.02
Total Land		**604,663**	**2,447**	**100**

* Land which has not yet been cultivated or used
Source: Land Records Department, Dawei District (2011)

Laung Lone Township

Laung Lone Township is bounded by Yebyu in the north, Andaman Sea to the west, Dawei Township to the east, and Thayetchaung Township to the south in Thaninharyi Region, southern part of Myanmar. Its size is much smaller than Yebyu (227,787 acres or 921.8 km2). About one-third of total area is utilized for agricultural purposes while nearly two-third of the area is not utilized (combination of forest, virgin, uncultivated land, etc) as shown in Table 5.4-8.

According to the village profile survey in 18 affected villages, the average land holding per one household is 5.33 acres. The highest average land holding per household is in Kha Maung Chaung Village (15 acres/household) while the lowest average land holding per household is in Mudu and Pan Din In Village (1 acres/household).

The land use for residential area of 18 villages is only 0.83 acres / household. The residential land use per household of most villages is 1 acre while the residential land use of 6 villages (Mayin gyi, Yalai, Pagaw Zoon, Mudu, Thit Toh Taut, and Pan Din In) is 0.5 acres per household.

Table 5.4-8 Type of Land Utilization in Laung Lone Township

No.	Type of Land Use	Area		Percentage
		Acres	Km^2	
1	Forest Land	78,255.8	316.69	34.35
2	Uncultivated Land	68,806	278.45	30.21
3	Cultivatable Waste Land	40,815.1	165.2	17.92
4	Agricultural Land	33,345.1	165.1	14.64
5	Virgin Land*	6,553.2	26.5	2.88
6	Fallow Land	12	0.05	0.01
Total Land		**227,787**	**921.8**	**100**

* Land which has not yet been cultivated or used

Source: Land Records Department, Dawei District (2011)

Most of land use in eighteen villages is for agricultural purpose (average 6.33 acres/household). Kha Maung Chaung Village has the highest average land use for agricultural area (15 acres/ household), followed by Min Dut Village (12 acres/ household), Payadat Village, Htain Gyi Village, and Wet Chaung Village (10 acres/ household). Mudu village has the smallest average land use for agricultural area (only 2 acres/household). The Average land holding and land use per household. (were shown in Table 5.4-9)

Table 5.4-9 Average Land Holding and Land Use

Village	Average Land Holding (Acres/ Household)	Average Land Use (Acres/ Household)	
		Residential Area	Agricultural Area
Mayin Gyi	5	0.5	5
Payadat	10	1	10
Htain Gyi	5	1	10
Lae Shaung	5	1	5
Kha Maung Chaung	15	1	15
Yalai	7	0.5	7
Min Dut	10	1	12
Wet Chaung	10	1	10
Pagaw Zoon	3	0.5	3
Nyaung Bin Seik	2	1	5
Mudu	1	0.5	2
Thit Toh Taut	3	0.5	4
Kyauk Whet Kone	3	1	5
Pein Shaung	5	1	5
Tha Byae Zoon	4	1	5

Table 5.4-9 Average Land Holding and Land Use (Cont.)

Village	Average Land Holding (Acres/ Household)	Average Land Use (Acres/ Household)	
		Residential Area	Agricultural Area
Kya Khat Tabin In	3	1	3
Bawah existing	4	1	5
Pan Din In	1	0.5	3
Average (18 villages)	**5.33**	**0.83**	**6.33**

Source: SEATEC in association with UAE (2013)

Regarding land issue, most of villages indicate that they have land rights; excepting Nyaung bin seik Village that does not obtain land rights document. The average land price of village area, paddy field, and orchard (garden) is 3,093,750 kyats/acres, 900,000 kyats/acre and 2,000,000 kyats/acre; respectively. However, the land price data of two villages: Wet Chaung and Nyaung Bin Seik is not available. Table 5.4-10 shows land rights and average land price of village area, paddy field and orchard area.

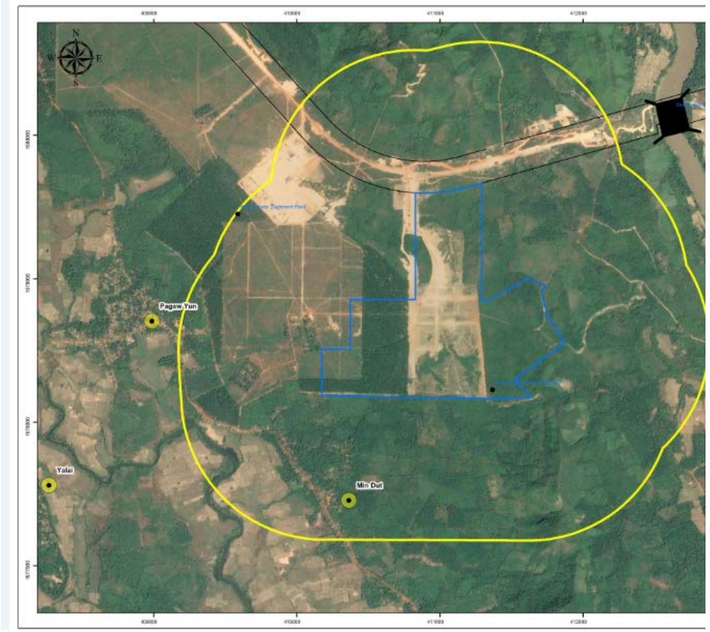
Table 5.4-10 Land Rights and Average Land Price

Village	Land Rights	Land Price (kyat/ acre)		
		Villagearea	Paddyfield	Orchard/Garden
Mayin Gyi	Yes	3,000,000	1,000,000	1,200,000
Payadat	Yes	3,000,000	1,000,000	1,500,000
Htain Gyi	Yes	3,000,000	1,000,000	1,000,000
Lae Shaung	Yes	4,000,000	1,000,000	1,000,000
Kha Maung Chaung	Yes	2,000,000	500,000	1,500,000
Yalai	Yes	3,000,000	1,000,000	2,000,000
Min Dut	Yes	500,000	300,000	800,000
Wet Chaung	Yes	n/a*	n/a*	n/a*
Pagaw Zoon	Yes	2,000,000	500,000	1,000,000
Nyaung Bin Seik	No	n/a*	n/a*	n/a*
Mudu	Yes	5,000,000	1,000,000	1,000,000
Thit Toh Taut	Yes	3,000,000	1,000,000	3,000,000
Kyauk Whet Kone	Yes	5,000,000	1,000,000	4,000,000
Pein Shaung	Yes	5,000,000	2,000,000	3,000,000
Tha Byae Zoon	Yes	2,000,000	600,000	1,000,000
Kya Khat Tabin In	Yes	3,000,000	1,000,000	4,000,000
Bawah existing	Yes	1,000,000	500,000	1,000,000
Pan Din In	Yes	5,000,000	1,000,000	5,000,000
Average Land Price of 16 villages (excluding Wet Chaung and Nyaung Bin Seik which data are not available)		3,093,750	900,000	2,000,000

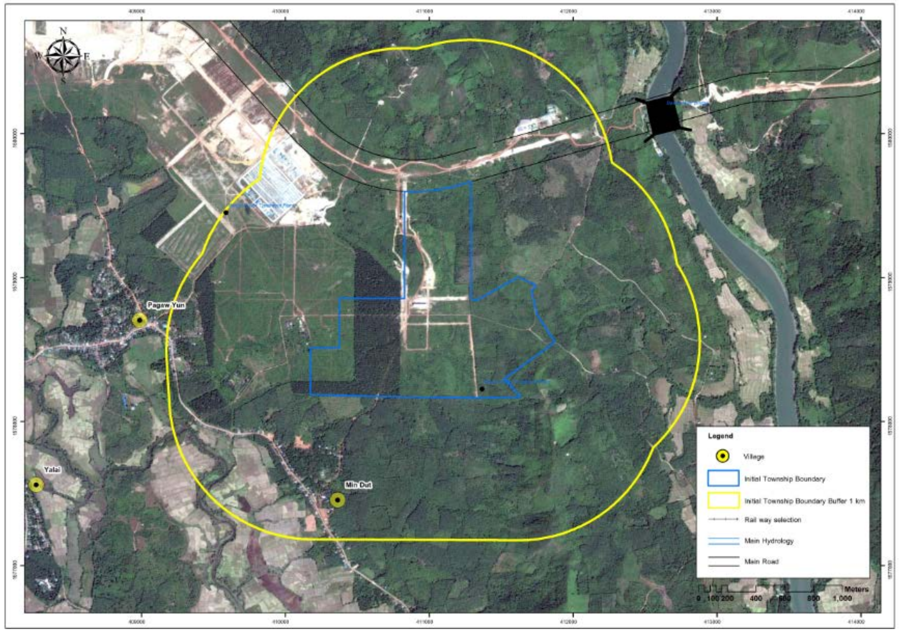
Source: SEATEC in association with UAE (2013)
Remark: n/a = data is not available

Land use in Project Area

In the past, the most of landuse in the project area were agriculture purpose i.e. plam plantation of Myanmar's Government and crops and tree plantation of villages. The palm plantation is up to 80% of the study area. In the present, the palm plantation are clearcut for project development. Comparison of the project area in year 2013 (Before Clearcutting) and in year 2016 (After Clearcutting) are shown in Figure 5.44-



Year 2013



Year 2016

Source:www.goggle.com

Figure 5.44- The Comparison of Landuse of Project Area in Year 2013 between to Year 2016

5.4.2 Health Profile

5.4.2.1 Study Area

The area of study focuses on division level (Thanintharyi), district level (Dawei) and precisely in the village level. According to Transnational Institute (2012), 32,274 people (3,977 households) in 19 villages in Laung Lone and Yebyu townships of Dawei District will be affected by the relocation. These 19 villages are the direct targets of this study.

As a result of the industrial estate development, 16 villages have to be relocated. The host area for resettlement includes 3 villages: Bawah existing; Pagaw zoon; and Pan Din In. The migrants from 16 villages may have to adapt themselves to the new environment and to change the way of life. Local people in the host villages may be also affected by the conflict with migrants and competition to access public resources. The number of population and households in these 19 affected villages is shown in **section 5. 4. 3** Population and communities.

5.4.2.2 Scope and Methodology

The aim of this study is to evaluate the potential impacts of project development on public health andoccupational health. The proposed scope of work will at least cover the following concerns:

- Data collection on public health and epidemic, including public hygiene problems, environmental sanitary use, diseases-endemic, seasonal epidemics, and other contagious diseases of local people living downstream and those relocated to provided residence
- Nutrition condition: a comparison between the local people and the neighborhood
- Identification of ecological conditions susceptible to an increase in the parasitic condition of aquatic carriers such as fish and mosquitoes (as carriers of malaria, dengue, etc.)
- Evaluation of existing data of health and sanitary condition of people in the community near the project site
- Assessment of obtained data focusing on an induction of the project development on an increasing of health determinants stressors and other occupational or environmental illness of local people living downstream
- Investigation of public health problems due to diseases enhanced by the project existence
- Suggestion on mitigation measures.

5.4.2.3 Sources of Information

Sources of data include primary and secondary information. For primary data collection, the socio-economic survey was conducted on 11 – 18 February 2013 by Myanmese Consultant (REM). The socio-economic survey covers 371 households in 18 affected villages (16 villages in the industrial estate area and 2 villages for resettlement area). The secondary data sources include previous EIA reports, academic journals and official websites which are:

- Environmental Impact Assessment (EIA) for the Dawei Deep Sea Port (TEAM, 2013).

- Environmental Impact Assessment (EIA) for Main Road (SEATEC, 2012c)
- IEE Environmental Studies for Dawei Sea Port & Industrial Estate Development Project (TEAM, 2012a).
- 2011 Socio-Economic Data (Dawei Township Office, 2012 (in Burmese)

Public health and occupational health impact assessment is the process of evaluating the potential impact caused by project activities, which likely affect the determinants of health. This topic presents the condition of existing health determinants which have the potential to be influencedby project activities. The identified data are incorporated into the health impact assessment process, as discussed in Chapter 6 of this report (Impact Assessment) . The sources of baseline data included in this chapter are as shown in Table 5.4-11.

Table 5.4-11 Baseline Data Classified by Health Determinants and Sources of Data

Baseline Data for Health Impact Assessment	Primary	Secondary
1) Physical Environment	✓	
2) Social Environment	✓	✓
3) Economic Characteristic		✓
4) Health Status		✓
5) Accident and Public Safety	✓	✓
6) Sufficiency and Capacity of Health Service Facilities	✓	✓
7) Person’s Individual Characteristic/ Behaviors		✓
8) Infrastructure and Public Service	✓	✓

5.4.2.4 Baseline Findings

The determinants of health to evaluate the health impacts of project activities:

(a) Physical Environment

The physical environment, e.g. air quality, noise and vibration, may lead to public health impact as presented in section 5.2 respectively. According to the social attitude survey, the existing physical environment problems are water supply, solid and waste water management, dust and noise from construction, bad odor, etc. as shown in **Chapter 9 Public Involvement and Disclosure**.

(b) Social Environment

Information of the social environment, includingpolitical structure, population characteristic, and social status is shown in **section 5.4 Socio-Economic Components**.

(c) Economic Environment

The economic environment including population income, household income, and expenditure is shown in **section 5.4 Socio-Economic Conditions**.

(d) Health Status

The health status of the Thanintharyi region can be considered from the morbidity rate, mortality rate and public health service capacity which have been collected from the Ministry of Health:

Morbidity Rate

The most five common diseases in Thanintharyi region are malaria, diarrhea, tuberculosis, dysentery and liver cirrhosis. Malaria has been the most widespread disease with more than 13,000 cases treated in 2011 however no casualties due to the diseases are reported. In community level, malaria is also the most common disease and can be found in almost every month as shown in Table 5.4-12, Table 5.4-13 and Figure 5.4-2, respectively.

Table 5.4-12 Widespread Disease

Township / Subtownship	Disease (visit) in 2011									
	Malaria		Diarrhea		Tuberculosis		Dysentery		Liver cirrhosis	
	Sick	Death	Sick	Death	Sick	Death	Sick	Death	Sick	Death
Dawei	4,292	0	1,263	0	124	0	454	0	0	0
Yebyu	288	0	59	0	14	0	3	0	0	0
Laung Lone	7,201	0	1496	0	0	0	546	0	0	0
Thayetchaung	593	0	173	0	23	0	50	0	0	0
Mitta (subtownship)	463	0	142	0	0	0	43	0	0	0
Ka Lain Aung (subtownship)	200	0	16	0	2	0	11	0	0	0
Total	13,174	0	3,149	0	163	0	1,097	0	0	0

Reference : Dawei Township Office. 2012.2011 Socio-Economic Data (in Burmese)
Remark : (Number) = the number of treat. One patient can be treated more than one time.

Table 5.4-13 Common Diseases in Villages

Sr.	Name of Disease	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	TOTAL
1	Malaria	79	70	55	45	29	25	48	21	31	20	26	0	449
2	Diarrhea	26	40	21	26	16	18	21	9	16	12	14	0	219
3	Dysentery	7	10	7	7	8	8	13	6	9	2	8	0	85
4	A.R.I	9	10	7	6	7	8	20	16	18	15	11	0	129
5	Tuberculosis	1	1	4	0	2	0	1	3	0	6	7	3	28

Source: Leshaung Village, Rural Health Care

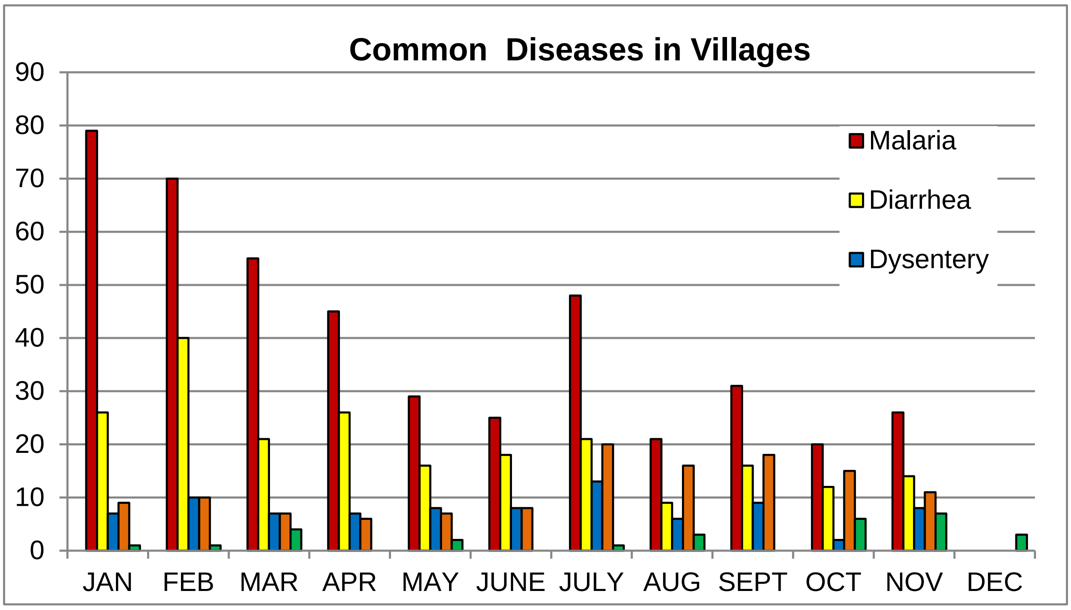


Figure 5.4-2 Common Diseases in Villages

<u>Mortality Rate</u>

The Ministry of Health reports that the Thanintharyi region has a mortality rate for under 5 years old children of 93. 63 per one thousand live birth and a maternal mortality rate of 3.07 per one thousand live birth as shown in Figure 5.4-3 and Figure 5.4-4 respectively. In addition, the miscarriage rate is high in Yebyu while the mortality rate of Laung Loune is highest as presented in Table 5.4-14. These data indicate that the health care facilities as well as health education in the region is quite poor compared with other areas of the country.

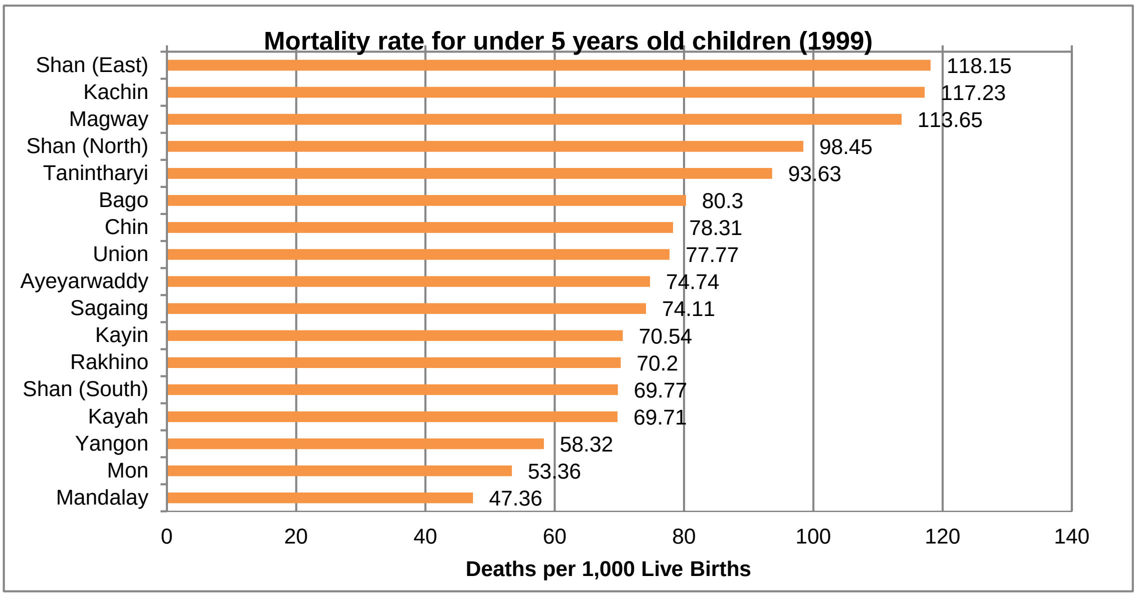


Figure 5.4-3 Mortality Rate for under 5 Years Old Children (1999)

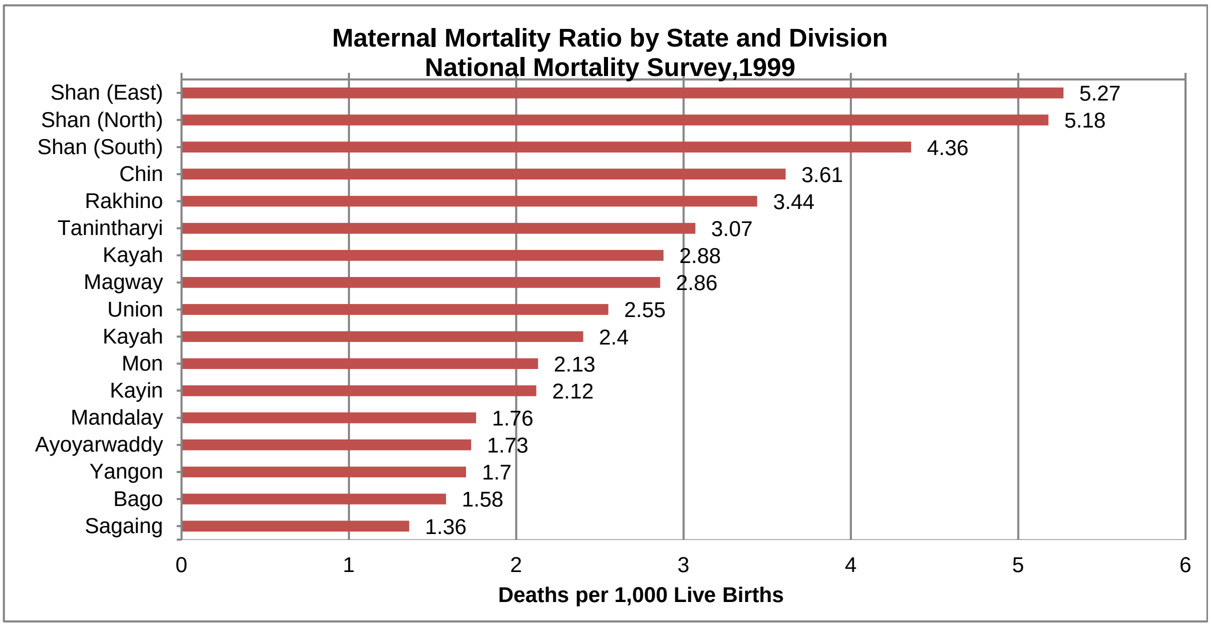


Figure 5.4-4 Maternal Mortality Rate

Table 5.4-14 Birth and Mortality per 1000 People

Township / Subtownship	Rate per 1000 persons		
	Birth	Mortality	Miscarriage
Dawei	20.4	2.5	0.4
Yebyu	7.1	2.2	15.2
Laung Loune	11.7	5.6	3.1
Thayetchaung	10.9	3.6	5.2
Mitta (subtownship)	0	0	0
Ka Lain Aung (subtownship)	0	0	0

Reference : Dawei Township Office. 2012.2011 Socio-Economic Data (in Burmese)

Health Problems and Treatment

In the project area, the most common non communicable disease is hypertension where as the most common communicable disease is malaria.

In addition, the communities have given their opinion regarding to sickness. Most of the respondents did not have any sickness in the previous year (30.2%). The major sickness of most respondents included cough, stroke, and gaiter disease (22.6%), followed by communicable disease (18.3%) and heart and cardiovascular disease (12.7%). Most of the respondents went to see the doctor at hospital to cure their sickness (71.2%) while 11.6 percent of the respondents did not do anything to cure their sickness.

(e) Accident and Public Safety

Excluding the unidentified cases, the primary cause involving with public safety is car and motorbike accidents during 2010-2011. The number of cases due to burglar and thieves in 2011 is higher than in 2010 as shown in Table 5.4-15.

Table 5.4-15 Thieves and Accident Cases

Type	2010				2011			
	No. of Cases	No. of Lawsuit	Lawsuit Suspended	Not going to court	No. of Cases	No. of Lawsuit	Lawsuit Suspended	Not going to court
Burglar / Thieves	12	7	4	1	15	10	4	1
Normal accidents	11	10	0	1	18	18	0	0
Car and motorbike accidents	40	32	3	5	62	56	5	1
Others	62	54	1	7	88	87	1	0
Total	125	103	8	14	183	171	10	2

Reference: Dawei Township Office. 2012.2011 Socio-Economic Data (in Burmese)

(f) Sufficiency and Capacity of Health Service Facilities

Health Service Provider

Health service providers in this project area include 34 health service facilities that belong to the Government, and eight of private health service facilities. There is one large hospital located at Dawei, three of medium size hospitals located at Yebyu, Laung Lone and Thayetchaungas well as six specific medical clinic dealing with leprosy, malaria and tuberculosis located at Dawei, Yebyu, Laung Lone and Thayetchaung as shown in Table 5.4-16. However, some villages have no health service facilities, the villagers have to visit the health center located at the village nearby.

Table 5.4-16 Number of Health Service Provider

Township / Subtownship	Hospital				Clinic				
	Government			Private	Government				Private
	Small <16 beds	Medium >25 beds	Large (100 beds)		Village	Leprosy	Malaria	TB	
Dawei	0	0	1	4	4	1	1	1	4
Yebyu	1	1	0	0	3	0	0	1	0
Laung Lone	2	1	0	0	6	0	0	1	0
Thayetchaung	1	1	0	0	4	0	0	1	0
Mitta (subtownship)	1	0	0	0	0	0	0	0	0
Ka Lain Aung (subtownship)	1	0	0	0	1	0	0	0	0
Total	6	3	1	4	18	1	1	4	4

Reference: Dawei Township Office. 2012.2011 Socio-Economic Data (in Burmese)

Public Health Professionals and Facilities

According to the ministry of health, there are 11 medical doctors per 100,000 populations in the Thanintharyi region in 2007. In comparison, the overall country is 17 while of the Yangon Region is 46 doctors per 100,000 populations. Additionally, there are 22 nurses per 100,000 people and 22 midwifes per 100,000 populations in 2009 as shown in Figure 5.4-5 and Figure 5.4-6.

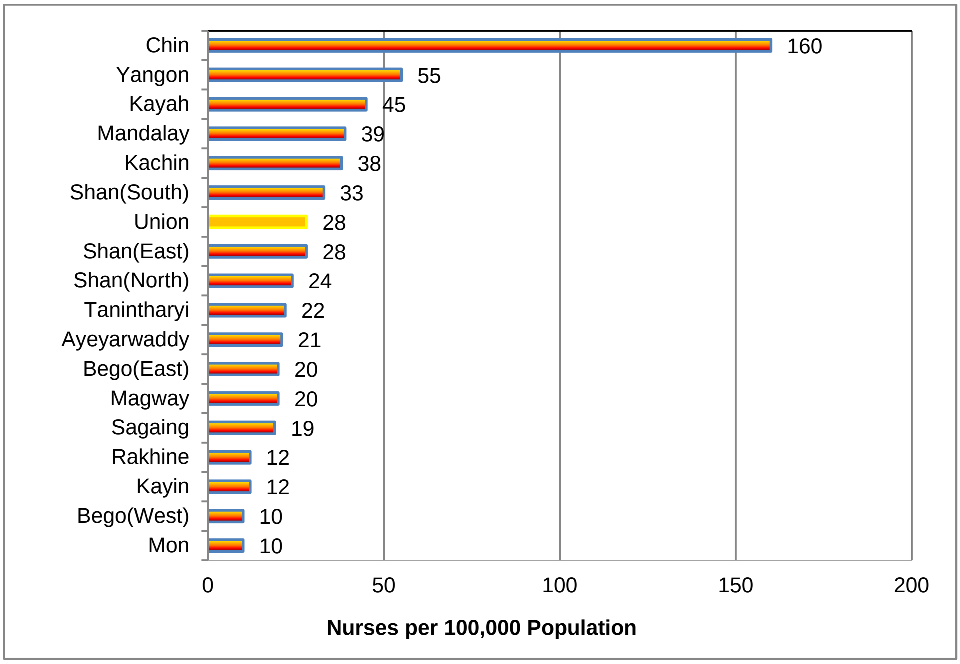


Figure 5.4-5 Availability of Nurses

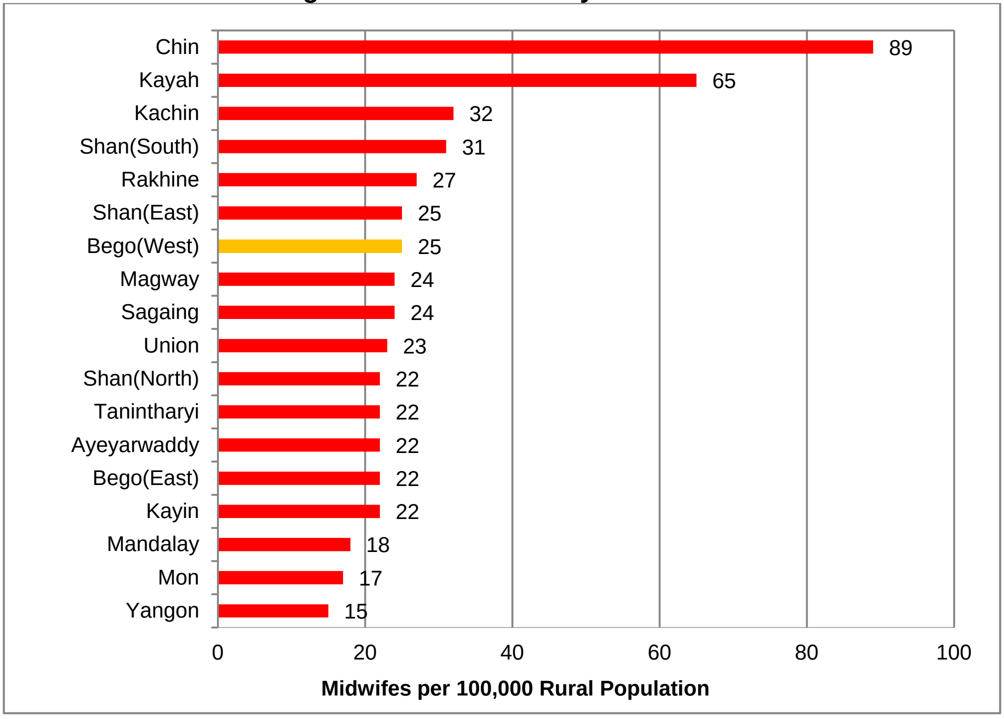


Figure 5.4-6 Availability of Midwifes

In the study area, there are 20 doctors, 68 nurses and 22 nurse assistant, most of them working in Dawei, Laung Lone and Thayetchaung as presented in Table 5.4-17.

Table 5.4-17 Medical Staff

Township / Subtownship	Population	Doctors		Nurses		Nurse Assistants	
		Number of Doctors	Ratio	Number of Nurses	Ratio	Number of Nurse Assistants	Ratio
Dawei	204,280	6	34,046	10	20,428	7	29,182
Yebyu	145,321	3	48,440	10	14,532	2	72,660
Laung Loune	211,920	5	43,984	18	13,217	6	36,653
Thayetchaung	181,870	4	45,467	19	9,572	4	45,467
Mitta (subtownship)	22,329	1	22,329	6	37,215	2	11,164
Ka Lain Aung (subtownship)	18,052	1	18,052	5	3,610	1	18,052
Total	791,772	20	39,588	68	11,643	22	32,726

Reference: Dawei Township Office. 2012.2011 Socio-Economic Data (in Burmese)

Health Care Centre and Manpower

There are 2 rural health centers with health assistance and a senior blue nurse (LHV Lady Health Assistance) in Lae Shaung and Pan Din In village. Most of the people around the study area visit these clinics for treatment of minor illness such as common cold, cough, headache and dizziness. Most villagers depend on a public drug store and health assistance to solve their health problems. If they suffer serious illness, they are admitted to Dawei hospital because of better health care equipments and services.

Most people in this area have hypertension. Thus, they should regularly check their blood pressure at a rural health center. For the people who are diagnosed with hypertension, they are referred to the closet health center; i.e. Maungmagan Sub-township Hospital or General Hospital of Dawei.

Availability of and Accessibility to Healthcare Services

Development of the project, both construction and operational phases, may cause an increase of morbidity and mortality rate which may pressure on public health resources including the number of service facilities, number of health professions, medical equipments, and devices. From field survey conducted during 11 – 18 February 2013, they stated that the most distance between some villages to health center is about 23 Km and ten villages have helath volunteers (as shown in Table 5.4-18). Half of the respondents said that the number of physician and nurse was sufficient (50.7%) while the other half (49.3%) said that the physician and nurse were insufficient. However, most of the respondents (92.5%) reported that the specialist physicians such as surgeon, environmental and occupational medicine were insufficient. Regarding to the location of public health service, 44.7 percent of the respondents said that they were convenient to access the public health service while 53.9 percent of the respondents indicated that the location of public health service was too far and inconvenient. Most of the respondents (95.1%) reported that they had to pay for medical charge while 3.5 percent of the respondents got the government supports. And Healthcare centers in the project area was shown in Figure 5.4-7.

Table 5.4-18 Number of Hospital and Health Center in Project Area

Village	Number of Hospital	Number of Health Center	Distance from Major Health Service (km)	Health Volunteer
Mayin Gyi	0	0	3.0	No
Payadat	0	0	23.0	No
Htain Gyi	0	0	23.0	No
Lae Shaung	0	1	22.0	Yes
Kha Maung Chaung	0	0	9.0	Yes
Yalai	0	0	5.0	Yes
Min Dut	0	0	0.5	No
Wet Chaung	0	0	0.5	No
Pagaw Zoon	0	0	4.5	Yes
Nyaung Bin Seik	0	0	3.0	No
Mudu	0	0	20.0	Yes
Thit Toh Taut	0	0	6.0	Yes
Kyauk Whet Kone	0	0	12.0	Yes
Pein Shaung	0	0	8.0	Yes
Tha Byae Zoon	0	0	1.5	No
Kya Khat Tabin In	0	0	2.0	No
Bawah existing	0	0	2.0	Yes
Pan Din In	0	1	1.0	Yes
Summary	**Total = 0**	**Total = 2**	**Average = 8.1 km**	**Yes = 10** **No =8**

Source: SEATEC in association with UAE (2013)

Health Care Centre (Lae shaung Village)

Health Care Centre (Pan Din In Village)

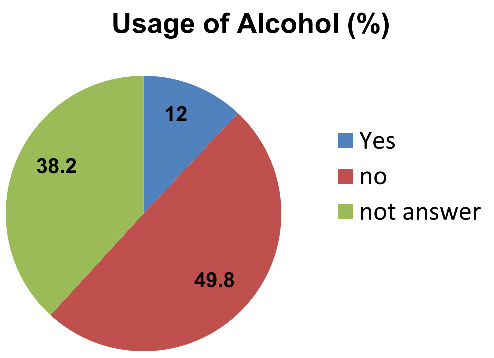
Figure 5.4-7 Health Care Centers in the Project Area

(g) Person's Individual Characteristic/ Behaviors

The results of the survey indicated that 70.8% of people have smoke tobacco and 12% of people drink alcohol regularly Figure 5.4-8. Drinking alcohol and Smoking can cause many kinds of diseases including hypertension, heart disease, lung disease, and cancer.

(h) Source of Food

From the result of filed survey, main source of food of the respondents was from the self-plantation (84.72%) followed by buying from market (9.94%) and natural resources/fishery/forest/river (5.56%). Some villages for example, Mayin Gyi Min Dut, Nyaung Bin Seik and Pan Din In are closed to the sea therefore the source of food for people come from sea. The detail is shown in Table 5.4-19.



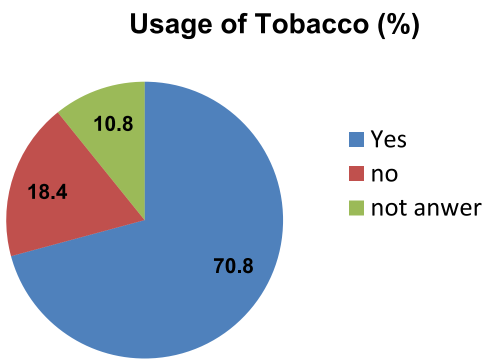


Figure 5.4-8 Usage of Alcohol and Tobacco

Table 5.4-19 Percentage of Source of Food

Village	Source of Food (%)			
	Garden / Farm	Forest	Sea	Market
Mayin Gyi	80	0	10	10
Payadat	80	0	0	20
Htain Gyi	90	0	0	10
Lae Shaung	90	0	0	10
Kha Maung Chaung	90	0	0	10
Yalai	90	0	0	10
Min Dut	85	0	5	10
Wet Chaung	90	0	0	10
Pagaw Zoon	90	0	0	10
Nyaung Bin Seik	95	0	5	0
Mudu	90	0	0	10
Thit Toh Taut	95	0	0	5
Kyauk Whet Kone	90	0	0	10
Pein Shaung	90	0	0	10
Tha Byae Zoon	90	0	0	5
Kya Khat Tabin In	90	0	0	10
Bawah existing	90	0	0	10
Pan Din In	10	0	80	10
Average Percentage	**84.72**	**0**	**5.56**	**9.44**

Source: SEATEC in association with UAE (2013)

(i) Infrastructure and Public Service

The details of infrastructure and public service within the study area such as the water supply, waste management, electricity, etc. as followed.

Water supply

The primary source of domestic water supply, in the study area, is the shallow well. Other sources of water, for local villages, are from artesian wells and rain fall. Normally, there are one or two shallow wells that supply water among one village. For the project site, the water supply for local agricultural purposes is primarily from the Dawei River. There are four rivers: Nabule River; Dawei River; Kunchaung River; and Pan Din In Chaung River near and within the project site. However, the water supply is not adequate during the dry season.

In the project development area, artesian wells are a source of water during the construction phase.

Most households, in the affected villages, have good water source from shallow wells and streams in the Bawah village. Pan Din In has limited water resources and often experiences water shortages in the dry season. In this village, some households have to share wells with the others, and some have to pay a fee to well owners due to limited water

availability, especially in the dry season. In general, the water quality is good for consumption.And domestic water supply in project area was shown in **Figure 5.4-9**

Figure 5.4-9 Domestic Water Supply

Drinking water quality is in good condition around the project area (Figure 5.4-10). More than 50% of the villagers use the filter treatment and 26.5% boil water before consumption.

Figure 5.4-10 Drinking Water

Most of the interviewed respondents use groundwater (93.8%) as source of drinking water, followed by tap water (3.5%) and river/ canal (0.3%).

<u>Electricity</u>

In the nearby area of the project site, local villagers have no electricity supply system. Only some households generate electricity from small generators; e.g. main generator (400 kV) and 7-10 kV of generators which the household members share cost for diesel fuel (Table 5.4-20).

In the project development area, the main generators are used for electricity generation during construction. The electricity in the project area was turned off during 12:00-13:00 and 22:00-03:00.

There is no electricity system supported either by the government or by private companies in these villages. Some villagers possess small generators and generate electricity to share so that their neighbors can have power at night time; however, they have to pay in terms of their utilization and electricity supply in project area was shown in Figure 5.4-11.

Figure 5.4-11 Electricity Supply

Table 5.4-20 Electricity supply

Township / Subtownship	Demand (kW)	Government Generation (kW)	Private Generation (kW)	
			No. of Generators	Generation Capacity (kW)
Dawei	8,800	3,800	2	3,800
Yebyu	1,000	170	2	170
Laung Lone	1,670	480	3	500
Thayetchaung	1,360	180	1	180
Mitta (subtownship)	350	26	1	26
Ka Lain Aung (subtownship)	410	70	1	70
Total	13,590	4,746	10	4,746

Reference: Dawei Township Office. 2012.2011 Socio-Economic Data (in Burmese)

Environmental Sanitary: Solid Waste Management and Wastewater System

In the Dawei area, environmental sanitation, such as solid waste and wastewater treatment system, is inadequate, resulting in poor environmental sanitation. Presently, Dawei does not have proper management on solid waste and sanitation. The solid waste is collected and disposed of by open dumping or open burning within their household (Figure 5.4-12). For organic waste, most of villager feed to their pig and cow. Tough toilet systems are relatively available in Htain Gyi, Lae Shuang, Mudu and Payadat. Provision of both solid waste and wastewater systems are rather limited in all villages.

During the construction phase, the solid wastes in the project site are: domestic waste; (plastic bag and food waste) and waste from construction activities (Steel scrap, etc.) The domestic waste is collected in the garbage bins which are set at all camp sites and canteens. Then, the waste is collected everyday and dumped in the landfill within project area. When the domestic waste inside landfill is full, the landfill is covered by soil. The waste from construction activities is collected in the storage area for reuse.

The results of field survey also indicate that public health services in local communities are quite limited. For household wastewater management, most of the respondents discharge wastewater to the ground (82.2%), followed by discharge to public

drainage system (5.9%), discharge into the garden (5.1%) and discharge to the public river (4%).

Regarding to solid waste disposal, most of the respondents manage by open burn (93.8%), followed by pile up outside the house (2.7%), landfill (2.2%) and throw away to pubic area (0.8%). Only 0.3 percent of the respondents make fertilizer from solid waste. And domestic solid waste disposal in project area was shown in Figure 5.4-12.

Figure 5.4-12 Domestic Solid Waste Disposal

Road

The roads in the project site and local villages are unpaved surface about 4 m width. Most of the roads can be accessed year round but the condition is relatively poor; especially in the wet season and road condition in project area was shown in Figure 5.4-13.

In addition, the results from the attitude survey show that the most common problem related to infrastructure/ public services are a shortage of drinking/ consumption water, shortage of electricity, inconvenient transportation, flood, and solid waste management as shown in **Chapter 9 Public Involvement and Disclosure**.

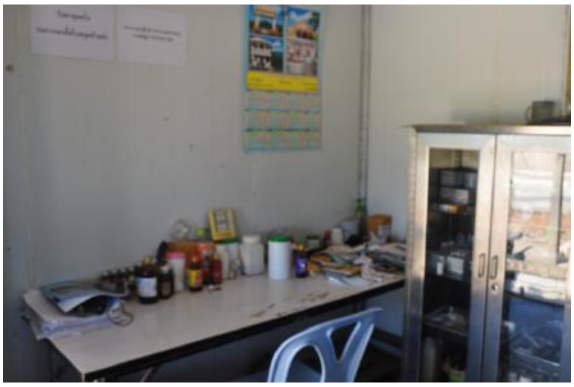
Figure 5.4-13 Road Condition

(j) Health Service in Current Camp Site

Currently ITD has provided health service at the campsite (Figure 5.4-14) with the physician at all time. Three common illnesses are respiratory disease, skin disease and gastrointestinal disease. Malaria is also found with small number of incident (Table 5.4-21 and Figure 5.4-15). The ambulance car is always in use for transfer the serious case to Dawei hospital. Health education is also performed.

Health Care Service in Camp Site

Medicines for Medical Treatment



Health Care Service in Camp Site

Campaign to Prevent and Control Disease

Figure 5.4-14 Health Service in Camp Site

Table 5.4-21 Summary of the Patient per Month in 2012

Disease	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Mararia Disease	2	1	5	0	9	2	3	7	3
Respiratory Disease	129	83	81	71	80	139	236	255	309
Gastrointestinal Disease	39	48	45	54	53	87	48	91	83
Musculoskeletal Diseases	59	38	44	50	41	50	37	139	78
Skin Diseases ; Other	71	58	102	84	132	174	139	105	171
Total	**300**	**228**	**277**	**259**	**315**	**452**	**463**	**597**	**644**

Source: Presence Sheet, J.1790 Dawei Sea Port & Industrial Estate Development Project (Dawei)

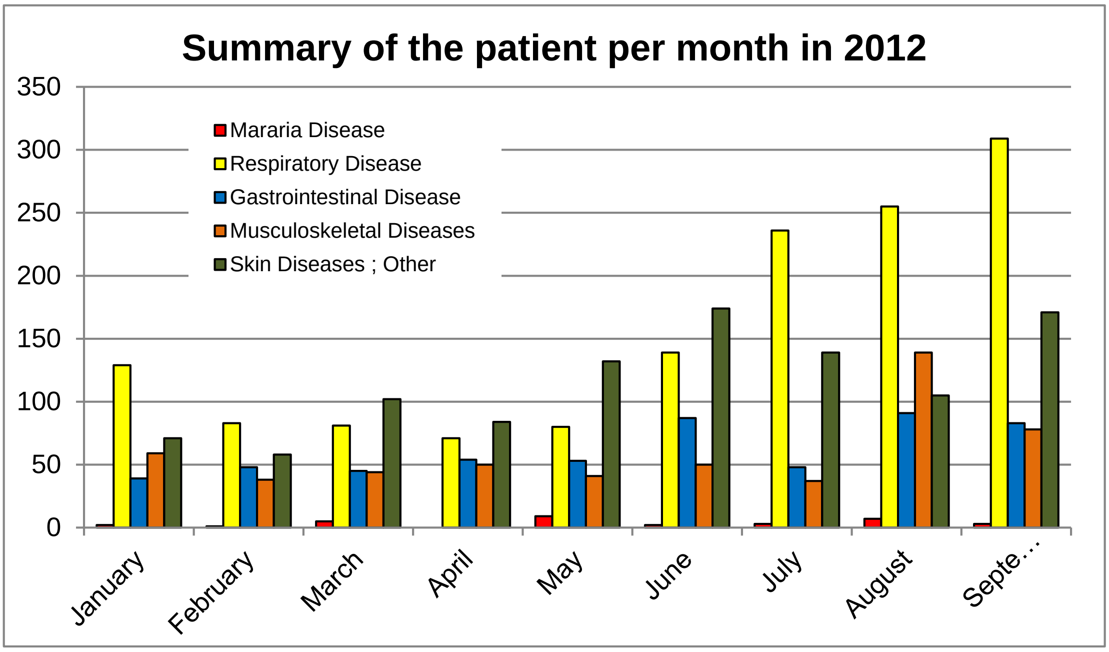


Figure 5.4-15 Summary of the Patient per Month in 2012

5.4.3 Infrastructure Facilities

Study Area

Infrastructure facilities, such as water supply, waste management, electricity, and communication facilities are inadequate in Myanmar. Therefore, the Initial Township Project, will have to generate all of its infrastructures onsite. The project influence area (impact zone) of the Initial Township Project was determined as the infrastructure involves large quantity of earth moving and clearing of existing vegetation in the area.

<u>Baseline Infrastructure Facility Conditions</u>

The conditions of baseline infrastructure facilities have been surveyed in the previous studies. The source of information in this section is:

- Environmental Impact Assessment (EIA) for the Dawei Deep Sea Port (TEAM, 2013).
- Draft Environmental Impact Assessment for Dawei Industrial Estate Project (SEATEC in association with UAE, 2012)

Field survey and data collection of infrastructure facilities in villages within and nearby the project area was also conducted as part of social and public health infrastructure survey. More information from the site survey can be found in **Section 5.4.3**

5.4.3.1 Water Supply

The primary source of domestic water supply in the study area is the shallow groundwater wells. Other sources of water for local villages are from artesian wells and rain. Normally, there are one or two shallow wells to supply water among one village. For the project site, the water supply for local agricultural purpose is primarily from Dawei River. There are four rivers, namely Nabule River, Dawei River, Kunchaung River and Pan Din In Chaung River near the project site; however, the water supply is not adequate during dry season.

In the project development area, artesian wells are a source of water supply in the project site during construction phase.

5.4.3.2 Electricity

In nearby area of project site, local villagers have no electricity grids. Only some households are able to generate electricity via a small generator; e.g. main generator (400 kV) and 7-10 kV of generators which the household members share cost for diesel fuel. In other larger villages, generators are located in the village's temple with small distribution system connecting the generators with the households, and the villagers share the cost of fuel and maintenance.

5.4.3.3 Solid Waste Management

Presently, Dawei does not have proper management on solid waste and sanitation. The solid waste is collected and disposed of by open dumping or open burning within their household. For organic waste, most villagers feed the waste to their pigs and cows.

5.4.4 Traffic and Transportation

Study Area

Around and inside the project area, there were only local roads in poor conditions. There were no transportation routes in the project site. When Initial Township Project is developed, the internal access roads will be constructed for supplying the construction materials within project area. Therefore, the traffic is expected to be increased in the surrounding area. The project influence area (impact zone) is considered to be the nearby communities and households within the project area.

Baseline Traffic and Transportation Conditions

Baseline traffic and transportation has been surveyed in the previous relevant studies. These are:

- Environmental Impact Assessment (EIA) for Main Road (SEATEC, 2012c).
- IEE Environmental Studies for Dawei Sea Port & Industrial Estate Development Project (TEAM, 2012a).
- Draft Environmental Impact Assessment for Dawei Industrial Estate Project (SEATEC in association with UAE, 2012)

The studies include survey of traffic volume on the main local roads. The results of the studies can be summarized below.

Land Transportation

There is only one main road within a five km. radius from the complex zone: Highway no. 8; which is a two lane, paved road, with no shoulder and under poor condition. The other secondary roads for transporting between villages are dirt roads.

The road condition at the project site and local village is laterite surface, about 4.0 m. wide. Most of the roads can be accessed all year round, but conditions are relatively poor, especially in the wet season.

The traffic survey was reviewed at Kamyawkin point, located at North Latitude 14.0942o and East Longitude 98.1795o in the northwest of Dawei city on the Dawei-Nabule Road. Recorded vehicles included express buses, mini buses, trucks, vans and pickup trucks. The largest amount of passenger cars was found at the Dawei-Thayetchaung and the Dawei-Kyauknimaw routes. Most of the cars on these routes were express buses, minibuses, and pickup trucks (Table 5.4-22). Yangon-Dawei-Myeik and Mawlamyine-Dawei-Myeik routes also pass through the project area. There are seven cars daily from the Yangon-Dawei-Myeik route. Most of the cars and buses are running on the local road network.

Table 5.4-22 Passenger Cars Recorded Around Project Area

Trips	Number of Cars per day
Dawei-Thayetchaung	40
Dawei-Kyauknimaw	24
Dawei-Yebyu	19
Dawei-Laung Lone	17
Dawei-Maungmagan	14
Dawei-Ashaytaw	9
Yangon-Dawei/Myeik	7
Dawei-Kanpauk	4
Dawei-Pulaw	3
Mawlamyine-Dawei-Myeik	3
Dawei-Yay	2
Dawei-Shinmotehti	1

Source: TEAM (2012a)

In 2011, the highest traffic volume was observed during August. The traffic volume observed at Kamyawkin point in August was 8,384 vehicles. Total traffic volume during April and September is 47,508 vehicles (Table 5.4-23). The highest numbers of vehicles were express buses and mini buses.

Table 5.4-23 Passenger Cars Recorded at Kamyawkin Point

Months	Number of Vehicles				Total
	Above 5 tons	3-5 tons	1-3 tons	Below 1 ton	
April	296	1,048	58	6,264	7,666
May	310	930	62	6,696	7,998
June	300	900	60	6,480	7,740
July	300	1,080	60	6,420	7,860
August	320	1,152	64	6,848	8,384
September	300	1,080	60	6,420	7,860
Total	**1,826**	**6,190**	**364**	**39,128**	**47,508**

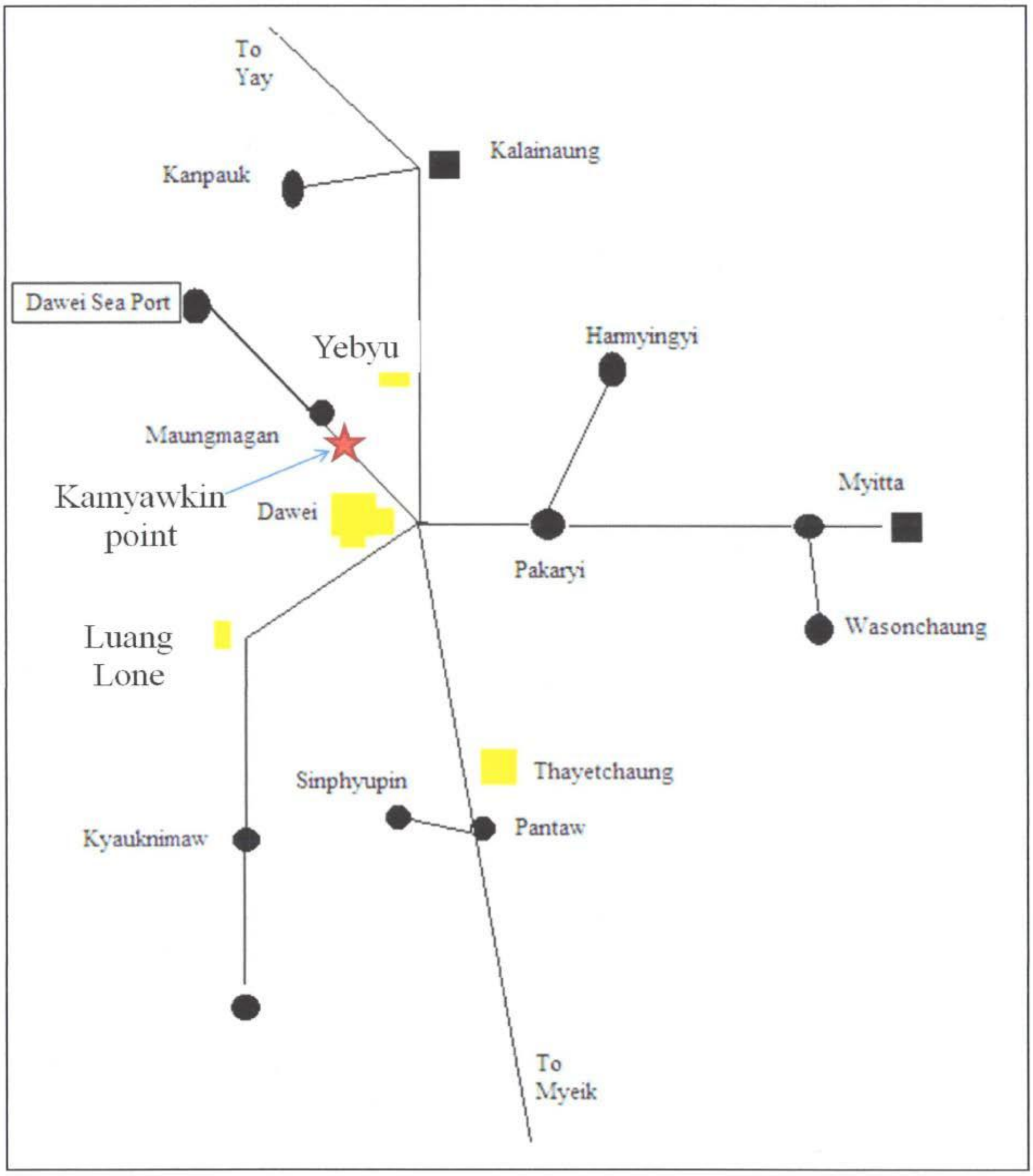
Source: TEAM (2012a)

The volume of vehicles at Kamyawkin point was recorded (Dawei-Nabule Road) during 1-2 October, 2011 as shown in Table 5.4-24. and Figure 5.4-16 The dominant type of vehicles was motorcycle with the highest volume during 10:00 a.m. – 02:00 p.m.

Table 5.4-24 Volume of Vehicles at the Kamyawkin Point

Time Account	<1 ton (Motorcycle)	1-3 tons (Light Truck)	3-5 tons (Light Bus)	>5 tons (Heavy Truck)	Total
1/10/2011					
0:00-6:00 hrs	38	6	5	2	51
6:00-10:00 hrs	390	46	10	8	454
10:00-14:00 hrs	445	68	20	4	537
14:00-18:00 hrs	209	38	14	6	267
18:00-0:00 hrs	18	4	6	2	30
1/10/2011					
0:00-6:00 hrs	40	7	4	2	53
6:00-10:00 hrs	400	36	12	8	456
10:00-14:00 hrs	500	24	24	2	550
14:00-18:00 hrs	300	28	10	6	344
18:00-0:00 hrs	15	3	4	1	23
Grand Total	**2,355**	**260**	**109**	**42**	**2,765**

Source: TEAM (2012a)



Source : TEAM (2012a)

Figure 5.4-16 Map of Traffic survey Location (Kamyawkin Point)

Each category of vehicles has its own Passenger Car Unit (PCU) which can be calculated in form of Passenger Car Equivalents (PCE), with conversion factor in Table 5.4-25.

Table 5.4-25 Passenger Cars Equivalent Factor of each Vehicles

Type of vehicle	Passenger Car Equivalents Factor (PCE)
Passenger Car and Taxi	1.00
Light Bus	1.25
Heavy Bus	2.00
Light Truck	1.50
Medium Truck	1.75
Heavy Truck	2.00
Motorcycle	0.33
Bicycle, Tri-cycle	0.20

Source: 1. Puopong Ninjunpansri, 1997. Highway Engineering Department of Civil Engineering, Faculty of Engineering. Rachamongkol Technology Institute, 312 p.
2. Department of Highway, 2001. Highway Traffic Report

The result of traffic volume in terms of PCU/hour at Kamyawkin point can be described in Table 5.4-26, which showed that PCU/hour for working hours (estimate 10 hours) in Kamyawkin point was 69.45. The obtained V/C Ratio will be used for comparison with the standard values for future traffic condition with assumptions as listed in Table 5.4-27.

The V/C ratio of the existing condition can be calculated as shown in Table 5.4-28. The result showed that the traffic condition is very high traffic flow.

Table 5.4-26 The PCU/Day Result of Vehicles on the Kamyawkin Point

Types of Vehicle	Average Number of Vehicle During 1-2 October 2011 (No./day)	PCU/day	PCU/hr[1/]
< 1 ton (Motorcycle)	1178	388.74	38.87
1-3 tons (Light Truck)	130	195	19.5
3-5 tons (Light Bus)	55	68.75	6.88
>5 tons (Heavy Truck)	21	42	4.2
Total	1384	694.49	69.45

Source: [1/] Estimate working hours (TEAM, 2012a)

Table 5.4-27 Standard Values (Range of V/C Ratio) for Traffic Condition Classification in the Future

Range of V/C Ratio Value	Classification of Traffic Condition
0.88-1.00	Severe traffic congestion
0.67-0.88	Heavy traffic congestion
0.52-0.67	Satisfactory traffic flow
0.36-0.52	Good traffic flow
0.22-0.36	Very high traffic flow

Source: 1. Puopong Ninjunpansri, 1997. Highway Engineering Department of Civil Engineering, Faculty of Engineering. Rachamongkol Technology Institute, 312 p.

Table 5.4-28 Standard Values (Range of V/C Ratio) for Traffic Condition Classification in the Present Time

Information	Average
Traffic volume: 10 hrs of working hour (PCU/hour)	69.45
Carrying capacity (C) (PCU/hour)	2000
V/C ratio for the working hour	0.035
Traffic condition	Very high traffic flow

Source: 1. Puopong Ninjunpansri, 1997. Highway Engineering Department of Civil Engineering, Faculty of Engineering. Rachamongkol Technology Institute, 312 p.

Air Transportation

There is a local airport at Dawei. All international flights are operated by Myanmar Airways International. Air Mandalay, Air Kanbawza, Asian Winds, Air Bagan and Yangon Airways are for domestic passengers. Flight time from Yangon to Dawei is about one hour.

Railways

Dawei- Yay railroad is running through Yebyu Township in the North- South direction parallel to the Dawei – Yay Highway. Dawei- Yebyu railroad section was completed on 30 May 1995 and Yebyu – Kaleinaung railroad was opened on 1st July, 1996. It was totally completed and opened on 26th May, 1998. The length of railroad from Dawei to Yay is about 166.0 km. From Dawei to Yebyu, it is about 17.0 km. There are 22 stations between Dawei and Yay stations. At present, from Dawei to Mawlamyine, Myanmar Railways provide transport service with three diesel locomotives, five carriages, and one wagon. The train leaves Dawei at 5:15 am. and reaches Mawlamyein at 9:15 pm.

Water Transportation

Only cargo boats utilize the Dawei jetty. Passengers to Yangon, Myeik and Kawthang use speed boats from Thayetchaung jetty. There are two speed boats for passenger services.

5.4.5 Land Use

5.4.5.1 Study Area

The proposed project will alter existing land use in the project area. A high portion of the project area and nearby areas is used for agricultural purposes. A number of villages are also located within the project boundary. This section describes the existing land use prior to development of Initial Township.

5.4.5.2 Baseline Land Use Conditions

The source of secondary information on the land use conditions in the project area include:

- The Geology of Burma (Myanmar): An Annotated Bibliography of Burma's Geology (USACE, 2008)
- Land use survey map from Italian Thai Development Plc.

Site survey as part of socio- economic and public health conditions was also conducted. More information regarding land use survey in each village can be found in **Section 5.4. 5**

Results of the Studies

The project area is on relatively flat plains among a mountain range that runs along the coast line of the Southern part of Myanma. Some parts of the project cover the lower ridge along the coast, while the majority is on the relatively flat area sloping to the sea. There are extensive networks of natural drainage channels on these plains created by considerable amount of surface run-off from mountainous areas surrounding the project land. The main natural drainage of the whole area is the Dawei River and Thanintharyi River, along with their tributaries.

Examination data from land use survey provided by the survey team of Italian Thai Development Plc. On site, there are three major types of land use on and around the project area.

- Agricultural Land: Flat plains are, for the most part, extensively cultivated with crops and paddy fields. Plantations are found on the higher ground, the lower parts of the ridges. Major types of plantations are oil palm, cashew nut, rubber, and some are coconut and betel palm.
- Forest Land: Deciduous forest still covers the mountainous area where they are not easily accessible or with steep slope.
- Rural Settlements: There are 16 villages in the project area.

Section 5. 4. 5 provides more detailed information of land use from review of government's information and site survey.

5.5 CULTURAL COMPONENTS

5.5.1 Historical and archeological sites

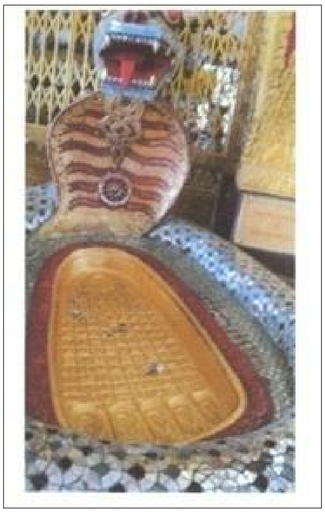
According to local legends, there were 17 towns that had been established by different kings during the 15th Century until the 18th Century until the British occupied lower Burma in the first Anglo-Burmese War. The localTavoyan people are very proud of Buddhism and their cultures, because they believe that the Lord Buddhavisited their region. The Tavoyan dance of carrying water with pots (made of mud) was a well-known dance in the communities. Many communities have various Buddhist heritages exemplified in their monasteries andhave preserved and maintained this religious and cultural value from generation to generation (Dawei Project Watch, 2012). This information is supported by Moore (2011) who stated that Dawei community remains a strong element of present Dawei culture. This can be seen in the local dialect, songs and the neighborhood-village public role in important festivals in Dawei town and surrounding pagodas. The founding story of many of these is woven into the founding story of Thagara involving a prince, Maung Nwa (Mr. Bull) who becomes a hermit. From the union of the hermit and a Nakoma fish, the first dynasty of Thagara emerged. As noted above, on the Weidi side of the Dawei River, place names are traditionally seen to refer to the Buddha‘s previous life as a buffalo king versus his life as a royal peacock on the Dawei side of the river.

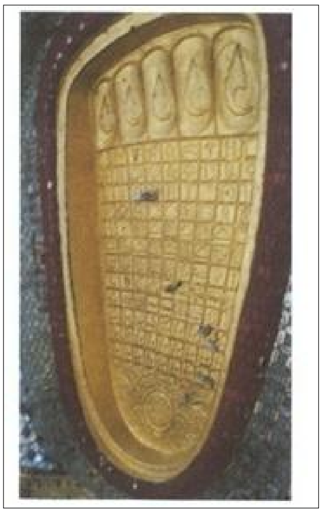
The village profile survey by REM (2013) found "Foot Print of Buffalo Pagoda" in Payadat Village and "Nabule Settawyar or Buddha Foot Print" in Lae Shaung Village. Moreover, there is one monastery in Mudu Village and two pagodas (one in Min Dut and the other in Pan Din In Village). The historical and archeological places in the project area are listed in Table 5.5-1. Pictures of the historical and archeological places are shown in Figure 5.5-1.

Table 5.5-1 Historical and Archeological Places in the Project Area

Village	Historical/ archeological places
Payadat	Foot Print of King of Buffalo Pagoda (Buddha)
Lae Shaung	Nabule Settawyar (Buddha Foot Print)
Min Dut	Pagoda
Mudu	Monastery and Spirit (Nat) Animism
Pan Din In	Pagoda

Source: SEATEC in association with UAE (2013)





Nabule Settawyar or Buddha Foot Print in Lae Shaung

Spirit (Nat) Animism (Mudu Village)

Monastery (Mudu Village)

Pagoda (Min Dut Village)

Pagoda (Pan Din In Village)

Figure 5.5-1 Historical and Archeological Sites in the Project Area

CHAPTER 6
IMPACT AND RISK ASSESSMENT AND MITIGATION MEASURES

6.1 INTRODUCTION

This chapter provides assessment of potential impacts to the environment due to project activities as described in Chapter 4. The assessment of potential impacts is conducted on key physical resources, ecological resources, economic development and social and cultural resources, using quantitative approach wherever possible. Mitigation measures discussed in this chapter are explained in **Chapter 8 Environmental Management Plan.**

6.2 CONSTRUCTION PHASE

6.2.1 Physical Components

6.2.1.1 Air Quality

Potential impacts to the air quality during construction activities are generally from the following sources:

- Dust from transportation routes, which are unpaved, and transported materials;
- Dust from construction site, and cleared land; and

Impacts caused by the above activities are commonly localized to the area close to the source.

The potential drift distance of particles is governed by the initial injection height of the particle, the terminal settling velocity of the particle, and the degree of atmospheric turbulence. Theoretical drift distance, as a function of particle diameter and mean wind speed, has been computed for fugitive dust emissions. Results indicate that, for a typical mean wind speed of 16 km./hr. (10 mph), particles larger than about 100 micron are likely to settle out within 6 to 9 meters (20 to 30 feet [ft.]) from the edge of the road or other point of emission. Particles that are 30 to 100 microns in diameter are likely to undergo impeded settling. These particles, depending upon the extent of atmospheric turbulence, are likely to settle within a few hundred feet from the road. Smaller particles, particularly smaller than about 15 microns have much slower gravitational settling velocities and are much more likely to have their settling rate retarded by atmospheric turbulence.

Impacts occurred only during construction period. Dust suppression methods, such as water spray and cover of bulk materials on trucks, will be required to reduce the impacts due to the activities. Burning of vegetation will be limited to only other methods are not practical, and the vegetation has to piled and burned in the area away from the sensitive receptors such as communities and work camps

6.2.1.2 Noise and Vibration

This section contains noise and vibration evaluation of potential impacts during construction and operation phases. However, the main concern is on the noise and vibration generated by the project activities during construction phase than the operation phase when most of the processes and equipment are typically enclosed.

The noise levels created by construction equipment will vary greatly depending on factors such the type of equipment, the specific model, the operation being performed, and the condition of the equipment. The equivalent sound level (L_{Aeq}) of the construction activity also depends on the fraction of time that the equipment is operated over the time period of construction. This section provides information on typical levels of noise and vibration generated by various construction equipment and assessment of potential impacts due to their operation.

(a) Noise

Diesel engine, without sufficient muffling.Some construction processes generate noise also, i.e. impact pile driving or pavement breaking. For noise assessment, construction equipment can be considered to operate in two modes, stationary and mobile. Stationary equipment operates in one or more days at a time, with either a fixed power operation (i.e. compressors and generators) or a variable noise operation (i.e. pile drivers) or to and from the site (trucks). Variation in power imposes additional complexity in characterizing the noise source level from a piece of equipment. This is handled by describing the noise at a reference distance from operating at full power and adjusting it based on the duty cycle of the activity to determine the L_{Aeq} of the operation. Typical noise levels from representative pieces of equipment are listed in **Table 6.2-1**.

The purpose of the assessment is to determine not only the levels, but also the duration of the noise. The L_{Aeq} of each phase is determined by combining the contributions from each piece of equipment used in that phase. A construction noise assessment is performed by comparing the predicted noise levels with criteria established for the project. The recommended method for predicting construction noise impact is suggested by the Federal Highway Administration (FHWA).

$$L_{Aeq}\ \mathit{equip}) = E.L. + 10 \log(U.F.) - 20 \log(D/50) - 10G \log(D/50)$$

Where:

- L (equip) is the L at a receiver resulting from the operation of a single piece of equipment over a specified time period
- E.L. is the noise emission level of the particular piece of equipment at the reference distance of 50 feet, taken from **Table 6.2-1**.
- G is a constant that accounts for topography and ground effects, for hard ground G = 0
- D is the distance from the receiver to the piece of equipment
- U.F. is a usage factor that accounts for the fraction of time that the equipment is in use over the specified time period.

Table 6.2-1 Construction Equipment Noise Emission Levels

Equipment	Typical Noise Level (dBA) 50 ft (15 m) from Source
Air Compressor	81
Backhoe	80
Ballast Equalizer	82
Ballast Tamper	83
Compactor	82
Concrete Mixer	85
Concrete Pump	82
Concrete Vibrator	76
Crane, Derrick	88
Crane, Mobile	83
Dozer	85
Generator	81
Grader	85
Impact Wrench	85
Jack Hammer	88
Loader	85
Paver	89
Pile-driver (Impact)	101
Pile-driver (Sonic)	96
Pneumatic Tool	85
Pump	76
Rail Saw	90
Rock Drill	98
Roller	74
Saw	76
Scarifies	83
Scraper	89
Shovel	82
Spike Driver	77
Tie Cutter	84
Tie Handler	80
Tie Inserter	85
Truck	88

Source: US.EPA (1971)

The following assumptions are adequate for a general assessment of each phase of construction:

- Full power operation for a time period of one hour is assumed because most construction equipment operates continuously for periods of one hour or more at some point in the construction period. Therefore, U.F. = 1, and 10 log(U.F.) = 0.
- Hard field conditions are assumed and ground effects are ignored. Consequently, G = 0.
- Emission level at 50 feet, E.L., is taken from **Table 6.2-1**.
- All pieces of equipment are assumed to operate at the center of the project.
- The predictions include only the two noisiest pieces of equipment expected to be used in each construction phase.

The predicted noise levels in the distance of 100 ft. (33 m) to 3300 ft. (1000 m.) from construction equipment sources are estimated as shown in **Table 6.2-2**. The selected noise source emission levels range from 85 to 101 dB(A) which covers all the noise emission from construction equipment. The highest noise source is 101dB(A) from pile-driver (impact type) and the estimated noise level is 70.6dB(A) at 1650ft (500m). Therefore any noise source lower than 101 dB(A) will result in noise level lower than 70 dB(A) at 500 m. However the community in the distance of less the 500 m may be affected from noise when comparing to the measured L_{eq} 24- hr (45.9 – 55.4dB(A)) of station A2 and A6 .Construction within 500 m from the any sensitive receptors such as communities therefore have to be controlled either by restricting the construction to day-time only, or an agreement has to be made with the nearby villagers should extended working hours are needed.

Table 6.2-2 Estimated Noise Levels from Various Equipment at 100 ft. to 3,300 ft

E.L. (dB(A))	L_{Aeq}, equip (dB(A)				
	D=100 ft.	D=330 ft.	D=660ft.	D=1650ft.	D=3300ft.
Loader (85 dB(A))	79.0	68.6	62.6	54.6	48.6
Jack Hammer (88 dB(A))	82.0	71.6	65.6	57.6	51.6
Paver (89 dB(A))	83.0	72.6	66.6	58.6	52.6
Pile-driver (Sonic) (96 dB(A))	90.0	79.6	73.6	65.6	59.6
Rock Drill (98 dB(A))	92.0	81.6	75.6	67.6	61.6
Pile-driver (Impact) (101 dB(A))	95.0	84.6	78.6	70.6	64.6

Source: US.EPA (1971)

The noise impact criteria in **Table 6.2-3** are based on comparison of the existing outdoor noise levels and the future outdoor noise levels from the proposed project. The noise criteria and descriptors depend on land use, as defined in **Table 6.2-4**.

As indicated in **Table 6.2-4**, the noise impact criteria and descriptors depend on land use, designated Category 1, Category 2, or Category 3. Category 1 includes uses where quietness is an essential element in their intended purpose, such as indoor concert halls or outdoor concert pavilions or National Historic Landmarks where outdoor interpretation routinely takes place. Category 2 includes residences and buildings where people sleep, while Category 3 includes institutional land uses with primarily daytime and evening use such as schools, places of worship and libraries.

Should there be any of the structures or facilities of these categories within the range of distances from the construction equipment given in **Table 6.2-2** and the comparison shows that noise level generated from the equipment may exceed the recommended noise levels; construction activities should be limited to the time that is least disturbing to the receptors.

Table 6.2-3 Noise Levels Defining Impact for Transit Projects

Existing Noise Exposure* L_{Aeq} (h) or L_{Adn} (dB(A)	**Project Noise Impact Exposure,*L_{Aeq}(h) or L_{Adn} (dB(A)**					
	Category 1 or 2 Sites			**Category 3 Sites**		
	No Impact	**Moderate**	**Severe Impact**	**No Impact**	**Moderate**	**Severe Impact**
<43	<Ambient+10	Ambient + 10 to 15	>Ambient+15	<Ambient+15	Ambient + 15 to 20	>Ambient+20
43	<52	52-58	>58	<57	57-63	>63
44	<52	52-58	>58	<57	57-63	>63
45	<52	52-58	>58	<57	57-63	>63
46	<53	53-59	>59	<58	58-64	>64
47	<53	53-59	>59	<58	58-64	>64
48	<53	53-59	>59	<58	58-64	>64
49	<54	54-59	>59	>59	59-64	>64
50	<54	54-59	>59	>59	59-64	>64
51	<54	54-60	>60	>59	59-65	>65
52	<55	55-60	>60	<60	60-65	>65
53	<55	55-60	>60	<60	60-65	>65
54	<55	55-61	>61	<60	60-66	>66
55	<56	56-61	>61	>61	61-66	>66
56	<56	56-62	>62	>61	61-67	>67
57	<57	57-62	>62	<62	62-67	>67
58	<57	57-62	>62	<62	62-67	>67
59	<58	58-63	>63	<63	63-68	>68
60	<58	58-63	>63	<63	63-68	>68
61	<59	59-64	>64	<64	64-69	>69
62	<59	59-64	>64	<64	64-69	>69
63	<60	60-65	>65	<65	65-70	>70
64	<61	61-65	>65	<66	66-70	>70
65	<61	61-66	>66	<66	66-71	>71
66	<62	62-67	>67	<67	67-72	>72
67	<63	63-67	>67	<68	68-72	>72
68	<63	63-68	>68	<68	68-73	>73
69	<64	64-69	>69	<69	69-74	>74
70	<65	65-69	>69	<70	70-74	>74
71	<66	66-70	>70	<71	71-75	>75
72	<66	66-71	>71	<71	71-76	>76
73	<66	66-71	>71	<71	71-76	>76
74	<66	66-72	>72	<71	71-77	>77
75	<66	66-73	>73	<71	71-78	>78
76	<66	66-74	>74	<71	71-79	>79
77	<66	66-74	>74	<71	71-79	>79
>77	<66	66-75	>75	<71	71-80	>80

* Ldnis used for land use where nighttime sensitivity is a factor; Leqduring the hour of maximum transit noise exposure is used for land use involving only daytime activities.

Table 6.2-4 Land Use Categories and Metrics for Transit Noise Impact Criteria

Land Use Category	Noise Metric (dB(A)	Description of Land Use Category
1	Outdoor L_{Aeq} (h)*	Tracts of land where quietness is an essential element in their intended purpose. This category includes lands set aside for serenity and quiet, and such land uses as outdoor amphitheaters and concert pavilions, as well as National Historic Landmarks with significant outdoor use. Also included are recording studios and concert halls.
2	Outdoor L_{Adn}	Residences and buildings where people normally sleep. This category includes homes, hospitals and hotels where a nighttime sensitivity to noise is assumed to be of utmost importance.
3	Outdoor L_{Aeq} (h)*	Institutional land uses with primarily daytime and evening use. This category includes schools, libraries, theaters, and churches where it is important to avoid interference with such activities as speech, meditation and concentration on reading material. Places for meditation or study associated with cemeteries, monuments, museums, campgrounds and recreational facilities can also be considered to be in this category. Certain historical sites and parks are also included.

Source: Transit Noise and Vibration Impact Assessment, FTA (2006).

* L_{Aeq} for the noisiest hour of transit-related activity during hours of noise sensitivity.

(b) Vibration

The result of construction activities is various degrees of ground vibration, depending on the equipment and methods employed. Operation of construction equipment causes ground vibrations that spread through the ground and diminish in strength with distance. Buildings founded on the soil in the vicinity of the construction site respond to these vibrations, with varying results ranging from no perceptible effects at the lowest levels, low rumbling sounds and perceptible vibrations at moderate levels, and slight damage at the highest levels.

Ground vibrations from construction activities do not often reach the levels that can damage structures, but they can achieve the audible and feelable ranges in buildings very close to the site. In this case where prolonged annoyance or damages from construction vibrations are not expected, a qualitative assessment is appropriate.

Construction vibration may be generated from blasting, pile-driving, vibratory compaction, demolition, and drilling or excavation in close proximity to sensitive structures. The existing conditions of the area do not have any high-rise buildings or structures that may be sensitive to vibration. Some religious places, such as pagodas and temples, exist, but presumably these places will be relocated before the construction activities can commence close to them. Overall impacts due to vibration from construction equipment are expected to be negligible.

Notwithstanding, should a quantitative assessment of vibration impacts from construction is needed in the future, the guidance below can be used.

Damage Assessment

Select the equipment and associated vibration source levels at a reference distance of 25 feet from **Table 6.2-5**. Make the propagation adjustment according to the following formula (this formula is based on point sources with normal propagation conditions):

$$PPV_{equip} = PPV_{ref} x\ (25/D)^{1.5}$$

where:

- PPV (equip) is the peak particle velocity in in/sec of the equipment adjusted for distance
- PPV (ref) is the reference vibration level in in/sec at 25 feet from **Table 6.2-5**.
- D is the distance from the equipment to the receiver.

Apply the vibration damage criteria from Table 6.2-6.

Vibration Source Levels from Construction Equipment

A major concern with regard to construction vibration is building damage. Construction vibration is generally assessed in terms of peak particle velocity (PPV). Various types of construction equipment have been measured under a wide variety of construction activities with an average of source levels reported in terms of velocity as shown in **Table 6.2-5**. The table gives one level for each piece of equipment, it should be noted that there is a considerable variation in reported ground vibration levels from construction activities. The data provide a reasonable estimate for a wide range of soil conditions.

Table 6.2-5 Vibration Source Levels for Construction Equipment (From Measured Data.)

Equipment		PPV at 25 ft (in/sec)
Pile Driver (impact)	upper range	1.518 (38.5572 mm)
	typical	0.644 (16.3576 mm)
Pile Driver (sonic)	upper range	0.734 (18.6436 mm/s)
	typical	0.170 (4.318 mm/s)
Clam shovel drop (slurry wall)		0.202 (5.1308 mm/s)
Hydromill (slurry wall)	in soil	0.008 (0.2032 mm/s)
	in rock	0.017 (0.4318 mm/s)
Vibratory Roller		0.210 (5.334 mm/s)
Hoe Ram		0.089 (2.2606 mm/s)
Large bulldozer		0.089 (2.2606 mm/s)
Caisson drilling		0.089 (2.2606 mm/s)
Loaded trucks		0.076 (1.9304 mm/s)
Jackhammer		0.035 (0.889 mm/s)
Small bulldozer		0.003 (0.0762 mm/s)

Source: UAE (2016)

Construction Vibration Criteria

The primary concern regarding construction vibration relates to potential damage effects. Guideline vibration damage criteria are given in **Table 6.2-6** for various structural categories.

Table 6.2-6 Summary of Building Damage criteria in DIN 4150-3:1999

Type of structure	Short-term vibration				Long-term vibration
	PPV at the foundation at a frequency of			PPV at horizontalplane of highest floor (mm/s)	PPV at horizontalplane of highest floor (mm/s)
	1 -10Hz (mm/s)	1 – 50Hz (mm/s)	50 - 100 Hz (mm/s)		
Commercial/Industrial	20	20 – 40	40 – 50	40	10
Residential/School	5	5 – 15	15 – 20	15	5
Historic or sensitive structures	3	3 – 8	8 – 10	8	2.5

Source: UAE (2016)

6.2.1.3 Topography and Soil

The project area is a relatively industrial estate main road on the north, high terrain and Dawei River, the area along the eastern boundary of DSEZ on the east, light industrial estate on the west, and agricultural plain area on the south. Mountains and highlands surrounding the project area are either excluded from the project boundary or will be preserved as green area and, therefore, will not be disturbed by the construction activities.

However, the area, as a flat basin that is subjected to occasional flood, has to be filled up to +6 m Chart datum (CD) to be above the recorded flood level.

Changes and impacts to the topography during the construction are expected to be quite small. Soil piling on the project area will be careful about soil erosion and collapse

6.2.1.4 Surface Water and Sediment

This section contains surface water and sediment evaluation of potential impact during construction and operation periods.

Two waterways will be receiving treated wastewater from the Initial Township area:

- Dawei River, which is the primary river in the area flowing from north to south at the foothills of Thanintharyi mountain range and entering into the Andaman Sea at the Thanintharyi Coast Region. The Dawei River is situated at the project boundary to the east
- Kunchaung River (Kyaning Chaung), which is located at the southeastern part of the project boundary. It is a combination of many canals in the north: Sin Pu Nit Chaung; Pein Shaung; and Ya Laing Chaung, flowing from north to southeast and into Dawei River. Kunchuang River will be the primary receiving water, where treated wastewater starts flowing into the canal (near Min Dut Village) which is in the Southern part of the project with the distance of 5 kilometers before flowing rapidly into Dawei River, the secondary receiving water.

Water quality results from various studies indicated that existing water quality prior to the project implementation in Dawei River and Kunchaung River are generally suitable for agricultural purpose, and, to an extent, consumption with pretreatment (refer to **Chapter 4** for more detail). However, high levels of suspended solid and turbidity were observed during the dry season, and in some sampling locations, certain pollutants were higher than the levels expected in natural water, such as phenol, manganese, zinc, copper, lead, and nickel.

Additional water quality monitoring in Dawei River before the project implementation is recommended so that a longer term water quality data are available, and attempt should be made to identify possible sources of these contaminants, potentially from upstream of the project area.

Construction Phase

Source of pollutants that may impact water quality during construction period include: domestic wastewater from workers and sediment from runoff, particularly in the land development activities where vegetation clearing is needed.

The land development of the Initial Township area, may result in increased sedimentation in surface water from surface runoff in rainy season. Control of sedimentation from the construction sites will be required during the period to reduce release of sediment to the waterways. Vegetation clearing will only be conducted to the area that is needed for construction activities. Control measures such as sedimentation pond and silt fence will need to be constructed to reduce sediment loading to the natural waterways. Potential impacts due to sediment during construction will be limited to only the construction period. Local villagers rely on surface water for agricultural purpose, and water for consumption is sourced from shallow groundwater well. Therefore, impacts to the use of water are expected to be quite limited and short-term.

Domestic wastewater generated from the construction work camps are another source of pollutants to the waterways. Approximately 29.68 m^3/day of domestic wastewater from the main construction camp is estimated, based on an assumption that the wastewater is generated at the rate of 80 liter/person with a total numbers of workers at 371 persons in the camp (The accommodation is expected to support a maximum of 371 worker employed by Italian-Thai Development Plc.., the main construction contractor of Initial Township). Toilets in these camps will be provided with septic and seepage tanks. The location of these tanks will need to be at least 100 m from natural waterways and above expected flood level in the area.

Other concerns may be wastewater and used oil from equipment maintenance and workshops. Used oil will need to be controlled and accounted for. It is recommended that the used oil are kept temporarily on site in a proper storage area until appropriate oil disposal facilities are identified locally or until the waste management facilities of the industrial estate is constructed and operational. Storage of oil and chemical used during the construction period needs to be properly constructed with secondary containment to reduce the impact in case of leakage or spills.

6.2.1.5 Groundwater

Groundwater is one of the major sources of water supply in the adjacent areas and also exploiting for the project construction activities. There are two locations of using groundwater from water wells for domestic use, Payadat Village located in the northwest part of the project area is exploiting groundwater from existing water wells nearby the proposed solid waste storage. The second village is Pan Din In Village located in the southwest part of the project area.

According to Chapter 5 groundwater quality of the existing wells within the project area can be observed as the following issues:

- Groundwater within this area contains relatively high Total Dissolved Solids, TDS (less than 25 to 2,720 ppm, GW1, 2, 3, 4, 5, 6 and 7). Groundwater at locations of GW4, 5, 6 and 7 is slightly brackish. This may be due to the aquifer that is situated in the coastal area.

- All locations show relatively low pH (4.7 to 6.2). Groundwater is slightly acidity. This may be due to these areas that are underlain by high mineralization.
- Moreover some relatively medium to high contents of cadmium and zinc in stations GW4 to GW7.

The values above provide background concentrations in the groundwater prior to the project implementation. The project activity that may result in impact to groundwater quality is the waste management facilities where sanitary and secured landfills are located. Groundwater monitoring program will be required particularly for the waste management facilities. Considering that the project location is a low-lying land surrounded by mountain ranges and that the hydrogeological gradient is likely to be drained into the coastal area and is unlikely to be connected with groundwater system of the resettled communities, when the project is fully developed, the impact to groundwater use is considered limited. The raw water resource for Initial Township in the full development phase is small water reservoir (Pa Yain Byu).Project activities will not use groundwater and effluent will be discharged through public drainage system without discharge through public water resource. Therefore, the project operation phase will not impact on groundwater quality.

6.2.1.6 Solid Waste

(a) Non-Hazardous Waste

Non- hazardous waste generated from the construction work camps. Approximately 371 kg/ day of non- hazardous waste from the main construction camp is estimated, based on an assumption that the non-hazardous waste is generated at the rate of 1 kg/ person/ day with a total numbers of workers at 371 persons in the camp (The accommodation is expected to support a maximum of 371 worker employed by Italian-Thai Development Plc., the main construction contractor of Initial Township). The waste will be appropriated with disposal. The disposal of non-hazardous waste is to use the service of Initial Industrial Estate landfill. There is suitable management system and no discharge through Dawei River.

(b) Hazardous Waste

Hazardous waste generated from the construction work camps such as used oil, waste paints, machinery lubricants and other items that may have inseparable hazardous constituents. The amount of hazardous wastes could be estimated at 3%of Municipal Waste, the amount of hazardous waste was estimated at about 11.13 kg/day. The disposal of hazardous waste is to use the service of Industrial Estate landfill. There is suitable management system and no discharge through Dawei River.

6.2.1.7 Geology and Seismology

According to the review of baseline information (Chapter 4), the project area located in Zone 1, minor damage, which is the range of ground acceleration less than 0.075 g, which is equivalent to MMI class V and less. Also, the seismic records indicated that none of earthquake situation in Dawei and project area. Although the risk is considered low, the project may consider cooperating with the local authority in updating and exchange of the seismological information.

6.2.2 Biological Components

6.2.2.1 Surface Water Biology

The surface runoff will increase sediment into the surface water resources. This will result in increased levels of turbidity and suspended solids affecting photosynthesis of phytoplankton and productivity of water resources. Mitigation measures controlling release of sediment from construction sites need to be implemented to limit the amount of sediment being released to the environment.

Wastewater from construction work camps, if not controlled, may result in degradation of water quality and dissolved oxygen, particularly in smaller streams, resulting in loss of or reduced aquatic life. Appropriate primary treatment of domestic wastewater and sewage is required to prevent this impact. Use of seepage tanks and selection of location of the tanks away from the natural waterways will help reduce the potential impacts.

Used oil from equipment maintenance and workshops may be effected to aquatic organism. Used oil will need to be controlled and accounted for. It is recommended that the used oil are kept temporarily on site in a proper storage area until appropriate oil disposal facilities are identified locally or until the waste management facilities of the township is constructed and operational, will help reduce the potential impacts to aquatic life.

6.2.2.2 Terrestrial Ecology

The natural forests in the area designated for Initial Township have long been encroached by local population and used as farmlands and villages. However, from a site observation, mangrove forest, beach forest, dry evergreen forest, and dry Dipterocarp forest still exist in many parts of the area.

Wildlife found in the Initial Townshipproject area in the previous studies are mostly common. The project area is mostly disturbed by human activities and does not offer good feeding ground and habitats.

During construction phase, clearing of vegetation for construction of Initial Township will be required. The situation is unavoidable, but impacts can be reduced through mitigation measures.

Although wildlife in the project area may not be of a major concern, hunting of wildlife inside and outside the project area needs to be prohibited.

6.2.3 Economic Development

6.2.3.1 Infrastructure Facilities

Infrastructure facilities include water supply, electricity, and solid waste management system in the area and if these facilities will be affected by the project activities during construction and operation phases.

Local villagers rely on shallow groundwater wells as source of water for general use and consumption. Electricity is generated from diesel generators located in each village. Solid waste management system is not well established in the area yet and open burn or dumping is still being used.

During construction, groundwater will be the source of water for construction camps. Electricity in the camps will be generated either by diesel generators or the LNG power plant installed during first phase of Industries Phase. No impact to the existing water use and electricity generation of the local villagers is expected.

As there is no adequate solid waste management system in Dawei or near project area. Waste generated during the construction of the project will need to be classified into hazardous and non-hazardous waste. Unless appropriate management facilities are identified, hazardous waste needs to be stored temporarily until the waste management facilities are operational. Disposal site for non-hazardous waste to be used during construction phase needs to be established.

6.2.3.2 Traffic and Transportation

Issues related to volume and management of traffic and transportation are mainly covered under EIAs for Main Road and Trans-border Road Link. However, there is one aspect that may need to be addressed within the scope of this EIA, the existing use of local roads through the project area by local villagers.

The existing villages inside theDawei Industrial area rely on 2 main roads traversing the Dawei Industrial area in a north-south direction. One road is on the west side of the Dawei Industrial area connecting the area to the north of the Dawei Industrial area (i.e. Bawah) to the south (i.e. Maungmagan). This road crosses the Main Road at about Km+4.000. Another route is on the east part of the Dawei Industrial area starting from Yebyu on the southeast of the Dawei Industrial area to the north and crosses the Main Road at approximately Km +15.000.

Transportation of construction materials within the project area is the main traffic volume during this stage. Transportation of construction materials such as cement, rebar, architectural materials (doors and windows), and other materials that cannot be sourced from within Myanmar will be imported from Thailand. The main transportation route from the Small Port connects with the Main Road at approximately Km+3.000 and does not cross any permanent villages.

However, the volume of traffic from smaller vehicles, such as pick-up trucks, is expected to be higher than the period before the project, thus increased risk of accident between the vehicles used in the project and motorcycles, which is the most common transportation mean of the local villagers.

To reduce the risk of accidents, the project will install sign boards along the roads that most frequently used by the project's vehicles. Ling of sight and curvature of the road will be progressively improved.

6.2.3.3 Land Use

Major concerns related to land use during construction period include:

- Forest encroachment by relocated villagers.
- Temporary services for constructions their crews will initially formed and later turn into uncontrolled settlement, forest encroachment.
- At the stage of project preparation, one of the major task will be land acquisition and relocation of villagers in the project area.

When construction starts, there will be a large number of personnel moving in. The majority will be construction crews with low wages. They will likely depends in part on the locals to provide certain low cost basic services, such as food, cleaning, transportation and especially those entertainment or relaxation not allowed on the official construction camps. Naturally there will be temporary structures set up to provide such services at the place most convenient to the clients, predictably nearest to the main route, crew camps and the entrance to the site, due to the limited mobility and road access of the crews in such early stage. These squatted temporary settlements will overtime take more permanent forms but not necessary

are tidy, safe, or sanitary. While designated township zone is already provided under the proposed plan, the legitimate area for labor services may not be located according to the zone due to convenient distance to the camps and construction sites. In terms of land use, it is important such temporary service activities and structures set up for workers' needs be planned out monitored regularly. Relocation may be needed in intervals as appropriate so that eventually most or all services for project personnel will not be allowed to scatter outside the designated township zone.

6.2.4 Social and Cultural Components

6.2.4.1 Socio-Economic Conditions

Occupations of the local villagers are farmers with basic education from local schools. The concerns of the villagers collected during public consultation activities, apart from concerns regarding compensation and resettlement which are addressed in Public Involvement and Disclosure which is mentions in **chapter 9** of this report and Resettlement Action Plan (RAP) conducted separately, include:

- Lack of knowledge of project activities and planning; and

Another social aspect that needs to be considered is potential conflict between the local populations and immigrant workers particularly due to different culture, language, way of life, and way of thinking.

Influx of construction workers from different culture and nationalities will start from this construction phase. These immigrant workers may unknowingly offend social norms and customs. Potential impacts due to this issue can range from slight to possible widespread creating conflicts between different nationalities inside the project area. To minimize the potential impacts, foreign workers need to receive orientation regarding appropriate / inappropriate actions. A guide, in form of booklet, may be provided to each of the new workers.

Lack of knowledge of project activity and planning is one of the key concerns received from the public consultation activities. This may lead to negative rumors and misconception of the project. The project will need to be proactive and engage the local villagers routinely throughout the preparation and construction phase to ensure that the information is sufficiently disseminated to the villagers. This will also help promote the relationship and trust between the project and the villagers. Concerns of the public can also be collected and addressed during this routine engagement.

The Dawei Special Economic Zone Law requires that the factories employ Myanmese at a certain percentage of all workforces every year. Despite this requirement, if the knowledge and skills of local villagers do not meet the requirements of the industries, the industries will have to employ Myanmese from other regions such as from Yangon resulting in lost opportunity for the local populations. Career training and workshop aiming to improve skills of local populations need to be established to prepare them for future employment in the industrial estate since the construction phase.

6.2.4.2 Sites of Historical and Cultural Importance

Buddhism is the religion of the majority of the populations in the project area. Each of the villages has at least 1 temple. The temple is the center of the community and the senior monks are highly respected by the villagers. Pagodas have been observed to be scattered in various places in the project area, and sometimes in the middle of paddy fields. There are three sites of high historical and cultural values to the local villagers, which are Nabule Settawyar or Buddha Foot Print (Laeshaung Village), the monastery (Mudu Village), and

Pagodas (Min Dut). These sites are within the project area and will require careful planning as to how they are maintained or relocated.

Religious places are highly important in Myanmar and potential impacts due to mishandling of these sites and insufficient engagement and acceptance with local villagers and authorities are considered high.

Sites of cultural and historical importance have to be surveyed, recorded, and clearly marked on project maps. Construction activities that may generate vibration such as pile driving may need to be avoided close to the site unless permission from the local villagers is granted.

Procedure when the construction crews encounter a potential site with historical and cultural values not surveyed or included in the list needs to be established. The construction activities at the site will need to be temporarily suspended, and authorities will be contacted for direction.

6.2.4.3 Public and Occupational Health

Public and occupation health impact assessment is prepared for the following objectives.

1) To identify health hazards of both workers and communities relating to the major activities of the construction.
2) To propose mitigation measures and monitoring programs in order to minimize or prevent the adverse effects possibly caused by the project.

Potential sources of impact to public and occupational health conditions during construction phase can be identified as follow:

- Construction activities usually consist of civil works, mechanical and electrical services, and support services. Accidents and injuries are frequently occurred during these activities.
- The construction materials, such as concrete, structural steel, pipe, machinery and other associated infrastructure items, are to be delivered to the site by trucks and vans via temporary unpaved roads. An increasing of transportations may increase accidents and injuries.
- The influx of workforces and the employment of foreign labors, including skilled and unskilled labors. Moreover, growth of other supporting industries and surrounding areas would create pressure on adequacy of infrastructure amenities and services, public health facilities as well as sanitation.
- Increase of accommodation for workers.
- Emission of air pollution, noise, wastewater, and solid waste into environment inappropriately will contaminate ambient environment and may affect health and living conditions of communities.
- Chemicals, chemical and hazardous waste, in case of accidents, may create major hazards such as fire, explosion or chemical leakages.

Potential impacts during construction phase under each important aspect are discussed below:

(a) Occupational Health and Safety

Accidents and Injuries:

During the construction phase, accidents and injuries will be notable for workers, especially among untrained ones. The wide range of injuries may be found from minor or medical aid required only to serious cases, disabling injuries and/or death. Faulty electrical devices, blunt injuries, cut wounds, falling, as well as eye irritation and burns are common, however, broken limbs, trauma and or serious injuries can also occur. Besides, increased number of traffic accidents can be expected. Therefore, the prevention and mitigation measures need to be provided.

Occupational, Sexual Transmission and Communicable Diseases:

Potential respiratory diseases may be aggravated, due to pollutants exposure in the workplace, such as dust, exhaust gas, chemicals or solvents. Underlying chronic diseases: asthma, allergy, peptic ulcer, or mental disorder, can be exacerbated by the exposure of hazardous/chemical wastes. Moreover, noise vibration and workplace temperature are likely to be expected. Workers will experience new jobs, hard work and an unfamiliar environment. Hence, they may encounter stress, anxiety, and hypertension. Being away from home, workers easily turn to drink more alcoholic beverages, smoking and/or substance abuse.

Moreover, unhygienic habits, poor personal hygiene and environmental sanitation, may possibly increase diarrhea, hepatitis and communicable diseases. Malaria and dengue fever and local disease from the affected area, can be easily spread. Sexually transmitted disease and HIVs are also expected and needed to be seriously concerned to designate prevention and control measures.

Emergency Response and First–Aid:

Fire may occur from ignition of flammable materials or other reactive chemicals which can lead to accident and injuries as well as loss of properties. Thus, emergency response plan dealing with fire, explosion and chemicals leaks should be established.

Dawei Residence (Myanmar); DRC, as the project owner, has provided the first-aid unit in the campsite at all times. However, when the construction phase is at full scale with some activities at remote sites, additional first-aid units with comprehensive and appropriate equipment should be provided as appropriate. The qualified first-aid units should also be established to ensure that can properly handle with serious or trauma cases. Patients should be taken care and transferred to appropriate medical facilities in time.

(b) Community Health

The project activities during the construction phase possibly have certain impacts beyond the project boundaries. Communities around the project area may be affected in various issues.

Housing and Sanitation:

Even though Dawei Residence (Myanmar); DRC has provided adequate accommodations for the construction workforce, increasing of numbers of workers and also growth of other supporting industries and surrounding areas, possibly numerous accommodations will be constructed outside the estate. This will create pressure on public health services, public health facilities, and sanitation. Currently the public health services provided by local authorities are rather limited. Improper management of sewage, wastewater

and solid waste may generate sources of diseases. Therefore, the sufficient infrastructure amenities and services should be provided, e.g. solid waste disposal, to mitigate the impact.

Environmental/Communicable Diseases:

According to construction activities and transportations, communities will be exposed to excessive dust and noise that can lead to increase of respiratory diseases and nuisances.

Due to mobility of workforce, sexually transmitted diseases, such as HIV/AIDS, will be the most concerned communicable diseases. These diseases can be spread widely. Increasing of malaria, dengue fever, dysentery, hepatitis, pneumonia, and tuberculosis is also expected due to the poor sanitation.

The migrated workers may bring emerging diseases to the project area. If this happens, local villagers will be likely exposed to new strains of diseases. Common cold and flu as well as respiratory tract infection caused by probably new strains are also possible. An increase of alcoholic drinking, smoking and substance abuse and increasing of migrated labors, violence and social disturbance are expected as well. Appropriate mitigation measures should be implemented to reduce these impacts that may occur.

Accident/Fire/Chemical Leaks:

Unsafe vehicle transport with poor road conditions can trigger vehicle accidents and injuries, particularly among young adults. Accidents may occur while transporting construction materials and supplies including chemicals such as gasoline, solvents or lubricants. These accidents will lead to releases of hazardous materials that may result in fire, explosion and/or toxic chemical leaks into the environment. Thus, the emergency response plan should be established.

Adequacy and Readiness of Healthcare Services:

Local healthcare services and healthcare personnel, in quantitative and potentiality dimension are quite limited at present. However, the injuries and illness will be increased in term of quantity and complexity. The mitigation measures should be, therefore, provided to reduce pressure on the healthcare facilities.

6.3 OPERATIONAL PHASE

6.3.1 Physical Components

6.3.1.1 Air Quality

(a) Air Emission

During operation period, the activity that may create air pollution is exhaust from vehicles in transportation of residents and commercial. Increase of population that will live and work in the Township may impair air quality especially traffic. However, according to baseline air quality, all parameters are still much lower than air quality standard. So, there still has a range of carrying capacity for air emission.

Air pollutant suppression methods, such as planting trees around the boundary at ground floor, will be required to increase shady area and reduce heat including the CO_2 absorption to reduce pollutants from exhaust.

(b) Greenhouse Gases Emission

As an international concerned issue increasing of greenhouse gases (GHGs) will result in global warming and climate changes. It consequences now are devastation for environment such as raising of temperature, sea level change, impacts to ecosystem and biota. Although, the Republic Union of Myanmar is not in Annex I (non-Annex I) countries and no need to commit with targets emission of GHGs, according to the Kyoto Protocol (1995), the union has been aware of the threatening and plan to join activities of the United Nations Framework Convention on Climate Change (UNFCC) in the near future. So far, GHG emission is advised by the MONREC (official comment on 11th March 2015 and 2nd February 2016 meeting) to instigate Eco-Township for all new establishment.

Operation of the Township such as transportation of residents and commercial by mobile vehicles will emit a level of Greenhouse Gases (GHGs), from exhaust. GHGs from transportation are Carbon monoxide (CO), Non-Methane (CH_4), Organic compounds (VOCs), Oxides of nitrate (NOx) and Sulphur dioxide (SO_2). Estimate total amount of GHGs will depends on number of population and their transportation activities, their choices of fuel and condition of their vehicles. These factors will contribute CO_2 level in the air and may include traffic condition. Rate of CO_2 emission and the other non-CO_2 are presented in **Table 6.3-1.**

Table 6.3-1 Estimated carbon emission factors from CO2 and Non-CO2 groups in transportation

Type of Fuels			CO2 Carbon Emission Factor (tC/TJ)	Non-CO2 Carbon Emission Factor (tC/TJ)
1.	NGV	Gases	17	15.3
2.	LPG		17	17.2
3.	Ron 91	Engine Oils	19	18.9
4.	Ron 95		19	
6.	E 20		19	
7.	E 85		19	
9.	HSD	Diesels	20	20.2
10.	LSD		*	
11.	Palm diesel	Biodiesels	*	19.3
12.	B5		20	

Remark: * No data

Source: US 40CFR Part 98, subparts HH and TT

Another source of GHGs is from wastewater treatment system. As the project has onsite treatment unit, to treat wastewater for each building. The effluent from these units will be collected and treat in the polishing ponds (tanks) with aeration when the BOD have reach the set level (see **Chapter 4, Section 4.1.7**). Major GHG from the system are CH_4 methane. NO_x Nitrous Oxides is probably minority. Amount of GHGs emission from wastewater treatment system will depend on specification of the activated sludge tank such as BOD_5 and TNK of the influent, efficient of the facilities i.e. aerated tank (>95%), size and operation hours of the tank.

When GHGs is required, evaluation of GHGs need to be re-assessed due to certain number of population, number and specification of equipment / instrument / facilities are required in determination.

Table 6.3-2 Default values for Methane collection and biomass yield for wastewater treatment system

Treatment System	MCF[a]	λ
Wastewater Treatment Processes		
Aerated treatment process (e.g., activated sludge system), well managed	0	0.65 [b]
Aerated treatment process, overloaded (anoxic areas)	0.3	0.45 [b,c]
Anaerobic treatment process (e.g., anaerobic reactor)	0.8	0.1 [c,d]
Facultative lagoon, shallow (< 2 m deep)	0.2	0
Facultative lagoon, deep (≥ 2 m deep)	0.8	0
Sludge Treatment Processes		
Aerobic sludge digestion	0	Use λ from wastewater treatment process
Anaerobic sludge digestion	0.8	

Source: US 40CFR Part 98, subparts HH and TT

6.3.1.2 Noise and Vibration

The operation phase of residential building that needs quietness has no activities creating noise and vibration. Therefore, the operation of Initial Township has no noise and vibration impacts on nearby area.

6.3.1.3 Topography and Soil

After construction finished, impacts to topographic and soil has no impact in operation phase.

6.3.1.4 Surface Water and Sediment

An evaluation of potential impacts during the operation period is wastewater from domestic consumption. Estimated wastewater volume in onsite wastewater treatment plant at each building and polishing ponds is followed. Wastewater treatment plant is separated into 2 zones i.e. north zone and south zone. At the north zone, wastewater per building generated from building with capacity as 15 m^3/day (150 m^3/day from 10 buildings) is prepared for treated wastewater from 3-floor workforce apartment, 84 m^3/day (1,512 m^3/day from 18 buildings) is prepared for treated wastewater from 5-floor workforce apartment and 27 m^3/day (162 m^3/day from 6 buildings) is prepared for treated wastewater from 8-floor serviced apartment. Total wastewater volume from north zone is 1,824 m^3/day. At the south zone, wastewater per building generated from building with capacity as 15 m^3/day (780 m^3/day from 52 buildings) is prepared for treated wastewater from 3-floor workforce apartment and 84 m^3/day (13,272 m^3/day from 158 buildings) is prepared for treated wastewater from 5-floor workforce apartment. Total wastewater volume from south zone is 14,052 m^3/day. BOD of effluent will be not exceed 20 mg/l complied with the notification of the Ministry of Natural Resources and Environment in the topic of wastewater standard from wastewater treatment of community. Effluent will be discharged to public drain and through Dawei River. Therefore, the project operation phase will not generate the pollutant to impact on surface water quality.

However, before starting the initial phase of Initial Township, there will be construction of 9 buildings (5-storey) and 1 building (8-storey) for project's workers and officials respectively (It means 9+1 phase that the details are shown in **Chapter 4**) , impact on water resources is also less than impact of full phase operation due to less capacity or less population (maximum 700 persons/building in 5-storey building and maximum 222 persons in 8-storey building). Discharge point is Kunchang River only.

6.3.1.5 Solid Waste

Solid waste generated during the operation period can be divided into 3 parts i.e., non-hazardous waste, hazardous waste and infectious waste. Non-hazardous waste and hazardous waste will be appropriated with disposal. The disposal of non-hazardous waste and hazardous waste is to use the service of Initial Industrial Estate landfill. For infectious waste is transferred to incinerator for disposal. There is suitable management system and no discharge through Dawei River.

(a) Non-Hazardous Waste

Maximum non-hazardous waste from Initial Industrial Estate and Township is 255.34 ton/day and 126.67 ton/day, respectively. Total is 382.01 ton/day.In the first 15 years of operation, non-hazardous waste will be disposed by sanitary landfill. And in year 16-50 (full phases in 50 years), it will be disposed by non-hazardous waste incinerator of Industrial Estate. Its capacity of 2-incinerator is 200 ton/day. Ash from incinerators will be disposed by landfill. Volume of waste whole 50 years is 2,257,631.36 m3. There are 9 ponds in the sanitary landfill that can support 2,311,893 m3 of waste. This capacity is sufficient to support.

(b) Hazardous Waste

Maximum hazardous waste from Initial Industrial Estate and Township is 13.44 ton/day and 3.92 ton/day, respectively. Total is 17.36 ton/day. In the first 15 years of operation, hazardous waste will be disposed by secure landfill. And in year 16-50 (full phases in 50 years), it will be disposed by hazardous waste incinerator of Industrial Estate. Its capacity of incinerator is 20 ton/day. Ash from incinerators will be disposed by landfill. Volume of waste whole 50 years is 311,033.24 m^3. There are 2 ponds in the sanitary landfill that can support 336,700 m^3 of waste.

(c) Infectious waste

Maximum volume of infectious waste from Township is 0.042ton/day. It will be transferred to incinerator for disposal with suitable disposal.

6.3.2 Biological Resources

6.3.2.1 Surface Water Biology

Freshwater biology can be affected mainly from release of wastewater into the receiving waterways or the sea. Wastewater from the project area, if not properly treated, is expected to contain high organic matters, which will affect the living organisms and also the quality of their habitats. However, treated wastewater will be discharged through public drainage system without discharge through public water resource. Therefore, the project operation will not create impact on surface water quality and freshwater aquatic organisms.

6.3.2.2 Terrestrial Ecology

Direct impacts to terrestrial ecology during operation phase are expected to be small as the environment would have been altered since the construction phase.

Due to influx of workers to the industrial area and live in Initial Township, demand of wildlife meat and parts may be increased resulting escalation of wildlife poaching and hunting in more futile reserved forests elsewhere. Education and discouragement of consumption and domestication of wildlife need to be conducted all through the project life.

6.3.3 Economic Development

6.3.3.1 Infrastructure Facilities

During operation phase, sources of raw water will be from small water reservoir (Pa Yain Byu and Talaing Gya Weir). The raw water will be delivered to the water treatment plant located near the reservoir before delivered to Initial Township.

Electricity will be generated by the power plants inside the industrial estate. The electricity demand for 8 floor serviced apartment and 5 floor workforce apartments is 9,036 and 37,800 VA respectively.

A waste management facility is planned near Township area. The waste management facility will be capable of handling both hazardous and non-hazardous waste (SEATEC, 2012a). Environmental monitoring program will be in place at the waste management facility to monitor if the environmental protection measures at the site is efficient. Waste from Initial Township will disposal at waste management facility in Township

Overall, it is expected that there will be no impacts from the project to the existing infrastructure facilities of the local communities.

6.3.3.2 Traffic and Transportation

Dawei Industrial Estate Main Road at KM 18.5 is starting point enters to the Initial Township. The current design of Initial Township, when fully developed, incorporates zoning and control of access of vehicles. According to the shape of project area, the Initial Township grid system has been designed into fan-shaped grids with multiple town accesses which will prevent traffic congestion at one access

For the workforce areas, the grids are equally divided the blocks into walking distance to make sure the workers can get off the bus and continue walking to their homes conveniently. In the gated type community such serviced apartments, there will be only one or two accesses to increase both privacy and safety to residents. Public lighting and drainage system will be applied along the grid.

Overall, it is expected that there will be no impacts from the project to the existing traffic and transportation of the local communities.

6.3.3.3 Land Use

The major concern during operation period is the unplanned land uses that will naturally change to accommodate the livelihood and convenience of those working in the project.

The practice of land use planning in Myanmar is at a very beginning stage. As of present (2013), the government has near absolute authority on land use designation though land use planning practice is still rare. Realizing the need for planning practice, there are efforts from international community in assistance for expertise. The Department of Human

Settlements and Housing Development (DHSHD), Ministry of Construction and UN-Habitat has just announced in press release a launch of a collaborative project on development of guidelines on land use planning.

The strip along the zone designed for township is in a danger of encroachment due to the higher cost of commercial and residential operations to be charged on the designated land which will induce substandard, low-cost shelters and structures outside the boundaries nearby.

Potential negative impacts on land use are predicted to affect the town of Dawei also. As the project is in operation, there will be needs for services other than those day-to-day services that can be provided within the township zone of the project. Naturally, it can be predicted that the town of Dawei, with certain level of infrastructure and social services, will grow rapidly to accommodate requirements of project personals such as, residences for the supervisors or consultants who prefer not to stay within the estate, business clients and guests who visit the project estate shortly for specific purposes, or other workers who perform services to the project personnel but are not allowed to stay in the township zone. Dawei will also provide entertainment activities for the workforces when off-duty on the weekend. These sometimes undesirable uses are not allowed in the township zone of the project but will find their places in the town. Zoning and control for such entertainment district should be laid out ahead of time for the town of Dawei.

6.3.4 Social and Cultural Components

6.3.4.1 Socio-Economic Conditions

Issues related to the socio-economic and social issues during operation phase are similar to the construction phase.

Number of apartments including facility designed in the Project has been evaluated, to be enough in term of capacity, space and utilization for sustainable development. Also, growth of the township shall be concurrently developed with growth of the industrial estate for phase by phase. However, over migration of workers and influx of workers from the Tanintaryee region is still concerned because of migration.

For this issue, it shall not be significant problem that will rise from the Project development. This is because most of permanent workers will be sponsored or supported by their plants/factories have been accounted and calculated within this study. They are included in the design and assessment. In addition, most of workers are potentially single workers and the Project has policy to employ local worker who mostly have already had accommodation in the Project vicinity. On the other hand, other type of migrants or influx i.e. dependents of the migrant (family) or temporary or non-sponsors workers or others related business migrants shall be planed and prepared for the FSD by relevant Township agencies.

6.3.4.2 Sites of Historical and Cultural Importance

If the handling and relocation of historical and cultural places during construction phase is performed properly, potential impacts during operation phase is not expected.

6.3.5 Public and Occupational Health

Potential sources of impact to public and occupational health conditions during operation phase can be identified as follow

- Most of industries are labor intensive (may live in Township); therefore, numerous workers, including foreign/migrated and untrained workers, are expected.
- DRC has set a plan to provide a township consists of hospital, school and other infrastructure amenities located inside the industrial estate boundary.
- Increase of accommodation and growth of supporting industries in the surrounding areas will create pressure on adequacy of infrastructure amenities, public health services, public health facilities as well as sanitation, especially around the project area.

Potential impacts during operation phase under each important aspect are discussed below:

(a) Occupational Health and Safety

Sexual Transmission and Communicable Diseases:

Sexual transmission diseases and vector-borne infection are mostly related to poor personal hygiene and poor sanitation. Foreign or migrated workers who live in Initial Township are possibly exposed to local diseases, malaria and dengue fever. Strict prevention and control measures as well as health care promote for living.

Adequacy and Readiness of Healthcare Services:

Regarding the significant numbers of workers in the project area, a hospital/healthcare facility located in the project township will be established. This newly established healthcare facility should be the comprehensive one, in term of adequacy, capability, and accessibility since at present public health facilities and services provided by local authorities are quite limited.

(b) Community Health

(1) Sanitation:

Increasing of supporting industries and surrounding areas will have pressure on adequacy of infrastructure amenities and services, as well as public health facilities. Improper management of sewage, wastewater and solid waste may lead to poor sanitation and environmental health stresses. Currently, public health services of the local authorities are limited therefore the project owner should closely collaborate with the local authorities to create the mitigation measures to prevent the consequences that may occur.

(2) Environmental, Communicable/Non-Communicable Diseases:

Spread to the local residents, especially in the area with poor hygiene practices. Sexual transmission diseases, HIV/AIDs, and communicable diseases are associated with mobility of workers.

Higher public incomes may result in unhealthy habits e.g., low nutritious food, alcohol drinking and less exercise, which may cause chronic health problems: hypertension, diabetes, heart disease, stroke and cancers. More alcohol consumptions and smoking will be normally found. In fact, these non-communicable diseases will be serious problems, and need a sophisticated approach for the solution.

Table 6.3-3 Types of Negative Impacts on Project

No.	Construction Phase	No	Operation Phase
1.	Accidents/Injuries	1	Sexual Transmission and Communicable Diseases
2.	Occupational, Sexual Transmission and Communicable Diseases	2	Adequacy and Readiness of Healthcare Services
3.	Emergency Response and First-Aid		

Source: UAE (2016)

Table 6.3-4 Types of Negative Impacts on Communities

No.	Construction Phase	No.	Operation Phase
1.	Housing and Sanitation	1.	Sanitation
2.	Environmental and Communicable diseases	2.	Environmental/ and Communicable/Non-Communicable Diseases
3.	Accidents/Fire/Chemical Leaks	3.	Adequacy and Readiness of Healthcare Services.
4.	Adequacy and Readiness of Healthcare Services		

Source: UAE (2016)

(3) Adequacy and Readiness of Healthcare Services:

Qualified healthcare services are needed due to an increase of illness, injuries, accidents and fatalities. The wide range of injuries and disabilities will create an excessive burden of health services. Consequently, the effective health surveillance system is needed.

The potential impacts of worker and public during construction and operation phases can be concluded as shown in **Table 6.3-3** and **Table 6.3-4**.

The Project plan to have a 60 beds hospital equipped with medical treatment and facilities, details in Chapter 4, *Section 4.1.2.4*. This size of hospital is estimated to be enough for size of population that will reside in Township.

6.3.6 Natural Disaster

Lately, frequent natural disaster, cyclone, flooding, fire and earthquake have been frequently reported, which raise a concern for new establishment in order to protect people life and properties in accordance with Myanmar Action Plan on Disaster Risk Reduction (MAPDRR). Disaster assessment and Emergency Response Plan is required in ESIA. The issue is mentioned by 2nd and 3rd of MONREC comments. Thus, three threatening disaster in the Project region are assessed in this section.

6.3.6.1 Flooding

Base on physical resource in **Chapter 5, Section 5.2**, location of the Project is in monsoon and in warm and humid climate. In accord with flooding map with return period of 100 years, annual flood may not often expose the Project to flooding because the Project is located in upstream area, not regular flooding area, downstream of both Kun Chuang and Dawei Rivers (See **Figure 4.1-33**).

Periodical cyclone, has started frequent occurring for the past decades and recently impacted Myanmar many times, especially in Ayeyarwaddy river delta region. As location of the Project in Tanintharyi region that is not in direction of the cyclone, so, it is situated in low risk area. However, the storm is regional meteorological condition, the Project area may still be under the storm influence. Heavy and continuous rainfall may prone risk of rapid flooding in local including cumulative flooding in regional area. Thus, the Project has designed the Flood Controlling System **(Chapter 4, Section 4.2.4**) that can effectively drain runoff and can insist up to 140 mm/hour of rainfall or approximately 4 hours of flood retention times.

To ensure that the Project will be minimal impacted by storm and flood hazards, The Project shall follow the Flood Emergency Response Procedure as prescribed in **Section 4.1.10.3.**.

6.3.6.2 Earthquake and Tsunami

Base on physical resource in **Chapter 5, Section 5.2***,* Location of the Project (See **Figure 5.2.7**) is in active zone of earthquake, around 500 km from subduction or collision boundary between Indian and Eurasian Plate margins. However, this is a deep earthquake, around 150 to 200 km below the ground and may not expose damages to the Project unless, a regional to global scale of earthquake will occur, which will be consequently an unavoidable disaster.

In the contrary, attention shall pay to intra- plate movement, active fault. "*The Sagain Fault* " is the major fault that cause severe damages and ruins, as recorded in long history of the Union of Myanmar (See **Figure 5.2.8** and **Table 5.2-1**). Because the fault is still active, shallow earthquake (less than 50 km), frequent occur and expose on land in northern Myanmar. The Sagaing Fault is N-S trending, from Sagaing region downward to Yangon region before submerges under the Andaman sea. It system are such as normal faults and the Andaman spreading ridges. Location of the Project is around 300 km east from the trend and overlays on passive earth, detritus sediments/sedimentary rocks of Quaternary, the Project shall be expose low risk. However, the Project may associate earthquake for a level depending on scale and magnitude of regional earthquake, the scale may ranging from feelable to some damages on structure.

According to, seismic zoning map prepared by Tint Lwin Swe (2012) as presented in **Figure 5.2-7**.and **Table 6.3-5** suggested that hazard from earthquake is moderate. At the present, risk is still low due to exposure to number of population. It shall be higher risk when number of population and structures are increased.

Table 6.3-5 Probable earthquake and tsunami hazards along coastal areas of Myanmar (Thein et. al., 2011)

Coastal Region	Area	Earthquake Hazard	Tsunami Hazard
Rakhine Coast	Northern part	Strong Zone with MMI 8	Moderate
	Southern part	Moderate Zone with MMI 7	Moderate
Delta Area	Ayeyawady Delta	Moderate Zone with MMI 7	Moderate
	Sittoung Estuary	Severe Zone with MMI 8–9	Moderate
Taninthayi Coast	Northern part	Moderate Zone with MMI 7	Moderate
	Southern part	Moderate Zone with MMI 7	Light

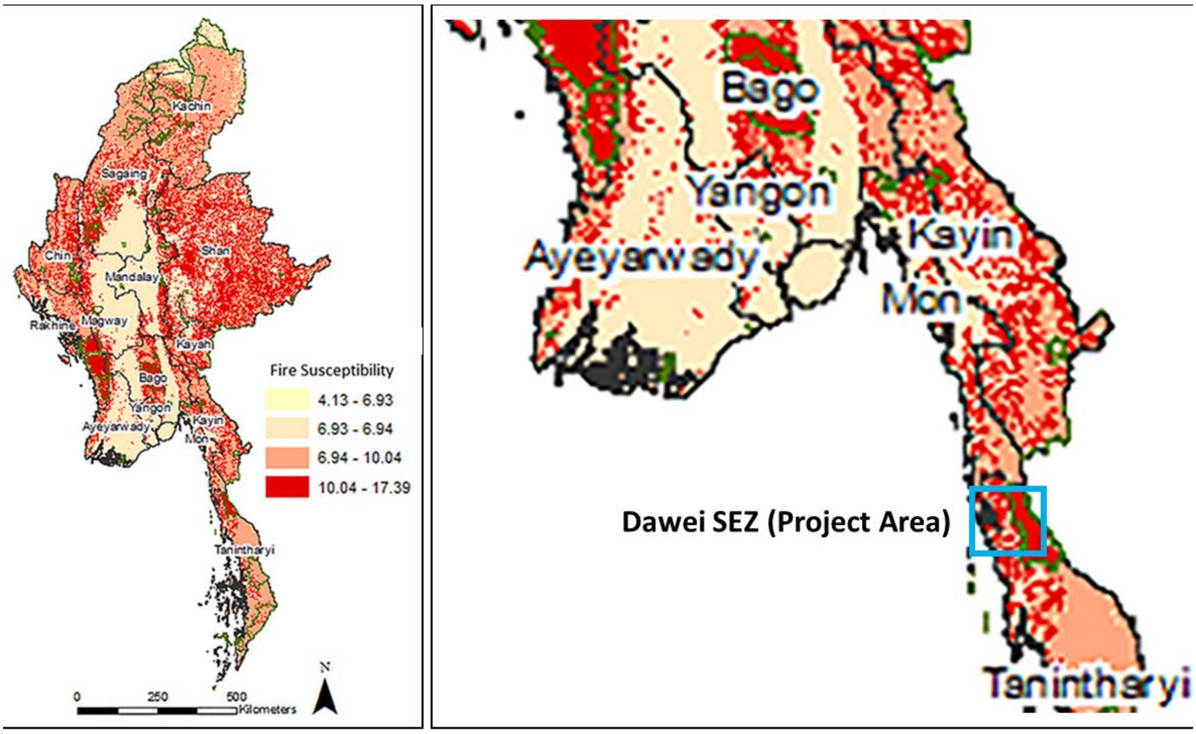
Source: Thein et.al. (2015)

The Project may associate tsunami for a level depending on scale and magnitude of the sub-marine earthquakes that originates in Indian Ocean. However, due to setting of the Project location is not on shoreline, which is in low tsunamic impact zone and as reported in Myanmar, none of wave are exceeding 3 meters (Thein et. al, 2011 and Satake et. al., 2006). At least 10 km further in landward, the Project shall not be directly wiped off by this height of Tsunami (Refer to the worst Tsunami, case with maximum 60 meters height, hit the Andaman shoreline in December 2004). The Project shall be in low risk from Tsunami.

In this EIA report, ERP will not include the earthquake and tsunami emergency because likelihood of occurrence is low and temporary. In case unavoidable disaster i.e. regional or global scale, the Project and related people shall follow general procedure for evacuation and safety guideline in responding to Earthquake and Tsunami ;*http://www.earthquakecountry.org/downloads/LivingonShakyGround_NorthCoast.pdf* (**Annex 6-1**).

6.3.6.3 Fire Vegetation

Fire prone research, probabilistic frequency ratio analysis of fire vegetation, by Biswas et.al. (2015) *http://journals.plos.org/plosone/article?id=10.1371/journal.pone.*0124346 reveals that anthropogenic sources contributes fire risk factor rather than biophysical factor e.g. vegetation, elevation and temperature. Area in vicinity of the Project, around 20-50 km in radius, has high exposure to fire vegetation, as presented in **Figure 6.3-1.** Fire vegetation in Project area likely causes by agriculture burns including shifting burns of land and crops. Northeast of the Project area, is protected forest, has also high risk of fire due to type of vegetation and elevation. It can be source of fire vegetation by spreading. Especially, in dry month between November and April, fire is more prone by winds and fuels rather than in wet month where humidity is limited ignition of fire. For this reason, the Project is located in high fire hazard areas due to it surrounded with settlement of people and protected forest; the impact from fire vegetation is medium.



Source: Biswas et.al. (2015)

Figure 6.3-1 Fire risk map

To ensure that the Project will be minimal impacted by fire vegetation, the Project shall follow the Fire Emergency Response Procedure as prescribed in *Section 4.3.2* and mitigation measures as follow:

- Manage fire defending space area surround the Industrial Estate i.e. location connect to plantation
- Vegetation for buffer zone shall not be ignitable plant species e.g. Eucalyptus are among flammable plants.
- Manage vegetation, weeds, organics rubbish by other mechanical ways instead of burning. In case necessity, open burning must not leave over or ignorance. The burning must be controllable.
- Engage community, to acknowledge villagers about hazard of fire vegetation, reduce burning and fire prevention plan.

6.4 RISK ASSESSMENT

6.4.1 Conceptual Framework

A. Concept and Definition of Environmental Risk

In most documents on environmental risk assessment, environmental risk is narrowly defined to focus on a hazard from an environmental event which could affect receptors through an environmental pathway. For example:

- environmental event: Disposal of toxic and hazardous wastes on land causing soil contamination which could pollute groundwater
- Environmental pathway: groundwater
- Consequences on receptors: health impacts on communities nearby the disposal site that rely on groundwater for domestic use and consumption

In these environmental risk assessment documents, impacts are easily confused with risks if the risk context is not clearly established. In the above example, if toxic and hazardous waste are not properly disposed off in the site, soil will be contaminated and pollutants could reach the aquifer. If the disposal site is on the aquifer used by the communities, it is certain that the groundwater will be polluted causing adverse consequences on the communities. In this respect, groundwater pollution is certain and the issue needs to be investigated in the context of EIA not environmental risk assessment. On the contrary, if the wastes are properly disposed in engineered landfill, there still is a concern that the liner may possibly leak. This concern is a risk that should be investigated in the context of environmental risk management and will have to be managed to minimize the possibility of leak.

The consultant considers environmental risk within the context and framework of project risk management as environmental risk is one of several categories of project risks, such as technical risk, financial risk, legal risk, and market risk. Environmental risk will need to be managed as part of project risk management, which is an integral part of project management, during the construction phase and the operational phase of a project in parallel with other categories of project risks.

A project risk is variously defined in risk management document but all definitions share three key word: event, likelihood of occurrence of event, and consequence of the event, if occurred, on the project. The Consultant defines a project risk in general as:

"*A project risk is an undesirable event which may or may not occur, but if it occurs it will have negative consequences on the achievement of project objectives."*

In investigating environmental risk of this project, the consultant, base on the above definition of a project risk, treats an environmental risk as:

"*An event which may or may not occur, but if it occurs it will have negative consequences on the achievement of the project's environmental management objectives, i.e. Compliance with environmental performance requirement prescribed by Dawei Residence Company Limited (DRC) and other authorities*."

B. Objectives of Environmental Risk Assessment

In line with the objectives of EIA, the objectives of environmental risk assessment (ERA) are to: (i.) identify and assess environmental risk during the construction and operational phases of the project; and (ii) prepare an environmental risk management plan (ERMP) for the project covering the construction phase (CERMP) and the operational phase (OERMP). The ERMP will be part of the project risk management plan (PRMP) to be implemented as part of project management.

C. Environmental Risk Management Planning Process

The ERM planning process is similar in principle to the project risk management planning process, and the planning process for the construction phase is similar to that for the operation phase. The project risk management planning is different from the environmental risk management planning in scope and risk management context.

The ERM planning process adopted for this project, in general, consists of the following steps:

(1) Establish the Environmental Risk Management Context

The establishment of environmental risk management context is to gain a clear understanding of the following subjects: (i) project management arrangements, especially project risk management; (ii) arrangements for environmental management of the project during the construction phase; (iii) responsibilities of contractors, project owner, project management team, and supervision consultants; and (iv) linkage between environmental risk management and project risk management, and between environmental risk management and environmental management.

Information on the project implementation and its environmental impacts will be the basis for forming judgmental views on the potential uncertain events which constitute risks, likelihood of occurrence of the events, and their impacts on the environmental management objectives of the project.

(2) Risk Identification

Risk identification is to identify various concerns related to possible events that, if occur, could result in the project being unable to comply with environmental requirements prescribed by DRC and other authorities. Such events would consist of external events and internal event.

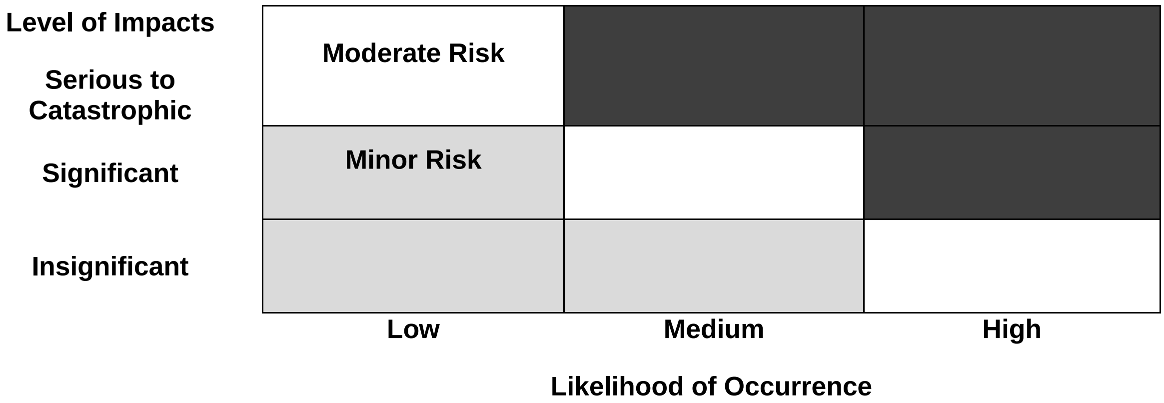
(3) Risk Analysis

In this step, each identified event will be analyzed to come up with a rational conclusion on its likelihood of occurrence (high, medium, low), its impacts on the achievement of the project's environmental management objectives and direct and indirect on-site and off-site costs, and causative factors related to the occurrence of the event.

(4) Risk Classification

The results of risk analysis are used to prepare a risk classification matrix based on the likelihood of occurrence and the magnitude of impact. **Figure 6.4-1** shows an example of a simple risk classification matrix. In this example, risks are classified into minor, moderate and major risk.

- Minor risks are characterized by low impact and low likelihood of occurrence. Minor risks can be accepted or ignored.
- Moderate risks are characterized by high impact and low likelihood of occurrence or by low impact and high likelihood of occurrence. Moderate risks will need treatment.
- Major risks are characterized by high impact and high likelihood of occurrence. Major risks will need close attention of the management and significant levels of treatment.



Simple Risk Classification Matrix

Source: Modified from the matrix in NASA Risk Management Presentation

Figure 6.4-1 Simple Risk Matrix

A risk profile should be prepared for each risk to be managed. The risk profile should include:

- A description of the risk;
- Potential cause of the risk;
- Likelihood of the risk occurring;
- Potential effect or consequences of the risk;
- Ranking or severity of the risk; and
- The evaluation of the acceptability of the risk.

(5) Formulation of Cost Effective Risk Treatment or Mitigation Measures

For a risk related to uncontrollable external event, such as flooding, risk mitigation measures will either aim at protection or minimizing the impacts or both.

For a risk related to internal event, the risk mitigation measure to be adopted could be designed to reduce the likelihood of occurrence, reduce consequences if the event occurs; avoid the event by not taking actions that have risks; and transfer the risk. A minor risk

would be accepted if the mitigation measure is not financially justified. Designing a cost effective mitigation measure needs to consider the root cause of the event constituting the risk.

(6) Arrangements for Implementing and Managing the Risk Mitigation Measures

This step will propose arrangements for implementing the proposed risk mitigation measures, including: (i) responsible person for each risk; (ii) organization for environmental risk management; (iii) risk monitoring and evaluation; and (iv) reporting and corrective actions.

The environmental risk management plan will need to be linked with the environmental management plan as well as the project risk management plan to ensure that any dependencies or potential resource conflicts between project and environmental management tasks and environmental risk mitigation are identified and resolved. Managing environmental risk is essentially an element of project risk management. For example, the individual environmental risks will need to be included in the project risk registration process.

6.4.2 Environmental Risk Management-Construction Phase

A. Environmental Risk Management Context

For this project, the ITD contractor would be contractually responsible for: (i) preparation of detailed designs and specifications of all equipment and facilities; and (ii) procurement and construction. The environmental performance requirements of the project construction and operation will need to be adequately incorporated in the designs, specifications, and construction. All environmental mitigation measures recommended in this Final EIA Report and accepted by the DRC will be implemented by his subcontractors under the supervision of construction supervision consultants of project proponent. Monitoring of the environmental performance of the ITD contractor will be carried out by the project management team of project proponent.

The environmental risk management will be carried out by the project management team as part of the overall project risk management. The environmental risk mitigation measures will be implemented by the project management team within the scope of and procedures for project risk management.

B. Risk Identification

During the construction phase, uncertain events or environmental risk would be of concern to the project proponent is the project may not be able to comply with environmental requirements prescribed by DRC or other concerned authorities.

This uncertain event could have the following consequences on the project:

- The authorities may order the project to suspend the construction or in the worst case they may revoke the construction permit.
- Physical damages or body damages on-site or off-site with cost to be incurred by the project.

C. Risk Analysis

The identified risk events could be cause by the following:

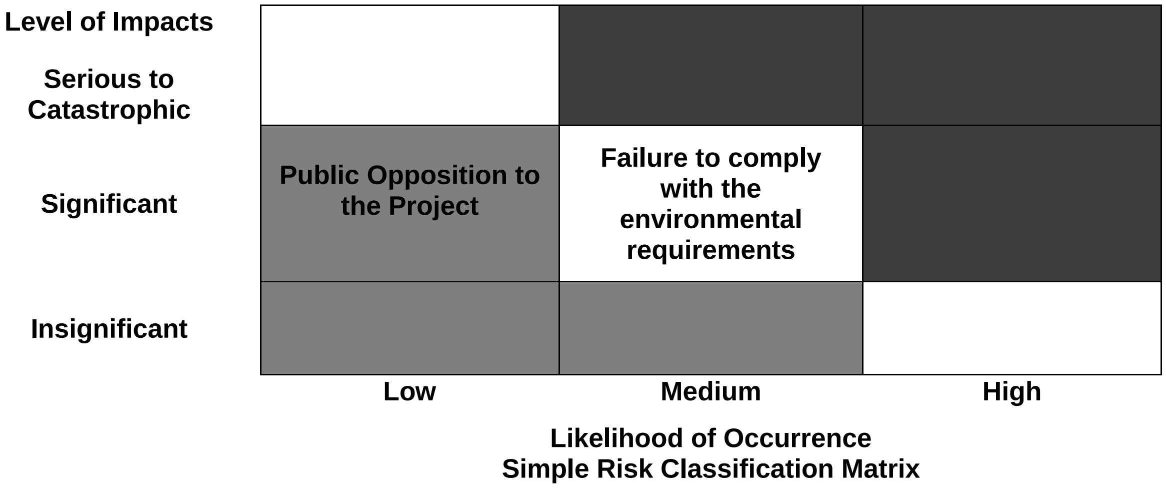
Risk: Failure to comply with the environmental requirements

Potential causes:

- The ITD contractor and subcontractor have inadequate understanding of the environmental performance requirements of the project.
- The ITD contractor and subcontractor unintentionally omit the environmental requirements due to ambiguity of the environmental requirements in the contract.
- Inadequate supervision and monitoring of environmental mitigation activities of the ITD contractor and subcontractors.
- Changes in designs or construction methods without revising the originally proposed mitigation measures.
- Change in the environmental requirements during the construction without the revision of the originally proposed mitigation measures.

D. Risk Classification

Figure 6.4-2 shows a risk matrix for the construction phase. Risk is considered major risk as it would have a high level of likelihood of occurrence and a high level of impacts.



Source: Modified from the matrix in NASA Risk Management Presentation

Figure 6.4-2 Risk Matrix for the Construction Phase

E. Risk Mitigation Measures

Risk mitigation measures need to address the identified causes of the risk. Mitigation measures for the identified risks correspond to the identified causes are presented in **Table 6.4-1**. The measures will be implemented through contractual arrangement.

Table 6.4-1 Mitigation Measures for Environmental Risk Management during Construction Phase

Cause	Mitigation Measures
The ITD contractor and subcontractor have inadequate understanding of the environmental performance requirements of the project.	Require the ITD contractor to: - Prepare a Construction Phase Environmental Management Plan (CEMP) base on the EIA report and associated CEMP, detailed design and construction plan and schedule. The CEMP must clear define. - The project's environmental requirements and obligation - Physical measures that are needed to comply with the requirements and obligation. - Construction measures that are needed to comply with the requirements and obligation. - Assignment of responsibilities to each subcontractors.
The ITD contractor and subcontractor unintentionally omit the environmental requirements due to ambiguity of the environmental requirements in the contract.	1. TOR for procurement of the ITD contract must clearly state the project' s environmental requirements during the construction phase that the ITD contractor must ensure that the project construction will meet the requirements. 2. The ITD contract must clearly prescribes environmental management responsibility of the ITD contractor.
Inadequate supervision and monitoring of environmental mitigation activities of the ITD contractor and subcontractors.	1. The supervision consultant will be required to submit a supervision and monitoring plan that clearly indicates the environmental tasks to be supervised and monitored. This supervision and monitoring plan for the implementation of the environmental mitigation measures. 2. Monthly reviews of the ITD contractor environmental performance. 3. Close supervision of truck operations especially during the site filling period.
Changes in designs or construction methods without revising the originally proposed mitigation measures.	Changes in designs or construction methods may be initiated by the ITD contractor or the project proponent. The request for changes must be subject to the change procedure in project management. The request for changes must be accommodated by an analysis of environmental implications and revised mitigation measures.
Change in the environmental requirements during the construction without the revision of the originally proposed mitigation measures.	Change in the environmental requirements may be initiated by DRC or the project proponent with approval of DRC. The change must be subject to the change procedure in project management. The ITD contractor will analyze environmental implications of the changes and revise the originally proposed mitigation measures accordingly.

Source: UAE (2016)

F. Implementation Arrangements

(1) Responsible Persons and Organization

Environmental risk management needs to be an integral element of environmental management of the project. Therefore, the organization for environmental management proposed in the Construction Phase Environmental Management Plan (CEMP) will also implement the environmental risk mitigation measures in cooperation with the construction supervision manager.

(2) Risk Monitoring and Evaluation

Risk monitoring involves periodic monitoring of risk triggers. A risk trigger is an event which could lead to the occurrence of the risk event. For example, a risk trigger for a flood risk is the intensity and frequency of rain falls in the catchment area. The rainfall data will be analyzed to evaluate the likelihood of occurrence of flood.

Risk monitoring and evaluation in environmental risk management will be carried out as part of the environmental monitoring program for environmental management. Some data could serve both risk monitoring and environmental monitoring.

Risk: Failure to comply with the environmental requirements

The monitoring and evaluation should cover the following risk trigger:

- Inadequacies of the CEMP prepared by the ITD contractor and the timeliness in correcting deficiencies in the CEMP found by the project management team;
- Trend of the ITD contractor and subcontractors not conform with the construction requirements related to the CEMP; and
- Response of the ITD contractor to the instructions of the supervision engineers and the SHE manager regarding the implementation of environmental impact mitigation measures and monitoring of the environmental management performance.

(3) Reporting and Corrective Actions

The process for reporting and corrective actions in environmental management will also be applied to the environmental risk management.

6.4.3 Environmental Risk Management-Operational Phase

The operation phase of residential building has no risk activities. Therefore, the operation of Initial Township has no risk impacts on nearby area.

CHAPTER 7
CUMULATIVE IMPACT ASSESSMENT

7.1 INTRODUCTION

Cumulative impacts are the result from incremental changes caused by other past, present, or reasonably foreseeable actions together with the project. The reasonable foreseeable actions are usually obtained from available government policy, town planning and/or development plans that are applicable to the area of interest.

Initial Township is small area located in the east of Dawei Initial Industrial Estate.Dawei Initial Industrial Estate and associated components are by far the single largest development plan in this region of Myanmar. No other town planning or development plans have been identified during the study period. Myanmar also lacks overall economic development planning, which hinders prediction of future cumulative impacts. It is therefore assumed that the future scenario will include expansion of villages and townships surrounding the project area due to expanded local economy and immigrated workers.

For the cumulative impact assessment of the Initial Township project is assessed in overall of Dawei Initial Industrial Estate. It is assessed in case of opening the all operation phase. Past and present development and impacts to the area are from smaller scale human development mainly from agriculture (paddy fields, and orchards) and communities. Mining is one of the key industries in Myanmar, but the locations of mines are generally in the mountain ranges further away from the project area.

Present environmental qualities which can be used to represent past and present impacts, from the baseline and existing environmental surveys in several studies of the project, are in acceptably good conditions except for surface water quality in major rivers, where some parameters such as phenol and COD may occasionally exceed the referenced standard levels. The surveys show that groundwater quality has evidence of being contaminated with wastewater and sewage from communities due to escalated level of coliform bacteria. Terrestrial ecology in the project area has been changed from natural conditions to agricultural lands and communities. The area on the west bank of Dawei River has evidence of being encroached by local populations based on site observation. Marine ecology, however, is still quite diverse most likely due to limited marine fisheries activities in the area and no large scale commercial fishing has been observed.

It is therefore believed that the current activities in the area have already put stress on some of the environmental aspects, particularly on surface water quality, groundwater quality, and terrestrial ecology, in the project area. The present water quality impacts are most likely from lack of sanitary system in the communities within and surrounding the project.

A simple matrix can be used to identify and evaluate cumulative impacts due to project development and other past, present, reasonably foreseeable activities against elements of environment or sensitive receptors. The levels of potential impacts are assessed qualitatively based on available information from the above sections and the best professional judgment. **Table 7.1-1** is shown the results of the evaluation.

Beneficial cumulative impacts are identified in two areas: infrastructure facilities and socio-economic conditions. Although, initially, the Initial Industrial Estate will only install power plant sufficient to sustain the project operation, the Initial Industrial Estate may expand the grids to cover the adjacent communities in the future. This will provide a more stable and reliable electricity source to the current system in the communities that relies on diesel generator.

Adverse cumulative impacts on terrestrial ecology and land use are of the most concern. Although the Initial Industrial Estate area and project area has already been encroached and largely used by local populations, expansion of the communities and population as an indirect impact of the project may increase demand of lands and wildlife products, which will lead into further encroachment into forest area and increased wildlife poachers. Lack of land use and town planning, as discussed in the previous sections, may worsen the situation surrounding the project area.

Moderate impacts are identified for air quality, surface water and sediment, traffic and transportation, and sites of historical and cultural importance.

Table 7.1-1 Cumulative Impact Evaluation Matrix

Potential Impacts Area	Proposed Action	Past Actions	Other Present Actions	Future Actions	Cumulative Impacts
Physical Resources					
Air Quality	**			*	**
Noise and Vibration	*				*
Surface Water and Sediment	**	*	*	**	**
Groundwater	*	*	*	*	*
Geology and Seismology					
Solid Waste	*				*
Biological Resources					
Surface Water Biology	*				
Terrestrial Ecology	*	**	**	**	***
Economic Development					
Infrastructure Facilities	+				+
Traffic and Transportation	*			**	**
Land Use	***			**	***
Social and Cultural Resources					
Socio-Economic Conditions	+			+	+
Sites of Historical and Cultural Importance	**				**
Public and Occupational Health	*	*	*	**	**
Risk Assessment					
Environmental Risk Assessment	*				*

Remark: * - low adverse impact ** - moderate adverse impact *** - high adverse impact
+ - beneficial impacts

Source: EIA Study Team

Surface water and groundwater quality, as discussed earlier, already show signs of impacts due to the past and present human activities. Wastewater from households and agricultural areas are discharged into receiving waterways, which end up in Dawei River. Only basic sewage treatment system, such as septic and seepage tanks, exists in a few places. Most of the households still use open pits for disposal of sewage. This leads to contamination of groundwater wells, which are being used for consumption. The project has less potential to impact groundwater quality but discharge of treated wastewater will be made to Dawei River. Without improvement to the sanitation system within the communities, which are expected to be expanded in the future, cumulative effects on the quality of surface and groundwater are foreseeable.

The local road network outside the project area is small and in deteriorated conditions. Expansion of the local road networks will be needed to alleviate the potential impacts in the future.

The Industrial Estate has plans for building its own healthcare facilities for construction and operation period. This will reduce stress to the public healthcare facilities outside the project that are already in deficiency, based on the baseline conditions discussed in Chapter 4. An increase of population in local communities is expected, and it is likely that the local healthcare facilities may not be developed quickly enough to cope with the increased in population. However, the increase of population will support the local economic.

Initial Township has established EMP to address some of these concerns, such as for land use issue. However, many of the cumulative impacts and possible mitigation measures are considered to be beyond the scope and capability of the Initial Township to implement. Close cooperation with local and national government agencies will be required to address these concerns and to ensure that the potential impacts are predicted and appropriate measures are planned and implemented.

CHAPTER 8
ENVIRONMENTAL MANAGEMENT PLAN

For each of the potential environmental impacts described in the previous chapter, measures are suggested either to prevent those impacts or to mitigate their effects. The various preventative mitigation measures proposed for different types of impacts, implementation parties, the responsible authorities, location of usual construction or operation activities, estimated cost and duration are prescribed in this Chapter.

The key organizations responsible for implementation of the mitigation measures include: the Governing Bodies of the Government of Myanmar, the Project Proponent, the Construction Contractor and Sub- Contractors (during construction phase), and the Investors/Tenants. Definition and responsibility of each party are described in **Section 8.6** Institutional Arrangement.

8.1 ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN

As enacted in the EIA Procedure, 2015. The two EMPs during construction phase and operation phase are defined as follows:

"***Construction Phase EMP*** *means a detailed and comprehensive Environmental Management Plan (EMP) for the construction phase of a Project. Such plan shall present all relevant commitments, Emission Limit Values, Environmental Quality Standards and other environmental requirements and include a description of the construction works, present an overview of Adverse Impacts, present mitigation measures and monitoring programs together with time schedules, overview maps, images, aerial photos, satellite image, site layout plans, cross sections, transects, environmental management and monitoring sub-plans for each construction site, thematic sub-plans, and management procedures as appropriate*".

"*Operation Phase EMP* *mean a detailed and comprehensive EMP for the operational phase of a Project. Such plan shall present all relevant commitments, Emission Limit Values, Environmental Quality Standards and other environmental requirements and include a description of the construction works, present an overview of Adverse Impacts, present mitigation measures and monitoring programs together with time schedules, overview maps, images, aerial photos, satellite image, site layout plans, cross sections, transects, environmental management and monitoring sub-plans for each construction site, thematic sub-plans, and management procedures as appropriate*".

The above definitions make clear that the two EMPs required by MONREC will need to be comprehensive and have more details than very brief EMPs presented in EIA reports of the past. This requirement of MONREC is in line with current ESIA practices in developed countries. It should be noted that the two EMPs prepared as part of this ESIA study are invariably framework plans as they are based on outline designs of the Project. They are therefore intended to provide framework and prescribe requirements for the preparation of

detailed CEMP and OEMP by the appointed EPC contractor (Contractor). Consequently, they could be considered and referred to as the Project Proponent's or Owner's EMPs to distinguish them from the Contractor's EMP after the ESIA during project implementation.

8.2 EMP AND EMoP FOR CONSTRUCTION PHASE

As discussed in Chapter 6, the Project is not expected to have major environmental impacts during construction apart from environmental disturbances normally experienced in Township construction. Nevertheless, the Project Proponent will ensue that the Contractor will make best efforts to minimize the impacts during the construction phase despite their insignificant levels. In this regard, the Project Proponent will ensure that the Contractor-CEMP will incorporate all mitigation measures as prescribed in the Owner-CEMP in preparing detailed designs of the township and its associated facilities, construction methods, and specifications. CEMP is present as below:

8.2.1 Erosion and Sedimentation Action Plan

(a) Principle and Rational

Construction and earth-moving activities accelerate erosion mainly by exposing areas of soil to rain and running water. If this runoff is not properly controlled, the result is often serious siltation of nearby watercourses. The consequences are degradation or destruction of fish and wildlife habitat, and water being less useful for freshwater supplies.

(b) Objectives

To prevent soil erosion in the construction site into water resource and area nearby.

(c) Project Area

Project construction area

(d) Description of Mitigation Measures

CC shall prepare the Erosion and Sediment Control Plan for construction activities and submit to DRC for approval prior to commencement of construction activities in the area. The major effort at construction sites will focus on the management of erosion of excavated surfaces, especially during the wet season when the volume of runoff is expected to be high. The plan shall have the following components:

- An assessment of the potential for contamination of natural waterways. Basic principles include the size of the disturbed area, site drainage, and waterways receiving storm water from the disturbed area;

- Plans for water management during construction shall be established and include adequate drainage system to manage runoff from 2-year ARI storm flow;
- Sedimentation controls shall be implemented in the form of silt trap fences and sedimentation basins where appropriate, and all runoff from the disturbed area shall be directed to the sediment controls;
- Measures to be taken to collect, store and treat storm water prior to discharge from the site considering options for water re-use onsite;
- Management of material storage area – Stockpile and spoil disposal area shall not be located on drainage line;

Control of erosion and sedimentation shall be constructed progressively prior to commencement of each stage of earthworks until the permanent protection is established.

(e) Description of Monitoring Program

DRC shall develop a monitoring program to include inspections of drainage works, sediment traps and other structures designed to treat water to reach an acceptable quality before discharge into natural and/or constructed watercourses meet the appropriate standard. The monitoring program for erosion and sediment control include:

- Inspect that erosion and sediment controls are in place prior to wet season,
- Inspect that the drainage system and sediment controls are functional during wet season,
- The sediment basins have a capacity of reducing the suspended solid from storm water by fifty percent (50%),
- Designate water quality monitoring plan to include locations of sampling upstream and downstream of the entry points of surface water runoff from construction area; frequency and methods of testing, and applicable standards for suspended solid.

A total of 6 sediment sampling stations similar to those surveyed during baseline sampling is recommended. Details of the stations and parameters are provided in Figure 8.2-1 and Table 8.2-1 but in 9+1 phase (details are shown in **Chapter 4**) only 2 sampling stations are TS-SW2 and TS-SW3 will be monitored

(f) Work Plan (Duration)

During construction period

(g) Responsible Organizations or Agency

CC under supervision by DRC shall develop and implement *Erosion and Sediment Control Plan* according to the site condition and progress of construction work.

DRC shall review and approve the *Erosion and Sediment Control Plan* before the construction in the area can be commenced, then inspect and monitor the implementation of *Erosion and Sediment Control Plan* according to the monitoring program. DRC shall prepare the report with the result of the implementation to MC every 6 months.

(h) Budget

Included in construction budget.

8.2.2 Surface Water and Sediment Quality and Aquatic Biology Action Plan

(a) Principle and Rational

Release of pollutants from construction activities, work camps, workshops, and chemical storage to the environment may affect quality of freshwater, coastal water, and sediment. Control of release is necessary to limit the potential impacts caused by such activities.

(b) Objectives

- To prevent soil erosion and wastewater runoff into natural water resources.
- To prevent wastewater contamination from campsite

(c) Project Area

Project construction area

(d) Description of Mitigation Measures

The following mitigation measures need to be implemented by DRC and CC:

- Prepare and implement the measures for Erosion and Sediment Control.
- Prepare and implement the measures for Waste Management.
- Prepare and implement the measures for Construction Work Camps.
- Release of oil and grease from workshop facilities is prohibited. Used oil need to be stored separately and managed as per Waste Management Plan.
- Stock yards; gasoline, oil, lubricant and hydraulic oil storage areas; and machines/vehicles cleaning areas should be located at least 100 meters away from natural waterways.
- Sedimentation pond or settling pond or sediment trap shall be implemented.

(e) Description of Monitoring Program

Integrate monitoring program for inspection of mitigation measure implementation with relevant plans.

Additionally, it is recommended that the project continue sampling of surface water quality in Dawei River and Yalaib Chaung every 6 months, before and after rainy season, during the construction period for another 3 years so that the project has a more complete and continual baseline surface water quality before commencement of the Initial Township area.

In Full phase, a total of 6 sampling stations similar to those surveyed during baseline sampling is recommended. Details of the stations and parameters are provided in Table 8.2-1 and Figure 8.2-1 but in 9+1 phase (details are shown in **Chapter 4**) only 2 sampling stations are TS-SW2 and TS-SW3 will be monitored.

Table 8.2-1 Analysis Methods of Surface Water and Sediment Quality Parameters and Sampling Stations During Construction Period

Parameters	Analysis Method[1/]	Sampling Station
Surface Water		
Depth/ Width	Depth Meter	TS-SW1: Discharge point at the north of the project at KM 18+500 TS-SW2: Upstream at Yalai Chaung at meeting point of Yalai Chaung and canal(that receiving wastewater from discharge point at south of the project) TS-SW3: Downstream at Yalai Chaung at meeting point of Yalai Chaung and canal(that receiving wastewater from discharge point at south of the project) TS-SW4: Dawei River at the boundary of the project area at Ta Nyin In village TS-SW5: Dawei River (at about 500 meters upstream from the Yang Gaeng bridge) TS-SW6: Dawei River (at about 500 meters downstream from the Yang Gaeng bridge)
Temperature	Thermometer	
Flow Rate	Flow Meter	
pH	Electrometric Method	
Salinity	Electrical conductivity Method	
Electrical Conductivity	Electrical Conductivity Method	
DO	Membrane Electrode Method	
BOD	Membrane Electrode Method	
Turbidity	Nephelometric Method	
TSS	TSS Dried At 103-105 ^{o}C	
TDS	TDS Dried At 180 ^{o}C	
TS	TS Dried At 103-105 ^{o}C	
Nitrate-Nitrogen	Cadmium Reduction Method	
Ammonia-Nitrogen	Phenate Method	
Phosphate -Phosphorus	Ascorbic Acid Method	
TKN	Kjeldahl Method	
Oil&Grease	Soxhlet Extraction Method	
Phytoplankton	Microscopic	
Zooplankton	Microscopic	
Benthos	Macroscopic	

Remark: [1/] APHA, AWWA and WEF. Standard Methods For The Examination of Water And Wastewater. 22nd ed. Washington, DC: APHA. 2012.

[2/] United States Environmental Protection Agency. SW-846 Method.

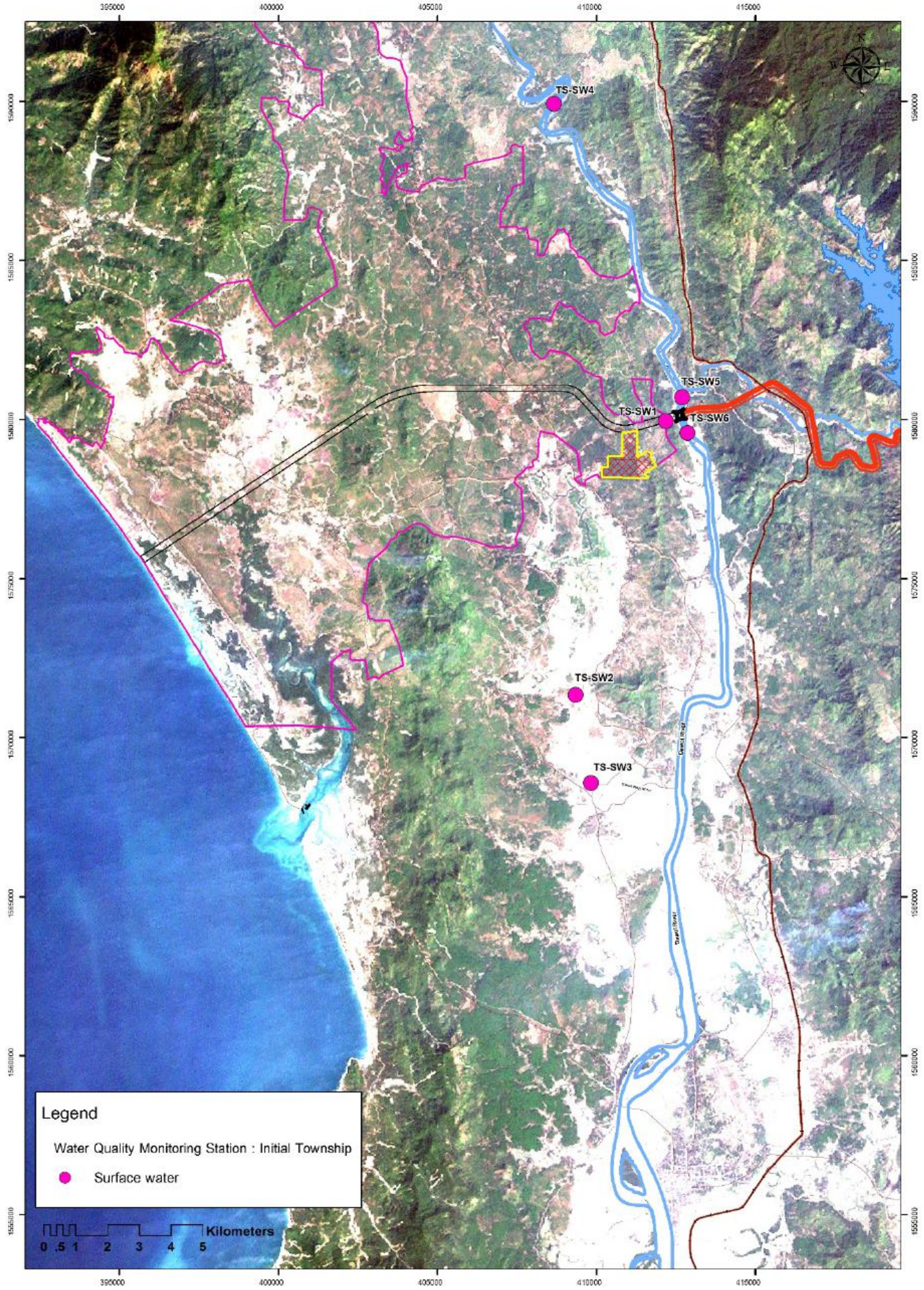


Figure 8.2-1 Sampling Locations for Surface Water, Sediment and Aquatic Biology Monitoring in Construction Phase

(f) Work Plan (Duration)

During construction period

(g) Responsible Organizations or Agency

Refer to the relevant plan.

(h) Budget

Approximately 48,000 USD/Year

8.2.3 Terrestrial Biology Action Plan

(a) Principle and Rational

Although the much of the project area has been encroached by local villagers and used as farmland and residential areas. Attempts should be made to conserve the native plant species and minimize disturbance to sensitive environment.

(b) Objectives

To prevent a natural forests, endangered plant species, native plant species and minimize disturbance to sensitive environment such as mangrove area.

(c) Project Area

Project construction area and surrounding area

(d) Description of Mitigation Measures

DRC needs to coordinate with CC to ensure that the measures below are incorporated in their construction plan.

- Only clear the area needed for construction of infrastructure and utility system. Avoid disturbance of forest and mangrove areas as much as possible.
- Wherever possible, identify the endangered species and transfer them to safe locations prior to clearing the vegetation.
- Hunting of wildlife is prohibited.
- Disturbance of forest areas outside the project area by CC and their subcontractors is prohibited.

(e) Description of Monitoring Program

DRC will be monitoring the progress of construction work and vegetation clearing. Excessive vegetation clearing particularly prior to rainy season has to be minimized. Natural forests and mangrove areas that can be conserved throughout the construction phase has to be identified and signposted

(f) Work Plan (Duration)

Vegetation clearing plan and detailed survey of endangered species has to be conducted before the area is cleared. The plan can be revisited throughout the construction period.

(g) Responsible Organizations or Agency

DRC is responsible to identify the area where natural forest and mangrove can be conserved. DRC needs to consider further survey of endangered plant species identified in baseline environmental survey to map out their locations and numbers. DRC shall communicate the plan to CC for action.

(h) Budget

Included in construction budget.

8.2.4 Air Emission and Noise Control Action Plan

(a) Principle and Rational

Main potential impacts to air quality during construction activities are dust from construction areas (land clearing) and unpaved roads. Other sources include exhaust from machineries used in the construction activities. Main potential noise impacts are the diesel engine and pile driving or pavement breaking which may affect nearby communities and receptors.

(b) Objectives

To reduce and control dispersion of dust and noise due to construction activity and to reduce air pollution emission and noise from construction machinery equipment. To reduce air pollution and noise impact on community nearby the area.

(c) Project Area

Project construction area and surrounding area

(d) Description of Mitigation Measures

DRC shall formally notify CC and enforce the following measures to reduce emission of air pollutants and noise from construction activities.

- All equipment and vehicles will need to be maintained in good mechanical conditions;
- Stationary noise sources (such as generators, concrete batching plants, etc) shall be sited as far as possible from villages, construction camps and resettlement areas;

- Construction works within the distance of 500 meters from villages and resettlement areas will be carried out between 06:00 to 18:00;
- Dump trucks with loads that may generate dust will be covered when travelling though communities including limited speed of vehicles to 40 km/hr;
- Water spraying at least once a day in the construction areas and on unpaved roads is required in the following conditions:
  - On the section of unpaved transportation routes that pass through communities or construction work camps;
  - When dust generating activities e.g. alteration of topography are being carried out within 100 meters of a village or construction work camp;
  - When visual inspection indicates excessive dust generation in the construction areas and unpaved roads used for material transportation;
- Burning of waste materials including waste vegetation from site clearing will be allowed under the following conditions:
  - The materials that are allowed to be burned are general garbage and vegetation waste. No burning of materials that may generate toxic gases is allowed;
  - A trained fire protection officer with appropriate firefighting equipment has to be present near the burning areas;
  - Burning is not allowed during severe wind conditions;
  - Burning is carried out at a safe distance from vegetated areas and not within 2 km. from a village, a construction work camp, or resettlement areas on the upwind direction;
- Avoid impact pile-driving where possible in vibration-sensitive areas. Drilled piles or the use of a sonic or vibratory pile driver causes lower vibration levels where the geological conditions permit their use.
- Construction workers exposed to noise levels of 80 dB(A) or more shall be provided with adequate Personal Protective Equipment (PPE) for hearing protection.
- Check complaints/grieves from communities about dust/noise and construction activities. Ensure that the complaints/grieves are settled.

(e) Description of Monitoring Program

DRC is responsible for monitoring that the CC is complying with the measures mentioned above. The monitoring program can be described as follow:

- Each construction machineries are inspected at least every 6 months with a written certificate / maintenance records of each machinery provided by qualified mechanics of the CC;

- Inspect that the dust suppression measures are implemented according to the mitigation measures;
- Inspect that the burning of waste materials are conducted according to the relevant mitigation measures;

Monitor the Community Grievance Record related to dust and noise and ensure that the complaints are responded to and closed appropriately according to the relevant mitigation measures

(f) Work Plan (Duration)

During construction phase of the Initial Township.

(g) Responsible Organizations or Agency

DRC shall ensure that the mitigation measures were distributed to and acknowledged by CC.

CC shall implement the mitigation measures under supervision of DRC.

DRC shall report the results of implementation to MC every 6 months.

(h) Budget

Included in construction budget

8.2.5 Waste Management Action Plan

(a) Principle and Rational

A number of elements of the construction activities have the potential to generate waste that can have adverse effects on the surrounding environment in terms of water quality, soil quality, air quality (odor and pollutants) and human health. Waste can be both non-hazardous and hazardous waste. These wastes require different management methods. Lack of appropriate waste management facilities in the vicinity of the project area requires that the project needs to manage the waste generated from the construction activities by themselves.

(b) Objectives

- To prevent and resolve waste and solid waste impact from the project.
- To minimize waste and provide guideline for solid waste management according to the law and regulation and appropriate method.
- To prevent and resolve impact from remaining solid waste. To get rid of bleeding area in solid waste storage location.

(c) Project Area

Project construction area

(d) Description of Mitigation Measures

DRC shall develop *Waste Management Plan* that will be applicable to all contractors in the project. The *Waste Management Plan* shall include the following components:

- Identify classification of waste. The minimum waste classification shall be non-hazardous and hazardous waste;
- Identify the size and location of the temporary hazardous waste storage area and non-hazardous waste disposal site for the construction phase of the initial township;
- A mechanism for coordination between DRC and CC in waste separation, waste transfer and record of waste quantity.
- Hazardous waste shall include, but not limited to, the following waste materials. Any mixed waste stream that contains any of the hazardous waste shall be categorized as hazardous waste:
    - Acids and acid waste;
    - Alkalis and caustic waste;
    - Batteries;
    - Spent catalysts, solvents, and chemicals;
    - Empty containers which held chemicals, paint, oil and solvents;
    - Oil contaminated waste including oily rags, oil filters, used gloves;
    - Used oil, hydraulic fluids, chemicals, and solvents;
    - First aid and medical waste;
    - Spill clean-up waste;
    - Waste from grease trap; and
    - Sludge from chemical wastewater treatment system.
- Hazardous waste shall be stored in appropriate temporary hazardous waste storage areas until the permanent hazardous waste management facilities for the operation phase is functional. Minimum requirements of the temporary hazardous waste storage areas include:
    - Impervious floor without cracks or spaces that may allow spills to perforate into the ground;
    - Surrounded by secondary containment bunds. The secondary containment bunds shall be at least 0.5 m high with a volume large enough to contain the spill of the largest container expected in the storage area;
    - Designate storage area for liquids or materials that are not allowed to be mixed, such as acids and alkalis;
    - Equipped with spill response kits;

- Consider providing the area with roofing and temporary walls with a provision that the temporary hazardous waste storage area will have to be in use for at least 3 years until the permanent hazardous waste management facilities of the initial township are functional.
- Type and quantity of hazardous waste in the storage area shall be recorded and kept up to date.

- Burning of the following non-hazardous waste is allowed: cardboard, pallets, papers, and wood/vegetation waste. The waste burning site shall be designated in the *Waste Management Plan* and shall be at least 2 km from any villages, construction work camps, or resettlement areas.
- Other non-hazardous waste shall be transferred to non-hazardous waste disposal site to be used during construction phase shall meet the following minimum requirements:
  - The disposal site shall be on higher ground not subject to flood.
  - The disposal site shall be at least 2 km from any groundwater well that is being used by workers or local villagers.
  - The disposal site shall be in the area where no excavation is planned. It shall be delineated with clear sign boards.
  - The waste shall be covered with soil on daily basis.
  - The location of all disposal sites during construction period shall be recorded as expanded appendices to the *Waste Management Plan*.
- Establish a training program for workers related to waste classification, storage and disposal.
- The *Waste Management Plan* may be expanded to cover recyclable waste and compostable waste in the future.

(e) Description of Monitoring Program

DRC is responsible for monitoring that the CC is complying with the measures mentioned above. The monitoring program is described below.

- Inspect that appropriate containers for type of waste as categorized in the Waste Management Plan are provided for construction work camps, workshops, construction sites and other supporting facilities;
- Weekly inspection of waste segregation at the construction facilities and at the hazardous waste storage and non-hazardous waste disposal site;
- Weekly inspection of hazardous waste storage area and record of hazardous waste inventory.
- The location of waste burning area is designated and no waste burning is conducted outside the area;

- Waste management training record;

(f) Work Plan (Duration)

During construction phase of the initial township

(g) Responsible Organizations or Agency

DRC shall develop the *Waste Management Plan* to be implemented by both DRC and CC during construction phase.

DRC shall operate the temporary hazardous waste storage area and waste disposal site. DRC shall keep record of types and quantity of waste received to the temporary hazardous waste storage area and non-hazardous waste disposal site. DRC shall provide and keep record of waste management training program. DRC shall report the implementation of Waste Management Plan to MC every 6 months.

CC shall collect, separate, and transport the waste to the appropriate waste handling facility. CC to designate waste burning area.

(h) Budget

Included in construction budget.

8.2.6 On-site Traffic and Access Management Action Plan

(a) Principle and Rational

Access roads used for transportation of construction materials and for traveling between construction sites overlap with the existing roads used by local villagers inside the project area. Roads are currently unpaved and have blind spots. Improvement of road safety conditions will be required.

(b) Objectives

To control using for transportation of construction materials and for traveling between construction sites

(c) Project Area

Project construction area and surrounding area

(d) Description of Mitigation Measures

DRC as the project owner shall be responsible and instruct relevant CC to implement the following measures to improve access road safety conditions.

- All access roads in the construction area shall be signposted with the following information in Myanmese and English:

- Speed limit;
- Construction activities and machinery;
- Roadside borrow pits and material stockpiles;
- Any applicable load limit, particularly for temporary bridges; and
- Road features that may affect driving conditions such as curves, hidden accesses etc.

- A speed limit of 40 km/hr shall be applied in village areas and construction camps. Drivers shall be trained and notified of such limit;
- Consider building speed humps before and after each village, where appropriate;
- Route for heavy vehicles used for transportation of construction materials shall be designated. Route with least number of villages and residential area is most preferable;
- Survey of the access roads to identify blind spots need to be regularly conducted. Improvement to the blind spots such as removal of obstructing objects when necessary; and
- Access road used for the construction activities shall be maintained in good conditions.

(e) Description of Monitoring Program

DRC is responsible for monitoring the above measures implemented by all parties. DRC shall coordinate with CC in selection of the most appropriate transportation routes that will contribute to least impact to the locals using the road for their daily travel;

(f) Work Plan (Duration)

During construction phase of the township, until the permanent roads are completed

(g) Responsible Organizations or Agency

CC responsible for construction and maintenance of the access roads shall be responsible for implementing the measures relevant to signposts and road improvement.

DRC and CC are responsible for using the designate routes for transportation of construction materials and traveling between construction sites. Speed limit needs to be respected and punishment system should be in place in case of violation.

(h) Budget

Included in construction budget.

8.2.7 Construction Work Camps Action Plan

(a) Principle and Rational

Construction work camps can be sources of wastewater pollution and health impacts. Thousands of workers are expected during the construction period, and proper management of the camps will be required to ensure that the potential impacts are controlled.

(b) Objectives

To control sources of wastewater pollution and health impacts from work camps.

(c) Project Area

Project construction area

(d) Description of Mitigation Measures

It is assumed that DRC, CC and subcontractors will have their own compounds and camp management bodies. The following measures will be required for each of the worker camps in the project area:

- Camp rules shall be established and informed to all residences. The rules should contain the following components:
  - Policy on alcohol and substance abuse;
  - Safety measures and emergency response particularly in case of fire;
  - Waste management requirements;
  - Other measures to prevent dissemination of vectors and transmissible disease including STDs and HIV/AIDs;
- General areas of the camp shall be kept clean and tidy. Waste shall be collected regularly to avoid accumulation of waste in the camp;
- Toilets shall be provided at a ratio as1 toilet per 15 workers. All toilets shall be equipped with septic and seepage tanks of adequate size. The toilets need to be at least 100 meters from any natural waterways. Sludge from tank cleaning shall be stabilized by adding lime (pH = 12 for 30 minutes) and disposed of in designated pit for sludge disposal. The pit shall be at least 1 kilometer from any groundwater wells
- Proper drainage has to be provided. Improve areas with stagnant water as much as possible; and
- Pest control measures shall be planned and implemented. All bedrooms need to be equipped with mosquito protection.

(e) Description of Monitoring Program

DRC shall be the party inspecting the camps periodically to ensure that all the implementation are made

(f) Work Plan (Duration)

Since the start of any construction work camp until end of its use

(g) Responsible Organizations or Agency

All parties are responsible for managing their own camps in line with the above mitigation measures

(h) Budget

Included in construction budget.

8.2.8 Historical and Cultural Resources Action Plan

(a) Principle and Rational

There are a number of sites with historical and cultural values in the project area. Each village also has at least one temple. Pagodas are observed in many places nearby the project area. Construction activities may disturb and damage these structures. Removal or relocation of these sites will be eventually required when the project is fully developed. If not handled properly, this matter will create significant conflict between local populations and the project.

(b) Objectives

To reduce disturbing and damaging historical and cultural values in the project area.

(c) Project Area

Project construction area and surrounding area

(d) Description of Mitigation Measures

DRC as the project owner will need to take ultimate responsibility in handling the matter and ensure that CC understand the risk and follow the procedures and measures described below to reduce potential impacts with the communities.

- Sites with historical and cultural values shall be identified, recorded and located in the map. This information shall be agreed upon by the local authorities and villagers.
- Inform ward/village administrator if ancients or antiques objects have been found. Relocation/remove must be consulted with local communities.

- If construction activities have to be carried out within 50 meters from these sites, the leaders of the communities that the sites belong to need to be notified at least 1 week prior to commencement of the activities.
- Establish a plan and communication channel in case an unidentified site is encountered during the construction work to avoid damage to the site.
- Removal and relocation method and destination shall be a mutual agreement between DRC, local authorities, and the leader of the communities that the site belongs to.

(e) Description of Monitoring Program

DRC needs to keep record and map up to date and make them available to all parties including CC and their subcontractors. DRC needs to monitor the construction work progress with the locations of known sites so that timely action can be taken is the sites will be subject to disturbance by construction activities

(f) Work Plan (Duration)

All through the construction phase

(g) Responsible Organizations or Agency

DRC as the project owner is ultimately responsible for this matter

(h) Budget

Included in construction budget

8.2.9 Public and Occupational Health Action Plan

(a) Principle and Rational

Construction activities can directly and indirectly affect the conditions of public and occupational health. Potential impacts include accidents, injuries, communicable diseases, increase in stress to the existing public health facilities, etc. Mitigation measures related to each aspect of public and occupational health are described below.

(b) Objectives

To reduce accidents, injuries, communicable diseases, increase in stress to the existing public health facilities

(c) Project Area

Project construction area

(d) *Description of Mitigation Measures*

Occupational Health and Safety:

During the construction phase, DRC as the project owner and CC as the implementer should establish the preventive and protective measures to mitigate the potential occupational health impacts as follows:

Accidents and Injuries

- Establish occupational and safety management plan and program for the construction should be established to assess and manage EHS impacts and risks. Project or activity-specific plans or procedures should be prepared and the basic site rules of work should be included.
- Perform occupational accidents and disease recording and reporting, and investigate all incidents to understand the cause of accident and to identify measures necessary to prevent a recurrence.
- Provide contractor management plan to ensure that the contractor will have safety performances and procedures to protect their employee. Supervise and monitor contractor performance periodically.
- Train and provide information to employees. Occupational health training program should be provided as needed, for example, hazard awareness, specific hazards and safe work practices, to ensure that workers are capable of work safely.
- Provide appropriate personal protective devices to employee and ensuring that personal protective devices will be worn during working at all time.
- Restrict local community to access the site or area using fencing, signage and risks communication.
- Appropriately mark area signage and labeling of equipment , determine hazardous area for example, electrical rooms, compressor, etc., as well as installations, materials and emergency exits, and label in accordance with international standards, and easily to understand by workers, visitors and general public.

Occupational, Sexual Transmission and Communicable Diseases

- Supervise and monitor performance of contractors and sub-contractors on housekeeping in the campsite.
- Include training programs for workers with these following topics: health awareness, hygiene and sanitary, waste management, communicable and transmission diseases, cultural awareness, regulations and compliance, and drug abuse.

- Register foreign or migrated workers should be seriously performed to ensure that these workers have medical and health certificates to guarantee their personal health conditions.
- Conduct surveillance and active screening and treatment of workers. Immunization program may be required.

Emergency Response and First-Aid

- Establish emergency response plan and procedures which also should be in place for any remote sites. The emergency response plan has to be revise time to time with changes of envi
- Provide appropriate emergency services and personnel to expedite emergency response when needed, maintain equipment facilities, fire-fighting equipment in good working order, accessible and adequate for the dimension and the basis use.
- Provide health services and first-aid unit at all time, with comprehensive and appropriate equipment, establish the qualified the first-aid unit to properly handle with serious or trauma cases, and sufficient to meet the requirements, treat and/or patients to appropriate medical facilities in time.

Community Health:

Housing and Sanitation

- Provide sufficient infrastructure amenities and public health services in the campsite, for example accommodations, water and drinking water availability, solid wastes disposal and sewage treatment

Environmental/Communicable Diseases:

- In close collaboration with the community health authorities, implement an integrated control strategy for environmental and occupational diseases, such as integrated vector control programs, eliminating of breeding habitats in the campsite, and eradicating disease reservoirs.
- Collaborate with community health authorities to enhance the worker families to access public health services, and promote immunization.
- Distribute appropriate education materials for example health awareness, sexual transmission disease and communicable disease.

Accidents/Fire/Chemical Leaks

- Consider the level of local firefighting capacity to identify firefighting equipment that should be available when needed, and provide all necessary equipment with regular maintenance program.

- Communicate potential accidents and/or hazards to local authorities, communities and relevant parties.
- Conduct emergency response practices, including liaison with local response organizations and local responders.
- Revised or/and establish Emergency Response Plans in accordance with recent policy, laws and regulation.

Adequacy and Readiness of Healthcare Services

- Provide the first aid unit at the campsite for their workers, assess whether the local health service capacity sufficient for worker's family and supporting industries, and in close collaborating with local authorities, consider supporting/additional health service facility.
- Risk and impact to environment from construction of Health Centre Services i.e. hospital shall be assessed including establishment of environmental management plan and mitigation measures.

(a) Description of Monitoring Program

DRC will keep monthly update of health and safety statistics and records. Performance of construction health and safety is monitored against a set benchmark. DRC inspect health and safety conditions of the CC and subcontractor's construction sites and camps periodically

(b) Work Plan (Duration)

Throughout the construction period

(c) Responsible Organizations or Agency

DRC or Third party consultant shall ensure that the mitigation measures were distributed to and acknowledged by CC.

CC shall implement the mitigation measures under supervision of DRC.

DRC shall report the results of implementation for audit every 6 months.

(d) Budget

Included in construction budget.

8.2.10 Public Participation and Dissemination

a) *Principle and Rational*

Public participation and information dissemination is apart environmental assessment process and sustainable development that will be result in economic, environmental and social values. General public idea about the project such as concerns of

stakeholders, information and recommendation from public can be gathered through public meetings and social surveys which this information will be considered and can take accounted by DRC for further project management plans.

b) *Objectives*

To inform the stakeholders about the Initial Township project, gain public views, concerns and values, increase public confidence, improve transparency and accountability in the EIA decision-making process.

c) *Project Area / Stakeholders*

Project construction area and impacted area with various level of government agencies, relevant and responsible agencies, project impacted people, media and dependent organizations.

d) *Description of Mitigation Measures*

DRC shall establish public relation and public participation plan to incorporate in requests and recommendation of the continuous engagement of stakeholders following

- Inform about project activities to community
- Support nearby community as appropriate to build good relationship with community
- Communicate to build community understanding about
  - Construction activities and progress
  - Potential environmental impacts and mitigation measures
- Conduct by DRC consistent with the applicable standard for public meeting/consultation
- Disclose about project information and public relation activities through channels such as website, e-mails, meeting/visiting and local exhibition board or local media.
- Take account the results of the public consultation in improving and revised the EMPs.

e) *Description of Monitoring Program*

DRC will conduct public meeting or public relation e.g. using questionnaire or attitude survey for communities surrounded the Initial Township Project within 1 km in radius of the project areas. The result must be report and the method must achieve acceptable standard and been carried out with representative samples with confidence statistics.

f) *Work Plan (Duration)*

Once for the entire construction phase

g) *Responsible Organizations or Agency*

DRC as the project owner is ultimately responsible for this matter

h) *Budget*

Included in construction budget

8.2.11 Grievances Redress

a) *Principle and Rational*

For transparency and performance of the project in dealting with grieves that raise by communities and affected people. Grievance mechanism shall be implemented.

b) *Objectives*

To received grieves and complains from affected people or organization and manage the grieves effectively.

c) *Project Area / Stakeholders*

Project construction area and impacted area with project impacted people or impacted organizations.

d) *Description of Mitigation Measures*

DRC shall establish Grievance Redress Committee and Grievance Redress procedure to address any complaints / grieves to resolve / settle disputes that brought forward by community pertaining to project activities.

e) *Description of Monitoring Program*

Ensure that the grievance redress mechanism has been implemented. Complaints/grieves are systematically recorded and cases are settled.

f) *Work Plan (Duration)*

Once for the entire construction phase

g) *Responsible Organizations or Agency*

DRC as the project owner is ultimately responsile for this matter

h) *Budget*

Included in construction budget

8.3 EMP AND EMOP FOR OPERATION PHASE

The operators refer to the investors build and operate their facilities in the Initial Township. Responsibilities of the operators, which will be during the operating phase, include:

- Comply with environmental requirements of DRC during construction and operation of their facility.

8.3.1 Air and Noise Quality Action Plan

(a) Principle and Rational

Main potential impacts to air quality during operation period is exhaust from vehicles.

Noise from operation phase in the residential buildings and township area is similar with cities. It has no noise and vibration impacts.

(b) Objectives

To control the main potential impacts to air quality during operation period is exhaust from vehicles and to not exceeding the relevant international standards.

(c) Project Area

Project and surrounding area

(d) Description of Mitigation Measures

Mitigation measures for air emission and noise can be listed below:

- Provide some space areas for tree planting within the project area.
- Care and maintain the trees planted; in case the trees are dead, shall plant trees to replace the dead ones.
- Install sign to notice that "Do not start the car while parking for waiting" at the parking area and reiterate the security guards to control strictly.
- Limit vehicle speed inside township area as 30 km/hr to mitigate possible noise impacts on nearby area.
- Install the "No Audible" sign within residential and township areas in obvious places.
- Plan for emission of GHGs from the Project shall be established and/or revised in concurrently with the relevant GHGs policy and regulations.

(e) Description of Monitoring Program

No monitoring program is required

(f) Work Plan (Duration)

Throughout the operation phase

(g) Responsible Organizations or Agency

DRC is responsible to comply with the mitigation measures and prepare report and communicate with MC every 6 months.

The township operator is responsible to report the operating results to DRC every 6 months.

(h) Budget

Included in operation monitoring budget

8.3.2 Waste Management Action Plan

(a) Principle and Rational

Waste generated from township is expected to be non-hazardous waste mainly. However, they can be essentially divided into 2 types: hazardous and non-hazardous waste. Waste management facility of Dawei Industrial Estate is expected to be complete at the same time as commencement of Early Industries Phase 2, which is in 2015-2016. The facility will be able to handle both hazardous and non-hazardous waste. However, prior to the commission of the facility, waste generated from Early Industries Phases will also have to be properly managed to reduce potential impact to the environment.

(b) Objectives

To control leakage of waste from landfill site to the ground have potential to affect the quality of ground water and environment

(c) Project Area

Project area

(d) Description of Mitigation Measures

Nevertheless, the Initial Township will use the waste management facilities together with the Dawei Industrial Estate but the waste management facilities will be completed before the operation phase of the Initial Township.

- Design and construction of the landfill shall be in accordance with Solid Waste Disposal Facility Criteria – Technical Manual published by U.S. EPA (1993) or other applicable standards.

- Detailed hydrogeological condition of the proposed landfill area has to be studied in the design of landfill.
- Groundwater monitoring wells will be installed. As a minimum, 1 well is to be installed up-gradient of the landfill and at least 3 wells is to be installed down-gradient of the landfill. Depth of screens and well construction depends on the results from the hydrogeological condition study.
- The components of the waste management facility: i.e. sanitary landfill, secured landfill and incinerator shall be designed and constructed according to the internationally accepted standards.
- The facility shall create its Standard Operating Procedure covering steps from receiving waste, laboratory analysis, stabilization, temporary storage, incineration and disposal. Audit by third party is necessary.
- The landfill shall be closed daily to prevent vectors and odors.
- Classify hazardous and non-hazardous waste according to the definitions in the Waste Management Plan prepared.
- Workers need to be trained of Waste Management Plan.
- All hazardous and non-hazardous waste generated shall be transferred to the facility for disposal.
- Waste manifest system has to be created and implemented.
- Record of type of waste including its quantity shall be kept in the database of DRC.
- Waste Management Facility (if constructed in the landfill)

(e) Description of Monitoring Program

Monitoring of environmental quality around the site is necessary. The monitoring requirements may be divided into each type of environmental matrix as follow:

- Groundwater monitoring:
  - Collect baseline groundwater quality before the operation of the landfill.
  - Monitor groundwater quality every month for the first 6 months and then every 6 months unless unusual concentrations are observed.
  - For the waste management facility where hazardous waste stabilization and disposal is conducted, monitor the following parameters: pH, redox potential, dissolved oxygen, temperature, conductivity, turbidity and metals (cadmium, copper, lead, manganese, nickel, arsenic, selenium, and mercury).

- Compare the results with Thailand's groundwater quality standards or other applicable international standards.

- Runoff and wastewater monitoring

The waste management facility is considered equal to a city area. The same requirements of wastewater management will be applied

(f) Work Plan (Duration)

During the operation of the waste management facility

(g) Responsible Organizations or Agency

DRC is the party responsible for operating the infrastructure and utility system and thus is the operator of the waste management facilities, both during Early Industries Phases and at full development stage.

(h) Budget

Approximately 2,300 USD/year

8.3.3 Water and Sediment Quality Action Plan

(a) Principle and Rational

Discharge of wastewater and release of waste materials to the receiving water have potential to affect the quality of water and sediment in both fresh water and marine environment. Organic loading in the treated wastewater may reduce the dissolved oxygen content in the receiving water to the point that is not suitable for living organisms.

(b) Objectives

To prevent wastewater from project area runoff into natural water resources

(c) Project Area

Project and surrounding area

(d) Description of Mitigation Measures

The mitigation measures for water quality management are mainly consistent with wastewater and waste management system. However, specific consideration is proposed to further reduce the impact in the receiving water. The mitigation measures are discussed below:

- Prepare and implement the measures for Waste Management.
- Prepare and implement the measures for Wastewater Management.

- The discharged of untreated wastewater into the receiving water is strictly prohibited all time.
- Wastewater from the initial township operation shall be reused to water the trees planted in the initial township.
- Emergency plan for operation of wastewater treatment should be established to prevent untreated effluent discharged into the receiving water.

(e) Description of Monitoring Program

The monitoring program can be conducted from freshwater and sediment.

<u>Surface water and sediment</u>

- Surface water and sediment qualities monitoring should be established. A total of 6 sampling stations similar to those surveyed during baseline sampling is recommended. but in 9+1 phase ,only 2 sampling stations are TS-SW2 and TS-SW3 will be monitored
- The parameter and sampling station of surface water and sediment quality monitoring are shown in
- and
- The surface water and sediment monitoring should be conducted at least 3 times a year (dry, early wet and end of wet season).

Table 8.3-1 Analysis Methods of Surface Water and Sediment Quality Parameters and Sampling Stations During Operation Period

Parameters	Analysis Method[1/]	Sampling Station
Surface Water		
Water Level/Depth/ Width	Depth Meter	TS-SW1: Discharge point at the north of the project at KM 18+500 TS- SW2: Upstream at Yalai Chaung at meeting point of Yalai Chaung and canal (that receiving wastewater from discharge point at south of the project) TS-SW3: Downstream at Yalai Chaung at meeting point of Yalai Chaung and canal (that receiving wastewater from discharge point at south of the project) TS- SW4: Dawei River at the boundary of the project area at Ta Nyin In village TS-SW5: Dawei River (at about 500 meters upstream from the Yang Gaeng bridge) TS-SW6: Dawei River (at about 500 meters downstream from the Yang Gaeng bridge)
Temperature	Thermometer	
Flow Rate	Flow Meter	
pH	Electrometric Method	
Salinity	Electrical conductivity Method	
Electrical Conductivity	Electrical Conductivity Method	
DO	Membrane Electrode Method	
BOD	Membrane Electrode Method	
Turbidity	Nephelometric Method	
TSS	Total Suspended Solids Dried At 103-105 °C	
TDS	Total Dissolved Solids Dried At 180 °C	
TS	Total Solids Dried At 103-105°C	
Nitrate-Nitrogen	Cadmium Reduction Method	
Ammonia-Nitrogen	Phenate Method	
Phosphate -Phosphorus	Ascorbic Acid Method	
TKN	Kjeldahl Method	
Oil&Grease	Soxhlet Extraction Method	
TCB	Multiple Tube Fermentation Technique	
FCB	Multiple Tube Fermentation Technique	
E.Coli	Multiple Tube Fermentation Technique	

Remark: [1/] APHA, AWWA and WEF. Standard Methods For The Examination of Water And Wastewater. 22nd ed. Washington, DC: APHA. 2012.

[2/] United States Environmental Protection Agency. SW-846 Method.

(f) Work Plan (Duration)

Throughout the operation phase

(g) Responsible Organizations or Agency

DRC shall maintain overall ambient environment monitoring program and results. The results need to be communicated with WC every 6 months.

(h) Budget

Approximately 40,000 USD/year

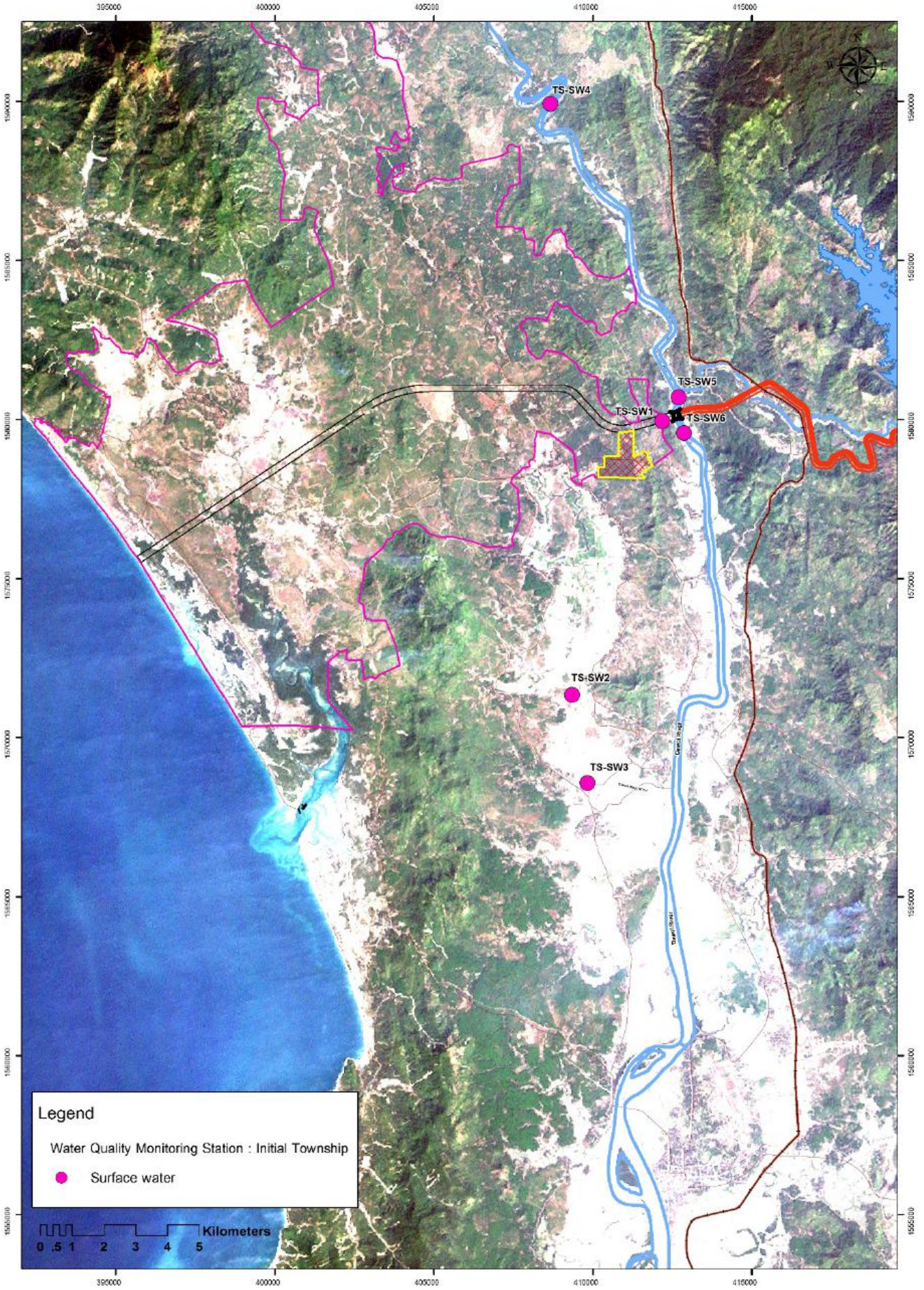


Figure 8.3-1 Sampling Locations for Surface Water and Sediment Quality Monitoring in Operation Phase

8.3.4 Terrestrial Ecology Action Plan

(a) Principle and Rational

Potential impacts to terrestrial ecology during operation phase are considered negligible. However, influx of workers from outside the area may result in increased demand of wildlife meat and poaching. Education and discouragement of consumption and domestication of wildlife need to be conducted all through the project life.

(b) Objectives

To prevent waste from project area runoff into natural resources. And reducing impact to wildlife habitats or plants

(c) Project Area

Surrounding area of the project

(d) Description of Mitigation Measures

The mitigation measures for terrestrial biology is proposed as follow:

- Wherever possible, conserve the existing trees, particularly in the green areas,
- Coordinate with local authorities and engage local communities for reforestation projects surrounding the project area.
- Discourage and educate the workers towards wildlife consumption to reduce demand and indirect impacts to the wildlife in reserved forests elsewhere outside the project area.

(e) Description of Monitoring Program

No monitoring program is required

(f) Work Plan (Duration)

Throughout the operation phase

(g) Responsible Organizations or Agency

DRC in corporation with the local authorities should promote the implementation of the above mitigation measures

(h) Budget

Included in operation monitoring budget.

8.3.5 Land Use, Township and Community Management Action Plan

(a) Principle and Rational

Change of land use surrounding the project area is of concern. Spontaneous development surrounding the township need to be planned and controlled.

(b) Objectives

To control the effect to landuse changing and community

(c) Project Area

In the project area only

(d) Description of Mitigation Measures

<u>Special Plan and Buffer Zone</u>

A special specific area plan is needed to control the land use adjacent to the project area. The plan must be legitimate and authorized by the state. The purpose of the plan is to control land use nearby but outside the township and to prevent forming of temporary settlement growing outside the township area at inappropriate places. Moreover, a clear and marked buffer zone all around the township boundary should be set up to control and prevent any uses other than agriculture and forest. The size of the buffer zone should be determined by land use expert to ensure that in case of fire or other hazards, only a minimum number of people will be affected and rescue and relocation efforts will be with ease.

In addition, the town of Dawei, the nearest town and most likely place to be used for services to the non-local personnel, will be greatly affected by the estate and township development. A comprehensive plan authorized by the state for the future of Dawei is needed for appropriate growth. Otherwise, the project development will likely cause uncontrollable growth of Dawei resulting in degrading physical, uses and cultural condition of Dawei city in the near future.

<u>Setting up a management committee overseeing the project land use.</u>

A team or committee should be set up to monitor and manage activities and structures built in and around the project area. The purpose is to insure that those temporary service centers originated from basic needs and convenience of the workers are always in the appropriate places that will not obstruct or endanger the operation of the township. The team should have legitimate authority to control the areas adjacent or nearby, though outside the township boundary.Squatters must be notified that they are only allowed to operate temporarily and must be relocated when the time comes in order to prevent scattered temporary structures from evolving into unsuitable permanent settlements outside the initial area.

Transportation and Infrastructure Outside the Initial Area

For the area immediately outside the township, not only land use should be controlled, but also other infrastructure that will enable setting up structures and services, such as, local roads, electricity, water supply and drainage, should be also well planned and controlled. The strategic locating or prohibiting of these basic infrastructure will induce and encourage early settlers and services outside designated township zone into the area planned by the management to provide temporary services in the early stage of development.

Enforcement

The proposed set-up land use management committee/team should have duty to regularly monitor land use activities outside and inside the township area as the development progresses. Co-operation with local or state authority is needed to be able to control, direct, or enforce private buildings outside the project boundaries to prevent unsuitable and obstructing growth nearby the project area.

(e) Description of Monitoring Program

The mitigation measures mentioned above a long-term and involve many parties in planning and implementing the land use surrounding the project to help ensure that on a longer term, communities will be located at a safe distance from the initial township and conflicts between both developments can be reduced

(f) Work Plan (Duration)

Throughout the operation phase

(g) Responsible Organizations or Agency

DRC through cooperation with local authorities.

(h) Budget

Included in operation monitoring budget.

8.3.6 Public and Occupational Health Action Plan

(a) Principle and Rational

Operation phase of the project possess different risks to the workers and public. DDC as the owner of the project will need to have a program in place to handle the situations that may arise from the work-related illness and impacts in workers and local populations.

(b) Objectives

To reduce risk and prevent danger and accident which may happen to worker and people transport or live in the operational area of the project.

(c) Project Area

Project and surrounding area

(d) Description of Mitigation Measures

Occupational Health and Safety:

During operation phase, DRC or the project owner should establish the preventive and protective measures to mitigate the potential occupational health impacts as follows:

Accidents and Injuries

- Provide the environmental health and safety management system and programs for the whole initial township.
- Establish occupational health and safety management plans and programs to assess and manage EHS impacts and risks which are based on comprehensive job safety analyses.
- Include the following issues in the occupational health and safety management system:
  - Accident investigation, recording and reporting
  - Surveillance of the employee's health
  - Training and hazard communication
  - Monitoring and auditing procedures to evaluate the effectiveness of prevention and control measures
- Perform occupational accidents and disease recording and reporting, investigate all incidents to understand the cause of accident and to identify measures necessary to prevent a recurrence.
- Provide area signage and labeling of equipment in accordance with international standards and easily to understand by employees, visitors and general public.
- Promote traffic safety programs to all personnel, for example;
  - Improving driving skill
  - Use of speed control devices

Occupational, Sexual Transmission and Communicable Diseases:

- Conduct surveillance and active screening and treatment of employees. Immunization program may be required.

- Provide training programs for employees in these following topics: health awareness and promote health protection strategies including encouraging condom use.
- Perform periodic employee's health checks in accordance with the potential risks.

Fire and Other Hazards:

- Provide comprehensive emergency preparedness and response plan and procedures covering fire and other hazards control.
- Provide appropriate emergency services and personnel to execute emergency response when needed, and maintain equipment facilities, fire-fighting equipment in good working order, accessible and adequate for the dimension and the basis use.
- Establish appropriate fire safety system to ensure its capability to cope with all the potential hazards.
- Conduct annual training and updating emergency preparedness and response plan to account for changes in equipment, personnel and facilities.

Adequacy and Readiness of Healthcare Services

- Establish the hospital in the township area, and periodically evaluate in terms of adequacy, capacity and readiness in accordance with the change in numbers of population in the township.

<u>Community Health:</u>

Sanitation

- Provide sufficient infrastructure amenities and public health services for the township, for example accommodations, water and drinking water availability, solid wastes disposal and sewage treatment in order to reduce pressure on local authorities in servicing public.
- Technically support or collaborate with local authorities to enhance potentiality of communities in solid waste disposal by means of 3Rs (Reduce, Reuse and Recycle).

Environmental/Communicable/Non-Communicable Diseases:

- Establish the buffer strip/zone to separate the township and industrial estate to protect dwellers from pollutions emitted.

- Implement engineering preventive measures to install physical separation between industry and community, for example fence or tree plantation as buffer zone along the estate boundaries, and use of air modeling results and/or potential pollutions of each industry as the criteria for the distance between industries and affected community.
- Set up a grievance procedure to manage complaints, if any.

Accidents/Fire

- Invite representative of local emergency and securities services to participate in annual site inspections to ensure familiarity with the potential hazards present.
- Inform and communicate potential accidents that may impact to community to local communities and relevant parties.
- Prepare and train employees, people in township and nearby communities to respond to accidents, including providing technical and financial resources in order to control and response such events effectively and safely, and provide periodic emergency response practice with communities.
- Revised or/and establish Emergency Response Plans in accordance with recent policy, laws and regulations.

Adequacy and Readiness of Healthcare Services

- Promote collaboration with local authorities to enhance access of community to public health services for the employee's families and people being at residences in township to develop health service facility.
- Risk and impact to environment from operation of Health Centre Services i.e. hospital shall be assessed including establishment of environmental management plan and mitigation measures.

(e) Description of Monitoring Program

DRC will keep monthly update of health and safety statistics and records. Performance of operation health and safety is monitored against a set benchmark. DRC to periodic inspect health and safety conditions of the industry.

(f) Work Plan (Duration)

Throughout the operation phase

(g) Responsible Organizations or Agency

DRC shall establish EHS Plan expanding necessary components as listed above. DDC will be responsible for keeping all health and safety records and assessing health and

safety performance of the township. DRC is the party coordinating with local authorities on behalf of the project in the matter related to health and safety of the township.

(h) Budget

Included in operation monitoring budget

1.3.7 Employment and Training Program

a) *Principle and Rational*

Concerns from communities and the Project Affected People on skills necessary for employment including their job opporturinties and employment condition during the operation phase in the township.

b) *Objectives*

To support locals for job opportunities and employment and skills training.

c) *Project Area / Stakeholders*

Project operation area and local communities and with project impacted people.

d) *Description of Mitigation Measures*

DRC shall conduct employment with IFC EHS General guideline/Laws and regulations in terms of the employee management and established plan for training programme and implement.

e) *Description of Monitoring Program*

Ensure that the standard of employment in accordance with relevant law and regulation are implemented. Employlee has been trained as necessary.

f) *Work Plan (Duration)*

Every 5 years for the entire operation phase

g) *Responsible Organizations or Agency*

DRC as the project owner is ultimately responsile for this matter

h) *Budget*

Included in operation budget

1.3.8 Public Participation and Dissemination

a) *Principle and Rational*

Public participation and information dissemination is apart environmental assessment process and sustainable development that will be result in economic, environmental and social values. General public idea about the project such as concerns of stakeholders, information and recommendation from public can be gathered through public meetings and social surveys which this information will be considered and can take accounted by DRC for further project management plans.

b) *Objectives*

To inform the stakeholders about the Initial Township project, gain public views, concerns and values, increase public confidence, improve transparency and accountability in the EIA decision-making process.

c) *Project Area / Stakeholders*

Project operation area and impacted area with various level of government agencies, relevant and responsible agencies, project impacted people, media and dependent organizations.

d) *Description of Mitigation Measures*

DRC shall establish public relation and public participation plan to incorporate in requests and recommendation of the continuous engagement of stakeholders following

- Inform about project activities to community
- Support nearby community as appropriate to build good relationship with community
- Communicate to build community understanding about
    - Potential environmental impacts and mitigation measures
    - CSR activity
- Conduct by DRC consistent with the applicable standard for public meeting/consultation
- Disclose about project information and public relation activities through channels such as website, e-mails, meeting/visiting and local exhibition board or local media.
- Take account the results of the public consultation in improving and revised the EMPs.

e) *Description of Monitoring Program*

DRC will conduct public meeting or public relation e.g. using questionnaire or attitude survey for communities surrounded the Initial Township Project within 1 km in radius of the project areas every 5 years. The result must be report and the method must achieve

acceptable standard and been carried out with representative samples with confidence statistics.

f) *Work Plan (Duration)*

Every 5 years for the entire operation phase

g) *Responsible Organizations or Agency*

DRC as the project owner is ultimately responsible for this matter

h) *Budget*

Included in operation budget

1.3.9 Grievances Redress

a) *Principle and Rational*

For transparency and performance of the project in dealting with grieves that raise by communities and affected people. Grievance mechanism shall be implemented.

b) *Objectives*

To received grieves and complains from affected people or organization and manage the grieves effectively.

c) *Project Area / Stakeholders*

Project operation area and impacted area with project impacted people or impacted organizations.

d) *Description of Mitigation Measures*

DRC shall establish Grievance Redress Committee and Grievance Redress procedure to address any complaints / grieves to resolve / settle disputes that brought forward by community pertaining to project activities.

e) *Description of Monitoring Program*

Ensure that the grievance redress mechanism has been implemented. Complaints/grieves are systematically recorded and cases are settled.

f) *Work Plan (Duration)*

Every 5 years for the entire operation phase

g) *Responsible Organizations or Agency*

DRC as the project owner is ultimately responsile for this matter

h) *Budget*

Included in operation budget

Summary of the Environmental Management Plan (EMP) are shown in to Table 8.3-2 and Table 8.3-3. It should be noted that the two EMPs prepared as part of this ESIA study are invariably framework plans as they are based on outline designs of the Project. They are therefore intended to prescribe requirements for the preparation of detailed CEMP and OEMP by the appointed EPC contractor (Contractor). Consequently, they could be considered and referred to as the Project Proponent's or Owner's EMPs to distinguish them from the Contractor's EMP after the ESIA during project implementation. Nevertheless, it should be noted that the planning and development of the Project has been dynamic throughout the study period. This includes also the organization of the project and other relevant agencies. The information used as the based scenario is considered the most valid one at the time of the report preparation. Changes to the project information may occur overtime and, therefore, readers and project implementers are advised to review at the time of the implementation.

Table 8.3-2 Environmental Management Plan (EMP) – Proposed Mitigation Measures for Construction Phase

Potential Environmental Impacts	Proposed Mitigation Measures	Institutional Responsibilities
Erosion and Sedimentation Control	CC shall prepare an *Erosion and Sediment Control Plan* for construction activities and submit to DRC for approval prior to commencement of construction activities in the area. The plan shall have the following components: 1. An assessment of the potential for contamination of natural waterways. Basic principles include the size of the disturbed area, site drainage, and waterways receiving storm water from the disturbed area; 2. Plans for water management during construction shall be established and include adequate drainage system to manage runoff from 2-year ARI storm flow; 3. Sedimentation controls shall be implemented in the form of silt trap fences and sedimentation basins where appropriate, and all runoff from the disturbed area shall be directed to the sediment controls; 4. Measures to be taken to collect, store and treat storm water prior to discharge from the site considering options for water re-use onsite; 5. Management of material storage area – Stockpile and spoil disposal area shall not be located on drainage line; 6. Control of erosion and sedimentation shall be constructed progressively prior to commencement of each stage of earthworks until the permanent protection is established.	CC with DRC's approval
Aquatic Biology	1. Prepared and implement the measures for erosion and sedimentation control, waste management, and construction work camp 2. Release of oil and grease from workshop facilities is prohibited. Used oil need to be stored separately and managed as per Waste Management Plan. 3. Stock yards; gasoline, oil, lubricant and hydraulic oil storage areas; and machines/vehicles cleaning areas should be located at least 100 meter away from natural waterways.	CC with approval and under DRC's supervision
Terrestrial Biology	1. Only clear the area needed for construction of infrastructure and utility system. Avoid disturbance of forest and mangrove as much as possible. 2. Wherever possible, identify the endangered species and transfer them to safe locations prior to clearing the vegetation. 3. Hunting of wildlife is prohibited. 4. Disturbance of forest areas outside the project area by CC and their subcontractors is prohibited.	CC under DRC's supervision

Table 8.3-2 Environmental Management Plan (EMP) – Proposed Mitigation Measures for Construction Phase (Cont.)

Potential Environmental Impacts	Proposed Mitigation Measures	Institutional Responsibilities
Air Emission and Noise Control	1. All equipment and vehicles will need to be maintained in good mechanical conditions; 2. Stationary noise sources (such as generators, concrete batching plants etc.) shall be sited as far as possible from villages, construction camps and resettlement areas; 3. Construction works within the distance of 500 m from villages and resettlement areas will be carried out between 06:00 to 18:00; 4. Dump trucks with loads that may generate dust will be covered when travelling though communities; 5. Water spraying at least once a day in the construction areas and on unpaved roads is required in the following conditions: 5.1 On the section of unpaved transportation routes that pass through communities or construction work camps; 5.2 When dust generating activities are being carried out within 100 m of a village or construction work camp; 5.3 When visual inspection indicates excessive dust generation in the construction areas and unpaved roads used for material transportation. 6. Burning of waste materials including waste vegetation from site clearing will be allowed under the following conditions: 6.1 The materials that are allowed to be burned are general garbage and vegetation waste. No burning of materials that may generate toxic gases is allowed; 6.2 A trained fire protection officer with appropriate firefighting equipment's has to be present near the burning areas; 6.3 Burning is not allowed during severe wind conditions; 6.4 Burning is carried out at a safe distance from vegetated areas and not within 2 km from a village, a construction work camp, or resettlement areas on the upwind direction. 7. Avoid impact pile-driving where possible in vibration-sensitive areas. Drilled piles or the use of a sonic or vibratory pile driver causes lower vibration levels where the geological conditions permit their use. 8. Construction workers exposed to noise levels of 80 dB(A) or more shall be provided with adequate Personal Protective Equipment (PPE).	CC under DRC's supervision
Waste Management	DRC shall develop *Waste Management Plan* that will be applicable to all contractors in the project. The Waste Management Plan shall include the following components:	DRC to develop *Waste Management Plan*;

Table 8.3-2 Environmental Management Plan (EMP) – Proposed Mitigation Measures for Construction Phase (Cont.)

Potential Environmental Impacts	Proposed Mitigation Measures	Institutional Responsibilities
	1. Identify classification of waste. The minimum waste classification shall be non-hazardous and hazardous waste; 2. Identify the size and location of the temporary hazardous waste storage area and non-hazardous waste disposal site for the construction phase of the industrial estate; 3. A mechanism for coordination between DRC and CC in waste separation, waste transfer, record of waste quantity. 4. Hazardous waste shall include, but not limited to, the following waste materials. Any mixed waste stream that contains any of the hazardous waste shall be categorized as hazardous waste: 4.1 Acids and acid waste; 4.2 Alkalis and caustic waste; 4.3 Batteries; 4.4 Spent catalysts, solvents, and chemicals; 4.5 Empty containers which held chemicals, paint, oil and solvents; 4.6 Oil contaminated waste including oily rags, oil filters, used gloves; 4.7 Used oil, hydraulic fluids, chemicals and solvents; 4.8 First aid and medical waste; 4.9 Spill clean-up waste; 4.10 Waste from grease trap; and 4.11 Sludge from chemical wastewater treatment system. 5. Hazardous waste shall be stored in appropriate temporary hazardous waste storage areas until the permanent hazardous waste management facilities for the operation phase is functional. Minimum requirements of the temporary hazardous waste storage areas include: 5.1 Impervious floor without cracks or spaces that may allow spills to perforate into the ground; 5.2 Surrounded by secondary containment bunds. The secondary containment bunds shall be at least 0.5 m high with a volume large enough to contain the spill of the largest container expected in the storage area; 5.3 Designate storage area for liquids or materials that are not allowed to be mixed, such as acids and alkalis; 5.4 Equipped with spill response kits;	CC to implement the plan under DRC's supervision

Table 8.3-2 Environmental Management Plan (EMP) – Proposed Mitigation Measures for Construction Phase (Cont.)

Potential Environmental Impacts	Proposed Mitigation Measures	Institutional Responsibilities
	5.5 Consider providing the area with roofing and temporary walls with a provision that the temporary hazardous waste storage area will have to be in use for at least 3 years until the permanent hazardous waste management facilities of the initial township are functional. 5.6 Type and quantity of hazardous waste in the storage area shall be recorded and kept up to date. 6. Burning of the following non-hazardous waste is allowed: cardboard, pallets, papers, and wood/vegetation waste. The waste burning site shall be designated in the Waste Management Plan and shall be at least 2 km from any villages, construction work camps, or resettlement areas. 7. Other non-hazardous waste shall be transferred to non-hazardous waste disposal site to be used during construction phase shall meet the following minimum requirements: 7.1 The disposal site shall be on higher ground not subject to flood. 7.2 The disposal site shall be at least 2 km from any groundwater well that is being used by workers or local villagers. 7.3 The disposal site shall be in the area where no excavation is planned. It shall be delineated with clear sign boards. 7.4 The waste shall be covered with soil on daily basis. 7.5 The location of all disposal sites during construction period shall be recorded as expanded appendices to the Waste Management Plan. 8. Establish a training program for workers related to waste classification, storage and disposal. 9. The Waste Management Plan may be expanded to cover recyclable waste and compostable waste in the future.	
On-Site Traffic and Access Management	1. All access roads in the construction area shall be signposted with the following information in Myanmese and English: 1.1 Speed limit; 1.2 Construction activities and machinery; 1.3 Roadside borrow pits and material stockpiles; 1.4 Any applicable load limit, particularly for temporary bridges; and 1.5 Road features that may affect driving conditions such as curves, hidden accesses etc.	CC under DRC's supervision

Table 8.3-2 Environmental Management Plan (EMP) – Proposed Mitigation Measures for Construction Phase (Cont.)

Potential Environmental Impacts	Proposed Mitigation Measures	Institutional Responsibilities
	2. A speed limit of 40 km/hr. shall be applied in village areas and construction camps. Drivers shall be trained and notified of such limit; 3. Consider building speed humps before and after each village, where appropriate; 4. Route for heavy vehicles used for transportation of construction materials shall be designated. Route with least number of villages and residential area is most preferable; 5. Survey of the access roads to identify blind spots need to be regularly conducted. Improvement to the blind spots such as removal of obstructing objects when necessary; and 6. Access road used for the construction activities shall be maintained in good conditions.	
Construction Work Camps	1. Camp rules shall be established and informed to all residences. The rules should contain the following components: 1.1 Policy on alcohol and substance abuse; 1.2 Safety measures and emergency response particularly in case of fire; 1.3 Waste management requirements; 1.4 Other measures to prevent dissemination of vectors and transmissible disease including STDs and HIV/AIDs; 2. General areas of the camp shall be kept clean and tidy. Waste shall be collected regularly to avoid accumulation of waste in the camp; 3. Toilets shall be provided at a ratio as 1 toilet per 15 workers. All toilets shall be equipped with septic and seepage tanks of adequate size. The toilets need to be at least 100 meters from any natural waterways. Sludge from tank cleaning shall be stabilized by adding lime (pH = 12 for 30 minutes) and disposed of in designated pit for sludge disposal. The pit shall be at least 1 kilometer from any groundwater wells and is higher than groundwater table; 4. Proper drainage has to be provided. Improve areas with stagnant water as much as possible; and 5. Pest control measures shall be planned and implemented. All bedrooms need to be equipped with mosquito protection.	CC under DRC's supervision
Historical and Cultural Resources	1. Sites with historical and cultural values shall be identified, recorded and located in the map. This information shall be agreed upon by the local authorities and villagers. 2. If construction activities have to be carried out within 50 meters from these sites, the leaders of the communities that the sites belong to need to be notified at least 1 week prior to commencement of the activities.	CC under DRC's supervision

Table 8.3-2 Environmental Management Plan (EMP) – Proposed Mitigation Measures for Construction Phase (Cont.)

Potential Environmental Impacts	Proposed Mitigation Measures	Institutional Responsibilities
	3. Establish a plan and communication channel in case an unidentified site is encountered during the construction work to avoid damage to the site. 4. Removal and relocation method and destination shall be a mutual agreement between DRC, local authorities, and the leader of the communities that the site belongs to.	
Risk Assessment	1. Require the ITD contractor to: - Prepare a Construction Phase Environmental Management Plan (CEMP) base on the EIA report and associated CEMP, detailed design and construction plan and schedule. The CEMP must clear define. - The project's environmental requirements and obligation. - Physical measures that are needed to comply with the requirements and obligation. - Construction measures that are needed to comply with the requirements and obligation. - Assignment of responsibilities to each subcontractors. 2. TOR for procurement of the ITD contract must clearly state the project's environmental requirements during the construction phase that the ITD contractor must ensure that the project construction will meet the requirements. 3. The ITD contract must clearly prescribes environmental management responsibility of the ITD contractor. 4. The supervision consultant will be required to submit a supervision and monitoring plan that clearly indicates the environmental tasks to be supervised and monitored. This supervision and monitoring plan for the implementation of the environmental mitigation measures. 5. Monthly reviews of the ITD contractor environmental performance. 6. Close supervision of truck operations especially during the site filling period. 7. Changes in designs or construction methods may be initiated by the ITD contractor or the project proponent. The request for changes must be subject to the change procedure in project management. The request for changes must be accommodated by an analysis of environmental implications and revised mitigation measures. 8. Change in the environmental requirements may be initiated by DRC or the project proponent with approval of DRC. The change must be subject to the change procedure in project management. The ITD contractor will analyze environmental implications of the changes and revise the originally proposed mitigation measures accordingly.	CC under DRC's supervision

Table 8.3-2 Environmental Management Plan (EMP) – Proposed Mitigation Measures for Construction Phase (Cont.)

Potential Environmental Impacts	Proposed Mitigation Measures	Institutional Responsibilities
Public and Occupational Health	1. Accidents and Injuries 1.1 Establish occupational and safety management plan and program for the construction should be established to assess and manage EHS impacts and risks. Project or activity-specific plans or procedures should be prepared and the basic site rules of work should be included. 1.2 Perform occupational accidents and disease recording and reporting, and investigate all incidents to understand the cause of accident and to identify measures necessary to prevent a recurrence. 1.3 Provide contractor management plan to ensure that the contractor will have safety performances and procedures to protect their employee. Supervise and monitor contractor performance periodically. 1.4 Train and provide information to employees. Occupational health training program should be provided as needed, for example, hazard awareness, specific hazards and safe work practices, to ensure that workers are capable of work safely. 1.5 Provide appropriate personal protective devices to employee and ensuring that personal protective devices will be worn during working at all time. 1.6 Restrict local community to access the site or area using fencing, signage and risks communication. 1.7 Appropriately mark area signage and labeling of equipment, determine hazardous area, for example electrical rooms, compressor etc., as well as installations, materials and emergency exits, and label in accordance with international standards, and easily to understand by workers, visitors and general public. 2. Occupational, Sexual Transmission and Communicable Diseases 2.1 Supervise and monitor performance of contractors and sub-contractors on housekeeping in the camp site. 2.2 Include training programs for workers with these following topics: health awareness, hygiene and sanitary, waste management, communicable and transmission diseases, cultural awareness, regulations and compliance, and drug abuse. 2.3 Register foreign or migrated workers should be seriously performed to ensure that these workers have medical and health certificates to guarantee their personal health conditions. 2.4 Conduct surveillance and active screening and treatment of workers. Immunization program may be required.	CC under DRC's supervision

Table 8.3-2 Environmental Management Plan (EMP) – Proposed Mitigation Measures for Construction Phase (Cont.)

Potential Environmental Impacts	Proposed Mitigation Measures	Institutional Responsibilities
	3. Emergency Response and First-Aid 3.1 Establish emergency response plan and procedures which also should be in place for any remote sites. 3.2 Provide appropriate emergency services and personnel to expedite emergency response when needed, maintain equipment facilities, fire-fighting equipment in good working order, accessible and adequate for the dimension and the basis use. 3.3 Provide health services and first-aid unit at all time, with comprehensive and appropriate equipments, establish the qualified the first-aid unit to properly handle with serious or trauma cases, and sufficient to meet the requirements, treat and/or patients to appropriate medical facilities in time.	
Community Health	1. Housing and Sanitation 1.1 Provide sufficient infrastructure amenities and public health services in the camp site, for example accommodations, water and drinking water availability, solid wastes disposal and sewage treatment. 2. Environmental/Communicable Diseases 2.1 In close collaboration with the community health authorities, implement an integrated control strategy for environmental and occupational diseases, such as integrated vector control programs, eliminating of breeding habitats in the camp site, and eradicating disease reservoirs. 2.2 Collaborate with community health authorities to enhance the worker families to access public health services, and promote immunization. 2.3 Distribute appropriate education materials for example health awareness, sexual transmission disease and communicable disease. 3. Accidents/Fire/Chemical Leaks 3.1 Consider the level of local firefighting capacity to identify firefighting equipment that should be available when needed, and provide all necessary equipment with regular maintenance program. 3.2 Communicate potential accidents and/or hazards to local authorities, communities and relevant parties. 3.3 Conduct emergency response practices, including liaison with local response organizations and local responders. 3.4 Revise or/and establish Emergency Response Plans that in concurrent with relevant policy, law and regulation.	

Table 8.3-2 Environmental Management Plan (EMP) – Proposed Mitigation Measures for Construction Phase (Cont.)

Potential Environmental Impacts	Proposed Mitigation Measures	Institutional Responsibilities
	4. Adequacy and Readiness of Healthcare Services 4.1 Provide the first aid unit at the camp site for their workers, assess whether the local health service capacity sufficient for worker's family and supporting industries, and in close collaborating with local authorities, consider supporting/additional health service facility. 4.2 Risk and impact to environment from construction of Health Centre Services i.e. hospital shall be assessed including establishment of environmental management plan and mitigation measures.	
Public Participation and Dissemination	• Establish *Public Relation and Public Participation Plan* to incorporate in requests and recommendation of the continuous engagement of stakeholders following: 1. Inform about project activities to community 2. Support nearby community as appropriate to build good relationship with community 3. Communicate to build community understanding about - Construction activities and progress - Potential environmental impacts and mitigation measures 4. Conduct by DRC consistent with the applicable standard for public meeting/consultation 5. Disclose about project information and public relation activities through channels such as website, e-mails, meeting/visiting and local exhibition board or local media. • Take account the results of the public consultation in improving and revised the EMPs	DRC
Grievances Redress	Establish *Grievance Redress Procedure* to address any complaints/grieves to resolve/settle disputes that brought forward by community pertaining to project activities.	DRC

MC: Management Committee

DRC: Dawei Residence Company Limited

CC: Construction Contractors

Table 8.3-3 Environmental Management Plan (EMP) – Proposed Mitigation Measures for Operation Phase

Potential Environmental Impacts	Proposed Mitigation Measures	Institutional Responsibilities
Environmental Policy, Rules, and	DRC as the project owner has to establish the *Environmental Policy and Rules* for Initial Township based on the following principles: 1. Eco city concept which have the following key components: 1.1 Integration with natural system. 1.2 Maximize energy efficiency through facility design and other means. 1.3 Material flow through the whole area and ensure maximum reuse and recycling. 1.4 Water conservation, reuse, and recycling in the Initial Township. 2. Prepare *Environmental, Health and Safety Plan*. EHS management plan or programs should also be reassessed periodically to ensure that the key environmental health and safety risks are determined in accordance with changes in order that the potential risks will be appropriately addressed. Thus, EHS system and performance should be improved continuously by a combination of ongoing monitoring of the Initial Township and high performances as well as effective accountability of the facility 3. Establish *Environmental Rules* that the township has to follow. These rules will be in accordance with the EMP for operation period. The rules will be attached with the contractual document between the contractor, operator and DRC.	DRC
Overall Roles and Responsibilities of Project Owner	DRC has to establish a strong organization to handle the dynamic and changes that will occur during the operation phase of the project, and should consider the following measures. 1. DRC should establish a sector responsible for safety health and environmental management of the Initial Township to prepare and perform the environmental management plan and programs to ensure that the Initial Township comply with environmental legislation and other relevant safety health and environmental requirements, and to achieve the most up-to-date environmental protection requirements/ measures/ standards. 2. DRC should periodically assess/reassess the environmental management plan or programs to ensure that the key environmental health and safety risks are evaluate. 3. Due to the long period of the Initial Township project, DRC should ensure that EHS performance will be improved continuously via a combination of ongoing monitoring program and cooperation with the residences and community mall inside the Initial Township. 4. DRC needs to prepare and commission a database system to keep track of and analyze environmental data, flow of materials and waste, water consumption, wastewater generation rate and quality, and energy consumption. The data base will help organize the data from monitoring program of DRC and of the township, and can also be used as a tool to promote conservation of material, energy, and water among the industries, if the database is designed properly.	DRC

Table 8.3-3 Environmental Management Plan (EMP) – Proposed Mitigation Measures for Operation Phase (Cont.)

Potential Environmental Impacts	Proposed Mitigation Measures	Institutional Responsibilities
	5. DRC should provide provisions to ensure that the project can apply proper environmental health and safety management to protect health and safety of workers and the public.	
Air Emission and Noise Control	1. Provide some space areas for tree planting within the project area. 2. Care and maintain the trees planted; in case the trees are dead, shall plant trees to replace the dead ones. 3. Install sign to notice that "Do not start the car while parking for waiting" at the parking area and reiterate the security guards to control strictly. 4. Limit vehicle speed inside township area as 30 km/hr. to mitigate possible noise impacts on nearby area. 5. Install the "No Audible" sign within residential and township areas in obvious places. 6. Plan for emission of GHGs from the Project shall be established and/or revised in concurrently with the relevant policy and regulations.	DRC or MC's Authorized Agency
Waste Management	1. Design and construction of the landfill shall be in accordance with Solid Waste Disposal Facility Criteria – Technical Manual published by U.S. EPA (1993) or other applicable standards. 2. Detailed hydrogeological condition of the proposed landfill area has to be studied in the design of landfill. 3. Groundwater monitoring wells will be installed. As a minimum, 1 well is to be installed up-gradient of the landfill and at least 3 wells is to be installed down-gradient of the landfill. Depth of screens and well construction depends on the results from the hydrogeological condition study. 4. The components of the waste management facility: i.e. sanitary landfill, secured landfill and incinerator shall be designed and constructed according to the internationally accepted standards. 5. The facility shall create its Standard Operating Procedure covering steps from receiving waste, laboratory analysis, stabilization, temporary storage, incineration and disposal. Audit by third party is necessary. 6. The landfill shall be closed daily to prevent vectors and odors. 7. Classify hazardous and non-hazardous waste according to the definitions in the Waste Management Plan prepared.	DRC or MC's Authorized Agency

Table 8.3-3 Environmental Management Plan (EMP) – Proposed Mitigation Measures for Operation Phase (Cont.)

Potential Environmental Impacts	Proposed Mitigation Measures	Institutional Responsibilities
	8. Workers need to be trained of Waste Management Plan. 9. All hazardous and non-hazardous waste generated shall be transferred to the facility for disposal. 10. Waste manifest system has to be created and implemented. 11. Record of type of waste including its quantity shall be kept in the database of DRC.	
Water and Sediment Quality and Monitoring Program	1. Prepare and implement the measures for Waste Management and Wastewater Management. 2. The discharged of untreated wastewater into the receiving water is strictly prohibited at all time. 3. Wastewater from the initial township operation shall be reused to water the trees planted in the initial township. 4. Emergency plan for operation of wastewater treatment should be established to prevent untreated effluent discharged into the receiving water.	DRC or MC's Authorized Agency
Terrestrial Ecology	1. Wherever possible, conserve the existing trees, particularly in the green areas, 2. Coordinate with local authorities and engage local communities for reforestation projects surrounding the project area. 3. Discourage and educate the workers in the industrial estate against wildlife consumption to reduce demand and indirect impacts to the wildlife in reserved forests elsewhere outside the project area.	DRC or MC's Authorized Agency
Land Use, Township, and Community Management	1. Special Plan and Buffer Zone: 1.1 A special specific area plan, legitimate and authorized by the state, is needed to control the land use adjacent to the project estate. 1.2 A clear and marked buffer zone all around the township boundary should be set up to control and prevent any uses other than agriculture and forest. 1.3 The size of the buffer zone should be determined by land use expert to ensure that in case of fire or other hazards, only a minimum number of people will be affected and rescue and relocation efforts will be with ease. 1.4 A comprehensive plan authorized by the state for the future of Dawei is needed for appropriate growth. 2. A Management Committee Overseeing The Project Land Use:	DDC or MC's Authorized Agency

Table 8.3-3 Environmental Management Plan (EMP) – Proposed Mitigation Measures for Operation Phase (Cont.)

Potential Environmental Impacts	Proposed Mitigation Measures	Institutional Responsibilities
	2.1 A team or committee should be set up to monitor and manage activities and structures built in and around the project area. 2.2 The team should have legitimate authority to control the areas adjacent or nearby, though outside the township boundary. 2.3 Squatters must be notified that they are only allowed to operate temporarily and must be relocated when the time comes in order to prevent scattered temporary structures from evolving into unsuitable permanent settlements outside the initial area. 3. Transportation and Infrastructure outside the Estate Area: 3.1 For the area immediately outside the township and other infrastructures that will enable setting up structures and services, such as, local roads, electricity, water supply, and drainage, should be also well planned and controlled. 3.2 The strategic locating or prohibiting of these basic infrastructures will be needed to induce and encourage early settlers and services outside designated township zone into the planned area. 4. Enforcement: 4.1 The proposed set-up land use management committee/team should have duty to regularly monitor land use activities outside and inside the township area as the development progresses. 4.2 Co-operation with local or state authority is needed to be able to control, direct, or enforce private buildings outside the project boundaries to prevent unsuitable and obstructing growth nearby the project area.	
Occupational Health and Safety	1. Accidents and Injuries 1.1 Provide the environmental health and safety management system and programs for the whole initial township. 1.2 Establish occupational health and safety management plans and programs to assess and manage EHS impacts and risks which are based on comprehensive job safety analyses. 1.3 Include the following issues in the occupational health and safety management system: • Accident investigation, recording and reporting • Surveillance of the employee's health • Training and hazard communication	DRC or MC's Authorized Agency

Table 8.3-3 Environmental Management Plan (EMP) – Proposed Mitigation Measures for Operation Phase (Cont.)

Potential Environmental Impacts	Proposed Mitigation Measures	Institutional Responsibilities
	• Monitoring and auditing procedures to evaluate the effectiveness of prevention and control measures. 1.4 Perform occupational accidents and disease recording and reporting, investigate all incidents to understand the cause of accident and to identify measures necessary to prevent a recurrence. 1.5 Provide area signage and labeling of equipment in accordance with international standards and easily to understand by employees, visitors and general public. 1.6 Promote traffic safety programs to all personnel, for example; • Improving driving skill • Use of speed control devices 2. Occupational, Sexual Transmission and Communicable Diseases 2.1 Conduct surveillance and active screening and treatment of employees. Immunization program may be required. 2.2 Provide training programs for employees in these following topics: health awareness, and promote health protection strategies including encouraging condom use. 2.3 Perform periodic employee's health checks in accordance with the potential risks. 3. Fire and Other Hazards 3.1 Provide comprehensive emergency preparedness and response plan and procedures covering fire and other hazards control. 3.2 Provide appropriate emergency services and personnel to execute emergency response when needed, and maintain equipment facilities, fire-fighting equipment in good working order, accessible and adequate for the dimension and the basis use. 3.3 Establish fire safety system to ensure its capability to cope with all the potential hazards. 3.4 Conduct annual training and updating emergency preparedness and response plan to account for changes in equipment, personnel and facilities. 4. Adequacy and Readiness of Healthcare Services 4.1 Establish the hospital in the township area, and periodically evaluate in terms of adequacy, capacity and readiness in accordance with the change in numbers of population in the township.	

Table 8.3-3 Environmental Management Plan (EMP) – Proposed Mitigation Measures for Operation Phase (Cont.)

Potential Environmental Impacts	Proposed Mitigation Measures	Institutional Responsibilities
Community Health	1. Sanitation 1.1 Provide sufficient infrastructure amenities and public health services for the township, for example accommodations, water and drinking water availability, solid wastes disposal and sewage treatment in order to reduce pressure on local authorities in servicing public. 1.2 Technically support or collaborate with local authorities to enhance potentiality of communities in solid waste disposal by means of 3 R (Reduce, Reuse and Recycle). 2. Environmental/Communicable/Non-Communicable Diseases 2.1 Establish the buffer strip/zone to separate the township and industrial estate to protect dwellers from pollutions emitted. 2.2 Implement engineering preventive measures to install physical separation between industry and community, for example fence or tree plantation as buffer zone along the estate boundaries, and use of air modeling results and/or potential pollutions of each industry as the criteria for the distance between industries and affected community. 2.3 Set up a grievance procedure to manage complaints, if any. 3. Accidents/Fire 3.1 Invite representative of local emergency and securities services to participate in annual site inspections to ensure familiarity with the potential hazards present. 3.2 Inform and communicate potential accidents that may impact to community to local communities and relevant parties. 3.3 Prepare and train employees, people in township and nearby communities to respond to accidents, including providing technical and financial resources in order to control and response such events effectively and safely, and provide periodic emergency response practice with communities. 3.4 Revised or/and establish Emergency Response Plans in concordance with recent policy, law and regulation 4. Adequacy and Readiness of Healthcare Services 4.1 Promote collaboration with local authorities to enhance access of community to public health services for the employee's families and people being at residences in township to develop health service facility.	DRC in collaboration with local authorities

Table 8.3-3 Environmental Management Plan (EMP) – Proposed Mitigation Measures for Operation Phase (Cont.)

Potential Environmental Impacts	Proposed Mitigation Measures	Institutional Responsibilities
	4.2 Risk and impact to environment from operation of Health Centre Services i.e. hospital shall be assessed including establishment of environmental management plan and mitigation measures.	
Employment and Training Program	Comply with IFC EHS General guideline/Laws and regulations in terms of the employee management and established plan for training programme and implement.	DRC
Public Participation and Dissemination	• Establish *Public Relation and Public Participation Plan* to incorporate in requests and recommendation of the continuous engagement of stakeholders following: 1. Inform about project activities to community 2. Support nearby community as appropriate to build good relationship with community 3. Communicate to build community understanding about - Potential environmental impacts and mitigation measures - CSR activity 4. Conduct by DRC consistent with the applicable standard for public meeting/consultation 5. Disclose about project information and public relation activities through channels such as website, e-mails, meeting/visiting and local exhibition board or local media. • Take account the results of the public consultation in improving and revised EMPs	DRC
Grievance Redress	Establish *Grievance Redress Procedure* to address any complaints/grieves to resolve/settle disputes that brought forward by community pertaining to project activities.	DRC
Revised and Report	• Revised EMP and Emergency Response Plan depending on the changing in condition such fire hazard, safety from chemicals, flooding and earthquake and submitted to DSEZMC and MONREC • Reporting on performance of basic infrastructure e.g. local roads, electricity, water supply, safety and results of continuous public consultation in the monitoring reports that will carry out every 6 months and submitted to DSEZMC and MONREC	DRC

MC: Management Committee

DRC: Dawei Residence Company Limited

CC: Construction Contractors

8.4 Budget for Environmental Management and Monitoring

This section describes the budget plans for the environmental management and environmental monitoring by the Project Proponent. Most of the environmental management cost and mitigation measures such as construction of retention ponds, polishing ponds, are already included in the project cost.

In terms of the budget for environmental monitoring before/during construction and operation phases, main monitoring cost is a cost for field measurements such as air quality, water, and quality noise. Annual costs for field measurements in the construction phase by contractor and in the operation phase by the Project Proponent are estimated in Table 8.4-1 and Table 8.4-2.

Table 8.4-1 Environmental Management Plan (EMP) – Proposed Monitoring Measures for Construction Phase

	Positions	Number	Estimated Budgets/Year (USD)
Staff	1. Environmental Health and Safety (EHS) Manager	1	55,200
	2. Environmental Supervisor	1	30,000
	- Staff	3	64,800
	3. Health and Safety Supervisor	1	37,200
	- Staff	2	43,200
Total Staff Estimated Budgets/Year			230,400

Attribute	Inspection Issues and Monitoring Parameters	Location	Frequency	Responsibilities	Estimated Budgets (USD)
Erosion and Sedimentation Control	<u>Issues</u>: 1. Erosion and sediment controls are in place prior to wet season; 2. The drainage system and sediment controls are functional during wet season; 3. The sediment basins have a capacity of reducing the suspended solid from storm water by fifty percent (50%)	Construction area	Every 6 months	DRC or Third party consultant	
	<u>Parameter</u>: Total Suspended Solid	upstream and downstream of the entry points of surface water runoff from each construction area	As indicated in the Erosion and Sediment Control Plan	DRC or Third party consultant	50 /construction area
Surface Water and Sediment Quality	<u>Parameters</u>: All parameters and analysis methods of as indicated in	Full Phase ,6 Sampling stations as shown in and 9+1 Phase ,2 Sampling stations (TS-SW02 and 03)	Every 6 months before and after rainy season, through the construction period or at least for 3 years	DRC or Third party consultant	36,000/year 12,000/year
Terrestrial Biology	<u>Issues</u>: Progress of construction work and vegetation clearing	Construction area/natural forests and mangrove areas	Every 6 months	DRC or Third party consultant	

Table 8.4-1 Environmental Management Plan (EMP) – Proposed Monitoring Measures for Construction Phase (Cont.)

Attribute	Inspection Issues and Monitoring Parameters	Location	Frequency	Responsibilities	Estimated Budgets (USD)
Air Emission and Noise Control	<u>Issues:</u> 1. Each construction machineries are inspected at least every 6 months with a written certificate/ maintenance records of each machinery provided by qualified mechanics of the CC; 2. The dust suppression measures are implemented according to the mitigation measures; 3. The burning of waste materials are conducted according to the relevant mitigation measures; 4. The Community Grievance Record related to dust and noise ensure that the complaints are responded to and closed appropriately according to the relevant mitigation measures.	Construction areas	Every 6 months	DRC or Third party consultant	
Waste Management	<u>Issues:</u> 1. Appropriate containers for type of waste as categorized in the Waste Management Plan are provided for construction work camps, workshops, construction sites and other supporting facilities;	Construction areas	Every 6 months	DRC or Third party consultant	
	2. Waste segregation at the construction facilities and at the hazardous waste storage and non-hazardous waste disposal site;		Every month		
	3. Hazardous waste storage area and record of hazardous waste inventory.		Every month		
	4. The location of waste burning area is designated and no waste burning is conducted outside the area;		Every 6 months		
	5. Waste management training record		Every 6 months		

Table 8.4-1 Environmental Management Plan (EMP) – Proposed Monitoring Measures for Construction Phase (Cont.)

Attribute	Inspection Issues and Monitoring Parameters	Location	Frequency	Responsibilities	Estimated Budgets (USD)
On-Site Traffic and Access Management	Issues: Implementation of relevant mitigations measures	Construction area and nearby areas	Throughout construction phase	DRC or Third party consultant	
Construction Work Camps	Issues: Implementation of relevant mitigations measures	Construction area	Throughout construction phase	DRC or Third party consultant	
Historical and Cultural Resources	Issues: 1. Keep record and map up to date and making them available to all parties. 2. The construction work progress with the locations of known sites so that timely action can be taken is the sites will be subject to disturbance by construction activities.	Construction area	Throughout construction phase	DRC or Third party consultant	
Public and Occupational Health	Issues: 1. Keep monthly update of health and safety statistics and records. 2. Implementation of relevant mitigations measures 3. Inspect health and safety conditions of the CC and subcontractor's construction sites and camps.	Construction area	Throughout construction phase	DRC or Third party consultant	
Site Audit		Construction Area	Every 6 months	DRC or Third party consultant	6,400/year
Report Preparation (10 sets)			Every 6 months	DRC or Third party consultant	11,700/year

MC: Management Committee DRC: Dawei Residence Company Limited CC: Construction Contractors

Table 8.4-2 Environmental Management Plan (EMP) – Proposed Monitoring Measures for Operation Phase

	Positions		**Number**	**Estimated Budgets/Year (USD)**	
Staff	1. Environmental Health and Safety (EHS) Manager		1	55,200	
	2. Environmental Supervisor - Staff		1 3	30,000 64,800	
	3. Health and Safety Supervisor - Staff		1 2	37,200 43,200	
Total Staff Estimated Budgets/Year				230,400	
Attribute	**Inspection Issues and Monitoring Parameters**	**Location**	**Frequency**	**Responsibilities**	**Estimated Budgets (USD)**
Waste Management Facility (if constructed in the landfill)	Parameters: 1. Baseline groundwater quality before the operation of the landfill. Parameters when hazardous waste stabilization and disposal is conducted: pH, redox potential, dissolved oxygen, temperature, conductivity, turbidity and metals (cadmium, copper, lead, manganese, nickel, arsenic, selenium, and mercury).	Designated monitoring well	Every month for the first 6 months and then every 6 months unless unusual concentrations are observed.	DRC or Third party consultant	2,300/year
Surface Water and Sediment Quality	Parameters: Surface water and sediment, as shown in	Full Phase ,Total of 6 sampling stations, as described in and **Figure 8.4-1** 9+1 Phase ,2 Sampling stations (TS-SW02 and 03)	At least thrice a year (dry, early wet and end of wet season).	DRC or Third party consultant	30,000/year 10,000/year
Public and Occupational Health	Keep monthly update of health and safety statistics and records.	Township area	Every month	DRC or Third party consultant	
Report Preparation (10 sets)			Every 6 months	DRC or Third party consultant	11,700/year

MC: Management Committee DRC: Dawei Residence Company Limited CC: Construction Contractors

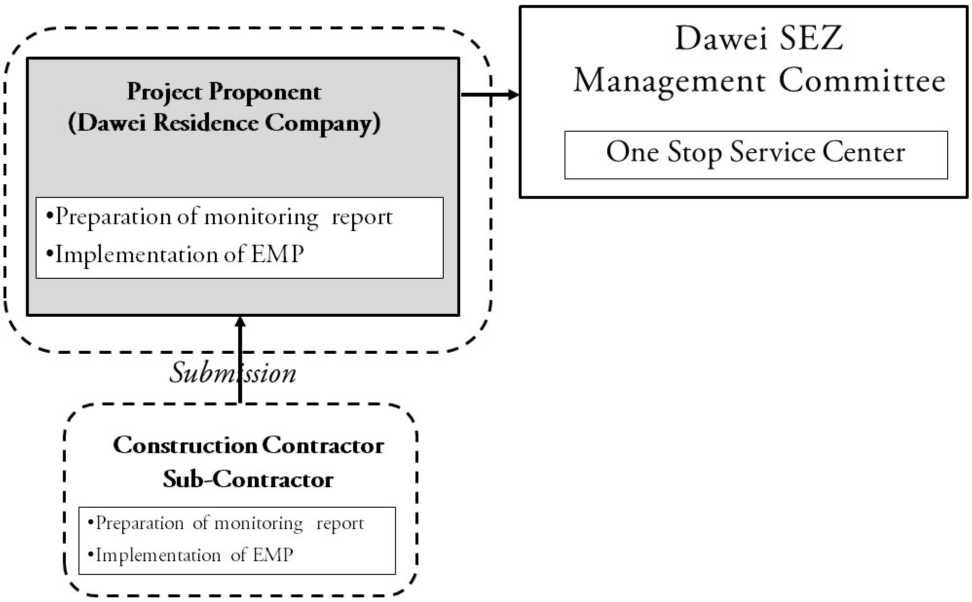
8.5 IMPLEMENTATION SCHEDULE

The implementation schedule as of May 2017 of the pre-construction, construction, and operation phases of the Initial Township project is as follows:

1) Pre-construction period : from 2017 to get approval of ESIA and land lease agreement
2) Construction period: 24 months after get approval of ESIA and land lease agreement, depend on demand basis of residence.
3) Operation period: 75 years (Maximum)

8.6 INSTITUTIONAL ARRANGEMENT

The organization structure for the operation and management of environmental monitoring is shown in **Figure 8.6-1.**



Source: EIA Study Team

Figure 8.6-1 Organization structure for EMP and EMoP of the Project during operation phase

8.6.1 Governing Bodies

According to the Myanmar Special Economic Zone Law (2011), there are 3 levels of government agencies directly associated with DRC

- Central Body

- Central Working Body
- Management Committee

The Central Body (CB) consists of members from ministries and government departments as assigned by the Government of Myanmar. CB is a policy making level among the three organizations. The duties of CB include reviewing proposals for development of a Special Economic Zone, determining type business, and other financial and taxes related matter. It reports to the Government of Myanmar. The Central Body is responsible to forming and assigning detailed duties to the Central Working Body (CWB) and Management Committee (MC).

CWB assists CB in reviewing the Special Economic Zone plan, determining of appropriate category of investment, and advising CB on matters regarding administration, management and legal issues in the Special Economic Zone. CWB reports to CB.

MC is the implementation mechanism of the governing bodies. One of the key duties of MC is supervising and inspecting the matters on implementation of investment plans and other matters including land use, environmental conservation, waste control, health, education, finance and taxation, transport, communication, security, electricity, energy and water supply etc. MC reports to both CB and CWB.

8.6.2 Project Proponent

The Project Proponent will be in charge of the overall operation of the initial township during the construction and operation. The Project Proponent will implement, EMP and EMoP as stated in this EIA report and almost by through construction contractors and sub-contractors.

Main tasks for environmental and social consideration in the Project are managed by Environment, Safety and Health section and / or Community relation division in Table 8.6-1.

Table 8.6-1 Main Tasks for Environmental and Social Consideration in the Initial Township

Division/Section	Main Tasks
Environment, Safety and Health section	1) Monitoring the DSEZ Initial Industrial Estate area operations according to EMP and EMoP 2) Submitting environmental monitoring reports to DSEZMC
Community relation division	1) Grievance Adjustment - Handling complains/ claims/ requests from community and its response as necessary - Coordinating between tenant and community for grievance adjustment 2) Planning and implementation of CSR activities

Source: EIA Study Team

8.6.3 Construction Contractor and sub-contractors

Construction Contractors (CC) refer to the contractors for the development of Initial Township, which include constructions of utility systems (i.e. water treatment and distribution system, wastewater collection and treatment system, irrigation system, electricity generation and distribution system, solid and hazardous waste management facilities etc.), internal roads, and basic infrastructure for the Complex.

CC must operate in accordance with the mitigation measures stipulated in this EIA report. CC report to the Project Owner.

Responsibilities of CC during construction phase include:

- Implement environmental mitigation measures for the construction activities and work camps as required by DRC;
- Liaise and coordinate with DRC on matters related to environment and public consultation; and
- Develop emergency response plan and establish emergency response capability for construction phase, which may include accidents, fire and first aid and medical evacuation.

8.7 PROJECT POLICY

8.7.1 Policy

The Project Proponent refers to Dawei Residence Company Limited (DRC), which falls under the category of 'Developer' according to Myanmar Special Economic Zone Law (2011). DRC roles in the project include design, construction, and operation of infrastructure and amenities in the Initial Township. DRC will be responsible for technical planning, enforcing, and monitoring of all environmental mitigation measures as stipulated in the EMP. The Project Owner reports to the Governing Body.

8.7.1.1 Construction Phase

Responsibilities of DRC prior to and during construction phase include:

- Hold discussions with the government agencies to develop procedure for inter-agency coordination and reporting;
- Ensure that provision of relevant environmental mitigation measures are reflected in the contract between DRC and construction contractors;
- Develop monitoring programs and monitor the implementation of environmental mitigation measures for construction period; and

- Liaise and coordinate with government agencies on the matters related to environment and public consultation.

8.7.1.2 Operation Phase

Responsibilities of DRC during operation phase include:

- Establish environmental requirements for the industrial estate following the mitigation measures for the operation phase;
- Distribute the environmental requirements to the factories/manufacturers and ensure that the factories/manufacturers comply with the environmental requirements both during construction and operation of the facilities;
- Operate the utility systems of the industrial estate including electricity generation, water treatment and distribution, solid and hazardous waste management, and wastewater treatment system;
- Develop emergency response plan and establish emergency response capability for operating phase, which may include traffic accidents, fire and chemical pollution incidents within the industrial estate area;
- Develop monitoring programs and monitor the implementation of environmental mitigation measures for operating phase; and
- Liaise and coordinate with government agencies on the matters related to environment and public consultation.

8.7.2 Environmental Management System

DRC as the project owner has to establish the environmental policy and rules that will govern environmental practices and performance of the Initial Township as a whole. The establishment and implementation of this component is of utmost important due to absence of local environmental regulations and authorities fully responsible for environment and pollution control in Myanmar. Once established, DRC shall adhere to these policy and rules. However, in the future, when the environmental protection laws may be announced and published by the Government of Myanmar, DRC shall ensure that the requirements as set in the policy and rules are fully in compliance with the laws.

Environmental policy and rules for Initial Township shall be based on the following principles:

- Eco city concept which have the following key components:
  - Integration with natural system.
  - Maximize energy efficiency through facility design and other means.
  - Material flow through the whole area and ensure maximum reuse and recycling.

- Water conservation, reuse and recycling in the Initial Township.

- Prepare Environmental, Health and Safety Plan. EHS management plan or programs should also be reassessed periodically to ensure that the key environmental health and safety risks are determined in accordance with changes in order that the potential risks will be appropriately addressed. Thus, EHS system and performance should be improved continuously by a combination of ongoing monitoring of the Initial Township and high performances as well as effective accountability of the facility
- Establish *Environmental Rules* that the township has to follow. These rules will be in accordance with the EMP for operation period. The rules will be attached with the contractual document between the contractor, operator and DRC.

In addition to the above policy and rules, DRC will play a leading role in maintaining and improving overall environmental performance of the whole Initial Township. The EIA was prepared in a broad scope to cover all possible activities in the Initial Township in high level. DRC will have to establish a strong organization to handle the dynamic and changes that will occur during the construction and operation of the project. To achieve environmental safety and health management goals, to protect the environment, workers and the public from any adverse impacts caused by the project, the strong environmental management commitments and the proficient mitigation measures are needed. In order to develop the comprehensive environmental management plan, DRC as the project owner should be aware of the change during the operation period, and should consider the following measures.

- DRC should establish a sector responsible for safety health and environmental management of the Initial Township to prepare and perform the environmental management plan and programs to ensure that the Initial Township comply with environmental legislation and other relevant safety health and environmental requirements, and to achieve the most up-to-date environmental protection requirements/ measures/ standards.
- DRC should periodically assess/reassess the environmental management plan or programs to ensure that the key environmental health and safety risks are evaluate.
- Due to the long period of the Initial Township Project, DRC should ensure that EHS performance will be improved continuously via a combination of ongoing monitoring program and cooperation with the residences and community mall inside the Initial Township.
- DRC needs to prepare and commission a database system to keep track of and analyze environmental data, flow of materials and waste, water consumption, wastewater generation rate and quality, and energy consumption. The database will help organize the data from monitoring program of DRC and of the township, and can also be used as a tool to

promote conservation of material, energy, and water among the township, if the database is designed properly.

- DRC should provide provisions to ensure that the project can apply proper environmental health and safety management to protect health and safety of workers and the public.

8.7.3 Mitigation Measures Commitments

The Project commits to comply with all mitigation measures as stated in the Environmental Management Action Plans during construction phase and operation phase.

CHAPTER 9
PUBLIC CONSULTATION AND DISCLOSURE

Sustainable development is a result of economic, environmental, and social values integration. Therefore, the public involvement and disclosure is a part of environmental assessment process. The importance of civil society participation has been recognized in international environmental law and policy, most prominently in Principle 10 of the Rio Declaration on Environment and Development which states that "*Environmental issues are best handled with the participation of all concerned citizens, at the relevant level*"[1].

In accordance with the Myanmar Environmental Impact procedure (2015), participation of public and information disclosure are a part of the process. It is requested the project proponent to provide opportunities of public to express their opinions, concerns, recommendation and suggestion in developing the project. The public participation and information disclosure are international practice and have long been used as a tool to assess concerns of the stakeholders. Therefore, herein the Dawei Initial Township Project implements the public consultation.

9.1 PURPOSE OF THE CONSULTATION DURING THE PREPARATION OF EIA REPORT

The purpose of public participation and disclosure are;

- to inform the stakeholders about the project,
- to gain public views, concerns and values,
- to increase public confidence, and
- to improve transparency and accountability in decision-making process.

9.2 METHODOLOGY AND APPROACH

9.2.1 Identification of Stakeholders and Group Affected by The Project

According to ADB Environmental Assessment Guideline and standards of the World Health Organization (WHO) and the Industry Foundation Classes (IFC), there are 5 categories of stakeholders; local communities, civil society, government bodies, private sector bodies, and other institutions. By adjusting such guideline and standards into practice in Myanmar

[1] THE UNITED NATIONS CONFERENCE ON ENVIRONMENT AND DEVELOPMENT. Year. Rio declaration on environment and development. *In:* Report of the United Nations conference on environment and development, Rio de Janeiro, 1992. 3-14.

context, the key stakeholders of this project are divided into two main groups; 1) the regulatory authorities and 2) local stakeholders. The regulatory authorities and public/ private agencies include Provincial Authorities, District Authorities, and Dawei Special Economic Zone supportive group. The local stakeholders include villagers in the Initial Township project area. Therefore, the public consultations of this report already covered the primary stakeholders who are directly affected in positive and negative way.

The target groups for public consultation included 2 villages that will be the location of the Initial Township. These 2 villages are Min dut and Pagaw Yun.

9.2.2 Methods of Consultations

According to ITD has delegates the United Analyst and Engineering Consultant Co., Ltd. as the consultant of this project. The consultant has sub-contracted "*Resource & Environment Myanmar Ltd*." (*REM*) as a local company and a sub-contractor to conduct meetings with local stakeholders. The reasons to select REM include their experiences in EIA study, their professional staffs and the familiar of Dawei Projects; in addition, REM can cooperate and engage with local stakeholder better than non-local company. REM started conducting projects since 1998. Also, they have been involved in Dawei Sea Port, Main Road, and Dawei Industrial Estate projects; therefore they are well familiar with the area.

Thai consultant designs the public involvement process, defines stakeholders, and conducts presentation for REM. REM is responsible for coordinating with government permission process, inviting participants, managing public consultation meeting, and recording raw data. The guideline to arrange public consultation meeting is provided to REM to ensure that all necessary steps were conducted. Communications between the consultant and REM have been conducted via phone, email, and face-to-face meeting to safeguard the mutual understanding. The consultant also observed some meetings to ensure that the meeting process was correctly conducted.

To recruit the participants of each meeting, REM used the traditional process to invite people. Firstly, REM coordinator called the head of village and informed him/her about the meeting and objective of meeting as well as to make appointment for date and place of meeting. The head of village later disseminated this information to the people who are interested to involve in the meeting.

In the public consultation process, the REM staffs firstly introduced themselves and the consultant to local people. Secondly, REM briefly informed about the project information. PowerPoint Presentation was used to show some pictures. The PowerPoint was conducted by the consultant and REM translated the content to Myanmese language. Regarding ADB Environmental Assessment Guideline, public consultation involves engaging people in dialogue, a two-way flow of information and ideas between the project proponent and the stakeholders with opportunity for the stakeholders to express their views and concerns. Thus, REM staffs asked the participants whether they had any questions or concerns related to the project. All concerns were recorded and translated to English by REM staffs. It is very essential

to clearly notify that only concerns related to Initial Township project were taken into consideration in this Chapter.

9.2.3 Approach to The Public Meetings

The following approach to the public meetings was adopted;

- Each meeting at the community level was organized by the consultant in Myanmar namely “Resource & Environment Myanmar Ltd. (REM)” to confirm that the stakeholders feel free to express their concerns towards the project. The meetings were also conducted in local language to ensure that the stakeholders clearly understand the provided information.
- REM firstly contacted headman of each village to make appointment of the meeting. Headman of each village had identified participants to be invited, and in making arrangements for the meeting venue and issuing invitation.
- The project proponents and UAE (Thai consultant) were responsible for providing information on brief project information including development plan, EIA study as well as potential impacts of the projects and mitigation measures to minimize the impacts. This information was translated to local language by REM. The project proponent, UAE, and REM had worked as a project team.
- The meeting began by informing the participants of the objectives of the meeting and expected outcome. After that, the project team gave information about the project and EIA.
- The meeting then provided an open forum for discussions. The participants expressed their concerns, offer their views and suggestions.

9.3 SUMMARY OF CONSULTATION ACTIVITIES UNDERTAKEN

The Project conducted the public consultation program 3 times during the environmental impacts assessment process. The first consultation (Early program) were carried out during 2012 and 2013. To inform public overall about the entire initial industrial estate that included the initial township information, potential impacts and mitigation measures (Annex 9-1). The second consultation (Middle program) was in 2015 so focus on the initial township itself and have details following:

9.3.1 Public consultation program in 2015 (Middle)

The public consultation meeting was conducted during 21-22 March 2015. The Project information were presented and disseminated to PAPs by handouts (Annex 9-2). The Project proponent also carried out opinion survey using questionnaire (Annex 9-3).

Figure 9.3-1 The Second Public Consultation during March 2015

To begin with, the consultant visited Dawei Working Body to introduce consultant team and to inform about the public consultation meeting. After receiving permission from the government, the meetings were conducted with 122 people in 2 affected villages. The date, place, stakeholder group, and number of participants involved in the public consultation meetings are shown in Table 9.3-1.

Table 9.3-1 Date, Place, Stakeholder Group, and Number of Participants in the Public Consultation Meetings

No	Date/Time	Village	Number of Participants
1	21 March 2015 10.00 hr	Min dut	66
2	22 March 2015 10.00 hr	Pagaw Yun	56
TOTAL			**122**

Source: REM (2015)

9.3.1.1 Summary of main comments received from stakeholders

After receiving information of project, the participants expressed their concerns about the project as follows;

(1) Min dut

- The villagers are worried that the project might lead to water pollution and they will not able to drink water from village's well. Thus, the project owners

must be careful and the project activities should not harm their water resources.

- The villagers complained that they cannot use the stream besides the project because the project bulldozes the stream. Consequently, the villagers cannot grow any crops or trees because the stream is too shallow. The villagers requested the project owner to disinter the stream if possible.
- The villagers would like to be employed in the Initial Township project. Thus, they requested for the technic training program concerning with this project.
- The local people want to use the villages' existing road after the project is done.

(2) Pagaw Yun

- The villagers are concerned about seven groups of temporary workers in oil-palm garden. If the garden is eradicated, they will have no place to live.
- The villagers are confused about the management of existing oil-palm garden. The government informed them that the government will leave 350 oil-palm trees. However, ITD informed them that all oil-palm trees will be cut off. The villagers want to retain some oil-palm trees to keep the region green and to be a buffer zone of the project.
- The villagers would like to know about the actual plan that will not be changed again and again.
- The villagers are worries about the environmental pollutions caused by Initial Township project.

To conclude, the concerns towards the project are listed as follows;

- Environmental impacts such as water pollution
- Local employment and career training program
- Public information

9.3.1.2 How these comments were taken in account

The project proponent took these concerns into account and the mitigation measures to minimize the public concerns are addressed in the next section. For the result of the public consultation meeting can be defined the mitigation measures for the public involvement and disclosure in construction phase and operation phase as shown in Table 9.3-2 and Table 9.3-3.

Table 9.3-2 Mitigation measures for construction phase

Mitigation Measures	Place	Period	Responsible Agency
1. Inform head of villagers about construction plan and activities	• 2 Villages	• At least 2 weeks prior to the construction	DRC
2. Local people can complain about the project activities directly to the complaint handling unit or via the community leader. The corrective actions of each complaint must be done within a month or at the period of time that developer and local people mutually agree	• Via community leader house • Putting complaint in the comment boxes • Oral inform at complaint handling unit	• Over construction phase	DRC
3. Provide on-site construction skill training for local people and give them wages at least those indicated by Myanmese labor law	• At the construction site	• On-site training	DRC

Source: EIA Study Team

Table 9.3-3 Mitigation measures for operation phase

Mitigation Measures	Place	Period	Responsible Agency
1. Inform head of villagers about the operation plan and activities in the operation phase	• 2 Villages	• At least once a month over operation phase	DRC
2. Local people can complain about the project activities directly to the complaint handling unit or via the community leader. The corrective actions of each complaint must be done within a month or at the period of time that developer and local people mutually agree	• Via community leader house • Putting complaint in the comment boxes • Oral inform at complaint handling unit	• Over operation phase	DRC
3. Provide industrial skill training for local people	• In the community to avoid difficulty of travelling	• On-site training	DRC
4. Contract all tenants to give the first priority for local employment		• Over operation phase	DRC

Source: EIA Study Team

9.3.2 The Third Public Consultation Program (Final)

9.3.2.1 Objectives of The Public Consultation Meeting

The ESIA was approved on 25th October 2017. Thus the Project organized the public consultation again on 28th March 2018. The objectives of the public consultation were to introduce the project information and to inform about EIA study, potential impacts, and mitigation measures to the local stakeholders as well as to gather recommendation for future cooperation.

9.3.2.2 Schedule and Stakeholder Group

The public consultation meeting was conducted on 28th March 2018. The consultation is hosted by the Environmental Conservation Department (ECD), MONREC. The consultation held in DSEZ MC Auditorium in DSEZ between 8.30 am and 12.00 am. The handout presentation (Annex 9-4) were disseminated and handed to participants. One thousands and sixty stakeholders (not include the project proponent staff) were among government agencies e.g. Tanintayi regional ministry, authorized agencies, Environmental Conservation Department, DSEZ management committee, CSO/ NGO and project affected villages are invited and participated. Details in the public consultation were noted in the Minute Of Meeting (MOM) in Annex 9-5 and result of the consultation can be summarized in Table 9.3-1.

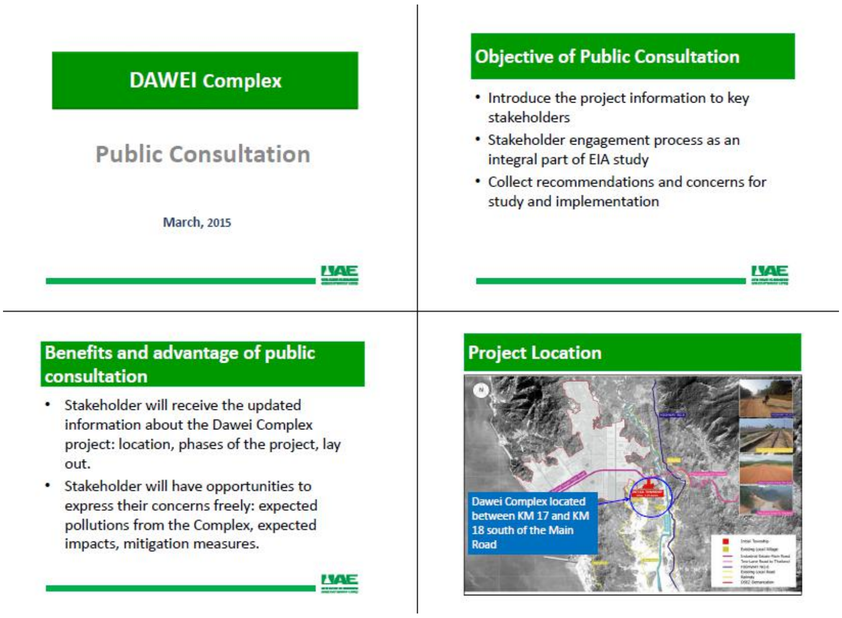
Figure 9.3-2 Dawei DSEZ MC auditorium and participants in the final public consultation

Table 9.3-4 Summary of issues and response received from stakeholders in the consultation

	Stakeholders	Issues	Responses
1.	Villager	Land acquisition, job opportunity and social issues	Suggestion: He has attended various meetings since the start of the Dawei SEZ projects and also participated in various sessions on the land compensation and job opportunities events. So far, the main problem in job opportunities for local people is education. They are worried about insufficient skills and education. The CBO (Civil Base Organization) is a representative of local people organization. He would like to nominate himself in being the representative, in order to cooperate and negotiate between government agencies, Project proponent and local people on the land compensation, job opportunity and social issues. (Loud claps) Grievance and suggestion: In 2013, there used to have the CBO but somehow the problem occurred. Since then, there has none CBO anymore. So, now he wants the re-establishment of the CBO. He and villagers agrees with the Project proponent that the projects are well benefits and will be helpful for the local people and the region.
2.	Villager	Project commitments and EMPs	Question:"*What are the Project Commitments and Environmental Management Plans?*" Answer (by Ministry of Tannintayi Region): "*The Dawei SEZ project is initiated by the previous government. Now we are democracy government elected by public, so you all can voice your opinions in our region. We are facing a demand of electricity and infrastructure in transportation. Thus, we do need the 2-lane road from Dawei to Tiki and, if the 2-lane road project is completely successful, Dawei will be so developed. The Tannintayi government has also a Master plan for the Dawei deep sea port which prepared by JICA (Japan International Cooperation Agency) and the ADB (Asian Development Bank) project loan for the 2-lane road. We will implement the Environmental Management Plans for Dawei SEZ projects by accountabilities of public opinions and responsibilities. We are welcome for your suggestions and comments*."
3.	Villager (Mudu)	Compensation	Concern: "*We are worried about compensation. The previous data collected 3 years ago, so it may be out of date. As well as the condition now is changed and very different. Number of households and villagers have been increased*." Answer by Representative of the Dawei SEZ Management Committee (DSEZMC): "*DSEZMC will establish Resettlement Compensation Committee (RCC) consisting of regional minister, government officers, village leaders etc. Previously, the DSEZMC had no experiences in the land compensation and did the wrong things. Now we are implementing in accordance with the international resettlement standard. We hired the international consultant ERM (Environmental Resource Management) to do a guideline for Resettlement Action Plan*."

9.4 DISSEMINATION OF PROJECT INFORMATION

Public consultation and information disclosure were conducted since the beginning stage of the EIA process through the ending stage, approval of the EIA. Each of the public consultation and meeting, objectives of EIA and the project details and mitigation measures were informed and communicate to the villagers through the Power Point Presentation and handouts type as shown in Figure 9.4-1 and in Annex 9-1, Annex 9-2 and Annex 9-4 both in Myanmese and in English.



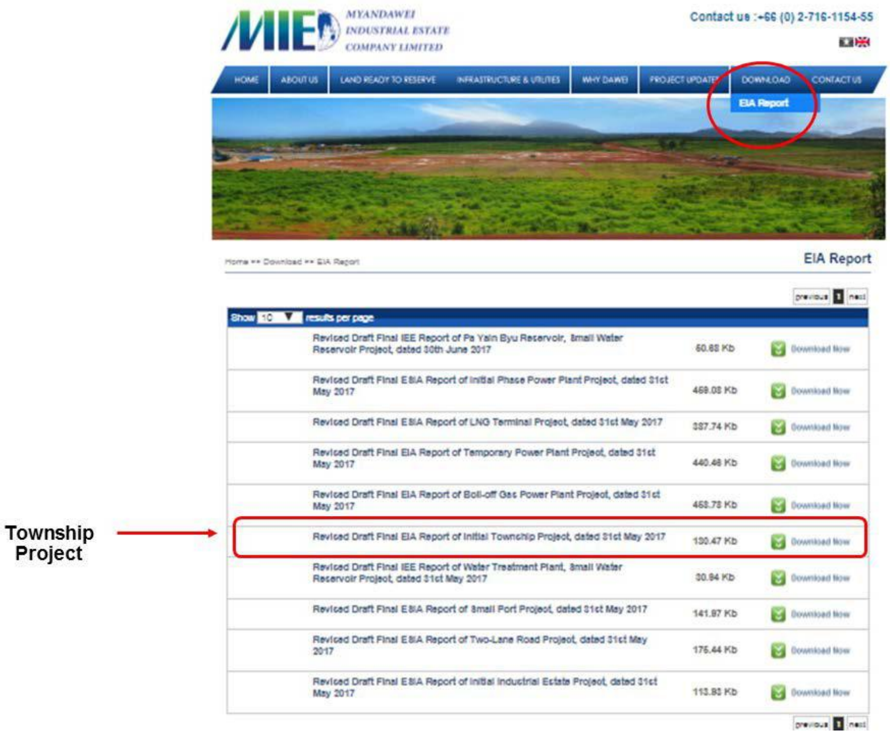
Source: The EIA Study Team

Figure 9.4-1 The Project information communicated through the Power Point Presentation in the Public consultation meetings

Outline of the Power Point Presentation are included;

- Objectives of EIA
- Updated Project location and layout
- Phase of the project, operation year, and targeted industries
- Potential impacts of the project
- Mitigation measures to minimize the impacts.

Furthermore, public can access and gain more the Project information and the EIA report on the MIE's website. The EIA Report has been published on the following website link: http://www.daweiindustrialestate.com/download.php?cid=110&cname=EIA%20Report.



Source: MIE (2017)

Figure 9.4-2 Disclosure of the EIA Report on the MIE's Website.

9.5 RECOMMENDATION FOR FUTURE CONSULTATION

The major concerns obtained from the public consultation meetings included environmental pollutions from the project and their way of life after the project is implemented. Regarding environmental pollutions, the villagers are worried that the project might generate water pollutions and they cannot use water in the natural water sources.

In additions, they villagers are worried about their occupations after the project is implemented. Thus, they need a train program that can help them work in the industrial sector. The villagers also need to know about the actual project schedule and project description. Since the information has been changed all the time, they feel uncertain about their future.

The key recommendations from public consultations are to keep inform the villagers about project schedule, impacts, and mitigation measures to minimize the impacts from Initial Township as well as to provide appropriate training to the local people including establish committee, which will consist of government agencies, villagers and project proponent to organize and manage social issues.

9.6 RESETTLEMENT AND RELOCATION

According to the land use survey, the Initial Township is located in the plantation areas, which belong to government. Thus, none resettlement and relocation will be required. However, if there will have involve such resettlement or relocation in the future. The Project will comply by the relevant laws and regulation or the compensation as mentioned in Chapter 3 and the latest Resettlement Action Program.

9.7 SKILL TRAINING PROGRAM

To prepare the employment in the Initial Township and new business opportunities that come with the Project, short-term training should be provide in various skills that would be in demand in the Early Industry development. The project aims to establish the Dawei Skill Training Center to support demand of skilled workers pursuant the type of business that will raise in the Initial Township. This type of skill training will be agreement between employers and employee, in choosing the best program for themselves such as:

- Construction related skills including carpentry, painter and masonry;
- Motorcycle repair;
- Computer repair and home appliance repair;
- Small business management;
- Handicraft making
- Security Training
- Food Production Training
- Furniture Production Training
- Car Driving Course
- Electricity installation Course Training
- Car repairing Training
- Computer skill Training
- Language skill Training

Training program will legal establish in accordance with the relevant laws as mentioned in **Chapter 3**. The center will also authorize to conduct vocational training for works and staff including students; provide outsourcing services and agencies in the region. The Project aims to support the local and to enhance their job opportunities within the Township itself and the initial industrial estate.

9.8 COOPERATE SOCIAL RESPONSIBILITIE (CSR) PROGRAM

9.8.1 COOPERATE SOCIAL RESPONSIBILITIES POLICY

The Company has a guideline for the Corporate Social Responsibility as follows;

- The Corporate Governance: The management system of the Company shall have efficiency, transparency, and accountability for the confidence of shareholders, investors, stakeholders and related parties and lead to the sustainable growth of the Company.
- The Business Ethics: The Company believed that moral in business operation can benefit the Company in the long-term. The Company will avoid engaging the activities which are against morality.
- The Respect to Human Right and Labor Equity: Human resource is the effective factor to drive the business and add value for the corporate. The Company, therefore, shall improve their working environment and provide them a chance to training for skill enhancement.
- The Responsibility to the Consumer: The construction business is high competition. The success of previous project and the satisfaction of the customer can benefit to the Company competitive advantage. The Company, therefore, shall maintain its standard of goods and services and can be the part of society to mitigate the social problems.
- The Community Development: The community's sustainability is one of the significant factors which can support the Company's business. The Company will establish the activities which can strengthen the community for example the education support, human resource development, employment creation, and other development project.
- The Environmental Concern: The people nowadays concern for the environment. The operation with suitable environmental impact protection system can help the Company timely complete the project. The Company, therefore, shall set the environmental impact protection system comply with laws and regulation and participate in environmental activities with other part of society.
- CSR Report: The Company will disclose the information related to CSR activities of the Company in the annual report.

9.8.2 COOPERATE SOCIAL RESPONSIBILITIES PROGRAM

The Project plans to conduct CSR programs that will support development in Dawei region and local communities such social, environmental and standard of living. The program are

- Education;
- Natural Disaster Emergency;

9.8.2.1 Education

The project aims to donate scholarships for students who live in vicinities of the project from school level until university level in every Q3 of every years.

9.8.2.2 Natural Disaster Emergency

The project aims to donate and support the local communities or in the Dawei region during the emergency such as fire, natural disaster and epidemic or terrorism. The donation will conclude such life supporting bags and food and water and rescue equipment. Supports during recovery period, such as cleaning, clearing blocking drainages or cannels.

CHAPTER 10
CONCLUSION

Initial Township Project located in the Dawei Special Economic Zone (DSEZ) is planned to develop along with the initial industrial estate, the two-lane linked road, the water reservoir and treatment plants, the power plants, the LNG terminal and the telecommunication landline projects. Aim of the Initial Township Project is to support high-quality residences to accommodate both Myanmar people and the foreigners who work in the DSEZ.

Initial phase of the township will cover an area of 1.365 square kilometers. It can expand more in the final phase to serve up to 370,116 of people. Construction of infrastructure and phase 9+1 buildings consisting of 5-floor workforce apartment, 8-floor service apartment and may include 3-floor retails shop, is scheduled to start in 2018. The Project will develop by phase depending on demand of housing and residence in DSEZ. Utility system for the initial township will include power and electricity, water, waste management, flood protection and emergency response systems and the facilities center will include fire station, transportation hub and health care/hospital. Waste management will be operated and shared with the Initial Industrial Estate’s waste management facilities.

The assessment of the environmental impacts includes reviews of the information and secondary data, site investigation, environmental baseline and socio-economic surveys and public consultation. Key potential impacts have been assessed and are summarized in Table 10-1. Although, adverse impacts on terrestrial ecology and land use are of the most concern cumulative impacts, the project area has already been encroached and largely used by expansion of community. Thus, mitigation measures including establishment of the buffer zone, enforcement, and education and campaign programs have to be conducted.

The other adverse impacts are on air and surface/groundwater quality. The project will be source of air emission during construction and from residents’ vehicles will be mobile source during operation. Quality of surface water and groundwater have already been impacted by the activities of human settlement due to septic and seepage tanks still exists in a few places and most of the local households still use open pits for disposal. While, the project itself has onsite treatment unit to control effluent for each buildings and waste management systems, mitigation measures and monitoring program have to be followed up.

Initial Township has established EMP to address the potential impacts that may be caused by the project during both construction and operation phases. Together with an effective implementation of monitoring programs, the measures will help controlling the potential impacts to the acceptable level. However, many of the cumulative impacts and possible mitigation measures are considered to be beyond the scope and capability of the Initial Township to implement. Close cooperation with local and national government agencies will be required to address these concerns and to ensure that the potential impacts are predicted and appropriate measures are planned and implemented.

Table 10-1 Key Potential Impacts

Impacts	Proposed Action	Past Actions	Other Present Actions	Future Actions	Cumulative Impacts
Physical Resources					
Air Quality	*	*	*	*	**
Noise and Vibration	*				*
Surface Water and Sediment	*	*	*	**	**
Groundwater	*	*	*	*	*
Geology and Seismology					
Biological Resources					
Surface and Coastal Water Biology	*				
Terrestrial Ecology	*	**	**	**	***
Economic Development					
Infrastructure Facilities	+				+
Traffic and Transportation	*			**	**
Land Use	***			**	***
Social and Cultural Resources					
Socio-Economic Conditions	+			+	+
Sites of Historical and Cultural Importance	**				**
Public and Occupational Health	*	*	*	**	**

Note: * - low adverse impact ** - moderate adverse impact *** - high adverse impact
+ - beneficial impacts

Cost estimates of the project already incorporated and provided budget provision to the important components for other environmental management and monitoring system; however, such budget estimates may be revisited when the project enters detailed design stage.

Public consultation activities have been conducted in Myanmese by local consultant with the villagers potentially affected by the project activities. Concerns of the public are the buffer zone to remain green area, water pollution and water for irrigation and employment by the industry. All the comments are taken in account via social mitigation measures i.e. inform of project activities and consultation, grievance redress and a training program to restore their income and employment.

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ENVIRONMENTAL MANAGEMENT PLANS

For each of the potential environmental impacts described in the ESIA report, various preventative measures proposed to mitigate different types of the impacts. This Environment Management Plans included details of responsible authorities, implemented parties, location, estimated cost including monitoring plans are prescribed here.

The key organizations responsible for implementation of the mitigation measures include: the Governing Bodies of the Government of Myanmar, the Project Proponent, the Construction Contractor and Sub-Contractors and the investors or tenants.

1.1 ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN

As enacted in the EIA Procedure, 2015. The two EMPs during construction phase and operation phase are defined as follows:

"***Construction Phase EMP*** *means a detailed and comprehensive Environmental Management Plan (EMP) for the construction phase of a Project. Such plan shall present all relevant commitments, Emission Limit Values, Environmental Quality Standards and other environmental requirements and include a description of the construction works, present an overview of Adverse Impacts, present mitigation measures and monitoring programs together with time schedules, overview maps, images, aerial photos, satellite image, site layout plans, cross sections, transects, environmental management and monitoring sub-plans for each construction site, thematic sub-plans, and management procedures as appropriate*".

"***Operation Phase EMP*** *mean a detailed and comprehensive EMP for the operational phase of a Project. Such plan shall present all relevant commitments, Emission Limit Values, Environmental Quality Standards and other environmental requirements and include a description of the construction works, present an overview of Adverse Impacts, present mitigation measures and monitoring programs together with time schedules, overview maps, images, aerial photos, satellite image, site layout plans, cross sections, transects, environmental management and monitoring sub-plans for each construction site, thematic sub-plans, and management procedures as appropriate*".

The above definitions make clear that the two EMPs required by MONREC will need to be comprehensive and have more details than very brief EMPs presented in EIA reports of the past. This requirement of MONREC is in line with current ESIA practices in developed countries. It should be noted that the two EMPs prepared as part of this ESIA study are invariably framework plans as they are based on outline designs of the Project. They are therefore intended to provide framework and prescribe requirements for the preparation of detailed CEMP and OEMP by the appointed EPC contractor (Contractor). Consequently, they could be considered and referred to as the Project Proponent's or Owner's EMPs to distinguish them from the Contractor's EMP after the ESIA during project implementation.

1.2 EMP AND EMoP FOR CONSTRUCTION PHASE

As discussed in the EIA, the Project is not expected to have major environmental impacts during construction apart from environmental disturbances normally experienced in Township construction. Nevertheless, the Project Proponent will ensue that the Contractor will make best efforts to minimize the impacts during the construction phase despite their insignificant levels. In this regard, the Project Proponent will ensure that the Contractor-CEMP will incorporate all mitigation measures as prescribed in the Owner-CEMP in preparing detailed designs of the township and its associated facilities, construction methods, and specifications. CEMP is present as below:

1.2.1 Erosion and Sedimentation Action Plan

a) *Principle and Rational*

Construction and earth-moving activities accelerate erosion mainly by exposing areas of soil to rain and running water. If this runoff is not properly controlled, the result is often serious siltation of nearby watercourses. The consequences are degradation or destruction of fish and wildlife habitat, and water being less useful for freshwater supplies.

b) *Objectives*

To prevent soil erosion in the construction site into water resource and area nearby.

c) *Project Area*

Project construction area

d) *Description of Mitigation Measures*

CC shall prepare the Erosion and Sediment Control Plan for construction activities and submit to DRC for approval prior to commencement of construction activities in the area. The major effort at construction sites will focus on the management of erosion of excavated surfaces, especially during the wet season when the volume of runoff is expected to be high. The plan shall have the following components:

- An assessment of the potential for contamination of natural waterways. Basic principles include the size of the disturbed area, site drainage, and waterways receiving storm water from the disturbed area;
- Plans for water management during construction shall be established and include adequate drainage system to manage runoff from 2-year ARI storm flow;
- Sedimentation controls shall be implemented in the form of silt trap fences and sedimentation basins where appropriate, and all runoff from the disturbed area shall be directed to the sediment controls;

- Measures to be taken to collect, store and treat storm water prior to discharge from the site considering options for water re-use onsite;
- Management of material storage area – Stockpile and spoil disposal area shall not be located on drainage line;

Control of erosion and sedimentation shall be constructed progressively prior to commencement of each stage of earthworks until the permanent protection is established.

e) *Description of Monitoring Program*

DRC shall develop a monitoring program to include inspections of drainage works, sediment traps and other structures designed to treat water to reach an acceptable quality before discharge into natural and/or constructed watercourses meet the appropriate standard.The monitoring program for erosion and sediment control include:

- Inspect that erosion and sediment controls are in place prior to wet season,
- Inspect that the drainage system and sediment controls are functional during wet season,
- The sediment basins have a capacity of reducing the suspended solid from storm water by fifty percent (50%),
- Designate water quality monitoring plan to include locations of sampling upstream and downstream of the entry points of surface water runoff from construction area; frequency and methods of testing, and applicable standards for suspended solid.

A total of 6 sediment sampling stations similar to those surveyed during baseline sampling is recommended. Details of the stations and parameters are provided in Figure 1.2-1 and Table 1.2-1 but in 9+1 phase only 2 sampling stations are TS-SW2 and TS-SW3 will be monitored

f) *Work Plan (Duration)*

During construction period

g) *Responsible Organizations or Agency*

CC under supervision by DRC shall develop and implement *Erosion and Sediment Control Plan* according to the site condition and progress of construction work.

DRC shall review and approve the *Erosion and Sediment Control Plan* before the construction in the area can be commenced, then inspect and monitor the implementation of *Erosion and Sediment Control Plan* according to the monitoring program. DRC shall prepare the report with the result of the implementation to MC every 6 months.

h) *Budget*

Included in construction budget.

1.2.2 Surface Water and Sediment Quality and Aquatic Biology Action Plan

a) *Principle and Rational*

Release of pollutants from construction activities, work camps, workshops, and chemical storage to the environment may affect quality of freshwater, coastal water, and sediment. Control of release is necessary to limit the potential impacts caused by such activities.

b) *Objectives*

- To prevent soil erosion and wastewater runoff into natural water resources.
- To prevent wastewater contamination from campsite

c) *Project Area*

Project construction area

d) *Description of Mitigation Measures*

The following mitigation measures need to be implemented by DRC and CC:

- Prepare and implement the measures for Erosion and Sediment Control.
- Prepare and implement the measures for Waste Management.
- Prepare and implement the measures for Construction Work Camps.
- Release of oil and grease from workshop facilities is prohibited. Used oil need to be stored separately and managed as per Waste Management Plan.
- Stock yards; gasoline, oil, lubricant and hydraulic oil storage areas; and machines/vehicles cleaning areas should be located at least 100 meters away from natural waterways.
- Used water shall be treated and disinfected before discharge into natural drainage

e) *Description of Monitoring Program*

Integrate monitoring program for inspection of mitigation measure implementation with relevant plans.

Additionally, it is recommended that the project continue sampling of surface water quality in Dawei River and Yalaib Chaung every 6 months, before and after rainy season, during the construction period for another 3 years so that the project has a more complete and continual baseline surface water quality before commencement of the Initial Township area.

In Full phase, a total of 6 sampling stations similar to those surveyed during baseline sampling is recommended. Details of the stations and parameters are provided in Table 1.2-1 and Figure 1.2-1 but in 9+1 phase only 2 sampling stations are TS-SW2 and TS-SW3 will be monitored.

Table 1.2-1 Analysis Methods of Surface Water and Sediment Quality Parameters and Sampling Stations During Construction Period

Parameters	Analysis Method[1/]	Sampling Station
Surface Water		
Depth/ Width	Depth Meter	TS-SW1: Discharge point at the north of the project at KM 18+500 TS-SW2: Upstream at Yalai Chaung at meeting point of Yalai Chaung and canal(that receiving wastewater from discharge point at south of the project) TS-SW3: Downstream at Yalai Chaung at meeting point of Yalai Chaung and canal(that receiving wastewater from discharge point at south of the project) TS-SW4: Dawei River at the boundary of the project area at Ta Nyin In village TS-SW5: Dawei River (at about 500 meters upstream from the Yang Gaeng bridge) TS-SW6: Dawei River (at about 500 meters downstream from the Yang Gaeng bridge)
Temperature	Thermometer	
Flow Rate	Flow Meter	
pH	Electrometric Method	
Salinity	Electrical conductivity Method	
Electrical Conductivity	Electrical Conductivity Method	
DO	Membrane Electrode Method	
BOD	Membrane Electrode Method	
Turbidity	Nephelometric Method	
TSS	TSS Dried At 103-105 ^{o}C	
TDS	TDS Dried At 180 ^{o}C	
TS	TS Dried At 103-105 ^{o}C	
Nitrate-Nitrogen	Cadmium Reduction Method	
Ammonia-Nitrogen	Phenate Method	
Phosphate -Phosphorus	Ascorbic Acid Method	
TKN	Kjeldahl Method	
Oil&Grease	Soxhlet Extraction Method	
Phytoplankton	Microscopic	
Zooplankton	Microscopic	
Benthos	Macroscopic	

Remark: [1/] APHA, AWWA and WEF. Standard Methods For The Examination of Water And Wastewater. 22nd ed. Washington, DC: APHA. 2012.

[2/] United States Environmental Protection Agency. SW-846 Method.

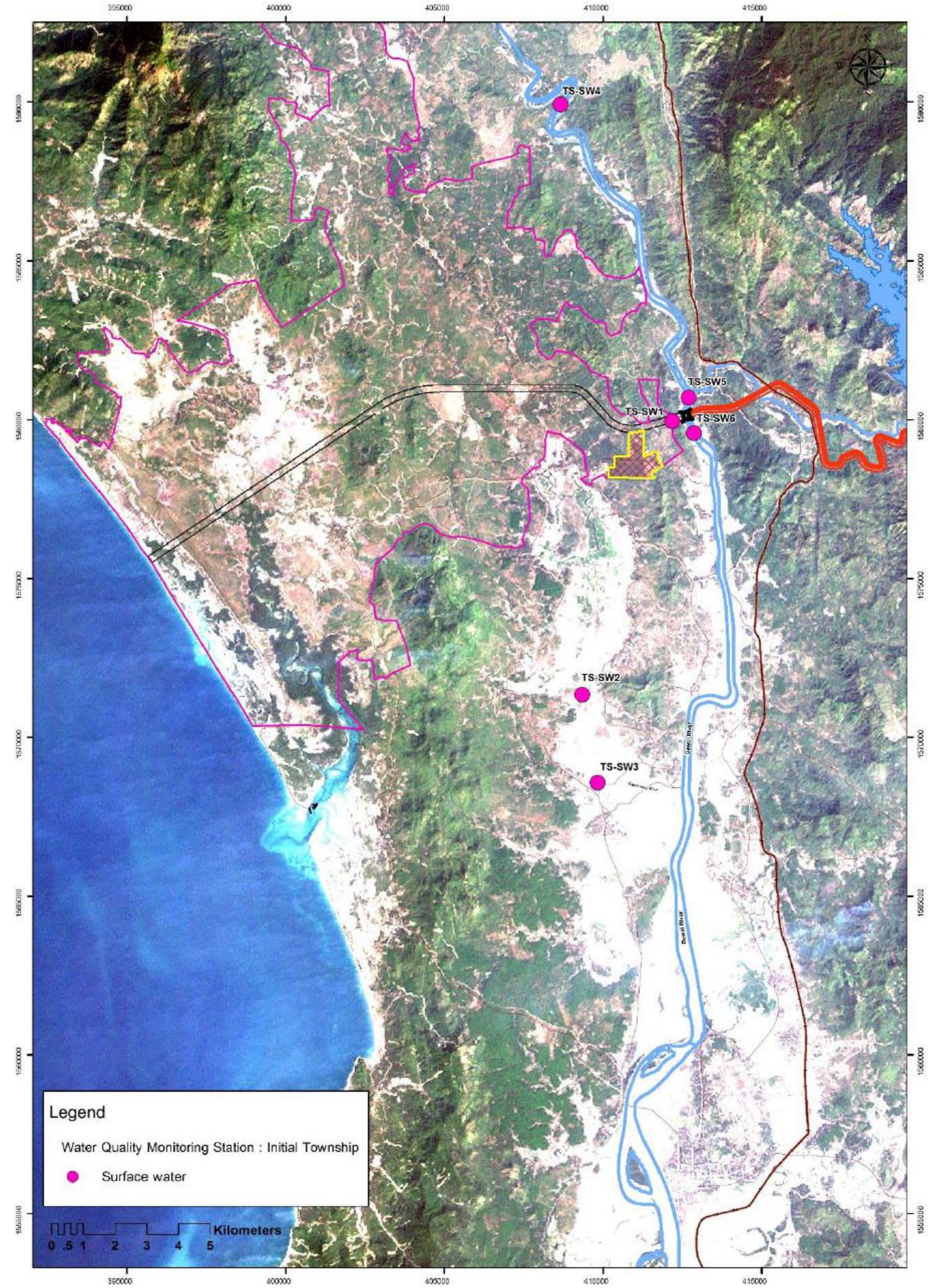


Figure 1.2-1 Sampling Locations for Surface Water , Sediment and Aquatic Biology Monitoring in Construction Phase

f) *Work Plan (Duration)*

During construction period

g) *Responsible Organizations or Agency*

Refer to the relevant plan.

h) *Budget*

Approximately 48,000 USD/Year

1.2.3 Terrestrial Biology Action Plan

a) *Principle and Rational*

Although the much of the project area has been encroached by local villagers and used as farmland and residential areas. Attempts should be made to conserve the native plant species and minimize disturbance to sensitive environment.

b) *Objectives*

To prevent a natural forests, endangered plant species, native plant species and minimize disturbance to sensitive environment such as mangrove area.

c) *Project Area*

Project construction area and surrounding area

d) *Description of Mitigation Measures*

DRC needs to coordinate with CC to ensure that the measures below are incorporated in their construction plan.

- Only clear the area needed for construction of infrastructure and utility system. Avoid disturbance of forest and mangrove areas as much as possible.
- Wherever possible, identify the endangered species and transfer them to safe locations prior to clearing the vegetation.
- Hunting of wildlife is prohibited.
- Disturbance of forest areas outside the project area by CC and their subcontractors is prohibited.

e) *Description of Monitoring Program*

DRC will be monitoring the progress of construction work and vegetation clearing. Excessive vegetation clearing particularly prior to rainy season has to be minimized. Natural forests and mangrove areas that can be conserved throughout the construction phase has to be identified and signposted

f) *Work Plan (Duration)*

Vegetation clearing plan and detailed survey of endangered species has to be conducted before the area is cleared. The plan can be revisited throughout the construction period.

g) *Responsible Organizations or Agency*

DRC is responsible to identify the area where natural forest and mangrove can be conserved. DRC needs to consider further survey of endangered plant species identified in baseline environmental survey to map out their locations and numbers. DRC shall communicate the plan to CC for action.

h) *Budget*

Included in construction budget.

1.2.4 Air Emission and Noise Control Action Plan

a) *Principle and Rational*

Main potential impacts to air quality during construction activities are dust from construction areas (land clearing) and unpaved roads. Other sources include exhaust from machineries used in the construction activities. Main potential noise impacts are the diesel engine and pile driving or pavement breaking which may affect nearby communities and receptors.

b) *Objectives*

To reduce and control dispersion of dust and noise due to construction activity and to reduce air pollution emission and noise from construction machinery equipment. To reduce air pollution and noise impact on community nearby the area.

c) *Project Area*

Project construction area and surrounding area

d) *Description of Mitigation Measures*

DRC shall formally notify CC and enforce the following measures to reduce emission of air pollutants and noise from construction activities.

- All equipment and vehicles will need to be maintained in good mechanical conditions;
- Stationary noise sources (such as generators, concrete batching plants, etc) shall be sited as far as possible from villages, construction camps and resettlement areas;

- Construction works within the distance of 500 meters from villages and resettlement areas will be carried out between 06:00 to 18:00;
- Dump trucks with loads that may generate dust will be covered when travelling though communities;
- Water spraying at least once a day in the construction areas and on unpaved roads is required in the following conditions:
  - On the section of unpaved transportation routes that pass through communities or construction work camps;
  - When dust generating activities are being carried out within 100 meters of a village or construction work camp;
  - When visual inspection indicates excessive dust generation in the construction areas and unpaved roads used for material transportation and;
  - Limit vehicle speed to 40 m per hour when pass through communities;
- Burning of waste materials including waste vegetation from site clearing will be allowed under the following conditions:
  - The materials that are allowed to be burned are general garbage and vegetation waste. No burning of materials that may generate toxic gases is allowed;
  - A trained fire protection officer with appropriate firefighting equipment has to be present near the burning areas;
  - Burning is not allowed during severe wind conditions;
  - Burning is carried out at a safe distance from vegetated areas and not within 2 km. from a village, a construction work camp, or resettlement areas on the upwind direction;
- Avoid impact pile-driving where possible in vibration-sensitive areas. Drilled piles or the use of a sonic or vibratory pile driver causes lower vibration levels where the geological conditions permit their use.
- Construction workers exposed to noise levels of 80 dB(A) or more shall be provided with adequate Personal Protective Equipment (PPE) for hearing protection.

e) *Description of Monitoring Program*

DRC is responsible for monitoring that the CC is complying with the measures mentioned above. The monitoring program can be described as follow:

- Each construction machineries are inspected at least every 6 months with a written certificate / maintenance records of each machinery provided by qualified mechanics of the CC;

- Inspect that the dust suppression measures are implemented according to the mitigation measures;
- Inspect that the burning of waste materials are conducted according to the relevant mitigation measures;

Monitor the Community Grievance Record related to dust and noise and ensure that the complaints are responded to and closed appropriately according to the relevant mitigation measures

f) *Work Plan (Duration)*

During construction phase of the Initial Township.

g) *Responsible Organizations or Agency*

DRC shall ensure that the mitigation measures were distributed to and acknowledged by CC.

CC shall implement the mitigation measures under supervision of DRC.

DRC shall report the results of implementation to MC every 6 months.

h) *Budget*

Included in construction budget

1.2.5 Waste Management Action Plan

a) *Principle and Rational*

A number of elements of the construction activities have the potential to generate waste that can have adverse effects on the surrounding environment in terms of water quality, soil quality, air quality (odor and pollutants) and human health. Waste can be both non-hazardous and hazardous waste. These wastes require different management methods. Lack of appropriate waste management facilities in the vicinity of the project area requires that the project needs to manage the waste generated from the construction activities by themselves.

b) *Objectives*

- To prevent and resolve waste and solid waste impact from the project.
- To minimize waste and provide guideline for solid waste management according to the law and regulation and appropriate method.
- To prevent and resolve impact from remaining solid waste. To get rid of bleeding area in solid waste storage location.

c) *Project Area*

Project construction area

d) *Description of Mitigation Measures*

DRC shall develop *Waste Management Plan* that will be applicable to all contractors in the project. The *Waste Management Plan* shall include the following components:

- Identify classification of waste. The minimum waste classification shall be non-hazardous and hazardous waste;
- Identify the size and location of the temporary hazardous waste storage area and non-hazardous waste disposal site for the construction phase of the initial township;
- A mechanism for coordination between DRC and CC in waste separation, waste transfer and record of waste quantity.
- Hazardous waste shall include, but not limited to, the following waste materials. Any mixed waste stream that contains any of the hazardous waste shall be categorized as hazardous waste:
  - Acids and acid waste;
  - Alkalis and caustic waste;
  - Batteries;
  - Spent catalysts, solvents, and chemicals;
  - Empty containers which held chemicals, paint, oil and solvents;
  - Oil contaminated waste including oily rags, oil filters, used gloves;
  - Used oil, hydraulic fluids, chemicals, and solvents;
  - First aid and medical waste;
  - Spill clean-up waste;
  - Waste from grease trap; and
  - Sludge from chemical wastewater treatment system.
- Hazardous waste shall be stored in appropriate temporary hazardous waste storage areas until the permanent hazardous waste management facilities for the operation phase is functional. Minimum requirements of the temporary hazardous waste storage areas include:
  - Impervious floor without cracks or spaces that may allow spills to perforate into the ground;
  - Surrounded by secondary containment bunds. The secondary containment bunds shall be at least 0.5 m high with a volume large enough to contain the spill of the largest container expected in the storage area;
  - Designate storage area for liquids or materials that are not allowed to be mixed, such as acids and alkalis;
  - Equipped with spill response kits;

- Consider providing the area with roofing and temporary walls with a provision that the temporary hazardous waste storage area will have to be in use for at least 3 years until the permanent hazardous waste management facilities of the initial township are functional.
- Type and quantity of hazardous waste in the storage area shall be recorded and kept up to date.

- Burning of the following non-hazardous waste is allowed: cardboard, pallets, papers, and wood/vegetation waste. The waste burning site shall be designated in the *Waste Management Plan* and shall be at least 2 km from any villages, construction work camps, or resettlement areas.
- Other non-hazardous waste shall be transferred to non-hazardous waste disposal site to be used during construction phase shall meet the following minimum requirements:
  - The disposal site shall be on higher ground not subject to flood.
  - The disposal site shall be at least 2 km from any groundwater well that is being used by workers or local villagers.
  - The disposal site shall be in the area where no excavation is planned. It shall be delineated with clear sign boards.
  - The waste shall be covered with soil on daily basis.
  - The location of all disposal sites during construction period shall be recorded as expanded appendices to the *Waste Management Plan*.
- Establish a training program for workers related to waste classification, storage and disposal.
- The *Waste Management Plan* may be expanded to cover recyclable waste and compostable waste in the future.

e) *Description of Monitoring Program*

DRC is responsible for monitoring that the CC is complying with the measures mentioned above. The monitoring program is described below.

- Inspect that appropriate containers for type of waste as categorized in the Waste Management Plan are provided for construction work camps, workshops, construction sites and other supporting facilities;
- Weekly inspection of waste segregation at the construction facilities and at the hazardous waste storage and non-hazardous waste disposal site;
- Weekly inspection of hazardous waste storage area and record of hazardous waste inventory.
- The location of waste burning area is designated and no waste burning is conducted outside the area;

- Waste management training record;

f) *Work Plan (Duration)*

During construction phase of the initial township

g) *Responsible Organizations or Agency*

DRC shall develop the *Waste Management Plan* to be implemented by both DRC and CC during construction phase.

DRC shall operate the temporary hazardous waste storage area and waste disposal site. DRC shall keep record of types and quantity of waste received to the temporary hazardous waste storage area and non-hazardous waste disposal site. DRC shall provide and keep record of waste management training program. DRC shall report the implementation of Waste Management Plan to MC every 6 months.

CC shall collect, separate, and transport the waste to the appropriate waste handling facility. CC to designate waste burning area.

h) *Budget*

Included in construction budget.

1.2.6 On-site Traffic and Access Management Action Plan

a) *Principle and Rational*

Access roads used for transportation of construction materials and for traveling between construction sites overlap with the existing roads used by local villagers inside the project area. Roads are currently unpaved and have blind spots. Improvement of road safety conditions will be required.

b) *Objectives*

To control using for transportation of construction materials and for traveling between construction sites

c) *Project Area*

Project construction area and surrounding area

d) *Description of Mitigation Measures*

DRC as the project owner shall be responsible and instruct relevant CC to implement the following measures to improve access road safety conditions.

- All access roads in the construction area shall be signposted with the following information in Myanmese and English:

- Speed limit;
- Construction activities and machinery;
- Roadside borrow pits and material stockpiles;
- Any applicable load limit, particularly for temporary bridges; and
- Road features that may affect driving conditions such as curves, hidden accesses etc.

- A speed limit of 40 km/hr shall be applied in village areas and construction camps. Drivers shall be trained and notified of such limit;
- Consider building speed humps before and after each village, where appropriate;
- Route for heavy vehicles used for transportation of construction materials shall be designated. Route with least number of villages and residential area is most preferable;
- Survey of the access roads to identify blind spots need to be regularly conducted. Improvement to the blind spots such as removal of obstructing objects when necessary; and
- Access road used for the construction activities shall be maintained in good conditions.

e) *Description of Monitoring Program*

DRC is responsible for monitoring the above measures implemented by all parties. DRC shall coordinate with CC in selection of the most appropriate transportation routes that will contribute to least impact to the locals using the road for their daily travel;

f) *Work Plan (Duration)*

During construction phase of the township, until the permanent roads are completed

g) *Responsible Organizations or Agency*

CC responsible for construction and maintenance of the access roads shall be responsible for implementing the measures relevant to signposts and road improvement.

DRC and CC are responsible for using the designate routes for transportation of construction materials and traveling between construction sites. Speed limit needs to be respected and punishment system should be in place in case of violation.

h) *Budget*

Included in construction budget.

1.2.7 Construction Work Camps Action Plan

a) *Principle and Rational*

Construction work camps can be sources of wastewater pollution and health impacts. Thousands of workers are expected during the construction period, and proper management of the camps will be required to ensure that the potential impacts are controlled.

b) *Objectives*

To control sources of wastewater pollution and health impacts from work camps.

c) *Project Area*

Project construction area

d) *Description of Mitigation Measures*

It is assumed that DRC, CC and subcontractors will have their own compounds and camp management bodies. The following measures will be required for each of the worker camps in the project area:

- Camp rules shall be established and informed to all residences. The rules should contain the following components:
  - Policy on alcohol and substance abuse;
  - Safety measures and emergency response particularly in case of fire;
  - Waste management requirements;
  - Other measures to prevent dissemination of vectors and transmissible disease including STDs and HIV/AIDs;
- General areas of the camp shall be kept clean and tidy. Waste shall be collected regularly to avoid accumulation of waste in the camp;
- Toilets shall be provided at a ratio as1 toilet per 15 workers. All toilets shall be equipped with septic and seepage tanks of adequate size. The toilets need to be at least 100 meters from any natural waterways. Sludge from tank cleaning shall be stabilized by adding lime (pH = 12 for 30 minutes) and disposed of in designated pit for sludge disposal. The pit shall be at least 1 kilometer from any groundwater wells
- Proper drainage has to be provided. Improve areas with stagnant water as much as possible; and
- Pest control measures shall be planned and implemented. All bedrooms need to be equipped with mosquito protection.

e) *Description of Monitoring Program*

DRC shall be the party inspecting the camps periodically to ensure that all the implementation are made

f) *Work Plan (Duration)*

Since the start of any construction work camp until end of its use

g) *Responsible Organizations or Agency*

All parties are responsible for managing their own camps in line with the above mitigation measures

h) *Budget*

Included in construction budget.

1.2.8 Historical and Cultural Resources Action Plan

a) *Principle and Rational*

There are a number of sites with historical and cultural values in the project area. Each village also has at least one temple. Pagodas are observed in many places nearby the project area. Construction activities may disturb and damage these structures. Removal or relocation of these sites will be eventually required when the project is fully developed. If not handled properly, this matter will create significant conflict between local populations and the project.

b) *Objectives*

To reduce disturbing and damaging historical and cultural values in the project area.

c) *Project Area*

Project construction area and surrounding area

d) *Description of Mitigation Measures*

DRC as the project owner will need to take ultimate responsibility in handling the matter and ensure that CC understand the risk and follow the procedures and measures described below to reduce potential impacts with the communities.

- Inform ward/village general administrator if antiques object or ancient monument are found in the project area.
- Sites with historical and cultural values shall be identified, recorded and located in the map. This information shall be agreed upon by the local authorities and villagers.

- If construction activities have to be carried out within 50 meters from these sites, the leaders of the communities that the sites belong to need to be notified at least 1 week prior to commencement of the activities.
- Establish a plan and communication channel in case an unidentified site is encountered during the construction work to avoid damage to the site.
- Removal and relocation method and destination shall be a mutual agreement between DRC, local authorities, and the leader of the communities that the site belongs to.

e) *Description of Monitoring Program*

DRC needs to keep record and map up to date and make them available to all parties including CC and their subcontractors. DRC needs to monitor the construction work progress with the locations of known sites so that timely action can be taken is the sites will be subject to disturbance by construction activities

f) *Work Plan (Duration)*

All through the construction phase

g) *Responsible Organizations or Agency*

DRC as the project owner is ultimately responsible for this matter

h) *Budget*

Included in construction budget

1.2.9 Public and Occupational Health Action Plan

a) *Principle and Rational*

Construction activities can directly and indirectly affect the conditions of public and occupational health. Potential impacts include accidents, injuries, communicable diseases, increase in stress to the existing public health facilities, etc. Mitigation measures related to each aspect of public and occupational health are described below.

b) *Objectives*

To reduce accidents, injuries, communicable diseases, increase in stress to the existing public health facilities

c) *Project Area*

Project construction area

d) *Description of Mitigation Measures*

<u>Occupational Health and Safety:</u>

During the construction phase, DRC as the project owner and CC as the implementer should establish the preventive and protective measures to mitigate the potential occupational health impacts as follows:

Accidents and Injuries

- Establish occupational and safety management plan and program for the construction should be established to assess and manage EHS impacts and risks. Project or activity-specific plans or procedures should be prepared and the basic site rules of work should be included.
- Perform occupational accidents and disease recording and reporting, and investigate all incidents to understand the cause of accident and to identify measures necessary to prevent a recurrence.
- Provide contractor management plan to ensure that the contractor will have safety performances and procedures to protect their employee. Supervise and monitor contractor performance periodically.
- Train and provide information to employees. Occupational health training program should be provided as needed, for example, hazard awareness, specific hazards and safe work practices, to ensure that workers are capable of work safely.
- Provide appropriate personal protective devices to employee and ensuring that personal protective devices will be worn during working at all time.
- Restrict local community to access the site or area using fencing, signage and risks communication.
- Appropriately mark area signage and labeling of equipment , determine hazardous area for example, electrical rooms, compressor, etc., as well as installations, materials and emergency exits, and label in accordance with international standards, and easily to understand by workers, visitors and general public.

Occupational, Sexual Transmission and Communicable Diseases

- Supervise and monitor performance of contractors and sub-contractors on housekeeping in the campsite.
- Include training programs for workers with these following topics: health awareness, hygiene and sanitary, waste management, communicable and transmission diseases, cultural awareness, regulations and compliance, and drug abuse.

- Register foreign or migrated workers should be seriously performed to ensure that these workers have medical and health certificates to guarantee their personal health conditions.
- Conduct surveillance and active screening and treatment of workers. Immunization program may be required.

Emergency Response and First-Aid

- Establish emergency response plan and procedures which also should be in place for any remote sites. Emergency response plan shall be appropriate to change such environmental condition and natural disasters.
- Provide appropriate emergency services and personnel to expedite emergency response when needed, maintain equipment facilities, fire-fighting equipment in good working order, accessible and adequate for the dimension and the basis use.
- Provide health services and first-aid unit at all time, with comprehensive and appropriate equipment, establish the qualified the first-aid unit to properly handle with serious or trauma cases, and sufficient to meet the requirements, treat and/or patients to appropriate medical facilities in time.

<u>Community Health:</u>

Housing and Sanitation

- Provide sufficient infrastructure amenities and public health services in the campsite, for example accommodations, water and drinking water availability, solid wastes disposal and sewage treatment.

Environmental/Communicable Diseases:

- In close collaboration with the community health authorities, implement an integrated control strategy for environmental and occupational diseases, such as integrated vector control programs, eliminating of breeding habitats in the campsite, and eradicating disease reservoirs.
- Collaborate with community health authorities to enhance the worker families to access public health services, and promote immunization.
- Distribute appropriate education materials for example health awareness, sexual transmission disease and communicable disease.

Accidents/Fire/Chemical Leaks

- Consider the level of local firefighting capacity to identify firefighting equipment that should be available when needed, and provide all necessary equipment with regular maintenance program.
- Communicate potential accidents and/or hazards to local authorities, communities and relevant parties.
- Conduct emergency response practices, including liaison with local response organizations and local responders.
- Revised or/and establish Emergency Response Plans as necessary according to changing of environmental situation including notify the Minister and Dawei Special Economic Zone Management Committee.

Adequacy and Readiness of Healthcare Services

- Provide the first aid unit at the campsite for their workers, assess whether the local health service capacity sufficient for worker's family and supporting industries, and in close collaborating with local authorities, consider supporting/additional health service facility.
- Risk and impact to environment from construction of Health Centre Services i.e. hospital shall be assessed including establishment of environmental management plan and mitigation measures.

e) *Description of Monitoring Program*

DRC will keep monthly update of health and safety statistics and records. Performance of construction health and safety is monitored against a set benchmark. DRC inspect health and safety conditions of the CC and subcontractor's construction sites and camps periodically

f) *Work Plan (Duration)*

Throughout the construction period

g) *Responsible Organizations or Agency*

DRC or Third party consultant shall ensure that the mitigation measures were distributed to and acknowledged by CC.

CC shall implement the mitigation measures under supervision of DRC.

DRC shall report the results of implementation for audit every 6 months.

h) *Budget*

Included in construction budget.

1.2.10 Public Participation and Dissemination

a) *Principle and Rational*

Public participation and information dissemination is apart environmental assessment process and sustainable development that will be result in economic, environmental and social values. General public idea about the project such as concerns of stakeholders, information and recommendation from public can be gathered through public meetings and social surveys which this information will be considered and can take accounted by DRC for further project management plans.

b) *Objectives*

To inform the stakeholders about the Initial Township project, gain public views, concerns and values, increase public confidence, improve transparency and accountability in the EIA decision-making process.

c) *Project Area / Stakeholders*

Project construction area and impacted area with various level of government agencies, relevant and responsible agencies, project impacted people, media and dependent organizations.

d) *Description of Mitigation Measures*

DRC shall establish public relation and public participation plan to incorporate in requests and recommendation of the continuous engagement of stakeholders following

- Inform about project activities to community
- Support nearby community as appropriate to build good relationship with community
- Communicate to build community understanding about
  - Construction activities and progress
  - Potential environmental impacts and mitigation measures
- Conduct by DRC consistent with the applicable standard for public meeting/consultation
- Disclose about project information and public relation activities through channels such as website, e-mails, meeting/visiting and local exhibition board or local media.
- Take account the results of the public consultation in improving and revised the EMPs.

e) *Description of Monitoring Program*

DRC will conduct public meeting or public relation e.g. using questionnaire or attitude survey for communities surrounded the Initial Township Project within 1 km in radius

of the project areas. The result must be report and the method must achieve acceptable standard and been carried out with representative samples with confidence statistics.

f) *Work Plan (Duration)*

Once for the entire construction phase

g) *Responsible Organizations or Agency*

DRC as the project owner is ultimately responsible for this matter

h) *Budget*

Included in construction budget

1.2.11 Grievances Redress

a) *Principle and Rational*

For transparency and performance of the project in dealting with grieves that raise by communities and affected people. Grievance mechanism shall be implemented.

b) *Objectives*

To received grieves and complains from affected people or organization and manage the grieves effectively.

c) *Project Area / Stakeholders*

Project construction area and impacted area with project impacted people or impacted organizations.

d) *Description of Mitigation Measures*

DRC shall establish Grievance Redress Committee and Grievance Redress procedure to address any complaints / grieves to resolve / settle disputes that brought forward by community pertaining to project activities.

e) *Description of Monitoring Program*

Ensure that the grievance redress mechanism has been implemented. Complaints/grieves are systematically recorded and cases are settled.

f) *Work Plan (Duration)*

Once for the entire construction phase

g) *Responsible Organizations or Agency*

DRC as the project owner is ultimately responsile for this matter

h) *Budget*

Included in construction budget

1.3 EMP AND EMOP FOR OPERATION PHASE

The operators refer to the investors build and operate their facilities in the Initial Township. Responsibilities of the operators, which will be during the operating phase, include:

- Comply with environmental requirements of DRC during construction and operation of their facility.

1.3.1 Air and Noise Quality Action Plan

a) *Principle and Rational*

Main potential impacts to air quality during operation period is exhaust from vehicles.

Noise from operation phase in the residential buildings and township area is similar with cities. It has no noise and vibration impacts.

b) *Objectives*

To control the main potential impacts to air quality during operation period is exhaust from vehicles and to not exceeding the relevant international standards.

c) *Project Area*

Project and surrounding area

d) *Description of Mitigation Measures*

Mitigation measures for air emission and noise can be listed below:

- Provide some space areas for tree planting within the project area.
- Care and maintain the trees planted; in case the trees are dead, shall plant trees to replace the dead ones.
- Install sign to notice that "Do not start the car while parking for waiting" at the parking area and reiterate the security guards to control strictly.
- Limit vehicle speed inside township area as 30 km/hr to mitigate possible noise impacts on nearby area.
- Install the "No Audible" sign within residential and township areas in obvious places.

- Plan for emission of GHGs from the Project shall be established and/or revised in concurrently with the relevant GHGs policy and regulations.

e) *Description of Monitoring Program*

No monitoring program is required

f) *Work Plan (Duration)*

Throughout the operation phase

g) *Responsible Organizations or Agency*

DRC is responsible to comply with the mitigation measures and prepare report and communicate with MC every 6 months.

The township operator is responsible to report the operating results to DRC every 6 months.

h) *Budget*

Included in operation monitoring budget

1.3.2 Waste Management Action Plan

a) *Principle and Rational*

Waste generated from township is expected to be non-hazardous waste mainly. However, they can be essentially divided into 2 types: hazardous and non-hazardous waste. Waste management facility of Dawei Industrial Estate is expected to be complete at the same time as commencement of Early Industries Phase 2, which is in 2015-2016. The facility will be able to handle both hazardous and non-hazardous waste. However, prior to the commission of the facility, waste generated from Early Industries Phases will also have to be properly managed to reduce potential impact to the environment.

b) *Objectives*

To control leakage of waste from landfill site to the ground have potential to affect the quality of ground water and environment

c) *Project Area*

Project area

d) *Description of Mitigation Measures*

Nevertheless, the Initial Township will use the waste management facilities together with the Dawei Industrial Estate but the waste management facilities will be completed before the operation phase of the Initial Township.

- Design and construction of the landfill shall be in accordance with Solid Waste Disposal Facility Criteria – Technical Manual published by U.S. EPA (1993) or other applicable standards.
- Detailed hydrogeological condition of the proposed landfill area has to be studied in the design of landfill.
- Groundwater monitoring wells will be installed. As a minimum, 1 well is to be installed up-gradient of the landfill and at least 3 wells is to be installed down-gradient of the landfill. Depth of screens and well construction depends on the results from the hydrogeological condition study.
- The components of the waste management facility: i.e. sanitary landfill, secured landfill and incinerator shall be designed and constructed according to the internationally accepted standards.
- The facility shall create its Standard Operating Procedure covering steps from receiving waste, laboratory analysis, stabilization, temporary storage, incineration and disposal. Audit by third party is necessary.
- The landfill shall be closed daily to prevent vectors and odors.
- Classify hazardous and non-hazardous waste according to the definitions in the Waste Management Plan prepared.
- Workers need to be trained of Waste Management Plan.
- All hazardous and non-hazardous waste generated shall be transferred to the facility for disposal.
- Waste manifest system has to be created and implemented.
- Record of type of waste including its quantity shall be kept in the database of DRC.
- Waste Management Facility (if constructed in the landfill)

e) *Description of Monitoring Program*

Monitoring of environmental quality around the site is necessary. The monitoring requirements may be divided into each type of environmental matrix as follow:

- Groundwater monitoring:
  - Collect baseline groundwater quality before the operation of the landfill.
  - Monitor groundwater quality every month for the first 6 months and then every 6 months unless unusual concentrations are observed.

- For the waste management facility where hazardous waste stabilization and disposal is conducted, monitor the following parameters: pH, redox potential, dissolved oxygen, temperature, conductivity, turbidity and metals (cadmium, copper, lead, manganese, nickel, arsenic, selenium, and mercury).
- Compare the results with Thailand's groundwater quality standards or other applicable international standards.

• Runoff and wastewater monitoring

The waste management facility is considered equal to a city area. The same requirements of wastewater management will be applied

f) *Work Plan (Duration)*

During the operation of the waste management facility

g) *Responsible Organizations or Agency*

DRC is the party responsible for operating the infrastructure and utility system and thus is the operator of the waste management facilities, both during Early Industries Phases and at full development stage.

h) *Budget*

Approximately 2,300 USD/year

1.3.3 Water and Sediment Quality Action Plan

a) *Principle and Rational*

Discharge of wastewater and release of waste materials to the receiving water have potential to affect the quality of water and sediment in both fresh water and marine environment. Organic loading in the treated wastewater may reduce the dissolved oxygen content in the receiving water to the point that is not suitable for living organisms.

b) *Objectives*

To prevent wastewater from project area runoff into natural water resources

c) *Project Area*

Project and surrounding area

d) *Description of Mitigation Measures*

The mitigation measures for water quality management are mainly consistent with wastewater and waste management system. However, specific consideration is proposed to further reduce the impact in the receiving water. The mitigation measures are discussed below:

- Prepare and implement the measures for Waste Management.
- Prepare and implement the measures for Wastewater Management.
- The discharged of untreated wastewater into the receiving water is strictly prohibited all time.
- Wastewater from the initial township operation shall be reused to water the trees planted in the initial township.
- Emergency plan for operation of wastewater treatment should be established to prevent untreated effluent discharged into the receiving water.

e) *Description of Monitoring Program*

The monitoring program can be conducted from freshwater and sediment.

<u>Surface water and sediment</u>

- Surface water and sediment qualities monitoring should be established. A total of 6 sampling stations similar to those surveyed during baseline sampling is recommended. but in 9+1 phase ,only 2 sampling stations are TS-SW2 and TS-SW3 will be monitored
- The parameter and sampling station of surface water and sediment quality monitoring are shown in
- and
- The surface water and sediment monitoring should be conducted at least 3 times a year (dry, early wet and end of wet season).

Table 1.2-2 Analysis Methods of Surface Water and Sediment Quality Parameters and Sampling Stations During Operation Period

Parameters	Analysis Method[1/]	Sampling Station
Surface Water		
Water Level/Depth/ Width	Depth Meter	TS-SW1: Discharge point at the north of the project at KM 18+500 TS- SW2: Upstream at Yalai Chaung at meeting point of Yalai Chaung and canal (that receiving wastewater from discharge point at south of the project) TS-SW3: Downstream at Yalai Chaung at meeting point of Yalai Chaung and canal (that receiving wastewater from discharge point at south of the project) TS- SW4: Dawei River at the boundary of the project area at Ta Nyin In village TS-SW5: Dawei River (at about 500 meters upstream from the Yang Gaeng bridge) TS-SW6: Dawei River (at about 500 meters downstream from the Yang Gaeng bridge)
Temperature	Thermometer	
Flow Rate	Flow Meter	
pH	Electrometric Method	
Salinity	Electrical conductivity Method	
Electrical Conductivity	Electrical Conductivity Method	
DO	Membrane Electrode Method	
BOD	Membrane Electrode Method	
Turbidity	Nephelometric Method	
TSS	Total Suspended Solids Dried At 103-105 °C	
TDS	Total Dissolved Solids Dried At 180 °C	
TS	Total Solids Dried At 103-105°C	
Nitrate-Nitrogen	Cadmium Reduction Method	
Ammonia-Nitrogen	Phenate Method	
Phosphate -Phosphorus	Ascorbic Acid Method	
TKN	Kjeldahl Method	
Oil&Grease	Soxhlet Extraction Method	
TCB	Multiple Tube Fermentation Technique	
FCB	Multiple Tube Fermentation Technique	
E.Coli	Multiple Tube Fermentation Technique	

Remark: [1/] APHA, AWWA and WEF. Standard Methods For The Examination of Water And Wastewater. 22nd ed. Washington, DC: APHA. 2012.

[2/] United States Environmental Protection Agency. SW-846 Method.

f) *Work Plan (Duration)*

Throughout the operation phase

g) *Responsible Organizations or Agency*

DRC shall maintain overall ambient environment monitoring program and results. The results need to be communicated with WC every 6 months.

h) *Budget*

Approximately 40,000 USD/year

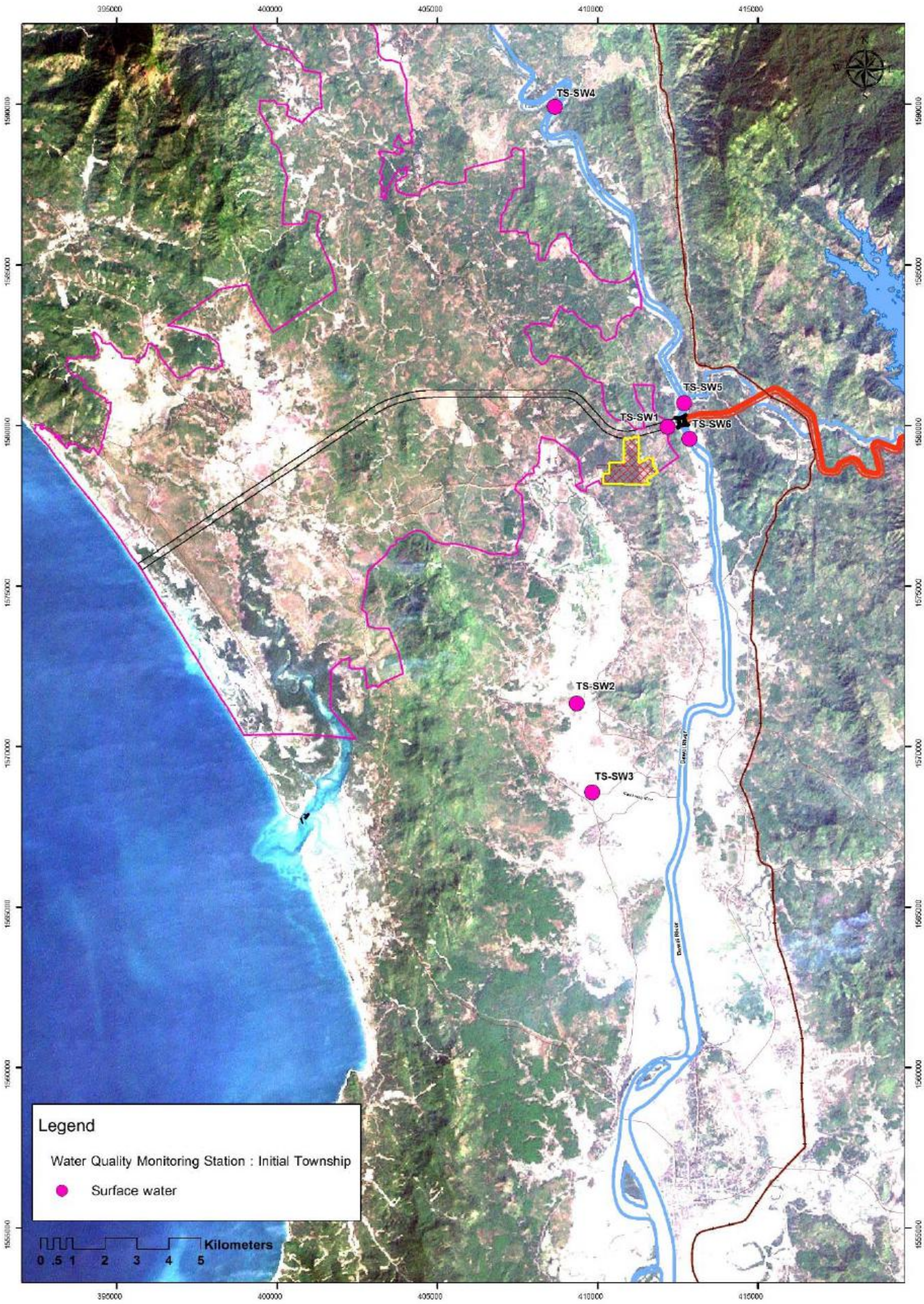


Figure 1.2-2 Sampling Locations for Surface Water and Sediment Quality Monitoring in Operation Phase

1.3.4 Terrestrial Ecology Action Plan

a) *Principle and Rational*

Potential impacts to terrestrial ecology during operation phase are considered negligible. However, influx of workers from outside the area may result in increased demand of wildlife meat and poaching. Education and discouragement of consumption and domestication of wildlife need to be conducted all through the project life.

b) *Objectives*

To prevent waste from project area runoff into natural resources. And reducing impact to wildlife habitats or plants

c) *Project Area*

Surrounding area of the project

d) *Description of Mitigation Measures*

The mitigation measures for terrestrial biology is proposed as follow:

- Wherever possible, conserve the existing trees, particularly in the green areas,
- Coordinate with local authorities and engage local communities for reforestation projects surrounding the project area.
- Discourage and educate the workers towards wildlife consumption to reduce demand and indirect impacts to the wildlife in reserved forests elsewhere outside the project area.

e) *Description of Monitoring Program*

No monitoring program is required

f) *Work Plan (Duration)*

Throughout the operation phase

g) *Responsible Organizations or Agency*

DRC in corporation with the local authorities should promote the implementation of the above mitigation measures

h) *Budget*

Included in operation monitoring budget.

1.3.5 Land Use, Township and Community Management Action Plan

a) *Principle and Rational*

Change of land use surrounding the project area is of concern. Spontaneous development surrounding the township need to be planned and controlled.

b) *Objectives*

To control the effect to landuse changing and community

c) *Project Area*

In the project area only

d) *Description of Mitigation Measures*

<u>Special Plan and Buffer Zone</u>

A special specific area plan is needed to control the land use adjacent to the project area. The plan must be legitimate and authorized by the state. The purpose of the plan is to control land use nearby but outside the township and to prevent forming of temporary settlement growing outside the township area at inappropriate places. Moreover, a clear and marked buffer zone all around the township boundary should be set up to control and prevent any uses other than agriculture and forest. The size of the buffer zone should be determined by land use expert to ensure that in case of fire or other hazards, only a minimum number of people will be affected and rescue and relocation efforts will be with ease.

In addition, the town of Dawei, the nearest town and most likely place to be used for services to the non-local personnel, will be greatly affected by the estate and township development. A comprehensive plan authorized by the state for the future of Dawei is needed for appropriate growth. Otherwise, the project development will likely cause uncontrollable growth of Dawei resulting in degrading physical, uses and cultural condition of Dawei city in the near future.

<u>Setting up a management committee overseeing the project land use.</u>

A team or committee should be set up to monitor and manage activities and structures built in and around the project area. The purpose is to insure that those temporary service centers originated from basic needs and convenience of the workers are always in the appropriate places that will not obstruct or endanger the operation of the township. The team should have legitimate authority to control the areas adjacent or nearby, though outside the township boundary.Squatters must be notified that they are only allowed to operate temporarily and must be relocated when the time comes in order to prevent scattered temporary structures from evolving into unsuitable permanent settlements outside the initial area.

Transportation and Infrastructure Outside the Initial Area

For the area immediately outside the township, not only land use should be controlled, but also other infrastructure that will enable setting up structures and services, such as, local roads, electricity, water supply and drainage, should be also well planned and controlled. The strategic locating or prohibiting of these basic infrastructure will induce and encourage early settlers and services outside designated township zone into the area planned by the management to provide temporary services in the early stage of development.

Enforcement

The proposed set-up land use management committee/team should have duty to regularly monitor land use activities outside and inside the township area as the development progresses. Co-operation with local or state authority is needed to be able to control, direct, or enforce private buildings outside the project boundaries to prevent unsuitable and obstructing growth nearby the project area.

e) *Description of Monitoring Program*

The mitigation measures mentioned above a long-term and involve many parties in planning and implementing the land use surrounding the project to help ensure that on a longer term, communities will be located at a safe distance from the initial township and conflicts between both developments can be reduced

f) *Work Plan (Duration)*

Throughout the operation phase

g) *Responsible Organizations or Agency*

DRC through cooperation with local authorities.

h) *Budget*

Included in operation monitoring budget.

1.3.6 Public and Occupational Health Action Plan

a) *Principle and Rational*

Operation phase of the project possess different risks to the workers and public. DDC as the owner of the project will need to have a program in place to handle the situations that may arise from the work-related illness and impacts in workers and local populations.

b) *Objectives*

To reduce risk and prevent danger and accident which may happen to worker and people transport or live in the operational area of the project.

c) *Project Area*

Project and surrounding area

d) *Description of Mitigation Measures*

<u>Occupational Health and Safety:</u>

During operation phase, DRC or the project owner should establish the preventive and protective measures to mitigate the potential occupational health impacts as follows:

Accidents and Injuries

- Provide the environmental health and safety management system and programs for the whole initial township.
- Establish occupational health and safety management plans and programs to assess and manage EHS impacts and risks which are based on comprehensive job safety analyses.
- Include the following issues in the occupational health and safety management system:
  - Accident investigation, recording and reporting
  - Surveillance of the employee's health
  - Training and hazard communication
  - Monitoring and auditing procedures to evaluate the effectiveness of prevention and control measures
- Perform occupational accidents and disease recording and reporting, investigate all incidents to understand the cause of accident and to identify measures necessary to prevent a recurrence.
- Provide area signage and labeling of equipment in accordance with international standards and easily to understand by employees, visitors and general public.
- Promote traffic safety programs to all personnel, for example;
  - Improving driving skill
  - Use of speed control devices

Occupational, Sexual Transmission and Communicable Diseases:

- Conduct surveillance and active screening and treatment of employees. Immunization program may be required.

- Provide training programs for employees in these following topics: health awareness and promote health protection strategies including encouraging condom use.
- Perform periodic employee's health checks in accordance with the potential risks.

Fire and Other Hazards:

- Provide comprehensive emergency preparedness and response plan and procedures covering fire and other hazards control.
- Provide appropriate emergency services and personnel to execute emergency response when needed, and maintain equipment facilities, fire-fighting equipment in good working order, accessible and adequate for the dimension and the basis use.
- Establish appropriate fire safety system to ensure its capability to cope with all the potential hazards.
- Conduct annual training and updating emergency preparedness and response plan to account for changes in equipment, personnel and facilities.

Adequacy and Readiness of Healthcare Services

- Establish the hospital in the township area, and periodically evaluate in terms of adequacy, capacity and readiness in accordance with the change in numbers of population in the township.

Community Health:

Sanitation

- Provide sufficient infrastructure amenities and public health services for the township, for example accommodations, water and drinking water availability, solid wastes disposal and sewage treatment in order to reduce pressure on local authorities in servicing public.
- Technically support or collaborate with local authorities to enhance potentiality of communities in solid waste disposal by means of 3Rs (Reduce, Reuse and Recycle).

Environmental/Communicable/Non-Communicable Diseases:

- Establish the buffer strip/zone to separate the township and industrial estate to protect dwellers from pollutions emitted.

- Implement engineering preventive measures to install physical separation between industry and community, for example fence or tree plantation as buffer zone along the estate boundaries, and use of air modeling results and/or potential pollutions of each industry as the criteria for the distance between industries and affected community.
- Set up a grievance procedure to manage complaints, if any.

Accidents/Fire

- Invite representative of local emergency and securities services to participate in annual site inspections to ensure familiarity with the potential hazards present.
- Inform and communicate potential accidents that may impact to community to local communities and relevant parties.
- Prepare and train employees, people in township and nearby communities to respond to accidents, including providing technical and financial resources in order to control and response such events effectively and safely, and provide periodic emergency response practice with communities.
- Establish Emergency Response Plans in concordance with recent policy, law and regulation. Emergency response plan shall be appropriate to such current environmental condition and natural disasters and;
- Revise Emergency Response Plans as necessary according to changing of environmental situation including notify the Minister and Dawei Special Economic Zone Management Committee.

Adequacy and Readiness of Healthcare Services

- Promote collaboration with local authorities to enhance access of community to public health services for the employee's families and people being at residences in township to develop health service facility.
- Risk and impact to environment from operation of Health Centre Services i.e. hospital shall be assessed including establishment of environmental management plan and mitigation measures.

e) *Description of Monitoring Program*

DRC will keep monthly update of health and safety statistics and records. Performance of operation health and safety is monitored against a set benchmark. DRC to periodic inspect health and safety conditions of the industry.

f) *Work Plan (Duration)*

Throughout the operation phase

g) *Responsible Organizations or Agency*

DRC shall establish EHS Plan expanding necessary components as listed above. DDC will be responsible for keeping all health and safety records and assessing health and safety performance of the township. DRC is the party coordinating with local authorities on behalf of the project in the matter related to health and safety of the township.

h) *Budget*

Included in operation monitoring budget

1.3.7 Employment and Training Program

a) *Principle and Rational*

Concerns from communities and the Project Affected People on skills necessary for employment including their job opporturinties and employment condition during the operation phase in the township.

b) *Objectives*

To support locals for job opportunities and employment and skills training.

c) *Project Area / Stakeholders*

Project operation area and local communities and with project impacted people.

d) *Description of Mitigation Measures*

DRC shall conduct employment with IFC EHS General guideline/Laws and regulations in terms of the employee management and established plan for training programme and implement.

e) *Description of Monitoring Program*

Ensure that the standard of employment in accordance with relevant law and regulation are implemented. Employlee has been trained as necessary.

f) *Work Plan (Duration)*

Every 5 years for the entire operation phase

g) *Responsible Organizations or Agency*

DRC as the project owner is ultimately responsile for this matter

h) *Budget*

Included in operation budget

1.3.8 Public Participation and Dissemination

a) *Principle and Rational*

Public participation and information dissemination is apart environmental assessment process and sustainable development that will be result in economic, environmental and social values. General public idea about the project such as concerns of stakeholders, information and recommendation from public can be gathered through public meetings and social surveys which this information will be considered and can take accounted by DRC for further project management plans.

b) *Objectives*

To inform the stakeholders about the Initial Township project, gain public views, concerns and values, increase public confidence, improve transparency and accountability in the EIA decision-making process.

c) *Project Area / Stakeholders*

Project operation area and impacted area with various level of government agencies, relevant and responsible agencies, project impacted people, media and dependent organizations.

d) *Description of Mitigation Measures*

DRC shall establish public relation and public participation plan to incorporate in requests and recommendation of the continuous engagement of stakeholders following

- Inform about project activities to community
- Support nearby community as appropriate to build good relationship with community
- Communicate to build community understanding about
  - Potential environmental impacts and mitigation measures
  - CSR activity
- Conduct by DRC consistent with the applicable standard for public meeting/consultation
- Disclose about project information and public relation activities through channels such as website, e-mails, meeting/visiting and local exhibition board or local media.
- Take account the results of the public consultation in improving and revised the EMPs.

e) *Description of Monitoring Program*

DRC will conduct public meeting or public relation e.g. using questionnaire or attitude survey for communities surrounded the Initial Township Project within 1 km in radius of the project areas every 5 years. The result must be report and the method must achieve

acceptable standard and been carried out with representative samples with confidence statistics.

f) *Work Plan (Duration)*

Every 5 years for the entire operation phase

g) *Responsible Organizations or Agency*

DRC as the project owner is ultimately responsible for this matter

h) *Budget*

Included in operation budget

1.3.9 Grievances Redress

i) *Principle and Rational*

For transparency and performance of the project in dealting with grieves that raise by communities and affected people. Grievance mechanism shall be implemented.

j) *Objectives*

To received grieves and complains from affected people or organization and manage the grieves effectively.

k) *Project Area / Stakeholders*

Project operation area and impacted area with project impacted people or impacted organizations.

l) *Description of Mitigation Measures*

DRC shall establish Grievance Redress Committee and Grievance Redress procedure to address any complaints / grieves to resolve / settle disputes that brought forward by community pertaining to project activities.

m) *Description of Monitoring Program*

Ensure that the grievance redress mechanism has been implemented. Complaints/grieves are systematically recorded and cases are settled.

n) *Work Plan (Duration)*

Every 5 years for the entire operation phase

o) *Responsible Organizations or Agency*

DRC as the project owner is ultimately responsile for this matter

p) *Budget*

Included in operation budget

Summary of the Environmental Management Plan (EMP) are shown in Table 1.3-2 to Table 1.3-3 should be noted that the two EMPs prepared as part of this EIA study are invariably framework plans as they are based on outline designs of the Project. They are therefore intended to prescribe requirements for the preparation of detailed CEMP and OEMP by the appointed EPC contractor (Contractor). Consequently, they could be considered and referred to as the Project Proponent's or Owner's EMPs to distinguish them from the Contractor's EMP after the EIA during project implementation. Nevertheless, it should be noted that the planning and development of the Project has been dynamic throughout the study period. This includes also the organization of the project and other relevant agencies. The information used as the based scenario is considered the most valid one at the time of the report preparation. Changes to the project information may occur overtime and, therefore, readers and project implementers are advised to review at the time of the implementation.

Table 1.3-2 Mitigation Measures and Monitoring Program During Construction Phase For Initial Township Project

Management Issue	Mitigation Measure	Monitoring Program	Responsibilities
Erosion and Sedimentation Control	CC shall prepare an *Erosion and Sediment Control Plan* for construction activities and submit to DRC for approval prior to commencement of construction activities in the area. The plan shall have the following components: • An assessment of the potential for contamination of natural waterways. Basic principles include the size of the disturbed area, site drainage, and waterways receiving storm water from the disturbed area; • Plans for water management during construction shall be established and include adequate drainage system to manage runoff from 2-year ARI storm flow; • Sedimentation controls shall be implemented in the form of silt trap fences and sedimentation basins where appropriate, and all runoff from the disturbed area shall be directed to the sediment controls; • Measures to be taken to collect, store and treat storm water prior to discharge from the site considering options for water re-use onsite; • Management of material storage area – Stockpile and spoil disposal area shall not be located on drainage line and; • Control of erosion and sedimentation shall be constructed progressively prior to commencement of each stage of earthworks until the permanent protection is established.	• Inspect construction area every 6 months for the following: - Erosion and sediment control are in place prior to wet season - Drainage system and sediment controls are functional during wet season - Sediment basins have a capacity of reducing the suspended solid from storm water by 50% • Monitor water quality every 6 months for Total Suspended Solid in 2 locations; upstream and downstream of the entry points of surface water runoff from construction area. • Monitor sediment quality every 6 months following: - 9+1 phase monitor 2 sampling stations (TS-SW02 and TS-SW03) - Full phase monitor 6 sampling stations in Figure 8.2-1	CC with DRC's approval
Surface Water Quality and Aquatic Biology	• Prepared and implement the measures for erosion and sedimentation control, waste management, and construction work camp. • Release of oil and grease from workshop facilities is prohibited. Used oil need to be stored separately and managed as per the *Waste Management Plan*. • Stock yards; gasoline, oil, lubricant and hydraulic oil storage areas; and machines/vehicles cleaning areas should be located at least 100 meter away from natural waterways. • Used water shall be treated and disinfected before discharge into natural drainage.	• Monitor every 6 months before and after rainy season through the construction period or at least for 3 years of all parameters in Table 8.2-1 and analysis methods as indicated in Table 8.2-1. • 9+1 phase monitor 2 sampling stations (TS-SW02 and TS-SW03). • Full phase monitor 6 sampling stations as shown in Figure 8.2-1.	CC with approval and under DRC's supervision

Table 1.3-2 Mitigation Measures and Monitoring Program During Construction Phase For Initial Township Project (Cont.)

Management Issue	Mitigation Measure	Monitoring Program	Responsibilities
Terrestrial Biology	• Only clear the area needed for construction of infrastructure and utility system. Avoid disturbance of forest and mangrove as much as possible. • Wherever possible, identify the endangered species and transfer them to safe locations prior to clearing the vegetation. • Hunting of wildlife is prohibited. • Disturbance of forest areas outside the project area by CC and their subcontractors is prohibited.	• Monitor every 6 months progress of construction work and vegetation clearing in construction areas/natural forests mangrove areas.	CC under DRC's supervision
Air Emission and Noise Control	• All equipment and vehicles will need to be maintained in good mechanical conditions. • Stationary noise sources (such as generators, concrete batching plants shall be sited as far as possible from villages, construction camps and resettlement areas. • Construction works within the distance of 500 m from villages and resettlement areas will be carried out between 06:00 to 18:00. • Dump trucks with loads that may generate dust will be covered when travelling though communities. • Water spraying at least once a day in the construction areas and on unpaved roads is required in the following conditions: 1. On the section of unpaved transportation routes that pass through communities or construction work camps; 2. When dust generating activities i.e. from modification of topography of land are being carried out within 100 m of a village or construction work camp; 3. When visual inspection indicates excessive dust generation in the construction areas and unpaved roads used for material transportation and; 4. Limit vehicle speed to 40 km per hour when pass through communities. • Burning of waste materials including waste vegetation from site clearing will be allowed under the following conditions: 1. The materials that are allowed to be burned are general garbage and vegetation waste. No burning of materials that may generate toxic gases is allowed; 2. A trained fire protection officer with appropriate firefighting equipment has to be present near the burning areas; 3. Burning is not allowed during severe wind condition and; 4. Burning is carried out at a safe distance from vegetated areas and not within 2 km from a village, a construction work camp, or resettlement areas on the upwind direction.	• Monitor every 6 months in construction areas following: - Inspection construction machineries with a written certificate/maintenance records of each machinery provided by qualified mechanics of the CC. - Dust suppression measures are implemented according to the mitigation measures. - Burning of waste materials are conducted according to the relevant mitigation measures.	CC under DRC's supervision

Table 1.3-2 Mitigation Measures and Monitoring Program During Construction Phase For Initial Township Project (Cont.)

Management Issue	Mitigation Measure	Monitoring Program	Responsibilities
	• Avoid impact pile-driving where possible in vibration-sensitive areas. Drilled piles or the use of a sonic or vibratory pile driver causes lower vibration levels where the geological conditions permit their use. • Construction workers exposed to noise levels of 80 dB(A) or more shall be provided with adequate Personal Protective Equipment (PPE) for hearing protection.		
Waste Management	DRC shall develop *Waste Management Plan* that will be applicable to all contractors in the project. The Waste Management Plan shall include the following components: • Identify classification of waste. The minimum waste classification shall be non-hazardous and hazardous waste; • Identify the size and location of the temporary hazardous waste storage area and non-hazardous waste disposal site for the construction phase of the initial township; • A mechanism for coordination between DRC and CC in waste separation, waste transfer, and record of waste quantity; • Hazardous waste shall include, but not limited to, the following waste materials. Any mixed waste stream that contains any of the hazardous waste shall be categorized as hazardous waste: - Acids and acid waste; - Alkalis and caustic waste; - Batteries; - Spent catalysts, solvents, and chemicals; - Empty containers which held chemicals, paint, oil and solvents; - Oil contaminated waste including oily rags, oil filters, used gloves; - Used oil, hydraulic fluids, chemicals and solvents; - First aid and medical waste; - Spill clean-up waste; - Waste from grease trap and; - Sludge from chemical wastewater treatment system. • Hazardous waste shall be stored in appropriate temporary hazardous waste storage areas until the permanent hazardous waste management facilities for the operation phase is functional. Minimum requirements of the temporary hazardous waste storage areas include; 1. Impervious floor without cracks or spaces that may allow spills to perforate into the ground; 2. Surrounded by secondary containment bunds. The secondary containment bunds shall be at least 0.5 m high with a volume large enough to contain the spill of the largest container expected in the storage area;	• Monitor every 6 months in construction areas the following issues: - Appropriate containers for type of waste as categorized in the *Waste Management Plan* are provided for construction work camps, workshops, construction sites and other supporting facilities; - Weekly inspection of waste segregation at the construction facilities and at the hazardous waste storage area and record of hazardous waste inventory; - The location of waste burning area is designated and no waste burring is conducted outside the area. - Inspect waste management training record.	DRC to develop *Waste Management Plan*; CC to implement the plan under DRC's supervision

Table 1.3-2 Mitigation Measures and Monitoring Program During Construction Phase For Initial Township Project (Cont.)

Management Issue	Mitigation Measure	Monitoring Program	Responsibilities
	3. Designate storage area for liquids or materials that are not allowed to be mixed, such as acids and alkalis; 4. Equipped with spill response kits; 5. Consider providing the area with roofing and temporary walls with a provision that the temporary hazardous waste storage area will have to be in use for at least 3 years until the permanent hazardous waste management facilities of the initial township are functional; 6. Type and quantity of hazardous waste in the storage area shall be recorded and kept up to date; • Burning of the following non-hazardous waste is allowed: cardboard, pallets, papers, and wood/vegetation waste. The waste burning site shall be designated in the *Waste Management Plan* and shall be at least 2 km from any villages, construction work camps, or resettlement areas. • Other non-hazardous waste shall be transferred to non-hazardous waste disposal site to be used during construction phase shall meet the following minimum requirements: 1. The disposal site shall be on higher ground not subject to flood; 2. The disposal site shall be at least 2 km from any groundwater well that is being used by workers or local villagers; 3. The disposal site shall be in the area where no excavation is planned. It shall be delineated with clear sign boards; 4. The waste shall be covered with soil on daily basis; 5. The location of all disposal sites during construction period shall be recorded as expanded appendices to the *Waste Management Plan*; • Establish a training program for workers related to waste classification, storage and disposal; • The *Waste Management Plan* may be expanded to cover recyclable waste and compostable waste in the future.		

Table 1.3-2 Mitigation Measures and Monitoring Program During Construction Phase For Initial Township Project (Cont.)

Management Issue	Mitigation Measure	Monitoring Program	Responsibilities
On-Site Traffic and Access Management	• All access roads in the construction area shall be signposted with information in Myanmese and English; 1. Speed limit 2. Construction activities and machinery; 3. Roadside borrow pits and material stockpiles; 4. Any applicable load limit, particularly for temporary bridges; and 5. Road features that may affect driving conditions such as curves, hidden accesses etc. • A speed limit of 40 km/hr shall be applied in village areas and construction camps. Drivers shall be trained and notified of such limit; • Consider building speed humps before and after each village, where appropriate; • Route for heavy vehicles used for transportation of construction materials shall be designated. Route with least number of villages and residential area is most preferable; • Survey of the access roads to identify blind spots need to be regularly conducted. Improvement to the blind spots such as removal of obstructing objects when necessary; and • Access road used for the construction activities shall be maintained in good conditions.	• Ensure that relevant mitigation measures implemented in construction area and nearby areas throughout construction phase for all parties. • Ensure that the most appropriate transportation routes were selected to contribute the least impact to locals using the road for their daily travel.	CC under DRC's supervision
Construction Work Camps	• Camp rules shall be established and informed to all residences. The rules should contain the following components: 1. Policy on alcohol and substance abuse; 2. Safety measures and emergency response particularly in case of fire; 3. Waste management requirements; 4. Other measures to prevent dissemination of vectors and transmissible disease including STDs and HIV/AIDs; • General areas of the camp shall be kept clean and tidy. Waste shall be collected regularly to avoid accumulation of waste in the camp; • Toilets shall be provided at a ratio as 1 toilet per 15 workers. All toilets shall be equipped with septic and seepage tanks of adequate size. The toilets need to be at least 100 meters from any natural waterways. Sludge from tank cleaning shall be stabilized by adding lime (pH = 12 for 30 minutes) and disposed of in designated pit for sludge disposal. The pit shall be at least 1 kilometer from any groundwater wells and is higher than groundwater table; • Proper drainage has to be provided. Improve areas with stagnant water as much as possible and; • Pest control measures shall be planned and implemented. All bedrooms need to be equipped with mosquito protection.	• Ensure that relevant mitigation measures implemented in construction area throughout construction phase and the camps are periodically inspected.	CC under DRC's supervision

Table 1.3-2 Mitigation Measures and Monitoring Program During Construction Phase For Initial Township Project (Cont.)

Management Issue	Mitigation Measure	Monitoring Program	Responsibilities
Historical and Cultural Resources	• Inform ward/village general administrator if antiques object or ancient monument are found in the project area. • Sites with historical and cultural values shall be identified, recorded and located in the map. This information shall be agreed upon by the local authorities and villagers. • If construction activities have to be carried out within 50 meters from these sites, the leaders of the communities that the sites belong to need to be notified at least 1 week prior to commencement of the activities. • Establish a plan and communication channel in case an unidentified site is encountered during the construction work to avoid damage to the site. • Removal and relocation method and destination shall be a mutual agreement between DRC, local authorities, and the leader of the communities that the site belongs to.	• Ensure that the records and maps are kept and up to date and available to all parties. • Locations subjected to be disturbed by the construction have been informed or notified about construction progress.	CC under DRC's supervision
Risk Assessment	Require the ITD contractor to: • Prepare a Construction Phase Environmental Management Plan (CEMP) base on the EIA report and associated CEMP, detailed design and construction plan and schedule. The CEMP must clear define: 1. The project's environmental requirements and obligation; 2. Physical measures that are needed to comply with the requirements and obligation; 3. Construction measures that are needed to comply with the requirements and obligation and; 4. Assignment of responsibilities to each subcontractor. • TOR for procurement of the ITD contract must clearly state the project's environmental requirements during the construction phase that the ITD contractor must ensure that the project construction will meet the requirements; • The ITD contract must clearly prescribes environmental management responsibility of the ITD contractor; • The supervision consultant will be required to submit a supervision and monitoring plan that clearly indicates the environmental tasks to be supervised and monitored. This supervision and monitoring plan for the implementation of the environmental mitigation measures; • Monthly reviews of the ITD contractor environmental performance; • Close supervision of truck operations especially during the site filling period; • Changes in designs or construction methods may be initiated by the ITD contractor or the project proponent. The request for changes must be subject to the change procedure in project management. The request for changes must be accommodated by an analysis of environmental implications and revised mitigation measures and;		CC under DRC's supervision

Table 1.3-2 Mitigation Measures and Monitoring Program During Construction Phase For Initial Township Project (Cont.)

Management Issue	Mitigation Measure	Monitoring Program	Responsibilities
	• Change in the environmental requirements may be initiated by DRC or the project proponent with approval of DRC. The change must be subject to the change procedure in project management. The ITD contractor will analyze environmental implications of the changes and revise the originally proposed mitigation measures accordingly.		
Occupational Health and Safety	• Accidents and Injuries: 1. Establish occupational and safety management plan and program for the construction should be established to assess and manage EHS impacts and risks. Project or activity-specific plans or procedures should be prepared and the basic site rules of work should be included; 2. Perform occupational accidents and disease recording and reporting, and investigate all incidents to understand the cause of accident and to identify measures necessary to prevent a recurrence; 3. Provide contractor management plan to ensure that the contractor will have safety performances and procedures to protect their employee. Supervise and monitor contractor performance periodically; 4. Train and provide information to employees. Occupational health training program should be provided as needed; for example, hazard awareness, specific hazards and safe work practices, to ensure that workers are capable of work safely and; 5. Provide appropriate personal protective devices to employee and ensuring that personal protective devices will be worn during working at all time. 6. Restrict local community to access the site or area using fencing, signage and risks communication: 7. Appropriately mark area signage and labeling of equipment, determine hazardous area; for example, electrical rooms, compressor, etc., as well as installations, materials and emergency exits, and label in accordance with international standards, and easily to understand by workers, visitors and public. • Occupational, Sexual Transmission and Communicable Diseases: 1. Supervise and monitor performance of contractors and sub-contractors on housekeeping in the camp site; 2. Include training programs for workers with these following topics: health awareness, hygiene and sanitary, waste management, communicable and transmission diseases, cultural awareness, regulations and compliance, and drug abuse; 3. Register foreign or migrated workers should be seriously performed to ensure that these workers have medical and health certificates to guarantee their personal health conditions;	• Ensure that relevant mitigation measures are implemented through the construction phase in construction area the following: - Health and safety statistics and records are kept and updated. - Performance of construction health and safety is monitored against a set benchmark. - Inspect health and safety conditions of the CC and subcontractor's constructions sites and camps periodically. - Emergency equipment and facilities in response to fire, accidents are available and well maintenance. - Emergency response plan is appropriate to changes of the environmental condition such fire situation and natural disasters. • Revised Emergency Responses Plan are submitted to relevant agencies and the State Management Committee.	CC under DRC's supervision

Table 1.3-2 Mitigation Measures and Monitoring Program During Construction Phase For Initial Township Project (Cont.)

Management Issue	Mitigation Measure	Monitoring Program	Responsibilities
	4. Conduct surveillance and active screening and treatment of workers. Immunization program may be required. • Emergency Response and First-Aid: 1. Establish emergency response plan and procedures which also should be in place for any remote sites. Emergency response plan shall be appropriate to change such environmental condition and natural disasters; 2. Provide appropriate emergency services and personnel to expedite emergency response when needed, maintain equipment facilities, fire-fighting equipment in good working order, accessible and adequate for the dimension and the basis use. 3. Provide health services and first-aid unit at all time, with comprehensive and appropriate equipment, establish the qualified the first-aid unit to properly handle with serious or trauma cases, and sufficient to meet the requirements, treat and/or patients to appropriate medical facilities in time.		
Community Health	• Housing and Sanitation: 1. Provide sufficient infrastructure amenities and public health services in the camp site; for example, accommodations, water and drinking water availability, solid wastes disposal and sewage treatment. • Environmental/Communicable Diseases: 1. In close collaboration with the community health authorities, implement an integrated control strategy for environmental and occupational diseases, such as integrated vector control programs, eliminating of breeding habitats in the camp site, and eradicating disease reservoirs; 2. Collaborate with community health authorities to enhance the worker families to access public health services, and promote immunization and; 3. Distribute appropriate education materials; for example, health awareness, sexual transmission disease and communicable disease. • Accidents/Fire/Chemical Leaks: 1. Consider the level of local firefighting capacity to identify firefighting equipment that should be available when needed, and provide all necessary equipment with regular maintenance program; 2. Communicate potential accidents and/or hazards to local authorities, communities and relevant parties; 3. Conduct emergency response practices/training with local response organizations and local responders and;	• Ensure that relevant mitigation measures are implemented.	CC under DRC's supervision

Table 1.3-2 Mitigation Measures and Monitoring Program During Construction Phase For Initial Township Project (Cont.)

Management Issue	Mitigation Measure	Monitoring Program	Responsibilities
	4. Revise or/and establish Emergency Response Plans as necessary according to changing of environmental situation including notify the Minister and Dawei Special Economic Zone Management Committee. • Adequacy and Readiness of Healthcare Services: 1. Provide the first aid unit at the camp site for their workers, assess whether the local health service capacity sufficient for worker's family and supporting industries, and in close collaborating with local authorities, consider supporting/additional health service facility. 2. Risk and impact to environment from construction of Health Centre Services i.e. hospital shall be assessed including establishment of environmental management plan and mitigation measures.		
Public Participation and Dissemination	• Establish *Public Relation and Public Participation Plan* to incorporate in requests and recommendation of the continuous engagement of stakeholders following: 1. Inform about project activities to community 2. Support nearby community as appropriate to build good relationship with community 3. Communicate to build community understanding about - Construction activities and progress - Potential environmental impacts and mitigation measures 4. Conduct by DRC consistent with the applicable standard for public meeting/consultation 5. Disclose about project information and public relation activities through channels such as website, e-mails, meeting/visiting and local exhibition board or local media. 6. Take account the results of the public consultation in improving and revised the EMPs	• Monitor 1 time for entire construction phase using questionnaire for communities within 1 km of the Project area.	DRC
Grievances Redress	• Establish *Grievance Redress Procedure* to address any complaints/grieves to resolve/settle disputes that brought forward by community pertaining to project activities.	• Ensure that complaints/grieves are recorded and cases are settled.	DRC

Remarks: MC: Management Committee
DRC: Dawei Residence Company Limited
CC: Construction Contractors

Table 1.3-3 Mitigation Measures and Monitoring Program During Operation Phase For Initial Township Project

Management Issue	Mitigation Measure	Monitoring Program	Responsibilities
Environmental Policy, Rules, and	DRC as the project owner has to establish the Environmental Policy and Rules for Initial Township based on the following principles: • Eco city concept which have the following key components: 1. Integration with natural system; 2. Maximize energy efficiency through facility design and other means; 3. Material flow through the whole area and ensure maximum reuse and recycling and; 4. Water conservation, reuse, and recycling in the Initial Township. • Prepare *Environmental, Health and Safety Plan* or *EHS Management Plan* or programs should also be reassessed periodically to ensure that the key environmental health and safety risks are determined in accordance with changes in order that the potential risks will be appropriately addressed. Thus, EHS system and performance should be improved continuously by a combination of ongoing monitoring of the Initial Township and high performances as well as effective accountability of the facility and; • Establish *Environmental Rules* that the township has to follow. These rules will be in accordance with the EMP for operation period. The rules will be attached with the contractual document between the contractor, operator and DRC.		DRC
Overall Roles and Responsibilities of Project Owner	DRC has to establish a strong organization to handle the dynamic and changes that will occur during the operation phase of the project, and should consider the following measures: • DRC should establish a sector responsible for safety health and environmental management of the Initial Township to prepare and perform the environmental management plan and programs to ensure that the Initial Township comply with environmental legislation and other relevant safety health and environmental requirements, and to achieve the most up-to-date environmental protection requirements/ measures/ standards; • DRC should periodically assess/reassess the environmental management plan or programs to ensure that the key environmental health and safety risks are evaluate and; • Due to the long period of the Initial Township project, DRC should ensure that EHS performance will be improved continuously via a combination of ongoing monitoring program and cooperation with the residences and community mall inside the Initial Township;		DRC

Table 1.3 -3 Mitigation Measures and Monitoring Program During Operation Phase For Initial Township Project (Cont.)

Management Issue	Mitigation Measure	Monitoring Program	Responsibilities
	• DRC needs to prepare and commission a database system to keep track of and analyze environmental data, flow of materials and waste, water consumption, wastewater generation rate and quality, and energy consumption. The data base will help organize the data from monitoring program of DRC and of the township, and can also be used as a tool to promote conservation of material, energy, and water among the industries, if the database is designed properly and; • DRC should provide provisions to ensure that the project can apply proper environmental health and safety management to protect health and safety of workers and the public.		
Air Emission and Noise Control	• Provide some space areas for tree planting within the project area. • Care and maintain the trees planted; in case the trees are dead, shall plant trees to replace the dead ones. • Install sign to notice that "*Do not start the car while parking for waiting*" at the parking area and reiterate the security guards to control strictly including in Myanmese language. • Limit vehicle speed inside township area as 30 km/hr to mitigate possible noise impacts on nearby area. • Install the "*No Audible*" sign within residential and township areas in obvious places. • Plan for emission of GHGs from the Project shall be established and/or revised in concurrently with the relevant policy and regulations.	• Ensure that relevant mitigation measures are implemented and been reported to MC every 6 months.	DRC or MC's Authorized Agency
Waste Management	• Design and construction of the landfill shall be in accordance with *Solid Waste Disposal Facility Criteria* – Technical Manual published by U.S. EPA (1993) or other applicable standards. • Detailed hydrogeological condition of the proposed landfill area has to be studied in the design of landfill. • Groundwater monitoring wells will be installed. As a minimum, 1 well is to be installed up-gradient of the landfill and at least 3 wells is to be installed down-gradient of the landfill. Depth of screens and well construction depends on the results from the hydrogeological condition study. • The components of the waste management facility i.e. sanitary landfill, secured landfill and incinerator shall be designed and constructed according to the internationally accepted standards.	• Monitor groundwater very month for the first 6 months and then every 6 months unless unusual concentration are observed and compared the results with Thailand's groundwater quality standards or other applicable international standards following: - Collect baseline groundwater quality before the operation of the landfill. - For where the hazardous waste stabilization and disposal are conducted, monitor the following parameters: pH, redox potential, dissolved oxygen, temperature	DRC or MC's Authorized Agency

Table 1.3-3 Mitigation Measures and Monitoring Program During Operation Phase For Initial Township Project (Cont.)

Management Issue	Mitigation Measure	Monitoring Program	Responsibilities
	• The facility shall create its *Standard Operating Procedure* covering steps from receiving waste, laboratory analysis, stabilization, temporary storage, incineration and disposal. Audit by third party is necessary. • The landfill shall be closed daily to prevent vectors and odors. • Classify hazardous and non-hazardous waste according to the definitions in the Waste Management Plan prepared. • Workers need to be trained of *Waste Management Plan*. • All hazardous and non-hazardous waste generated shall be transferred to the facility for disposal. • Waste manifest system has to be created and implemented. • Record of type of waste including its quality shall be kept in the database of DRC. • Waste Management Facility (if constructed in landfill).	conductivity, turbidity and metals; Cd, Cu, Pb, Mn, Ni, As, Se and Hg. • Monitor every 6 months runoff and wastewater.	DRC or MC's Authorized Agency
Water and Sediment Quality	• Prepare and implement the measures for *Waste Management* and *Wastewater Management*. • The discharged of untreated wastewater into the receiving water is strictly prohibited at all time. Wastewater must be treated and comply with NEQG standard before discharge into natural drainage. • Wastewater from the initial township operation shall be reused to water the trees planted in the initial township. • *Emergency plan for operation of wastewater treatmen*t should be established to prevent untreated effluent discharged into the receiving water.	• Monitor 3 times (dry, early wet and end of wet season) per year surface water and sediment with parameters as prescribed in Table 8.3-1: - For full phase: 6 sampling stations with parameters as in Figure 8.3-1. - For 9+1 phase: 2 sampling stations (TS-SW2 and TS-SW3).	DRC or MC's Authorized Agency
Terrestrial Ecology	• Wherever possible, conserve the existing trees, particularly in the green areas, • Coordinate with local authorities and engage local communities for reforestation projects surrounding the project area. • Discourage and educate the workers towards wildlife consumption to reduce demand and indirect impacts to the wildlife in reserved forests elsewhere outside the project area.		DRC or MC's Authorized Agency
Land Use, Township, and Community Management	• Special Plan and Buffer Zone: 1. A special specific area plan, legitimate and authorized by the state, is needed to control the land use adjacent to the project estate; 2. A clear and marked buffer zone all around the township boundary should be set up to control and prevent any uses other than agriculture and forest;	• Ensure that mitigation measures and land use plan are implemented and in long-term communities located in safe distance from the initial township and conflicts were reduced.	DRC or MC's Authorized Agency

Table 1.3-3 Mitigation Measures and Monitoring Program During Operation Phase For Initial Township Project (Cont.)

Management Issue	Mitigation Measure	Monitoring Program	Responsibilities
	3. The size of the buffer zone should be determined by land use expert to ensure that in case of fire or other hazards, only a minimum number of people will be affected and rescue and relocation efforts will be with ease and; 4. A comprehensive plan authorized by the state for the future of Dawei is needed for appropriate growth. • A Management Committee Overseeing the Project Land Use: 1. A team or committee should be set up to monitor and manage activities and structures built in and around the project area. 2. The team should have legitimate authority to control the areas adjacent or nearby, though outside the township boundary. 3. Squatters must be notified that they are only allowed to operate temporarily and must be relocated when the time comes in order to prevent scattered temporary structures from evolving into unsuitable permanent settlements outside the initial area. • Transportation and Infrastructure outside the Estate Area: 1. For the area immediately outside the township and other infrastructures that will enable setting up structures and services, such as, local roads, electricity, water supply, and drainage, should be also well planned and controlled. 2. The strategic locating or prohibiting of these basic infrastructures will be needed to induce and encourage early settlers and services outside designated township zone into the planned area. • Enforcement: 1. The proposed set-up land use management committee/team should have duty to regularly monitor land use activities outside and inside the township area as the development progresses. 2. Co-operation with local or state authority is needed to be able to control, direct, or enforce private buildings outside the project boundaries to prevent unsuitable and obstructing growth nearby the project area.		
Occupational Health and Safety	• Accidents and Injuries: 1. Provide the environmental health and safety management system and programs for the whole initial township. 2. Establish occupational health and safety management plans and programs to assess and manage EHS impacts and risks which are based on comprehensive job safety analyses.	• Ensure that occupational health and safety statistics and records were monthly update.	DRC

Table 1.3-3 Mitigation Measures and Monitoring Program During Operation Phase For Initial Township Project (Cont.)

Management Issue	Mitigation Measure	Monitoring Program	Responsibilities
	3. Include the following issues in the occupational health and safety management system: - Accident investigation, recording and reporting - Surveillance of the employee's health - Training and hazard communication - Monitoring and auditing procedures to evaluate the effectiveness of prevention and control measures. 4. Perform occupational accidents and disease recording and reporting, investigate all incidents to understand the cause of accident and to identify measures necessary to prevent a recurrence. 5. Provide area signage and labeling of equipment in accordance with international standards and easily to understand by employees, visitors and general public. 6. Promote traffic safety programs to all personnel, for example; - Improving driving skill - Use of speed control devices • Occupational, Sexual Transmission and Communicable Diseases: 1. Conduct surveillance and active screening and treatment of employees. Immunization program may be required. 2. Provide training programs for employees in these following topics: health awareness, and promote health protection strategies including encouraging condom use. 3. Perform periodic employee's health checks in accordance with the potential risks. • Fire and Other Hazards 1. Provide comprehensive emergency preparedness and response plan and procedures covering fire and other hazards control. 2. Provide appropriate emergency services and personnel to execute emergency response when needed, and maintain equipment facilities, fire-fighting equipment in good working order, accessible and adequate for the dimension and the basis use. 3. Establish appropriate fire safety system to ensure its capability to cope with all the potential hazards. 4. Conduct annual training and updating emergency preparedness and response plan to account for changes in equipment, personnel and facilities. • Adequacy and Readiness of Healthcare Services:	• Monitor performance of health and safety operation against a set benchmark • Inspect periodically health and safety conditions. • Ensure implementation of the following: - Emergency equipment and facilities in response to fire, natural disasters and accidents are available and well maintenance. - Emergency response plan is appropriate to changes of the environmental condition such fire situation and natural disasters. • Revised Emergency Responses Plan are submitted to relevant agencies.	DDC or MC's Authorized Agency

Table 1.3-3 Mitigation Measures and Monitoring Program During Operation Phase For Initial Township Project (Cont.)

Management Issue	Mitigation Measure	Monitoring Program	Responsibilities
	1. Establish the hospital in the township area, and periodically evaluate in terms of adequacy, capacity and readiness in accordance with the change in numbers of population in the township.		
Community Health	- Sanitation: 1. Provide sufficient infrastructure amenities and public health services for the township; for example, accommodations, water and drinking water availability, solid wastes disposal and sewage treatment in order to reduce pressure on local authorities in servicing public. 2. Technically support or collaborate with local authorities to enhance potentiality of communities in solid waste disposal by means of 3 R (Reduce, Reuse and Recycle). - Environmental/Communicable/Non-Communicable Diseases: 1. Establish the buffer strip/zone to separate the township and industrial estate to protect dwellers from pollutions emitted. 2. Implement engineering preventive measures to install physical separation between industry and community; for example, fence or tree plantation as buffer zone along the estate boundaries, and use of air modeling results and/or potential pollutions of each industry as the criteria for the distance between industries and affected community. 3. Set up a grievance procedure to manage complaints, if any. - Accidents/Fire: 1. Invite representative of local emergency and securities services to participate in annual site inspections to ensure familiarity with the potential hazards present. 2. Inform and communicate potential accidents that may impact to community to local communities and relevant parties. 3. Prepare and train employees, people in township and nearby communities to respond to accidents, including providing technical and financial resources in order to control and response such events effectively and safely, and provide periodic emergency response practice with communities. 4. Establish *Emergency Response Plans* in concordance with recent policy, law and regulation. Emergency response plan shall be appropriate to such current environmental condition and natural disasters and;		DRC in collaboration with local authorities

Table 1.3-3 Mitigation Measures and Monitoring Program During Operation Phase For Initial Township Project (Cont.)

Management Issue	Mitigation Measure	Monitoring Program	Responsibilities
	5. Revise Emergency Response Plans as necessary according to changing of environmental situation including notify the Minister and Dawei Special Economic Zone Management Committee. • Adequacy and Readiness of Healthcare Services: 1. Promote collaboration with local authorities to enhance access of community to public health services for the employee's families and people being at residences in township to develop health service facility. 2. Risk and impact to environment from operation of Health Centre Services i.e. hospital shall be assessed including establishment of environmental management plan and mitigation measures.		
Employment and Training Program	• Comply with IFC EHS General guideline/Laws and regulations in terms of the employee management and established plan for training programme and implement.		DRC
Public Participation and Dissemination.	• Establish *Public Relation and Public Participation Plan* to incorporate in requests and recommendation of the continuous engagement of stakeholders following: 1. Inform about project activities to community 2. Support nearby community as appropriate to build good relationship with community 3. Communicate to build community understanding about - Potential environmental impacts and mitigation measures - CSR activity 4. Conduct by DRC consistent with the applicable standard for public meeting/consultation 5. Disclose about project information and public relation activities through channels such as website, e-mails, meeting/visiting and local exhibition board or local media. 6. Take account the results of the public consultation in improving and revised EMPs	• Monitor every 5 years for entire operation phase using questionnaire for communities within 1 km of the Project area. Ensure that sufficient number of questionnaires are sampling and base on reliable statistic.	DRC
Grievances Redress	Establish *Grievance Redress Procedure* to address any complaints/grieves to resolve/settle disputes that brought forward by community pertaining to project activities.	• Ensure that complaints/grieves are recorded and cases are settled.	DRC

Table 1.3-3 Mitigation Measures and Monitoring Program During Operation Phase For Initial Township Project (Cont.)

Management Issue	Mitigation Measure	Monitoring Program	Responsibilities
Revised and Report	1. Revised EMP and Emergency Response Plan depending on the changing in condition such fire hazard, safety from chemicals, flooding and earthquake and submitted to DSEZMC and MONREC 2. Reporting on performance of basic infrastructure e.g. local roads, electricitity, water supply, safety and results of continuous public consultation in the monitoring reports that will carry out every 6 months and submitted to DSEZMC and MONREC	• Ensure that monitoring reports included performance of basic infrastructure and submit to relevant agencies every 6 months or as stated in the EMP • Ensure that revised ERP is submitted to relevant agencies depend on the changes condition.	DRC

Remarks: MC: Management Committee

DRC: Dawei Residence Company Limited

CC: Construction Contractors

1.4 BUDGET FOR ENVIRONMENTAL MANAGEMENT AND MONITORING

This section describes the budget plans for the environmental management and environmental monitoring by the Project Proponent. Most of the environmental management cost and mitigation measures such as construction of retention ponds, polishing ponds, are already included in the project cost.

In terms of the budget for environmental monitoring before/during construction and operation phases, main monitoring cost is a cost for field measurements such as air quality, water, and quality noise. Annual costs for field measurements in the construction phase by contractor and in the operation phase by the Project Proponent are estimated in Table 1.4-1 and Table 1.4-2.

Table 1.4-1 Environmental Management Plan (EMP) – Proposed Monitoring Measures for Construction Phase

	Positions		Number	Estimated Budgets/Year (USD)	
Staff	1. Environmental Health and Safety (EHS) Manager 2. Environmental Supervisor - Staff 3. Health and Safety Supervisor - Staff		1 1 3 1 2	55,200 30,000 64,800 37,200 43,200	
Total Staff Estimated Budgets/Year				230,400	
Attribute	**Inspection Issues and Monitoring Parameters**	**Location**	**Frequency**	**Responsibilities**	**Estimated Budgets (USD)**
Erosion and Sedimentation Control	Issues: 1. Erosion and sediment controls are in place prior to wet season; 2. The drainage system and sediment controls are functional during wet season; 3. The sediment basins have a capacity of reducing the suspended solid from storm water by fifty percent (50%)	Construction area	Every 6 months	DRC or Third party consultant	
	Parameter: Total Suspended Solid	upstream and downstream of the entry points of surface water runoff from each construction area	As indicated in the Erosion and Sediment Control Plan	DRC or Third party consultant	50 /construction area
Surface Water and Sediment Quality	Parameters: All parameters and analysis methods of as indicated in	Full Phase ,6 Sampling stations as shown in and 9+1 Phase ,2 Sampling stations (TS-SW02 and 03)	Every 6 months before and after rainy season, through the construction period or at least for 3 years	DRC or Third party consultant	36,000/year 12,000/year
Terrestrial Biology	Issues: Progress of construction work and vegetation clearing	Construction area/natural forests and mangrove areas	Every 6 months	DRC or Third party consultant	

Table 1.4-1 Environmental Management Plan (EMP) – Proposed Monitoring Measures for Construction Phase (Cont.)

Attribute	Inspection Issues and Monitoring Parameters	Location	Frequency	Responsibilities	Estimated Budgets (USD)
Air Emission and Noise Control	<u>Issues:</u> 1. Each construction machineries are inspected at least every 6 months with a written certificate/ maintenance records of each machinery provided by qualified mechanics of the CC; 2. The dust suppression measures are implemented according to the mitigation measures; 3. The burning of waste materials are conducted according to the relevant mitigation measures; 4. The Community Grievance Record related to dust and noise ensure that the complaints are responded to and closed appropriately according to the relevant mitigation measures.	Construction areas	Every 6 months	DRC or Third party consultant	
Waste Management	<u>Issues:</u> 1. Appropriate containers for type of waste as categorized in the Waste Management Plan are provided for construction work camps, workshops, construction sites and other supporting facilities;	Construction areas	Every 6 months	DRC or Third party consultant	
	2. Waste segregation at the construction facilities and at the hazardous waste storage and non-hazardous waste disposal site;		Every month		
	3. Hazardous waste storage area and record of hazardous waste inventory.		Every month		
	4. The location of waste burning area is designated and no waste burning is conducted outside the area;		Every 6 months		

Table 1.4-1 Environmental Management Plan (EMP) – Proposed Monitoring Measures for Construction Phase (Cont.)

Attribute	Inspection Issues and Monitoring Parameters	Location	Frequency	Responsibilities	Estimated Budgets (USD)
	5. Waste management training record		Every 6 months		
On-Site Traffic and Access Management	Issues: Implementation of relevant mitigations measures	Construction area and nearby areas	Throughout construction phase	DRC or Third party consultant	
Construction Work Camps	Issues: Implementation of relevant mitigations measures	Construction area	Throughout construction phase	DRC or Third party consultant	
Historical and Cultural Resources	Issues: 1. Keep record and map up to date and making them available to all parties. 2. The construction work progress with the locations of known sites so that timely action can be taken is the sites will be subject to disturbance by construction activities.	Construction area	Throughout construction phase	DRC or Third party consultant	
Public and Occupational Health	Issues: 1. Keep monthly update of health and safety statistics and records. 2. Implementation of relevant mitigations measures 3. Inspect health and safety conditions of the CC and subcontractor's construction sites and camps.	Construction area	Throughout construction phase	DRC or Third party consultant	
Site Audit		Construction Area	Every 6 months	DRC or Third party consultant	6,400/year
Report Preparation (10 sets)			Every 6 months	DRC or Third party consultant	11,700/year

MC: Management Committee DRC: Dawei Residence Company Limited CC: Construction Contractors

Table 1.4-2 Environmental Management Plan (EMP) – Proposed Monitoring Measures for Operation Phase

	Positions	Number	Estimated Budgets/Year (USD)
Staff	1. Environmental Health and Safety (EHS) Manager	1	55,200
	2. Environmental Supervisor - Staff	1 3	30,000 64,800
	3. Health and Safety Supervisor - Staff	1 2	37,200 43,200
Total Staff Estimated Budgets/Year			230,400

Attribute	Inspection Issues and Monitoring Parameters	Location	Frequency	Responsibilities	Estimated Budgets (USD)
Waste Management Facility (if constructed in the landfill)	Parameters: 1. Baseline groundwater quality before the operation of the landfill. Parameters when hazardous waste stabilization and disposal is conducted: pH, redox potential, dissolved oxygen, temperature, conductivity, turbidity and metals (cadmium, copper, lead, manganese, nickel, arsenic, selenium, and mercury).	Designated monitoring well	Every month for the first 6 months and then every 6 months unless unusual concentrations are observed.	DRC or Third party consultant	2,300/year
Surface Water and Sediment Quality	Parameters: Surface water and sediment, as shown in	Full Phase ,Total of 6 sampling stations, as described in and **Figure 8.4-1** 9+1 Phase ,2 Sampling stations (TS-SW02 and 03)	At least thrice a year (dry, early wet and end of wet season).	DRC or Third party consultant	30,000/year 10,000/year
Public and Occupational Health	Keep monthly update of health and safety statistics and records.	Township area	Every month	DRC or Third party consultant	
Report Preparation (10 sets)			Every 6 months	DRC or Third party consultant	11,700/year

MC: Management Committee DRC: Dawei Residence Company Limited CC: Construction Contractors

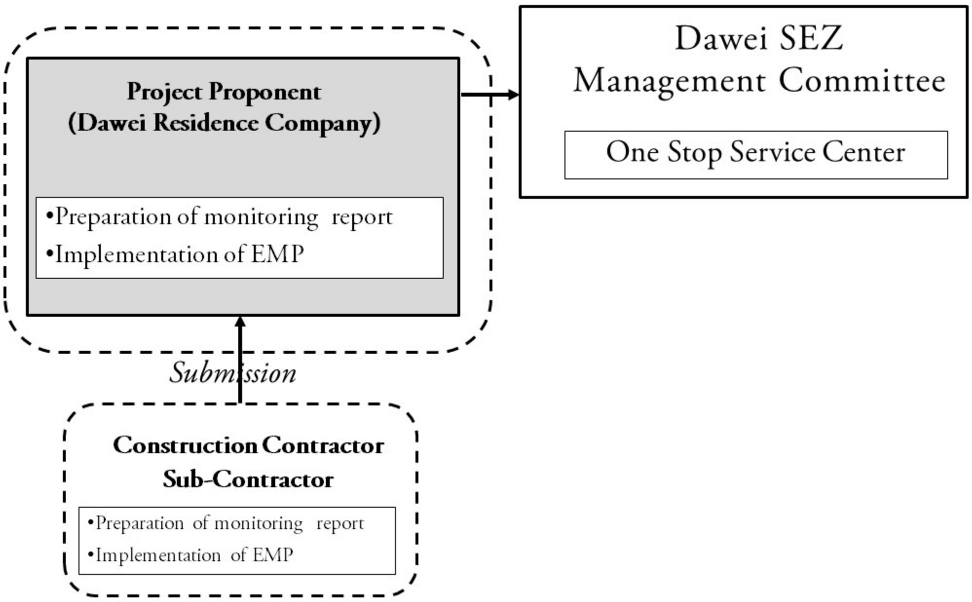
1.5 IMPLEMENTATION SCHEDULE

The implementation schedule as of May 2017 of the pre-construction, construction, and operation phases of the Initial Township project is as follows:

1) Pre-construction period : from 2017 to get approval of ESIA and land lease agreement
2) Construction period: 24 months after get approval of ESIA and land lease agreement, depend on demand basis of residence.
3) Operation period: 75 years (Maximum)

1.6 INSTITUTIONAL ARRANGEMENT

The organization structure for the operation and management of environmental monitoring is shown in **Figure 1.6-1.**



Source: EIA Study Team

Figure 1.6-1 Organization structure for EMP and EMoP of the Project during operation phase

1.6.1 Governing Bodies

According to the Myanmar Special Economic Zone Law (2011), there are 3 levels of government agencies directly associated with DRC

- Central Body
- Central Working Body
- Management Committee

The Central Body (CB) consists of members from ministries and government departments as assigned by the Government of Myanmar. CB is a policy making level among the three organizations. The duties of CB include reviewing proposals for development of a Special Economic Zone, determining type business, and other financial and taxes related matter. It reports to the Government of Myanmar. The Central Body is responsible to forming and assigning detailed duties to the Central Working Body (CWB) and Management Committee (MC).

CWB assists CB in reviewing the Special Economic Zone plan, determining of appropriate category of investment, and advising CB on matters regarding administration, management and legal issues in the Special Economic Zone. CWB reports to CB.

MC is the implementation mechanism of the governing bodies. One of the key duties of MC is supervising and inspecting the matters on implementation of investment plans and other matters including land use, environmental conservation, waste control, health, education, finance and taxation, transport, communication, security, electricity, energy and water supply etc. MC reports to both CB and CWB.

1.6.2 Project Proponent

The Project Proponent will be in charge of the overall operation of the initial township during the construction and operation. The Project Proponent will implement, EMP and EMoP as stated in this EIA report and almost by through construction contractors and sub-contractors.

Main tasks for environmental and social consideration in the Project are managed by Environment, Safety and Health section and / or Community relation division in Table 1.6-1.

Table 1.6-1 Main Tasks for Environmental and Social Consideration in the Initial Township

Division/Section	Main Tasks
Environment, Safety and Health section	1) Monitoring the DSEZ Initial Industrial Estate area operations according to EMP and EMoP 2) Submitting environmental monitoring reports to DSEZMC
Community relation division	1) Grievance Adjustment - Handling complains/ claims/ requests from community and its response as necessary - Coordinating between tenant and community for grievance adjustment 2) Planning and implementation of CSR activities

Source: EIA Study Team

1.6.3 Construction Contractor and sub-contractors

Construction Contractors (CC) refer to the contractors for the development of Initial Township, which include constructions of utility systems (i.e. water treatment and distribution system, wastewater collection and treatment system, irrigation system, electricity generation

and distribution system, solid and hazardous waste management facilities etc.), internal roads, and basic infrastructure for the Complex.

CC must operate in accordance with the mitigation measures stipulated in this EIA report. CC report to the Project Owner.

Responsibilities of CC during construction phase include:

- Implement environmental mitigation measures for the construction activities and work camps as required by DRC;
- Liaise and coordinate with DRC on matters related to environment and public consultation; and
- Develop emergency response plan and establish emergency response capability for construction phase, which may include accidents, fire and first aid and medical evacuation.

1.7 PROJECT POLICY

1.7.1 Policy

The Project Proponent refers to Dawei Residence Company Limited (DRC), which falls under the category of 'Developer' according to Myanmar Special Economic Zone Law (2011). DRC roles in the project include design, construction, and operation of infrastructure and amenities in the Initial Township. DRC will be responsible for technical planning, enforcing, and monitoring of all environmental mitigation measures as stipulated in the EMP. The Project Owner reports to the Governing Body.

1.7.1.1 Construction Phase

Responsibilities of DRC prior to and during construction phase include:

- Hold discussions with the government agencies to develop procedure for inter-agency coordination and reporting;
- Ensure that provision of relevant environmental mitigation measures are reflected in the contract between DRC and construction contractors;
- Develop monitoring programs and monitor the implementation of environmental mitigation measures for construction period; and
- Liaise and coordinate with government agencies on the matters related to environment and public consultation.

1.7.1.2 Operation Phase

Responsibilities of DRC during operation phase include:

- Establish environmental requirements for the industrial estate following the mitigation measures for the operation phase;
- Distribute the environmental requirements to the factories/manufacturers and ensure that the factories/manufacturers comply with the environmental requirements both during construction and operation of the facilities;
- Operate the utility systems of the industrial estate including electricity generation, water treatment and distribution, solid and hazardous waste management, and wastewater treatment system;
- Develop emergency response plan and establish emergency response capability for operating phase, which may include traffic accidents, fire and chemical pollution incidents within the industrial estate area;
- Develop monitoring programs and monitor the implementation of environmental mitigation measures for operating phase; and
- Liaise and coordinate with government agencies on the matters related to environment and public consultation.

1.7.2 Environmental Management System

DRC as the project owner has to establish the environmental policy and rules that will govern environmental practices and performance of the Initial Township as a whole. The establishment and implementation of this component is of utmost important due to absence of local environmental regulations and authorities fully responsible for environment and pollution control in Myanmar. Once established, DRC shall adhere to these policy and rules. However, in the future, when the environmental protection laws may be announced and published by the Government of Myanmar, DRC shall ensure that the requirements as set in the policy and rules are fully in compliance with the laws.

Environmental policy and rules for Initial Township shall be based on the following principles:

- Eco city concept which have the following key components:
  - Integration with natural system.
  - Maximize energy efficiency through facility design and other means.
  - Material flow through the whole area and ensure maximum reuse and recycling.
  - Water conservation, reuse and recycling in the Initial Township.
- Prepare Environmental, Health and Safety Plan. EHS management plan or programs should also be reassessed periodically to ensure that the key environmental health and safety risks are determined in accordance with changes in order that the potential risks will be appropriately addressed. Thus, EHS system and performance should be improved continuously by a combination of ongoing monitoring of the Initial Township and high performances as well as effective accountability of the facility

- Establish *Environmental Rules* that the township has to follow. These rules will be in accordance with the EMP for operation period. The rules will be attached with the contractual document between the contractor, operator and DRC.

In addition to the above policy and rules, DRC will play a leading role in maintaining and improving overall environmental performance of the whole Initial Township. The EIA was prepared in a broad scope to cover all possible activities in the Initial Township in high level. DRC will have to establish a strong organization to handle the dynamic and changes that will occur during the construction and operation of the project. To achieve environmental safety and health management goals, to protect the environment, workers and the public from any adverse impacts caused by the project, the strong environmental management commitments and the proficient mitigation measures are needed. In order to develop the comprehensive environmental management plan, DRC as the project owner should be aware of the change during the operation period, and should consider the following measures.

- DRC should establish a sector responsible for safety health and environmental management of the Initial Township to prepare and perform the environmental management plan and programs to ensure that the Initial Township comply with environmental legislation and other relevant safety health and environmental requirements, and to achieve the most up-to-date environmental protection requirements/ measures/ standards.
- DRC should periodically assess/reassess the environmental management plan or programs to ensure that the key environmental health and safety risks are evaluate.
- Due to the long period of the Initial Township Project, DRC should ensure that EHS performance will be improved continuously via a combination of ongoing monitoring program and cooperation with the residences and community mall inside the Initial Township.
- DRC needs to prepare and commission a database system to keep track of and analyze environmental data, flow of materials and waste, water consumption, wastewater generation rate and quality, and energy consumption. The database will help organize the data from monitoring program of DRC and of the township, and can also be used as a tool to promote conservation of material, energy, and water among the township, if the database is designed properly.
- DRC should provide provisions to ensure that the project can apply proper environmental health and safety management to protect health and safety of workers and the public.

1.7.3 Mitigation Measures Commitments

The Project commits to comply with all mitigation measures as stated in the Environmental Management Action Plans during construction phase and operation phase.