MYANDAWEI
INDUSTRIAL ESTATE
COMPANY LIMITED

FINAL REPORT

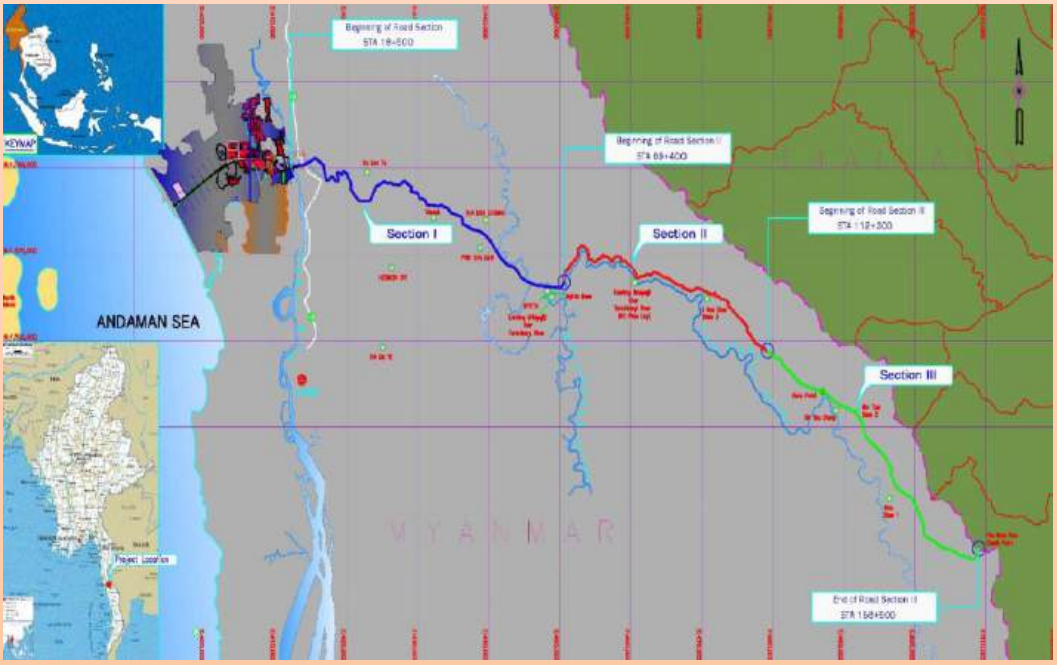
For

Environmental and Social Impact Assessment (ESIA)

On

Two-Lane Road Project,
Linking the Dawei SEZ with Thai Border

in Dawei District, The Republic of the Union of Myanmar



Prepared by

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June 2018

ပြည်ထောင်စုသမ္မတမြန်မာနိုင်ငံတော်အစိုးရ
သယံဇာတနှင့်သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဝန်ကြီးဌာန
ပြည်ထောင်စုဝန်ကြီးရုံး

စာအမှတ် (သစ်တော) ၃(၂)/၁၆၆(ဃ)(၁၈၇၄/၂၀၁၈)
ရက်စွဲ ၂၀၁၈ ခုနှစ် ၊ မေလ ၃၁ ရက်

သို့

ထား၀ယ်အထူးစီးပွားရေးဇုန်စီမံခန့်ခွဲမှုကော်မတီ

အကြောင်းအရာ။ **Myandawei Industrial Estate Co., Ltd မှ ထား၀ယ်အထူးစီးပွားရေးဇုန်တွင်အကောင်အထည်ဖော်ဆောင်ရွက်မည့် ၂ လမ်းသွားကားလမ်းစီမံကိန်းနှင့်ပတ်သက်၍ ပြန်လည်တင်ပြလာသည့် ESIA အစီရင်ခံစာအား အတည်ပြုပြန်ကြားခြင်းကိစ္စ**

ရည်ညွှန်းချက် ။ ထား၀ယ်အထူးစီးပွားရေးဇုန် စီမံခန့်ခွဲမှုကော်မတီ၏ ၁၀-၄-၂၀၁၈ ရက်စွဲ ပါစာအမှတ်၊ ထ၀-၆/DSEZ/ ၂၀၁၈(၀၉၈)

Myandawei Industrial Estate Co., Ltd မှ ထား၀ယ်အထူးစီးပွားရေးဇုန် ကနဦးအဆင့်တွင် အကောင်အထည်ဖော်ဆောင်ရွက်မည့် ၂ လမ်းသွားစီမံကိန်းနှင့်ပတ်သက်၍ ပြန်လည်ပြင်ဆင်တင်ပြလာသည့် ပတ်၀န်းကျင်နှင့်လူမှုရေးထိခိုက်မှုဆန်းစစ်ခြင်း (Revised Environmental and Social Impact Assessment-ESIA) အစီရင်ခံစာအပေါ် သယံဇာတနှင့်သဘာ၀ပတ်၀န်းကျင်ထိန်းသိမ်းရေး၀န်ကြီးဌာနအနေဖြင့် စိစစ်တွေ့ရှိချက်များအရ ပတ်၀န်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ထုံးလုပ်နည်း အပိုဒ် ၆၃ ပါအချက်များနှင့် ကိုက်ညီမှုရှိကြောင်း စိစစ်တွေ့ရှိရပါသဖြင့် အဆိုပါအစီရင်ခံစာကို အတည်ပြုပါကြောင်းနှင့် စီမံကိန်းဆောင်ရွက်ရာတွင် အောက်ဖော်ပြပါအချက်များကို အလေးထားလိုက်နာဆောင်ရွက်ရန် လိုအပ်ပါကြောင်း အကြောင်းကြားအပ်ပါသည်-

(က) အကြိုတည်ဆောက်ခြင်း၊ တည်ဆောက်ခြင်းနှင့် လုပ်ငန်းလည်ပတ်ဆောင်ရွက်ခြင်း၊ ရပ်ဆိုင်းခြင်း၊ ပိတ်သိမ်းခြင်းနှင့် ပိတ်သိမ်းပြီးကာလ စသည့်စီမံကိန်းလုပ်ငန်းအဆင့်အလိုက် စီမံကိန်းကြောင့် ပတ်၀န်းကျင်ထိခိုက်နိုင်မှုများ (ထုတ်လွှတ်အခိုးအငွေ့၊ စွန့်ပစ်ရေ၊ ဆူညံသံ၊ အန္တရာယ်၊ စွန့်ထုတ်အရည်အသွေး) ကို အမျိုးသားပတ်၀န်းကျင်ဆိုင်ရာ(ထုတ်လွှတ်မှု) လမ်းညွှန်ချက်များနှင့်အညီဖြစ်စေရေးစီမံဆောင်ရွက်ရန်နှင့် စောင့်ကြပ်ကြည့်ရှုရန်၊

(ခ) ပတ်၀န်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်ပါ လုပ်ငန်းလည်ပတ်ခြင်းကာလ Air Quality Monitoring, Noise Monitoring, Surface Water Quality Monitoring,

4.6.2018
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Forest and Wildlife Monitoring, Transportation Monitoring ကို နှစ်လမ်းသွားစီမံကိန်း၏ လုပ်ငန်းလည်ပတ်ချိန်တစ်လျှောက်လုံး (Operation Phase) တွင် ဆောင်ရွက်ရန်၊

(ဂ) တည်ဆောက်ခြင်းကာလနှင့် လုပ်ငန်းလည်ပတ်ဆောင်ရွက်ခြင်းကာလများတွင် စီမံကိန်းကြောင့် လေအရည်အသွေး၊ ဆူညံသံနှင့် တုန်ခါမှုများကို အမျိုးသား ပတ်ဝန်းကျင်ဆိုင်ရာ (ထုတ်လွှတ်မှု) လမ်းညွှန်ချက်များနှင့်အညီဖြစ်စေရေး စောင့်ကြပ်ကြည့်ရှုစစ်ဆေးခြင်းကို construction sites, transport routes များအပါဝင် အဆင့်မြှင့်တင်ဖောက်လုပ်မည့် နှစ်လမ်းသွားလမ်းမကြီးတစ်လျှောက်ရှိ လမ်းနှင့်အနီးဆုံးကျေးရွာများအား လုံးတွင် စောင့်ကြပ်ကြည့်ရှုစစ်ဆေးရန်၊

(ဃ) စီမံကိန်းသည် တံတား ၂၁ စင်း တည်ဆောက်မည်ဖြစ်သဖြင့် တည်ဆောက်ရေး ကာလတွင် ရေအရည်အသွေးနှင့် စွန့်ထုတ်အရည်များ စောင့်ကြပ်ကြည့်ရှုခြင်းကို တံတားဖောက်လုပ်မည့်နေရာများအား လုံးတွင် ဆောင်ရွက်ရန်၊

(င) စီမံကိန်းအဆိုပြုသူသည် ပတ်ဝန်းကျင်၊ လူမှုရေးနှင့် ကျန်းမာရေးဆိုင်ရာ ထိခိုက်မှုများကို လျော့ချမည့်နည်းလမ်းများ၊ ပတ်ဝန်းကျင်စီမံခွဲမှုအစီအစဉ်များ၊ ၎င်းနှင့် ဆက်စပ်သည့် အစီအစဉ်ခွဲများ၊ စောင့်ကြပ်ကြည့်ရှုမည့် နည်းလမ်းများအပါအဝင် ဆောင်ရွက်ရမည့်ကိစ္စရပ်များအား လုံးကို အတည်ပြုထားသည့် ပတ်ဝန်းကျင် ထိခိုက်မှုဆန်းစစ်ခြင်း အစီရင်ခံစာတွင် ဖော်ပြထားသည့်အတိုင်း လိုက်နာ အကောင်အထည်ဖော်ဆောင်ရွက်ရန်၊

(စ) အစီရင်ခံစာတွင် ဖော်ပြထားသည့် ကတိကဝတ်များအား အပြည့်အဝလိုက်နာ ဆောင်ရွက်ရန်၊

(ဆ) စီမံကိန်း၏ ကြွင်းကျန်သက်ရောက်မှုများနှင့် ဘေးအန္တရာယ်ရှိမှုများအား တည်ဆဲ စည်းမျဉ်းစည်းကမ်း၊ စံချိန်စံညွှန်းများ၊ လမ်းညွှန်ချက်များနှင့်အညီဖြစ်စေရေး စီမံဆောင်ရွက်ရန်နှင့် စောင့်ကြပ်ကြည့်ရှုရန်၊

(ဇ) Project Design နှင့် Operation များပြောင်းလဲမှုရှိပါက Myandawei Industrial Estate Co., Ltd သည် ပူးပေါင်းဆောင်ရွက်သူများကိုယ်စား ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာနသို့ အကြောင်းကြားတင်ပြရန်၊

(ဈ) ဒေသခံပြည်သူများ၊ ဆက်စပ်ပတ်သက်သူများ (stakeholders) နှင့်စဉ်ဆက်မပြတ်တွေ့ဆုံဆွေးနွေးပြီး ၎င်းတို့၏အကြံပြုချက်နှင့် လိုလားချက်များအား အလေးထားပေါင်းစပ်ဆောင်ရွက်ရန်၊

(ည) ပတ်ဝန်းကျင်နှင့်လူမှုရေးဆိုင်ရာ စောင့်ကြပ်ကြည့်ရှုမှုအစီရင်ခံစာကို သယံဇာတနှင့်သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဝန်ကြီးဌာနသို့ သတ်မှတ်ထားသည့် အချိန်အတွင်းတင်ပြရန်၊

(ဋ) ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ထုံးလုပ်နည်းအရ လိုက်နာဆောင်ရွက်ရမည့် အချက်များအား လုံးကို လိုက်နာဆောင်ရွက်ရန်၊

(ဌ) Myandawei Industrial Estate Co., Ltd သည် မြန်မာဘာသာပြန်ထားသော ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း အစီရင်ခံစာအကျဉ်းချုပ်နှင့် စီမံကိန်းမှ လိုက်နာဆောင်ရွက်မည့် ပတ်ဝန်းကျင်နှင့်လူမှုရေးဆိုင်ရာ ကတိကဝတ်များအား စီမံကိန်းနှင့် ဆက်စပ်ပတ်သက်သူများသို့ ဖြန့်ဝေအသိပေးရန်၊

(ဍ) စီမံကိန်းပိုင်ရှင်သည့် အတည်ပြုထားသည့် ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း အစီရင်ခံစာကို အများပြည်သူသိရှိနိုင်စေရေး ထုတ်ဖော်ကြေငြာရန်၊

(ဎ) စီမံကိန်းပိုင်ရှင်အနေဖြင့် ဒေသအကျိုးပြုလုပ်ငန်းများ၊ ဒေသခံပြည်သူများ၏ လူမှုစီးပွားဆိုင်ရာ ဖွံ့ဖြိုးရေးလုပ်ငန်းများကို တတ်နိုင်သမျှဆောင်ရွက်ပေးရန်၊

(ဏ) စီမံကိန်းပိုင်ရှင်အနေဖြင့် အများပြည်သူနှင့်တိုင်ပင်ဆွေးနွေးခြင်း၊ စီမံကိန်းအကြောင်းအရာများနှင့် ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း အစီရင်ခံစာကို အများပြည်သူသိရှိနိုင်စေရေး ထုတ်ဖော်ကြေငြာခြင်းများ ဆောင်ရွက်ရာတွင် သက်ဆိုင်ရာအစိုးရအဖွဲ့အစည်းများ၊ အခြားအဖွဲ့အစည်းများ၊ လူမှုဖွဲ့အစည်းများနှင့် စီမံကိန်းကြောင့် ထိခိုက်ခံစားရသူများအပါအဝင် ဆက်စပ်ပတ်သက်သူများ၏ တောင်းဆိုအကြံပြုသည့်အချက်များကို အလေးထားဆောင်ရွက်ပေးရန်နှင့် ညှိနှိုင်းဖြည့်ဆည်းပေးရန်၊

(တ) တိုင် ကြားမှုများအား စီမံခန့်ခွဲခြင်းနှင့် ဖြေရှင်းမည့်လုပ်ထုံးလုပ်နည်းများထားရှိရန်၊

(ထ) အိမ်ယာပြောင်းရွှေ့ရမှုနှင့် မြေယာလျော်ကြေးပေးချေခြင်းများကို ထားဝယ်အထူးစီးပွားရေးဇုန် စီမံခန့်ခွဲမှုကော်မတီ၏ ကြီးကြပ်မှုဖြင့် ဌာနဆိုင်ရာများ၊ ဆက်စပ်ပတ်သက်သူများပါဝင်သော ကော်မတီဖွဲ့စည်း၍ ဒေသခံများနှင့် ညှိနှိုင်းသဘောတူညီချက်များရယူကာ သက်ဆိုင်ရာဝန်ကြီးဌာနများက ထုတ်ပြန်ထားသော လုပ်ထုံးလုပ်နည်းများ၊ အပြည်ပြည်ဆိုင်ရာ အလေ့အကျင့်ကောင်းများကို လိုက်နာ၍ ဆောင်ရွက်ရန်၊

(ဒ) စီမံကိန်းအတွက် သစ်ပင်များခုတ်ထွင်ရှင်းလင်းမည်ဆိုပါက သစ်တောဦးစီးဌာနထံမှ ခွင့်ပြုချက်ရယူ၍ သစ်တောဦးစီးဌာန၏ လုပ်ထုံးလုပ်နည်းများအတိုင်း လုပ်ဆောင်ရန်၊

(ဓ) စီမံကိန်းပိုင်ရှင်သည် ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း အစီရင်ခံစာပါ ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်နှင့် ပတ်ဝန်းကျင်စောင့်ကြပ်ကြည့်ရှုခြင်း အစီအစဉ်များကို အကောင်အထည်ဖော်ရာတွင် ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း အစီရင်ခံစာတွင်ဖော်ပြထားသော ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်နှင့်ပတ်ဝန်းကျင်စောင့်ကြပ်ကြည့်ရှုခြင်း အစီအစဉ်များကို အကောင်အထည်ဖော်ရန်အတွက် ရန်ပုံငွေလျာထားချက်နှင့် လုံလောက်မှုမရှိပါက ရန်ပုံငွေထပ်မံဖြည့်သွင်းဆောင်ရွက်ရန်၊

(န) ၂ လမ်းသွားလမ်းမကြီးတစ်လျှောက်ရှိ wildlife crossing နေရာများတွင် တောရိုင်းတိရစ္ဆာန်များ ဖြတ်သန်းသွားလာမှုအခြေအနေများကို စောင့်ကြပ်ကြည့်ရှုခြင်းကို monitoring program တစ်ခုခုဖြင့်ဆောင်ရွက်ရန်နှင့် wildlife crossing နေရာများတွင် တိရစ္ဆာန်များ ဖြတ်သန်းသွားနိုင်ရေးအတွက် wildlife corridor များ၊ wildlife crossing structure များ ထည့်သွင်းတည်ဆောက်ပေးရန်၊

ပြည်ထောင်စုဝန်ကြီး (ကိုယ်စား)
(ဝင်းဇော်၊ဒုတိယအမြဲတမ်းအတွင်းဝန်)

မိတ္တူကို

ညွှန်ကြားရေးမှူးချုပ်
ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာန

The Republic of the Union of Myanmar

Ministry of Natural Resources and Environmental Conservation

No: (Forest) 3 (2)/16(D) (1874/2018)

Date: 31st May, 2018

To

Dawei Special Economic Zone Committee

Subject: Matter about submitting to reply the confirmation for Environmental and Social Impact Assessment Report of Two Lane Project which plan to implement by Myandawei Industrial Estate Co., Ltd at Dawei Special Economic Zone

Reference: Letter No. Hta Wa-6/ DSEZ/ 2018 (098), dated on 10-4- 2018 by DSEZ Management Committee

There was resubmitting the Final Revised Environmental Impact Assessment Report with complete responses for Two Lane Project, which plan to implement at DSEZ Initial Phase by Myandawei Industrial Estate Co., Ltd. In accordance with the resubmitting final revised Environmental Impact Assessment Report which is match with Environmental Impact Assessment Procedure (Paragraph 63). Therefore, Ministry of Natural Resources and Environment Conservation is approved and project developer must support the following during the project develop:

(a) Project developer must implements the Environmental impact (emission, wastewater, noise, odor and effluent quality) monitoring at pre-construction, construction, operation, decommissioning, closure and post-closure phase of project with National Environmental Quality (Emission) Guidelines.

(b) Project developer must implements the Air Quality Monitoring, Noise Monitoring, Surface Water Quality Monitoring, Forest and Wildlife Monitoring, Transportation Monitoring which included in EMP of operation phase.

(c) Emission of air quality, noise and vibration must complies with National Environmental Quality (Emission) Guidelines and monitoring must implement at construction sites, transport routes, along the road and nearest villages of a long road construction.

(d) Project includes 21 bridges construction and monitoring of water quality and effluent must implement at every bridges construction site.

(e) Project developer must follows mitigation measures, environmental management plan and their sub-plan and monitoring for environmental, social and health impact which described at EIA report.

(f) Must follows all of the commitments which described at EIA report.

(g) Residual impact and safety must monitors and complies with rules and regulations, standard and guidelines.

(h) Myandawei Industrial Estate must informs to Environmental Conservation Department (ECD) when project design and operation changed.

(i) Must connects continuously with local and stakeholders and emphasis their comments and suggestions.

(j) Environmental Management Plan and Monitoring Report must submit to Environmental Conservation Department (ECD) at specified period.

(k) Must follows every instructions which described at Environmental Impact Assessment Procedure.

(l) Myandawei Industrial Estate Co., Ltd must distributes EIA Executive Summary (Myanmar version) and environmental and social commitments (Myanmar version) to stakeholders.

(m) Project developer must announces to public about the EIA report which already received approval from government.

(n) Project developer must supports Corporate Social Responsibility (CSR).

(o) Project developer must emphasizes the comments and suggestions of related governments, other parties, NGOs and stakeholders which suggested at disclosure of public consultation meeting, consultation and clarification meeting of EIA report.

(p) Must prepares Grievance Mechanism for complaints.

(q) Related government department and stakeholder must implement committee under management of Dawei Special Economic Zone Committee for relocation and land compensation. This committee must negotiate with local by following procedures of related Ministry and international practices.

(r) When forest clearing is required to operate, permission of Forest Department is required and must follow procedure from Forest Department.

(s) When estimate budget for environmental management plan and monitoring plan implementation are not enough, must add budget.

(t) Wildlife crossing monitoring plan must implements along 2 lane road and must constructs wildlife corridor and wildlife crossing structure for wildlife crossing.

Signature

Behalf of Union Minister
Win Zaw, Vice Permanent
Secretary

Cc to;

- Director
- Environmental Conservation Department

MYANDAWEI INDUSTRIAL ESTATE COMPANY LIMITED

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စာအမှတ် - MIE ၁၂/၂၀၁၈

၂၀၁၈ခုနှစ် ဇွန်လ ၂၁ရက်
သယံဇာတနှင့် သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဝန်ကြီးဌာန
ရုံးအမှတ် (၁၉)
နေပြည်တော်၊ မြန်မာ

ရည်ညွှန်းချက်။ ဦးလှမောင်သိန်း
ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာန

အကြောင်းအရာ။ ထားဝယ်အထူးစီးပွားရေးဇုန် (DSEZ) တွင် အကောင်အထည်ဖော်တည်ဆောက်မည့် နှစ်လမ်းသွားဖောက်လုပ်ရေး စီမံကိန်း၏ ပတ်ဝန်းကျင်နှင့် လူမှုရေးဆိုင်ရာထိခိုက်မှု ဆန်းစစ်ခြင်း အစီရင်ခံစာ (ပတ်ဝန်းကျင် စီမံခန့်ခွဲမှု အစီအစဉ် EMP ပါဝင်သော) တင်ပြခြင်း

သို့
ဦးအုန်းဝင်း

Myandawei Industrial Estate Company Limited (MIE)၏ ညွှန်ပြချက်များနှင့် TEAM Consulting Engineering and Management Co., Ltd. မှ ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ထုံး လုပ်နည်း (၂၀၁၅ခုနှစ်၊ ဒီဇင်ဘာလ ၂၉ ရက်နေ့)နှင့်အညီ ပတ်ဝန်းကျင်နှင့် လူမှုရေးဆိုင်ရာထိခိုက်မှု ဆန်းစစ်ခြင်း (ESIA) ကိုပြင်ဆင်ပြီး Myandawei Industrial Estate Company Limited မှ ပတ်ဝန်းကျင်ထိန်းသိမ်းရေး ဦးစီးဌာန (ECD) သို့ ၂၀၁၇ခုနှစ် မေလ ၂၉ ရက်နေ့တွင် တရားဝင် တင်သွင်း ခဲ့ပါသည်။

ဤနေရာတွင် သယံဇာတနှင့် သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဝန်ကြီးဌာန (MONREC) ၏ တရားဥပဒေအရ ဘောင်ဝင်စေရန်နှင့် ဘဏ္ဍာရေးအရ ယုံကြည်စိတ်ချရန်အလို့ငှာ အောက်ပါအတိုင်း ဖော်ပြထား ပါသည်။

က။ သယံဇာတနှင့် သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဝန်ကြီးဌာန (MONREC) မှ ပတ်ဝန်းကျင်နှင့် လူမှုရေးဆိုင်ရာထိခိုက်မှု ဆန်းစစ်ခြင်း (ESIA) အားပြီးမြောက်မှုနှင်ကန်ကြောင်း ထောက်ခံ အတည်ပြုပါသည်။

၃။ သယံဇာတနှင့် သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေး ဝန်ကြီးဌာန (MONREC) မှ ပတ်ဝန်းကျင်ထိခိုက်မှု ဆန်းစစ်ခြင်း (EIA) သည် ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ထုံးလုပ်နည်းနံပါတ် အပါအဝင် မြန်မာနိုင်ငံ၏ ဥပဒေများနှင့်အညီ အတိအကျလိုက်နာ ပြင်ဆင်ထားကြောင်း တာဝန်ယူ အတည်ပြုခြင်းနှင့် နယ်ပယ်အတိုင်းအတာသတ်မှတ်ခြင်း အစီရင်ခံစာကို သယံဇာတနှင့် သဘာဝ ပတ်ဝန်းကျင် ထိန်းသိမ်းရေး ဝန်ကြီးဌာန (MONREC) မှ ၂၀၁၅ခုနှစ် နိုဝင်ဘာလ ၁၉ ရက်တွင်အသိအမှတ်ပြုခဲ့ပြီး ပတ်ဝန်းကျင် ထိန်းသိမ်းရေး ဦးစီးဌာန(ECD) မှ အသိအမှတ်ပြုသက်သေလက်မှတ် စာအမှတ် EIA - ၂/၂ (၁၂၉/၂၀၁၇) ကို ၂၀၁၇ခုနှစ် ဇန်နဝါရီလ ၃၀ရက်တွင် ရရှိခဲ့ပါသည်။

၄။ ယခုစီမံကိန်းသည် Myandawei Industrial Estate Company Limited မှ အကောင်အထည်ဖော်သော နှစ်လမ်းသွားလမ်းဖောက်လုပ်ရေး စီမံကိန်းဖြစ်ပြီး (က) EIA တွင် ပါဝင်ရမည့် ကတိကဝတ်များနှင့် တာဝန်ဝတ္တရားများ (ခ) အစီအစဉ်အားလုံးနှင့် အမျိုးမျိုး သော အစိတ်အပိုင်းများအတွက် အကန့်အသတ်မဲ့ခြင်း၊ ထိခိုက်မှုရှောင်ရှားခြင်း၊ လျော့ချခြင်း နှင့် ပြန်လည် ကုစားမှုနည်းလမ်းများပါဝင်ကြောင်းကို သယံဇာတနှင့် သဘာဝပတ်ဝန်းကျင် ထိန်းသိမ်းရေး ဝန်ကြီးဌာနမှ တာဝန်ယူ အတည်ပြုပြီး စီမံကိန်း ဖွံ့ဖြိုး တိုးတက်ရေး၊ တည်ဆောက်ရေး၊ လုပ်ငန်းအပ်နှံရေး၊ လုပ်ငန်းလည်ပတ်ရေးနှင့် စီမံကိန်း ထိန်းသိမ်းမှု များအတွက် ကတိကဝတ်များ၊ တာဝန်ယူမှုများ၊ အစီအစဉ်များနှင့် နည်းလမ်းများအား ဆောင်ရွက်ရန် ကန်ထရိုက်တာ၊ ဆပ်ကန်ထရိုက်တာ သို့မဟုတ် အခြားသော အဖွဲ့အစည်း အားဆောင်ရွက်စေပါမည်။

၅။ ကျရှုံးမှားယွင်းမှုများ ဖြစ်ပေါ်ခဲ့ပါက သယံဇာတနှင့် သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေး ဝန်ကြီးဌာန (MONREC) သို့ ငွေကြေးပေးလျော်ခြင်းနှင့် ဥပဒေ သို့မဟုတ် စီမံကိန်း၏ လိုက်လျော သဘော တူညီမှု နှင့် ၄င်း၏ နောက်ဆက်တွဲများအတွက် ပြစ်ဒဏ်ပေးလျော်ခြင်း တို့ကို သဘောတူ လက်ခံပြီး သယံဇာတနှင့် သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေး ဝန်ကြီးဌာန (MONREC)မှ သတ်မှတ်သော ကုန်ကျစရိတ်များနှင့် သင့်တော်သော ပြုပြင်မှုများအတွက် Myandawei Industrial Estate Company Limited မှ တာဝန်ယူ ဆောင်ရွက်သွားပါမည်။

၆။ ကျရှုံးမှားယွင်းမှုများကို သယံဇာတနှင့် သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေး ဝန်ကြီးဌာန (MONREC)မှ ပြန်လည်ပြုပြင်ရန် ခွင့်ပြုချက်အား ကုမ္ပဏီမှ ဆောင်ရွက်ရမည်။ ခွင့်ပြုချက်၊ သဘော တူညီချက် စည်ကမ်း သတ်မှတ်ချက်များနှင့် မကိုက်ညီပါက မြန်မာနိုင်ငံအစိုးရ၏ အခြားသော သတ်မှတ်ချက်အတိုင်း ကုစားရမည် ဖြစ်ပါသည်။

ယခုအတည်ပြုချက် နှင့် လိုအပ်သော တာဝန်ယူမှုအားလုံးကို ပူပေါင်းတာဝန်ယူလုပ်ဆောင်ခဲ့ကာ Myandawei Industrial Estate Company Limited မှ တာဝန်ယူလုပ်ပိုင်ခွင့်ရထားပြီး လက်မှတ်ရေးထိုးခွင့် ခွင့်ပြုချက်ပေးအပ်သော ရှေ့နေ၏ အာဏာနှင့် အောက်ဖော်ပြရာနေရာတွင် တာဝန်ရှိသူတစ်ဦးမှ အတိအလင်း လက်မှတ်ရေးထိုးလိုက်ပါသည်။

.....

မှ Myandawei Industrial Estate Company Limited
အမည် Dr.Somchet Thinaphong
ရာထူး မန်နေးဂျင်း ဒါရိုက်တာ

MYANDAWEI INDUSTRIAL ESTATE COMPANY LIMITED

MYANDAWEI
INDUSTRIAL ESTATE
COMPANY LIMITED

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Reference No. MIE 12 / 2018

21st June 2018

Ministry of Natural Resource and Environmental Conservation
Office No. (19)
Nay Pyi Taw, Myanmar

Attn: U Hla Maung Thein
Environmental Conservation Department

Re: Environmental and Social Impact Assessment Report in respect of the Dawei SEZ Initial Phase Development of Two Lane Project (the "ESIA including EMP")

Dear U Ohn Win,

We refer to the captioned ESIA, which was prepared and finalized by TEAM Consulting Engineering and Management Co., Ltd. in accordance with the Environmental Impact Assessment Procedure (29th December 2015) under the instructions of Myandawei Industrial Estate Company Limited (MIE) and formally submitted by Myandawei Industrial Estate Company Limited to Environmental Conservation Department (ECD) under letter dated 29th May 2017.

Intending to be legally bound hereby and financially liable to Ministry of Natural Resource and Environmental Conservation/MONREC hereunder, we:

a. Endorse and confirm to Ministry of Natural Resource and Environmental Conservation/MONREC the accuracy and completeness of the ESIA,

b. Confirm and undertake to Ministry of Natural Resource and Environmental Conservation/ MONREC that the ESIA has been prepared in strict compliance with applicable Myanmar law, including EIA Procedures (2015) and with the Scoping Report / Terms of Reference dated 19th November, 2015 as approved by Ministry of Natural Resource and Environmental Conservation/MONREC on 30th January, 2017 evidenced by No. EIA-2/2 (129/2017) and

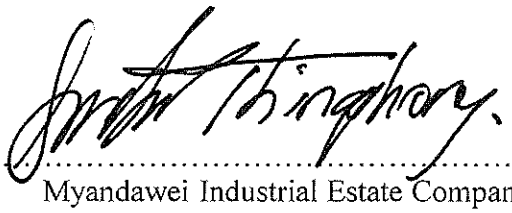
c. Confirm and undertake to Ministry of Natural Resource and Environmental Conservation/ MONREC that the project company established by Myandawei Industrial Estate Company Limited in respect of the Two Lane project shall at all times comply fully with: (i) any and all commitments and obligations as set forth in the EIA, and (ii) any and all plans and the various components thereof, including without limitation, impact avoidance, mitigation, and remediation measures, and with respect to both (i) and (ii), including but not limited to such commitments, obligations, plans and measures as relate to the development,

construction, commissioning, operation and maintenance of the project, and any circumstance in which work done or to be done, or services performed or to be performed, in connection with the project's development, construction, commissioning, operation and maintenance is carried out or intended or required to be carried out by any contractor, subcontractor or other party.

d. We acknowledge and agree that any failure to so comply shall subject us to liability for breach of this undertaking and that, in addition to making financial compensation to Ministry of Natural Resource and Environmental Conservation/MONREC and payment of any applicable penalties under the law or under the project's concession agreement and its appendixes, Myandawei Industrial Estate Company Limited shall be responsible to Ministry of Natural Resource and Environmental Conservation/MONREC to carry out and bear all costs of the immediate and proper rectification of the event of non-compliance and any effects thereof.

e. We acknowledge and agree, further, that any failure to so comply may be treated by Ministry of Natural Resource and Environmental Conservation/MONREC as a breach by the project company under the concession agreement which, if not rectified in accordance with the terms and conditions of the concession agreement, may lead to termination or other due exercise by the GOVERNMENT OF MYANMAR of remedies available to it thereunder.

The issuance of this confirmation and undertaking has been duly authorized by all necessary corporate actions and a copy of the resolution of the Myandawei Industrial Estate Company Limited authorizing it and the power of attorney explicitly granting signing authorization to the individual who has signed below are attached as schedules hereto.



By: Myandawei Industrial Estate Company Limited
Name: Dr.Somchet Thinaphong
Title: Managing Director

နှစ်လမ်းသွားဖောက်လုပ်ရေးစီမံကိန်း

စီမံကိန်း၏ ပတ်ဝန်းကျင်နှင့် လူမှုရေးဆိုင်ရာ ထိခိုက်မှုဆန်းစစ်ခြင်း (ESIA) အတွက် ကတိကဝတ်များ

ကတိကဝတ်ဖော်ပြရွက်နေရာ	ကတိကဝတ်
ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း (EIA) အစီရင်ခံစာ	
အခန်း (၃) မူဝါဒ၊ ဥပဒေဆိုင်ရာနှင့် ခွဲ့စည်းဆောင်ရွက်ပုံဆိုင်ရာ ဇေယျသုံးသပ်ချက်	
အပိုင်း ၃.၁ - ပတ်ဝန်းကျင်နှင့် လူမှုရေးဆိုင်ရာ မူဝါဒများ ပေါင်းစပ်ခြင်း	စီမံကိန်း အကောင်အထည်ဖော်သူသည် တည်ဆောက်ဆဲကာလနှင့် လုပ်ငန်းလည်ပတ်ဆောင်ရွက်သည့်ကာလများတွင် ဖြစ်ပေါ်လာသော ပတ်ဝန်းကျင်နှင့်လူမှုရေးဆိုင်ရာ စီမံခန့်ခွဲမှုများအတွက် ပတ်ဝန်းကျင်နှင့်လူမှုရေးဆိုင်ရာ မူဝါဒများကို လမ်းညွှန် သွားပါမည်။
အပိုင်း ၃.၂.၁ - ပတ်ဝန်းကျင်ဆိုင်ရာစီမံခန့်ခွဲမှု အခြေခံများအတွက် ပေါ်လစီနှင့် ဥပဒေဆိုင်ရာ မူဘောင်များ	စီမံကိန်းအကောင်အထည်ဖော်သူသည် အမျိုးသားပတ်ဝန်းကျင်ဆိုင်ရာ ပေါ်လစီ (၁၉၉၄)၊ ပတ်ဝန်းကျင်ထိန်းသိမ်းရေး ဥပဒေ (၂၀၁၂) နှင့် ပတ်ဝန်းကျင် ထိန်းသိမ်းရေး နည်းဥပဒေ (၂၀၁၄) တို့ကို လိုက်နာဆောင်ရွက်ပါမည်။
အပိုင်း ၃.၂.၂ - ပတ်ဝန်းကျင် ထိခိုက်မှု ဆန်းစစ်ခြင်းနှင့် စီမံခန့်ခွဲမှုနှင့် သက်ဆိုင်သော စည်းမျဉ်းများ	စီမံကိန်းအကောင်အထည်ဖော်သူသည် ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ထုံးလုပ်နည်း (၂၀၁၅) နှင့် အမျိုးသားပတ်ဝန်းကျင်ဆိုင်ရာ အရည် အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန်ချက်များ (၂၀၁၅) တို့ကို လိုက်နာဆောင်ရွက်ပါမည်။
အပိုင်း ၃.၂.၃ - ပတ်ဝန်းကျင် ကာကွယ်ရေးနှင့် လူမှုရေး ထိခိုက်မှု စီမံခန့်ခွဲမှုများနှင့် သက်ဆိုင်သော ဥပဒေနှင့် စည်းမျဉ်းများ	စီမံကိန်းအကောင်အထည်ဖော်သူသည် အောက်ဖော်ပြတို့ကို လိုက်နာသွားမည် ဖြစ်ပါသည်။ • ပေါက်ကွဲမှု အက်ဥပဒေ (၁၈၈၇) - အပိုဒ် ၆ (၃)၊ ၇ (၁)၊ ၈၊ ၁၃ • အလုပ်သမားလျော်ကြေးအက်ဥပဒေ (၁၉၂၃) - အပိုဒ် ၃ (၁)၊ ၁၂ (၁)၊ ၁၄ (၁) • ခွင့်နှင့်အလုပ်ပိတ်ရက်များ အက်ဥပဒေ (၁၉၅၁) - အပိုဒ် ၅၈ (၂၀၁၄ ခုနှစ် ဇူလိုင်လတွင် ဥပဒေကို ပြင်ဆင်ခဲ့သည်) • ပြည်သူ့ကျန်းမာရေး ဥပဒေ (၁၉၇၂) • မော်တော်ကား နည်းဥပဒေ (၁၉၈၇) • ရေရှိုင်းလုပ်ငန်း ဥပဒေ (၁၉၉၁) - အပိုဒ် ၄၀ • သစ်တော ဥပဒေ (၁၉၉၂) - အပိုဒ် ၁၂ • မြန်မာ့အာမခံလုပ်ငန်း ဥပဒေ (၁၉၉၃) - အပိုဒ် ၁၆ • တောရိုင်းတိရစ္ဆာန်ကာကွယ်ရေးနှင့် သဘာဝသယံဇာတများ ထိန်းသိမ်းရေး ဥပဒေ (၁၉၉၄) • ယဉ်ကျေးမှုအမွေအနှစ်ဒေသများ ကာကွယ်ထိန်းသိမ်းရေး ဥပဒေ (၁၉၉၈)၊ အမှတ်စဉ် ၁/၂၀၁၉ အဖြစ် ပြင်ဆင်ခဲ့သည်။ • ရေအရင်းအမြစ်နှင့် မြစ်၊ ချောင်းများ ထိန်းသိမ်းရေး ဥပဒေ (၂၀၁၆) - အပိုဒ် ၈၊ ၁၁ (က)၊ ၁၉ • အလုပ်သမားအဖွဲ့အစည်းဥပဒေ (၂၀၁၁) - အပိုဒ် ၁၈၊ ၂၁၊ ၂၇၊ ၂၉၊ ၃၁၊ ၄၂၊ ၄၃ • လူမှုဖူလုံရေး ဥပဒေ (၂၀၁၂) - အပိုဒ် ၁၅၊ ၁၆၊ ၁၈ (က) (ခ)၊ ၄၈ (က)၊ ၅၁၊ ၅၃၊ ၅၄၊ ၇၅ (က) (ခ) • ပတ်ဝန်းကျင်ထိန်းသိမ်းရေး ဥပဒေ (၂၀၁၂) • အလုပ်သမားရေးရာ အငြင်းပွားမှုဖြေရှင်းရေး ဥပဒေ (၂၀၁၂) - အပိုဒ် ၃၉ • အနုည်းဆုံးအခကြေးငွေ ဥပဒေ (၂၀၁၃) - အပိုဒ် ၁၂၊ ၁၃၊ ၁၈ • မြန်မာနိုင်ငံ အင်ဂျင်နီယာကောင်စီဥပဒေ (၂၀၁၃) - အပိုဒ် ၃၄၊ ၃၇ • အလုပ်အကိုင်နှင့် ကျွမ်းကျင်မှု ဖွံ့ဖြိုးတိုးတက်ရေး ဥပဒေ (၂၀၁၃) - အပိုဒ် ၁၄၊

ကတိကဝတ်ဖော်ပြချက်နေရာ	ကတိကဝတ်
	၁၅၊ ၃၀ • အမျိုးသား ပတ်ဝန်းကျင်ဆိုင်ရာ အရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန်ချက်များ (၂၀၁၅) • တိုင်းရင်းသားလူမျိုးများ အကျိုးစီးပွား ကာကွယ်စောင့်ရှောက်ရေး ဥပဒေ (၂၀၁၅) - အပိုဒ် ၅ • မြန်မာနိုင်ငံ မီးသတ်တပ်ဖွဲ့ဥပဒေ (၂၀၁၅) - အပိုဒ် ၂၅ • ရှေးဟောင်းအဆောက်အအုံများ ကာကွယ်ထိန်းသိမ်းရေး ဥပဒေ (၂၀၁၅) - အပိုဒ် ၁၂ • ရှေးဟောင်းဝတ္ထုပစ္စည်းများ ကာကွယ်ထိန်းသိမ်းရေး ဥပဒေ (၂၀၁၅) - အပိုဒ် ၁၂၊ ၁၅ (ဇ)၊ ၂၀ (စ) • မော်တော်ယာဉ် ဥပဒေ (၂၀၁၅) - အပိုဒ် ၅၁၊ ၅၂၊ ၅၄၊ ၅၇ • မြန်မာနိုင်ငံ ရင်းနှီးမြှုပ်နှံမှု ဥပဒေ (၂၀၁၆) - အပိုဒ် ၅၀ (က) (ဃ)၊ ၅၁ (ခ) (ဂ) (ဃ)၊ ၆၅ (ဆ) (ဈ) (ည) (ဋ) (ဌ) (ဍ) (ဏ) (တ) (ထ) • အခကြေးငွေပေးချေရေး အက်ဥပဒေ (၂၀၁၆) - အပိုဒ် ၄၊ ၇၊ ၈၊ ၉၊ ၁၀၊ ၁၁ • လယ်သမားဥပဒေ (၂၀၁၂) တို့ဖြစ်ပါသည်။
အပိုင်း ၃.၂.၄ - စီမံကိန်းနေရာ အတွက်သီးသန့် ဥပဒေ	စီမံကိန်းအကောင်အထည်ဖော်သူသည် အောက်ဖော်ပြပါ မြန်မာအထူးစီးပွားရေးဇုန် ဥပဒေဖြစ်သော အပိုဒ် ၁၁ (စ) (တ)၊ ၇၄၊ ၇၅၊ ၇၆၊ ၈၀ (က) (ခ)နှင့် ထားဝယ် အထူး စီးပွားရေးဇုန် ဥပဒေ - အပိုဒ် ၈ (ဆ)၊ ၁၀ (က) (ဂ)၊ ၃၁၊ ၃၃ (က) (ငါး) တို့ကို လိုက်နာ ဆောင်ရွက်သွားမည် ဖြစ်ပါသည်။
အပိုင်း ၃.၃ - အပြည်ပြည် ဆိုင်ရာ လုပ်ထုံးလုပ်နည်းများ၊ စာချုပ်များနှင့် သဘော တူညီချက်များ	စီမံကိန်းအကောင်အထည်ဖော်သူသည် အောက်ဖော်ပြတို့ကို လိုက်နာသွားမည် ဖြစ်ပါသည်။ • အရှေ့တောင်အာရှနှင့် ပစိဖိတ်ဒေသများအတွက် ဓါတ်အားပေးစက်ရုံ ကာကွယ်ရေး သဘောတူညီချက်၊ ရောမ၊ ၁၉၅၆ခုနှစ် • ကုလသမဂ္ဂ ရာသီဥတုပြောင်းလဲခြင်းဆိုင်ရာ ညီလာခံ (UNFCCC)၊ နယူးယောက်၊ ၁၉၉၂ခုနှစ် • ဇီဝမျိုးကွဲများဆိုင်ရာ ညီလာခံ၊ ရီယိုဒီ ဂျနေရို၊ ၁၉၉၂ခုနှစ် • ကမ္ဘာ့ယဉ်ကျေးမှုနှင့် သဘာဝ အမွေအနှစ်များ ကာကွယ်ခြင်းညီလာခံ၊ ပဲရစ်(စ်)၊ ၁၉၇၂ • သဘာဝပတ်ဝန်းကျင်နှင့် သဘာဝအရင်းအမြစ်များ ထိန်းသိမ်းရေး အာဆီယံ (ASEAN) သဘောတူညီမှု ၊ ကွာလာလမ်ပူ၊ ၁၉၈၅ • ကာတာဂျီနာ (Catagena) ဇီဝလုံခြုံမှု သဘောတူညီမှုစာချုပ် ကာတာဂျီနာ၊ ၂၀၀၀ ခုနှစ် • ရာသီဥတုပြောင်းလဲခြင်းဆိုင်ရာ ကျိုတိုသဘောတူညီမှု ၊ ကျိုတို၊ ၁၉၉၇ ခုနှစ် တို့ဖြစ်ပါသည်။
အပိုင်း ၃.၄.၁ - အမျိုးသားဆိုင်ရာ နှင့် ကဏ္ဍအဆင့်အလိုက် အစီအစဉ်များ	စီမံကိန်းအကောင်အထည်ဖော်သူသည် သယံဇာတနှင့် သဘာဝပတ်ဝန်းကျင် ထိန်းသိမ်းရေး ဝန်ကြီးဌာန (MONREC) လက်အောက်ရှိ ပတ်ဝန်းကျင်ထိန်းသိမ်း ရေးဦးစီးဌာန (ECD) မှ ထုတ်ပြန်ထားသော ပတ်ဝန်းကျင် ထိန်းသိမ်းစောင့်ရှောက် ရေး ကော်မတီ (ENCC) ကို လိုက်နာ ဆောင်ရွက်ပါမည်။
အပိုင်း ၃.၄.၂ - စီမံကိန်းနေရာ၏ အစီအစဉ်များ	စီမံကိန်းအကောင်အထည်ဖော်သူသည် မြန်မာနိုင်ငံ၏ အေသအုပ်ချုပ်ရေး ဖွဲ့စည်းပုံ နှင့် ထားဝယ်အထူးစီးပွားရေးဇုန် စီမံခန့်ခွဲမှုကော်မတီတို့ကို လိုက်နာ ဆောင်ရွက်ပါမည်။
ဇယား ၃.၄-၁ - ထားဝယ်အထူး စီးပွားရေးဇုန်မှ သက်ဆိုင်ရာ တာဝန်ရှိ ဦးစီးဌာနများ၏ တာဝန်နှင့် ဝတ္တရားများ	စီမံကိန်းအကောင်အထည်ဖော်သူသည် အောက်ဖော်ပြပါတို့ကို လိုက်နာသွားမည် ဖြစ်ပါသည်။ • အထွေထွေအုပ်ချုပ်ရေး ဦးစီးဌာန

ကတိကဝတ်ဖော်ပြချက်နေရာ	ကတိကဝတ်
	• လူထုအခြေချခြင်းနှင့် အိုးအိမ် ဦးစီးဌာန • လူဝင်မှုကြီးကြပ်ရေးနှင့် အမျိုးသားမှတ်ပုံတင် ဦးစီးဌာန • မြန်မာနိုင်ငံ ရဲတပ်ဖွဲ့ • အလုပ်သမား ဦးစီးဌာန • ကုန်သွယ်ရေး ညွှန်ကြားမှု ဦးစီးဌာန • ဖွံ့ဖြိုးတိုးတက်မှုရေးရာ ဦးစီးဌာန • လမ်းပန်းဆက်သွယ်ရေး ဦးစီးဌာန • ရင်းနှီးမြှုပ်နှံခြင်းနှင့် ကုမ္ပဏီအုပ်ချုပ်ရေး ဦးစီးဌာန • အကောက်ခွန် ဦးစီးဌာန • ဥပဒေ၊ တရားရုံးနှင့် တရားမျှတမှု ဦးစီးဌာန • မြို့တော်စည်ပင် ဦးစီးဌာန • တနလ်ာရီတိုင်းဒေသကြီး၏ ကိုယ်စားပြုအဖွဲ့အစည်းတို့ဖြစ်ပါသည်။
အပိုင်း ၃.၅.၁ - IFC ၏ စံနှုန်းနှင့် လမ်းညွှန်ချက်များ	စီမံကိန်းအကောင်အထည်ဖော်သူသည် ၂၀၁၂ ခုနှစ် ဇန်နဝါရီလ ၁ရက်နေ့တွင် ထုတ်ပြန်ထားသော ပတ်ဝန်းကျင်နှင့် လူမှုရေးရေရှည်တည်တံ့မှုဆိုင်ရာ လုပ်ဆောင်မှု စံနှုန်းများနှင့် ၂၀၀၇ ခုနှစ် ဧပြီလ ၃၀ ရက်နေ့တွင် ထုတ်ပြန်ထားသော ပတ်ဝန်းကျင်၊ ကျန်းမာရေးနှင့် ဘေးကင်းလုံခြုံရေး ယေဘူယျ လမ်းညွှန်ချက်များကို လိုက်နာ ဆောင်ရွက်ပါမည်။
အပိုင်း ၃.၅.၂ - ကမ္ဘာ့ဘဏ်	စီမံကိန်းအကောင်အထည်ဖော်သူသည် ကမ္ဘာ့ဘဏ်မှထုတ်ပြန်ထားသောညစ်ညမ်းမှုကာကွယ်ရေးနှင့် လျော့ချရေးဆိုင်ရာလက်စွဲစာအုပ် (PPAH)ကို လိုက်နာ ဆောင်ရွက်ပါမည်။
ဇယား ၃.၆-၁ - ဆက်စပ်နေ သော ပတ်ဝန်းကျင်ဆိုင်ရာ လမ်းညွှန်ချက်များနှင့် စံနှုန်းများ	စီမံကိန်းအကောင်အထည်ဖော်သူသည် အောက်ဖော်ပြပါတို့ကို စီမံခန့်ခွဲပြီး ထိခိုက်မှုများကို ထိန်းချုပ်သွားမည် ဖြစ်ပါသည်။ • ပတ်ဝန်းကျင်လေထု အရည်အသွေး • ပတ်ဝန်းကျင်ဆူညံသံ အဆင့်များ • တုန်ခါမှု • မြေအောက်ရေ အရည်အသွေးတို့ ဖြစ်ပါသည်။
အခန်း (၄) - စီမံကိန်းဖော်ပြချက်နှင့် အခြားသော ရွေးချယ်နည်းလမ်းများ	
အပိုင်း ၄.၂.၂.၁ - စီမံကိန်း ဖော်ပြချက်	စီမံကိန်းသည် လက်ရှိဖောက်လုပ်ပြီးသား လမ်းချောမခင်းရသေးသည့် နစ်လမ်းသွား လမ်းကို ထိုင်းနိုင်ငံ၏ အဝေးပြေးလမ်း ဦးစီးဌာန (DOH)၏ စံနှုန်း ဖြစ်သည့် အဆင့် (၄) အဝေးပြေးဒီဇိုင်း စံနှုန်းများဖြင့် ဖောက်လုပ်သွားပါမည်။
အပိုင်း ၄.၂.၂.၃ - စီမံကိန်း ဒီဇိုင်း	စီမံကိန်းအကောင်အထည်ဖော်သူသည် အောက်ဖော်ပြပါတို့ကို လိုက်နာဆောင်ရွက် ပါမည်။ • စီမံကိန်းလမ်း၏ ဘူမိဆိုင်ရာ ဒီဇိုင်းသည် ထိုင်းနိုင်ငံ၏ အဝေးပြေးဆိုင်ရာ စံနှုန်းဖြစ်သော " အဝေးပြေးလမ်းနှင့် လမ်းမများအတွက် ဘူမိဒီဇိုင်းဆိုင်ရာ ပေါ်လစီ၊ ၂၀၀၄ ခုနှစ်" ကို လိုက်နာသွားမည် ဖြစ်ပါသည်။ • တံတားများ၏ ဖွဲ့စည်းပုံဒီဇိုင်းများသည် AASHTO LRFD တံတားအသေးစိတ် ဒီဇိုင်းနှင့် HL-93 အဝေးပြေးလမ်း စံနှုန်းတို့ကို လိုက်နာသွားမည် ဖြစ်ပါသည်။ • စီမံကိန်းလမ်းတွင် လမ်းအသုံးပြုခကောက်ခံသည့်နေရာများထည့်သွင်းခြင်းဖြင့် လည်ပတ်သွားမည် ဖြစ်ပါသည်။ • လျောစောက်တည်မြို့မှု၊ တိုက်စားမှု ထိန်းချုပ်ခြင်း၊ အမျိုးမျိုးသော ဒီဇိုင်း စံနှုန်းများ၏ အသေးစိတ်ဒီဇိုင်းကို အောက်ဖော်ပြပါအတိုင်း လိုက်နာသွားမည် ဖြစ်ပါသည်။ - အာဆီယံ (ASEAN) အဝေးပြေးဒီဇိုင်း စံနှုန်း - AASHTO - အဝေးပြေးလမ်းဒီဇိုင်းအတွက် မြန်မာနိုင်ငံ နည်းပညာ စံနှုန်း

ကတိကဝတ်ကော်ပြချက်နေရာ	ကတိကဝတ်
	- အဝေးပြေးလမ်း စွမ်းဆောင်မှု လက်စွဲ - ထိုင်းနိုင်ငံ၏ အဝေးပြေးလမ်း ဦးစီးဌာန • WWF၏ လမ်းဖောက်လုပ်ခြင်းအတွက် ဒီဇိုင်းလက်စွဲလေ့လာမှုစာတမ်းမှ အကြံပေး ချက်များကို ထည့်သွင်းစဉ်းစားကာ စီမံကိန်းလမ်းဒီဇိုင်းပြင်ဆင်မှုနှင့် ဆောက်လုပ်ရေး လုပ်ငန်းများတွင် ထည့်သွင်း အသုံးပြုသွားပါမည်။
အပိုင်း ၄.၂.၃ - စီမံကိန်း အခြားရွေးချယ်စရာများ	ယခုစီမံကိန်းသည် လက်ရှိဖောက်လုပ်ထားပြီးသား လမ်းဟောင်းကို ပြန်လည် အဆင့်မြှင့်တင်သည့် စီမံကိန်းဖြစ်သောကြောင့် အခြားအရွေးချယ်စရာများ မရှိပေ။ နှစ်လမ်းသွားလမ်းသည် ကနဦးကာလ ထားဝယ်အထူးစီးပွားရေးဇုန် ဖွံ့ဖြိုးတိုးတက်မှု အတွက် များပြားလာသော ယာဉ်သွားလာမှုများအတွက် ဖောက်လုပ်ခြင်းဖြစ်ပြီး ရင်းနှီးမြှုပ်နှံမှု နည်းနည်းနှင့် လုပ်ဆောင်ခြင်းဖြစ်သည်။ မြေပိုင်ရှင်များ၊ သက်ဆိုင်ရာ အာဏာပိုင်များ၏ ခွင့်ပြုချက်များရရှိစေရန် မြေပိုင်ရှင်များကို အကြောင်းကြားကာ ခွင့်ပြုချက်တောင်းခံပြီး စီမံကိန်း ဖွံ့ဖြိုးတိုးတက်မှုအတွက် ကနဦး ပေးလျော်မှုကို RAP အစီရင်ခံစာတွင် ဖော်ပြချက် အတိုင်း ပေးလျော်မှုကော်မတီနှင့်အတူ ငွေပေးလျော်မှုများ စတင်လုပ်ဆောင် ပါမည်။
အခန်း (၆) - ထိခိုက်သက်ရောက်မှု ဆန်းစစ်ခြင်းနှင့် လျော့ချရေးနည်းလမ်းများ	
အပိုင်း ၆.၂ - အကြိုတည် ဆောက်ရေးကာလ - ထိခိုက်မှု သတ်မှတ်ခြင်း၊ ဆန်းစစ်ခြင်းနှင့် လျော့ချခြင်း	စီမံကိန်းအကောင်အထည်ဖော်သူသည် EPC နှင့် ပူးပေါင်းကာ လျော့ချရေး နည်းလမ်း များကို အောက်ဖော်ပြပါအတိုင်း လိုက်နာဆောင်ရွက်သွားမည် ဖြစ်ပါသည်။ <u>မြေယာ ရယူခြင်း</u> • ပေးလျော်ခြင်းများပြုလုပ်ရာတွင် သက်ဆိုင်ရာအပြည်ပြည်ဆိုင်ရာ စံနှုန်းများ နှင့်အညီ လုပ်ဆောင်ပြီး ထိခိုက်ခံစားရသူများအတွက် နေထိုင်မှုစံနှုန်းများ တိုးတက်စေရန် ရည်ရွယ်ချက်များဖြင့် လုပ်ဆောင်သွားပါမည်။ ကောက်ပဲ သီးနှံများ၊ တန်ဖိုးရှိသော သစ်ပင်များအားလုံးကို ပေးလျော်သွားပါမည်။ ထိခိုက် ခံစားရသော ကျေးရွာများ၏ ကျေးရွာသူ/သားများနှင့် တွေ့ဆုံဆွေးနွေး ရာတွင် ငွေသား ပေးလျော်ခြင်းကို သဘောတူညီကြပါသည်။ • အခြေခံ အဆောက်အဦးဖွံ့ဖြိုးတိုးတက်မှုများဖြစ်သော ကျန်းမာရေးဆိုင်ရာ၊ သောက်သုံးရေ ထောက်ပံ့ပေးခြင်းဆိုင်ရာ၊ ပညာရေးဆိုင်ရာ၊ လျှပ်စစ်ထောက်ပံ့ ပေးခြင်း ဆိုင်ရာနှင့် အခြားသော ယေဘူယျ လူမှုရေးလုပ်ငန်းများကို ဒေသခံနှင့် မြို့နယ် အာဏာပိုင်များနှင့် ပူပေါင်းကာ ဖွံ့ဖြိုးတိုးတက်မှုလုပ်ငန်းများ လုပ်ဆောင် ပေးပါမည်။ <u>ဖုန်မှုန့်ထွက်ရှိမှုကြောင့် ဖြစ်ပေါ်လာသောပတ်ဝန်းကျင်ဆိုင်ရာ အနှောက်အယှက် များ</u> • TSP ၏ သိပ်သည်းပါဝင်မှုပမာဏ စံနှုန်းသည် ၂၃၀ g/m^3 ထက် မကျော်လွန် စေရပါ။ • ဖုန်မှုန့်ထွက်ပေါ်မှုကို လျော့ကျစေရန် ရေဖြန်းခြင်းအပြင် အခြားသော ဖုန်မှုန့် လျော့ချခြင်း နည်းလမ်းများကို အသုံးပြုခြင်းဖြင့် ဖုန်မှုန့်ထွက်ပေါ်ခြင်း၏ ၇၅% ကို လျော့ချပေးပါမည်။ • ဒေသခံနေရာများကို ဖြတ်သန်းသွားလာနေသော ကုန်တင်ကားများ၏ အမြန်နှုန်းကို တစ်နာရီလျှင် ၄၀ ကီလိုမီတာထက် မပိုစေရန် ကန့်သတ်ထားပြီး ဆောက်လုပ်ရေးလုပ်ငန်း ကိရိယာများကို အကာအကွယ်များဖြင့် ဖုံးအုပ်ထား ပါမည်။
အပိုင်း ၆.၃ - တည်ဆောက်ဆဲ ကာလ - ထိခိုက်မှု သတ်မှတ်ခြင်း၊ ဆန်းစစ်ခြင်းနှင့် လျော့ချခြင်း	စီမံကိန်းအကောင်အထည်ဖော်သူသည် EPC နှင့် ပူးပေါင်းကာ လျော့ချရေး နည်းလမ်းများကို အောက်ဖော်ပြပါအတိုင်း လိုက်နာဆောင်ရွက်သွားမည် ဖြစ်ပါ သည်။

ကတိကဝတ်ဖော်ပြချက်နေရာ	ကတိကဝတ်
	<u>ခါတ်ငွေ့ထုတ်လွှတ်မှုများ</u> • EPC ကန်ထရိုက်တာသည် ခါတ်ငွေ့ထုတ်လွှတ်မှုများ လျော့နည်းစေရန် အကောင်းဆုံး လုပ်ဆောင်မှုများဖြစ်သည့် သင့်တော်သော လုပ်ငန်းခွင်သုံး ကိရိယာများ အသုံးပြုရာတွင် အသုံးပြုသူများကို လုံလောက်သော သင်တန်း ပို့ချမှုများ သင်ကြားပေးပြီး အသုံးပြုစေခြင်း စသော နည်းလမ်းများကို အသုံးပြု ပါမည်။ သို့သော် အမှုန်အမွှားထိခိုက်မှုများ လျော့နည်းစေရန် ကိရိယာကြိုး များကို မောင်းနှင်ကိုင်တွယ်သူများကို နာခေါင်းစီး အကာအကွယ်များ ထောက်ပံ့ ပေးပါမည်။ <u>ဆူညံသံ</u> • မြန်မာနိုင်ငံ၏ အမျိုးသား ပတ်ဝန်းကျင်ဆိုင်ရာ အရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန်ချက်များနှင့် IFC စံနှုန်းများမှ ဆူညံသံအတွက် သတ်မှတ်ထားသော အမြင့်ဆုံး ဆူညံသံအဆင့်ဖြစ်သည့် နေ့အချိန် (၅၅ dBA)နှင့် ညအချိန် (၄၅ dBA)ထက် မကျော်လွန်စေရန် သတ်မှတ်ထားပါမည်။ • ပတ်ဝန်းကျင် ဆူညံသံအဆင့်သည် Leq တစ်နာရီတွင် ၃ dBA ထက် မကျော်လွန်စေပါ။ (မြန်မာနိုင်ငံ၏ အမျိုးသား ပတ်ဝန်းကျင်ဆိုင်ရာ အရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန်ချက်များ) <u>တုန်ခါမှု</u> • ၁၉၇၁ခုနှစ်တွင် ထုတ်ပြန်ထားသော US Bureau of Mines (USBM) အရ တိုင်းတာရာနေရာအရင်းအမြစ်မှ အကွာအဝေး ၃၀၀-၅၀၀မေ အကွာတွင် Peak Particle Velocity ၏ တန်ဖိုးသည် တစ်စက္ကန့်လျှင် တစ်လက်မထက် မကြီးပါ။ <u>မြေပေါ်ရေ အရည်အသွေး</u> • EPC ကန်ထရိုက်တာသည် လမ်းဖောက်လုပ်ခြင်း၊ တံတားဆောက်လုပ်ခြင်းနှင့် ယာယီစခန်းဆောက်လုပ်မှုကြောင့် ရေနောက်ကျိခြင်းဆိုင်ရာ ထိခိုက်မှုနှင့် ရေဆိုးညစ်ညမ်းမှုဖြစ်ပေါ်ခြင်းတို့ကို လျော့ကျစေရန် အကောင်းဆုံး စီမံခန့်ခွဲမှု နည်းလမ်းများကို အသုံးပြုပါမည်။ <u>အင်္ဂတဝါဂေဟာစနစ်</u> • ရေနောက်ကျိခြင်းဆိုင်ရာ ထိခိုက်မှုနှင့် ရေဆိုးညစ်ညမ်းမှုဖြစ်ပေါ်ခြင်း မြေပေါ်ရေ အရည်အသွေး လျော့ချရေးနည်းလမ်းများအတိုင်း ထိန်းချုပ် လိုက်နာဆောင်ရွက် ပါမည်။ <u>မြေဆီလွှာပျက်စီးခြင်းနှင့် မြေဆီလွှာ ညစ်ညမ်းခြင်း</u> • စီမံကိန်းဒီဇိုင်းသည် AASHTO စံနှုန်းဖြစ်သည့် "အဝေးပြေးလမ်းနှင့် လမ်းမများ အတွက် ဘူမိဒီဇိုင်းဆိုင်ရာ ပေါ်လစီ" ၂၀၀၄ခုနှစ် , အာဆီယံ (ASEAN) အဝေးပြေးလမ်းဒီဇိုင်း စံနှုန်း အဆင့် (၂)နှင့် ထိုင်းနိုင်ငံ၏ အဝေးပြေးလမ်း ဦးစီးဌာန (DOH)၏ စံနှုန်း ဖြစ်သည့် အဆင့် (၄) အဝေးပြေးဒီဇိုင်း စံနှုန်းများ စသည့် အပြည်ပြည်ဆိုင်ရာ စံနှုန်းများကို လိုက်နာဆောင်ရွက်ပါမည်။ • ဆောက်လုပ်ရေးလုပ်ငန်းခွင် စွန့်ပစ်ပစ္စည်းများကို ခွင့်ပြုထားသော အမှိုက် စွန့်ပစ်ရန် သတ်မှတ်ထားသော နေရာတွင် စွန့်ပစ်ပါမည်။ <u>သစ်တောနှင့် တောရိုင်းတိရစ္ဆာန်</u> • ဖယ်ရှားလိုက်သော သစ်ပင်မှန်သမျှကို ပြန်လည်အစားထိုး စိုက်ပျိုးပေးပါမည်။ • ဆောက်လုပ်ရေး ဝန်ထမ်းများနှင့် စီမံကိန်း အလုပ်သမားများကို တောရိုင်း တိရစ္ဆာန်များကြောင့် ဖြစ်ပေါ်လာနိုင်သော ဘေးအန္တရာယ်များကို ရှောင်ရှားနိုင်ရန် လိုအပ်သော လုပ်ဆောင်မှုများ ပြုလုပ်ထားပါမည်။ <u>လူမှုစီးပွား</u> • ဒေသခံများမှ လိုအပ်ချက်များကိုတောင်းဆိုရန်၊ တောင်းဆိုမှုများကို တုန့်ပြန် ပေးရန်နှင့် ပြဿနာများကို ဖြေရှင်းပေးရန် ဒေသခံ လူထုများနှင့် စီမံကိန်း

ကတိကဝတ်ဖော်ပြချက်နေရာ	ကတိကဝတ်
	အကောင်အထည်ဖော်သူတို့သည် ဆက်သွယ်မှု ထားရှိပါမည်။ ဥပမာ - တိုင်ကြားမှုပြုလုပ်နိုင်သော နေရာ အကောင်အထည်ဖော်ပေးခြင်း၊ စီမံကိန်း လိပ်စာနှင့် ဖုန်းနံပါတ်ကို ဒေသခံများကို အသိပေးထားပါမည်။ • စီမံကိန်း တည်ဆောက်ဆဲကာလတွင် စီမံကိန်းအကောင်အထည်ဖော်သူသည် CSR အစီအစဉ်ကို ဖော်ဆောင်ပါမည်။ <u>မြေယာအသုံးပြုမှု</u> • အသေးစိတ် ဒီဇိုင်းထွက်ပေါ်လာသည့်နှင့် လမ်းတစ်ဖက်တစ်ချက်မြေ (ROW) သည် မီတာ (၄၀) ထက် မကျော်လွန်ကြောင်းကို အမြန်ဆုံး ကြေငြာပါမည်။ <u>ယဉ်ကျေးမှုအမွေအနှစ်</u> • စီမံကိန်းမြေနေရာတွင် တစ်ဦးတစ်ယောက်ခြင်း သို့မဟုတ် အဖွဲ့လိုက် စီမံကိန်း တည်ဆောက်တူးဖော်လုပ်ဆောင်မှုများ ပြုလုပ်ရာတွင်ရှာဖွေတွေ့ရှိမှုများရှိခဲ့ပါက သက်ဆိုင်ရာ တာဝန်ရှိသူများဖြစ်သော ဒေသခံနှင့် အစိုးရ၏ ယဉ်ကျေးမှု အမွေအနှစ် အုပ်ချုပ်ရေး ဦးစီးဌာနသို့ ချက်ချင်း အကြောင်းကြားပါမည်။ <u>ဘေးအန္တရာယ် ဆန်းစစ်ခြင်း</u> • စီမံကိန်း တည်ဆောက်ဆဲတွင် ဖြစ်ပေါ်လာသော ပတ်ဝန်းကျင်ဆိုင်ရာ ဘေးအန္တရာယ် စီမံခန့်ခွဲမှုအားလုံးကို စီမံကိန်း စီမံခန့်ခွဲမှုအဖွဲ့မှ တာဝန်ယူ ဆောင်ရွက်သွားပါမည်။ စီမံကိန်းစီမံခန့်ခွဲမှုအဖွဲ့မှ စီမံကိန်း ဘေးအန္တရာယ် စီမံခန့်ခွဲမှု နယ်ပယ်နှင့် လုပ်ငန်းစဉ်များကို သတ်မှတ် ဆောင်ရွက်ပြီးပတ်ဝန်းကျင်ဆိုင်ရာ ဘေးအန္တရာယ် လျော့ချမှု နည်းလမ်းများကို လုပ်ဆောင်ပါမည်။
အပိုင်း ၆.၄ - လုပ်ငန်းလည် ပတ် ဆောင်ရွက်သည့် ကာလ - ထိခိုက်မှု သတ်မှတ်ခြင်း၊ ဆန်းစစ်ခြင်းနှင့် လျော့ချခြင်း	စီမံကိန်း အကောင်အထည်ဖော်သူသည် အောက်ဖော်ပြပါ လျော့ချရေး နည်းလမ်းများကို လိုက်နာ ဆောင်ရွက်ပါမည်။ <u>ဓါတ်ငွေ့ထုတ်လွှတ်မှုများ</u> • လူဦးရေထူထပ်သော နေရာများတွင် ယာဉ်ကြော ပိတ်ဆို့မှုများကို ရှောင်ရှား နိုင်ရန် ကောင်းမွန်သော ယာဉ်သွားလာမှု စီမံခန့်ခွဲခြင်းကို လုပ်ကိုင်ပါမည်။ <u>ဆူညံသံ</u> • အခြေချသောနေရာများတွင် ယာဉ်သွားလာမှုအရှိန်နှုန်းကို လျော့ချပေးပါမည်။ • လမ်းမျက်နှာပြင်ကို ကောင်းမွန်သော အခြေအနေဖြစ်အောင် အမြဲထိန်းသိမ်း ပါမည်။ <u>မြေပေါ်ရေ အရည်အသွေး</u> • ဝန်ဆောင်မှုဇရိယာများတွင် ရေဆိုးသန့်စင်မှုနေရာ၏ ရေဆိုးသန့်စင်မှုစနစ် စွမ်းဆောင်ရည်ကို ပုံမှန်စစ်ဆေးပါမည်။ <u>အင်္ဂါပါဂေဟစနစ်</u> • ရေဆိုးညစ်ညမ်းမှုအတွက် လုပ်ဆောင်သော လျော့ချရေးနည်းလမ်းများအတိုင်း လုပ်ဆောင်ပါမည်။ <u>သစ်တောနှင့် တောရိုင်းတိရစ္ဆာန်</u> • နှစ်လမ်းသွားလမ်းတစ်လျောက်ရှိ သစ်ပင်ပန်းမန်များကို ပုံမှန်ထိန်းသိမ်းခြင်း၊ စိုက်ပျိုးခြင်းအားဖြင့် ထိန်းသိမ်းခြင်းများ ပြုလုပ်သွားပါမည်။ • မကြာခဏ တိရစ္ဆာန်များ ဖြတ်သန်းသွားလာနိုင်သော နေရာများတွင် ယာဉ်မောင်းများ သတိထားမောင်းနှင်းနိုင်ရန် သတိပေးဆိုင်းဘုတ်များကို တပ်ဆင်ထားပေးပါမည်။ <u>လူမှုစီးပွား</u> • ဒေသခံများမှ ဒေသထွက်ကုန်/လက်မှုပစ္စည်းများကို ရောင်းချနိုင်ရန် အနားယူ သည့်နေရာတွင် နေရာများ ထောက်ပံ့ထားရှိပေးထားပါမည်။

ကဏ္ဍကဏ္ဍခံမော်ပြချက်နေရာ	ကဏ္ဍကဏ္ဍတ်
	• ဒေသခံများအား ပြောင်းလဲမှုများနှင့် နေသားကျစေရန် သက်ဆိုင်ရာ အစိုးရ အာဏာပိုင်များမှ ထောက်ပံ့ပေးမှုများ ပြုလုပ်ပေးပါမည်။ အခြေခံအဆောက်အဦးများ • ယာဉ်သွားလာမှုတိုးတက် အဆင်ပြေစေရန်ထက် ဘေးကင်းလုံခြုံမှု တိုးတက်စေရန် ရည်ရွယ်ပါသည်။ ဘေးအန္တရာယ် ဆန်းစစ်ခြင်း • အောက်ဖော်ပြပါ ဘေးကင်းလုံခြုံရေး ပေါ်လစီများကို လိုက်နာဆောင်ရွက်ရန် ပြင်းပြင်းထန်ထန် အကြံပြုပါသည်။ (က) ယာဉ်မောင်းများ ထိုင်ခုံခါးပတ် ပတ်ခြင်း (ခ) ယာဉ်မောင်းသင်တန်းနှင့် စစ်ဆေးခြင်းများကို မလုပ်မနေရ ပြုလုပ်ခြင်း (ဂ) ယာဉ်မောင်းနေစဉ် မူးယစ်ဆေးဝါး သို့မဟုတ် အရက်သေစာ သောက်စားခြင်းကို တားမြစ်ခြင်းနှင့် အပြစ်ဒဏ်ပေးခြင်း (ဃ) ကလေးငယ်များအား ယာဉ်အန္တရာယ် ကင်းရှင်းမှုအတွက် ပညာပေးခြင်း (င) ယာဉ်အားလုံးသည် ဘေးကင်းလုံခြုံရေး စံနှုန်းနှင့် ကိုက်ညီမှု ရှိ/မရှိကို စစ်ဆေးမှုများ ပြုလုပ်သွားပါမည်။
အခန်း (၈) - ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှု အစီအစဉ်များ	
အပိုင်း ၈.၃ - တည်ဆောက်ဆဲကာလအတွက် ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှု အစီအစဉ် အကျဉ်းချုပ် (CEMP)	စီမံကိန်း တည်ဆောက်ဆဲကာလတွင် ပိုင်ရှင်-CEMP (OCEMP)မှ တည်ဆောက်ရေးလုပ်ငန်း အစီအစဉ်များကို ရှင်းလင်းစွာ အကောင်အထည်ဖော်လုပ်ဆောင်ခြင်းနှင့် ပတ်ဝန်းကျင်ဆိုင်ရာ စီမံခန့်ခွဲမှုများ အတွက် လိုအပ်ချက်များကို လုပ်ဆောင်ပါမည်။ OCEMP ကို အခြေခံ၍ ကန်ထရိုက်တာသည် စီမံကိန်း အသေးစိတ် ဒီဇိုင်းများ၊ ဆောက်လုပ်ရေး နည်းစနစ်များနှင့် ဆောက်လုပ်ရေး အချိန်ဇယားများပါဝင်သည့် ကန်ထရိုက်တာ-CEMP (CCEMP)ကို ပြင်ဆင်ပါမည်။ CCEMP သည် ပတ်ဝန်းကျင်နှင့် သက်ဆိုင်သော ပြဿနာများကို စီမံခန့်ခွဲပြီး လျော့ချပေးရန်ဖြစ်ပြီး အဓိကအားဖြင့် (၂) ခုခွဲခြားထားပါသည်။ ၁) စီမံကိန်းအသေးစိတ် အစီအစဉ်များ - (က) လေထုအရည်အသွေး (ခ) ဆူညံသံ (ဂ) တုန်ခါမှု (ဃ) မြေပေါ်ရေ အရည်အသွေး (င) အက္ကဝါဂေဟာစနစ် (စ) မြေဆီလွှာတိုက်စားမှု ကာကွယ်ခြင်း (ဆ) အခွင့်အရေး ရှာဖွေခြင်း စီမံခန့်ခွဲခြင်းနှင့် ၂) အကြောင်းအရာအလိုက် အစီအစဉ်များတွင် - (က) သယ်ယူပို့ဆောင်ရေး (ခ) ရေအသုံးပြုမှု (ဂ) အစိုင်အခဲ စွန့်ပစ်ပစ္စည်း (ဃ) အန္တရာယ်ရှိသော စွန့်ပစ်ပစ္စည်း (င) သစ်တောနှင့် တောရိုင်းတိရစ္ဆာန် (စ) ဇီဝမျိုးကွဲများ (ဆ) လုပ်ငန်းခွင်ကျန်းမာရေး (ဇ) တည်ဆောက်ရေး အရေးပေါ်တုန့်ပြန်မှု အစီအစဉ် (ဈ) ပေးလျော်ခြင်းနှင့် အသက်မွေးဝမ်းကြောင်း ပြန်လည်တည်ထောင်ပေးခြင်း (ည) မြေအသုံးပြုမှု (၄) လှုမှု-စီးပွားတို့ ပါဝင်ပါသည်။ ပတ်ဝန်းကျင်ဆိုင်ရာ အစိတ်အပိုင်းများကို အောက်ဖော်ပြအတိုင်း စောင့်ကြည့်လေ့လာသွားပါမည်။ - လေထုအရည်သွေး (၅ နေရာ) - ဆူညံသံနှင့် တုန်ခါမှု တိုင်းတာခြင်း (၅ နေရာ) - မြေပေါ်ရေ အရည်အသွေးနှင့် အက္ကဝါ ဂေဟစနစ် (၇ နေရာ) - ယာဉ်သွားလာမှု စစ်တမ်းကောက်ခြင်း (၃ နေရာ) ထို့အပြင် OSH စီမံခန့်ခွဲမှု အစီအစဉ်နှင့် ကျေးရွာဆွေးနွေးပွဲတို့သည် CEMP တွင် ပါဝင်ပါသည်။ ကန်ထရိုက်တာသည် အကြိုတည်ဆောက်ရေးနှင့် တည်ဆောက်ဆဲကာလတွင် ပတ်ဝန်းကျင်ဆိုင်ရာ လုပ်ဆောင်မှုအစီရင်ခံစာကို ECD သို့ လစဉ် ပေးပို့တင်ပြပါမည်။ သုံ့ပွင့်ဆိုင်ကော်မတီတွင် သက်ဆိုင်ရာ အစိုးရဌာန၊ စီမံကိန်းအကောင်အထည်ဖော်သူနှင့် အနီးအနားရှိ ဒေသခံတို့ ပါဝင်ပါသည်။

ကတိကဝတ်ဖော်ပြချက်နေရာ	ကတိကဝတ်
အပိုင်း ၈.၄ - လုပ်ငန်းလည်ပတ်ဆောင်ရွက်သည့် ကာလအတွက် ပတ်ဝန်းကျင် စီမံခန့်ခွဲမှု အစီအစဉ် အကျဉ်းချုပ် (OEMP)	စီမံကိန်းအကောင်အထည်ဖော်သူသည် လုပ်ငန်းလည်ပတ်ဆောင်ရွက်သည့်ကာလ အတွက် ပတ်ဝန်းကျင် စီမံခန့်ခွဲမှု အစီအစဉ်ကို ပြင်ဆင် အကောင်အထည်ဖော် ပါမည်။ OEMP သည် ပတ်ဝန်းကျင်နှင့် သက်ဆိုင်သော ပြဿနာများကို စီမံခန့်ခွဲပြီး လျော့ချပေးမည်ဖြစ်ပြီး အဓိကအားဖြင့် (၂) ခုခွဲခြားထားပါသည်။ ၁) စီမံကိန်း အသေးစိတ် အစီအစဉ်များ - (က) လေထုအရည်အသွေး (ခ) ဆူညံသံ (ဂ) တုန်ခါမှု (ဃ) မြေပေါ်ရေ အရည်အသွေးနှင့် ၂) အကြောင်းအရာအလိုက် အစီအစဉ်များတွင် - (က) သယ်ယူပို့ဆောင်ရေး (ခ) သစ်တောနှင့် တောရိုင်း တိရစ္ဆာန် တို့ဖြစ်ပါသည်။ ပတ်ဝန်းကျင်ဆိုင်ရာ အစိတ်အပိုင်းများကို အောက်ဖော်ပြအတိုင်း စောင့်ကြည့် လေ့လာသွားပါမည်။ - လေထုအရည်သွေး (၅ နေရာ) - ဆူညံသံနှင့် တုန်ခါမှု တိုင်းတာခြင်း (၅ နေရာ) - မြေပေါ်ရေ အရည်အသွေးနှင့် အလွှာဝါ ဂေဟစနစ် (၇ နေရာ) - ယာဉ်သွားလာမှု စစ်တမ်းကောက်ခြင်း (၃ နေရာ) စီမံကိန်းအကောင်အထည်ဖော်သူသည် လုပ်ငန်းလည်ပတ်ဆဲကာလ တစ်လျှောက် လုံးတွင် ပတ်ဝန်းကျင်ဆိုင်ရာ လုပ်ဆောင်မှုအစီရင်ခံစာကို ECD သို့ (၆) လလျှင် တစ်ကြိမ် ပေးပို့တင်ပြရပါမည်။
အခန်း (၉) - အများပြည်သူတိုင်ပင်ဆွေးနွေးခြင်းနှင့် ထုတ်ဖော်ကြေညာခြင်း	
အပိုင်း ၉.၁ - နိဒါန်း	စီမံကိန်းအကောင်အထည်ဖော်သူသည် ဒေသခံများနှင့် သက်ဆိုင်နေသော ထိခိုက်မှုများ ဆန်းစစ်ခြင်း၊ လျော့ချရေးနည်းလမ်း အစီအစဉ်များနှင့် စောင့်ကြည့် လေ့လာရေး အစီအစဉ်များရေးဆွဲခြင်း စသည်တို့ကို ပတ်ဝန်းကျင် ဆိုင်ရာ လုပ်ထုံးလုပ်နည်းများ နှင့်အညီ လိုက်နာဆောင်ရွက်သွားပါမည်။
အပိုင်း ၉.၂ - နည်းလမ်းနှင့် ချဉ်းကပ်ခြင်း	• စီမံကိန်းအကောင်အထည်ဖော်သူသည် အများပြည်သူ ပါဝင်မှုနှင့်သက်ဆိုင် သော အခြေခံစည်းမျဉ်းများနှင့် လုပ်နည်းများကို လိုက်နာဆောင်ရွက်သွား ပါမည်။ • စီမံကိန်းအကောင်အထည်ဖော်သူသည် စီမံကိန်းနှင့် ပတ်သက်သည့် ပတ်ဝန်းကျင်နှင့် လူမှုရေးဆိုင်ရာ ပြဿနာများကို ဒေသခံများအား တင်ပြသွား ပါမည်။
အပိုင်း ၉.၃.၂ - EIA ပြင်ဆင်ခြင်း ကာလ၏ PCD	နှစ်လမ်းသွားလမ်းနှင့် ကျေးရွာများအတွက် လမ်းသွားလာမှု ဖွံ့ဖြိုးတိုးတက်မှု ဖြစ်ပေါ်လာခြင်းအတွက် ကျေးရွာများကို ဆက်စပ်ထားသောလမ်းနှင့် ပတ်သတ်၍ ဖြစ်ပေါ်လာသော ပြဿနာများကို စီမံကိန်းအကောင်အထည်ဖော်သူမှ လူထုတွေ့ဆုံမှုပွဲတွင် တုန့်ပြန်ဖြေရှင်းမှုကို အခန်း (၉)၊ ဇယား ၉.၃-၃ တွင် ဖော်ပြထားပြီး အောက်ကဇယားတွင်လည်း ဖော်ပြထားပါသည်။

အဓိကပြဿနာများ	စီမံကိန်းအကောင်အထည်ဖော်သူနှင့် အကြံပေးမှ ရှင်းလင်းချက်များ
၁။ အင်ဂျင်နီယာဆိုင်ရာ ပြဿနာများ	
၁) ကျေးရွာများသည် နှစ်လမ်းသွားလမ်းကို အသုံးပြုပြုခွင့်နှင့် ဖြတ်သန်းခွင့် ရှိ/မရှိ	စီမံကိန်းလမ်း ဒီဇိုင်းအရ အချို့နေရာများတွင် သာ ဘေးအန္တရာယ် ကင်းရှင်းရေးနှင့် လမ်းတိုး တက်ရေးအတွက် လိုအပ်သော အကာအကွယ် များကို ယာယီ သို့မဟုတ် အမြဲကာကွယ်ထား ခြင်းမှ လွဲ၍ အခြားသောလမ်းတစ်လျောက်လုံး သည် မည်သည့်အကာအကွယ်မှ ကာကွယ်ထား ခြင်း မရှိသောကြောင့် ကျေးရွာများသည် အလွယ် တကူ ဖြတ်သန်း သွားလာနိုင်ပါသည်။ ထို့အပြင် နှစ်လမ်းသွားလမ်းတွင်

ကတိကဝတ်ဖော်ပြချက်နေရာ	ကတိကဝတ်	
		ဖြတ်သန်းသွားလာမှု နေရာတိုင်း၊ အဝင်/အထွက် နေရာများ သည် ရုပ်ပိုင်းဆိုင်ရာ ဘေးအန္တရာယ် ကင်းရှင်းမှု ရှိပါသည်။
	၂) စီမံကိန်းသည် နှစ်လမ်းသွားလမ်းမနှင့် ကျေးရွာထဲရှိလမ်းကို ချိတ်ဆက်ပေးရန် ထည့်သွင်း စဉ်းစားပေး သင့်သည်။	နောက်ဆုံး လေ့လာမှုများအရ ကျေးရွာရှိ ချဉ်းကပ်လမ်းများသည် တည်ရှိနေပြီးသာဖြစ်ပြီး နှစ်လမ်းသွားလမ်းနှင့် ချိတ်ဆက်ဖောက်လုပ်ရန် အခြားသော ချဉ်းကပ်လမ်းများ ထောက်ပံ့ပေး ရန် မလိုအပ်ပါ။ ကျေးရွာနှင့် ကျေးရွာလူထု အတွက် လမ်းအသုံးပြုမှု တိုးတက်စေရေး အတွက် နှစ်လမ်းသွားလမ်းကို အသုံးပြုနိုင်ပြီး နှစ်လမ်း သွားလမ်းအား တိုးတက်စေရန် ထိန်းသိမ်းမှုများ ပြုလုပ်ပေးရန် မလိုအပ်ပဲ လျော့ပေါ့ပေးထား ပါသည်။
	၃) ဒေသခံများသည် စီမံကိန်း အကောင်အထည်ဖော်သူမှ ဖောက်လုပ်ပြီးသာလမ်းကို ထိန်းထိန်းသိမ်းသိမ်း ကောင်းမွန်စွာ အသုံးပြုစေလိုပါသည်။	ယခုလမ်းသည် ITDမှ ဖောက်လုပ်ခြင်းဖြစ်ပြီး က) ဆောက်လုပ်ခြင်းလုပ်ငန်းတွင် နှစ်လမ်း သွား လမ်းဖောက်လုပ်ခြင်း လုပ်ဆောင်မှုများ နှင့်အညီ လုပ်ဆောင်သွားမည် ဖြစ်ပါသည်။ ဒေသခံများနှင့် အတူတကွ လမ်းကိုဝေမျှ၍ အသုံးပြုသွားမည် ဖြစ်ပါသည်။ ခ) နှစ်လမ်းသွား ဖောက်လုပ်ပြီးသွားသည့် အချိန် တွင် ၄င်းချဉ်းကပ်လမ်းကို ဒေသ အုပ်ချုပ်ရေးသို့ လွှဲပြောင်းပေးအပ်မည် ဖြစ်ပြီး ကျေးရွာသူ/သား များမှ ချဉ်းကပ်လမ်းအနေဖြင့် အသုံးပြုနိုင်မည် ဖြစ်ပါသည်။
	၄) စီမံကိန်း အင်ဂျင်ရပ်များနှင့် လမ်းအသုံးပြုခကောက်ခံမှု ရုံးငယ် စီမံခန့်ခွဲခြင်း	စီမံကိန်းလမ်းတွင် အရှိုးသော လမ်းပိုင်းများတွင် ဘေးအန္တရာယ်ကင်းရှင်းရေးနှင့် တိုးတက်ရေးအ တွက် ယာယီ သို့မဟုတ် အမြဲအကာအကွယ် များ ကာကွယ်ထားခြင်းမှအပ လမ်းတစ် လျောက်တွင် အကာအကွယ်များ ကာကွယ် ထားခြင်း မရှိပါ။ ထို့ကြောင့် ကျေးရွာသူ/သား များ၏ ယာဉ်/ကုန် တင်ကားများသည် လမ်းအသုံးပြုခကောက်ခံ သော ရုံးငယ်လေး (လေးခု) ကို ဖြတ်သန်းသွား လာခြင်း မပြုမခြင်း နှစ်လမ်း သွားလမ်းမကို အခမဲ့ အသုံးပြုနိုင်မည် ဖြစ်ပါသည်။
	၅) အခြေခံပတ်ဝန်းကျင် ဆိုင်ရာ အခြေအနေ စစ်တမ်းများ ကောက်ယူရာ တွင် ကျေးရွာသူ/သားများ ကို ပါဝင်ခွင့် ပြုသင့်ပါသည်။	အကြိုပေးအဖွဲ့မှ အခြေခံစစ်တမ်း မကောက်ယူ မီ ကျေးရွာ အုပ်ချုပ်ရေးမှူး၏ ခွင့်ပြုချက်ကို ရယူထားပါက ဒေသခံ ကျေးရွာသူ/သားများ သည် အခြေခံ ပတ်ဝန်းကျင်ဆိုင်ရာ အခြေအနေ စစ်တမ်းများ ကောက်ယူရာတွင် ပါဝင်နိုင် ပါသည်။
	၆) EIA အစီရင်ခံစာ၏ ထုတ်ဖော်ချက်ကို ပြုလုပ်ပေးသင့်ပါသည်။	EIA အစီရင်ခံစာကို စီမံကိန်း တစ်လျောက်လုံး၏ ITD အခြေစိုက်စခန်းများ တွင်ထားရှိပြီး လူထု ဆွေးနွေးခြင်း အစည်းအဝေးတွင် EIA လေ့လာမှု အနှစ်ချုပ်

ကတိကဝတ်ဖော်ပြချက်ဇယား	ကတိကဝတ်	
		ကို တက်ရောက်လာသူအားလုံးအား လက်ကမ်းစာစောင်များဝေကာ ထုတ်ပြန်ကြေငြာပေးပါမည်။
အပိုင်း ၉.၄ - ဆက်လက်ဆွေးနွေးမှုများ၏ အကြံပြုချက်များ	စီမံကိန်း အကောင်အထည်ဖော်သူနှင့် အခြားသော စိတ်ပါဝင်စားသူများသည် စီမံကိန်း၏ ဖွံ့ဖြိုးတိုးတက်မှုဖြစ်စဉ်အစ/အဆုံး အားလုံးတွင် အပြည့်အဝပါဝင်ပါမည်။ • သက်ဆိုင်ရာအစိုးရအာဏာပိုင်အဖွဲ့အစည်းများ - ၁) အမျိုးသားအဆင့် အဓိကရုံးဌာနများမှာ - (က) မွေးမြူရေး၊ ရေလုပ်ငန်းနှင့် ကျေးလက်ဒေသဖွံ့ဖြိုးရေး ဝန်ကြီးဌာန (ခ) လယ်ယာစိုက်ပျိုးရေးနှင့် ဆည်မြောင်း ဝန်ကြီးဌာန (ဂ) သယံဇာတနှင့် သဘာဝ ပတ်ဝန်းကျင် ထိန်းသိမ်းရေး ဝန်ကြီးဌာန (ဃ) လူမှုဝန်ထမ်းကယ်ဆယ်ရေးနှင့် ပြန်လည်နေရာချထားရေး ဝန်ကြီးဌာန (င) ပို့ဆောင်ရေး ဝန်ကြီးဌာန (စ) ရထားပို့ဆောင်ရေး ဝန်ကြီးဌာန (ဆ) ဆောက်လုပ်ရေး ဝန်ကြီးဌာန တို့ဖြစ်ပါသည်။ ၂) တိုင်းဒေသကြီးအဆင့် အဓိကရုံးဌာနများမှာ - (က) တနင်္သာရီတိုင်းဒေသကြီး ၏ ပတ်ဝန်းကျင်ထိန်းသိမ်းရေး ဦးစီးဌာန (ခ) တနင်္သာရီတိုင်းဒေသကြီး၏ လူမှုဝန်ထမ်းကယ်ဆယ်ရေးနှင့် ပြန်လည် နေရာချထားရေး ဦးစီးဌာန (ဂ) တနင်္သာရီတိုင်းဒေသကြီး၏ ပို့ဆောင်ရေး ဦးစီးဌာန (ဃ) တနင်္သာရီတိုင်းဒေသကြီး၏ ရထားပို့ဆောင်ရေး ဦးစီးဌာန (င) တနင်္သာရီတိုင်းဒေသကြီး၏ ဆောက်လုပ်ရေး ဦးစီးဌာန (စ) တနင်္သာရီတိုင်းဒေသကြီး၏ လျှပ်စစ်နှင့် စွမ်းအင် ဦးစီးဌာန (ဆ) တနင်္သာရီတိုင်းဒေသကြီး၏ အမျိုးသားစီမံကိန်းနှင့် စီးပွားရေး ဖွံ့ဖြိုးတိုးတက်မှု ဦးစီးဌာန နှင့် (ဇ) လွှတ်တော်ဥက္ကဋ္ဌ တို့ဖြစ်ပါသည်။ ၃) ဒေသခံအဆင့် အဓိကရုံးဌာနများမှာ - (က) ရေဖြူမြို့နယ် အုပ်ချုပ်ရေးမှူးရုံး နှင့် (ခ) မေတ္တာမြို့နယ် အုပ်ချုပ်ရေးမှူးရုံးတို့ဖြစ်ပါသည်။ ထားဝယ်အထူးစီးပွားရေးဇုန်ကော်မတီ (DSEZMC) နှင့် ထားဝယ်အထူးစီးပွားရေး ဇုန်အား ထောက်ခံအားပေးနေသည့် (SWB) တို့ပါဝင်ပါသည်။ • အခြားစိတ်ပါဝင်စားသော အဖွဲ့အစည်းများ - ယခုကဲ့သို့တွင် ဖွံ့ဖြိုးတိုးတက်ရေးအတွက် အခန်းကဏ္ဍအမျိုးမျိုးမှ တာဝန်ယူဆောင်ရွက်နေကြသော အစိုးရဦးစီးဌာနများ နှင့် လူထုအရေပြုအဖွဲ့အစည်းများ ပါဝင်ပါသည်။ • သက်ရောက်ခံစားရမည့်လူထု - စီမံကိန်းအကောင်အထည်ဖော်မှု၏ သက်ရောက် ခံစားရသူများမှာ ဒေသခံလူထုနှင့် ရေဖြူမြို့နယ်နှင့် မေတ္တာမြို့နယ် တွင် တည်ရှိသော ကျေးရွာစုစုပေါင်း ၁၆ရွာ ဖြစ်သော - ဒေါက်လောက်၊ တလိုင်ယာ၊ ပိတောက်ကုန်း၊ ကလုံထား၊ သခက်ကုန်း၊ ရေပုံး၊ သပြူချောင်း၊ ပျဉ်းသတောသာ၊ မေတ္တာ၊ တောင်သုံးလုံး၊ ဆင်ဖြူတိုင်၊ လဒေါ်၊ ဝါးတော၊ အားမှု၊ ကတ္တရာခီးနှင့် ထီးခီး ကျေးရွာတို့ဖြစ်ပါသည်။

မှ: Myandawei Industrial Estate Company Limited
အမည်: Dr.Somchet Thinaphong
ရာထူး: မန်နေးဂျင်း ဒါရိုက်တာ

TWO LANE ROAD LINKING PROJECT

PROJECT KEY ESIA COMMITMENTS

Commitment Source	Commitment
EIA Report	
Chapter 3 Overview of the Policy, Legal and Institutional Framework	
Section 3.1: Corporate Environmental and Social Policies	Project proponent must formulate an environmental and social management policy to guide its environmental and social management during the construction phase and the operation phase.
Section 3.2.1: Policy and legal framework which provide the foundation for environmental management	Project proponent must follow National Environmental Policy (1994), the Environmental Conservation Law (2012), and Environmental Conservation Rules (2014).
Section 3.2.2: Regulations Related to Environmental Impact Assessment and Management	Project proponent must comply the Environmental Impact Assessment Procedure (EIA Procedure 2015), Environmental Impact Assessment Guidelines and National Environmental Quality (Emission) Guidelines (2015)
Section 3.2.3: Laws and Regulations Related to Environmental Protection and Social Impact Management	Project proponent must follow: • The Explosive Act (1887); section 6(3), 7(1), 8, 13 • The Workmen's Compensation (1923); section 3(1), 12(1), 14(1) • Leave and Holiday Act, 1951 (No.58) (Law Amended July, 2014) • Public Health Law (1972) • Motor Vehicle Rules (1987) • The Freshwater Fisheries Law (1991); section 40 • The Forest Law (1992); section 12 • Myanmar Insurance Law (1993); section 16 • The Protection of Wildlife and Conservation of Natural Areas Law (1994); • The Protection and Preservation of Cultural Heritage Regions Law (1998), Amended by Law No.1/2009 • The Conservation of Water Resources and River Law (2006); section 8, 11(a), 19 • Labour Organization Law (2011); section 18, 21, 27, 29, 31, 42, 43 • Social Security Law (2012)section 15, 16, 18(a) (b), 48(a), 51, 53, 54, 75(a) (b) • Environmental Conservation Law (2012) • Settlement of Labour Disputes Law (2012); section 39 • Minimum Wages Law (2013); section 12, 13, 18 • Myanmar Engineering Council Law (2013); section 34, 37 • Employment and Skill Development Law (2013); section 14, 15, 30 • National Environmental Quality (Emission) Guidelines, Myanmar (2015) • Protection of National Races Law (2015); section 5 • Myanmar Fire Bridge Law (2015); section 25 • The Protection and Preservation of Ancient Monuments Law (2015); section 12 • The Protection and Preservation of Antique Objects Law (2015); section 12, 15(h), 20(f) • Motor Vehicle Law (2015); section 51, 52, 54, 57 • Myanmar Investment Law (2016); section 50(a) (d), 51(b) (c) (d), 65(g) (I) (j) (k) (l) (m) (o) (p) (q) • Payment of Wages Act (2016); section 4, 7, 8, 9, 10, 11 • The Farmland Law (2012)
Section 3.2.4: Law Specific to the Project	Project proponent must follow Myanmar Special Economic Zone Law (2014); section 11(f) (p), 74, 75, 76, 80(a) (b) and Dawei Special

Commitment Source	Commitment
Site	Economic Zone Law (2011); section 8(g), 10(a) (c), 31, 33(a) (e).
Section 3.3: International Conventions, Treaties and Agreements	Project proponent must follow: • Plant Protection Agreement for the South-East Asia and the Pacific Region, Rome (1956) • United Nations Framework Convention on Climate Change, New York (1992) (UNFCCC) • Convention on Biological Diversity, Rio de Janeiro (1992) • The Convention for the Protection of the World Culture and Natural Heritage, Paris (1972) • ASEAN Agreement on the Conservation of Nature and Nature Resources, Kuala Lumpur (1985) • Catagena Protocol on Biosafety, Cartagena (2000) • Kyoto Protocol to the Convention on Climate Change, Kyoto (1997)
Section 3.4.1: Arrangement at the National and Sector Level	Project proponent must comply the Environmental Conservation Committee (ENCC) by MONREC through ECD.
Section 3.4.2: Arrangements at the Project Area	Project proponent must comply with Myanmar's Subnational Administrative Structure and Dawei Special Economic Zone Management Committee
Table 3.4-1: Roles and Responsibilities of Relevant Departments Functioning in DSEZ	Project proponent must comply: • Department of General Administration • Department of Human Settlement and Housing • Department of Immigration and National Registration • Myanmar Police Force • Department of Labour • Directorate of Trade • Department of Development Affairs • Department of Road Transportation • Department of Investment and Company Administration • Department of Custom • Department of Law, Court and Justice • Department of Municipality • Representative from Tanintharyi Division
Section 3.5.1: IFC's standards and guidelines	Project proponent must follow Performance Standards on Environmental and Social Sustainability, January 1st, 2012 and Environmental, Health, and Safety-General Guidelines, April 30th, 2007
Section 3.5.2: World Bank	Project proponent must follow the World Bank's Pollution Prevention and Abatement Handbook (PPAH)
Table 3.6-1: Relevant Environmental Guidelines and Standards	Project proponent must manage and control impacts as follows: • Ambient Air Quality • Ambient Noise Levels • Vibration • Groundwater Quality
Chapter 4 Project Description and Alternatives	
Section 4.2.2.1: Project Overview	The Project must upgrade the existing two-lane un-paved road based on Class 4 of the Highway Design Standards of the Department of Highways (DOH), Thailand.
Section 4.2.2.3: Project Design	Project proponent must follow: • The geometric design of the Project road follows the Standard of Highways in Thailand with AASHTO Standard "A Policy on Geometric Design of Highways and Street" 2004. • The structural design of bridges and viaduct structures is based on AASHTO LRFD Bridge Design Specifications and HL-93 standard highway loading. • The Project road must be operated as a toll road with controlled access and toll booths. • The detailed design of slope stability and erosion control, various

Commitment Source	Commitment
	design standards are adopted as follows; - ASEAN Highway Design Standard - AASHTO - Myanmar Technical Standard for Highway Design - Highway Capacity Manual - Department of Highway, Thailand • The project also considered about recommendation in road design preparation and construction from WWF's study for design manual for road construction and take this recommendation into project design.
Section 4.2.3: Project Alternatives	Due to the project has no alignment alternatives as it will upgrade the existing road. The two lane road is adopted to suit expected traffic demand during the initial phase development of DSEZ and to keep the investment low. Regarding allowance of land owner and related government ministries, the project must inform land owners and ask for permission and there must be payment of compensation prior to project development as stated in RAP report via compensation committee.
Chapter 6 Impact and Risk Assessment and Mitigation Measures	
Section 6.2: Pre-Construction Phase - Impact Identification, Assessment and Mitigation	Project proponent collaborate with EPC must comply the mitigation measure as follows: <u>Land Acquisition</u> • The compensation must be done according to international standards and with the overall objectives of improving the standard of living for those who will be affected. All crops, valuable trees must be compensated. Cash compensation is the mode agreed with the people in project affected village during consultations. • Cooperation with local and district authorities regarding improved infrastructural development could enhance mitigation measures dealing with health, drinking water supply education, electricity supply and general social uplift. <u>Environmental Disturbances Caused by Fugitive Dust</u> • The standard prescribes the concentration of TSP not exceeding 230 g/m^3. • Spray water together with strict implementation of other dust suppression measures should be able to reduce fugitive dust emission as much as 75%. • Enforce speed limit for trucks not to exceed 40 km/hr when passing the communities and cover construction materials by tarpaulin sheet.
Section 6.3: Construction Phase - Impact Identification, Assessment and Mitigation	Project proponent collaborate with EPC must comply the mitigation measure as follows: <u>Gaseous Emissions</u> • The EPC contractor must be required to adopt best practices to minimize gaseous emissions at sources such as provide adequate training to the equipment operators in the proper use of equipment. However, heavy equipment operators must be provided with masks, if deemed necessary, to minimize the impact of particulates. <u>Noise</u> • The maximum background noise level expressed in Leq-1 hr. exceeded the limit set by Myanmar National Environmental Quality (Emission) Guidelines and the IFC Standard during both daytime (55 dBA) and nighttime (45 dBA). • The increase in the ambient noise level is not more than 3 dB(A) Leq-1 hour (Myanmar National Environmental Quality (Emission) Guidelines). <u>Vibration</u> • The Peak Particle Velocity value at the distance from the source between 301-500 ft not greater than 1 inch/s set by US Bureau of Mines (USBM), 1971.

Commitment Source	Commitment
	Surface Water Quality • The EPC Contractor must be required to implement best management practices in reducing the impacts on water turbidity and wastewater contamination caused by road construction, bridge construction and camp site. Aquatic Ecology • Apply the mitigation measures as for controlling the water turbidity and wastewater contamination as same as surface water quality. Soil Erosion and Soil Contamination • The project design must also follow applicable international standards such as those prescribed in AASHTO Standard "A Policy on Geometric Design of Highways and Street" 2004, Class II of ASEAN Highway design standards and Class IV of the Highway Design Standards of the Department of Highways (DOH), Thailand. • Remove all construction wastes from the site to approved waste disposal sites. Forest and Wildlife • Replacement of trees where they are removed; for every tree removed tree should be replanted. • Construction workers and site foremen must watch for wildlife that may be harmed and take avoidance action as required. Socio-Economic • Provide communication access between communities and project developer to receive requests and to listen to the needs and problem of communities including to respond to the requests and to solve the problem e.g. establishing complaint center, informing communities about project address and telephone number. • The project proponent must set up CSR unit during project construction period Land Use • Declare the actual R.O.W which does not exceed 40 meters of width as soon as possible after detail design is accomplished. Cultural heritage • The person or group (identifier) who identified or exposed the burial ground must cease all activity in the immediate vicinity of the site then inform the relevant personnel responsible included local and government cultural heritage administrative department. Risk Assessment • Environmental risk management during project construction must be carried out by the Project Management Team as part of the overall project risk management. Environmental risk mitigation measures will be implemented by the project management team within the scope of and procedures for project risk management.
Section 6.4: Operation Phase - Impact Identification, Assessment and Mitigation	Project proponent must comply the mitigation measure as follows: Gaseous Emissions • Providing good traffic management to avoid traffic congestion in populated areas. Noise • Reduction of speed limit in settlement areas. • Always maintain road surface in good condition. Surface Water Quality • Regular check-up wastewater treatment system with carrying capacity within the wastewater treatment area of the service areas. Aquatic Ecology • Apply the same mitigation measures as for wastewater contamination Forest and Wildlife • Protect vegetation alongside the Two-lane road by undertaking maintenance regularly and vegetation if needed.

Commitment Source	Commitment
	• Install signs warning motorists of the presence of animals in areas of frequent animal crossings. Socio-Economic • Provide space in vista site (Rest area) for local people to sell local products/handicraft. • Related government agencies should support the communities to sustainably exist with ability to adapt to changes and innovations. Infrastructure Facilities • Proposed to improve road safety rather than to improve traffic flow. Risk Assessment • The following safety policies are strongly recommended: (a) mandatory use of seat belts; (b) compulsory driver training and testing; (c) prohibition and punishment of driving while impaired by drugs or alcohol; (d) traffic safety education for children; and (e) testing and inspection of all vehicles for compliance with safety standards.
Chapter 8 Environmental Management Plans	
Section 8.3: Summary of Environment Management Plan for Construction Period (CEMP)	For construction phase, the key objective of the Owner-CEMP (OCEMP) is to establish a clear operational framework and requirements for environmental management during the construction phase of the Project. Based on the OCEMP, the Contractor must prepare a Contractor-CEMP (CCEMP) which must have operational details based on the detailed designs, construction methods, and construction schedule. CCEMP aim to manage and mitigate all related environmental issues and divided into 2 categories as 1) Site specific plans comprising i) air quality; (ii) noise; (iii) vibration; (iv) surface water quality; (vi) aquatic ecology; (vi) soil erosion protection; (vii) chance find management; and 2) Thematic plans included (i) transportation; (ii) water use; (iii) solid waste; (iv) hazardous waste; (v) forest and wildlife; (vi) biodiversity; (vii) occupational health; (viii) construction emergency response plan; (ix) compensation and livelihood restoration; (x) land use; and (xi) socio-economic. Environmental components which would be monitored followings: - Air quality (5 stations) - Noise and vibration measurement (5 stations) - Surface water quality and aquatic ecology (7 station) - Traffic counting (3 stations) In addition, OSH Management Plan and village forum are included in the CEMP. Contractor is required to submit monthly report on environmental performance to ECD during pre-construction and construction period. Tripartite committee which included representative from government, project's proponent and nearby communities would be set up.
Section 8.4: Summary of Environment Management Plan for Operation Period (OEMP)	Project's proponent is required to prepare and implement Environment Management Plan for Operation Period (OEMP). OEMP aim to manage and mitigate all related environmental issues and divided into 2 categories as 1) Site specific plans comprising i) air quality; (ii) noise; (iii) vibration; (iv) surface water quality; and 2) Thematic plans included (i) transportation; and (ii) forest and wildlife. Environmental components which would be monitored followings: - Air quality (5 stations) - Noise and vibration measurement (5 stations) - Surface water quality and aquatic ecology (7 station) - Traffic counting (3 stations) Project proponent by EHS is required to submit six-month report on environmental monitoring to ECD throughout the project's life.

<table>
<tr><th>Commitment Source</th><th>Commitment</th></tr>
<tr><td colspan="2">Chapter 9 Public Consultations and Disclosure</td></tr>
<tr><td>Section 9.1: Introduction</td><td>Project proponent must follow the environmental procedure which public concerns should also be taken into account in assessing impacts, designing mitigation measures, and selecting monitoring parameters.</td></tr>
<tr><td>Section 9.2: Methodology and Approach</td><td>• Project proponent follows the standard principles and practices in public participation.
• Project proponent must inform the stakeholders about the Project, environmental and social issues</td></tr>
<tr><td>Section 9.3.2 PCD during the EIA Preparation</td><td>Project proponent response on issues related with an access road to link village and the Two lane road and road improvement between villages during the public consultation meetings as presented in Table 9.3-3 of Chapter 9 and shown in Table below;
<table>
<tr><th>Main Issues</th><th>Clarifications by the Project Proponent and Consultant</th></tr>
<tr><td>1. Engineering Issues</td><td></td></tr>
<tr><td>1) Villagers can access and cross the two lane road or not?</td><td>Referring to project design, along most part of the project alignment there would be no fence except at some specific sections where road safety, security and road improvement are required, temporary or permanent fence or barricade would be provided, therefore villagers can easily access and cross the Two lane road.
Furthermore, For any crossing between the access road and the two lane road, the entrance/ exit point will be physically enhanced to improve its safety.</td></tr>
<tr><td>2) The project should consider on provision of access road to link village and the two lane road.</td><td>Based on latest observation, access roads have been already in place, there is no need to provide additional access road from village to the Two lane road project alignment.
In case of road improvement between villages, villagers along the two lane road can use the two lane road to commute between villages, no need for road improvement as the Two lane road shall be well maintained throughout by the concessionaire.</td></tr>
<tr><td>3) Villagers are willing to maintain the road constructed by the developer in case they can use as well.</td><td>For the current access road constructed by ITD
a) During construction stage, it will be used to support two lane road construction activities. Usage of road can be shared with local commuters.
b) After finish two lane road construction, this access road will be handovered to local administration and villagers will still be able to use this access road.</td></tr>
<tr><th>Main Issues</th><th>Clarifications by the Project Proponent and Consultant</th></tr>
<tr><td>4) Project features and toll booth management.</td><td>The project road is express way without fence along project alignment except at some specific sections where road safety, security and road improvement are required, temporary or permanent fence or barricade would be provided. Therefore, villager car/truck can use the two lane road</td></tr>
</table></td></tr>
</table>

Commitment Source	Commitment	
		free of charge as long as they do not passing through the toll gates (Situated in 4 locations).
	5) Villagers should have opportunity to participate in baseline environmental condition survey.	Local villagers can participate in baseline environmental condition survey by confirmation with head village before the Consultant conduct baseline survey.
	6) There should be disclosures of EIA Report.	EIA Report was delivered to each base camp of ITD along project alignment and summary result of EIA study was also published in brochures and disclosed to all participants in the public consultation meetings.
Section 9.4: Recommendations for Ongoing Consultations	The Project stakeholders and interested parties could be fully participated from the beginning and through the entire process of project development are as follows; • **Relevant Government Authorities, 1) Key offices at the national level** are: (i) Ministry of Livestock, Fisheries and Rural Development, (ii) Ministry of Agriculture and Irrigation, (iii) Ministry of Natural Resources and Environmental Conservation, (iv) Ministry of Welfare, Relief and Resettlement, (v) Ministry of Transport, (vi) Ministry of Rail Transport, and (vii) Ministry of Construction. **2) Key offices at the regional level** are: (i) Tanintharyi Region Office of the Environmental Conservation Department; (ii) Tanintharyi Region Office of Social Welfare, Relief and Resettlement; (iii) Tanintharyi Region Office of the Ministry of Transport; (iv) Tanintharyi Region Office of the Ministry of Rail Transport; (v) Tanintharyi Region Office of the Ministry of Construction; (vi) Tanintharyi Region of the Ministry of Electricity and Industry; (vii) Tanintharyi Region Office of Planning and Economic; and (vii) Chairman of Hluttaw. **3) Key offices at the local level** are: (i) Yebyu Township Administration; and (ii) Myitta Township Administration. Included the DSEZ Management Committee (DSEZMC) and the Supporting Working Body (SWB)-Support Working Group of DSEZ. • **Other Interested Parties,** this category are various government departments responsible for development of various sectors, and community based organizations. • **Potentially Affected People,** The Project's stakeholders in this category are village committees and individual villagers in the 16 villages in the study area namely Dauk Lauk, Tha Laing Ya, Pa Dao Gon, Tha Loat Htar, Thi Khat Done, Ye Bouk, Tha Byu Chaung, Pyin Tha Daw, Myitta, Taung Thone Long, Sin Byu Daing, La Or, Va Do, Armu, Gad Tra Khee and Hti Khee in Yebyu and Myitta Townships of Dawei District.	

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By: Myandawei Industrial Estate Company Limited
Name: Dr.Somchet Thinaphong
Title: Managing Director

နှစ်လမ်းသွားလမ်း စီမံကိန်းက 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။ ကူးစက်ရောဂါများကာကွယ်နှိမ်းနင်းရေးဥပဒေ(၁၉၉၅)

၉။ ဆေးလိပ်နှင့်ဆေးရွက်ကြိုးထွက်ပစ္စည်းသောက်သုံးမှုထိန်းချုပ်ရေးဥပဒေ(၂၀၁၆)

၁၀။ မြန်မာနိုင်ငံ မီးသတ်တပ်ဖွဲ့ဥပဒေ (၂၀၁၅)

၁၁။ မော်တော်ယာဉ်ဥပဒေ(၂၀၁၅) နှင့် မော်တော်ယာဉ်နည်းဥပဒေများ(၁၉၈၇)

၁၂။ မြန်မာ့အာမခံလုပ်ငန်းဥပဒေ(၁၉၉၃)

၁၃။ အလုပ်သမားအဖွဲ့အစည်းဥပဒေ(၂၀၁၁)

၁၄။ အလုပ်သမားရေးရာအငြင်းပွားမှုဖြေရှင်းရေးဥပဒေ(၂၀၁၂)

၁၅။ အလုပ်အကိုင်နှင့်ကျွမ်းကျင်မှုဖွံ့ဖြိုးတိုးတက်ရေးဥပဒေ(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။ မြန်မာ့ဆိပ်ကမ်းအာဏာပိုင်ဥပဒေ (၂၀၁၅)

၃၃။ ပို့ကုန်သွင်းကုန်ဥပဒေ (၂၀၁၂)

၁။ ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဥပဒေ(၂၀၁၂)

စီမံကိန်းပိုင်ရှင်သည်-

(က) ပတ်ဝန်းကျင်ကိုညစ်ညမ်းစေခဲ့လျှင်ဝန်ကြီးဌာနက သတ်မှတ်သည့်လျော်ကြေးငွေကို ပေးလျော်ပါမည်။ (ပုဒ်မ၇၊ ပုဒ်မခွဲ(၈) 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 တားမြစ်ချက်များကို လိုက်နာပါမည်။(ပုဒ်မ၂၉အရ)

၂။ ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးနည်းဥပဒေ(၂၀၁၄)

စီမံကိန်းပိုင်ရှင်သည်-

(က) နည်းဥပဒေဖေ့၊ နည်းဥပဒေခွဲ(က) အရ ပတ်ဝန်းကျင်ကိုညစ်ညမ်းစေသည့် ပစ္စည်းများကို အများပြည်သူအား တိုက်ရိုက်ဖြစ်စေ သွယ်ဝိုက်၍ဖြစ်စေ ထိခိုက်စေနိုင်မည့် နေရာတစ်ခုခုတွင်

တစ်နည်းနည်းဖြင့် ထုတ်လွှတ်ခြင်း၊ ထုတ်လွှတ်စေခြင်း၊ စွန့်ပစ်ခြင်း၊ စွန့်ပစ်စေခြင်း၊ စုပုံခြင်း၊ စုပုံစေခြင်း မပြုရပါ။

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

(ဂ) နည်းဥပဒေဖြစ်စေ၊နည်းဥပဒေခွဲ(ခ) အရ ဂေဟာစနစ်နှင့်ယင်းစနစ်ကြောင့် ဖြစ်ပေါ်ပြောင်းလဲနေသော သဘာဝပတ်ဝန်းကျင်ကို ထိခိုက်ပျက်စီးစေနိုင်သည့် ပြုလုပ်မှုကို ဆောင်ရွက်ခြင်းမပြုရပါ။

၃။ ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာလုပ်ထုံးနည်းလုပ်နည်း (၂၀၁၅)

စီမံကိန်းပိုင်ရှင်သည်-

(က) မိမိကိုယ်တိုင်ကြောင့်ဖြစ်စေ၊ မိမိကိုယ်စား ဆောင်ရွက်သည့်ကန်ထရိုက်တာ၊ လက်ခွဲ ဆောင်ရွက်ပေးသူ ဆပ်ကန်ထရိုက်တာ၊ အရာရှိ၊ အလုပ်သမား၊ ကိုယ်စားလှယ် သို့မဟုတ် အတိုင်ပင်ခံ၏ပြုလုပ်မှု သို့မဟုတ် ပျက်ကွက်မှုကြောင့်ပေါ်ပေါက်သည့် ဆိုးကျိုးသက်ရောက်မှုကို တာဝန်ယူရပါမည်။ (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) အကြီးတည်ဆောက်ခြင်း၊ တည်ဆောက်ခြင်း၊ လုပ်ငန်းလည်ပတ်ဆောင်ရွက်ခြင်း၊ လုပ်ငန်းရပ်စဲခြင်း၊ လုပ်ငန်းပိတ်သိမ်းခြင်းနှင့် လုပ်ငန်းပိတ်သိမ်းပြီးကာလတို့တွင် ဆိုးကျိုးသက်ရောက်မှု အားလုံးအတွက် စီမံကိန်းနှင့်ဆက်စပ်ဆောင်ရွက်မှုများကို စဉ်ဆက်မပြတ် ဘက်စုံစောင့်ကြပ် စစ်ဆေးပါမည်။(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၊ ပြည်သူ့ခန်းမ၊ အများပြည်သူစုဝေးရာနေရာနှင့် စီမံကိန်းရုံးဌာနတို့တွင် အများပြည်သူသိရှိစေရန် ယင်းအစီရင်ခံစာကိုတင်ပြပါမည်။ ယင်းအစီရင်ခံစာ၏ ဒီဂျီတယ်မိတ္တူ တောင်းခံချက်ကို လက်ခံရရှိသည့်နေ့မှစ၍ ၁၀ရက်အတွင်း အီးမေးလ်ဖြင့် ဖြစ်စေ၊ တောင်းခံသူနှင့် သဘောတူညီထားသည့် အခြားနည်းလမ်းဖြင့် ဖြစ်စေ တောင်းခံသူအား ပေးပါမည်။ (အပိုဒ်၁၁၀အရ)

(ည) စောင့်ကြပ်ကြည့်ရှုရန်နှင့် စစ်ဆေးရန်တာဝန်ရှိသူကို သာမန်အလုပ်ချိန်အတွင်း ဝင်ရောက်ခွင့် ပြုပါမည်။ (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 လျော့ချခြင်းတို့အတွက် အလုပ်သမားများကို တည်ဆဲဥပဒေ များနှင့်အညီ နစ်နာကြေးပေးပြီးမှသာ ရင်းနှီးမြှုပ်နှံမှုကို ရပ်ဆိုင်းပိတ်သိမ်း ပါမည်။ (ပုဒ်မ ၆၅ (ဈ) အရ)

(ဆ) နိုင်လုံသောအကြောင်းပြချက်ဖြင့် 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 (ဌ) အရ)

(ည) စီမံကိန်းလိုအပ်ချက်အရ ခွင့်ပြုထားခြင်း မဟုတ်သော ဆောင်ရွက်ခြင်းကြောင့် သဘာဝပတ်ဝန်းကျင် ထိခိုက်ပျက်စီးစေခြင်းနှင့် လူမှုစီးပွားအပေါ် ဆုံးရှုံးမှုများ ဖြစ်ပေါ်စေပါက အဆိုပါ ဆုံးရှုံးနစ်နာမှုအတွက် 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)

(၃) 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။ ပြည်သူကျန်းမာရေးဥပဒေ(၁၉၇၂)

စီမံကိန်းပိုင်ရှင်သည်-

(က) ပြည်သူကျန်းမာရေးအတွက် 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) ကြက်နှင့် 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 ဓရိယာအတွင်း 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။ မြန်မာနိုင်ငံ မီးသတ်တပ်ဖွဲ့ဥပဒေ (၂၀၁၅)

စီမံကိန်း ပိုင်ရှင်သည် -

(က) သီးသန့် မီးသတ်တပ်ဖွဲ့ 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) ခုံသမာဓိအဖွဲ့ သို့မဟုတ် 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 ကျွမ်းကျင်မှုဖွံ့ဖြိုးတိုးတက်ရေး ဥပဒေ(၂၀၁၃)

စီမံကိန်းပိုင်ရှင်သည်-

(က) အလုပ်သမားခန့်ထားရာတွင် ဤဥပဒေ ပုဒ်မ ၅ ပါ ပြဋ္ဌာန်းချက်များနှင့်အညီ စာချုပ်ချုပ်ဆို၍ ခန့်ထားပါမည်။ (ပုဒ်မ၅၁အရ)

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

(ဇ) 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) သဘာဝဘေးအန္တရာယ်အပါပဝင် မမျော်လင့်သော ထူးခြားသည့်အခြေအနေ ပေါ်ပေါက်ပါက အခကြေးငွေ ပြောင်းလဲပေးချေလိုကြောင်းကို သက်ဆိုင်ရာ အလုပ်သမားများ၏ သဘောတူညီချက်ဖြင့် တင်ပြပါမည်။ (ပုဒ်မ၅၅အရ)

(ဂ) အလုပ်သမားထံမှ နတ်ယူရန် 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၊ ပုဒ်မခွဲ (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 နတ်ယူပြီး 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။ ရေနုံနည်းဥပဒေများ(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) ကမ်းပါးမှ သဘာဝပတ်ဝန်းကျင် ထိခိုက်ပျက်စီးခြင်းဖြစ်စေမည့် စက်သုံးဆီ၊ ဓာတုပစ္စည်း၊ အဆိပ်သင့်ပစ္စည်းနှင့် အခြားပစ္စည်းများ စွန့်ပစ်ခြင်း၊ ပေါက်ကွဲစေတက်သောပစ္စည်း များ စွန့်ပစ်ခြင်းမပြုပါ။ (ပုဒ်မ ၁၁(က) အရ)

(ဂ) ကမ်းပါးမှ ရေလမ်းပျက်စီးခြင်း သို့မဟုတ် ရေကြောင်းပြောင်းလဲခြင်း ဖြစ်ပေါ်စေမည့် အရာဝတ္ထုတစ်ခုခုကို စွန့်ပြစ်ခြင်းမပြုပါ။ (ပုဒ်မ ၁၉ အရ)

(ဃ) ဦးစီးဌာနက မြစ်၊ ချောင်းအတွင်း ရေထုညစ်ညမ်းမှု မဖြစ်ပေါ်စေရေးနှင့် ရေလမ်းကြောင်းမပြောင်းလဲစေရေးအတွက် သတ်မှတ်ထားသော စည်းကမ်းချက်များကို ဖောက်ဖျက်ခြင်းမပြုပါ။ (ပုဒ်မ ၂၄ (က) အရ)

၂၄။ ရေချိုငါးလုပ်ငန်း ဥပဒေ (၁၉၉၁)

စီမံကိန်းပိုင်ရှင်သည်ရေချိုငါးလုပ်ငန်း ရေပြင်အတွင်း ရေထုညစ်ညမ်းစေခြင်းနှင့် ငါးနှင့် အခြားရေနေသတ္တဝါများကို 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)

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

၂၇။ ရှေးဟောင်း ဝတ္ထုပစ္စည်းများ ကာကွယ်ထိန်းသိမ်းရေး ဥပဒေ (၂၀၁၅)

စီမံကိန်းပိုင်ရှင်သည် မိမိ၏ စီမံကိန်း ဧရိယာအတွင်း ရှေးဟောင်းဝတ္ထုပစ္စည်းကို တွေ့ရှိပါက အနီးဆုံးရေပ်ကွက် 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 အဓိုင်အခဲများ စွန့်ပစ်ခြင်းနှင့် ဓာတုပစ္စည်းများ စွန့်ပစ်မည်ဆိုပါက ရှေးဟောင်းသုတေသန ဦးစီးဌာန၏ ကြိုတင်ခွင့် ပြုချက်ကို 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 လုပ်ထုံးလုပ်နည်း များဖြင့် သတ်မှတ်ပေးသည့် လိုက်နာရမည့် သတ်မှတ်ချက်များကို လိုက်နာဆောင်ရွက်ပါမည်။ (ပုဒ်မ ၁၁(စ) အရ)

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

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

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

(ဂ) အဆင့်မြင့်နည်းပညာနှင့် ကျွမ်းကျင်မှုဆိုင်ရာ လိုအပ်သော လုပ်ငန်းများတွင် နိုင်ငံသား ကျွမ်းကျင်သူ 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 ထားဝယ်အထူးစီးပွားဧရိယာအတွင်း 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၊ ရေးဟောင်းဝတ္ထုပစ္စည်းကို ဖြစ်စေ၊ ရတနာသိုက်ကိုဖြစ်စေ တွေ့ရှိလျှင် စီမံခန့်ခွဲမှုကော်မတီ သို့ ချက်ချင်းအကြောင်းကြားပါမည်။ ထိုပြင် 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။ မြန်မာ့ဆိပ်ကမ်းအာဏာပိုင်ဥပဒေ (၂၀၁၅)

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

၃၃။ ပို့ကုန်သွင်းကုန်ဥပဒေ (၂၀၁၂)

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

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မှ: Myandawei Industrial Estate Company Limited
အမည်: Dr.Somchet Thinaphong
ရာထူး: မနေးဂ်ငး ဒါရိုက္တာ

The Applicable Laws and Legal Commitments for Two Lanes Project in Dawei Special Economic Zone

Applicable Legislations, Guidelines and the Legal Framework of Environmental Issues

Past and Present Environmental Legislation and Regulations of Myanmar

The National Commissions for Environmental Affairs (NCEA) formed in February 1990 outlined **Myanmar Agenda 21**, which contains social, economic, institutional and infrastructural strengthening programmes as well as environmental conservation programmes.

To achieve sound environmental management in Myanmar, the respective Ministries fundamentally devise 56 environmental policies and regulations that are directly related with environmental conservation and protection. The State Law and Order Restoration Council ratified the **Forest Law in November 1992,** in order to conserve the environmental factors and to maintain a sustained yield of the forest produce and **Protection of Wild Life and Wild Plants and Conservation of Natural Areas Law in 1994.**

In order to uphold further environmental protection promote sustainable development and bring into line for environmental affairs, in April 2011, National Environmental Conservation Committee (NECC) was reformed for the national environmental management in Myanmar. The Ministry of Environmental Conservation and Forestry (MoECaF) was upgraded in place of The Ministry of Forestry in September 2011 as the focal and coordinating agency for the overall environmental management. The Government entered the set-up of Environmental Conservation Department as a separate organization under the Ministry of Environmental Conservation and Forestry (MoECaF) on 11 October 2012. The Ministry of Environmental Conservation and Forestry promulgated The Environmental Conservation Law on 30th March, 2012. The Environmental Conservation Law on 30th March, 2012.The Environmental conservation and Forestry issued the Environmental Conservation Rules on th 2014 and issued the Environmental Impact Assessment Producer and Emission Quality Standards Guideline on 29th December 2015.

The project is related to the following laws, rules, procedure and guideline-

1. The Environmental Conservation Law (2012)
2. The Environmental Conservation Rules (2014)
3. Environmental Impact Assessment Procedure (2015)
4. Emission Quality Standards Guideline (2015)
5. Myanmar Investment Law (2016)
6. The Rights of National Races Law (2015)
7. The Public Health Law (1972)
8. Prevention and Control of Communicable Disease Law (1995)
9. The Control of Smoking and Consumption of Tobacco Product Law (2006)
10. Myanmar Fire Force Law (2015)
11. The Motor Vehicle Law (2015) and Rules (1987)

12. The Myanmar Insurance Law (1993)
13. Labour Organization Law (2011)
14. Settlement of Labour Disputes law (2012)
15. The Development of Employment and Skill Law (2013)
16. 2013, Minimum Wages Law
17. 2016, Payment of Wages Law
18. Workmen's Compensation Act (1923)
19. The Leaves and Holiday Act (1951)
20. Social Security Law (2012)
21. Petroleum Act (1934)
22. The Petroleum Rules (1937)
23. Conservation of Water Resources and Rivers Law (2006)
24. Freshwater Fisheries Law (1991)
25. Myanmar Marine Fishery Law (1990)
26. The Protection and Preservation of Cultural Heritage Regions Law (1998)
27. The Protection and Preservation of Antique Objects Law (2015)
28. The Protection and Preservation of Ancient Monument Law (2015)
29. Forest Law (1992)
30. Special Economic Zone Law, 20114
31. Myanmar Engineering Council Law (2013)
32. Myanmar Port Authority Law (2015)
33. The Export and Import Law (2012)

1. The Environmental Conservation Law (2012)

Purpose; to construct a healthy and clean environment and to conserve natural and cultural heritage for the benefit of present and future generations; 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 section25 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.
- 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)

Purpose; 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. This law focuses as follows;

- 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 section51of said law.
- The project proponent has to appoint the nationalities only in normal work without expertise, in line with the sub-section (c) of section51of 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 section51of 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 section65of 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 section65of 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 section65of 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 section65of 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 section65of said law.
- The project proponent has to abide by labour laws, in line with the sub-section (m) of section65of 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 section65of 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 section65of 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 65of 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)

Purpose: To ensure to disclose to residents ethnic nationalities about the project fully, moreover to ensure to cooperate with them. This law focuses the following matters;

Section 5 - The project proponent has to disclose to the residents national races all about the project fully.

- The project proponent has to cooperate with the residents national races.

7. The Public Health Law (1972)

Purpose: 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 5 of said law.
- ***Section 3*** - The project proponent has to abide by any instruction or stipulation for public health.
- ***Section 5*** - The project proponent has to allow any inspection, anytime, anywhere if it is needed

8. Prevention and Control of Communicable Diseases Law (1995)

Purpose: To ensure the healthy work environment and prevention the communicable diseases by the cooperation with the relevant health department.

- The project proponent has to built 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)

Purpose: 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 power plant area, under sub-section (d) of section 9 of said law.

10. The Myanmar Fire Force Law (2015)

Purpose: 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. This law focuses the following

- The project proponent has to institute the specific fire services, under sub-section (a) of section 25.
- The project owner has to provide materials and apparatuses for fire precaution and prevention, Sub-section (b) of section 25.

11. The Motor Vehicles law (2015) and Rules (1987)

Purpose: 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

Purpose: The project can cause the damages to the environment and injuries to public so to ensure the needed insurances are insured at Myanmar Insurance. This law focuses the following matters;

- ***Section 15*** - If the project proponent uses the owned vehicles the project owner has to insure the insurance for injured person.
- ***Section 16*** 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.

13. Labour Organization Law (2011)

Purpose: 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.

- ***Section 17*** - The project owner promises 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.
- ***Section 18*** - The project proponent promises to demand the re-appointment of worker who is dismissed by the employer without the conformity with the labour laws.
- ***Section 19*** - The project proponent promises to send the representatives to the Conciliation Body in settling a dispute between the employer and the worker.
- ***Section 20*** - The project proponent promises 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.
- ***Section 21*** - The project proponent promises the labour organization to participate in solving the collective bargains of the employees in accord with the labour laws.
- ***Section 22*** - The project proponent promises 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 .

14. The Settlement of Labour Dispute Law, 2012

Purpose: To ensure negotiation and discussion between employees and project proponent, abiding the decision of Tribunal. This law focuses as follows;

- 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.

15. Employment and Skill Development Law (2013)

Purpose: 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 promise not to deduct from the payment of employees for above mentioned fund, under sub-section (b) of section 30 of said law.

16. 2013,The Minimum Wages Law

Purpose: 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 section13 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)

Purpose: To ensure the way of payment and avoiding delay payment to the employees. This law focuses as follows;

- 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.
- 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)

Purpose: To ensure the compensations to injured employee while implementing in line with the above law and pay the prescribed compensations in various kinds of injury. This law focuses as follow;

- ***Section 13*** 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)

Purpose: The employees can take the leaves and get the holidays legally and to ensure the right to get the holidays and leaves. This law focuses the following matters;

- The project proponent has to allow the leaves and holidays in line with the law.

20. Social Security Law

Purpose: 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 myself 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 myself 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)

Purpose: The project will carry the oil in any phase and may import it. So, 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)

Purpose: 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)

- The project proponent has to obtain the licence granted by the water officer for sinking the underground water before sinking water, under section 3 of said law (if the project needs to sink the underground water).

24. Conservation of Water Resources and Rivers Law (2006)

Purpose: 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.
- 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.

25. Freshwater Fisheries Law (1991)

Purpose: 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. This law focuses as follow;

- The project proponent has to avoid any water pollution and disturbing to fish &other aquatic lives in any fresh-water such as river, creek under section 40 of said law.

26. Myanmar Marine Fishery Law (1990)

Purpose: 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

The Protection and Preservation of Cultural Heritage Regions Law (1998)

Purpose: To ensure the protection of cultural heritages and the cultural heritage area from the damage by the natural disaster or man-made.

- Section 13 - 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.
- Section 22 - 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.

27. The Protection and Preservation of Antique Objective Law (2015)

Purpose: To ensure the protection of ancient monument and information about it if it was in the project area. This law focuses as follow;

- 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.

28. The Protection and Preservation of Ancient Monument Law (2015)

Purpose: To ensure the protection of ancient monument and information about it if it was in the project area. This law focuses as follows;

- ***Section 12*** - 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.
- ***Section 15*** - 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.

- ***Sub-section (f) of section 20*** - 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.

29. The Forest Law (1992)

- ***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.

30. The Special Economic Zone Law (2014)

Purpose: 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. This law focuses as follows;

- 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.
- 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 has to 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.

31. The Engineering Council Law (2013)

Purpose: To ensure the safety in technical and engineering work in the project. This law focuses the following;

- 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.

32. Myanmar Port Authority Law (2015)

Purpose: To ensure the conservation of water pollution in the port area. This law focuses the following;

- The project proponent has to avoid disposing the dangerous material, poisoned material, garbage, sewage or disposal into the water from the port area, under the sub-section (a) of section 23 of said law.

33. The Export and Import Law

Purpose: To ensure to abide by the conditions included in permit if it is needed to import the material for project. This law focuses as follow;

- The project proponent has to abide by the conditions included in permit, under section 7 of said law.

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Name: Dr.Somchet Thinaphong
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Environmental Mitigation Measures and Environmental Quality Monitoring Program

Environmental and Social Impact Assessment for Two-Lane Road Linking the Dawei Special Economic Zone with the Thai Border Project

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Certified the Environmental Mitigation Measures and Environmental Monitoring Program

Environmental and Social Impact Assessment for Two-Lane Road Linking the Dawei Special Economic Zone with the Thai Border Project

Certified Report by

S. Boonyuen

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(Dr. Sirinimit Boonyuen)
Senior Executive Vice President-International

Date June, 2018

Environmental Mitigation Measures and Environmental Quality Monitoring Program

Environmental and Social Impact Assessment for Two-Lane Road Linking the Dawei Special Economic Zone with the Thai Border Project

The Project's environmental mitigation and monitoring measures are as follows.

1. Mitigation Measures and Monitoring Program during Construction Phase **(Table 1)**
2. Mitigation Measures and Monitoring Program during Operational Phase **(Table 2)**

TABLE 1: MITIGATION MEASURES AND MONITORING PROGRAM DURING CONSTRUCTION PHASE

Environmental and Social Issue	Impacts	Mitigation Measures	Monitoring Program	Responsibility
Air Quality	• Increases in air pollutants caused by fugitive dust from construction activities; for example, top soil opening, excavation, drilling and etc.	***Fugitive Dust*** **a. At the Construction Sites** • Spray water at and around the construction areas during site preparation and grading. • Enforce a speed limit for vehicles and trucks in the construction sites not to exceed 40 km/hr. Construction activities shall be kept as planned so that the disturbed areas will be minimized at any time. • Restore, resurface, and rehabilitate the disturbed areas as soon as practicable after completion of construction or disturbance. • Prohibit the open burning of waste in the construction area. • Dust masks should be provided (where applicable) to all construction workers. **b. Along the Transportation Routes** • Enforce speed limit for trucks not to exceed 40 km/hr when passing the communities. • Cover construction materials by tarpaulin sheet during transportation, materials should be dampened, if necessary, before transportation. • Establish a vehicle washing facilities to minimize the quantity of material deposition on public roads. • Establish a checkpoint at project gate to ensure the vehicles leaving the project site are following the measures prescribed to reduce dust emissions. ***Gaseous Emissions at Sources*** • Adopt procedures to avoid construction vehicles idling for excessive periods (e.g. more than 5 minutes) if required to queue to enter the construction sites;	**Parameters** • Total Suspended Particulate (TSP) • Particulate Matter less than 10 µm (PM-10) • Wind speed and directions • Nitrogen Dioxide (NO2) • Carbon monoxide (CO) **Location** • Station 1: Located at Dauk Lauk village, Yebyu Township • Station 2: Located at Myitta village, Myitta Sub-Township • Station 3: Located at Vado village, Yebyu Township • Station 4: Located at Elasto Base 1 Camp, Yebyu Township • Station 5: Located at Hti Hkee village (proposed check point), Yebyu Township **Frequency** Twice a year during dry season (once) and wet season (once). Each sampling must be conducted for 5 consecutive days.	• Contractor • Myandawei Industrial Estate Company Limited

TABLE 1: MITIGATION MEASURES AND MONITORING PROGRAM DURING CONSTRUCTION PHASE (CONT'D)

Environmental and Social Issue	Impacts	Mitigation Measures	Monitoring Program	Responsibility
Air Quality (Cont'd)		*Gaseous Emissions at Sources (Cont'd)* • Maintain all construction equipment in proper working conditions according to the manufacturer's specifications. The engines of the construction equipment fleet must be routinely maintained by qualified mechanics to ensure their proper conditions during operations. • Provide adequate training to the equipment operators in the proper use of equipment. • Use the proper size of equipment for the job. • Use the equipment fitted engines with latest low emission technologies (repowered engines, electric drive trains). For example, the diesel generator set to be used must be equipped with modern pollution control equipment. • Perform on-site material hauling with trucks equipped with on-road engines (if determined to be less emissive than the off-road engines). • Take measures to manage the movement of construction vehicles entering and leaving the construction sites to avoid, or mitigate and manage the potential for vehicle emissions impacting on adjacent properties, except where such residential or sensitive activities front an arterial road to be used for access to or from the construction site. Measures for construction fleet management are to be provided in the construction vehicle management plan and the construction traffic management plan. Such measures may include avoiding or minimizing queuing on streets approaching the worksites or adjacent to other sensitive activities;	**Methodology** • PM-10 (Average 24 Hour): High-Volume Air Sampler (PM-10) / Gravimetric • TSP (Average 24 Hour): Method High-Volume Air Sampler/ Gravimetric Method) • Wind speed and directions: Cup Anemometer and Wind Vane • NO2 (Average 1 Hour): Chemiluminescence • CO (Average 1 Hour): NDRI **Implementation Schedule** Throughout the project construction period.	

TABLE 1: MITIGATION MEASURES AND MONITORING PROGRAM DURING CONSTRUCTION PHASE (CONT'D)

Environmental and Social Issue	Impacts	Mitigation Measures	Monitoring Program	Responsibility
Air Quality (Cont'd)		*Gaseous Emissions at Sources (Cont'd)* • For stationary plant and equipment powered by diesel motors, take measures to avoid or mitigate and manage the potential impacts of exhaust emissions on adjacent residential or other sensitive activities. For example, ensure all construction vehicles and stationary plant and equipment powered by diesel motors are fitted with emission control measures, and are regularly maintained to manufacturers' specifications.		

TABLE 1: MITIGATION MEASURES AND MONITORING PROGRAM DURING CONSTRUCTION PHASE (CONT'D)

Environmental and Social Issue	Impacts	Mitigation Measures	Monitoring Program	Responsibility
Noise	• Increase ambient noise level at the construction site and communities near the project construction sites.	• Major construction activities which generate loud noise should be limited to only during the day time. Activities that are necessary to be carried out at night time will need approval of the site engineers, and will need to have adequate noise control equipment or measures. • Speeds of vehicles in the construction site will not be more than 40 km/hr. • Noise performance requirements of construction equipment will need to be clearly stated in contract specifications. • The EPC contractor will be required to regularly monitor ambient noise levels at the receptors, particularly during the noise generation period. • The construction environmental management plan will need to include an efficient complaints redress procedure and an efficient corrective action procedure to address the non-compliance of noise performance.	**Parameters to be monitored** • Leq (24 hrs) • Lmax • Ldn • L90 **Location** • Station 1: Located at Dauk Lauk village, Yebyu Township • Station 2: Located at Myitta village, Myitta Sub-Township • Station 3: Located at Vado village, Yebyu Township • Station 4: Located at Elasto Base 1 Camp, Yebyu Township • Station 5: Located at Hti Hkee village (proposed check point), Yebyu Township **Frequency** Twice a year during dry season (once) and wet season (once). Each sampling must be conducted for 5 consecutive days. **Methodology** International Organization for Standardization (ISO1996) for noise level measurement. **Implementation Schedule** Throughout the project construction period	• Contractor • Myandawei Industrial Estate Company Limited

TABLE 1: MITIGATION MEASURES AND MONITORING PROGRAM DURING CONSTRUCTION PHASE (CONT'D)

Environmental and Social Issue	Impacts	Mitigation Measures	Monitoring Program	Responsibility
Vibration	• Impacts of the Project on vibration will be an issue of concern only during the construction phase. Major of vibration is heavy machines using.	• Major construction activities which generate vibration should be limited to only during the day time. Activities that are necessary to be carried out at night time will need approval of the site engineers. • Speeds of vehicles in the construction site will not be more than 40 km/hr. • Noise performance requirements of construction equipment will need to be clearly stated in contract specifications. • The EPC contractor will be required to regularly monitor ambient vibration levels at the receptors. • The construction environmental management plan will need to include an efficient complaints redress procedure and an efficient corrective action procedure to address the non-compliance of vibration performance.	**Parameters to be monitored** • Vibration or PPV measured **Location** • Station 1: Located at Dauk Lauk village, Yebyu Township • Station 2: Located at Myitta village, Myitta Sub-Township • Station 3: Located at Vado village, Yebyu Township • Station 4: Located at Elasto Base 1 Camp, Yebyu Township Station 5: Located at Hti Hkee village (proposed check point), Yebyu Township **Frequency** Twice a year during dry season (once) and wet season (once). Each sampling must be conducted for 5 consecutive days. **Methodology** International Organization for Standardization (ISO1996) for vibration measurement. **Implementation Schedule** Throughout the project construction period	• Contractor • Myandawei Industrial Estate Company Limited

TABLE 1: MITIGATION MEASURES AND MONITORING PROGRAM DURING CONSTRUCTION PHASE (CONT'D)

Environmental and Social Issue	Impacts	Mitigation Measures	Monitoring Program	Responsibility
Surface Water Quality	• Increased turbidity of river water due to the bridge construction of the road alignment crossing water courses. • Wastewater contamination caused by the camp site.	• Retain as much natural vegetation cover as possible during excavation. • No materials will be stored within 50 m of a water course. • Provide temporary drainage to ensure that any storm water running off construction areas will be controlled around permanent water bodies. • Install water collection basins and sediment traps in all areas where construction equipment is washed. • Place at fuel storage, maintenance shop and vehicle cleaning areas at least 300 m away from the nearest water body. • The bridge and cross drain construction should be conducted in dry season. • Provide an adequate number of latrines and other sanitary arrangements at the site and work areas, and ensure that they are cleaned and maintained in a hygienic state.	**Parameters to be monitored** • Depth • pH • Temperature • Transparency • Conductivity • Salinity • Dissolved oxygen • Turbidity • Suspended Solids • Total Dissolved Solids • Total Solids • Oil and grease • BOD5 • Lead • Cadmium • Total Iron • Total Coliform Bacteria • Fecal Coliform Bacteria • COD • Total Hardness • Total Petroleum Hydrocarbon (TPH) • Total Kjeldahl (TKN-N) • Ammonia Nitrogen(NH3-N) • Total Nitrogen (Nitrate+Nitrite) • Total Phosphate	• Contractor • Myandawei Industrial Estate Company Limited

TABLE 1: MITIGATION MEASURES AND MONITORING PROGRAM DURING CONSTRUCTION PHASE (CONT'D)

Environmental and Social Issue	Impacts	Mitigation Measures	Monitoring Program	Responsibility
Surface Water Quality (Cont'd)			**Parameters to be monitored (Cont'd)** • Copper(Cu) • Zinc (Zn) **Location** • Station 1 (WQ1) :Dawei River • Station 2 (WQ2) : Tha Laing Ya shaung • Station 3 (WQ3) :Tha Laing Ya shaung, Mia Phyu • Station 4 (WQ4) :Tha Byu Shaung • Station 5 (WQ5): Kamoethway River • Station 6 (WQ6) : Proposed Bridge No. 11 • Station 7 (WQ7): Proposed Bridge No. 13 **Frequency** Seven times per year during the construction phase (monthly monitoring during Wet Season (June-October) and quarterly monitoring during Dry Season). **Methodology** The Standard Methods for Examination of Water and Wastewater, 2005 (APHA-AWWA-WEF)	

TABLE 1: MITIGATION MEASURES AND MONITORING PROGRAM DURING CONSTRUCTION PHASE (CONT'D)

Environmental and Social Issue	Impacts	Mitigation Measures	Monitoring Program	Responsibility
Surface Water Quality (Cont'd)			**Implementation Schedule** Throughout the project construction period	
Aquatic Ecology	• Increasing amount of SS in watercourses and wastewater contamination generating from camp sites.	• Apply the same mitigation measures as for surface water quality. • Inform the construction schedule of bridge to local fishermen living near the river where the road alignment cut across	**Parameters to be monitored** • Plankton • Benthos **Location** • Station 1 (WQ1) :Dawei River • Station 2 (WQ2) : Tha Laing Ya shaung • Station 3 (WQ3) :Tha Laing Ya shaung, Mia Phyu • Station 4 (WQ4) :Tha Byu Shaung • Station 5 (WQ5): Kamoethway River • Station 6 (WQ6) : Proposed Bridge No. 11 • Station 7 (WQ7): Proposed Bridge No. 13 **Frequency** Seven times per year during the construction phase (monthly monitoring during Wet Season (June-October) and quarterly monitoring during Dry Season).	• Contractor • Myandawei Industrial Estate Company Limited

TABLE 1: MITIGATION MEASURES AND MONITORING PROGRAM DURING CONSTRUCTION PHASE (CONT'D)

Environmental and Social Issue	Impacts	Mitigation Measures	Monitoring Program	Responsibility
Aquatic Ecology (Cont'd)			**Methodology** The Standard Methods for Examination of Water and Wastewater, 2005 (APHA-AWWA-WEF) **Implementation Schedule** Throughout the project construction period	
Soil Erosion and Soil Contamination	• The impact of soil erosion mostly occurs in the construction site is erosion at slop areas of rolling and mountain areas. • Contamination of soil in the construction phase may result from the inappropriate transfer, storage, and disposal of petroleum products, lubricants, chemicals, hazardous materials, liquids and solid waste.	***Soil Erosion*** • Grass planting covering on side slope immediately after completion of embankment construction. • Minimizing the area of soil clearance. • Construction in erosion and flood-prone areas will be mainly restricted to the dry season where possible. • Properly stabilize slopes and re-vegetate disturbed surfaces using locally available indigenous grass species. • Use of temporary berms or other appropriate temporary drainage provisions at construction sites. ***Soil Contamination*** • Store chemicals/hazardous products and waste on impermeable surfaces in secure, covered areas with clear labeling of containers and with a tray or bund to contain leaks. • Regularly remove all construction wastes from the site to approved waste disposal sites.	**Parameters to be monitored** • Same as Surface Water Quality **Location** • Station 1 (WQ1) :Dawei River • Station 2 (WQ2) : Tha Laing Ya shaung • Station 3 (WQ3) :Tha Laing Ya shaung, Mia Phyu • Station 4 (WQ4) :Tha Byu Shaung • Station 5 (WQ5): Kamoethway River • Station 6 (WQ6) : Proposed Bridge No. 11 • Station 7 (WQ7): Proposed Bridge No. 13	• Contractor • Myandawei Industrial Estate Company Limited

TABLE 1: MITIGATION MEASURES AND MONITORING PROGRAM DURING CONSTRUCTION PHASE (CONT'D)

Environmental and Social Issue	Impacts	Mitigation Measures	Monitoring Program	Responsibility
Soil Erosion and Soil Contamination (Cont'd)			**Frequency** Seven times per year during the construction phase (monthly monitoring during Wet Season (June-October) and quarterly monitoring during Dry Season). **Methodology** The Standard Methods for Examination of Water and Wastewater, 2005 (APHA-AWWA-WEF) **Implementation Schedule** Throughout the project construction period	
Transportation	• Increase number of vehicles may increase impact on road damage and accident on passer and local villagers who locate near access road.	• Inform concerned authorities and local people about the project construction activities plan. • Strictly enforce drivers in following traffic regulations during transporting material, workers, and equipment during project construction. • The speed of truck should not exceed 40 km/hr. • Repair the damaged road surface where this caused by project transportation at least after finished site clearance and construction activities. This management should be cover in CSR program. • Cover material by canvas during transportation to prevent falling and spreading of material. • Provide sufficient traffic signs and easily observed signs to clearly indicate site construction zone. • In case of accident, the concerned sections must promptly follow the Construction Emergency Response Plan. • Test alcohol and drug use on drivers before transportation.	**Parameters to be monitored** • Traffic volume record • Traffic accident record **Location** • Station 1: Toll Booth No. 1 • Station 2: Toll Booth No. 3 • Station 3: Toll Booth No. 4 **Frequency** Twice a year and each sampling must be conducted for 2 consecutive days covered working day and holiday.	• Contractor • Myandawei Industrial Estate Company Limited

TABLE 1: MITIGATION MEASURES AND MONITORING PROGRAM DURING CONSTRUCTION PHASE (CONT'D)

Environmental and Social Issue	Impacts	Mitigation Measures	Monitoring Program	Responsibility
Transportation (Cont'd)		• Avoid operation of trucks at night. • The used/operated truck should be checked annually. • Establish a vehicle washing facility to minimize the quantity of material deposition on public roads. Establish a checkpoint at the project gate to ensure the vehicles leaving the project site are following the measures prescribed to reduce dust emissions.	**Methodology** • Collect data from related agencies. • Prepare report on traffic volume record and traffic accident record of the two lane road.	
Water Use	• The major impact during construction phase came from water requirement for workers and construction activities.	• Prepare sufficient and appropriate water tanks to collect water for worker consumption. • Prepare sufficient potable water for workers. • Avoid use of shallow well for worker consumption since it is main water source for nearby villages	• Number of complaints filed through the complaint response channel.	• Contractor • Myandawei Industrial Estate Company Limited
Solid Waste	• Solid waste will be generated from activities associated with the Project, the main types of solid waste include; solid waste from the construction workers and solid waste from the construction activities.	• Prepare garbage bins or containers with covers for garbage collection at the workers' campsites and inform concerned local authorities or agencies that get permission from government section to collect and dispose garbage • Prohibit open burning wastes in worker campsite and project area. • The biomass wastes should be separated into usable timber and woods • The separated timbers and woods will be sold based on the concerned laws and regulations. • The unusable wastes will be disposed of a disposal area or landfill site to be selected by the contractor with approval of the concerned authority. • For used oil and chemicals, they will collect at a temporary warehouse before sending back or disposed by contractors or inform concerned authorities to dispose used oil and chemicals.	• Daily checking amount of Solid waste generated during construction phase and results will be included in monthly reports.	• Contractor • Myandawei Industrial Estate Company Limited

TABLE 1: MITIGATION MEASURES AND MONITORING PROGRAM DURING CONSTRUCTION PHASE (CONT'D)

Environmental and Social Issue	Impacts	Mitigation Measures	Monitoring Program	Responsibility
Solid Waste (Cont'd)		• Prepare garbage bins or containers with covers for garbage collection at the workers' campsites and construction area. Also, inform concern local authorities or sub-contractor that gets permission from government section to collect and dispose garbage. • Solid waste disposal procedures will comply with solid waste management regulations, as well as any additional disposal facility requirements. • Separate each type of wastes and collected solid waste in appropriate and safety container for recycling where facilities are available. Any surplus to the recycling activity will be disposed of at an approved waste disposal site. • Prohibit dumping waste in watercourse or wildlife habitat. • No construction materials or debris are allowed to become waterborne. Any materials/debris that enters the aquatic environment must be removed immediately and disposed of in an approved manner. • All temporary structures, piles, false works, debris, cofferdams etc. will be removed from the waterway upon completion of the work. • Hazardous wastes will be collected and disposed of in accordance with the appropriate regulatory requirements. Prohibit burning waste in construction area and worker camp site.		

TABLE 1: MITIGATION MEASURES AND MONITORING PROGRAM DURING CONSTRUCTION PHASE (CONT'D)

Environmental and Social Issue	Impacts	Mitigation Measures	Monitoring Program	Responsibility
Hazardous Waste	• The impact from hazardous material to human health and environment, and controlling problem due to spillage situation.	• Preparation of emergency plan for all material used or store onsite the plan will cover planning, response and training measure for various scenarios. • Hazardous materials use will only handle be by personnel who are trained and qualified in the handling of these materials and in accordance with the manufacturer's instructions and government regulations. • Storage of hazardous materials will be in a designated, clearly marked area, and be at least 30 m from any watercourse. • There will be no smoking within any hazardous materials storage area. • Disposal of hazardous materials will be in accordance with applicable regulations in effect at the time of disposal. • Maintenance and cleaning of mobile construction equipment will not be carried out near residential properties, on the dam, or within 30 m of any watercourse and with no potential for POL materials to enter the watercourses. • Material safety data sheets (MSDS) must be located in close proximity to all areas where hazardous materials are handled and inventory is to be made available to regulatory agencies upon request. • Personal Protection equipment must be prepared in the site. • Ensure all vehicles and heavy equipment are equipped with a spill kit for using in the accident situation. • All containers, hoses and nozzles will be free of leaks. All fuel nozzles will be equipped with functional automatic shut-offs. • Training all workers to follow to the emergency responsible plan.	• Daily site inspection includes observation of the collection and storage of hazardous material in a construction site and the results will be included in monthly reports. • Report immediately to the relevant authorities any incident in term of accident from hazardous material leak to environment on effect to worker.	• Contractor • Myandawei Industrial Estate Company Limited

TABLE 1: MITIGATION MEASURES AND MONITORING PROGRAM DURING CONSTRUCTION PHASE (CONT'D)

Environmental and Social Issue	Impacts	Mitigation Measures	Monitoring Program	Responsibility
Biodiversity	***Impacts on Forest*** • The road construction will cause the loss of trees which are currently within the Right Of Way about 1,364 acres of land and the construction of the existing road was cleared about 1,514 acres of land, mostly forest area. In addition, the loss of forest land for construction of the 10 realigned sections will be about 306 acres. ***Impacts on Wildlife*** • Habitats of some wildlife species are altered through clearing tree and shrubs in the Right Of Way area and in the access road area. • Feeding areas and food sources, both direct and indirect, of wildlife are diminished.	***Tree Species Transplanting Activity*** • Survey focuses on above near threatened tree species at the appropriate size. • Trees to be transplanted are marked with color tag. **Tree Transplanting Techniques** 1. Set up marking circular shape for digging area around tree to be transplanted, in general, the circular mark is estimated over 0.5 to 1.0 of tree diameter. If a tree with crown is not wide, the digging circular is over 0.5 of tree diameter, otherwise the big tree with wide crown, the digging circular may be over 1.0 of tree diameter. 2. To dig around tree stumpage within circular marking with simple tool as pickax, spade, and etc. For the small tree with small root ball and the big tree, use small backhoe machine at first and then use pickax or spade to cut and embellish tree root ball completely. The root ball covering tree root system is to be spherical shape and at this stage it must retain main root and base soil under root ball for tree growing. After that root system should be decorated and fungicide should be used for fungi protection. 3. Soil mixed with dry coconut husk or/and peanut shell to use as fertilizer is to fill up the ditch of root ball. Use some straw to cover tree stumpage to keep moisture and water. To leave behind the transplanted tree about 2-3 months for tree adapting and new regenerated root system.	**Location** At proposed project site and the vicinity. **Methodology** The main agency for those activities is the Ministry of Forestry. Quarterly progress reports will be submitted to (MONREC). Final report will submitted after the completion of the activities.	• Contractor • Myandawei Industrial Estate Company Limited

TABLE 1: MITIGATION MEASURES AND MONITORING PROGRAM DURING CONSTRUCTION PHASE (CONT'D)

Environmental and Social Issue	Impacts	Mitigation Measures	Monitoring Program	Responsibility
Biodiversity (Cont'd)	***Impacts on Wildlife (Cont'd)*** • Wildlife may be disturbed by noise of construction machines, engines and the crowd of construction workers and vehicles. • Features of natural habitat in some areas may be changed due to and filling by residual soil getting from the road area and bridge construction vicinity areas.	***Tree Species Transplanting Activity (Cont'd)*** 4. After 2-3 months, branches should be pruned to reduce crown size to be suitable for tree transport and leaves transpiration. The above mixed soil should be dug and main root should be cut under root ball with bewared and new root system and root ball should be covered by sack. If root ball is so big that it is not possible to lift tree to cut root ball by labor, it is needed to use small crane fixing on truck or small back-hoe machine to lift before cutting root ball and also covering root ball with tightened sack to prevent root ball broken during tree transportation. For big tree lifting, it is needed to use bank-hoe machine or crane with rope instead of iron string at two lifting points' bottom and middle of tree. All of activities should be bewared to prevent root ball broken which may lead to tree mortality while waiting to be planted. For small tree lifting, small root ball can be lifted by labor with wood fixing at bottom of tree. 5. In case that nursery area is far and truck is used for transporting; small tree can be laid down in vertical direction and big trees may be transported by 2 or 3 trees/trip and only be placed in horizontal direction with their root balls being laid to the front of truck. 6. Due to tree root system is growing within limited area where water and nutrient absorption are not enough for tree growing; these may cause tree mortality or dormancy. The transplanted tree must be kept in maintainer with good condition. Therefore, plan of tree transplanting site preparation must be done rapidly. 7. For transplanting pit preparation, tree transplanting pit should be fitted with root ball of each tree and also the depth of pit should cover all of tree root ball. The reserved materials are existing soil mixed with organic and chemical fertilizers (15-30-15) for keeping tree adapting in new condition rapidly.		

TABLE 1: MITIGATION MEASURES AND MONITORING PROGRAM DURING CONSTRUCTION PHASE (CONT'D)

Environmental and Social Issue	Impacts	Mitigation Measures	Monitoring Program	Responsibility
Biodiversity (Cont'd)		*Tree Species Transplanting Activity (Cont'd)* 8. Tree transportation from nursery area to planting site should be carefully done; root ball must be always kept in good condition in hemp sack to prevent soil broken. 9. Tree lifting in planting pit, especially big tree size, should be done with small crane or back-hoe in the same procedures as tree root cutting activities. Hemp sack should be remained for root ball to allow it fertilized. Tree stem must be in natural horizontal direction, and fully fill up with soil mixed organic fertilizer in pit. 10. High and big trees may be fallen down by windstorm due to weak root system, therefore, the supporting wood for tree are needed. The building methods for supporting wood are available in many types which can be suitable adopted for different tree sizes, height, and tree forms, including planting sites and supporting materials. The general methods are as follow: 10.1 For supporting tree of small size, diameter 8-12 cm. and 4 m long, woody pile can be used. Stick pile into soil parallel with transplanting tree 1-2 piles and also use rope inserted in hose tie with tree stem. Use iron string to tie between wooden pile and rope with medium tightness, or use supporting pile with diameter 8 cm. and 3-4 m long as 3 sides supporting type. 10.2 To support tree with bigger size but less in height (under 10 m), stronger supporting piles should be used. Use wooden piles with diameter 12 cm. and 5-6 m long each to support between middle of the tree and ground as 4 sides type. 10.3 To support tree with bigger size, high crown and many branches, it needs stronger pile than other methods. Therefore the method as in Topic 10.2, should be strengthened with iron-string between the big branch or upper the tree stem.		

TABLE 1: MITIGATION MEASURES AND MONITORING PROGRAM DURING CONSTRUCTION PHASE (CONT'D)

Environmental and Social Issue	Impacts	Mitigation Measures	Monitoring Program	Responsibility
Biodiversity (Cont'd)		*Tree Species Transplanting Activity (Cont'd)* 11. Transplanted tree should be kept in good conditions that is free from weed and applied with chemical fertilizer, formula 15-30-15, 2-3 weeks/time to keep root system being in high growth. After 3 months, if the tree has not wilted symptom, and having sprout leave, it indicates that root system is in good condition and can absorb nutrients and water normally. However, supervisor should always maintain tree supporters until the transplanted tree grows up and can support itself, which may take 1-2 years up depending on tree conditions. *Trees Clearing Activity* • After road demarcations, all timber will be registered by Ministry of Forestry. The timber will then be removed by contractor, partly, by using own equipments and the rest will be removed by hiring local subcontractor. The timber transfer or logging will be conducted from east to west side or/and from middle of the road to find the boundary in order to incorporate with other relevant activities, such as tree transplanting. Existing service tracks will be used for transport mode. • Clearing and burning will be managed and implemented by using proposed level of clearing which has been considered by developer. These activities should be conformed to other activities, such as timber logging. • Clearing has to be restricted to the right of way area. For erosion protection it is important, in view of the relatively steep slopes, to conserve all the vegetation above road way. This can only be achieved if right of way to project is clearly marked in the field, and if the activities, especially of logging crews, are supervised.		

TABLE 1: MITIGATION MEASURES AND MONITORING PROGRAM DURING CONSTRUCTION PHASE (CONT'D)

Environmental and Social Issue	Impacts	Mitigation Measures	Monitoring Program	Responsibility
Biodiversity (Cont'd)		***Trees Clearing Activity (Cont'd)*** • Logging companies involved in the clearing process must be obliged to cut all the vegetation on the plots assigned to them, i.e. not just to remove valuable timber and leave the remaining part standing. • Left-over biomass from any form of clearing has to be burned. This burning has to be done carefully in order to prevent fires from spreading to near forest area. • Encouraging the removal of bamboo as construction material, paper production etc. by local enterprises; nothing will have to be paid for this activity, but bamboo will only be cut and removed from areas within close range to roads. • Use smaller stems either as construction material or for producing charcoal. Such activities also will be done on a commercial basis, i.e. without payment required, but with the same restrictions as far as transport is concerned. • Cut, if possible, all the large trees in the project area. If they cannot be removed, they might be left there to be recovered once within the wooden yard. Waiting for the next move. ***Forest Monitoring Activity*** • Observe the contractor's operation to ensure their conformity with relevant forest rule and regulations. • Study and survey the forest in the project vicinity and reforestation area.		

TABLE 1: MITIGATION MEASURES AND MONITORING PROGRAM DURING CONSTRUCTION PHASE (CONT'D)

Environmental and Social Issue	Impacts	Mitigation Measures	Monitoring Program	Responsibility
Biodiversity (Cont'd)		***Hunting Control and Other Measures for Wildlife Protection*** • Hunting and poaching are not allowed within forest and conservation area. This strict of this ban will be required from all workers appointed by the contractor and sub-contractors for construction of the project. • Ban firearm within the premises of the workers' camp site and the entire working site area. However, some firearms may be required to ensure the security of workers particularly when working in densely forest area. In this case, those in charge of security will be clearly registered and the use of their arms is strictly controlled. • All workers will be prohibited from wildlife hunting activities which may harm ecosystem, e.g. using explosive or poison. • Rehabilitate the destroyed forest around proposed project area. The rehabilitated forest can be further used as habitats for wildlife move from other changed areas. ***Deforestation Control Activity*** • The wildlife inventory in detail will be done before tree cutting or forest clearing to help and evacuate of slowly movement species, hole living species, and non-moving with long distance. • Tree cutting and forest clearing for construction should be done in necessity area. • Prohibit tree cutting outside construction area. • Do not settle camp site in dense forest area, it should be settled in degraded forest area. • Road construction through the forest must be the shortest way as possible. • Rehabilitate the destroyed forest around the proposed project area. The rehabilitated forest can further used as habitats for wildlife moved from other changed area.		

TABLE 1: MITIGATION MEASURES AND MONITORING PROGRAM DURING CONSTRUCTION PHASE (CONT'D)

Environmental and Social Issue	Impacts	Mitigation Measures	Monitoring Program	Responsibility
Occupational Health	• Impacts on health, sanitation, and safety from the project to workers	• Inspection of a medical care unit, its screening and caring of important infectious diseases among workers, necessary services and records. • Inspection of machinery maintenance records, occupational health and safety records of workers. • Inspection of construction camp's sanitation and living conditions. • Inspection of accident prevention measures such as traffic sings, use of seat belts, alcohol consumption. • Screening among all workers and personnel by taking blood examination for malarial infection. Cases found must be radically treated. • Chest radiography for workers to detect tuberculosis should be conducted. And cases detected must be closely under surveillance and treated. • Single dose treatment for helminthic infection for all workers and families should be implemented. • Any suspected case of sexually transmitted diseases (STD) should be adequately treated and followed-up with practical health education. • Conduct safety training courses and rehearsal for the workers, to prevent and reduce work accidents. • Ensure the continued safe disposal of all solid waste and sewage. • Implement fly, insect and other pest control at construction camp sites and in the project area. • Surveillance, investigate and document all disease outbreaks within the workforce. Using the epidemiologic approach. Consultation should be available. • The construction camps shall have an adequate supply of potable water compliant with WHO criteria and Applicable Laws.	• Inspection of a medical care unit, its screening and caring of important infectious diseases among workers, necessary services and records. • Inspection of machinery maintenance records, occupational health and safety records of workers. • Inspection of construction camp's sanitation and living conditions. • Inspection of accident precaution measures such as traffic sings, use of seat belts, alcohol drinking. **Methodology:** Observation, interview and site visit. **Frequency:** one time per month.	• Contractor • Myandawei Industrial Estate Company Limited

TABLE 1: MITIGATION MEASURES AND MONITORING PROGRAM DURING CONSTRUCTION PHASE (CONT'D)

Environmental and Social Issue	Impacts	Mitigation Measures	Monitoring Program	Responsibility
Occupational Health (Cont'd)		• Ventilation of buildings within the camp areas shall be in accordance with Applicable Laws and Standards. • Canteen and residential quarter shall be equipped with mosquito net and screen. • Camp sanitation facilities should be provided and routinely inspected. Any occurrence of water-borne diseases should be epidemiological studied. Local and provincial health agencies are good sources for advice. • Implement regular surveillance and inspection on occupational hazard, equipment and protective device. • Minimize dust, noise, air pollutants by strictly implement the mitigation plans of air quality and noise. • Prepare and enforce the wearing of safety protection equipment or devices to prevent accident or reduce severity such as eye glasses, safety shoes, ear muffs, safety belts, protective clothing and helmets with regular inspection. • Provide adequate proper material and equipment used in construction activities in order to increase effective working and decrease the risk of causing accidents or injuries. • Provide appropriate information and health education to the workforce on prevention of diseases, including, malaria, diarrhea, food poisoning, STD, AIDS and tuberculosis. • Providing emergency treatment and first aid for major accident/injuries and also emergency patient transfer. An ambulance shall be also provided. Connection can extend to neighboring countries. • Effective public relations activities and social cooperation is necessary with special attention on community leaders and young adults.		

TABLE 1: MITIGATION MEASURES AND MONITORING PROGRAM DURING CONSTRUCTION PHASE (CONT'D)

Environmental and Social Issue	Impacts	Mitigation Measures	Monitoring Program	Responsibility
Occupational Health (Cont'd)		• Recording of water-borne diseases, accident, dengue fever, malaria, STD, tuberculosis, and violence should be done and analyses for future prevention or reduction.		
Chance Find	• Heritage resources may be exposed or found during construction of the project.	• The person or group (identifier) who identified or discovered physical cultural resources must cease all activity in the immediate vicinity of the site; • The identifier must immediately inform his/her supervisor of the discovery; • The supervisor must ensure that the site is secured and control access; and • The supervisor must then inform the relevant personnel responsible included local and government cultural heritage administrative department. • Potential significance of the remains will be assessed and mitigate options will be identified. • If the significance of the physical cultural resources is judged to be sufficient to warrant further action and they cannot be avoided, then the project archaeologist in consultation with the government cultural heritage administrative department and representatives of local communities will determine the appropriate course of action.	• Performance monitoring of the Chance Find Management Plan will be implemented through the regular Compliance Monitoring inspections of construction sites in construction period. • There should be also visual inspections on whether construction workers are causing theft or destruction of physical cultural resource items.	• Contractor • Myandawei Industrial Estate Company Limited

TABLE 1: MITIGATION MEASURES AND MONITORING PROGRAM DURING CONSTRUCTION PHASE (CONT'D)

Environmental and Social Issue	Impacts	Mitigation Measures	Monitoring Program	Responsibility
Compensation and Livelihood Restoration	• The project will acquire about 340.5 acres of additional land outside the existing right-of-way for construction of all project components.	• A detailed compensation plan identifying individuals/families, which will lose their land due to project development. • An adequate compensation package to be developed in close collaboration with all stakeholders. • Compensation should be for both land and crops as well as for other properties such as valuable trees. • The compensation should be done according to international standards and with the overall objectives of improving the standard of living for those who will be affected.All crops, valuable trees should be compensated. Cash compensation is the mode agreed with the people in project affected village during consultations. • Set up grievance redress mechanism for project affected people. • Arrange vocational extension activities in accordance with peoples' need and site condition especially agricultural production, marketing and supplementary occupational support to compensate for reduced agricultural production. • Cooperation with local and district authorities regarding improved infrastructural development could enhance mitigation measures dealing with health, drinking water supply education, electricity supply and general social uplift. This means the project could become development opportunity with long-term, positive implications for the project area and the region as a whole.	• Interview with affected households	• Contractor • Myandawei Industrial Estate Company Limited
Land Use	• During construction period, the land use pattern will be permanently changed to be road right of way.	• Declare the actual R.O.W as soon as possible after detail design is accomplished • Limit width of route as necessary to minimize the lost of agricultural and residential area. • Inform the schedule and construction process in order to reduce conflict	• Interview with affected households	• Contractor • Myandawei Industrial Estate Company Limited

TABLE 1: MITIGATION MEASURES AND MONITORING PROGRAM DURING CONSTRUCTION PHASE (CONT'D)

Environmental and Social Issue	Impacts	Mitigation Measures	Monitoring Program	Responsibility
Socio-Economic	• The Project will employ about 1,200 people at peak during project construction. Most of the workers will be local. • Exposure of the affected communities to new social norms, value, traditions, practices, and new economic opportunities brought about by an influx of external workers and cash inflow into the village economy through project spending and employment. • Conflict between immigrated worker and local people.	• Hire construction workers from local sources as many as possible. • Initiate livelihood development programs designed to make the best use of new economic opportunities that will come with the project spending and employment. • Village headmen and the responsible authorities should establish local rules and regulations for control of alcoholic abuse and sexually transmitted diseases. • Stay on-site workers should be accommodated in more than one camp to be located far from the villages • Closely control workers behavior to not disturb people nearby construction area. • Provide communication access between communities and project developer to receive requests and to listen to the needs and problem of communities including to respond to the requests and to solve the problem e.g. establishing complaint centre, informing communities about project address and telephone number.	***Parameter*** • Socio-economic impact and opinion of local people toward the project development. ***Location*** • Villages along two-lane road project. ***Frequency*** • Every 6 months during 4 years of project construction. ***Methodology*** • Socio-economic survey to monitor socio-economic impact and opinion of local peoples toward the project. Interview village leaders, village committee and villagers in 15 villages about 400 samples by questionnaires.	• Contractor • Myandawei Industrial Estate Company Limited

TABLE 2: MITIGATION MEASURES AND MONITORING PROGRAM DURING OPERATIONAL PHASE

Environmental and Social Issue	Impacts	Mitigation Measures	Monitoring Program	Responsibility
Air Quality	• During operation period there would be more vehicles using the road. There would be impact on ambient air quality due to exhaust emission from motor vehicles.	• Establish speed limit along the road especially areas near communities. • Providing good traffic management to avoid traffic congestion in populated areas. • Planting tall, leafy and dense vegetation between roads and human settlements to filter pollutants. • Install roadside air quality monitoring program	**Parameters** • Total Suspended Particulate (TSP) • Particulate Matter less than 10 μm (PM-10) • Wind speed and directions • Nitrogen Dioxide (NO2) • Carbon monoxide (CO) **Location** • Station 1: Located at Dauk Lauk village, Yebyu Township • Station 2: Located at Myitta village, Myitta Sub-Township • Station 3: Located at Vado village, Yebyu Township • Station 4: Located at Elasto Base 1 Camp, Yebyu Township • Station 5: Located at Hti Hkee village (proposed check point), Yebyu Township **Frequency** Twice a year during dry season (once) and wet season (once). Each sampling must be conducted for 5 consecutive days.	• Myandawei Industrial Estate Company Limited

TABLE 2: MITIGATION MEASURES AND MONITORING PROGRAM DURING OPERATIONAL PHASE (CONT'D)

Environmental and Social Issue	Impacts	Mitigation Measures	Monitoring Program	Responsibility
Air Quality (Cont'd)			**Methodology** • PM-10 (Average 24 Hour): High-Volume Air Sampler (PM-10) / Gravimetric • TSP (Average 24 Hour): Method High-Volume Air Sampler/ Gravimetric Method) • Wind speed and directions: Cup Anemometer and Wind Vane • NO2 (Average 1 Hour): Chemiluminescence • CO (Average 1 Hour): NDRI **Implementation Schedule** • During the first 5 years of operation phase, if the monitoring results are within standards the monitoring can be stopped after 5 years.	

TABLE 2: MITIGATION MEASURES AND MONITORING PROGRAM DURING OPERATIONAL PHASE (CONT'D)

Environmental and Social Issue	Impacts	Mitigation Measures	Monitoring Program	Responsibility
Noise	• Increase in traffic volume on the road would cause increase of ambient noise level resulting in degrading of human welfare and disrupting wildlife. Chronic noise exposure can be source of annoyance, creating communication problems and leading to elevated stress levels as well as associated behavioral and health effect. It can cause auditory fatigue, temporary and permanent lessening of hearing ability and sleep disorders.	• Reduction of speed limit in settlement areas. • Always maintain road surface in good condition.	**Parameters to be monitored** • Leq (24 hrs) • Lmax • Ldn • L90 **Location** • Station 1: Located at Dauk Lauk village, Yebyu Township • Station 2: Located at Myitta village, Myitta Sub-Township • Station 3: Located at Vado village, Yebyu Township • Station 4: Located at Elasto Base 1 Camp, Yebyu Township • Station 5: Located at Hti Hkee village (proposed check point), Yebyu Township **Frequency** Twice a year during dry season (once) and wet season (once). Each sampling must be conducted for 5 consecutive days. **Methodology** International Organization for Standardization (ISO1996) for noise level measurement.	• Myandawei Industrial Estate Company Limited

TABLE 2: MITIGATION MEASURES AND MONITORING PROGRAM DURING OPERATIONAL PHASE (CONT'D)

Environmental and Social Issue	Impacts	Mitigation Measures	Monitoring Program	Responsibility
Noise (Cont'd)			**Implementation Schedule** During the first 5 years of operation phase, if the monitoring results are within standards the monitoring can be stopped after 5 years.	
Vibration	• The major sources of vibration in operation period are only vehicles including motorcycles, passenger cars, and trucks.	• Reduction of speed limit in settlement areas. • Always maintain road surface in good condition.	**Parameters to be monitored** • Vibration or PPV measured **Location** • Station 1: Located at Dauk Lauk village, Yebyu Township • Station 2: Located at Myitta village, Myitta Sub-Township • Station 3: Located at Vado village, Yebyu Township • Station 4: Located at Elasto Base 1 Camp, Yebyu Township Station 5: Located at Hti Hkee village (proposed check point), Yebyu Township **Frequency** Twice a year during dry season (once) and wet season (once). Each sampling must be conducted for 5 consecutive days. **Methodology** International Organization for Standardization (ISO1996) for vibration measurement.	• Myandawei Industrial Estate Company Limited

TABLE 2: MITIGATION MEASURES AND MONITORING PROGRAM DURING OPERATIONAL PHASE (CONT'D)

Environmental and Social Issue	Impacts	Mitigation Measures	Monitoring Program	Responsibility
Vibration (Cont'd)			**Implementation Schedule** During the first 5 years of operation phase, if the monitoring results are within standards the monitoring can be stopped after 5 years.	
Surface Water Quality	• Wastewater Contamination from Service Areas. • Water quality contamination from leachate of over road runoff.	• Regular monthly check up wastewater treatment system with carrying capacity within the wastewater treatment area of the service areas. • Continuous weekly check up and maintenance the project drainage system. • Provide adequate numbers of sanitary toilets (with septic tanks) at ratio of 15 persons/room (separated between men and women) at service areas and the toll Booths. • Grease & oil trap to collect grease & oil and wastewater from food shops at service areas must be installed before all wastes and waste water being drained into the central wastewater treatment system.	**Parameters to be monitored** • Depth • pH • Temperature • Transparency • Conductivity • Salinity • Dissolved oxygen • Turbidity • Suspended Solids • Total Dissolved Solids • Total Solids • Oil and grease • BOD5 • Lead • Cadmium • Total Iron • Total Coliform Bacteria • Fecal Coliform Bacteria • COD • Total Hardness • Total Petroleum Hydrocarbon (TPH)	• Myandawei Industrial Estate Company Limited

TABLE 2: MITIGATION MEASURES AND MONITORING PROGRAM DURING OPERATIONAL PHASE (CONT'D)

Environmental and Social Issue	Impacts	Mitigation Measures	Monitoring Program	Responsibility
Surface Water Quality (Cont'd)			**Parameters to be monitored (Cont'd)** • Total Kjeldahl (TKN-N) • Ammonia Nitrogen(NH3-N) • Total Nitrogen (Nitrate+Nitrite) Total Phosphate • Copper(Cu) • Zinc (Zn) **Location** • Station 1 (WQ1) :Dawei River • Station 2 (WQ2) : Tha Laing Ya shaung • Station 3 (WQ3) :Tha Laing Ya shaung, Mia Phyu • Station 4 (WQ4) :Tha Byu Shaung • Station 5 (WQ5): Kamoethway River • Station 6 (WQ6) : Proposed Bridge No. 11 • Station 7 (WQ7): Proposed Bridge No. 13	

TABLE 2: MITIGATION MEASURES AND MONITORING PROGRAM DURING OPERATIONAL PHASE (CONT'D)

Environmental and Social Issue	Impacts	Mitigation Measures	Monitoring Program	Responsibility
Surface Water Quality (Cont'd)			**Frequency** Seven times per year during the construction phase (monthly monitoring during Wet Season (June-October) and quarterly monitoring during Dry Season). **Methodology** The Standard Methods for Examination of Water and Wastewater, 2005 (APHA-AWWA-WEF) **Implementation Schedule** During the first 5 years of operation phase, if the monitoring results are within standards the monitoring can be stopped after 5 years.	

TABLE 2: MITIGATION MEASURES AND MONITORING PROGRAM DURING OPERATIONAL PHASE (CONT'D)

Environmental and Social Issue	Impacts	Mitigation Measures	Monitoring Program	Responsibility
Transportation	• During two lane road implementation, there are increasing of vehicles and traffic accidents.	• Provide and install appropriate traffic signs and notice boards along the road alignment including entrance-exist toll booths and service areas to alleviate traffic accidents. • Material for road traffic control will be provided e.g., Radio communication apparatus (long distance, short distance, base and hand held), long base ambulance vehicle, Patrol motorcycle and Safety cones. • The construction of overpasses will be carried out by capable suppliers through contractual agreement. Accessing pedestrian overpass on project road significantly reduces casualties, protects pedestrian from injury and contributes towards the goal of achieving reduced road fatalities. • Arrange training programs for local people in order to acknowledge them about traffic law, driving rules, traffic sign, notice boards and awareness on road using for both local pedestrian and drivers. • Technical and financial support for awareness creation activities – for example mass media, workshops and driver training. • Undertake road safety engineering activities along federal roads and urban areas and improved signs and markings. • Improve emergency service to victims. • Enforcement of traffic law for road safety along major roads with support for purchasing equipment and for road safety enforcement training. • Strictly enforce the traffic regulations (on drivers and pedestrians) to reduce road traffic accidents.	**Parameters to be monitored** • Traffic volume record • Traffic accident record **Location** • Station 1: Toll Booth No. 1 • Station 2: Toll Booth No. 3 • Station 3: Toll Booth No. 4 **Frequency** Twice a year and each sampling must be conducted for 2 consecutive days. **Methodology** • Collect data from related agencies. • Prepare report on traffic volume record and traffic accident record of the two lane road. **Implementation Schedule** During the first 5 years of operation phase, if the monitoring results are within standards the monitoring can be stopped after 5 years.	• Myandawei Industrial Estate Company Limited

TABLE 2: MITIGATION MEASURES AND MONITORING PROGRAM DURING OPERATIONAL PHASE (CONT'D)

Environmental and Social Issue	Impacts	Mitigation Measures	Monitoring Program	Responsibility
Transportation (Cont'd)		• Road traffic crash data, cause of road traffic crash, challenges to traffic police duty and the community's attitude will be assessed in order to increase enforcement. The scope of assessment and enforcement will increase as the time increases focused on enforcing critical road safety traffic law against drunk driving, speeding, use of mobile phones, and non-use of seatbelts and helmets.		
Biodiversity	• The impacts on flora and fauna during operation period comprise of increased vehicle derived pollutant, vehicle/wildlife collisions and increased edge effects and deterioration of habitat.	***Forest Rehabilitation Activity*** • As the forest plantation areas, the performance of each step should be considered by the coordination of developers, local people, related local government staff and NGOs. The area should be specified for forest resources planning due to project development. ***Forest Monitoring Activity*** • Observe the contractor's operation to ensure their conformity with relevant forest rule and regulations. • Study and survey the forest in the project vicinity and reforestation area.	**Implementation Schedule** • Reforestation program will start planting in the first year of operation phase and the planted trees will be maintained for another 9 years of operation phase (The total implementation period is 10 years). • Start overseeing logging activities and contractor's operation during forest clearing. • Survey the fertility of forest in vicinity of the project and reforestation area every two years during the first 10 years of operation phase.	

FINAL REPORT

ESIA FOR TWO-LANE ROAD LINKING THE DAWEI SPECIAL ECONOMIC ZONE WITH THAI BORDER PROJECT, MYANMAR

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အနှစ်ချုပ်

၁.၁ စီမံကိန်း အကျဉ်း

ထားဝယ်အထူးစီးပွားရေးဇုံနှင့် ထိုင်းနိုင်ငံနယ်စပ်ကိုဆက်သွယ်မည့် ၂-လမ်းသွား ကားလမ်းစီမံကိန်းသည် လက်ရှိအရှည် (၁၃၈)ကီလိုမီတာ ရှိသော ထားဝယ်နှင့် ထိုင်းနိုင်ငံ၊ ကန်ချနာဘူရီခရိုင်၊ ဖုနမ်ရွမ်ရှာအထိလက်ရှိလမ်းအခြေအနေကို အဆင့်မြှင့်တင်သောစီမံကိန်း ဖြစ်ပါသည်။စီမံကိန်းတင်သွင်းသူမှာမြန်မာပြည်အတွင်းလုပ်ငန်းဆောင်ရွက်နေသည့်ပြည်တွင်း ကုမ္ပဏီဖြစ်သော Myandawei Industrial Estate Company Limited (MIE) ဖြစ်ပါသည်။ ကုမ္ပဏီသည် ထားဝယ်အထူးစီးပွားရေးဇုံ စီမံခန့်ခွဲမှုကော်မတီမှ အဆိုပါလမ်းအား ပုဂ္ဂလိက-အများပိုင် ပါဝင်မှုအပေါ်အခြေခံ၍ BOO စနစ်ဖြင့် ဆောင်ရွက်ခွင့် ရရှိထားပါသည်။ ထားဝယ်အထူးစီးပွားရေးဇုံ ဖွံ့ဖြိုးရေး မူလစီမံကိန်းအရ အဆင့်မြှင့်တင်မည့် လက်ရှိလမ်းကြောင်းကို အီတာလျံ-ထိုင်း အများပိုင်ကုမ္ပဏီလီမိတက်မှ တာဝန်ယူတည်ဆောက်ခဲ့ခြင်း ဖြစ်သည်။လက်ရှိလမ်းအူကြောင်းကို ပင်မအစီရင်ခံစာထဲရှိ ပုံ ၂.၁-၁ တွင်ဖေါ်ပြထားပြီး လက်ရှိ အခြေအနေအရ ပြီးစီးမှုမရှိသေးသောကြောင့် တရားဝင်ဖွင့်လှစ်ပေးထားခြင်းမဟုတ်သော်လည်း အများပြည်သူသွားလာနိုင်ဖို့ ၂၀၁၂ခုနှစ်ကပင် ခွင့်ပြုထားခဲ့သည်။

အီတာလျံ-ထိုင်းကုမ္ပဏီ၏ မူလအစီအစဉ်မှာ လက်ရှိလမ်းအားအကျယ်(၈၀) မီတာ ရှိသော လေးလမ်းသွားအဖြစ် အဆင့်မြှင့်တင်ရန်ဖြစ်သည်။ ထိုအချိန်က လေးလမ်းသွား စီမံကိန်းအား "Transborder Road Link (Dawei-Phu Nam Ron)"ဟူသော အမည်ဖြင့် စတင်ဆောင်ရွက်ခဲ့သည်။ အဆိုပါလေးလမ်းသွားစီမံကိန်းအတွက် ပတ်ဝန်းကျင်ထိခိုက်မှုလေ့လာဆန်းစစ် ခြင်းအား အခြားသောအတိုင်ပင်ခံများနှင့် ၂၀၁၂ ခုနှစ်တွင်ဆောင်ရွက်ခဲ့ပြီး အစီရင်ခံစာ မူကြမ်းကို ၂၀၁၃ခုနှစ် စက်တင်ဘာလတွင် အီတာလျံ-ထိုင်းကုမ္ပဏီသို့တင်သွင်းခဲ့ပါသည်။ သို့သော်လည်း ထားဝယ်ရေနက်ဆိပ်ကမ်းအထူးစီးပွားရေးဇုံနှင့် လမ်းစီမံကိန်း ၏ ပြုပြင်ပြောင်းလဲမှုကြောင့် အဆိုပါအစီရင်ခံစာမူကြမ်းသည် သယံဇာတနှင့် သဘာဝပတ်ဝန်းကျင် ထိန်းသိမ်းရေးဝန်ကြီးဌာန ထံသို့တင်ပြနိုင်ခြင်းမရှိခဲ့ပေ။ EIA လေ့လာမှုများလည်း ဆက်လက်ဆောင်ရွက်နိုင်ခြင်း မရှိတော့ပေ။ နောက်ဆက်တွဲအနေဖြင့် လက်ရှိလမ်းကိုလည်း ယာယီတံတားများထိုးလျက် ကတ္တရာခင်းခြင်းမပြုနိုင်ပဲ နှစ်လမ်းသွား အဖြစ်သာ ဖေါက်လုပ် နိုင်ခဲ့သည်။

နောက်ဆက်တွဲ ထားဝယ်အထူးစီးပွားရေးဇုံ ဖွံ့ဖြိုးရေးစီမံကိန်းသည် အထူး စီးပွားရေးဇုံ၏ မူလအစီအစဉ်မှ ပြုပြင်ပြောင်းလဲယူထားခြင်းဖြစ်သည်။ မူလရှိသော ဖွံ့ဖြိုးရေးလုပ်ငန်း အစီအစဉ်များအား ပြန်လည်သုံးသပ်ခြင်းဖြစ်ပြီးကနဦးဖွံ့ဖြိုးရေး အဆင့်တွင် မဟာ ဗျူဟာမြောက် လုပ်ငန်းစဉ်များအား စတင်အကောင်အထည် ဖေါ်ရန်ဖြစ်သည်။ ထို့ကြောင့် လက်ရှိလမ်းကြောင်းအား ကတ္တရာခင်း နှစ်လမ်းသွား အဖြစ်အဆင့်မြှင့်တင်ရန်ရှိ သော ကြောင့် ပတ်ဝန်းကျင်ထိခိုက်မှု လေ့လာ ဆန်းစစ်ခြင်း EIA အသစ် လိုအပ်လာခြင်း ဖြစ်ပါသည်။

ဤနောက်ဆုံးမူကြမ်း အစီရင်ခံစာအား EIA အတိုင်ပင်ခံမှ MIE နှင့်ချိတ်ဆက်ပြီး ရေးသားပြုစုခဲ့ပါသည်။ EIA ကို ၂၀၁၅ ခုနှစ် ဇန်နဝါရီလတွင် စတင်ခဲ့ပြီး စီမံကိန်း၏အသေးစိပ်ဒီဇိုင်းကို TESCO Ltd ကုမ္ပဏီမှပြင်ဆင်ခဲ့ပြီး ၂၀၁၅ခုနှစ် အောက်တိုဘာလတွင်ထွက်ရှိခဲ့သည်။

၁.၂ မူဝါဒ၊ ဥပဒေရေးရာနှင့်ဖွဲ့စည်းတည်ဆောက်ပုံဆိုင်ရာ မူဘောင်များ

၁.၂.၁ လူမှု နှင့်ပတ်ဝန်းကျင်ဆိုင်ရာပူးပေါင်းခြင်းမူဝါဒ

စီမံကိန်းဆောင်ရွက်သူ အနေဖြင့် တည်ဆောက်သည့်ကာလနှင့်လုပ်ငန်းလည်ပတ်သည့်ကာလအတွင်း လူမှုနှင့်ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုကို လမ်းညွှန်ရန် အတွက်လူမှုရေးရာနှင့်ပတ်ဝန်းကျင်ဆိုင်ရာပူးပေါင်းဆောင်ရွက်မှု မူဝါဒကို ချမှတ်မည် ဖြစ်သည်။ အဆိုပါ မူဝါဒသည် ရင်းနှီးမြှုပ်နှံသူ (Myandawei Industrial Estate Company) မှထိုင်းနိုင်ငံ၏လက်ရှိ ဖွံ့ဖြိုးရေး စီမံကိန်းများမှ နမူနာယူထားသောအရာနှင့်ဆင်တူမည်ဖြစ်သည်။

၁.၂.၂ မြန်မာနိုင်ငံ၏မူဝါဒနှင့် ဥပဒေရေးရာ မူဘောင်အား လေ့လာခြင်း

ဤစီမံကိန်းနှင့်သက်ဆိုင်သော ပတ်ဝန်းကျင်ဆိုင်ရာစီမံခန့်ခွဲမှုအမျိုးသား မူဝါဒနှင့်ဥပဒေရေးရာမူဘောင်အားအတန်းအစားသုံးမျိုးခွဲခြားထားသည်။ အတန်းအစားတစ်ခုချင်းစီ ၏အနှစ်ချုပ်ကိုအောက်ပါအတိုင်း တွေ့ရသည်။

ပတ်ဝန်းကျင်ဆိုင်ရာစီမံခန့်ခွဲမှု ၏အခြေခံအုတ်မြစ် ။ ။ ပတ်ဝန်းကျင်ဆိုင်ရာ စီမံခန့်ခွဲမှုတရား ဝင်အခြေခံအုတ်မြစ်သည်(၂၀၀၈)အခြေခံဥပဒေ ပုဒ်မ ၃၇၊ ၄၂ နှင့် ၃၉၀ တို့အား ထောက်ပံ့ပေးသော ၁၉၉၄ ခုနှစ် အမျိုးသားပတ်ဝန်းကျင်ဆိုင်ရာ မူဝါဒဖြစ်သည်။ အမျိုးသား ပတ်ဝန်းကျင်ဆိုင်ရာမူဝါဒမှသည် ၂၀၁၂ ခုနှစ်ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဥပဒေဖြစ် ပေါ်လာခဲ့ပြီးထိုမှတဆင့် အသေးစိတ်အကောင်အထည် ဖော်စေသည့်ပတ်ဝန်း ကျင်ထိန်း သိမ်းရေးနည်းဥပဒေ ပေါ်ထွက်လာခဲ့သည်။ အဆိုပါ ဥပဒေနှစ်ရပ်လုံးသည် နိုင်ငံ၏ ပတ်ဝန်းကျင်ဆိုင်ရာစီမံခန့်ခွဲမှုမူဘောင်အားပြည့်စုံစေပါသည်။

EIA လုပ်ငန်းစဉ်နှင့်ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုဆိုင်ရာလိုအပ်ချက်များ။ ။ ၂၀၁၅ ခုနှစ် EIA လုပ်ငန်းစဉ်ထဲမှ စီမံခန့်ခွဲမှုညွှန်ကြားချက်နှင့် ၂၀၁၄ ခုနှစ် EIA လုပ်ငန်းစဉ် ခြောက်ခု မြောက်မူကြမ်းသည် EIA လုပ်ငန်းစဉ်အား ဖြင့်ပတ်ဝန်းကျင်ဆိုင်ရာ စီမံခန့်ခွဲမှု ဆောင်ရွက် ချက် များအတွက် ဥပဒေရေးရာအထောက်အကူဖြစ်စေသောအဓိကအရာများဖြစ်သည်။ ထိုအရာများသည် ပတ်ဝန်းကျင်ထိန်းသိမ်း ရေးဥပဒေတွင် ဖော်ပြထားချက်များအတိုင်း အတိအကျလိုက်နာခြင်းပင် ဖြစ်သည်။

ပတ်ဝန်းကျင်စံနှုန်းများနှင့်လူမှုဆိုင်ရာစီမံခန့်ခွဲမှုအတွက်လိုအပ်ချက်များ။ ။ EIA နှင့်ဆိုင်သောလိုအပ်ချက်များအရ စီမံကိန်းသည် တည်ဆောက်နေသည့်ကာလနှင့် လုပ်ငန်း လည်ပတ်သည့်ကာလအတွင်း ပတ်ဝန်းကျင်ဆိုင်ရာ၊ လူမှုဆိုင်ရာနှင့် ယဉ်ကျေးမှုဆိုင်ရာ စီမံခန့်ခွဲမှု

ကဏ္ဍများအတွက် အခြားသော ဥပဒေများကိုလည်း ထပ်မံလိုက်နာ ဆောင်ရွက်ပါမည်။ အဆိုပါကဏ္ဍများမှာ (၁)အလုပ်ခွင်ပိတ်ရက်များနှင့် ခွင့်ရက်များ (၂) စီမံကိန်းလုပ်သားနှင့်ပြည်သူတို့၏ ကျန်းမာရေး နှင့် ဘေးကင်းမှု၊ (၃)ဆန္ဒမပါပဲ ပြန်လည် နေရာချထားခံရမှု (၄)ယဉ်ကျေးမှု ထိခိုက်မှု (၅)သစ်တောနှင့် တွဲလျက်ဂေဟအရင်းအမြစ်၊ တောတွင်းတိရိစ္ဆာန်နှင့် သဘာဝဒေသ နှင့်(၆) ကမ်းရိုးတန်းနှင့် အဏ္ဏဝါပတ်ဝန်းကျင် စသည်တို့ဖြစ်ကြသည်။

၁.၂.၃ အပြည်ပြည်ဆိုင်ရာ ကြေငြာစာတမ်းများ၊ သဘောတူညီချက်များနှင့် စာချုပ်များ

ပြည်ထောင်စုမြန်မာနိုင်ငံသည် ပတ်ဝန်းကျင်စပ်ဆိုင်သော အပြည်ပြည်ဆိုင်ရာ ကြေငြာစာတမ်းများ၊ သဘောတူညီချက်များနှင့် စာချုပ်များစွာအား လက်မှတ်ရေးထိုး ထားပါသည်။ ၄င်းတို့အားပင်မအစီရင်ခံစာထဲရှိ အပိုင်း ၃.၃ တွင် အသေးစိပ်ဖေါ်ပြ ထားပါသည်။

၁.၂.၄ မြန်မာအစိုးရ၏ အဖွဲ့အစည်းဆိုင်ရာမူဘောင်

ဤစီမံကိန်းအတွက်ဆောင်ရွက်သည့် EIA လုပ်ငန်းစဉ်အား ECD ဗဟိုမှ တိုင်းဒေသကြီးအဆင့်၊ ခရိုင်အဆင့်နှင့်မြို့နယ်အဆင့်ရှိ သက်ဆိုင်ရာအုပ်ချုပ်ရေး အာဏာပိုင်များနှင့်ပူးပေါင်းပြီး စီမံခန့်ခွဲသွားမည်ဖြစ်သည်။

စီမံကိန်းအကောင်အထည်ဖော်နေစဉ်ကာလအတွင်း ထားဝယ်အထူး စီးပွားရေးဇုံ စီမံခန့်ခွဲမှုကော်မီတီနှင့် SWB အနေဖြင့် အစိုးရနှင့် ရင်းနှီးမြှုပ်နှံသူဘက်မှ တင်ပြလာသော ပြဿနာအခက်အခဲများကို တာဝန်ခံ ညှိနှိုင်းဖြေရှင်းသွားမည်ဖြစ်သည်။

၁.၂.၅ အပြည်ပြည်ဆိုင်ရာ မူဝါဒ၊ လမ်းညွှန်ချက်နှင့်စံနှုန်းထားများ

မြန်မာနိုင်ငံအနေဖြင့် အကြောင်းအရာတစ်ခုချင်းအပေါ် သီးသန့်မူဝါဒများ၊ လမ်းညွှန်ချက်များ နှင့်စံနှုန်းထားသတ်မှတ်ချက်များ မရှိသေးသောကြောင့် ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုတွင် နိုင်ငံတကာအသိအမှတ်ပြု လမ်းညွှန်ချက်များနှင့်စံနှုန်းထား သတ်မှတ်ချက်များ ကို သင့်လျော်သလို လက်ခံအသုံးပြုသွားရန်လိုအပ်ပါသည်။

၁.၃ စီမံကိန်းဖေါ်ပြချက်နှင့်အခြားသောနည်းများ

၁.၃.၁ စီမံကိန်းဖေါ်ပြချက်နှင့် တခြားသောနည်းလမ်းများ တင်ပြခြင်း

က စီမံကိန်းဖေါ်ပြချက်

ကလ္လာနှင့် ကလ္လာခွဲ ။ ။ စီမံကိန်းသည်သယ်ယူပို့ဆောင်ရေး ကလ္လာဖြစ်ပြီး လမ်းအဆင့်မြှင့်တင်ခြင်းသည် ကလ္လာခွဲ ဖြစ်ပါသည်။

စီမံကိန်းအကျဉ်း ။ ။ စီမံကိန်းသည်လက်ရှိ အရည် (၁၃၈)ကီလိုမီတာရှိသောမြေသားလမ်းအား ထိုင်းနိုင်ငံ၊အဝေးပြေးလမ်းဦးစီးဌာန၏ အဆင့် ၄ အဝေးပြေးလမ်းဒီဇိုင်းနှင့်ညီမျှသော နိုင်လွန်ကတ္တရာခင်းသည့်နှစ်လမ်းသွား စံနစ်အဖြစ်အဆင့်မြှင့်တင်ရန်ဖြစ်သည်။ စီမံကိန်းတွင် လမ်းနယ်အကျယ် (၄၀)မီတာတွင် (၇)မီတာအကျယ်မှာ ယာဉ်သွားလာ မည့်နှစ်လမ်းသွားဖြစ်ပြီး လမ်းတစ်ဖက်တစ်ချက်စီတွင် (၁)မီတာ အကျယ်စီရှိ သော လမ်းပခုံးသား ပါဝင်မည်ဖြစ်သည့်အတွက်စုစုပေါင်း နိုင်လွန်ကတ္တရာလမ်း အကျယ်သည် (၉)မီတာရှိမည်ဖြစ်သည်။

စီမံကိန်းသည်လက်ရှိလမ်းအူကြောင်း အတိုင်း ဖြစ်ရန်အ တတ်နိုင်ဆုံး ထိန်းသိမ်းဆောင်ရွက်သွားမည်ဖြစ်သည်။ သို့သော်လည်း လမ်းကြောင်း ၏ဂျီအိုမက်ထရစ်ဒီဇိုင်း (geometric design) ကိုအဆင့်မြှင့်တင်ရန်၊ တံတားတည်ဆောက်ရန် ရေစီးလမ်းကြောင်းများ တည်ဆောက်ပုံနှင့် မြစ်ချောင်း လမ်းကြောင်း အချို့ အစိတ် အပိုင်းများအား ဖြတ်ဖေါက်မှု ပြုလုပ်ရန်အတွက် စီမံကိန်း၏လမ်းကြောင်း နေရာအပိုင်းအချို့ အား ပြန်ပြင်ရန်ရှိပါသည်။

စီမံကိန်းနေရာချထားမှုနှင့် လမ်းအပိုင်းများ ။ ။ လက်ရှိလမ်းကြောင်း အား တည်ဆောက်ရေးလုပ်ငန်းနှင့် ပြုပြင်ထိန်းသိမ်းရေးလုပ်ငန်းအတွက် အောက်ပါအတိုင်း အပိုင်း (၃)ပိုင်း၊ ပိုင်းခြားထားပါသည်။

အပိုင်း(၁)သည် (၅၀.၉)ကီလိုမီတာအရှည်ရှိပါသည်။ ရေဖြူမြို့မြောက်ဘက်၊ ထားဝယ်မြစ်အနောက်ကမ်းရှိ(၁၈+၅၀၀)ကီလိုမီတာတိုင်မှ စတင်ပြီး (၆၉+၄၀၀)ကီလိုမီတာ တိုင်တွင် အဆုံးသတ်ပါသည်။

အပိုင်း(၂)သည် (၄၂.၉)ကီလိုမီတာအရှည်ရှိပြီး ကီလိုမီတာတိုင် (၆၉+၄၀၀)မှ (၁၁၂+၃၀၀) အထိဖြစ်ပါသည်။

အပိုင်း(၃)သည်(၄၄.၂)ကီလိုမီတာအရှည်ရှိပြီး ကီလိုမီတာတိုင် (၁၁၂+၃၀၀)မှ (၁၅၆+၅၀၀)တွင်ဆုံးပါသည်။

စုစုပေါင်း (၃၁)ကီလိုမီတာခန့် (လမ်းအရှည် ၁၃၈ ကီလိုမီတာ၏ ၂၂ % ခန့်) ရှိသောလမ်းကြောင်း၏အဓိက အစိတ်အပိုင်း(၁၀)ပိုင်းအား ၄င်း၏ဂျီအိုမေတြီဒီဇိုင်းအရ အဆင့်မြှင့်တင်ရန်လိုအပ်ပြီး၊ စုစုပေါင်း(၁၃၃၀)မီတာအရှည် ရှိမည့်တံတား(၁၉)စင်း တည်ဆောက်ရန်လည်း လိုအပ်သည်။

စီမံကိန်းအထောက်အကူပြုအရာများနှင့် အခြေခံအဆောက်အဦ ။ ။ စီမံကိန်းသည် တိုးဂိတ်ဖြင့်ထိန်းချုပ်မည့် လမ်းအနေဖြင့် လုပ်ငန်းလည်ပတ်သွားမည်ဖြစ်သည်။ တိုးဂိတ်နှင့် ပါဝင်မည့်အထောက်အကူပြုအရာများမှာ စီမံခန့်ခွဲရေးအဆောက်အဦနှင့် ဘေးကင်းရေးအတွက် လိုအပ်သောအထောက်အကူပြုအဆောက်အဦများအား လမ်းကြောင်း တစ်လျှောက် တိုးဂိတ်ရှိမည့်(၄)နေရာစလုံးတွင် အောက်ပါအတိုင်းတည်ဆောက်သွားမည် ဖြစ်သည်။

တိုးဂိတ်(၁) သည် ကီလိုမီတာတိုင် ၂၁+၀၀၀ ခန့်တွင်၊ တိုးဂိတ် (၂)သည် ကီလိုမီတာတိုင် (၆၆+၂၀၀)ခန့်တွင်၊တိုးဂိတ် (၃)သည်မေတ္တာမြို့နယ်ခွဲအနီး ကီလိုမီတာတိုင် (၆၉+၄၃၃)ခန့်တွင်ရှိမည်ဖြစ်ပြီး တိုးဂိတ် (၄)သည် ထီးခီးအမည်ဖြင့် ကီလိုမီတာ တိုင် (၁၅၅+၇၀၀)ခန့်တွင်တည်ရှိပါမည်။ အဆိုပါထီးခီးတိုးဂိတ်သည် ထိုင်းနယ်စပ်မှ မြန်မာနိုင်ငံ သို့ ဝင်ရောက်မည့် ပထမဆုံးဝင်ပေါက် ဖြစ်လိမ့်မည်ဖြစ်ပြီး၊ ကီလိုမီတာတိုင်(၇၉+၇၀၀)တွင် အနားယူစခန်း (သို့မဟုတ်) ဝန်ဆောင်မှုဌာနတစ်ခုလည်း ပါရှိမည်ဖြစ်ပါသည်။

အကောင်အထည်ဖော်မှု စီမံကိန်း ။ ။ လမ်းတည်ဆောက်ရေးစီမံကိန်းအား ၂၀၁၅ ခုနှစ် ဖေဖြေလတွင်စတင်ခဲ့ပြီး (၃၇)လအတွင်းပြီးစီးရန် အစီစဉ်ဆွဲထားသည်။

ခ. စီမံကိန်း၏အခြားနည်းလမ်းများ

စီမံကိန်းသည် လက်ရှိလမ်းကြောင်းကို အဆင့်မြှင့်တင်ခြင်းဖြစ်သည့် အတွက် အခြားဖေါက်လုပ်မည့်လမ်းကြောင်းများမရှိပါ။ ဤနှစ်လမ်းသွားလမ်းကြောင်းသည် ထားဝယ် အထူးစီးပွားရေးဇုံ၏ ကနဦးဖွံ့ဖြိုးရေးအဆင့်လုပ်ဆောင်နေသည့်ကာလအတွင်း တိုးပွား လာမည့်ယာဉ်ကြောအတွက် သင့်တော်မည်ဟုမျှော်မှန်းပါသည်။

လမ်းကြောင်းပြန်လည် နေရာချထားမှုရှိမည့်အချို့ အပိုင်းများသည် မြေမျက်နှာ သွင်ပြင်နှင့် ဂျီအိုမက်ထရစ် ဒီဇိုင်းအပေါ်အခြေခံပြီး စဉ်းစားထားသည်။

ဂ. စီမံကိန်းအကောင်အထည်မှုလက်ရှိအခြေအနေ

၂၀၁၅ ခုနှစ် ဇူလိုင်လ ၇ ရက်နေ့အထိ၊ စီမံကိန်း အကောင်အထည်ဖော်သူ သည် အကြိုလုပ်ငန်းများကို အောက်ပါအတိုင်းဆောင်ရွက်ခဲ့ပြီးဖြစ်သည်။

၁) အပိုင်း ၁ ။ ။ ဆာတာ တောင်ကုန်းတွင် (၁၀၅၀၀၀)ကုဗမီတာ ပမာဏရှိသော မြေကြီးများကိုတူးဖေါ်ခြင်းနှင့်ဆင်ခြေလျှော ဖြတ်ထုတ်ခြင်း

၂) အပိုင်း ၂ ။ ဆင်ဝိတောင်တွင် (၁၆၀၀၀၀)ကုဗမီတာ ပမာဏ ရှိသော မြေကြီးများကိုတူးဖေါ်ခြင်းနှင့်ဆင်ခြေလျှော ဖြတ်ထုတ်ခြင်း

၃) အပိုင်း ၃ ။ Base1 တောင်ကုန်းတွင် (၁၈၄၀၀) ကုဗမီတာ ပမာဏ ရှိသောမြေကြီးများကိုတူးဖေါ်ခြင်းနှင့် ဆင်ခြေလျှော ဖြတ်ထုတ်ခြင်း

၄) အပိုင်း ၄ ။ ။ ကီလိုမီတာတိုင် (၁၅၄+၇၃၈)ရှိ တံတားအမှတ် (၁၉)တည် ဆောက်ရန်လျာထားသည့်နေရာတွင် ချဉ်းကပ်တံတားအတွက် မြေတူးခြင်း

၁.၄ ပတ်ဝန်းကျင်အခြေအနေဖော်ပြချက်

၁.၄.၁ လေ့လာမှု နယ်ပယ်သတ်မှတ်ခြင်း

က. လေ့လာသည့်ဧရိယာနှင့် ပတ်ဝန်းကျင်နယ်ပယ်

လေ့လာမှုသည် စီမံကိန်းလမ်းကြောင်းအားအလယ်ဗဟိုထားလျက် လမ်းတစ်ဘက်တစ်ချက်စီ (၅၀၀)မီတာအကျယ်ရှိသောဧရိယာအတွင်းသတ်မှတ်ထားပြီး စုစုပေါင်း (၃၄၀၃.၃၅)ဧကကျယ်ဝန်းပါသည်။

လေ့လာသည့်ပတ်ဝန်းကျင်နယ်ပယ်သည် EIA လုပ်ငန်းစဉ်ထဲတွင် ဖော်ပြ ထားသည့်အတိုင်း ရုပ်ပိုင်းဆိုင်ရာ၊ ဇီဝဆိုင်ရာ၊လူမှု-စီးပွားဆိုင်ရာ၊ ယဉ်ကျေးမှုဆိုင်ရာနှင့် မျက်မြင်နိုင်သော အရာများ စသည်တို့အားလုံးပါဝင်သည်။

ပတ်ဝန်းကျင်နှင့်ဆိုင်သော အချက်အလက်များအားလေ့လာရာတွင် ကွင်းဆင်းကောက်ခံသည့်ဧရိယာသတ်မှတ်ပြီး အချက်အလက်မှတ်တမ်းယူ၊ကောက်ခံခြင်းနှင့် ကျမ်းကိုးအထောက်အထား ၊စာပေများအား လေ့လာစုဆောင်းခြင်းလည်းပါဝင်သည်။

ခ. ဒေသဆိုင်ရာ အုပ်ချုပ်ရေးနယ်ပယ်

လေ့လာသည့်နေရာဒေသသည် ရေဖြူမြို့နယ်နှင့် ထားဝယ်ခရိုင်အတွင်းရှိ ကျေးရွာများဖြစ်သော ဒေါက်လောက်၊ တလိုင်းယာ၊ ပိတောက်ကုန်း ၊ကလုံးထာ၊ သခတ်ကုန်း၊ ရေပေါက်၊ သပြုချောင်း၊ပျဉ်တော်သာ၊ တောင်သုံးလုံး ၊ဆင်ဖြူတိုင်၊ ဝါးတော၊ အားမူးကတရခီး၊ ထီးခီးနှင့် မေတ္တာမြို့နယ်ခွဲတို့ပါဝင်သည်။

၁.၄.၂ ရုပ်ပိုင်းဆိုင်ရာ လေ့လာမှုအပိုင်းများ

ကွင်းဆင်းလေ့လာမှုများအားဆောင်ရွက်ခဲ့ရာတွင် သန့်ရှင်းသောပတ်ဝန်းကျင်ညွှန်းဆိုချက်အဖြစ် အောက်ပါအတိုင်း သတ်မှတ်ပါသည်။

- လေထုအရည်အသွေးသည်မြန်မာအမျိုးသားပတ်ဝန်းကျင်အရည်အသွေး (ထုတ်လွှတ်မှု)လမ်းညွှန်ချက်များ (Myanmar Environmental Quality (Emission) Guidelines)၏စံချိန်စံညွှန်းနှင့်ကိုက်ညီမှုရှိသည်။ သို့ရာတွင် A1 တိုးဂိတ် (တိုးပလာဇာ စခန်း)နှင့် A3 တိုးဂိတ် (Elasto စခန်း-၁)နှစ်နေရာတွင် လေထု သတ်မှတ်ချက်တန်ဖိုး P-10 ဖြစ်ပြီး ခွင့်ပြုထားသော

သတ်မှတ်ချက်ထက် ကျော်လွန်နေသည်။ ထိုကဲ့သို့ ဖြစ်ရခြင်းမှာ လက်ရှိမြေသားလမ်းအား လွန်ခဲ့သောငါးနှစ်ကပင်စတင်အသုံးပြုလာခဲ့ခြင်းကြောင့် ဖုံမှုန့်ထူထပ် နေခြင်းကြောင့် ဖြစ်သည်။

- ဆူညံသံအဆင့်သည် မြန်မာအမျိုးသားပတ်ဝန်းကျင်အရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန်ချက်များ (Myanmar Environmental Quality (Emission) Guidelines) နှင့်အမေရိကန်နိုင်ငံ EPA ဆူညံသံစံနှုန်း တန်ဖိုး၏အမြင့်ဆုံး လက်ခံနိုင်သော သတ်မှတ် စံချိန်စံညွှန်း အောက်သိသိသာသာ လျော့နေကြောင်း တွေ့ရပါသည်။

- တုန်ခါမှုအဆင့်သည် ဂျာမကီနိုင်ငံ၏စံချိန်စံညွှန်း German Vibration Guideline Values (Din4150-3, 1999)မှ အမြင့်ဆုံးလက်ခံနိုင်သောသတ်မှတ်အဆင့် 2.0 mm/s ထက်များစွာ လျော့နေကြောင်းတွေ့ရှိရသည်။

- ရေနမူနာကောက်ယူသည့်နေရာ(၁၁)နေရာစလုံးမှတိုင်းထွာချက်များအရ ရေပြင်သည် အောက်စီဂျင်ပျော်ဝင်မှုအလွန်မြင့်မားနေပြီး၊ အခြားသောသတ္ထုနှင့်အော်ဂဲနစ်အညစ်အကြေးများအနယ်ထိုင်မှုအလွန်နဲပါးကြောင်းတွေ့ရှိရသည့်အတွက် ရေအရည်အသွေးအလွန်ကောင်းသည်ဟု သတ်မှတ်ပါသည်။

၁.၄.၃ ဇီဝဆိုင်ရာ လေ့လာမှုအပိုင်းများ

လေ့လာမှုပြုသည့် စီမံကိန်းနယ်မြေအတွင်း သစ်တောကြိုးဝိုင်းမရှိပါ။

(၂၄၂) မျိုးသော မျိုးစိတ်များကို ROWဇရိယာတွင် တွေ့ရှိရပြီး ၂၄၇မျိုးသော မျိုးစိတ်များကို လမ်း၏အလည်ဗဟိုမှ ၅၀၀ မီတာအတွင်း တွေ့ရှိရမည်။ယင်းတို့တွင် IUCN Red List (2013) စာရင်းအရ မျိုးသုဉ်းပျောက်ကွယ်နိုင်မည့် မျိုးစိတ် (၆)မျိုး ပါဝင်နေပါသည်။ စီမံကိန်းဇရိယာအတွင်း ၁၅၂မျိုးသော သတ္တဝါမျိုးစိတ်များကို တွေ့ရှိရသည်။ ၄င်းတို့မှာ နို့တိုက်သတ္တဝါမျိုးစိတ် (၂၃) မျိုး၊ ဌက်မျိုးစိတ် ၈၈မျိုး၊ တွားသွားသတ္တဝါမျိုးစိတ် (၂၇) မျိုးနှင့် ရေနေသတ္တဝါမျိုးစိတ် (၁၄) မျိုးကို တွေ့ရှိရပါသည်။ အများစုမှာ မျိုးသုဉ်းပျောက်ကွယ်နိုင်သည့် မျိုးစိတ်များ မဟုတ်ကြပါ။

ရေနေဂေဟစံနစ်တွင် phytoplankton ကဲ့သို့သော မိုက်ခရိုအော်ဂဲနစ် ရေနေ အပင်ငယ်လေးများ၊ zooplankton ကဲ့သို့သောရေနေအကောင်ငယ်လေးများ နှင့် benthos ကဲ့သို့သော ရေအောက်ကြမ်းပြင်နှင့်ရေထုအတွင်းနေထိုင်သော အော်ဂဲနစ်အကောင်ငယ်စသည့် ရေနေသတ္တဝါငယ်များနှင့် အပင်မွှားလေးများသည် အမျိုးအမည်ကွဲပြားစွာနှင့် သိပ်သည်းစွာ ရှိနေကြောင်းတွေ့ရှိရသည့်အတွက် ရေနေဂေဟစံနစ်ကောင်းသည်ဟု သတ်မှတ် ပါသည်။ phytoplankton အမျိုးအစား၏အဓိကအုပ်စုဖြစ်သော diatom ကဲ့သို့ရေညို အုပ်စုများအား များပြားစွာတွေ့ရခြင်းသည် လေ့လာသည့်စီမံကိန်းနယ်မြေအတွင်းရှိ သဘာဝမြစ် ချောင်းများထဲမှ ရေနေသတ္တဝါများအတွက် အစာအဟာရပြည့်ဝကုံလုံသော ရေနေဇီဝရုပ်များ မြင့်မားစွာ ပေါက်ဖွားမှုရှိနေကြောင်း ဖေါ်ပြနေပါသည်။

၁.၄.၄ လူမှုစီးပွားဆိုင်ရာ လေ့လာမှုအဝိုင်းများ

က. မြေယာ အသုံးချမှု

လေ့လာမှုပြုသည့်နေရာသည် စုစုပေါင်းဧရိယာ (၃၄၀၃၁.၃၅) ဧက ကျယ်ဝန်းပြီးဥင်းဧရိယာ၏(၅၃.၈၁%)သည် သစ်တောမြေဖြစ်ပါသည်။ နှစ်ရှည်ပင်နှင့် ဥယျာဉ်ခြံမြေ ဧရိယာသည် စုစုပေါင်း (၂၁.၅၄%) ဖြစ်ပြီး အသုံးပြုခြင်းမရှိသော အဆင့်နိမ့်သစ်တော ဧရိယာသည် (၅%)ခန့်ရှိပါသည်။

လမ်းနယ်စုစုဧရိယာမှာ (၁၅၃၂.၀၇)ဧကဖြစ်ပါသည်။ ထိုအထဲမှ မြေအသုံးချမှု အဓိက အမျိုးအစားများတွင် သစ်တောမြေ (၄၆.၄၆%)၊ ဥယျာဉ်ခြံနှင့်နှစ်ရှည်ပင် ဧရိယာ (၂၂.၉၈%) နှင့် ဝါးတောဧရိယာ (၅.၅၈%) ရှိပါသည်။

ခ. လူမှုစီးပွားရေး အခြေအနေများ

လေ့လာသည့်ဧရိယာ၏ လူမှုစီးပွားရေးအခြေအနေများကို ရေဖြူမြို့နယ်နှင့် ထားဝယ်ခရိုင်အတွင်းရှိ ကျေးရွာများဖြစ်သော ဒေါက်လောက်၊ တလိုင်းယာ၊ ပိတောက်ကုန်း၊ ကလုံးထာ၊ သခတ်ကုန်းရေပေါက်၊ သပြူချောင်းပျဉ်တော်သာ၊ တောင်သုံးလုံး၊ ဆင်ဖြူတိုင်၊ ဝါးတော၊ အားမူ၊ ဂရတာခီး၊ထီးခီးနှင့် မေတ္တာမြို့နယ်ခွဲဖြစ်ကြသော စုစုပေါင်း ကျေးရွာ (၁၅)ရွာ တို့၏ ကျေးရွာအုပ်ချုပ်ရေးမှူး၊ ရပ်မိရပ်ဖများနှင့် အဓိက တွေ့ဆုံမေးမြန်းခြင်းမှရရှိလာသော အချက်အလက်များဖြစ်သည်။ တွေ့ရှိရသောလူမှုစီးပွားရေးအခြေအနေများ၏ အဓိကအချက် များမှာ အောက်ပါအတိုင်းဖြစ်သည်။

- လေ့လာမှုပြုသည့်ဧရိယာတစ်ခုလုံးတွင်အိမ်ထောင်စု(၁၈၁၀)စု၊ စုစုပေါင်းလူဦးရေ (၈၁၈၃)ဦးရှိပြီး အိမ်ထောင်စုတစ်စုလျင် ပျမ်းမျှလူဦးရေ (၄-၅)ဦးရှိပါသည်။
- အဆိုပါရွာပေါင်း (၁၅)ရွာအတွင်း အမျိုးသမီးဦးရေသည်အမျိုးသားဦးရေထက် အနည်းငယ်ပိုများပြီး ကျား-မ အချိုးအစားအားဖြင့် (၁ : ၁.၀၀၈) ဖြစ်ပါသည်။
- လေ့လာသည့်ကျေးရွာ(၁၅)ရွာစလုံးတွင်ကြီးမားပြင်းထန်သော ကျန်းမာရေးပြဿနာများမတွေ့ရပါ။ ရေဖြူမြို့နှင့်မေတ္တာမြို့နယ်ခွဲတွင်အစိုးရဆေးရုံတစ်ရုံစီရှိပါသည်။
- ကျေးရွာ(၁၅)ရွာ၏အိမ်ထောင်စုတစ်စုလျင်ဝင်ငွေတစ်နှစ်လျင် အမေရိကန်ဒေါ်လာ (၁၀၀၀) မှ (၆၀၀၀)အကြားရှိပြီး ပျမ်းမျှအမေရိကန်ဒေါ်လာ(၃၅၀၀)ခန့် ရှိပါသည်။ အိမ်ထောင်စုတစ်စုအတွက်တစ်လလျင်ဝင်ငွေပျမ်းမျှ အမေရိကန်ဒေါ်လာ(၂၉၀)ခန့် ရှိကြောင်းတွေ့ရသည်။
- ကျေးရွာ(၁၅)ရွာအတွင်းရှိ အလုပ်လက်မဲ့နှုန်း အလွန်နည်းပါးပြီး အလုပ်လုပ် နိုင်သည့် အရွယ်ရှိလူဦးရေသည် ဥယျာဉ်ခြံလုပ်ငန်း၊ ကျပန်းအလုပ်၊ အရောင်းအဝယ် နှင့် ထိုင်းနိုင်ငံတွင် သွားရောက်အလုပ်လုပ်ကိုင်ခြင်းဖြင့် အသက်မွေးဝမ်းကြောင်း ပြုကြပါသည်။

- ကျေးရွာအားလုံးရှိ ရွာသူ/သားအများစုသည် အခြေခံပညာမူလတန်းအဆင့်အထိ ပညာသင်ကြားခဲ့ဖူးပြီးအနည်းငယ်သောလူဦးရေသည်အလယ်တန်းနှင့် အထက်တန်းအဆင့်အထိကျောင်းနေဖူးကြောင်းတွေ့ရသည်။အချို့သောအသက်ကြီးပိုင်း ကျေးရွာလူကြီးများသည် ဘုန်းတော်ကြီးကျောင်းတွင် စာသင်ကြားခဲ့ကြဖူးပါသည်။

- ကျေးရွာ (၁၅) ရွာအတွင်းနေထိုင်သော ထိခိုက်လွယ်သောလူအုပ်စု (Vulnerable groups) သည်စုစုပေါင်းလူဦးရေ၏ ၂.၇% ခန့် ရှိသောကြောင့် ပမာဏအားဖြင့် နည်းပါသည်။

၈. အခြေခံအဆောက်အဦ

လမ်း ။ ။ လေ့လာမှုပြုသည့်ဇရိယာအတွင်းဖြတ်သန်းသွားသောစီမံကိန်းနှင့် အနီးဆုံး လမ်းမကြီးမှာ အမှတ်(၈) ပြည်ထောင်စုလမ်းမကြီးဖြစ်ပါသည်။

လျှပ်စစ် ။ ။ လေ့လာခဲ့သည့်ကျေးရွာအားလုံးနီးပါးလျှစ်စစ်မီးမရရှိပါ၊ တောင်သုံးလုံးကျေးရွာနှင့် ထီးခီးကျေးရွာတွင်သာလျှပ်စစ်ဓါတ်အားဖြန့်ဖြူးသည့်စံနစ်ရှိပါသည်။ ယခုအခါ တွင်ဒေါက်လောက်၊ ပိတောက်ကုန်းကျေးရွာနှင့်မေတ္တာမြို့နယ်ခွဲတွင် ညဉ့်အချိန်မီးလင်း နိုင်ရန်အတွက် မီးစက်အသေးစားနှင့် ဘတ္ထရီးအိုးများအသုံးပြုကြပါသည်။

ရေဖြန့်ဝေခြင်းနှင့် ရေအသုံးပြုခြင်း ။ ။ လေ့လာမှုပြုခဲ့သောကျေးရွာ(၁၃)ရွာ တွင် ရေပိုက်ဖြင့် ရေသွယ်တန်းဖြန့်ဝေခြင်းမရှိပါ။ တလိုင်းယာနှင့် တခတ်ကုန်း ကျေးရွာနှစ်ရွာ တွင်တောင်ကျရေမှ ရေပိုက်သွယ်တန်းပြီး ကျေးရွာ အတွင်းဖြန့်ဝေမှုရှိပါသည်။ ချောင်းရေနှင့် တွင်းရေသည် အိမ်ထောင်စုသောက်သုံးရန်အတွက် လုံလောက်သော ရေအရင်းအမြစ်များဖြစ် နေကြောင်းတွေ့ရှိရသည်။

စာသင်ကျောင်းနှင့်ဘာသာရေးဆိုင်ရာအဆောက်အဦ ။ ။ ကျေးရွာ(၁၅)ရွာစလုံးတွင် ဘာသာရေးဆိုင်ရာ အဆောက်အဦများ ရှိကြပါသည်။

၁.၄.၅ ယဉ်ကျေးမှုဆိုင်ရာ လေ့လာမှုအပိုင်းများ

ရှေးဟောင်းလက်ရာ ပစ္စည်းများ ။ ။ စီမံကိန်းလမ်းကြောင်းနှင့်နီးကပ်သောနေရာ နှစ်နေရာတွင် ရှေးဟောင်းလက်ရာပစ္စည်း နှစ်မျိုးတွေ့ရှိရသည်။ တစ်နေရာမှာ ဒေါက်လောက် ကျေးရွာရှိ ကျောက်ဖြင့်လုပ်ထားသော ပုဆိန် နှင့် ကီလိုမီတာ တိုင် (၁၉+၈၅၀)ရှိ လမ်းနယ်မှ မီတာ ၅၀၀ အကွာတွင် ရွှံ့စေးဖြင့်ပြုလုပ်ထားသော ပိုက်လုံး တစ်ခုရှိကြောင်းတွေ့ရသည်။

ဘာသာရေးဆိုင်ရာ အထိမ်းအမှတ်များ ။ ။ စီမံကိန်းဇရိယာအတွင်းရှိ ဒေါက်လောက် ကျေးရွာတွင်ဘုရားစေတီသုံးဆူ ရှိနေပါသည်။

ဘုန်းတော်ကြီး ကျောင်းများ ။ ။ လေ့လာခဲ့သည့်စီမံကိန်းဇရိယာ အပိုင်း (၁) အတွင်း၊ ရေဖြူမြို့နယ်ထဲရှိကန်ရွဲကျေးရွာ၊ ဒေါက်လောက်ကျေးရွာ၊တလိုင်းယာ ကျေးရွာတို့တွင် နှစ်ပေါင်း (၅၀

မှ ၈၀) သက်တမ်းရှိသောဘုန်းတော်ကြီးကျောင်း တစ်ကျောင်းစီ ရှိသည့်အပြင် ထီးခီးကျေးရွာနှင့် မေတ္တာမြို့နယ်ခွဲတို့တွင်လည်း ဘုန်းတော်ကြီးကျောင်း တစ်ကျောင်းစီ ရှိနေကြပါသည်။

၁.၄.၆ မျက်မြင်နိုင်သောအရာဝတ္ထုအား လေ့လာမှုအဝိုင်းများ

လေ့လာခဲ့သည့် ဇရိယာတွင် မတူညီသောမြေမျက်နှာသွင်ပြင် အမျိုးမျိုးရှိနေပြီး မြေပြင်ပုံစံများ၊ ရေပြင်သဏ္ဍာန်များ၊ အပင်အစုအဖွဲ့များနှင့် အသုံးချမြေများ ဟူ၍တွေ့ရှိရသည်။ စီမံကိန်း လမ်းကြောင်းတစ်လျှောက်တွင် မြေပြင်ပုံသဏ္ဍာန်အများစုမှာ တောင်ကုန်း၊ တောင်တန်းများဖြစ်ကြပြီး လျှိုမြောင်ချိုင့်ဝှမ်းများလည်း ပါဝင်ရောယှက်နေသည်။ ထားဝယ်မြစ် အနီးတွင် မြေပြန့်လွင်ပြင် အနည်းငယ်အား ကီလိုမီတာတိုင် (၁၉+၅၀၀) မှ (၂၁+၅၀၀) အတွင်း တွေ့ရှိရပါသည်။

လမ်းကြောင်းဖြတ်သန်းသွားသည့် နေရာအများစုဖြစ်သော သစ်တောများ အတွင်းရှိ အပင်အစု အဖွဲ့အမျိုးမျိုးအား လေ့လာသည့်ဇရိယာအနေဖြင့်ခြုံငုံမှုရှိပါသည်။ အပင်အစု အဖွဲ့အား‌လုံး နီးပါးသည် အမြဲစိမ်းသစ်တောများ ဖြစ်ကြသောကြောင့် အရောင်ဆင်တူမှု ရှိကြပြီး တစ်နှစ် ပတ်လုံး စိမ်းလန်းနေသည့်တောများ ဖြစ်ကြသည်။ ထားဝယ်မြစ်အနီးတဝိုက်ရှိ မြေပြန့်လွင်ပြင်သည် ကွမ်းခြံနှင့်စပါးခင်းကဲ့သို့သော စိုက်ပျိုးမြေများ ဖြစ်ကြသည်။ လမ်းကြောင်း တစ်လျှောက်တွင်လည်း ကျေးရွာငယ်အချို့ ကျဲပါးစွာ တည်ရှိနေကြပါသည်။

၁.၅ ပတ်ဝန်းကျင်ထိခိုက်မှုများရှိနိုင်သောအဓိကအချက်များနှင့်လျော့ချသည့်အစီအမံများ

စီမံကိန်းတစ်ခုလုံး၏ တည်ဆောက်ခြင်း၊ လုပ်ငန်းလည်ပတ်ခြင်း သဘောသဘာဝ၊ စီမံကိန်း၏ ပတ်ဝန်းကျင်နှင့် လူမှု-စီးပွားအခြေအနေနှင့် စီမံကန်း၏ နယ်ပယ်အပေါ်မှာ အခြေခံပြီး တည်ဆောက်သည့်ကာလ နှင့် လုပ်ငန်းလည်ပတ်သည့်ကာလ ဟူ၍ ပိုင်းခြားလျက် ဖြစ်ပေါ်လာနိုင်သည့် ထိခိုက်မှု၊ အန္တရာယ်များကို သတ်မှတ်ဖော်ထုတ်ရာ ရလဒ်များကို အစီရင်ခံစာ အတွင်းရှိ ဇယား ၆.၂-၁ မှ ၆.၂-၅အထိသော်လည်းကောင်း ဇယား ၆.၃-၁ မှ ၆.၃-၂ အထိ သော်လည်းကောင်း ဖော်ပြထားရှိပါသည်။ ဖော်ထုတ်ထားသောအဓိက ရလဒ်များကိုအောက်ပါအတိုင်း အကျဉ်းချုပ် ဖော်ပြအပ်ပါသည်။

၁.၅.၁ တည်ဆောက်သည့်ကာလ

က. ထိခိုက်မှုအား လေ့လာဆန်းစစ်ခြင်း

စီမံကိန်းတည်ဆောက်ဆဲကာလအတွင်း လမ်း နှင့် အထောက်အကူပြုလုပ်ငန်းများ ဟူ၍ အဝိုင်း နှစ်ဝိုင်း ခွဲခြားအပ်ပါသည်။ ပတ်ဝန်းကျင်ပြဿနာများမှာ (၁) လေထုအရည်အသွေး (၂) အသံဆူညံမှု (၃) တုန်ခါမှု (၄) မြေပေါ်ရေ အရည်အသွေး (၅) ရေနေဂေဟစနစ် (၆)

မြေဆီလွှာတိုက်စားခြင်းနှင့် ပျက်စီးခြင်း (၇) သစ်တောနှင့် သတ္တဝါများ (၈) မြေနေရာယူခြင်း (၉) လူမှုစီးပွား (၁၀) မြေနေရာအသုံးချမှုတို့ဖြစ်ပါသည်။

တည်ဆောက်ရေး လုပ်ငန်းခွင်မှ ဖုန်မှုန့်များထွက်ပေါ်လာမှုကြောင့် လေထုညစ်ညမ်းမှုများ ဖြစ်ပေါ်တိုးပွားလာပါသည်။ ဥပမာ - မြေဆီအပေါ်လွှာဖယ်ထုတ်ခြင်း၊ တူးဖော်ခြင်း၊ တွင်းတူးခြင်း စသည်တို့ဖြစ်ပါသည်။ PM-10 နှင့် TSP ထွက်ပေါ်မှုနှုန်းထားအများဆုံးမှာ တည်ဆောက်ရေးလုပ်ငန်းခွင်၏ ၂၄နာရီ အခြေခံနှုန်းထားဖြစ်ပြီး ၎င်းတို့မှာ - PM-10အတွက် ၂၉.၀၆-၁၀၄.၀၆ နှင့် TSPအတွက် ၆၈.၆၂-၂၁၀.၆၂ $\mu g/m^3$ ဟူ၍ အသီးသီးဖြစ်သည်။ သို့သော် ဝန်းကျင်လေထု အရည်အသွေး ထိခိုက်မှုလျော့ချပေးရန် အစီအစဉ်များ (ဥပမာ - မြေပြင်အား ရေဖြန်းပေးခြင်း) ကို စီမံကိန်းမှ ပြင်ဆင်ထားပါသည်။

တည်ဆောက်ရေးကာလတွင် ဆူညံမှုထွက်ပေါ်ခြင်းမှာ တည်ဆောက်မှု အခြေအနေနှင့် ကိရိယာပစ္စည်းများအပေါ် မူတည်သည်။ ဆောက်လုပ်ရေးသုံးစက်ပစ္စည်းများမှာ - ဘက်ဟိုး၊ ဒိုဇာ၊ လမ်းခင်းစက်၊ လေကွန်ပရက်ဆာ၊ မြေသိပ်စက်၊ ကရိန်း (ရွှေလျား)၊ မြေကြီးအတွင်းသို့ တိုက်စိုက်စက်၊ ထရက်ကာ၊ လမ်းကြိတ်စက်နှင့် မြေညှစ်တို့ဖြစ်ပါသည်။ လမ်းနှင့် တံတားတည်ဆောက်ခြင်းမှ ဆူညံမှုနေရာအနှံ့မှ ထွက်ပေါ်ခြင်း ရလဒ်များမှာ တစ်နာရီတွင် (၄၈.၀-၉၆.၉) နှင့် (၅၅.၀-၁၀၄.၀) ဒက်ဆီဘယ်ရှိပါသည်။ လမ်းနှင့်တံတားတည်ဆောက်ရေးလုပ်ငန်းမှ (၁၉၀၀-၄၂၀၀) မီတာ အကွာအဝေးတွင် ဆူညံမှုတိုင်းတာခြင်းစံနှုန်း (တစ်နာရီတွင် ၅၅ ဒက်ဆီဘယ်) နှင့် ကိုက်ညီပြီး လုံခြုံမှုနယ်မြေအဖြစ် သတ်မှတ်နိုင်ပါသည်။ လမ်းတံတားတည်ဆောက်ရေးလုပ်ငန်းခွင်မှ (၁၅-၅၃၅၀) မီတာအတွင်း ဆူညံမှုနှုန်းထားရလဒ်မှာ (၃.၄-၅၃.၈) နှင့် (၁၀.၀-၆၀.၉) ဒက်ဆီဘယ် အသီးသီးဖြစ်ပါသည်။ လမ်းတံတားဆောက်လုပ်ရေးမှ အနောက်အယှက်ဖြစ်စေသော ဆူညံမှုထွက်ပေါ်ခြင်းသည် ၂၄၀၀ မှ ၅၃၅၀ မီတာအတွင်း ဖြစ်ပေါ်နိုင်ပါသည်။

လမ်းနှင့်တံတားတည်ဆောက်မှု လုပ်ငန်းများမှ အကြီးစားစက်ပစ္စည်းများ အသုံးပြုမှု အထူးသဖြင့် မြေကြီးအတွင်းသို့ တိုက်စိုက်ခြင်း၊ တုန်ခါဒလိမ့်တုံးများ၊ ကုန်တင်ယာဉ်များ၊ ဘူဒိုဇာ အသေးစားများကြောင့် တုန်ခါမှုများထွက်ပေါ်လာနိုင်ပါသည်။

လမ်းကြောင်းသတ်မှတ်သည့် နေရာအသစ် (၁၀) နေရာတွင် ဝန်ဆောင်မှု လုပ်ငန်းများနေရာ၊ အုပ်ချုပ်ရေးနှင့် ဘေးကင်းရေးအတွက် လိုအပ်သော အထောက်အကူပြု အဆောက်အဦများအား ဆောက်လုပ်ရန်အတွက် မြေပိုင်ရှင်ထံမှ မြေရယူခြင်းလုပ်ငန်းစဉ်အား ဆောင်ရွက်ရန် လိုအပ်ပါသည်။ လုပ်ငန်းခွင်မှ မီတာ ၅၀-၅၀၀ အတွင်း တုန်ခါနှုန်း ထိခိုက်မှု ရလဒ်မှာ ၀.၉၇-၀.၀၀၀၂ mm/s (၀.၀၃၈၃၃-၀.၀၀၀၀၁ in/s) ဖြစ်ပြီး လုပ်ငန်းခွင်သုံးဆောက်လုပ်ရေး ပစ္စည်းများကြောင့် တုန်ခါမှုကို (၅၀) မီတာအတွင်း ခံစားရပြီး ထိုတုန်ခါမှုကြောင့် ရေးဟောင်းအဆောက်အဦများ ပြိုကျနိုင်ပါသည်။ သို့သော် လမ်းအလည်ဝဟိုမှ မီတာ (၅၀)အတွင်း ရှေးဟောင်းအဆောက်အဦများ မရှိပါ။ တုန်ခါမှုကြောင့် ပတ်ဝန်းကျင်ထိခိုက်မှု မဖြစ်နိုင်ပါ။ တုန်ခါခြင်းဖြစ်ပေါ်သည့် လုပ်ငန်းတည်ဆောက်မှုမှ မီတာ ၁၀၀ ကျော်ကို အဆောက်အဦများအတွက် လုံခြုံမှုနယ်မြေအဖြစ်သတ်မှတ်ထားပါသည်။

တည်ဆောက်ရေးလုပ်ငန်းများကြောင့် မြေပေါ်ရေနှင့် ရေနေဂေဟစနစ်ကို အမှတ်တမဲ့ ညစ်ညမ်းစေခြင်းဖြစ်ပေါ်နိုင်ပါသည်။ အဓိကလမ်းပိုင်း ၁၀ခုတည်ဆောက်ခြင်း၊ တံတား (၂၁) စင်းတည်ဆောက်ခြင်း၊ ရေသွယ်မြောင်းတည်ဆောက်ခြင်းနှင့် တနင်္သာရီမြစ်အနီး ရှမ္ပော်ခင်းနေရာ (KM 79+700) တည်ဆောက်ခြင်းများကြောင့် ရေအရင်းအမြစ်များတွင် နောက်ကျိမှုဖြစ်ပေါ်ခြင်း၊ အနယ်ဖြစ်ပေါ်ပြီးညစ်ညမ်းစေပါသည်။

တည်ဆောက်ရေးသည် တောင်ကုန်းတောင်တန်းနေရာများ၊ စိုက်ပျိုးမြေများ၊ သစ်တောများကို ဖြတ်၍ ဖောက်လုပ်ရခြင်းဖြစ်သည်။ တောင်ကုန်းတောင်တန်းများနေရာတွင် မြေတိုက်စား၍ ဖောက်လုပ်ခြင်းများ ဖြစ်ပေါ်နိုင်ပါသည်။

လမ်းကြောင်းသတ်မှတ်သည့် နေရာအသစ် (၁၀) နေရာတွင် ဝန်ဆောင်မှု လုပ်ငန်းများနေရာ၊ အုပ်ချုပ်ရေးနှင့် ဘေးကင်းရေးအတွက် လိုအပ်သော အထောက်အကူပြု အဆောက်အဦများအား ဆောက်လုပ်ရန်အတွက် မြေပိုင်ရှင်ထံမှ မြေရယူခြင်းလုပ်ငန်းစဉ်အား ဆောင်ရွက်ရန် လိုအပ်ပါသည်။ စီမံကိန်းသည် ဖောက်လုပ်ရမည့်လမ်းအပြင် (၃၄၀.၅) ဧကသော အပိုမြေရရှိခဲ့ပါသည်။

အထက်မှာဖေါ်ပြခဲ့သည့်အတိုင်း စီမံကိန်းအောက်ရှိ လမ်းကြောင်းသတ်မှတ်သည့် နေရာ (၁၀) နေရာတွင် စုစုပေါင်းဧရိယာ (၃၀၆)ဧက ရှိမည်ဖြစ်ပြီး တည်ဆောက်ရေး လုပ်ငန်းအတွက် သစ်တောမြေအချို့ ဆုံးရှုံးပါမည်။ လက်ရှိလမ်းကြောင်း ဖေါက်လုပ်ခြင်း အတွက် သစ်တောမြေအများစုပါဝင်သော မြေစုစုပေါင်း (၁၅၁၄)ဧကခန့် တူးဖေါ် ရှင်းလင်း ခဲ့ပြီးဖြစ်သည်။ ထို့ကြောင့် နောက်ထပ် ရှင်းလင်းမည့်သစ်တောမြေဧက ပိုမို လျော့နည်း မည်ဖြစ်သည့်အတွက် ဂေဟစံနစ်အပေါ် ထိခိုက်မှုလည်း လျော့နည်းသွား လိမ့် မည်ဖြစ်သည်။

လမ်းကြောင်းအား အဆင့်မြှင့်တင်သည့်ကာလတွင် အချို့သော တောသားရိုင်း တိရိစ္ဆာန်တို့သည် ဆောက်လုပ်ရေးလုပ်ငန်းခွင်မှထွက်ပေါ်လာသည့် ကျယ်လောင်သော ဆူညံသံနှင့် စားကျက်မြေ ပျောက်ဆုံးသွားမည်ဖြစ်သောကြောင့် ထိုနေရာအား စွန့်ခွါ သွားကြပေလိမ့်မည်။ သို့သော်လည်း လမ်းနယ်အတွင်းတွေ့ရှိရသော ဤတိရိစ္ဆာန်အများစု သည် အရည်အသွေးနိမ့်ကျသော စားကျက်မြေတွင် ရှင်သန်ကြီးထွားနိုင်စွမ်းရှိကြသော အမျိုးအစားများ ဖြစ်ကြသည်။

တည်ဆောက်မှုအခြေအနေပေါ်မူတည်၍ မြေအသုံးပြုမှုများ (ဆောက်လုပ်ရေးရုံး၊ တဲစခန်း၊ စက်ကိရိယာနှင့် ပစ္စည်းများ)သည် ယာယီရွှေ့ပြောင်းနေပါသည်။ ကန်ထရိုက်တာသည် သီသန့်မြေဌား၍ ၄င်းတို့တည်ဆောက်ရန် စီစဉ်ရပါမည်။ ထို့ကြောင့် မြေအသုံးပြုမှုကြောင့် ဖြစ်ပေါ်လာမည့် ထိခိုက်မှုများသည် တည်ဆောက်ရေးကာလတွင်သာ ဖြစ်ပေါ်နိုင်ပါသည်။

အဓိကတည်ဆောက်မှုပြုလုပ်ချိန်တွင် လုပ်ငန်းခွင်ဝန်းထမ်းအများဆုံး (၁၂၀၀) အထိခန့်အပ်နိုင်ပါသည်။ ဆောက်လုပ်ရေးဝန်းထမ်းများကြောင့် ဒေသခံများ၏ လူမှုရေး-ယဉ်ကျေးမှုပြောင်းလဲခြင်းများဖြစ်ပေါ်နိုင်ပါသည်။ ကျေးရွာ၏ စီးပွားရေးမှာ (၁၅၀,၀၀၀) ဒေါ်လာရရှိပါသည်။ ကျေးရွာ၏ စီပွားရေး အခြေအနေပြောင်းလဲမှုကြောင့် လူမှု-ယဉ်ကျေးမှုများပြောင်းလဲနိုင်ပြီး ၄င်းသည် ကျေးရွာ၏ နေထိုင်မှု အသိုင်းအဝိုင်းအနေအထားများကို ပြောင်းလဲရန် ခြိမ်းခြောက်လျက်ရှိပါသည်။

စီမံကိန်းရှိပြင်ပဝန်ထမ်းများကြောင့် ပတ်ဝန်းကျင်လူထုတွင် စံချိန်စံညွှန်းအသစ်များ၊ တန်ဖိုးများ၊ ယဉ်ကျေးမှုများ၊ အလေ့အကျင့်များနှင့် စီပွားရေးအခွင့်အလမ်းအသစ်များဖြစ်ပေါ်ပြီး စီမံကိန်းလုပ်ဆောင်ချိန်တွင် ကျေးရွာစီပွားရေးအား ဖွံ့ဖြိုးစေနိုင်ပါသည်။

ခ. လျော့ချမှု နည်းလမ်းများ

တည်ဆောက်ရေးကာလရှိ ပတ်ဝန်းကျင်ထိန်းသိမ်းရေး နည်းစဉ်များမှာ ကောင်းမွန်စွာဖော်ပြပြီး ဆောက်လုပ်ရေးစာချုပ်များတွင် ထည့်သွင်းချုပ်ဆိုပြီးဖြစ်ပါသည်။ တိုင်းတာခြင်းများတွင် ဥပမာ - (၁) လေထုအရည်အသွေး (၂) ဆူညံမှု (၃) တုန်ခါနှုန်း (၄) မြေပေါ်ရေအရည်အသွေး (၅) ရေနေဂေဟစနစ် (၆) မြေဆီလွှာ တိုက်စားခြင်း နှင့် ပျက်စီးခြင်း (၇) သစ်တောနှင့် သတ္တဝါများ (၈) မြေနေရာရယူခြင်း (၉) လူမှုစီးပွား (၁၀) မြေနေရာအသုံးချမှု တို့ဖြစ်ပါသည်။

၁.၅.၂ လုပ်ငန်းလည်ပတ်သည့်ကာလ

က. ထိခိုက်သက်ရောက်မှုကိုအကဲဖြတ်စစ်ဆေးခြင်း

လုပ်ငန်းလည်ပတ်ချိန်တွင် ဖြစ်ပေါ်လာမည့် ဝန်းကျင်လေထုအရည်အသွေး ထိခိုက်မှုများမှာ - ယာဉ်သွားလာမှုများမှထွက်သော အိတ်ဇောထုတ်လွှတ်မှုများဖြစ်သည်။ နှစ်လမ်းသွားလမ်း၏ အလယ်ဗဟိုမှ အမျိုးမျိုးသော ထိခိုက်လွယ်သော နေရာများတွင် ကာဗွန်မိုနောက်ဆိုဒ်၊ နောက်ထရိုဂျင်ဒိုင်အောက်ဆိုဒ်နှင့် PM-10 တို့၏ သိပ်သည်းပါဝင်မှု ပမာဏမှာ ၀.၆ ppm၊ ၄၆.၄-၇၆.၄ ppbနှင့် ၁၀၀.၁-၁၀၀.၃ $\mu g/m^3$ အသီးသီးရှိပါသည်။ အမျိုးသား ပတ်ဝန်းကျင်ဆိုင်ရာ အရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန်ချက်များ နောက်ဆုံးမူကြမ်း (၂၀၁၅ခုနှစ်၊ ဧပြီလ) အရ ကာဗွန်မိုနောက်ဆိုဒ်နှင့် နိုက်ထရိုဂျင်ဒိုင်အောက်ဆိုဒ်၏ သိပ်သည်းပါဝင်မှုပမာဏမှာ စံချိန်စံညွှန်းနှင့် ကိုက်ညီသော်လည်း PM-10 ၏ သိပ်သည်းပါဝင်မှု ပမာဏမှာ စံချိန်စံညွှန်း၏ သိပ်သည်းပါဝင်မှု ပမာဏထက်များကြောင်း တွေ့ရပါသည်။

ယာဉ်သွားလာမှုများတိုးပွားလာခြင်းကြောင့် ဝန်းကျင်ဆူညံမှုနှုန်းထားများ ဖြစ်ပေါ်လာပြီး လူမှုစီးပွားနှင့် တောရိုင်းတိရစ္ဆာန်များအား နှောက်ယှက်မှု ဖြစ်ပေါ်လာနိုင်ပါသည်။ ရှည်ကြာသော ဆူညံမှုဖြစ်ပေါ်ခြင်းကြောင့် စိတ်မချမ်းမြေ့ခြင်း၊ ဆက်သွယ်ရေးပြဿနာများ ဖြစ်ပေါ်ခြင်း၊ စိတ်ဖိစီးမှုအကြောင်းအရာများဖြစ်ပေါ်မြင့်တက်လာခြင်းနှင့် ကျန်းမာရေး ထိခိုက်မှုများ ဖြစ်ပေါ်လာနိုင်ပါသည်။ စီမံကိန်းလည်ပတ်မှုကာလတွင် ယာဉ်သွားလာမှုကြောင့် အသံဆူညံခြင်း ထိခိုက်မှုကို လမ်းဗဟိုမှ မီတာ ၅၀ မှ ၆၂၀ အတွင်းတွင် ၄၁.၇-၆၁.၄ ဒက်ဆီဘယ် အထိခံစားရနိုင်ပါသည်။ လမ်းဗဟိုမှ မီတာ ၅၀ မှ ၆၂၀ အကွာအဝေးနေရာများ၏ ညအချိန် ဝန်းကျင်ဆူညံမှု အဆင့်စံနှုန်းသည် အမျိုးသား ပတ်ဝန်းကျင်ဆိုင်ရာ အရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန်ချက်တွင် ပါရှိသော ၄၅ ဒက်ဆီဘယ်ထက်နည်းပါသည်။

တုန်ခါခြင်းကြောင့် ဖြစ်ပေါ်လာသော ထိခိုက်မှုများသည် ကားများဖြတ်သန်းမှုကြောင့် ဖြစ်ပေါ်လာနိုင်သော တုန်ခါမှုအမြန်နှုန်း (PPV) နှင့် ကားများသွားလာမှုနှင့် ထိခိုက်နိုင်သောနေရာ၏

အကွာအဝေးအပေါ်မူတည်နေပါသည်။ ကုန်များတင်ဆောင်လာသော ကုန်တင်ယာဉ်များ ဖြတ်သန်းမှုသည် တုန်ခါထိခိုက်မှု အများဆုံး ဖြစ်ပေါ်နိုင်ပါသည်။ သို့သော် အမြင့်ဆုံးတုန်ခါမှု အခြေအနေ စောင့်ကြည့်လေ့လာခြင်း ရလဒ်များအရ ထိုအခြေအနေသည် သိမြင်နိုင်ရုံသော အဆင့်ဖြစ်ပြီး အခြားသောအဆောက်အဦးများအား ထိခိုက်ပျက်စီးနိုင်ခြင်းမဖြစ်ပေါ်စေပါ။ ထို့ကြောင့် စီမံကိန်းလည်ပတ်စဉ်ကာလတွင်ဖြစ်ပေါ်လာသော တုန်ခါမှုထိခိုက်ခြင်းသည် ပတ်ဝန်းကျင်လူထုကျန်းမာရေးနှင့် အဆောက်အဦးများအား သိသာထင်ရှားသော ထိခိုက်မှု မဖြစ်ပေါ်နိုင်ပါ။

စီမံကိန်းလည်ပတ်စဉ်ကာလတွင် လမ်းတစ်လျောက်တွင် ယာဉ်များ သွားလာခြင်းကြောင့် ဝန်ဆောင်မှုဧရိယာနှင့် ရှုမျှော်ခင်းကြည့်ရှုရာနေရာများတွင် အများသုံးသန့်စင်ခန်းများ၊ စားသောက်ဆိုင်များ တည်ရှိဖြစ်ပေါ်လာပြီး ၎င်းတို့မှ ရေဆိုးများ စွန့်ထုတ်ခြင်းဖြင့် မြေပေါ်ရေအရည်သွေးကို ထိခိုက်မှုများဖြစ်ပေါ်လာနိုင်ပါသည်။

နှစ်လမ်းသွားလမ်းစီမံကိန်းလုပ်ငန်းလည်ပတ်ချိန်တွင် သစ်တောနှင့် တောရိုင်းသတ္တဝါများအား ထိခိုက်မှု အနည်းငယ်ဖြစ်ပေါ်နိုင်ပါသည်။ ဥပမာ - ယာဉ်သွားလာမှုကြောင့် ညစ်ညမ်းမှုများတိုးပွားလာခြင်း၊ ထိခိုက်မှုများ တိုးပွားလာခြင်းနှင့် သတ္တဝါများ ကျက်စားရာနေရာများ ယိုယွင်းပျက်စီးလာခြင်းတို့ဖြစ်ပါသည်။ ဤနှစ်လမ်းသွားစီမံကိန်းသည် ယခင်ကတည်းက ဖောက်လုပ်ပြီးစီးထားသောလမ်းကို ပိုမိုကောင်းမွန်ဖွံ့ဖြိုးအောင်တည်ဆောက်ခြင်းဖြစ်သဖြင့် ထိုထိခိုက်မှုများသည် အရင်လမ်းဟောင်းဖောက်လုပ်စဉ်ကတည်းက ဖြစ်ပေါ်ပြီးသားဖြစ်ပါသည်။ စီမံကိန်းကြောင့် ယခင်ထက် ယာဉ်သွားလာမှုများပြားလာခြင်းသည် ပတ်ဝန်းကျင်ထိခိုက်မှုများ အနည်းငယ်တိုးပွားလာခြင်းသာ ဖြစ်ပါသည်။

တည်ဆောက်မှုပြီးစီးလျှင် လမ်းတစ်လျောက်ရှိ ကျေးရွာလူထု၏ လူထုစီးပွားဖွံ့ဖြိုးရန် အတွက် အစဉ်အမြဲအသုံးပြုရသော အခြေခံလမ်းပန်းဆက်သွယ်ရေး ဖြစ်လာမည်ဖြစ်ပါသည်။ စိုက်ပျိုးမြေအဖြစ် အသုံးပြုသော မြေများသည် လူနေထိုင်ရာမြေများ၊ ဈေးဆိုင်များအဖြစ်ပြောင်းလဲခြင်း၊ လမ်းတစ်ဖက်တစ်ချက်ရှိ မြေများ၏ မြေဈေးနှုန်းများ မြင့်တက်လာခြင်း၊ ပြင်ပမှနေထိုင်သူများ လမ်းအနီးသို့ ရွှေ့ပြောင်းလာခြင်း၊ ဆန်းသစ်မှုနှင့် နည်းပညာများကြောင့် နေထိုင်မှုပုံစံများနှင့် တွေးခေါ်ပုံများ ပြောင်းလဲလာခြင်းတို့ဖြစ်ပေါ်လာနိုင်ပါသည်။

၁. လျော့နည်းသက်သာစေရန် အစီအစဉ်များ

စီမံကိန်းလည်ပတ်မှုကာလအတွက် ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုတိုင်းတာခြင်းမှာ သမာရိုးကျဖြစ်ပြီး ကောင်းမွန်စွာဖော်ပြထားပါသည်။ ဥပမာ - (၁) လေထုအရည်အသွေး၊ (၂) အသံဆူညံမှု၊ (၃) မြေပေါ်ရေအရည်အသွေး၊ (၄) ရေနေဂေဟစနစ်၊ (၅) သစ်တောနှင့် သတ္တဝါများနှင့် (၆) လူမှု-စီပွားတို့ဖြစ်ပါသည်။

၁.၆ စုပေါင်းပြီးဖြစ်ပေါ်လာသော ထိခိုက်သက်ရောက်မှုကို အကဲဖြတ်စစ်ဆေးခြင်း

၁.၆.၁ စီမံကိန်း၏ စုပေါင်းပြီးဖြစ်ပေါ်လာသော ထိခိုက်သက်ရောက်မှုအကဲဖြတ်စစ်ဆေးခြင်း၏ အယူအဆမူဘောင်

ယေဘူယျအားဖြင့်ဆိုသော် စီမံကိန်းသို့မဟုတ် လူအများလုပ်ဆောင်မှုများ၏ အတိတ်၊ ပစ္စုပ္ပန်နှင့် အနာဂတ်ကာလများတွင် ပတ်ဝန်းကျင်အား ပြောင်းလဲမှုဖြစ်ပေါ်ခြင်းကို စုပေါင်းပြီးဖြစ်ပေါ်လာသော ထိခိုက်သက်ရောက်မှုများဟု ခေါ်ပါသည်။ ဤစီမံကိန်းသည် အရင်ကာလများမှ ဖောက်လုပ်ပြီးသား လမ်းဟောင်းကို နှစ်လမ်းသွားလမ်းအဖြစ် ပြန်လည်ဖောက်လုပ်ခြင်းဖြစ်သည်။ လမ်းအသုံးပြုစဉ်ကာလများနှင့် စီမံကိန်းထိန်းသိမ်းမှု၏ လေထုအရည်အသွေး၊ အသံဆူညံမှုနှင့် တုန်ခါနှုန်း ထိခိုက်မှုများသည် စုပေါင်းပြီးဖြစ်ပေါ်လာသော ထိခိုက်သက်ရောက်မှုများဖြစ်ပါသည်။

၁.၆.၂ စီမံကိန်းအတွက် စုပေါင်းပြီးဖြစ်ပေါ်လာသော ထိခိုက်သက်ရောက်မှုကို အကဲဖြတ်စစ်ဆေးခြင်းအတွက် လိုအပ်မှုများ

ESIA လေ့လာမှုအဖွဲ့သည် ဖွံ့ဖြိုးတိုးတက်မှုအသစ်ကြောင့် ဖြစ်ပေါ်လာနိုင်သော မျှော်လင့်ထားသည့် ထိခိုက်မှုများနှင့် လက်ရှိပတ်ဝန်းကျင်ကို ထိခိုက်နိုင်သော ထိခိုက်မှုအားလုံးကို ထည့်သွင်းစဉ်းစား၍ အခန်း (၆) တွင် ဖော်ပြထားပါသည်။ ထို့ကြောင့် ပတ်ဝန်းကျင်တွင် စုပေါင်းပြီးဖြစ်ပေါ်လာနိုင်သော ထိခိုက်သက်ရောက်မှုများကို သီးခြားဖော်ပြရန် မလိုအပ်ပါ။

၁.၇ သဘာဝပတ်ဝန်းကျင် စီမံကွပ်ကဲခြင်းစနစ်

EIA ရလဒ်စစ်ဆေးမှုများတွင် သဘာဝပတ်ဝန်းကျင် စီမံကွပ်ကဲခြင်းစနစ် ၂ခု မပါဝင်ခဲ့လျှင် အကောင်အထည်ဖော် ပြီးစီးမည် မဟုတ်ပါ။ ၎င်းတို့မှာ - တည်ဆောက်ရေးကာလ အတွက် သဘာဝပတ်ဝန်းကျင် စီမံကွပ်ကဲခြင်းစနစ်နှင့် လုပ်ငန်းလည်ပတ်စဉ်ကာလ အတွက် သဘာဝပတ်ဝန်းကျင် စီမံကွပ်ကဲခြင်းစနစ်တို့ဖြစ်ပါသည်။

တည်ဆောက်ရေးကာလ EMP (CEMP) နှင့် လုပ်ငန်းလည်ပတ်စဉ်ကာလ EMP (OEMP) တွင် ပတ်ဝန်းကျင်ကာကွယ်ရေးအကျိုးအတွက် စောင့်ကြည့်တိုင်းတာခြင်းများနှင့် လျော့ချရေးနည်းလမ်းများကို ဖော်ပြထားပါသည်။

စီမံကိန်း၏ CEMP တွင် အစီအစဉ် ၁၀ခု ပါဝင်ပါသည်။

၁။ လေထုအရည်အသွေး စီမံခန့်ခွဲမှု အစီအစဉ်

၂။ ဆူညံမှု စီမံခန့်ခွဲမှု အစီအစဉ်

၃။ တုန်ခါမှု စီမံခန့်ခွဲမှု အစီအစဉ်

၄။ မြေမျက်နှာပြင်ရေအရည်အသွေး စီမံခန့်ခွဲမှု အစီအစဉ်

၅။ ရေနေဂေဟာစနစ် စီမံခန့်ခွဲမှု အစီအစဉ်

၆။ မြေဆီလွှာတိုက်စားခြင်း စီမံခန့်ခွဲမှု အစီအစဉ်

၇။ သစ်တောနှင့် သတ္တဝါ စီမံခန့်ခွဲမှု အစီအစဉ်

၈။ မြေနေရာရယူခြင်း စီမံခန့်ခွဲမှု အစီအစဉ်

၉။ လူမှုစီပွား စီမံခန့်ခွဲမှု အစီအစဉ်

၁၀။ မြေနေရာအသုံးချမှု စီမံခန့်ခွဲမှု အစီအစဉ် တို့ဖြစ်ပါသည်။

စီမံကိန်း၏ OEMP တွင် အစီအစဉ် ၅ခု ပါဝင်ပါသည်။

၁။ လေထုအရည်အသွေး စီမံခန့်ခွဲမှု အစီအစဉ်

၂။ ဆူညံမှု စီမံခန့်ခွဲမှု အစီအစဉ်

၃။ မြေမျက်နှာပြင်ရေ အရည်အသွေး စီမံခန့်ခွဲမှု အစီအစဉ်

၄။ သစ်တောနှင့် သတ္တဝါ စီမံခန့်ခွဲမှု အစီအစဉ်

၅။ လမ်းပန်းဆက်သွယ်ရေး စီမံခန့်ခွဲမှု အစီအစဉ် တို့ဖြစ်ပါသည်။

CEMP နှင့် OEMP ၏ အသေးစိတ် ဖော်ပြချက်များကို အစီရင်ခံစာ (၂) တွင် ကြည့်ရှုနိုင်ပါသည်။

၁.၈ ပြည်သူများနှင့် ညှိနှိုင်းဆွေးနွေးခြင်း ဖော်ထုတ်ချက်

၁.၈.၁ ညှိနှိုင်းဆွေးနွေးခြင်းနှင့် ဖော်ထုတ်ခြင်း၏ ရည်ရွယ်ချက်

EIA စုံစမ်းစစ်ဆေးခြင်းတွင် ပြည်သူများနှင့် ညှိနှိုင်းဆွေးနွေးခြင်း ဖော်ထုတ်ချက် များသည် ကလေ့တစ်ခုအဖြစ် ပါဝင်ပါသည်။ ၎င်းတွင် ရည်ရွယ်ချက် ၃ခုရှိပါသည်။

- စီမံကိန်းအတွင်း ပါဝင်သူလူထုများအား စီမံကိန်းလုပ်ငန်းစဉ်များအား အသိပေးခြင်း၊ စီမံကိန်းတည်ဆောက်ရေးနှင့် လည်ပတ်ရေးကာလများတွင် ဖြစ်ပေါ်လာနိုင်သော ပတ်ဝန်းကျင်နှင့် လူမှုရေး ပြဿနာများ၊ ပတ်ဝန်းကျင်နှင့် လူမှုရေးထိခိုက်မှုများကို လျော့ချရေးနည်းလမ်းများ တင်ပြခြင်း
- စီမံကိန်းအတွင်း ပါဝင်သူလူထုများ၏ စီမံကိန်းပေါ်အမြင်များကို သိရှိရန်နှင့် လျော့ချရမည့် နည်လမ်းများ
- ဖြစ်ပေါ်လာသော ပြဿနာများကို ပါဝင်ဆောင်ရွက်ခြင်းနှင့် ပူးပေါင်း ဆောင်ရွက်ခြင်းအားဖြင့် ဆွေးနွေးခြင်းနှင့် အကဲဖြတ်ခြင်း တို့ဖြစ်ပါသည်။

ပြည်သူများနှင့် ညှိနှိုင်း ဆွေးနွေးခြင်းများသည် စီမံကိန်း၏ ပတ်ဝန်းကျင်နှင့် လူမှုရေးစီမံခန့်ခွဲမှု နည်းလမ်းများ ဖော်ဆောင်ရာတွင် အလွန်အသုံးဝင်ပါသည်။

၁.၈.၂ နည်းလမ်းနှင့် ချဉ်းကပ်မှု

နည်းလမ်းနှင့် ချဉ်းကပ်မှုများသည် PCDမှ ချမှတ်ထားသော ပြည်သူများ ပါဝင်မှု အလေ့အကျင့်များနှင့် အခြေခံမူများ ပါဝင်သည်။ ၎င်းတို့မှာ -

(၁) စီမံကိန်းကြောင့် ထိခိုက်သွားသော ပါဝင်သူများနှင့် အဖွဲ့အစည်းများ သတ်မှတ်ခြင်း။ ။ စီမံကိန်း တွင်ပါဝင်သူများ သတ်မှတ်ခြင်းနှင့် အမျိုးအစားခွဲရာတွင် EIA လုပ်ဆောင်မှုများတွင် ပါဝင်သော အစိုးရအာဏာပိုင် အဖွဲ့အစည်းများ၊ အခြားစိတ်ပါဝင်စားသော အဖွဲ့အစည်းများနှင့် ထိခိုက်သက်ရောက်မှု အလားအလာရှိသည့် ပြည်သူများဟူ၍ ဖြစ်ပါသည်။

(၂) ပြည်သူများနှင့် တွေ့ဆုံးညှိနှိုင်းဆွေးနွေးခြင်း ။ ။ စီမံကိန်းတွင် ပါဝင်ပတ်သတ်သူများနှင့် တွေ့ဆုံညှိနှိုင်း ဆွေးနွေးခြင်း၏ အဓိက ရည်ရွယ်ချက်မှာ စီမံကိန်း အစီအစဉ်၊ လျော့ချရေးနည်းလမ်းများ၊ ပါဝင်ဆောင်ရွက်ခြင်းနှင့် ပူးပေါင်းဆောင်ရွက်ခြင်း အကြောင်းအရာများကို စီမံကိန်းပါဝင် ပတ်သတ်သူများနှင့် တွေ့ဆုံဆွေးနွေးရန် ဖြစ်သည်။ ပြည်သူများနှင့် ညှိနှိုင်းဆွေးနွေးခြင်း၏ အဓိကနည်းလမ်းမှာ တွေ့ဆုံခြင်းဖြစ်သည်။ ထိုနည်းလမ်းကို EIA တွင် ယေဘူယျအားဖြင့် အသုံးပြုပြီး သတင်းအချက်အလက်များ ရယူရန်နှင့် ပြည်သူများကို ချဉ်းကပ်တွေ့ဆုံရန် အလွန်အသုံးဝင်သည်။

(၃) ထုတ်ဖော်ပြောကြားခြင်း ။ ။ တွေ့ဆုံပွဲတွင် ဒေသခံ ရွာသူရွာသားများအား မြန်မာဘာသာနှင့် ကယန်းဘာသာဖြင့် ရေးသားထားသော မြေပုံအပါအဝင် စီမံကိန်း သတင်းအချက်အလက်များ ပါသော လက်ကမ်းစာစောင်များကို ဝေငှသွားမည် ဖြစ်ပါသည်။

၁.၈.၃ ဆွေးနွေးအကြံပြုဆောင်ရွက်ချက်များ အနှစ်ချုပ်

(၁) Scroping Report ပြုလုပ်ချိန်တွင် ပြည်သူများနှင့်တွေ့ဆုံဆွေးနွေးပွဲ အနှစ်ချုပ် ရလဒ်များ

ပြည်သူများနှင့် တွေ့ဆုံညှိနှိုင်းဆွေးနွေးခြင်း ပြုလုပ်ရာတွင် သက်ဆိုင်သူများမှ ဖော်ပြသော ပြဿနာများအား အုပ်စုအလိုက်ဖော်ပြထားပါသည်။

အစိုးရအာဏာပိုင်အဖွဲ့အစည်းများ - SWB နှင့် နိုင်ငံအလိုက်၊ ပြည်နယ်အလိုက် ဆိုင်ရာ အစိုးရအာဏာပိုင်များ၏ ဆွေးနွေးဖော်ထုတ်ချက်များမှာ ပတ်ဝန်းကျင်ဆိုင်ရာထိခိုက်မှု ဆန်းစစ်ခြင်း (EIA)၊ မြေနေရာရယူခြင်းနှင့် EIA တင်သွင်းမှုရလဒ်များတို့ဖြစ်ပါသည်။

အခြားစိတ်ပါဝင်စားသော အဖွဲ့အစည်များ - လူထုအခြေပြုအဖွဲ့အစည်များ၏ ဆွေးနွေးဖော်ထုတ်ချက်များမှာ စီမံကိန်း၏ မှန်ကန်သော သတင်းအချက်အလက်များရရှိလိုခြင်း၊ အလုပ်ဝင်ရောက်လုပ်ကိုင်ခွင့် အခွင့်အလမ်းများ၊ ပေးလျော်ခြင်းကိစ္စများနှင့် ပတ်ဝန်းကျင် စီမံခန့်ခွဲမှု တို့ဖြစ်ပါသည်။

ရပ်ရွာလူထုအဖွဲ့အစည်း - ဒေါက်လောက်၊ တလိုင်းယာ၊ ပိတောက်ကုန်း၊ ကလုံထာ၊ သခတ်ကုန်း၊ ရေပေါက်၊ သပြူချောင်၊ ပျဉ်တော်သာ၊ မေတ္တာ၊ တောင်သုံးလုံး၊ ဆင်ဖြူတိုင်၊ ဗဒို၊ အားမူ၊ ဂရတ်ခီးနှင့် ထီးခီး တို့မှ ကျေးရွာသူကျေးရွာသားများ တက်ရောက်ဆွေးနွေးခဲ့ကြသည်။ ဆွေးနွေးချက်များမှာ - သစ်တောဂေဟစနစ်၊ ညစ်ညမ်းမှု၊ အရင်ဖြစ်ပွားခဲ့သော ထိခိုက်မှုများ၊ ပေးလျော်ခြင်းကိစ္စ၊ ဝင်ရောက်အလုပ်လုပ်ကိုင်ခွင့်၊ လမ်းအသုံးပြုမှုနှင့် လုံခြုံစိတ်ချမှုတို့ဖြစ်ပါသည်။

(၂) EIA ပြင်ဆင်ချိန်တွင် ပြည်သူများနှင့် တွေ့ဆုံဆွေးနွေးပွဲ အနှစ်ချုပ်ရလဒ်များ

ပြည်သူများနှင့် တွေ့ဆုံညှိနှိုင်းဆွေးနွေးခြင်း ပြုလုပ်ရာတွင် သက်ဆိုင်သူများမှ ဖော်ပြသော ပြဿနာများအား အုပ်စုအလိုက်ဖော်ပြထားပါသည်။

အစိုးရအာဏာပိုင်အဖွဲ့အစည်းများ - ကျေးရွာလူထုအား ထိုနှစ်လမ်းသွားလမ်းအား ဖြတ်သန်းသွားလာခွင့် ပြု/မပြုနှင့် စီမံကိန်းတွင် နှစ်လမ်းသွားလမ်းမှ ကျေးရွာအတွင်းသို့ ဆက်သွယ်ထားသောလမ်း ဖောက်လုပ်ပေးမှု ရှိ/မရှိ သိရှိလိုခြင်း

အခြားစိတ်ပါဝင်စားသော အဖွဲ့အစည်များ - အခြေခံပတ်ဝန်းကျင် အခြေအနေ စစ်တမ်းကောက်ခံရာတွင် ကျေးရွာလူထုမှ ပါဝင်ခွင့် အခွင့်အရေးပေးရန်

ရပ်ရွာလူထုအဖွဲ့အစည်း - ကျေးရွာလူထုဆွေးနွေးချက်မှာ အင်ဂျင်နီယာပိုင်းဆိုင်ရာ ပြဿနာ၊ ပတ်ဝန်းကျင်နှင့် လူမှုရေးဆိုင်ရာ ပြဿနာများ၊ အကြံပြုချက်များဟူ၍ ၃ပိုင်းပါဝင်ပြီး အသေးစိတ်ကို အပိုင်း ၉.၃ တွင် ဖော်ပြထားပါသည်။

၁.၈.၄ လုပ်ကိုင်ဆွေးနွေးဆဲ အခြေအနေအတွက် အကြံပြုချက်များ

အစီအစဉ် လုပ်ဆောင်မှုများ၏ သတင်းအချက်အလက်များ ဖြန့်ဝေခြင်းနှင့် PAPs လမ်းစဉ်နှင့် အညီဆွေးနွေးလုပ်ကိုင်ရန်ဖြစ်ပါသည်။

CHAPTER 1

EXECUTIVE SUMMARY

CHAPTER 1

EXECUTIVE SUMMARY

1.1 CONTEXT OF THE PROJECT

The *Two-Lane Road Linking the Dawei Special Economic Zone with the Thai Border Project* (the Project) will upgrade the existing 138-km unpaved road connecting Dawei in Myanmar with Phu Nam Ron in Kanchanaburi, Thailand. The Project Proponent is Myandawei Industrial Estate Company Limited ("MIE"), a company incorporated in Myanmar. The Company is entitled by the DSEZ Management Committee ("DSEZMC") to undertake this Project on a private-public participation basis under a BOO concession. The existing road to be upgraded was constructed by Italian Thai Development Public Company Limited (ITD) as part of the original plan for the development of Dawei Special Economic Zone. The existing road has been unofficially open for public use since 2012 although it is still uncompleted.

The original plan of ITD was for expanding the existing road to be a four-lane highway with 80-m right of way (RoW). At that time, the four-lane highway road project was entitled "Transborder Road Link (Dawei-Phu Nam Ron)" project. An ESIA study for the four-lane highway project was conducted by other consultant in 2012 and the draft EIA report was submitted to ITD in September 2013. However, the draft EIA report was not submitted to MONREC, and the EIA investigation was not continued due to the reformulation of the DSEZ development plan and the road project. Subsequently, the existing road was constructed as a provisional road with two unpaved traffic lanes and temporary bridges.

Further developments related to the development of Dawei SEZ resulted in the reformulation of the original plan for Dawei SEZ development. The development activities originally planned were reviewed and strategic activities will first be carried out under the Initial Phase Development. In this regard, the existing provisional road was planned to be upgraded to a two-lane paved road and a new EIA study is necessary.

This Draft Final Report was prepared by the EIA Consultant engaged by MIE. At the time this EIA started in January 2015, detailed designs of the Project were being prepared by TESCO Ltd., with a design report completed in October 2015.

1.2 THE POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

1.2.1 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. The policy will be similar to the one of the developer (Myandawei Industrial Estate Company Limited), which adopts for its existing development projects in Thailand.

1.2.2 Overview of Policy and Legal Framework in Myanmar

National policy and legal framework relevant to environmental management of this Project can be divided into three categories. The essence of each category can be briefly concluded as follows:

Foundation of Environmental Management: The legal foundation for environmental management is the National Environmental Policy (1994) which supports Articles 37, 42 and 390 of the new Constitution (2008). The National Environmental Policy was translated into actions by the Environmental Conservation Law (2012) which is elaborated for implementation by the Environmental Conservation Rules. The two legal documents provide the comprehensive legal framework for environmental management of the country.

EIA Process and Environmental Management Requirements: The Environmental Impact Assessment Procedure (2015) by Ministry of Natural Resources and Environmental Conservation is a key legal instruments for environmental management of development activities through the EIA process as stipulated in the Environmental Conservation Law.

Environmental Standards and Social Management Requirements: In addition to legal requirements related to EIA, the Project will have to comply with other laws in its management of environmental, social and cultural aspects during its construction and operations. These aspects include: (i) leave and holiday act; (ii) health and safety of community and employees; (iii) involuntary resettlement; (iv) cultural impact; (v) ecological resources associated to forest, wildlife and natural area; and (vi) coastal and marine environment.

1.2.3 International Conventions, Treaties and Agreements

Myanmar has signed several international conventions, treaties and agreements related to the environment. The relevant ones are shown and elaborated in the Main Report, ***Section 3.3***.

1.2.4 Myanmar Government Institutional Framework

The EIA process for this Project will be administered by the central ECD in coordination with the regional ECD and various concerned government organizations at the regional, township, and district levels.

During the project implementation, the DSEZ Management Committee and the DSEZ Supporting Working Body will be responsible for facilitating resolving issues raised by the government parties or the developers/investors.

1.2.5 International Policies, Guidelines and Standards

As Myanmar still has no issue-specific policies, guidelines and standards, environmental management of the Project will need to adopt recognized international guidelines and standards as appropriate.

1.3 PROJECT DESCRIPTION AND ALTERNATIVES

1.3.1 Presentation of the Project and Description of Alternatives

A. Project Description

Sector and Subsector: The Project is in the transportation sector and the road improvement subsector.

Project Overview: The Project will upgrade the existing 138-km two-lane unpaved road to a standard two-lane, asphaltic road meeting Class 4 of the Highway Design Standards of the Department of Highways, Thailand. The Project road will have a 40-m RoW, 7-m traffic surface width consisting of two traffic lanes, each with 3.5 m width, and a 1 m paved shoulder on each side (7 to 9 m road type). The Project will maintain the existing alignment as much as possible. However, the Project will need to realign some sections of the existing road to improve its geometric design, and construct permanent bridges, and road side and cross drainage structure at sections crossing natural water courses or cutting across the direction of surface runoff.

Project Alignment and Sections: The existing road is divided into three sections for construction and maintenance management as follows;

Section 1 is 50.9 km long. It starts from the west side of Dawei River at Sta. 18+500 north of Yebyu town and ends at Sta. 69+400.

Section 2 is 42.9 km long extending from Sta. 69+400 to Sta. 112+300.

Section 3 is 44.2 km long extending from Sta. 112+300 to Sta. 156+500 at the end of the existing road.

There will be ten major sections, with a total length of approximately 31km (around 22% of the total length of 138 km), which will be realigned to improve their geometry and the project will construct 19 bridges with an approximate total length of 1,330 m.

Project Facilities and Infrastructure: The Project road will be operated as a toll road with controlled access and toll booths. The toll booth and access control facilities including administration and rescue building will be constructed at four locations as same as toll booth along the road as follows; Booth 1 to be located at approximately KM 21+000, Booth 2 to be located at approximately KM 66+200 and Booth 3 at KM 69+433 in Myitta area and Booth 4 be located at approximately KM 155+700, namely "Hti Khee". It is the first entry gate from the Thai border. In addition, there is the vista point in rest area or service center to be developed at KM 79+700.

Implementation Schedule: The construction is scheduled to commence in July 2015, and will take about 38 months to complete.

B. Description of Project Alternatives

The project has no alignment alternatives as it will upgrade the existing road. The two lane road is adopted to suit expected traffic demand during the initial phase development of DSEZ and to keep the investment low.

The alignments of the realigned sections are dictated by topography and geometric design consideration.

C. Existing Status of Project Implementation

As of 7 July 2015, the Project Proponent has conducted preliminary works as follows;

1) Section 1: Excavation and slope cutting at Saddle Hill-total volume of excavation and cutting about 105,000 m^3.

2) Section 2: Excavation and slope cutting at Elephant Cry Hill-total volume of excavation and cutting about 160,000 m^3.

3) Section 3: Excavation and slope cutting at Base 1 Hill-total volume of excavation and cutting about 18,400 m^3.

4) Construction of No.19 Bridge: Excavation for abutment at KM 154+738.

1.4 DESCRIPTION OF THE ENVIRONMENT

1.4.1 Setting the Study Limits

A. Study Area and Scope of the Environment

The study area covers land areas within a 500 m wide on both sides of the center line, a total area of about 34,031.35 acres.

The scope of the Environment is prescribed in the EIA Procedure to cover physical, biological, socio-economic, cultural and visual components.

Information on environmental settings of the study area was collected from field investigation and literature review.

B. Local Administration

The study area covers fifteen village of Yebyu Township Administrations; namely Dauk Lauk, Ta Laing Ya, Pa Dao Geou, Tha Loat Htar, Tha Khat Done, Ye Bouk, Tha Byu Chaung, Pyin Tha Daw, Myitta, Taung Thone Long, Sin Byu Daing, Va Do, Armu, Gad Tra Khee and Hti Khee of Yebyu Township, Dawei District.

1.4.2 Physical Components

The field surveys conducted in the study area indicated clean environment as inferred from the following:

- Values of all ambient air quality parameters met the Myanmar National Environmental Quality (Emission) Guidelines except for PM-10 values at Station A1 (Toll Plaza Camp) and A3 (Elasto Base 1 Camp) which were over than permissible maximum values due to existing condition of project alignment is dirt road and this existing road has been used since 5 years ago.
- Levels of ambient noise level at all stations were significantly below the maximum limit set by Myanmar National Environmental Quality (Emission) Guidelines and U.S. EPA noise standard.
- Levels of all vibration level at all stations were still much below the perceptible level of 2.0 mm/s prescribed in German Vibration Guideline Values (Din4150-3, 1999).
- Surface water quality at eleven sampling stations was clean as indicated by high levels of dissolved oxygen and very low concentrations of heavy metals and organic pollutants.

1.4.3 Biological Components

There is no conservation forest nearby project alignment.

At least 242 plant species were found in the R.O.W area and 247 plant species were found within study area in 500 m strips from center line of road, 6 species are listed as Threatened Species in the IUCN Red List (2013). 152 wildlife species were found in the study area, consisting of 23 mammal species, 88 bird species, 27 reptile species, and 14 amphibian species, and mostly are classified as Least Concern Species.

The aquatic ecosystem was healthy as indicated by high densities and diversities of phytoplankton, zooplankton and benthos. The main group of phytoplankton was diatom indicated that high productivity of aquatic organisms within natural waterways within project study area.

1.4.4 Socio-economic Components

A. Land Use

The study area covers 34,031.35 acres, in total. Mostly, 53.81% is forest area. Orchard and perennial crop area cover 21.54%. About 5% of the study area is degraded and abandoned forest area. For Project Right of Way, it covers 1,532.07 acres. Most of land use type were forest area (46.46%), orchard and perennial crop area (22.98) and bamboo forest area (5.58%), respectively.

B. Socio-economic Conditions

Information about socio-economic conditions of the study area was derived mainly from interviewing village headmen and key informants in the fifteen villages of the study area ; namely Dauk Lauk, Ta Laing Ya, Pa Dao Geou, Tha Loat Htar, Tha Khat Done, Ye Bouk, Tha Byu Chaung, Pyin Tha Daw, Myitta, Taung Thone Long, Sin Byu Daing, Va Do, Armu, Gad Tra Khee and Hti Khee of Yebyu Township and Myitta Sub-township, Dawei District. Key findings on socio-economic conditions of these communities are summarized below:

- The study area has a total population of 8,183 living in 1,810 households with an average household size of 4-5 persons.
- Female population in the fifteen villages is slightly higher than male with the female to male population ratio of 1.008 to 1, and their roles are supportive to each other.
- The majority of villagers in these fifteen villages completed only primary education. Only few people had secondary and higher education. Some elders received only informal rudimentary education from monks in temples.
- There are 3 ethnic groups in the study area. Burmese and Mon are Buddhist and Karen are Christian.
- Vulnerable groups in these fifteen villages are small in number. Their number is estimated at about 2.7% of the total village population respectively.
- Main agricultural activities within the fifteen villages are betel palm, cashew nut and rubber tree.
- Unemployment in the fifteen villages was very low as family members of working age worked in farming, general wage labors, trading and working in Thailand.
- The annual household incomes in these fifteen villages ranged from 1,000 to 6,000 USD equivalent, an average of 3,500 USD equivalent per year or 290 USD equivalent per month.
- There were no serious health problems in the fifteen villages in the study area. Hospital services are available only in Yebyu and Myitta.

C. Infrastructure

Road: The only major road in the study area which cross and adjacent with project alignment is National Road No.8.

Electricity: Most of the villages in the project area have no electricity. Households in Taung Thone Long village and Hti Khee village are supplied with electricity. Currently, some households in Dauk Lauk, Pa Dao Geou and Myitta villages have small generators and battery for lighting only during nighttime.

Water Use and Water Supply: Thirteen villages have no piped water supply system . Ta Laing Ya and Tha Khat Done have Mountain tap water . Ground water and stream water are two supply sources which adequately provide water of good quality for domestic consumption.

School and Religious Facilities: The fifteen villages have religious facilities.

1.4.5 Cultural Components

Artifacts: There are two artifacts closed to project alignment i.e. stone tool at Dauk Lauk village and terracotta pipe at the foot of the hill approximately 500 m to the south of the project right-of-way (Sta. 19+850).

Religious Monuments: Within project study area, there are three Stupas located at Duak Lauk village.

Monasteries: Within project study area of Section 1, three monasteries were found at Yebyu, Dauk Lauk and Ta Laing Ya village and another one monastery in Myitta area and another one monastery at Hti Khee.

1.4.6 Visual Components

The study area contain different types of landscape features such as landforms, water features, plant communities and land uses. Most of landforms along the project route are rolling hills and mountain ranges interspersed with valleys. There are only a small portion of flat terrain near Dawei River between Sta.19+500-Sta.21+500. The study area is covered with various plant communities since majority of the road alignment passes through forest areas. Nearly entire plant communities are evergreen vegetation, so that they are similar in color and continue to be green all year round. Flat terrain areas close to the Dawei River are agricultural land i.e., palm plantation and paddy fields. Although there are some villages along the road alignment. They are small and very low in density.

1.5 KEY POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Key environmental impacts including risks during the construction and operational phases of the Project were identified and assessed based on nature and scope of the Project, its environmental and socio-economic settings, and the nature of Project construction and operation. The results are presented in ***Chapter 5*** in the ***Volume II***. Key findings are summarized below.

1.5.1 Construction Phase

A. Impact Assessment

Project activities during the construction phase could be divided into two components: the road component and the associated facility component. These environmental issues will be: (i) air quality; (ii) noise; (iii) vibration; (iv) surface water quality; (v) aquatic ecology; (vi) soil erosion and soil contamination; (vii) forest and wildlife; (viii) land acquisition; (ix) socio-economic; and (x) land use.

Increases in air pollutants caused by fugitive dust from construction activities; for example, top soil opening, excavation, drilling and etc. The result of PM-10

and TSP concentration from construction activity added by the highest PM-10 and TSP 24 hr of background concentration are about 29.06-104.06 and 68.62-211.62 $\mu g/m^3$ respectively. However, the project prepares mitigation measures such as spraying water on ground to reduce the impact to ambient air quality.

Noise impact during construction period is mainly depended on the activities and equipment. Construction machines include backhoe, dozer, paver, air compressor, compactor, crane (mobile), pile driver (impact), truck, roller and grader. Noise impact level results of road and bridge constructions at various distances are of 48.0-96.9 and 55.0-104.0 dBA at 1 hr respectively. The safe zones during road and bridge constructions which meet noise standard (55.0 dBA at 1 hr) are at 1,900 and 4,200 m respectively while the nuisance noise level results of road and bridge construction at 15-5,350 m are of 3.4-53.8 and 10.0-60.9 dBA respectively. Nuisance noise levels from road and bridge construction which meet nuisance noise standard are at 2,400 and 5,350 m from noise source.

Vibration impact from both road and bridge construction activities can be generated from heavy machines especially pile driver (impact), vibratory roller, loaded trucks, and small bulldozer. The vibration impact results at 50-500 m from source are found to be 0.97-0.0002 mm/s (0.03833-0.00001 in/s) and the highest vibration impact levels of construction equipment at 50 m can feel vibration and may destroy ancient monuments. However, at 50 m from centerline of road is in the right of way which does not include any ancient monuments. All distances are safe for human health which can just be sensed the vibration. While, the safe zone of building (at 0.3 mm/s or 0.012 in/s) is found to be more than 100 meter from source of vibration.

The project may impact on surface water quality and aquatic ecology during construction through accidental contamination and increased turbidity and SS of water courses included wastewater contamination caused by the camp site, particularly during the construction of the 10 major new road sections, construction of 19 bridges and cross drain structure, and the vista point at KM 79+700 near the Tanintharyi River.

Due to the construction of the road alignment will pass of rolling areas, mountain areas, plantation areas and forest areas. The erosion at slope areas of rolling and mountain areas may be occurred.

Land acquisition will be necessary for the construction of 10 new realigned sections, the service area, and the administration and rescue buildings. The project will acquire about 340.5 acres of additional land outside the existing right-of-way for construction of all project components.

The loss of forest land for construction of the 10 realigned sections under the Project will be about 306 acres as already indicated above. It should be noted that in the construction of the existing road, about 1,514 acres of land, mostly forest, were cleared. Therefore, impacts of the Project on the forest ecosystem due to additional forest clearing would be less than impacts of the existing road.

During the upgrading of existing road, some wildlife species would flee from the construction areas due to the loss of habitats and loud noise from road

improvement activities. However, most of the wildlife species found in the right of way area were small animals which had adapted to thrive well in disturbed and poor habitats

The land use pattern will be temporarily changed due to construction activities, i.e. being temporary construction office, campsite, machine and equipment area, etc. The contractor will hire private land for those construction works. Thus, the impact on land use pattern will occur only during construction period.

The Project will employ about 1,200 people at peak during project construction. Most of the workers will be local, therefore, socio-cultural changes induced by the construction workers will be significant. The village economy will involve about US$ 150,000 equivalent of transactions. This level of economic stimulant would be large enough to induce significant socio-cultural changes which could threaten the community fabric.

Exposure of the affected communities to new social norms, value, traditions, practices, and new economic opportunities brought about by an influx of external workers and cash inflow into the village economy through project spending and employment.

B. Mitigation Measures

Measures for environmental management of the construction phase are conventional, well established, and normally included in construction contracts. Examples of such requirement include: i) air quality; (ii) noise; (iii) vibration; (iv) surface water quality; (v) aquatic ecology; (vi) soil erosion and soil contamination; (vii) forest and wildlife; (viii) land acquisition; (ix) socio-economic; and (x) land use.

1.5.2 Operational Phase

A. Impact Assessment

The impact on ambient air quality during operation caused due to exhaust emission from motor vehicles. The overall CO, NO_2 and PM-10 concentrations affecting to sensitive areas at various distance from the center line of Two Lane road alignment are of 0.6 ppm, 46.4-76.4 ppb and 100.1-100.3 $\mu g/m^3$ respectively. Both overall CO and NO_2 concentrations meet National Environmental Quality (Emission) Guidelines (Final Draft) (April, 2015) but PM-10 is found to be higher than standard concentration due to high background concentrations.

An increase in traffic volume on the road would cause increase of ambient noise level resulting in degrading of human welfare and disrupting wildlife. Chronic noise exposure can be source of annoyance, creating communication problems and leading to elevated stress levels as well as associated behavioral and health effect. Noise impact levels from traffic forecast volume during operation period at 50-620 m from centerline during are approximately of 41.7-61.4 dBA. Noise ambient level standard at night time is assigned by National Environmental Quality (Emission) Guidelines (Final Draft (April, 2015)) less than 45 dBA in 1 hr, so distance between centerline of road and receptor at 620 m meets this standard.

The vibration impact depends on the magnitude of Peak Particle Velocity (PPV) of vehicles and distance between vehicles and receptors. Truck is considered as the most vibration impact because of its high load bearing. However, the highest vibration level of monitoring data is just perceptible level and not significantly damages of any type of buildings. So, the vibration impact of operation period of this project may not cause significant effect to human health and buildings too.

The project may impact on surface water quality and aquatic ecology during operation phase through road traffic along the road alignment, wastewater from public toilets and food shops where located at service areas and vista points.

There are several impacts on forest and wildlife during the operation of the Two-Lane road e.g. increased vehicle derived pollutants, increased edge effects and deterioration of habitat. Since the two-lane road would be developed in the same corridor with the existing access road all of these impacts have already existed. There would be some incremental impacts due to more vehicles.

After the construction is completed, the road will become a permanent infrastructure affecting socio-economic development in areas along the alignment i.e. change in land use from agricultural area into residential area and shops, increase in price of land along both sides of the road, in-migration of people from outside and alteration of way of living and way of thinking due to innovations and technology.

B. Mitigation Measures

Measures for environmental management of the operation phase are conventional, well established. Examples of such requirement include: i) air quality; (ii) noise; (iii) surface water quality; (iv) aquatic ecology; (v) forest and wildlife; and (vi) socio-economic.

1.6 CUMULATIVE IMPACT ASSESSMENT

1.6.1 Conceptual Framework for Cumulative Impact Assessment for this Project

In general, cumulative impacts can be defined as the changes to the environment caused by a proposed project in combination with other past, present, and reasonably foreseeable projects or human activities. For this Project, Two-lane road is to be constructed upon the existing dirt access road being in use. The existing air quality noise and vibration level are the impacts of existing road operation and maintenance of this Project are therefore cumulative impacts.

1.6.2 Need for Cumulative Impact Assessment for this Project

The ESIA study Team has already considered all existing environmental impacts in combination with the expected impacts from the new development as presented in ***Chapter 6***. Therefore, there is no need for a separated chapter for elaboration of the cumulative environmental impact assessment.

1.7 ENVIRONMENTAL MANAGEMENT PLAN

The results of EIA investigation will not lead to any results if they are not translated into two implementable environmental management plans (EMPs): one EMP for implementing in the construction phase of the Project and another EMP for implementing in the operational phase of the Project.

The construction phase EMP (CEMP) and the operation phase EMP (OEMP) describe how the mitigation and monitoring measures to enhance the benefits of environmental protection will be implemented.

The CEMP of the project includes 17 plans:

1) Environmental Management and Monitoring Plan

1.1) Site or Area Specific Plans and Programs

- Air Quality Management and Monitoring Plan
- Noise Management and Monitoring Plan
- Vibration Management and Monitoring Plan
- Surface Water Quality Management and Monitoring Plan
- Aquatic Ecology Management and Monitoring Plan
- Soil Erosion Protection Management and Monitoring Plan

1.2) Thematic Plans and Programs

- Transportation Management and Monitoring Plan
- Water Use Management and Monitoring Plan
- Solid Waste Management and Monitoring Plan
- Hazardous Waste Management and Monitoring Plan
- Biodiversity Action Plan
- Occupational Health Management and Monitoring Plan
- Construction Emergency Response Plan (CERP)

2) Social Management and Monitoring Plan

2.1) Site or Area Specific Plans and Programs

- Chance Find Management and Monitoring Plan

2.2) Thematic Plans and Programs

- Compensation and Livelihood Restoration Management and Monitoring Plan
- Land Use Management and Monitoring Plan

- Socio-Economic Management and Monitoring Plan

The OEMP of the project includes 6 plans

1) Environmental Management and Monitoring Plan

1.1) Site or Area Specific Plans and Programs

- Air Quality Management and Monitoring Plan
- Noise Management and Monitoring Plan
- Vibration Management and Monitoring Plan
- Surface Water Quality Management and Monitoring Plan

1.2) Thematic Plans and Programs

- Transportation Management and Monitoring Plan
- Biodiversity Action Plan

The detailed of CEMP and OEMP are described in Volume II.

1.8 PUBLIC CONSULTATIONS AND DISCLOSURE

1.8.1 Purpose of the Consultation and Disclosure

Public consultation and disclosure was carried out as part of the EIA investigation. It has three purposes:

- informing the stakeholders about the Project, environmental and social issues related to Project construction and operation, and mitigation measures to minimize environmental and social impacts;
- seeking views of the stakeholders on the Project and mitigation measures; and
- Participation and partnership where issues and needs are jointly discussed and assessed.

Results of the public consultation were useful to the formulation of environmental and social management plans for the Project.

1.8.2 Methodology and Approach

The approach and methodology adopted in the PCD for this Project follows principles and practices in public participation, and is briefly described as follows.

(1) Identification of Stakeholders and Groups Affected by the Project: the Project stakeholders could be identified and classified into three categories are Government Authorities Involved in EIA Administration, Other Interested Parties, and Potentially Affected People.

(2) Conducting Public Consultations: The Purposes of Public Consultation and Disclosure are informing the stakeholders about the Project, mitigation measures, and ensuring participation and partnership where the stakeholders and the Project jointly discussed. The main method used in the public consultation was public meeting. This method is generally used in EIA. It is most effective in achieving the informing purpose. And approach to the public meetings.

(3) Disclosure: Project information was provided in the meetings with local villagers in handouts in Burmese language and Karen language including supporting maps.

1.8.3 Summary of Consultation Activities Undertaken

(1) Summary Results of Public Consultation during Scoping Report

Issues identified by the stakeholders during the public consultation meetings can be summarized by group as follows:

Government Authorities: Issues identified by the SWB and government authorities at the national and regional levels; Participation in the Environmental Impact Assessment, Land acquisition, and Submitting the EIA results.

Other Interested Parties: Issues identified by the community based organizations; correct project information, employment opportunities, Compensation, and Environmental management

Local Community Groups: Issues identified by villagers in Dauk Lauk, Tha Laing Ya, Pa Dao Geou, Tha Loat Htar, Tha Khat Done, Ye Bouk, Tha Byu Chaung, Pyin Tha Daw, Myitta, Taung Thone Long, Sin Byu Daing, Va Do, Armu, Gad Tra Khee and Hti Hkee communities. The Project should provide accurate information about forest ecology, pollution, previous impacts, compensation, employment opportunities, and use of road and safety.

(2) Summary Results of Public Consultation during the EIA Preparation

Issues identified by the stakeholders during the public consultation meetings can be summarized by group as follows:

Government Authorities: Wonder whether villagers can access and cross the two lane road or not and the project should consider on provision of access road to link village and the two lane road.

Other Interested Parties: Villagers should have opportunity to participate in baseline environmental condition survey.

Local Communities: is divide into three parts are engineering issues, environmental and social Issues, and recommendation, there are detailed in ***Section 9.3.***

1.8.4 Recommendations for Ongoing Consultations

The program activities are aimed for dissemination of information and consultation with PAPs.

CHAPTER 2

CONTEXT OF THE PROJECT

CHAPTER 2

CONTEXT OF THE PROJECT

2.1 PRESENTATION OF THE PROJECT AND ITS JUSTIFICATION

2.1.1 Project Background

The proposed project, entitled "Two-Lane Road Linking the Dawei Special Economic Zone with the Thai Border Project" (the Project), will upgrade the existing 138-km unpaved road connecting Dawei in Myanmar with Phu Nam Ron in Kanchanaburi Province, Thailand. This existing road was constructed by Italian Thai Development Public Company Limited (ITD) as part of the original plan for the development of Dawei Special Economic Zone. The alignment of the existing road is shown in ***Figure 2.1-1***. The existing road has been unofficially open for public use since 2012 although it was not 100% completed.

The original plan of ITD was for upgrading the existing road to be a four-lane highway with 80-m wide right of way (RoW). At that time, the four-lane highway road project was entitled "Transborder Road Link (Dawei-Phu Nam Ron)" project. An ESIA study for the four-lane highway project was conducted over the period from 2012 to 2014 and the draft EIA report dated September 2013 was produced. However, the draft EIA report was not submitted to MONREC, and further works on the EIA were not continued.

Further developments related to the development of Dawei SEZ resulted in the reformulation of the original plan for Dawei SEZ development. The development activities originally planned were reviewed and strategic activities will first be carried out under the Initial Phase Development. Brief information on the development projects under the Initial Phase Development is given in ***Appendix 2A***. The Project is one of the projects to be implemented by Myandawei Industrial Estate Company Limited ("MIE").

Detailed designs of the Project was prepared by TESCO Ltd. (the Project Consultant) and completed in October 2015.

According to the Environmental Conservation Law issued by the Ministry of Environmental Conservation and Forestry (2013), an EIA study is required for this Project as the existing road to be upgraded is longer than 50 km. MIE engaged TEAM Consulting Engineering and Management Co., Ltd., (TEAM) and Total Business Solution (TBS), herein after referred to as the EIA Consultant, to conduct the EIA study. The EIA study started in January 2015 and is scheduled to complete in December 2015.

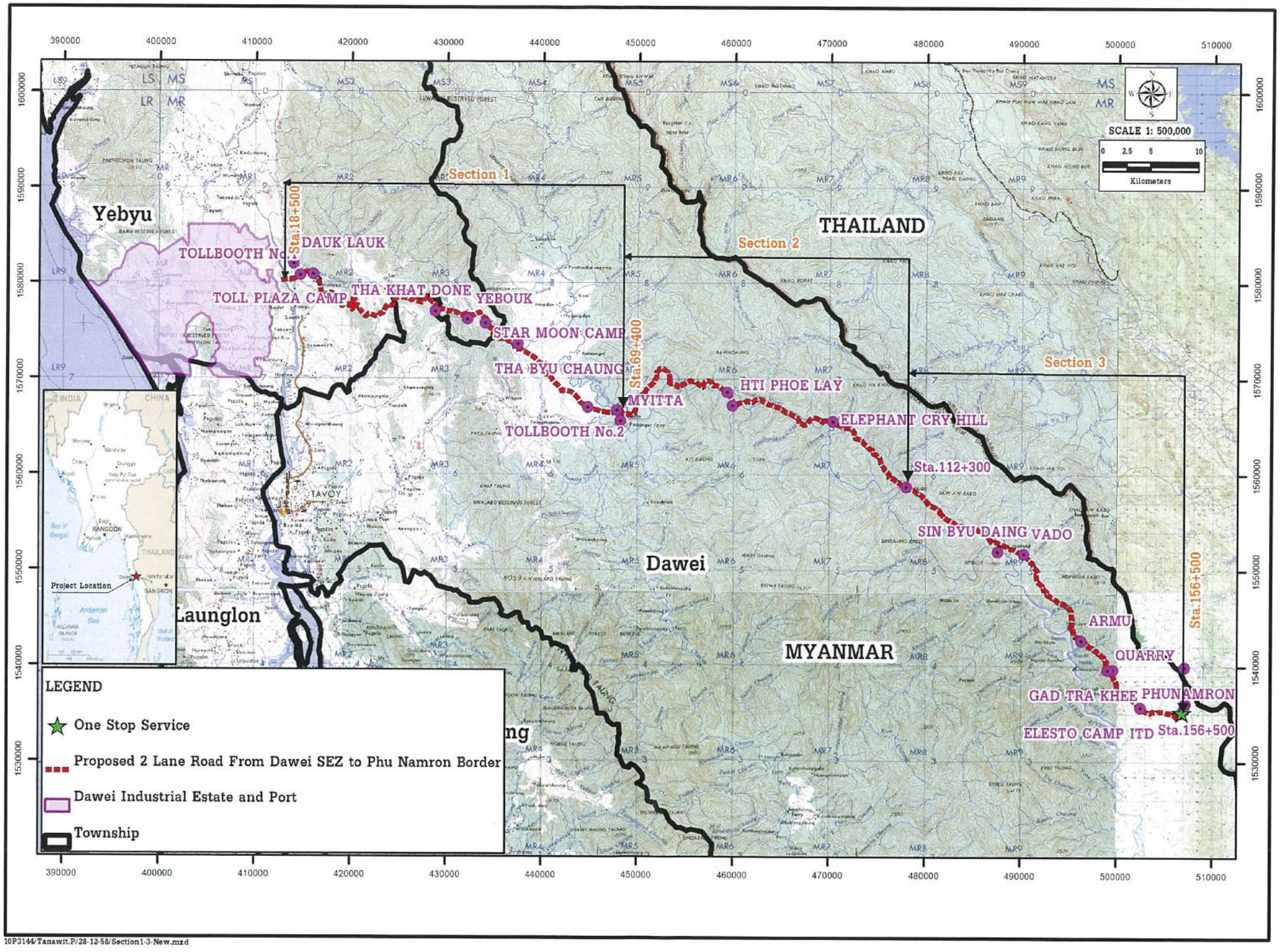


FIGURE 2.1-1 : THE PROPOSED PROJECT ROUTE ALIGNMENT OF THE TWO-LANE ROAD LINKING THE DAWEI SPECIAL ECONOMIC ZONE WITH THE THAI BORDER PROJECT

2.1.2 Project Justifications

The Project, after completion, will result in a paved two-lane road which will be open for traffic all year round. The justification for the Project is clear as the road will be the most critical logistic element of the DSEZ development. It will enable movement of goods and people between DSEZ and Thailand as well as other ASEAN countries through the highway and railway systems in Thailand. The project road will contribute to the realization of the Master Plan on ASEAN Connectivity 2012. It will certainly bring mutual benefits to both Myanmar and Thailand as well as other ASEAN countries.

2.1.3 MONREC's Comments on Scoping Report

As required in the EIA process, MIE submitted the Scoping Report prepared by the EIA Consultant to the Environmental Conservation Department (ECD) of the Ministry of Natural Resources and Environmental Conservation (MONREC) in November 2015. MONREC had recommendations on related law and regulation, additional environmental impacts and mitigation measures during pre-construction and closure phases, additional stakeholder's engagement for public consultation activities, additional public consultation activities during project operation phase and commitment of project proponent to conform with law, rule, procedure and guidelines during project implementation phase. The recommendations from MONREC have been duly considered and incorporated in the EIA report (The recommendations of MONREC on Scoping Report for EIA of Two-Lane Road Linking the Dawei Special Economic Zone with the Thai Border Project is presented in ***Appendix 2B***).

Subsequently, the EIA study was carried out according to the TOR for the EIA (presented in the Scoping Report and given in ***Appendix 2C*** of this EIA report for ready reference) and the recommendation from MONREC on Scoping Report.

This Final report has been structured following the EIA Table of Contents (Volume 1 EIA report) recommended in *Appendix 5* of the EIA Guidelines 2014 developed by MONREC.

2.2 RELATED PROJECTS AND DEVELOPMENTS

This Two-Lane Road shall be a highly significant link corridor providing accessibility to connect with both National Highway and Railway System in Thailand to the DSEZ industrial estate. The Project will be initial project prior to development of other projects in the DSEZ such as Industrial Estate, power plants, deep seaport and railways.

2.3 PRESENTATION OF THE PROJECT PROPONENT AND THE EIA CONSULTANT

2.3.1 Project Proponent

The Project is proposed by Myandawei Industrial Estate Company Limited ("MIE"), a company incorporated in Myanmar. The Company is delegated by the DSEZ Management Committee ("DSEZMC") to undertake its Project under each relevant concession agreement. MIE is granted the right to plan, develop, own and operate the Project facilities and infrastructure to be located in a designated area inside the Dawei Special Economic Zone ("DSEZ"). The Company has qualified and experienced staff and personnel to operate and manage its proposed Project in the most efficient manner.

2.3.2 EIA Consultant

TEAM Consulting Engineering and Management Co., Ltd., Thailand (TEAM), and Total Business Solution Co., Ltd. Myanmar (TBS) have been engaged by Myandawei Industrial Estate Company Limited ("MIE") to prepare the Environmental and Social Impact Assessment (ESIA) for the Two-Lane Road Linking the Dawei Special Economic Zone with the Thai Border Project.

Background Information on TEAM and TBS

TEAM

TEAM is one of the key subsidiaries of TEAM Group of Companies (TGC). Through its subsidiaries, TGC provides a wide range of consulting services from project conception through project planning and feasibility study, detailed design, construction supervision, and project management. The services cover various physical and utility infrastructures including urban mass transit system, water resources management, water supply, wastewater, ports, power plants, housing urban planning, environmental management, regional development planning, public event design and organizing, and management planning. Consequently, TGC can provide comprehensive services covering all aspects of development projects and business management. TGC has completed assignments not only in Thailand but also in neighboring countries, particularly Lao PDR, Viet Nam, Cambodia, and Myanmar.

TBS

Total Business Solution Co., Ltd., (TBS) is registered and located in Yangon, since its inception in 2012, TBS, in collaboration with TGS, has been providing consulting services to the private and public sectors in Myanmar. The two partners with their combined strengths provide one-stop service to assist investors in project development or setting up and operating businesses in Myanmar. Their services have gained recognition from Myanmar and foreign investors involved in development projects including port, industrial estate, power transmission, flood control, drainage and sewerage system, environmental and social management, and business establishment.

The EIA Team

The EIA study for this Project is conducted by a multidisciplinary professional team consisting of a core study and planning group and a technical support group. The Team Leader manages technical aspect of the EIA study. The Team Coordinator assists the Team Leader in coordination among members of the EIA team, Project Proponent, Environmental Conservation Department, and other concerned government agencies, especially agencies in the concerned townships i.e., Myitta and Yebyu townships of Dawei district, Tanintharyi Region.

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 identified in the Scoping Report and the TOR, including (i) air pollution; (ii) noise and vibration; (iii) impact on terrestrial and aquatic ecology; (iv) water quality and water use; (v) waste management; (vi) social impact; (vii) public health; (viii) visual quality degradation; (ix) archaeological and cultural impacts; (x) public participation; and (xi) environmental management planning. The environmental planning expert will assist the Team Leader in ensuring that the final EIA report will meet all requirements prescribed in the EIA procedure, and the proposed environmental management plans will be practical and implementable.

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 of the Project, including: (a) environmental sciences; (b) socio-economic; (c) public health; (d) terrestrial ecology; (e) civil engineering; and (f) transportation engineering.

Name of members of the EIA Study team are given in **Appendix 2D**.

TEAM and TBS have been certified as the third party to prepare the EIA report (see ***Appendix 2E***).

A simple organization Structure for Conducting and Managing the EIA study is shown in ***Figure 2.3-1***.

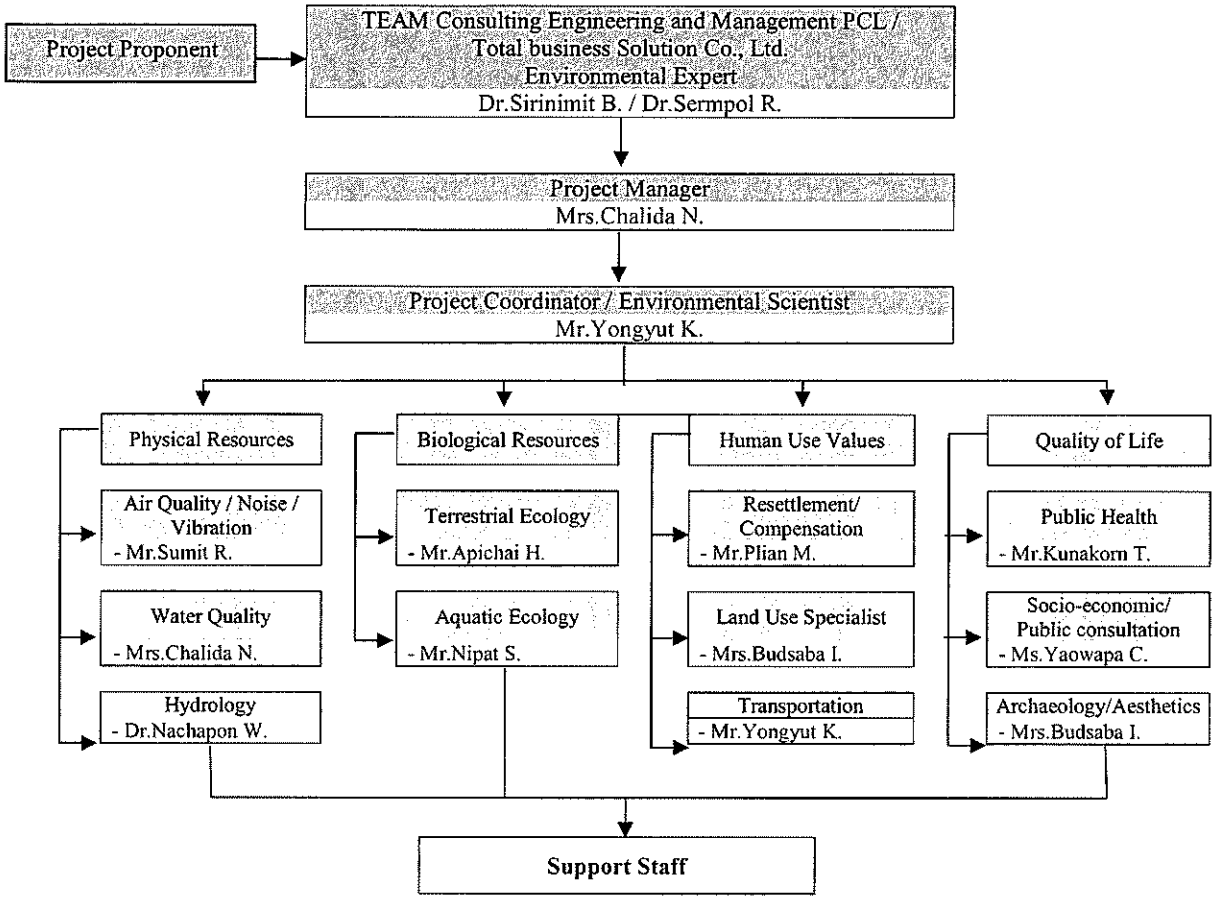


FIGURE 2.3-1 : ORGANIZATION CHART FOR THE EIA FOR TWO LANE ROAD LINKING THE DAWEI SPECIAL ECONOMIC ZONE WITH THAI BORDER PROJECT

CHAPTER 3

OVERVIEW OF THE POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

CHAPTER 3

OVERVIEW OF THE POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

3.1 OVERVIEW OF CORPORATE ENVIRONMENTAL AND SOCIAL POLICIES

The Project Proponent is committed to the sustainable development principle. In this regard, the Project Proponent will manage environmental aspects of the Project in accordance with the Corporate Governance Policy, Italian-Thai, 2015.

The Company has established the policy in term of environment and social which can summarize as follow:

Policy on occupational safety, health, and working environment

- Occupational safety and good working environment maintenance are responsibilities of all employees to cooperative perform in order to afford safety to themselves, company, and related person.
- The Company shall encourage all employees to understand and recognize occupational safety and health concern in their operation.
- The Company recognizes an important of operational accident prevention.
- The Company shall support and promote the improvement of working environment and working with safety and healthy.
- The management shall supervise occupational safety, health, and working environment of the subordinates according to related Company's regulation.
- The Company shall support and promote safety campaign for maximum effectiveness of an application of the policy in practice.
- The Company shall monitor and evaluate an application of the policy on occupational safety, health, and working environment for efficient and effectiveness according to legal requirements.

Policy on the Corporate Social Responsibility

- 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 believes 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 customer can benefit to the company competitive advantage. The Company, therefore, shall maintain its standard of goods and services, and it 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.

The project proponent will establish and activate the EHS Management System starting from the commencement of construction. The detail of the Corporate Governance Policy, Italian-Thai, 2015 are described in ***Appendix 3A***.

3.2 OVERVIEW OF POLICY AND LEGAL FRAMEWORK IN MYANMAR

National policy and legal framework relevant to environmental management of this Project can be divided into four categories:

(1) Policy and legal framework which provide the foundation for environmental management.

(2) Regulations which govern the EIA process, the processing of EIA documents for the issuance of environmental clearance certificate, and implementation of the environmental management plans.

(3) Laws and regulations related to environmental protection, environmental quality standards and social management requirements.

(4) Laws specific to the project site.

The national policy and legal framework will need to agree with international treaties and agreements which Myanmar is a signatory. In addition, they should be in line with international standards and guidelines.

3.2.1 The Foundation for Environmental Management

The Environmental Management in Myanmar is founded on the National Environmental Policy (1994), Environmental Conservation Law (2012), and Environmental Conservation Rules (2014).

A. National Environmental Policy (1994)

The National Environmental Policy was promulgated by the Government on 5th December 1994 marking the beginning of the country's endeavor in environmental management. The National Environment Policy is a one-paragraph statement, which proclaims the government's commitment to the principle of sustainable development. It states; to establish sound environment policies, utilization of water, land, forests, mineral, marine resources and other natural resources in order to conserve the environment and prevent its degradation, the Government of the Union of Myanmar hereby adopts the following policy. The objective of Myanmar's environment policy is aimed at achieving harmony and balance between these through the integration of environmental considerations into the development process to enhance the quality of life of all its citizens. In essence, the National Environmental Policy calls for the integration of environment and development to achieve sustainable development in the country and to give environmental protection a priority in promoting economic development. The Policy has established the basis of Myanmar's environmental statutory framework.

The project proponent has to follow the National Environmental Policy on order to conserve the environment and prevent its degradation.

B. Environmental Conservation Law (2012)

The Environmental Conservation Law (2012) was enacted by the national assembly on 30th March, 2012 to establish a legal basis for environmental management of the country. Environmental Conservation Law is to enable to implement the Myanmar National Environmental Policy, and lay down the basic principles and give guidance for systematic integration of the matters of environmental conservation in the sustainable development process. Then, forms the environmental conservation committee, and determines the duties and powers of Minister. The Law specifies environmental emergency, environmental quality standards, environmental conservation, management of urban environment, conservation of natural resources and cultural heritage, prior permission, insurance, prohibitions, offences and penalties, and miscellaneous with the Environmental Conservation Committee (ECC), the Ministry of Natural Resource and Environmental Conservation (MONREC), and environmental quality standards issued by the Ministry.

The project proponent has to follow the Environmental Conservation Law which must be implemented through implementation rules, specific laws, and specific procedures and guidelines.

C. Environmental Conservation Rules (2014)

The Environmental Conservation Rules was prepared by MONREC for implementing the Environmental Conservation Law. The available document in English is still a draft dated 2013 pending approval of the Government. In essence, the Environmental Conservation Rules prescribes:

1) Functions, duties, activities, and authorities of MONREC and the Environmental Conservation Department of MONREC related to the various work areas.

2) Responsibility of investors to have an EIA prepared for submission to MONREC.

3) Composition, functions and responsibility of the EIA Report Review Body which consists of experts from various relevant government organizations.

4) The need for investors to apply for a prior permission before executing investment plans. Institutional arrangements for cooperation and coordination between ECD and other government organizations at the national, region and state levels.

The project proponent has to follow the prescribed functions, responsibility, composition and the need for investors which conserves the environmental near the project area under of said law.

3.2.2 Regulations Related to Environmental Impact Assessment and Management

Requirements related to environmental (and social) impact management for development projects are described in two related documents-EIA Procedure and Administration Instruction for Environmental Impact Assessment Procedure.

A. EIA Procedure (2015)

To implement the Environmental Conservation Law, MONREC prepared an Environmental Impact Assessment Procedure (EIA) for guiding and supervising EIA of proposed development projects, on 29th December 2015. The Procedure is comprehensive and covers EIA documents, environmental management plans (EMP), implementation of EMPs, including monitoring and reporting of environmental performance of the Project. And corrective and punitive actions to be taken by MONREC if the performance deviates from the related standards.

This project falls into the category of EIA type project. All EIA type projects will undergo three stages of the EIA process that are scoping stage, EIA investigation stage and EMP implementation stage. Therefore, the Project Proponent has to follow the EIA Procedure by carefully.

B. Administrative Instruction for Environmental Impact Assessment Procedure

The Ministry has recently issued this draft document (the Instruction). The objectives of the Instruction are to provide a common framework and formats to ensure a minimum quality level of the reports and/or documents to be submitted to the Ministry. The Instruction prescribes the format for a scoping report and terms of reference in ***Annex 2***. The format is slightly different from that prescribed in the EIA Guidelines in the following: Key Potential Environmental Impacts and Mitigation Measures and Preliminary Environmental Impact Assessment and Mitigation Measures.

The project proponents and their environmental study teams has to consider the Instruction in their preparation of environmental report documents, including scoping reports, IEE reports, EIA reports, and environmental management plans.

3.2.3 Laws and Regulations Related to Environmental Protection and Social Impact Management

Requirements for environmental protection and social impact management are mostly prescribed in various sector laws and regulations. However, the issuance and enforcement of environmental quality standards are normally based on specific national environmental law.

A. Law Related to Environmental Protection

Environmental Conservation Law (2012)

The project proponent has to follow the Environmental Conservation Law (2012) in Article 7(d) and Article 10 authorizes MONREC to establish the following environmental quality standards and guidelines as below:

Article 7 (d): The duties and powers relating to the environmental conservation of the Ministry, prescribing environmental quality standards including standards on emissions, effluents, solid wastes, production procedures, processes and products for conservation and enhancement of environmental quality.

Article 10: The Ministry, the approval of the Union Government, and the Committee stipulate the following environmental quality standards of; suitable surface water quality, water quality standards for coastal and estuarine areas, underground water quality, atmospheric quality, noise and vibration, emissions, effluent, solid wastes, and other environmental quality.

National Environmental Quality (Emission) Guidelines (2015)

MONREC prepared the National Environmental Quality (Emission) Guidelines on 29th December 2015. The objectives are to provide the basis for regulation and control of noise and vibration, air emissions, and liquid discharges from various sources in order to prevent pollution for purposes of protection of human and ecosystem health. These Guidelines have been primarily excerpted from the International Finance Corporation (IFC), Environmental Health and Safety (EHS) Guidelines, which provide technical guidance on good international industry pollution prevention practice. The Guidelines are generally considered to be achievable in new facilities by existing technology at reasonable costs. Application of these Guidelines to existing facilities may involve the establishment of site-specific targets, with an appropriate timetable for achieving them.

The project proponent has to follow all the detail of the National Environmental Quality (Emission) Guidelines to prevent international/national pollution that might affect from the project activities.

B. Laws Related to Social Impact Management

(1) Community Health and Safety

The need for development projects to safeguard community health and safety is indicated in the **Public Health Law (1972),** and the **Prevention and Control of Communicable Diseases Law (1995).**

Public Health Law (1972)

The purpose of this law is to promote and safeguard public health and to take necessary measures in respect of environmental health. The Project Proponent has to ensure that health and safety of the community in the project area is protected for safeguard public health.

The Prevention and Control of Communicable Disease Law (1995)

The project proponent has to arrange the health officers to perform their duties when a principal epidemic diseases or a notifiable diseases occurs in an area as follows: under **section 5** of said law

(a) inspection of infected house, food processing industry, factory, place of work, markets and shops, other necessary houses, premises, location, buildings and causing sanitation and other necessary measures to he carried out.

(b) causing disinfection to be carried out in the locations mentioned in sub-section (a) and of articles, clothes, utensils, and other household goods in such locations

(c) causing disinfection to be carried out in trains, motor vehicles, aircrafts, vessels and other vehicles

(d) causing chlorination of wells and ponds to be carried out

(e) causing destruction of the vector

(f) causing necessary measures to be carried out against transmission of disease from Principal Epidemic Diseases infected corpse

(g) submitting and reporting the situation concerning the Principle Epidemic Disease to the relevant authorized body or person to enable the issue of the restrictive or prohibitive order under section 14

(h) directing the ban or destruction of food which are unfit for human consumption

(i) directing the destruction of or ban on the sale of food causing or suspected of causing the spread of a Principal Epidemic Disease or the closure of the factory, mill, place of work, market or shop producing or selling such food

(j) inspection of water supply works and laundry services and directing closure of such places if proved to be a sources of transmissions

The project proponent has to prevent the outbreak of Communicable Disease and effective control when it occurs, the public shall, under the supervision a guidance of the Health Officer in responsibility carrying out the following environmental sanitation measures: **section 8** of said law

(a) in-door, out-door sanitation or inside the fence, outside the fence sanitation

(b) well, ponds and drainage sanitation

(c) proper disposal of refuse and destruction thereof by fire

(d) construction and use of sanitary latrines

(e) other necessary environmental sanitation measures

The project proponent has to ensure that the head of the household or any member of the household shall report immediately to the nearest health department or hospital when any of the events occurs such as rat fall, outbreak of a Principle Epidemic Diseases, and outbreak of a Notification Disease, under **section 9** of said law

(2) Occupational Health and Safety

The Explosive Act (1887)

Fine of punishment for explosive manufacturing, processing or importing described under **section 6(3)** of said law.

The project proponent has to follow the explosive act for the transportation and import of explosive with any carriage or vessel, major hazard of static electricity sparks, gas leakage and internal explosions during construction phase which related with **section 7(1), 8 and 13** of said law.

Social Security Law (2012)

This law states clearly that employers have to take care of employees' benefits, security and welfare, especially benefit from injury and occupational diseases during pre-construction and construction phase. This law is therefore related to occupational health and safety (OHS) of employees under **section 15, 16** of said law.

The project proponent has to stipulate until the completion of the age of retirement or continues to work after such completion of the age of retirement during construction phase under **section 18(a)** of said law.

The project proponent has to deduct contributions to pay by employee from their wages together with contribution to be paid employee, and pay to the social security fund during construction phase of project. The employer has to incur the expense for such contribution under **section 18(b)** of said law.

The project proponent has to affect insurance during construction phase by registering at the relevant township social security office in order to get employment injury benefit by the workers applied to provisions of compulsory registration for employment injury benefit insurance system, and paying contribution to employment injury benefit fund, under **section 48(a)**.

The project proponent has to pay contribution monthly to Employment Injury Benefit Fund at the rates stipulated. If project proponent fails to contribute after effecting insurance for employment injury benefit, the project proponent has to pay defaulting fees stipulated under **section 51** of said law.

The project proponent has to coordinate with the Social Security Board or insurance agency for keeping safety and health in order to prevent employment injury, contracting disease and decease owing to occupation, and in addition to safety and educational work of the workers and accident at the establishment during construction phase, under **section 53** of said law.

The project proponent has to report immediately to the relevant township social security office if a serious occupational accident has been occurred to his insured

worker during construction phase of project. A team of officers and staff who inspect the establishments shall, if it is found that the occurrence of employment injury, decease and contracting diseases, report to the relevant township social security office in accord with the stipulations under **section 54** of said law.

The project proponent has to prepare and keep records and lists correctly of worker's daily attendance, appointment of new workers, employing worker by changing of work, termination, dismissal and resignation, promotion and paying remuneration, under **section 75(a)** of said law.

The project proponent has to inform the relevant township social security office if changes in number of workers and establishment, change of employer, change of business, suspension of work, and close-down of work, and employment injury, decease and contracting diseases during construction phase under **section 75(b)** of said law.

The Control of Smoking and Consumption of Tobacco Product Law (2006)

The project proponent has to specify the non-smoking areas such as buildings, compounds, rooms and place as follows: hospital buildings, offices, compounds and other building in the compound except staff houses and apartment in the hospital compound, medical treatment centers and clinics, stadium and indoor playing fields, children drill sheds and playgrounds, teaching buildings, classrooms, offices, compounds and other buildings in the compound, except staff houses and apartments in the school compound, teaching buildings of universities, degree colleges, colleges and institutes, classrooms and offices, opera house, cinema halls, video halls and other buildings of entertainment, marts, department stores, stores and market sheds, museums, archives, public libraries and reading rooms, elevators and escalators, motor vehicles and aircrafts for passenger transportation, air-conditioned public rooms, public auditoriums, teaching buildings and classrooms of private tuition classes and training schools, and other public compounds, buildings and places prescribed through notification by the Ministry of Health, under **section 6** of said law.

The project proponent has to ensure that places to which the public have access in the following buildings, vehicles and crafts are non-smoking areas except the private offices and rooms. However, specific places where smoking is allowed, shall be arranged in such areas: buildings of offices and departments, building of factories and workshops, buildings of hotels, motels, guest houses and loading houses, building of railway stations, airport, ports and highway bus terminals, restaurants, trains and vessels for passenger transportation, and other public buildings, rooms and places prescribe through notification by the Ministry of Health, under **section 7** of said law

The project proponent has to ensure that the person in charge shall do the following: under **section 9** of said law:

(a) keep the captain and mark referring that it is a non-smoking area at the place mentioned in section.

(b) arrange the specific place where smoking is allowed as mentioned in section 7, and keep the caption and mark also referring that it is a specific place where smoking is allowed

(c) supervise and carry out measures so that no one shall smoke at the non-smoking area

(d) accept the inspection when the supervisory body comes to the place for which he is responsible

Myanmar Insurance Law (1993)

This law describes how to overcome financial difficulties by effecting mutual agreement of insurance against social and economic losses.

The project proponent has follows as an entrepreneur or an organization operating an enterprise which may cause loss to State-owed property or which may cause damage to the life and property of the public or which may pollution to the environment shall effect compulsory General Liability Insurance with the Myanmar Insurance, under **section 16** of said law.

Myanmar Investment Law (2016)

The project proponent has to follow the details management of land or building owned by Union and land registration contract that: (a) The investor who obtains permit or endorsement has the right to obtain a long-term lease of land or building from the owner (private, the relevant government organization, or the Union) in order to do investment. Citizen investors may invest in their own land or building in accordance with relevant laws. (d) The investor shall register the land lease contract at the Office of Registry of Deeds, under **section 50(a) (d)** of said law.

The project proponent has to follow: (b) The investor may appoint of any citizen who is a qualified person as senior manager, technical and operational expert, and advisor in his investment within the Union. (c) The investor shall appoint only citizens for works which does not require skill. (d) The investor shall appoint skilled citizen and foreign workers, technicians, and staff by signing an employment contract between employer and employee, in accordance with the labor laws and rules, under **section 51(b) (c) (d)** of said law.

The project proponent has to follow the duties and responsibilities of investor that shall to do and comply with the customs, traditions and traditional culture of the ethnic groups in the Union, under labour law in order to investment, under **section 65(g) (i) (j) (k) (l) (m) (o) (p) and (q)** as follows:

(g) The investor shall abide by applicable laws, rules, procedures and best standards practiced internationally for this investment so as not to cause damage, pollution, and loss to the natural and social environment and not to cause damage to cultural heritage.

(i) The investor shall close and discontinue the investment only after payment of compensation to employees in accordance with applicable laws for any breach of employment contracts, closure of investment, sale and transfer of investment, dis continuation of investment, or reduction of workforce.

(j) The investor shall pay wages and salaries to employees during the period of suspension of investment for a credible reason.

(k) The investor shall pay compensation and indemnification to the relevant employee or his successor for injury, disability, disease and death due to the work.

(l) The investor shall supervise foreign experts, supervisors and their families who employ in their investment to abide by the applicable laws, rules, orders and directives, and the culture and traditions of Myanmar.

(m) The investor shall respect and comply with the labour laws.

(o) The investor shall pay effective compensation for loss incurred to the victim, if there are damage to the natural environment and socioeconomic losses caused by logging or extraction of natural resources which are not related to scope of the permissible investment, except from carrying out the activities required to conduct investment in a permit or an endorsement.

(p) The investor shall allow the Commission to inspect in any places, when the Commission informs the prior notice to inspect the investment.

(q) The investor shall take in advance permit or endorsement of the Commission may administer the investments which need to obtain prior approval under the Environmental Conservation Law, and the procedures of environmental impact assessment, and shall submit the situation of environmental and social impact assessment to the Commission along the period of activities of the investments which obtained permit or endorsement of the Commission.

Protection of National Races Law (2015)

The project proponent has to explain the detail of project and cooperate with the national races who resided in the project area, under **section 5** of said law.

Myanmar Fire Brigade Law (2015)

The project proponent has to follow the directive of the Department of Fire Bridge to reserve fire bridge, and provide fire safety equipment to protect the emergency and accident plan for public who resided in the project area, under **section 25** of said law.

Myanmar Engineering Council Law (2013)

This law describes about the engineering as specified by the council. The project proponent has to follow, if whoever has received a registration certificate is found to have breached any rules contained in the registration certificate or violated any prohibition contained in a rule, directive enacted under this law. The executive committee may take the following administrative actions; (a) giving a warning, (b) assessing a suitable fine, (c) suspending the registration certificate, and (d) canceling the registration certificate, under **section 34** of said law.

The project proponent has to follow that no one shall perform any engineering and technological work which are specified as being dangerous to the public by a rule enacted under this law, without having received a registration certificate issued by the council, except for engineers appointed in a government department or an organization in the performance of their duties, under **section 37** of said law.

Motor Vehicle Rules (1987)

The project proponent has to follow the detail section of motor vehicle rules to avoid the negative impact of air and noise pollution, occupation health and safety, and socio-safety for who lived near the project area, under this Law.

Motor Vehicle Law (2015)

The project proponent should announces local community to follow the law for road safety and should explain to workers, vehicle drives should follow the law of motor vehicle to avoid road accident, air and noise pollution during pre-construction and construction phase that described at **section 51, 52, 54, and 57** of said law as follows:

Section 51: No one is allowed to offer motor vehicle driving training without business driving license.

Section 52: No one is allowed to operate a private business of inspecting motor vehicles without a business license.

Section 54: No one is allowed to do the following; (a) working as a motor vehicle assistant permit, (b) driving a motor vehicle while in an inappropriate mental or physical state, (c) driving a motor vehicle loaded above the loading capacity, (d) failing to wear a helmet while driving a motor-cycle, (e) failing to wear a safety belt while driving vehicles, this includes passengers, (f) driving a motor vehicle in places reserved for pedestrians, (g) changing, without legal permission or reasons backed up by evidence, the original type of a vehicle, its main parts, or the facts in a motor vehicle inspection certificate, (h) driving a motor-cycle without back mirror or silencer over the shock absorber.

Section 57: No one is allowed to drive, or work as an assistant, by using the driving license or assistant permit of another person.

Leave and Holidays Act (1951) (No.58)

This law specifies that every employee can leave and have a holidays which described under this Act. They shall be granted by his employer that public holidays with full wages or pay, and who has completed a period of 12 months' continuous. The project proponent has to make any agreement or contract of service whereby an employee agrees to take leave or holidays on terms less favourable than those provided in this Act shall null and void in so far as it purports to reduce the liability of an employer and any change in ownership of any trade, industry or establishment shall not affect the employee's rights under this Act.

Labour Organization Law (2011)

This law aims to protect the rights of the worker, to have good relations among the workers between employer, enable to form and carry out the labour organizations systematically and independently. The followings describe in the Labour Organization Law which is related with the Project, that the project proponent has to follow:

Section 18: The labour has the right to demand the relevant employer to re-appoint a worker of such worker is dismissed by the employer and if there is cause to believe that the reasons of such dismissal were based on labour organization membership or activities, or were not in conformity with the labour laws.

Section 21: The labour organizations shall carry out peacefully in carrying out holding of meetings, going on strike and carrying out other collective activities in accord with their procedure, regulations, by-laws and any directives prescribed by the relevant Labour Federation.

Section 27: The fund of the labour organizations shall be used for the matters provided in their constitutions and rules such as social welfare, education, health, culture, sports, and training courses relating to skill etc. or those adopted by the majority of the members at a general meeting of that organization called for such purposes.

Section 29: The employer shall recognize the labour organizations of his trade as the organizations representing the workers.

Section 31: The employer shall assist as much as possible if the labour organizations request for help for the interest of his workers. However, the employer shall not exercise any acts designed to promote the establishment or functioning of labour organizations under his domination or control by financial or other means.

Section 42: If it is an illegal lock-out or illegal strike, it may be prohibited in accord with the existing law.

Section 43: No employer shall, without permission of the relevant conciliation body, lock-out a public utility service or service which is not included in public utility service.

Settlement of Labour Disputes Law (2012)

The project proponent has to negotiates and coordinate in respect of the compliant within the prescribed period without sufficient cause for employee under **section 38** of said law.

The project proponent has to alters the conditions of service relating to employee concerned in such dispute at the consecutive period before commencing the dispute during construction phase under **section 39** of said law.

Minimum Wages Law (2013)

The project proponent has to follow the duties of the employer which specified that the minimum wages should to pay for the worker who works from the Project during pre-construction and construction phase in **section 12, 13 and 18** of said law, as follows:

Section 12: The employer shall not pay wage to the worker less than the minimum wage, may pay more than the minimum wage and pay the minimum wage to the workers working in the commercial, production and service business in cash. And, in paying minimum wage to the workers working in the agricultural and livestock business,

some cash and some property at prevailing regional price may be paid jointly according to local custom or desire of the majority of workers or collective agreement under this law.

Section 13: The employer shall inform the rates of minimum wage relating to the business and advertise it at the workplace to enable to be seen by the relevant worker. Prepare and maintain the list, schedule, documents and wages of the workers correctly, then report them to the relevant department. Accept the inspection and allow them entry to the commercial, production and service business, agricultural and livestock breeding workplaces and give necessary assistance. If the workers cannot work due to sickness, shall give them holiday for medical treatment, and if the funeral matter of the member of the family of worker or his parent occurs shall give holiday without deducting from the minimum wage, in accord with the stipulations under this law.

Section 18: The inspection officer has the right to enter and inspect the relevant commercial, production and service workplaces, agricultural and livestock breeding workplaces with the rules, notifications, orders, directives and procedures, then report to the Department. If there are outside workers at employer, has the right to inspect information relating to such outside workers, in accord with the stipulations of this law,

Payment of Wages Act (2016)

The project proponent has to coordinate with the payment of Wages Act (2016), the employer must pay for part-time, daily, weekly, other part-time, temporary, or piecework when the work is done OR at the agreed time, and the time frame not exceed one month. Wages for the permanent work must pay per monthly basis, upon termination, within 2 days. If a resignation letter is submitted, wages must be paid at the ending day of the payment period. Wages must be paid to the legally recognized heir within 2 working days after the day he/she has died, under **section 4** of said law.

The project proponent has to understand that the employer can deduct from wages for absences except when such absence is during a public holiday or entitled leave, accommodation charges and transportation charges, meal allowances, charges for water and electricity, taxes and errors in payment shall be allowed for deduction. The employer can deduct from pre-issued, expensed and saved (or) contributed amount according to the law upon the employee contract, and deduct with the judgment of the Court of Arbitrator Jury Council, under **section 7** of said law.

The project proponent has to follow that the employer cannot deduct except the deduction in accordance with section 7 and section 11, under **section 8** of said law.

The project proponent has to ensure that the total amount of other deductions, except when the employee fails to perform their duties, shall not be more than 50% of the employee's wages, under **section 9** of said law.

The project proponent has to states clearly that the employer must get the permission prior to making deductions from wages and publicly posted. Fines must not exceed the value of damage caused by the action or cost of performance failure of the employee, do not deduct without allowing an appeal from the employee and deduct more than 5%. No deduction is allowed from a worker under 16 years old. The time frame for deductions shall be set upon an agreement from both sides, deductions shall be carried out

within the limited time frame upon the agreement of the Township Arbitration Council. Every deduction must be well documented, and submit a monthly report to the Department concerning deductions, under **section 10** of said law.

The project proponent has to specify that fine for performance failure by the employees; direct damage which is either international or due to negligence, and a breach of the employment contract or any rules for which a fine had been previously set, under **section 11** of said law.

Employment and Skill Development Law (2013)

The project proponent has to carry out the training program in accord with the work requirement to develop skill relating to the employment for the workers who are proposed to appoint and working during pre-construction and construction phase described under **section 14 and 15** of said law.

The project proponent has to put the fund monthly as put in fees without fail for to total wages under **section 30** of said law as follows:

The Workmen's Compensation Act (1923)

The project proponent has to describe the detail of the Workmen's Compensation Act (1923) for the employee who work in the project during construction phase under **section 3(1), 12(1), and 14(1)** as follows:

Section 3: Employers' liability for compensation, (1) If personal injury is caused to a workman by accident a rising out of and in the course of his employment, his employer shall be liable to pay compensation. Provided that the employer shall not be so liable in respect of any injury which does not result in the total or partial disablement of the workman for a period exceeding (four) days, and any an accident which is directly attributable to the workman having been at the time thereof under the influence of drink or drug, or the willful disobeddience of the workman to an order expressly given, or the willful removal or disregard by the workman of any safety guard or other device which he knew to have been provided for the purpose of securing the safety of workmen.

Section 12: (1) Where any person (hereinafter in this section referred to as the principal) for the purposes of business contracts with any other person (hereinafter in this section referred to as the contractor) with the execution by the contractor of the whole or any part of the trade or business of the principal. The principal shall be liable to pay to any workman employed in the execution of the work, any compensation liable to pay. And where compensation is claimed from the principal, except that the amount of compensation shall be calculated with reference to the wages of the workmen under the employer.

Section 14: (1) Where any employer has entered into a contract with any insurers in respect of any liability under this Act to any workman, then in the event of the employer becoming insolvent or making a composition or scheme of arrangement with his coordinators or, if the employer is a rights of the employer against the insurers as respect that liability shall, not withstanding anything in any law for the time being in force relating to insolvency or the winding up of companies, be transferred to and vest in the workman, and upon any such transfer the insurers shall have the same rights and

remedies and be subject to the same liabilities as if they were the employer, so, however, that the insurers shall not be under any greater liability to the workman than they would have been under to the employer.

The Farmland Law (2012)

The project proponent has to follow the farmland law in order to use the farmland by other means for the purpose of long-term national interests of the State, the relevant Ministry that will implement the huge projects may carry out with the approval of the Union Government after obtaining remark of the Central Administrative Body of the Farmland that describe under **section 29** of said law.

(3) Cultural Impact Concerns

The Protection and Preservation of Cultural Heritage Regions Law (1998), Amended by Law No.1/2009

This law aims to minimize impacts of development projects on the local heritage and cultural settings. The purposes of this law are to implement the protection and preservation policy with respect to perpetuation of cultural heritage that has existed for many years, promote public awareness and participation in the protection and preservation of cultural heritage regions, and carry out protection and preservation of the cultural heritage regions in conformity with international conventions committed to by the State.

The Ministry of Culture has the duty under this law to scrutinize applications of permission for construction and assess whether;

- It can cause obstruction of the view of the cultural heritage region.
- It is clear of the ancient monument or ancient site.
- It can obstruct the surrounding natural landscape.
- It can undermine the grandeur of the ancient monument
- It can affect the security of the cultural heritage
- It can cause environmental pollution

The project proponent has to follow the law which prohibits destruction of ancient monuments, the willful altering of the original ancient form and structure or original ancient workmanship of an ancient monument, and excavations to search for antiques and exploration for petroleum, natural gas, precious stones or minerals in a cultural heritage site. It is also prohibits to ploughing and cultivating or carrying out any activity that may cause damage to the cultural heritage.

The Protection and Preservation of Antique Objects Law (2015)

The project proponent has to follow this law that the person who finds an object which has no owner or custodian, he shall promptly inform the relevant Ward or Village-Tract Administrator if he knows or it seems reasonable to assume that the said object is an antique object under **section 12** of said law.

The Protection and Preservation of Ancient Monuments Law (2015)

The project proponent has to follow, if a person who finds an ancient monument of over one hundred years old and above or under the ground or above or under the water which has no owner or custodian knows or it seems reasonable to assume that the said monument is an ancient monument, he shall promptly inform the relevant Ward or Village-Tract Administrative Office, under **section 12** of said law.

The project proponent has to ensure that a person desirous of any of the followings within the specified area of an ancient monument shall apply to get prior permission to the Department, constructing a building which is not consistent with the terms and conditions stipulated according to the region by the Ministry near and at the surrounding of an ancient monument under **section 15(h)** of said law.

The project proponent has to ensure that no one shall carry out any of the following acts which is assumed to cause damage to an ancient monument within the specified area of an ancient monument or of a listed ancient monument without a written prior permission; (f) discarding chemical substance and rubbish which can affect an ancient monument and the environment under **section 20(f)** of said law.

C. Law Related to Ecological Concerns

The Forest Law (1992)

The project proponent has to ensure that whoever, within a forest land and forest covered land at the disposal Government is desirous of carrying out any development work or economic scheme shall obtain the prior approval of the Forestry Ministry, and who is desirous of carrying out educational or research work or conducting a training course or a study tour shall obtain the prior sanction of the Director-General or the Forest Officer empowered by him, under **section 12** of said law.

The Protection of Wildlife and Conservation of Natural Areas Law (1994)

The project proponent has to (i) protect wildlife, wild plants and conserve natural areas, (ii) contribute to natural scientific research, and (iii) establish zoological and botanical gardens. This law therefore covers protection and conservation of wildlife, ecosystems and migratory birds, including the protection of endangered species of wildlife and their natural habitats of said law.

The Conservation of Water Resources and River Law (2006)

The project proponent has to ensure that no person carry out any act or channel shifting with the aim to ruin the water resources and rivers and creeks, and no person shall cause the wastage of water resources willfully, under **section 8** of said law

The project proponent has to ensure that no person dispose engine oil, chemical, poisonous material and other materials which may cause environmental damage, or dispose of explosives from the bank or from a vessel which is plying, vessel which has berthed, anchored, stranded or sunk, under **section 11(a)** of said law.

The project proponent has to ensure that no one dispose of any substance into the river-creek that may cause damage to waterway or change of watercourse from the bank or vessel which is plying, vessel which has berthed, anchored, stranded or sunk, under **section 19** of said law.

D. Laws Related to Freshwater Environments

Laws related to freshwater environments are described in different sectoral laws under two ministries, the Ministry of Livestock and Fisheries and MONREC. For the Freshwater Fisheries Law (1991), the detail of laws can described as follow:

The Freshwater Fisheries Law (1991)

The project proponent has to ensure that no one cause harassment of fish and other aquatic organisms or pollution of the water in a freshwater fisheries waters under **section 40** of said law.

3.2.4 Law Specific to the Project Site

Within the project site, there are 2 key laws related to the Two-Lane Road Linking Project, including:

A. Myanmar Special Economic Zone Law (2014)

The Special Economic Zone (SEZ) Law was initially promulgated on 27th January 2011, and then the law was further amended and enacted in January 2014. This facilitates in developing export oriented industries, by providing incentives and additional needed supply chain industries.

The project proponent has to follow the functions and duties of management committees as follows: (f) specifying in notifications, orders, directives and procedures, particulars to be followed by the investors, (p) supervising environmental conservation and protection in special economic zone in accordance with the existing laws, scrutinizing the system to dispose industrial waste from the factories, requesting developers and investors to comply with the stipulations, under **section 11 (f) (p)** of said law.

The project proponent has to ensure that the investor follow the standards and norms contained in the Myanmar Environmental Conservation Law and International Standards and norms, and must prevent social and health impacts in accordance with the existing laws, under **section 35** of said law.

The project proponent has to ensure where expertise is not required, the investor shall hire citizens only for work, under **section 74** of said law.

The project proponent has to provide amongst skilled workers, technicians and staff, at least 25% must be citizens during the first two years from the commencement of commercial operations, at least 50% must be citizens during the second two years, and at least 75% must be citizens during the third two years, under **section 75** of said law.

The project proponent has to ensure that the relevant management committee negotiate and mediate in the disputes arising between the employer and the employees, technicians or staff. If no settlement has been reached following negotiations and mediation by such committee, the parties shall accept the decision under the Trade Dispute Act of the Union of Myanmar, under **section 76** of said law.

The project proponent has to follow, if an investor wishes to employ foreign employees for technology and management work in addition to the specific numbers, he may employ them with the approval of the relevant management committee, under **section 78** of said law.

The project proponent has to ensure that the developer or the investor (a) shall pay the agreed expenditures for transfer, resettlement and compensation if houses, buildings, gardens, paddy fields, fruit bearing plants and plantations on the land are required to be cleared or transferred, (b) shall, as necessary, negotiate with the management committee in order to ensure that the persons who have to leave the land do not fall below their previous standard of living, their fundamental needs are fulfilled and the transfer is easy and smooth, under **section 80 (a) (b)** of said law.

B. The Dawei Special Economic Zone Law (2011)

The Dawei Special Economic Zone Law (DSEZ) Law was enacted on 27th January 2011; the official name is "The State Peace and Development Council Law No.17". This Law contains the stipulations in order to facilitate in developing export oriented industries and additional needed supply chain industries.

The Project will be located in Dawei Special Economic Zone (DSEZ). DSEZ was established under the Dawei Special Economic Zone Law (2011). This law was specifically promulgated for the development and operations of DSEZ. Although the law has no specific requirements for EIA, it has several clauses which clearly indicate that the Government acknowledges the importance of environmental and social aspects of development in DSEZ. Environmentally related clauses in the law are quoted below:

The project proponent has to follow that the State shall encourage the investors in the Dawei Special Economic Zone to operate the following works in priority, businesses for conservation and protection of natural environment, under **section 8(g)** of said law.

The project proponent has to follow the functions and duties of the Management Committee of the Dawei Special Economic Zone under **section 10(a) (c) (j)** of said law are as follows:

(a) submitting the Dawei Special Economic Zone development plan to the Central Body and Central Working Bodies and obtaining approval for enabling to implement and operate the Dawei Special Economic Zone successfully.

(c) supervising and inspecting the matters on implementation of investment and establishment plans, land-use, environmental conservation, wastes control, health, education, finance and taxation, development, transport, communication, security, electricity, energy and water supply, etc., and coordinating with the relevant Government departments and organizations.

(j) supervising for the natural environmental conservation and protection in the Dawei Special Economic Zone in accord with the existing Laws, scrutinizing the disposal system of industrial wastes and if it is not in conformity with the stipulations, causing the developer or investor to perform in line with them,

The project proponent has to follow that the developer or investor shall take responsibility in order not to cause environmental pollution and air pollution in respect of his enterprise in the Dawei Special Economic Zone, under **section 31** of said law.

The project proponent has to follow the Central Body: under **section 33(a) (e)** of this law;

(a) may, with the approval of the Government, permit the developer or investor land lease or land use after causing payment of fees to be made for land lease or land use in the Dawei Special Economic Zone, for at least 30 years.

(e) may scrutinize and permit the term of period for land lease or land use which the developer or investor actually needs depending on the type of investment business and the amount of investment.

The project proponent has to follow the developer or investor shall bear the expenses of transferring and paying compensation of houses, buildings, farms and gardens, orchards/fields, plantation and land within the Dawei Economic Zone permitted by the Central Body if these are required to be transferred. Moreover, the developer shall carry out to fulfill fundamental needs of persons who transfer so as not to lower their original standard. The relevant Management Committee shall coordinate as may be necessary for the convenience of such works, under **section 34** of said law.

3.3 INTERNATIONAL CONVENTIONS, TREATIES AND AGREEMENTS

Myanmar has signed several international conventions, treaties and agreements related to the environment. Some of them are shown in ***Table 3.3-1***.

TABLE 3.3-1

RELEVANT INTERNATIONAL TREATIES SIGNED BY MYANMAR

No.	International Environmental Conventions/ Protocols/ Agreements	Date of Signature	Date of Ratification	Date of Member	Cabinet Approval Date
1	Plant Protection Agreement for the South-East Asia and the Pacific Region, Rome, 1956		4-11-1959 (Adherence)	4/11/1959	
2	United Nations Framework Convention on Climate Change, New York, 1992 (UNFCCC)	11-6-1992	25-11-1994 (Ratification)		41/94 9-11-94
3	Convention on Biological Diversity, Rio de Janeiro, 1992	11-6-1992	25-11-1994 (Ratification)		41/94 9-11-94
4	The Convention for the Protection of the World Culture and Natural Heritage, Paris, 1972		29-4-1994 (Acceptance)		6/94 9-2-94
5	ASEAN Agreement on the Conservation of Nature and Natural Resources, Kuala Lumpur, 1985	16-10-1997			
6	Catagena Protocol on Biosafety, Cartagena, 2000	11-5-2001			13/2001 22-3-01
7	Kyoto Protocol to the Convention on Climate Change, Kyoto, 1997		13-8-2003 (Accession)		26/2003 16-7-03

3.4 MYANMAR GOVERNMENT INSTITUTIONAL FRAMEWORK

3.4.1 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 ENCC are prescribed in Articles 7 to 13 of the EC Rules. Environment of the Republic of the Union of Myanmar.

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.

The EIA process for this Project will be administered by the central ECD in coordination with the regional ECD and various government organizations at the regional, township, and district levels.

3.4.2 Arrangements at the Project Area

A. Institutional Framework of Myanmar Government

Myanmar's Subnational Administrative Structure

The Republic of the Union of Myanmar is composed of seven (7) regions, there are 6 self-administered zones or divisions and 1 union territory. In detail, there are 325 townships and 67 districts in Myanmar's states and regions, according to Myanmar Information Management Unit (2011), Myanmar Statistical Year book (2011), and Ministry of National Planning and Economic Development. The smallest formal administrative unit is called "village", with various groups (towns, village, and urban) can be grouped into townships. Collections of townships are organized as districts and can be turned the form into regions or state (collections of districts).

State and region governments comprise of an unicameral, partially elected state or region Hluttaw, an executive led by a Chief Minister and a cabinet of state/region ministers, and state or region judicial institutions.

The ***Figure 3.4-1*** below illustrates organization structure of state and region government. In detail, there are nine (9) ministries and twelve (12) union ministries.

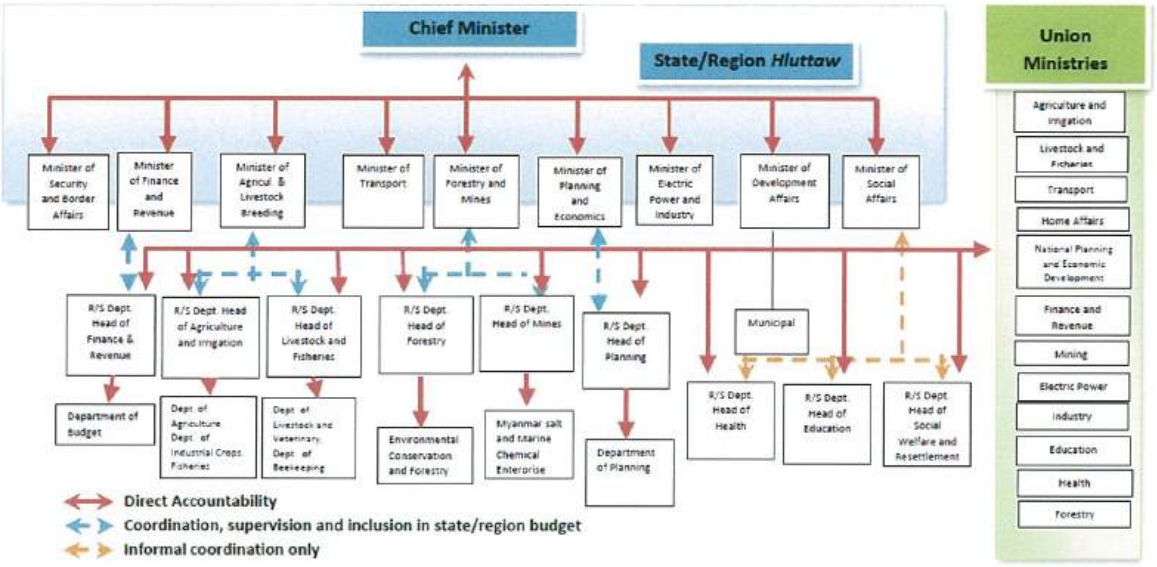


FIGURE 3.4-1 : ORGANIZATIONAL STRUCTURE OF STATE AND REGION GOVERNMENT

B. Institutional Framework of Management Government of the DSEZ

Dawei Special Economic Zone Management Committee

This Project will be implemented as a public-private participation (PPP) project under a concessional arrangement between the Project Proponent and the Dawei Special Economic Zone Management Committee. ***Figure 3.4-2*** shows an organizational structure for the development of DSEZ which is organized as prescribed by the Special Economic Zone Law (2011). The development of the Dawei Special Economic Zone (DSEZ) is carried out under the framework set by the Dawei Special Economic Zone Law. Under this law, two bodies were established-the Dawei Special Economic Zone Management Committee and the Dawei Special Economic Zone (DSEZ) Working Body-to take charge of DSEZ management and general administration affairs.

The DSEZ Management Committee (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.

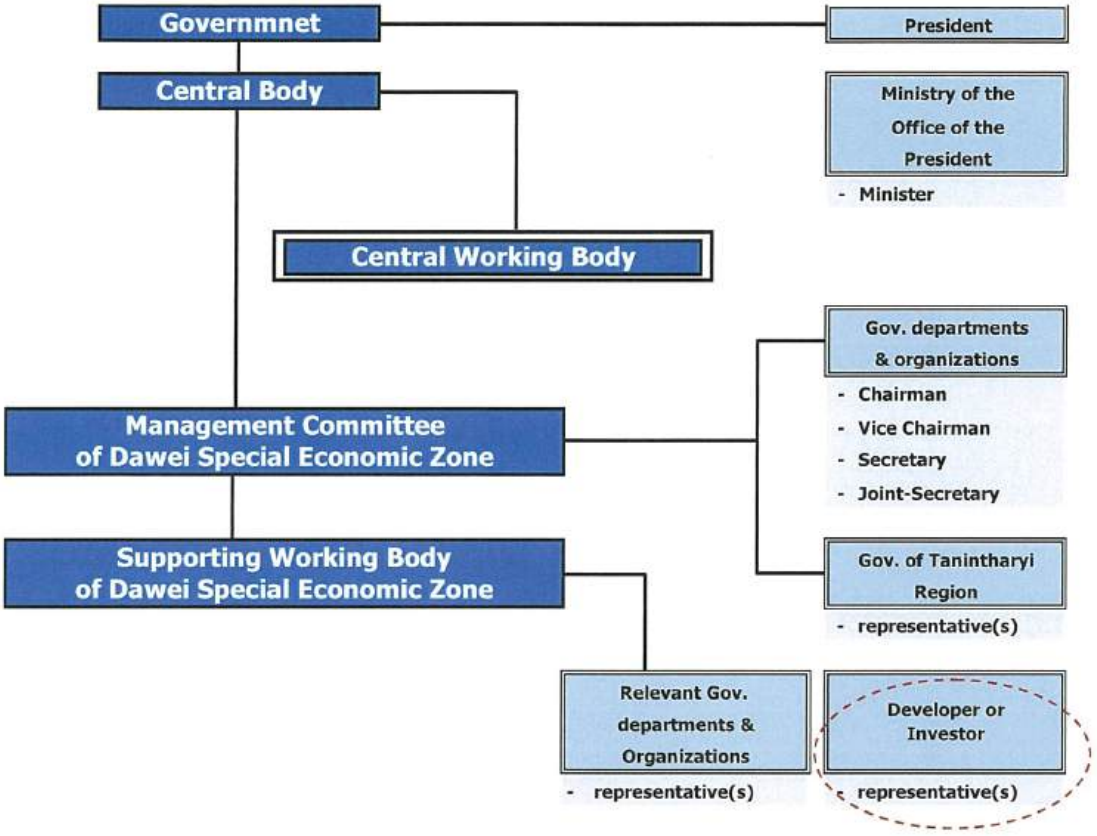


FIGURE 3.4-2 : ORGANIZATIONAL STRUCTURE OF DAWEI SPECIAL ECONOMIC ZONE (DSEZ)

C. Other Relevant Agencies

There are 14 representatives of relevant 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 3.4-1***.

TABLE 3.4-1

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 Port Authority	Responsibility to regulate and administer the coastal ports of Myanmar.
5	Myanmar Police Force	Establish civil jurisdictions in the project area.
6	Department of Labour	- 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.
7	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.
8	Department of Development Affairs	Responsible for the urban development.
9	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.
10	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.
11	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.
12	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.
13	Department of Municipality	Dealing with locally affairs, to the close contact with the daily life of the citizens.
14	Representative from Tanintharyi Division	To communicate with Local Government.

3.5 INTERNATIONAL POLICIES, GUIDELINES AND STANDARDS

International policies, guidelines and standards relevant to environmental and social impacts of projects that are referred to 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. They 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 herein.

3.5.1 IFC's Standards and Guidelines

IFC's standards and guidelines relevant to this Project are described in two documents:

- Performance Standards on Environmental and Social Sustainability (January 1st, 2012)
- Environmental, Health, and Safety-General Guidelines (April 30th, 2007)

The first document describes eight performance standards on environmental and social sustainability which IFC requires its clients to apply throughout the project life cycle.

The second document provides general guidelines for environmental, health and safety (EHS) for development projects.

Essential requirements in the two IFC documents pertaining to this Project are summarized below.

A. Performance Standards on Environmental and Social Sustainability (January 1st, 2012)

IFC prescribes eight Performance Standards (PS) to which its clients will need to comply throughout the investment life of IFC. The eight performance standards (PS) are:

Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts

Performance Standard 2: Labor and Working Conditions

Performance Standard 3: Resource Efficiency and Pollution Prevention

Performance Standard 4: Community Health, Safety, and Security

Performance Standard 5: Land Acquisition and Involuntary Resettlement

Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources

Performance Standard 7: Indigenous Peoples

Performance Standard 8: Cultural Heritage

The eight PSs cover all environmental and social aspects of development projects.

Major requirements of each PS are summarized as follows:

PS1: Assessment and Management of Environmental and Social Risks and Impacts

PS1 requires the client, in coordination with other responsible government agencies and third parties as appropriate, to conduct a process of environmental and social assessment, and establish and maintain an 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: Labour and Working Conditions

PS2 requires the client to: (i) formulate and implement human resources policies and procedures appropriate to its size and workforce that set out its approach to managing 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 client's work areas, including physical, chemical, biological, and radiological hazards, and specific threats to women. These requirements will also be applied to workers of the contractors through effective contractual arrangements between the client and the contractors.

PS3: Resource Efficiency and Pollution Prevention

PS3 requires the client's project to: (i) efficiently use energy and water, and (ii) use best available techniques (BAT) in pollution control.

PS4: Community Health, Safety, and Security

This PS requires the client to: (i) evaluate the risks and impacts to the health and safety of the Affected Communities during the project life-cycle, and (ii) establish preventive and control measures 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 the communities and operators will need to be fully considered in engineering design, construction and operations of all project's facilities, including support facilities or infrastructure. Health risks will also be included.

PS5: Land Acquisition and Involuntary Resettlement

This PS requires the client to avoid land expropriation, physical displacement, and adverse impacts on livelihoods and ways of life of people in the project area. 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 Resources

PS6 requires the EIA to consider direct and indirect project-related impacts on biodiversity and ecosystem services and identify any significant residual impacts. As a matter of priority, the client 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 impacts on biodiversity and ecosystem services over the long term, the client should adopt a practice of adaptive management in which the implementation of mitigation and management measures are responsive to changing conditions and the results of monitoring throughout the project's life cycle.

PS7: Indigenous Peoples

PS7 requires the EIA to identify all communities of Indigenous Peoples 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 impacts 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 client 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 Peoples.

PS8: Cultural Heritage

PS8 requires the client 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 cultural heritage and assess their value or importance at the community, provincial and national levels.

It should be noted that all the eight PSs are in line with the Government's policy and regulations. For this Project, PS5, PS7 and PS8 are not relevant as pointed out in Chapters 5 and 6.

B. Environmental, Health, and Safety-General Guidelines (April 30th, 2007)

This publication provides general EHS guidelines covering the following subjects:

Environment covering: (i) air emissions and ambient air quality, (ii) energy conservation, (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 hazards, (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.ng 89

3.5.2 World Bank's Pollution Prevention and Abatement Handbook 1998 Toward Cleaner Production

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 standards 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.

3.6 GUIDELINES AND STANDARDS APPLICABLE TO THIS PROJECT

Environmental management of the Project during construction and operation will comply with the national or international environmental guidelines and standards as appropriate. The international guidelines and standards will be adopted only when the national guidelines and standards do not exist. In addition, the Project will control stack emissions following the standards which are specifically agreed in the drafted concession agreement of the Project.

Table 3.6-1 presents international ambient environmental quality standards to be adopted as the national ambient environmental quality standards have not yet been issued. ***Table 3.6-2*** presents national effluents level standards to be adopted for the Two-Lane Road Linking Project. The national effluents level standards for the Two-Lane Road Linking Project will be set for management plan of this project.

TABLE 3.6-1

RELEVANT INTERNATIONAL ENVIRONMENTAL GUIDELINES AND STANDARDS

Subjects	Parameters	Values	References
Ambient Air Quality (24 hour average)	TSP average 24 hour PM10 average 24 hour NO_x as NO_2 average 1 hour NO_x as NO_2 average 24 hour SO_2 average 24 hour	230 µg/m^3 150 µg/m^3 200 µg/m^3 150 µg/m^3 125 µg/m^3	WHO Ambient Air Quality Guidelines stated on Environmental, Health, and Safety Guidelines: Environment Air Emissions and Ambient Air Quality of International Finance Corporation, 2007
Ambient Noise Levels - industrial and commercial area - residential areas	Leq (24 hrs) Leq (1 hr) Lmax	70 dB(A) 55 dB(A) daytime 45 dB(A) nighttime 115 dB(A)	Environmental, Health, and Safety (EHS) Guidelines: General EHS Guide GUIDELINES: ENVIRONMENTAL NOISE MANAGEMENT, IFC, 2007
Vibration - for industrial buildings and residential building	Peak Particle Velocity	5 mm/s	DIN4150
Groundwater Quality	pH at 25° C Nitrate-Nitrogen Nitrite-Nitrogen Cadmium Lead Arsenic Copper Mercury	6.5-8.5 ≤ 11 mg/l ≤ 0.9 mg/l ≤ 0.003 mg/l ≤ 0.01 mg/l ≤ 0.01 mg/l ≤ 2 mg/l ≤ 0.006 mg/l	WHO's Guidelines for Drinking Water Quality, 2011

TABLE 3.6-2

NATIONAL EFFLUENTS LEVEL STANDARDS FOR THE TWO LANE ROAD LINKING PROJECT

Parameter	Unit	Maximum Concentration
Biological Oxygen Demand	mg/l	30
Chemical Oxygen Demand	mg/l	125
Oil and Grease	mg/l	10
pH	-	6-9
Total Coliform Bacteria	100 ml	400
Total Nitrogen	mg/l	10
Total Phosphorus	mg/l	2
Total Suspended Solids	mg/l	50

Sources: National Environmental Quality (Emission) Guidelines, 2015.

TABLE 3.6-3

APPLICATION OF LAW AND REGULATION FOR MANAGEMENT PLAN, TWO LANE ROAD LINKING PROJECT

Main Concerned	Application of Law and Regulation
EIA Study	- Environmental Conservation Law (2012) - Environmental Conservation Rules (2014) - EIA Procedure (2015)
Management Plan	
1. General Construction	**Myanmar** - The Explosive Act (1887) - The Workmen's Compensation Act (1923) - Leave and Holidays Act (1951) - Motor Vehicle Rule (1987) - Myanmar Insurance Law (1993) - Labour Organization Law (2011) - Settlement of Labour Dispute Law (2012) - Social Security Law (2012) - Employment and Skill Development Law (2013) - Minimum Wages Law (2013) - Myanmar Engineering Council Law (2013) - Motor Vehicle Law (2015) - Payment of Wages Law (2016) - Myanmar Investment Law (2016) **World Bank** - Performance Standards on Environmental and Social Sustainability (January 1st, 2012) • Performance Standard 2: Labor and Working Conditions • Performance Standard 4: Community Health, Safety, and Security

TABLE 3.6-3

APPLICATION OF LAW AND REGULATION FOR MANAGEMENT PLAN, TWO LANE ROAD LINKING PROJECT (CONT'D)

Main Concerned	Application of Law and Regulation
2. Forest Management	**Myanmar** - The Forest Law (1992) - National Environmental Policy (1994) - The Protection of Wildlife and Conservation of Natural Areas Law (1994) **World Bank** - Performance Standards on Environmental and Social Sustainability (January 1st, 2012) • Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources
3. Air Quality Management	**Myanmar** - The Dawei Special Economic Zone Law (2011) - Environmental Conservation Law (2012) - Myanmar Special Economic Zone Law (2014) **World Bank** - Performance Standards on Environmental and Social Sustainability (January 1st, 2012) • Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts **Standard Control** - WHO Ambient Air Quality Guidelines Stated on Environmental, Health and Safety Guidelines: Environment Air Emissions and Ambient Air Quality of International Finance Corporation (2007) - National Ambient Air Quality Standard, National Environmental Quality (Emission) Guidelines, Myanmar (2015)
4. Noise Management	**Myanmar** - Motor Vehicle Rule (1987) - The Dawei Special Economic Zone Law (2011) - Environmental Conservation Law (2012) - Myanmar Special Economic Zone Law (2014) - Motor Vehicle Law (2015) **World Bank** - Performance Standards on Environmental and Social Sustainability (January 1st, 2012) • Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts **Standard Control** - U.S. Environmental Protection Agency Office of Noise Abatement and Control: Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety (1975) - National Noise Level Quality Standard, National Environmental Quality (Emission) Guidelines, Myanmar (2015)

TABLE 3.6-3

APPLICATION OF LAW AND REGULATION FOR MANAGEMENT PLAN, TWO LANE ROAD LINKING PROJECT (CONT'D)

Main Concerned	Application of Law and Regulation
5. Surface Water Quality Management	**Myanmar** - The Freshwater Fisheries Law (1991) - National Environmental Policy (1994) - The Conservation of Water Resources and River Law (2006) - The Dawei Special Economic Zone Law (2011) - Environmental Conservation Law (2012) - Myanmar Special Economic Zone Law (2014) **World Bank** - Performance Standards on Environmental and Social Sustainability (January 1st, 2012) • Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts • Performance Standard 3: Resource Efficiency and Pollution Prevention • Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources
6. Social Environmental Management	**Myanmar** - The Workmen's Compensation Act (1923) - Leave and Holidays Act (1951) - Labour Organization Law (2011) - The Dawei Special Economic Zone Law (2011) - Settlement of Labour Dispute Law (2012) - Social Security Law (2012) - Employment and Skill Development Law (2013) - Minimum Wages Law (2013) - Myanmar Special Economic Zone Law (2014) - Payment of Wages Act (2016) - Myanmar Investment Law (2016) **World Bank** - Performance Standards on Environmental and Social Sustainability (January 1st, 2012) • Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts • Performance S0tandard 4: Community Health, Safety, and Security
7. Resource Use Management	**Myanmar** - The Forest Law (1992) - The Protection of Wildlife and Conservation of Natural Areas Law (1994) - National Environmental Policy (1994) - The Conservation of Water Resources and River Law (2006) - The Dawei Special Economic Zone Law (2011) - Environmental Conservation Law (2012) - Myanmar Special Economic Zone Law (2014)

TABLE 3.6-3

APPLICATION OF LAW AND REGULATION FOR MANAGEMENT PLAN, TWO LANE ROAD LINKING PROJECT (CONT'D)

Main Concerned	Application of Law and Regulation
	World Bank - Performance Standards on Environmental and Social Sustainability (January 1st, 2012) • Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts • Performance Standard 3: Resource Efficiency and Pollution Prevention • Performance Standard 6-Biodiversity Conservation and Sustainable Management of Living Natural Resources
8. Occupational Health and Safety Management	**Myanmar** - The Explosive Act (1887) - The Workmen's Compensation Act (1923) - Leave and Holidays Act (1951) - Public Health Law (1972) - The Prevention and Control of Communicable Disease Law (1995) - Labour Organization Law (2011) - The Dawei Special Economic Zone Law (2011) - Social Security Law (2012) - Settlement of Labour Dispute Law (2012) - Employment and Skill Development Law (2013) - Minimum Wages Law (2013) - Myanmar Special Economic Zone Law (2014) - Protection of National Races Law (2015) - Payment of Wages Act (2016) **World Bank** - Performance Standards on Environmental and Social Sustainability (January 1st, 2012) • Performance Standard 2: Labor and Working Conditions • Performance Standard 4: Community Health, Safety, and Security
9. Land Traffic	**Myanmar** - Motor Vehicle Rule (1987) - The Dawei Special Economic Zone Law (2011) - Myanmar Special Economic Zone Law (2014) - Motor Vehicle Law (2015) **World Bank** - Environmental, Health and Safety-General Guidelines (April 30th, 2007) - Performance Standards on Environmental and Social Sustainability (January 1st, 2012) • Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts

TABLE 3.6-3

APPLICATION OF LAW AND REGULATION FOR MANAGEMENT PLAN, TWO LANE ROAD LINKING PROJECT (CONT'D)

Main Concerned	Application of Law and Regulation
10. Waste Management	**Myanmar** - Public Health Law (1972) - The Dawei Special Economic Zone Law (2011) - Myanmar Special Economic Zone Law (2014) **World Bank** - Performance Standards on Environmental and Social Sustainability (January 1st, 2012) • Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts • Performance Standard 3: Resource Efficiency and Pollution Prevention
11. Hazardous Waste Management	**Myanmar** - Public Health Law (1972) - The Dawei Special Economic Zone Law (2011) - Myanmar Special Economic Zone Law (2014) **World Bank** - Performance Standards on Environmental and Social Sustainability (January 1st, 2012) • Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts • Performance Standard 3: Resource Efficiency and Pollution Prevention
12. Emergency Plan for Fire Fighting	**Myanmar** - The Control of Smoking and Consumption of Tobacco Product Law (2006) - Social Security Law (2012) - Myanmar Fire Brigade Law (2015) **World Bank** - Performance Standards on Environmental and Social Sustainability (January 1st, 2012) • Performance Standard 4: Community Health, Safety, and Security
13. Cultural Tradition Management	**Myanmar** - Protection and Preservation of Cultural Heritage Regions Law (1988), Amended by Law No.1/2009 - Protection and Preservation of Antique Objectives Law (2015) - Protection and Preservation of Ancient Monuments Law (2015) **World Bank** - Performance Standards on Environmental and Social Sustainability (January 1st, 2012) • Performance Standard 8: Cultural Heritage

CHAPTER 4

PROJECT DESCRIPTION AND ALTERNATIVES

CHAPTER 4

PROJECT DESCRIPTION AND ALTERNATIVES

4.1 INTRODUCTION

This chapter presents details of Project description, including project alignment, project facilities, arrangements for the project construction, and inputs for the pavement, road operation, and organization for the operation of the project road. Most of the information is taken from the Detailed Design Report of Trans-border Road Link (Dawei-Phu Nam Ron) Project "Application Document for Dawei SEZ Initial Phase Development" submitted by Italian-Thai Development Public Company Limited, October 2015 and Inception Report for Consulting Services for Detailed Engineering Design Dawei-Phu Nam Ron Two-Lane Road Project prepared by TESCO Ltd., April 2015. It has been edited or elaborated as appropriate by the Consultant for presentation in this chapter. Some information is also taken from technical literatures relevant to road construction. The main text is intended to be concise. Support details are provided in appendices or referred to the Final Design Report as appropriate.

4.2 PRESENTATION OF THE PROJECT AND DESCRIPTION OF ALTERNATIVES

4.2.1 Importance of the Project

The Two-lane Road will be the key transport corridor linking DSEZ with the national highway and railway systems in Thailand. The Two-lane Road will connect DSEZ to the rural highway (**Route No. 5312**) at Ban Phu Nam Ron at the Myanmar-Thailand Border. This rural highway extends to Kanchanaburi City and a new motorway to be constructed from Bangkok to Kanchanaburi City (*see in* ***Figure 4.2-1***). The new motorway project is currently in the detailed design stage. The new motorway, referred to as Bangyai-Kanchanaburi Motorway or Motorway Route No. 81, will have 4 to 6 traffic lanes. Its alignment is shown in ***Figure 4.2-2***.

Within Myanmar, the proposed Two-lane Road will connect with the National Highway Route No.8 of the Myanmar road network, connecting Yangon to the southern part of Myanmar through Dawei–Myeik–Kawthoung as shown in ***Figure 4.2-3***.

These road linkages will form the GMS Southern Corridor traversing Viet Nam, Cambodia, Thailand and Myanmar as shown in ***Figure 4.2-4***.

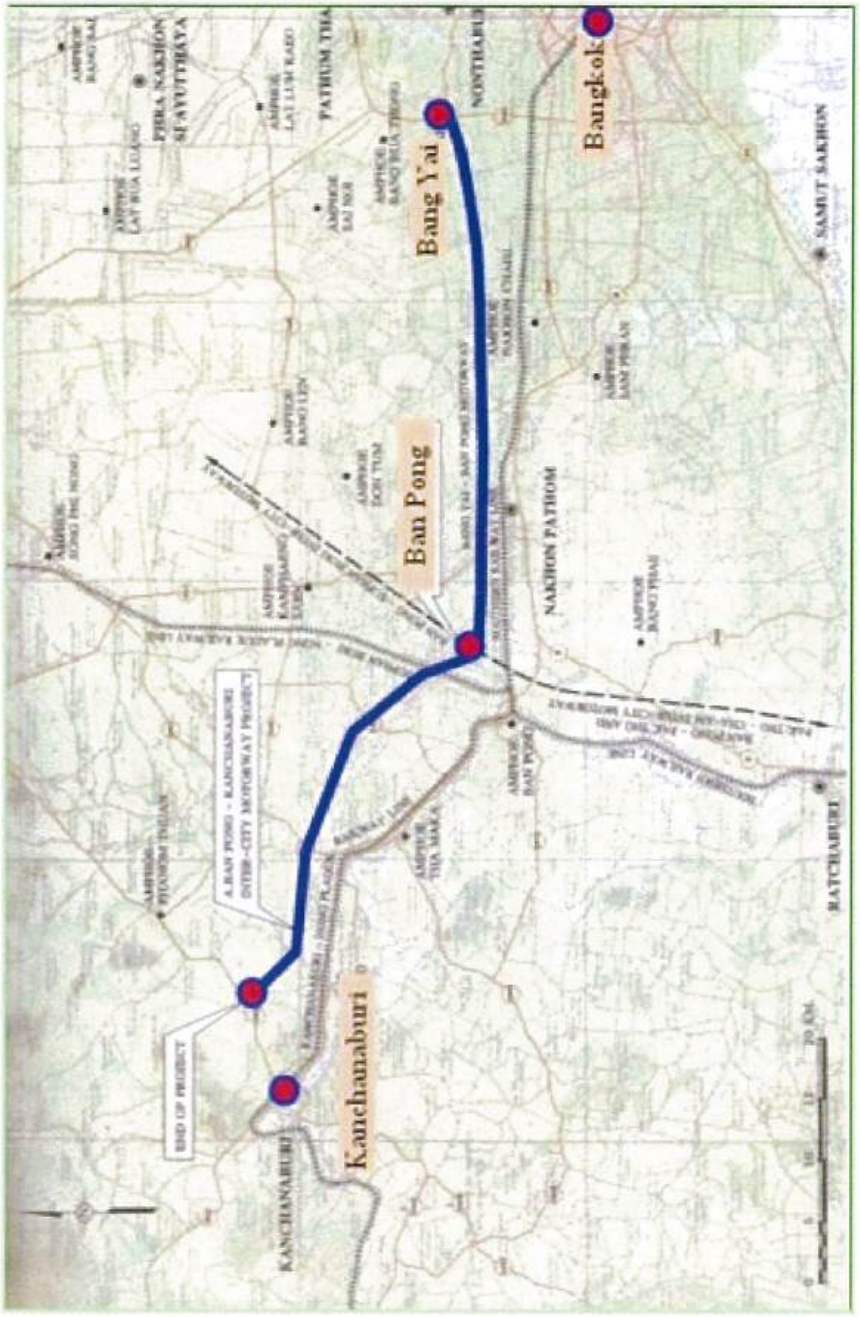


FIGURE 4.2-1 : THE NEW MOTORWAY FROM BAN PHU NAM RON TO KANCHANABURI PROVINCE

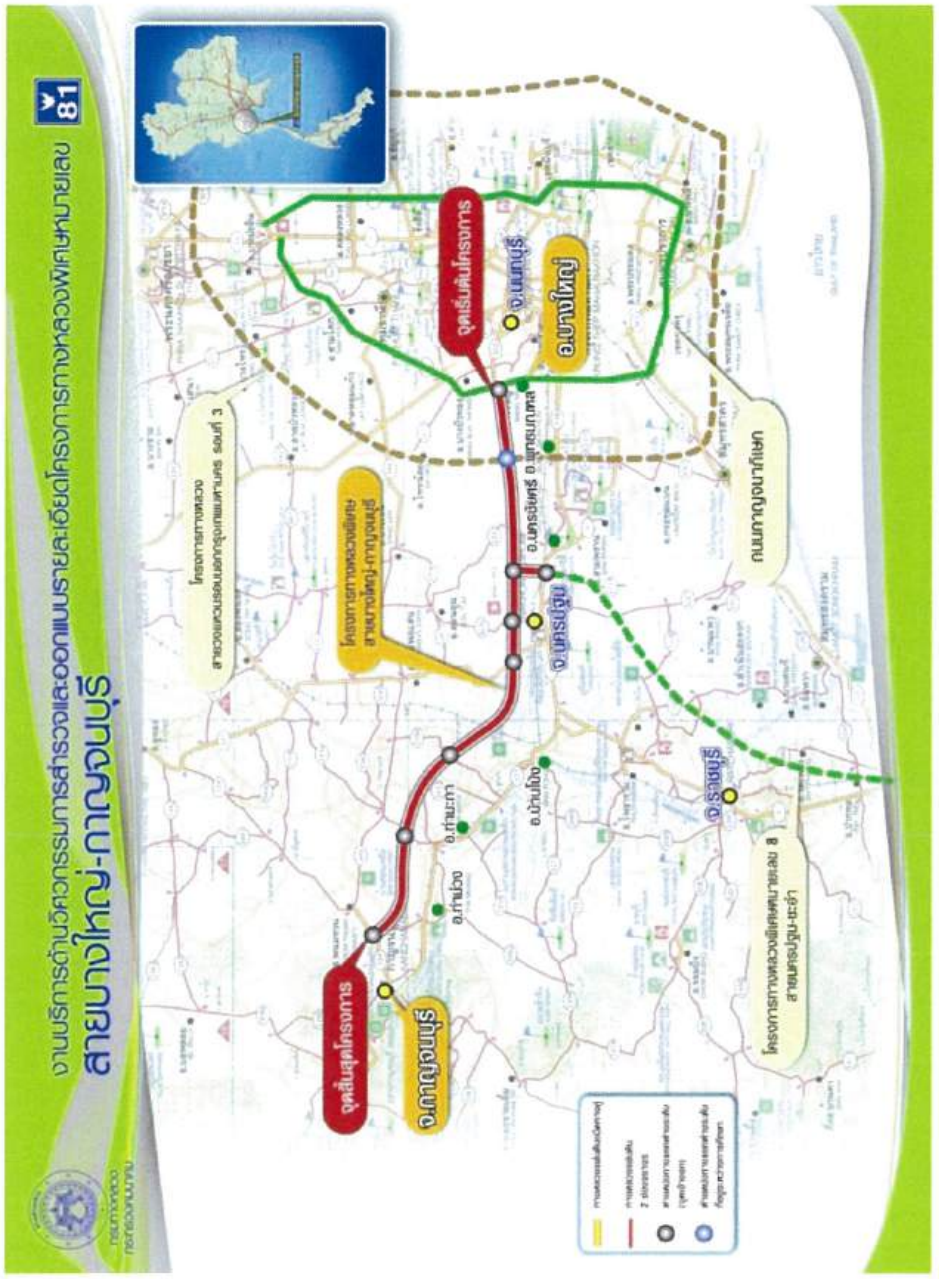


FIGURE 4.2-2 : PROPOSED ROUTE OF THE MOTORWAY NO.81-BANGYAI- KANCHANABURI

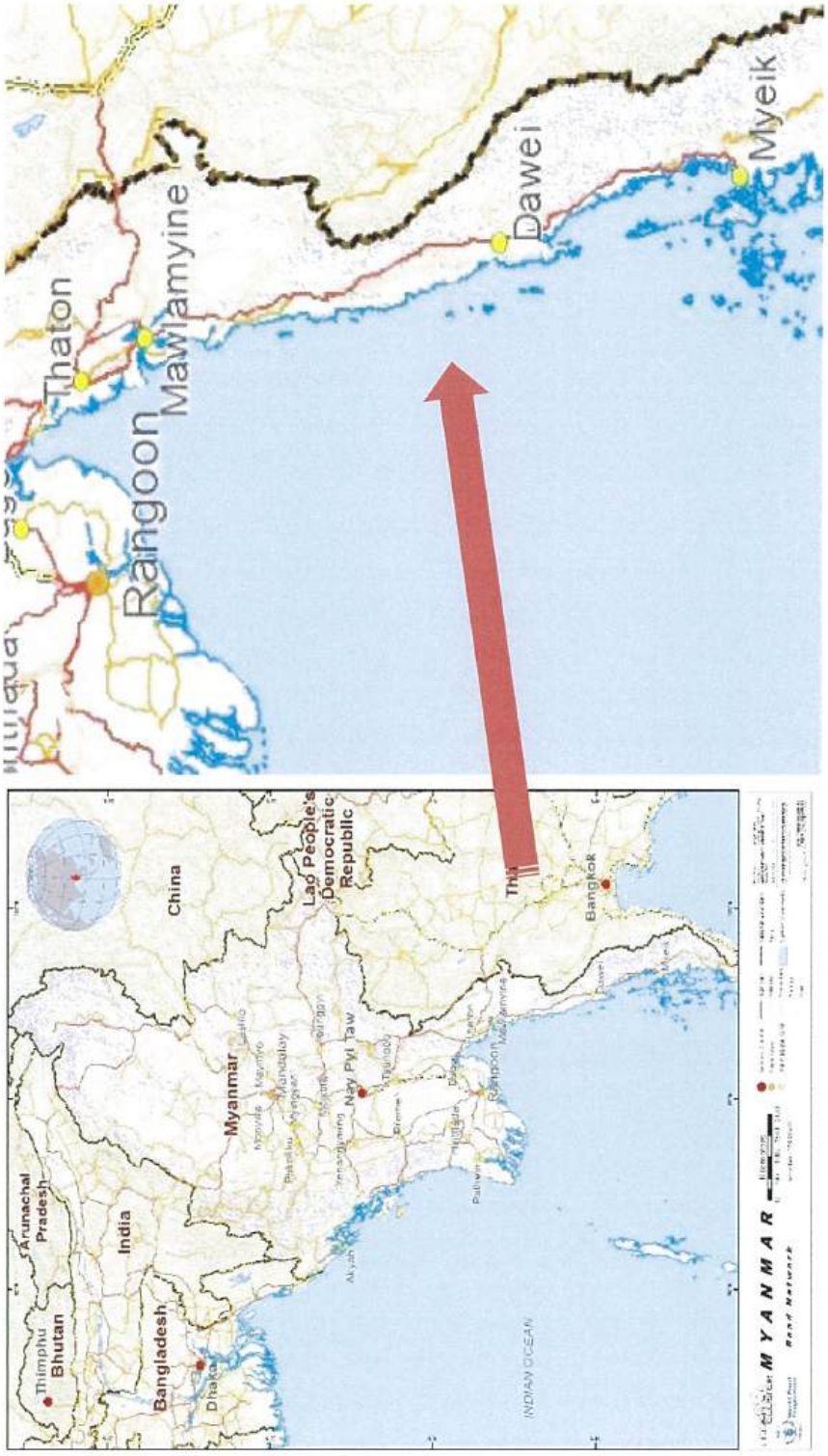


FIGURE 4.2-3 : MYANMAR'S NATIONAL HIGHWAY ROUTE NO.8

FIGURE 4.2-4 : GMS SOUTHERN CORRIDOR

4.2.2 Project Description and Alternatives

4.2.2.1 Project Overview

The Project will upgrade the existing two-lane un-paved road from the Thai border to Dawei SEZ by providing asphaltic road surface based on Class 4 of the Highway Design Standards of the Department of Highways (DOH), Thailand. The Project will also realign some sections of the existing road to improve its geometric design, and construct permanent bridges, and road side and cross drainage structure at sections crossing natural water courses or cutting across the direction of surface runoff. The Project will maintain the existing alignment as much as possible (see ***Figure 4.2-5***).

4.2.2.2 Project Alignment and Sections

The Project road will have a total length of about 138 km. The road will have a traffic surface width of about 7 m consisting of two traffic lanes, each with 3.5 m width, and 1 m paved shoulder on each side (7 to 9 m road type). The right-of-way ("R.O.W") will be 40 m. A typical cross section of the road is shown in ***Figure 4.2-6***.

The existing road is divided into three sections for construction and maintenance management.

Section 1-Sta. 18+500 to 69+400

Section 1 is 50.9 km long. It starts from the west side of Dawei River at Sta. 18+500 north of Yebyu town and ends at Sta. 69+400. ***Figure 4.2-7*** shows the alignment of Section 1.

From its starting point at elevation about +7.00m MSL, Section 1 runs eastward intersecting National Highway No.8, Dawei-Ye, at around Sta. 20+700. After this intersection, the alignment runs through mountainous areas with steep slopes in parallel with a branch of Dawei River. The elevation steadily increases to about +397 m MSL. The section between Sta. 52+000 and Sta. 53+000 is mountainous terrain north of the Myitta Base Camp of ITD. Deep-cuts, high-fills, and also bridges are required in this area before the alignment crosses the Kamaung Twe River at around Sta. 67+437. The alignment then runs parallel to this river to the end of Section 1 at Sta. 69+400.

Section 2-Sta. 69+400 to Sta. 112+300

Section 2 is 42.9 km long extending from Sta. 69+400 to Sta. 112+300. ***Figure 4.2-8*** shows the alignment of Section 2. The alignment passes through mountainous terrains and crossing several valleys. The most difficult terrain is a 700 m section from Sta. 102+400 to Sta. 103+100 at the Elephant Cry Hill (Khao Chang Rong or Sin Ngo Taung) area. This particular alignment runs through steep slope mountainous terrain along the north bank of Tanintharyi River. The alignment goes uphill to cross the ridge of the mountain at Elephant Cry Hill with the peak elevation of +420 m MSL.

Section 3-Sta. 112+300 to Sta. 156+500

Station 3 is 44.2 km long extending from Sta. 112+300 to Sta. 156+500 at the end of the existing road. ***Figure 4.2-9*** shows the alignment of this last section. The alignment of Section 3 at the beginning is close to the Tanintharyi River. The overall terrain is rolling and mountainous areas with high mountains from Sta. 142+100 to 144+200 with the highest points at about +430 m MSL.

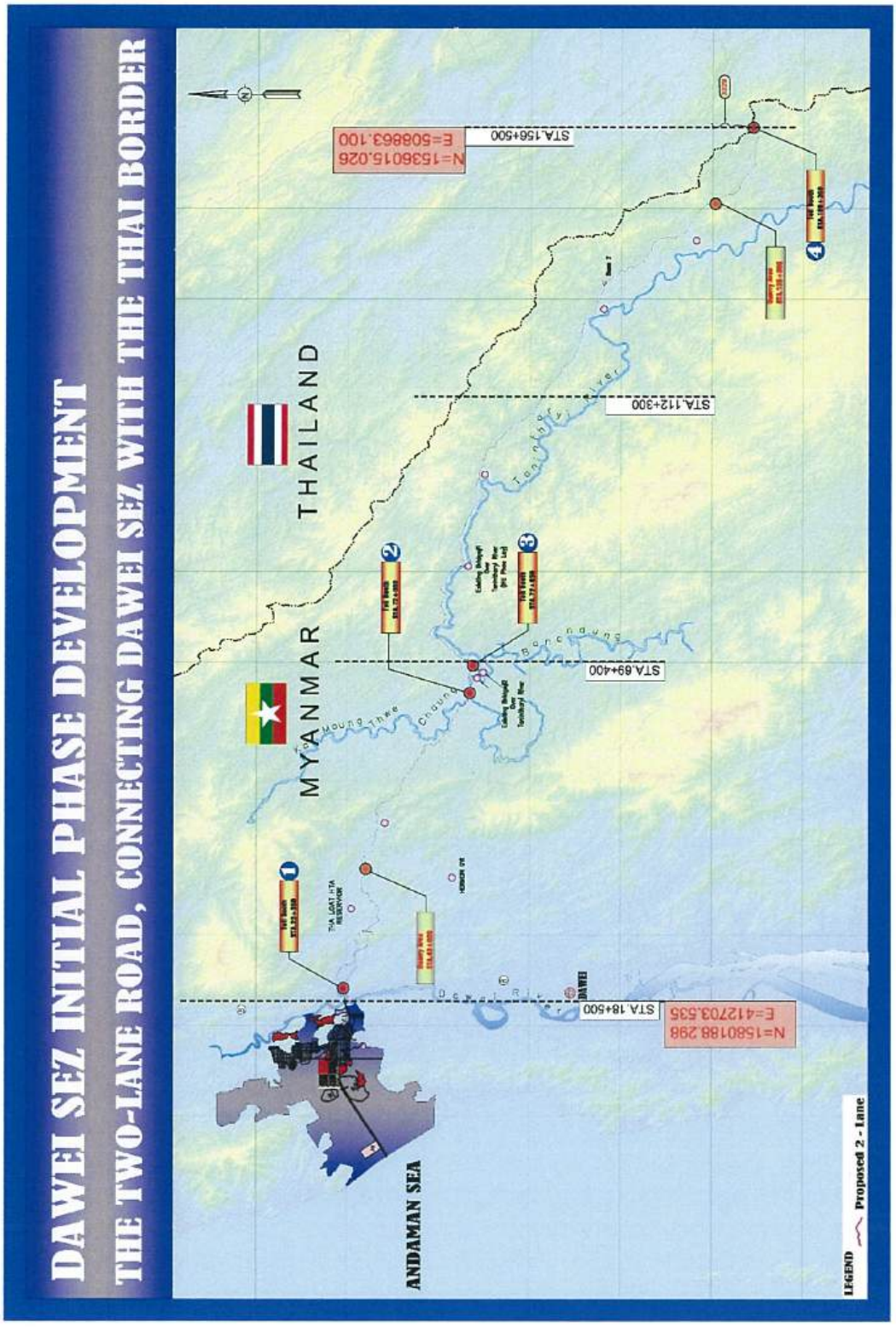


FIGURE 4.2-5 : THE TWO-LANE ROAD ALIGNMENT ON THE EXISTING ACCESS ROAD

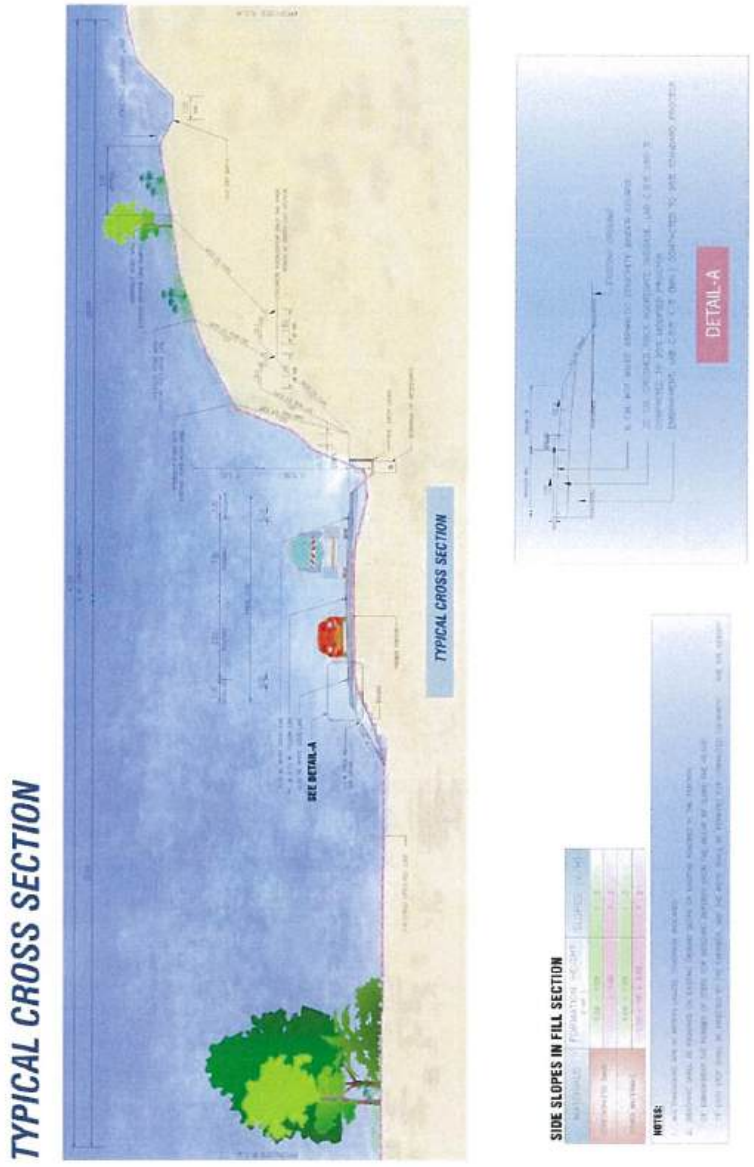


FIGURE 4.2-6 : TYPICAL CROSS SECTION OF TWO LANE ROAD PROJECT

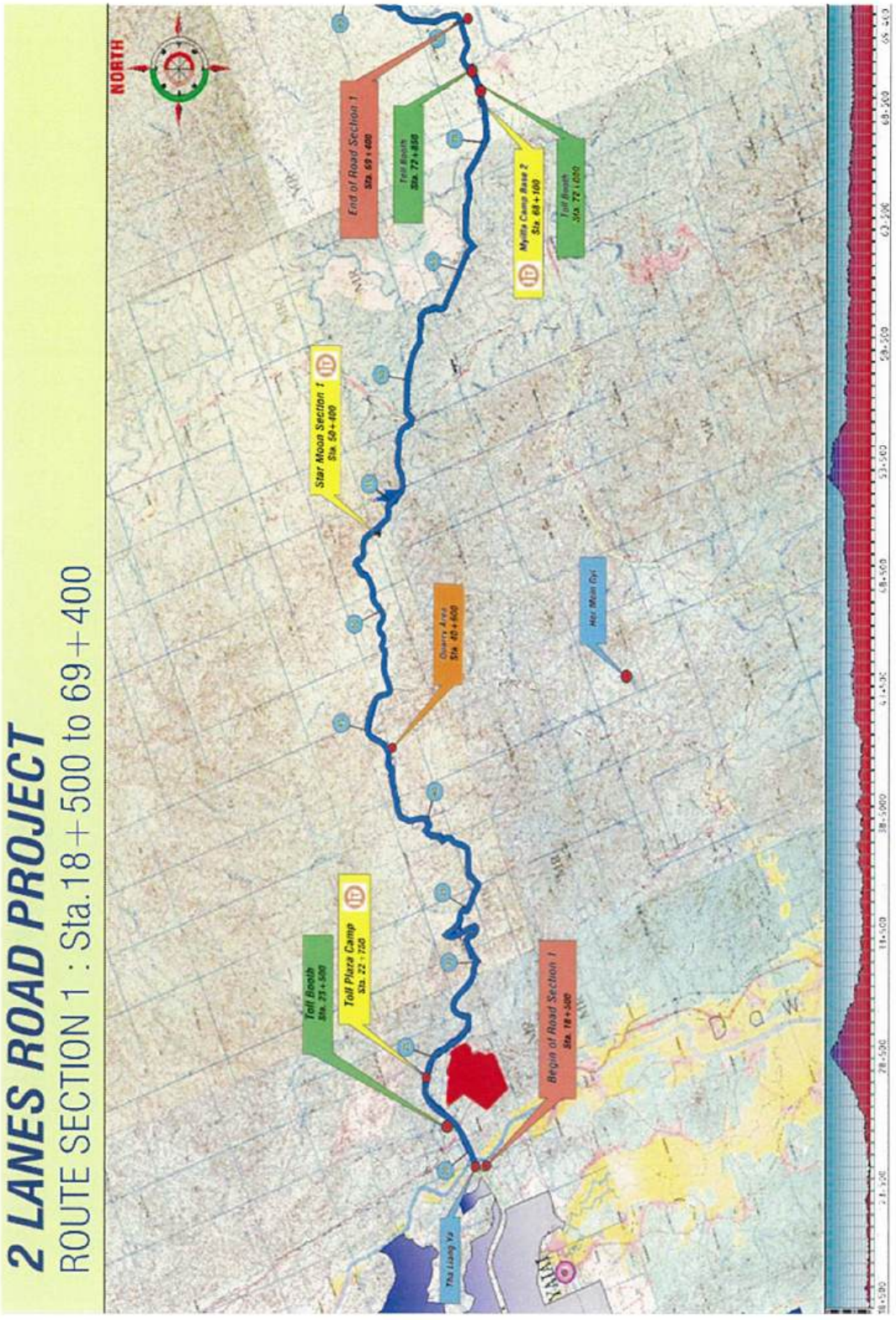


FIGURE 4.2-7 : THE TWO-LANE ROAD PROJECT-ROUTE SECTION 1 (KM 18+500-69+400)

FIGURE 4.2-8 : THE TWO-LANE ROAD PROJECT-ROUTE SECTION 2 (KM 69+400-112+300)

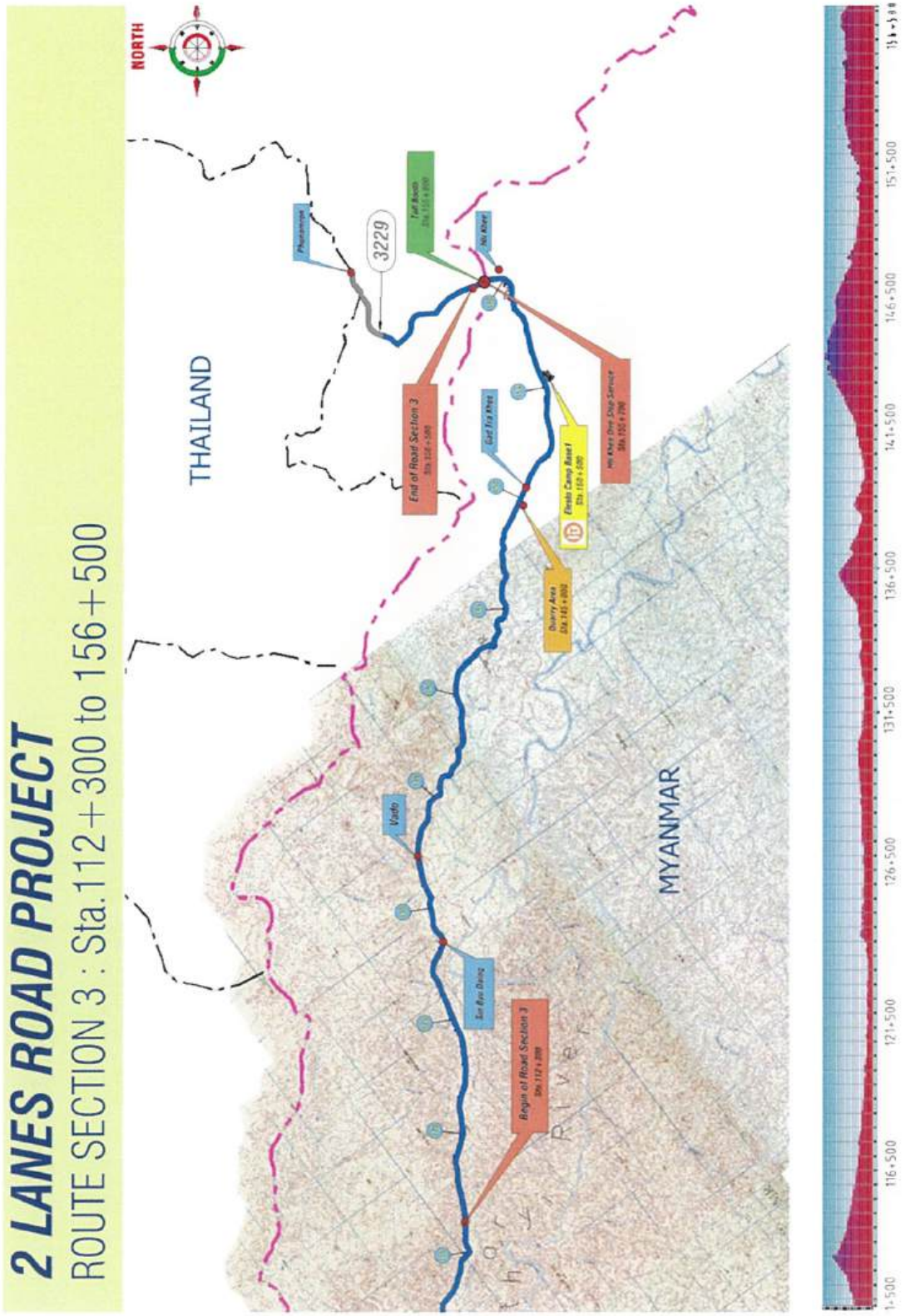


FIGURE 4.2-9 : THE TWO-LANE ROAD PROJECT-ROUTE SECTION 3 (KM 112+300-156+500)

4.2.2.3 Project Design

The project design is described in details in ***Appendix 4A***. Key information is presented below.

A. Geometric Design

The geometric design of the Project road follows the Standard of Highways in Thailand. In addition, the design will also follow applicable international standards such as those prescribed in AASHTO Standard "A Policy on Geometric Design of Highways and Street" 2004. In particular, Class II of ASEAN Highway design standards and Class IV of the Highway Design Standards of the Department of Highways (DOH), Thailand will be considered and adopted. The proposed geometric design standards are shown in ***Table 4.2-1***.

TABLE 4.2-1

THE PROPOSED GEOMETRIC DESIGN STANDARDS FOR TWO LANE ROAD PROJECT

Description	Terrain classification		
	L	R	M
Design speed, km/hr	70-90	55-70	40-55
Lane Width, m	3.50	3.50	3.50
Outer Lateral Clearance, (Shoulder), m	1.00	1.00	1.00
Minimum Horizontal Curve Radius, m	110	75	50
Maximum Super-elevation	10%		
Maximum Gradient	4%	8%	12%
Bridge Roadway Width, m	11.00	11.00	11.00
Vertical Clearance, m	5.00	5.00	5.00
Type of Pavement	Asphalt		

Note: 1. Abbreviation: L = Level Terrain M = Mountainous R = Rolling Terrain

Generally, the Two- lane Road will meet all requirements of the above design standards. However, as the Project is planned as the initial development phase with further upgrading in the future and it is necessary to keep the investment at a feasible level, the Project will adopt 8% and 12% maximum gradients in the rolling and mountainous terrains, respectively.

B. Bridge and Viaduct Structural Design

The structural design of bridges and viaduct structures is based on AASHTO LRFD Bridge Design Specifications and HL-93 standard highway loading. Certain issues are considered in the adopted design criteria such as loads of Chinese trucks, earthquake, and wind load. In addition, the additional level of Live Load of 1.3x HS20-44 is also adopted in addition to HL-93 to ensure that the bridges are designed to safely carry all types of heavy transport vehicles from Thailand and surrounding areas during and after the construction. It is recognized that this level of design load will be sufficient for all vehicles permitted in Thailand for bridges with spans less than 15 m.

C. Facilities and Infrastructure

The Project road will be operated as a toll road with controlled access and toll booths. In this regard, toll and access control facilities will be constructed at four locations along the road as shown in ***Figure 4.2-10***. The facilities will include:

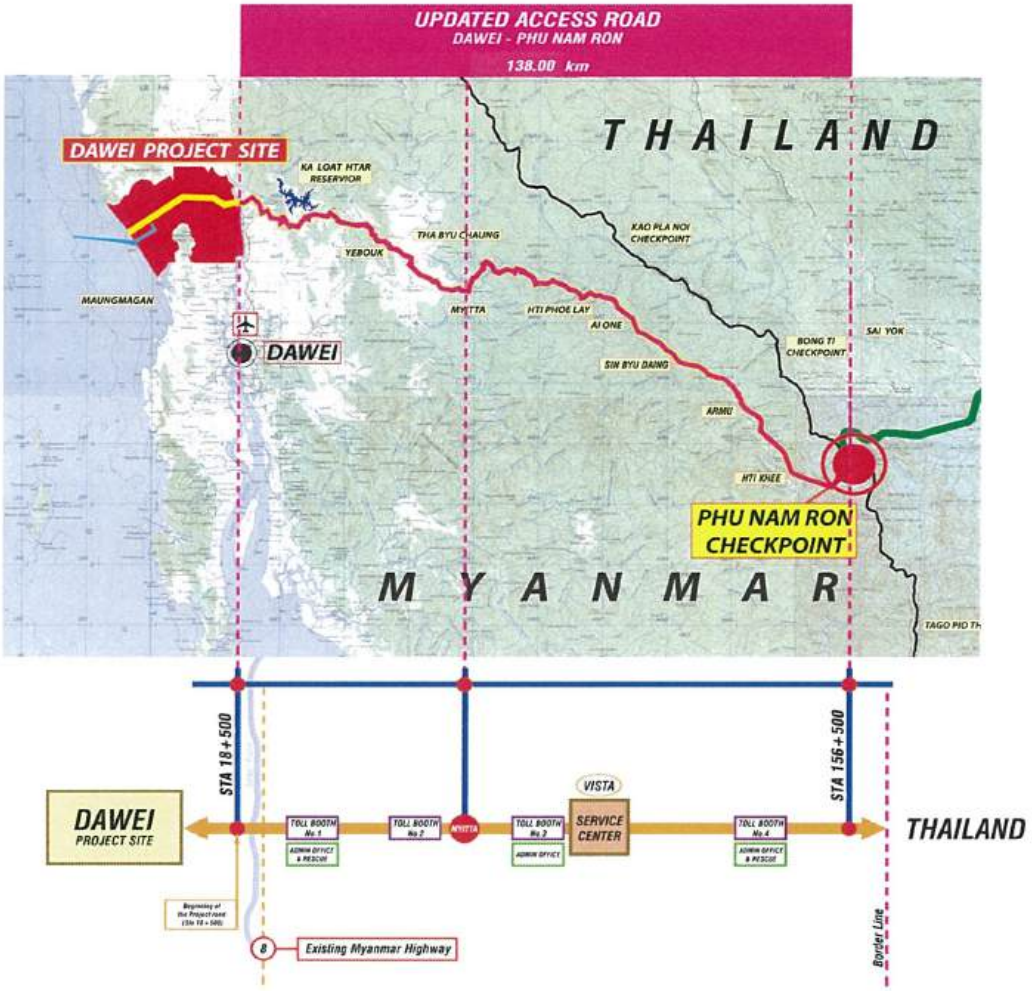


FIGURE 4.2-10 : THE TWO-LANE ROAD PROJECT-ROUTE SECTION 1 (KM 18+500-69+400)

(1) Four toll booths at four locations

- Booth 1 to be located at approximately KM 21+000-the first entrance to DSEZ from Thailand;
- Booth 2 to be located at approximately KM 66+200 in Myitta area;
- Booth 3 to be located at approximately KM 69+433 in Myitta area;
- Booth 4 be located at approximately KM 155+700, namely "Hti Hkee". It is the first entry gate from the Thai border.

The conceptual design of toll booths is shown in ***Figure 4.2-11*** and the locations of toll booths are shown in ***Figure 4.2-12***.

(2) Administration and rescue building as shown in Figure 4.2-13.

- Location 1 at KM 21+000;
- Location 2 and 3 at KM 66+200 and 69+433;
- Location 4 at KM 155+700 (Hti Hkee)

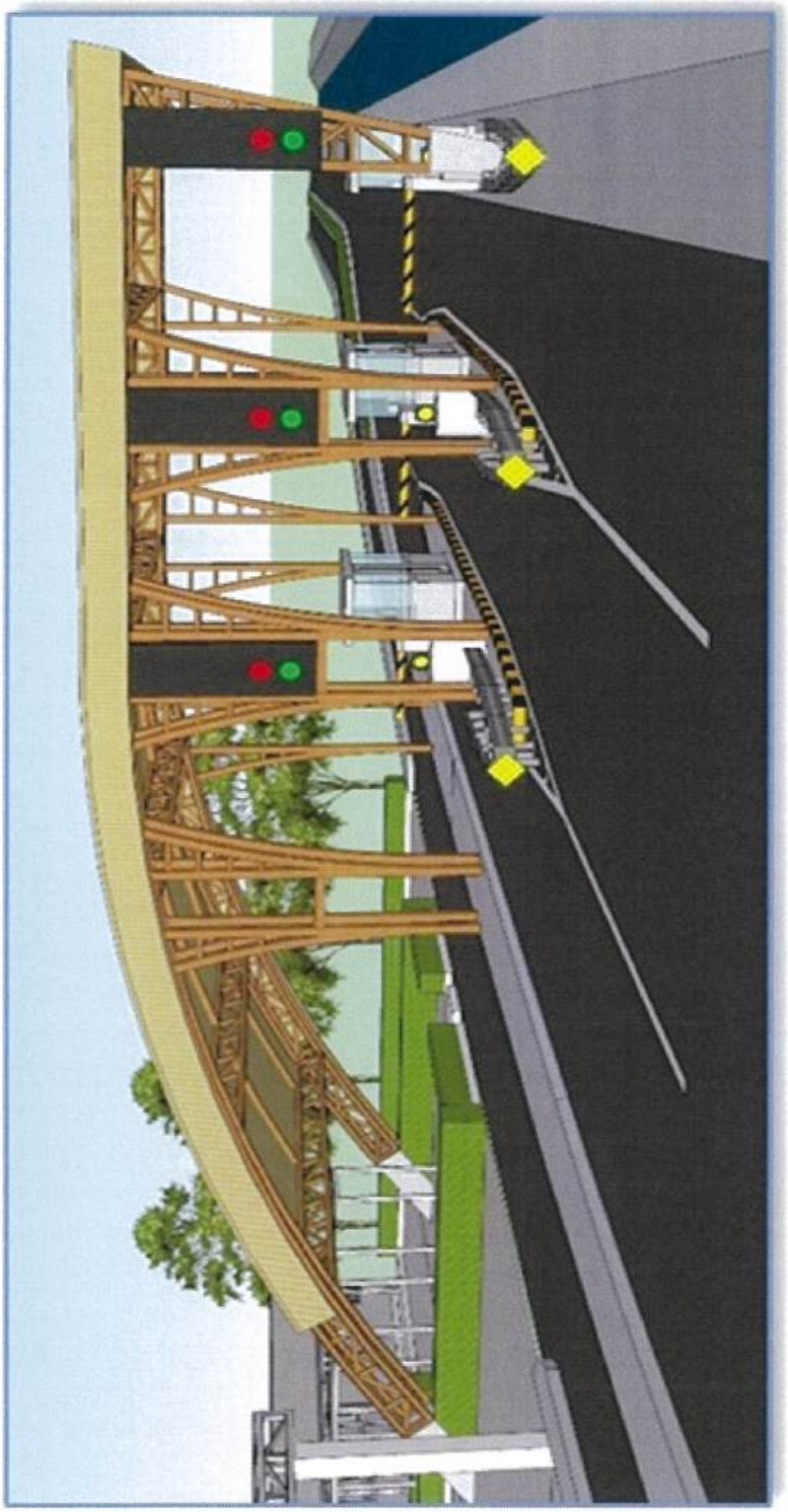
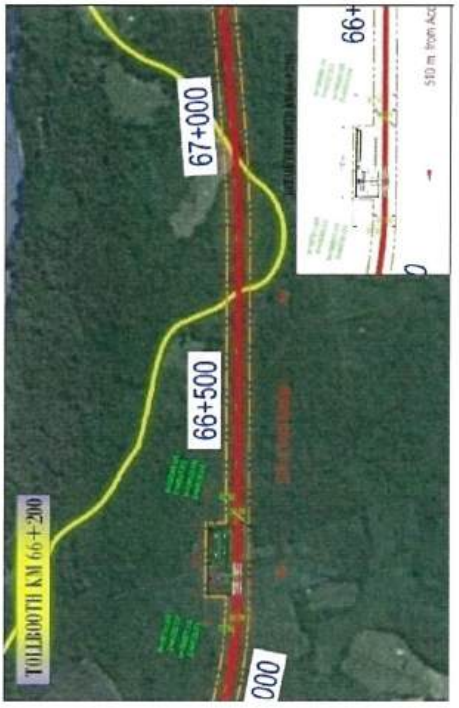
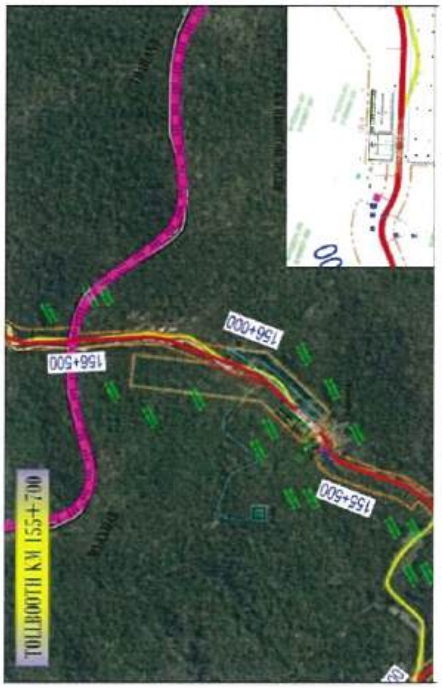


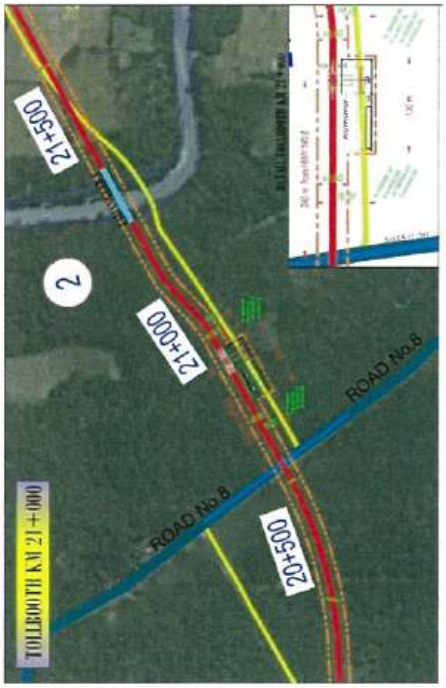
FIGURE 4.2-11 : CONCEPTUAL DESIGN OF TOLL BOOTH



Toll Booth at KM 66+200



Toll Booth at KM 155+700



Toll Booth at KM 21+000

Toll Booth at KM 69+433

FIGURE 4.2-12 : LOCATION OF TOLL BOOTHS

FIGURE 4.2-13 : ADMINISTRATION AND RESCUE BUILDING ILLUSTRATION AT KM 155+700 (HTI HKEE)

(3) Rest area (service center)

The rest area or service center will be developed at KM 79+700. Its conceptual layout is shown in ***Figure 4.2-14***.

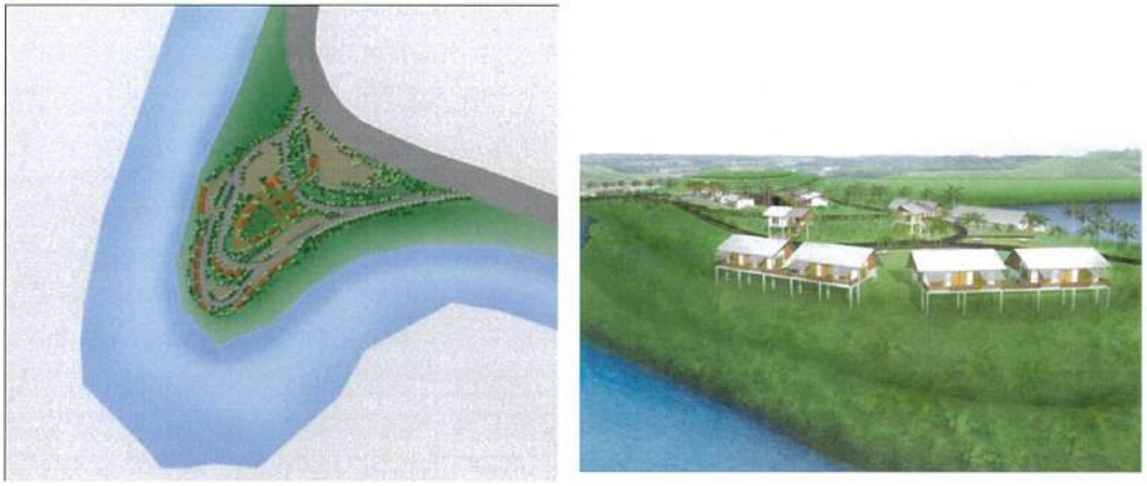


FIGURE 4.2-14 : CONCEPTUAL DESIGN OF REST AREA (SERVICE CENTER) AT KM 79+700

(4) Vista point

The vista point will be in the rest area (service center) at KM 79+700, about halfway along the road. This location offers beautiful views and scenery of Tanintharyi River and the untouched forest. A conceptual design of the vista point is shown in ***Figure 4.2-15***.

FIGURE 4.2-15 : CONCEPTUAL DESIGN OF VISTA POINT AT KM 79+700

D. Slope Stability and Erosion Control

For the Detailed Design of Two Lane Road Project, various design standards are adopted as follows;

1) ASEAN Highway Design Standard
2) AASHTO
3) Myanmar Technical Standard for Highway Design
4) Highway Capacity Manual
5) Department of Highway , Thailand

In case of drainage design, the project has design criteria as follows;

1. Hydrological Criteria

- Designed Run Off Flow Rate Calculation Method

  For less than 25 km^2 watershed area

  - Rational Formula Method

  For greater or equal to 25 km^2 watershed area

  - Unit Hydrograph method
  - Frequency Analysis of flow rate with Gumbel Method

- Return Period of Designed Maximum Run Off Flow Rate

  Return period of designed maximum flow run off rate for each drainage structure will be determined as follows.

  - 10 years return period for pipe culvert design
  - 20 years return period for reinforced concrete box culvert design
  - 50 years return period for reinforced concrete bridge design
  - 5 years return period for longitudinal drain design

2. Hydraulic Design Criteria

- Preliminary criteria for each drainage structure determination to drain side flow of project route which consists of bridge, pipe culvert, and box culvert are as follows:

(i) Bridge will be used where:

- The water way width is greater than 6.00 m. or the depth is deeper than 3.00 m.
- The area is perennial stream or navigation
- The irrigation canal is crossed by project route
- The reservoir is crossed by project route
- The appropriate or consistent with the design of the road

(ii) Box Culvert will be used where:

- The water way width is less than 6.00 m and the depth is less than 3.00 m
- The area has obvious water channel shape with non-navigation

(iii) Pipe Culvert will be used where:

- The unobvious drainage channel is crossed by project route or the plain with small watershed is crossed by project route.
- The farm ditch or road drainage is crossed by project route

- Factor of safety for designed peak flow is determined at 1.2 min.
- The drainage velocity for full pipe flow is designed at 0.6-3.0 m/s
- Opened channel flow calculation is applied with Manning's Equation Technique
- Bridge design is according to the increasing water due to narrowed water channel and bridge pier construction
- Culvert design is according to the increasing water due to friction loss and minor loss (Inlet Transition, Outlet Transition ,Entrance Loss, Exit Loss)
- Backwater elevation due to drainage structure (Bridge and Culvert) shall not exceed 0.30 m.

3. Designed Flow Rate Calculation

Designed run off flow rate calculation of the project will be applied with three (3) techniques: Rational Formula, Unit Hydrograph and Frequency Analysis of flow rate.

- **The Analysis of IDF Curve for the Project Route**

Because the rainfall station in Myanmar does not have the analysis of IDF curve. Therefore, there is applying from the IDF curve of rainfall station in Thailand.

- **Collected Rainfall Data**

The analysis of rainfall Intensity-Duration-Frequency (IDF curve) of Ranong rainfall station and Kanchanaburi rainfall station collected from Royal irrigation department of Thailand will be conducted.

The Daily rainfall data at Dawei rainfall station has been collected from Meteorology office in Dawei. The annual rainfall and Annual Maximum one (1) day Rainfall data at Myeik rainfall station was collected from Feasibility Study of Tanintharyi Hydropower Project Report.

Daily rainfall data at Rainfall stations in Thailand also has been collected from Meteorological Department of Thailand by selecting only the rainfall station located in provinces bordering with the Union of Myanmar in 18 stations.

- **Analyses of Rainfall Data**

Analysis of the average annual rainfall and the average annual maximum one (1) day rainfall of rainfall stations in Thailand and Myanmar will be performed.

The design of Highway Drainage for this project road is quite necessary to be carefully evaluated as most distances are along the mountainous area with the rainfall duration and intensity is normally higher than average. Identification of the size for drainage structure must be somewhat conservative for unexpected heavier flood and drainage along the side slope has to be especially cared. There are several main water channels that intersect the alignment in this section. The bridges are designed cross over these channels as shown in ***Photo 4.2-1 – 4.2-5***,

- Multiple box culverts cross under the project road with sizes varied from 2.40 x 2.40 m to 3.00 x 3.00 m are used for all water flow area.
- Multiple pipe culverts cross under the project road with size varied from 0.80-m to 1.50-m diameter are utilized for all tentative water flow area.

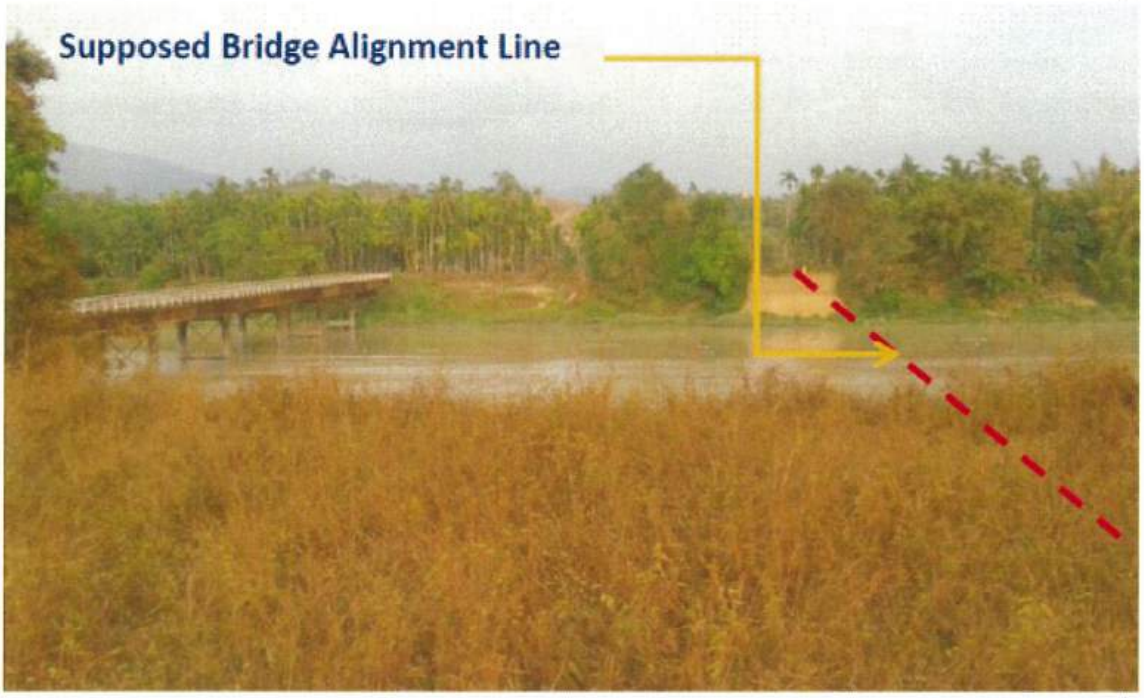


PHOTO 4.2-1 : DAWEI RIVER AT STA.16+885

PHOTO 4.2-2 : TALAING YA CHAUNG AT STA. 19+271

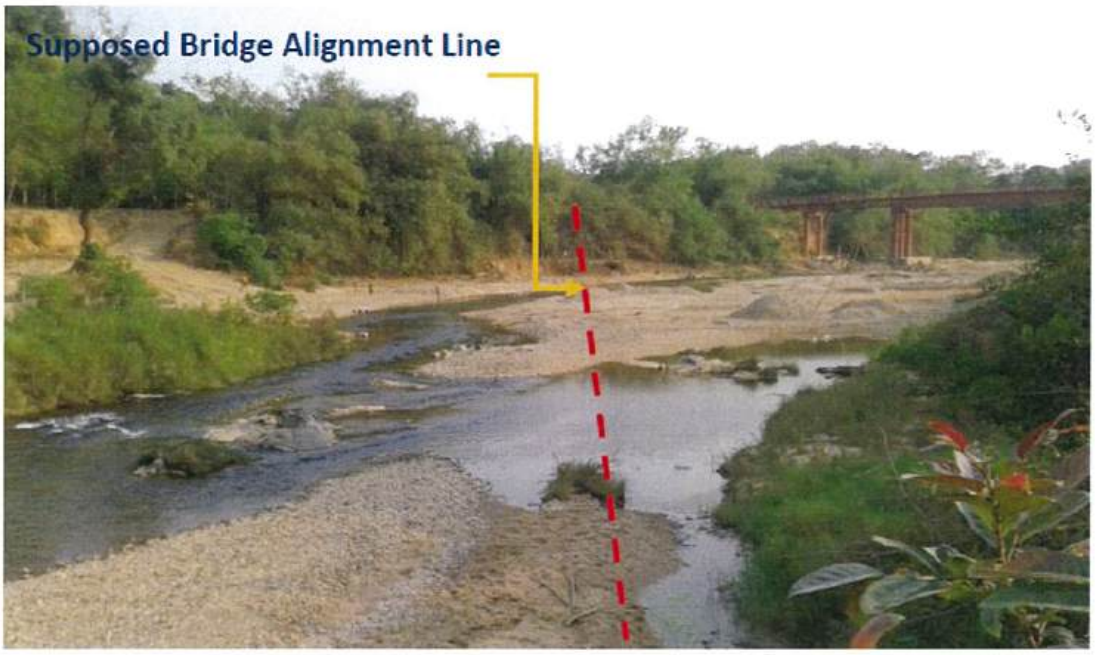


PHOTO 4.2-3 : TALAING YA CHAUNG AT STA. 21+933

PHOTO 4.2-4 : KYAUK ME DAUNG AT STA.66+397

PHOTO 4.2-5 : KA MAUNG THWE CHAUNG AT STA.68+596

The size of drainage structures within project RoW in each location is presented in ***Table*** below;

Item	Description	Length (m.)	Unit	Remark
4	**Drainage Works (Section 1)**			
4.1	**RCP. Pipe**			
	Pipe Culvert 0.60 m	91	m.	
	Pipe Culvert 0.80 m	347	m.	
	Pipe Culvert 1.00 m	707	m.	
	Pipe Culvert 1.20 m	2,200	m.	
	Total RCP.Culvert Section 1	**3,345**	**m.**	
	Drainage Works (Section 2)			
	RCP. Pipe			
	Pipe Culvert 0.60 m	904	m.	
	Pipe Culvert 0.80 m	873	m.	
	Pipe Culvert 1.00 m	699	m.	
	Pipe Culvert 1.20 m	543	m.	
	Total RCP.Culvert Section 2	**3,019**	**m.**	
	Drainage Works (Section 3)			
	RCP. Pipe			
	Pipe Culvert 0.60 m	606	m.	
	Pipe Culvert 0.80 m	550	m.	
	Pipe Culvert 1.00 m	368	m.	
	Pipe Culvert 1.20 m	1,368	m.	
	Total RCP.Culvert Section 3	**2,892**	**m.**	

Considering the design criteria and design standards for drainage system of the Project finding show that the Project has been adopted various design standards are ASEAN Highway Design Standard, AASHTO, Myanmar Technical Standard for Highway Design, Highway Capacity Manual, and Department of Highway's Thailand. The drainage system designed with the return period of 5 year for longitudinal drainage, and 50 years for reinforced concrete bridge with cross the large rivers or canals. Therefore, the drainage system is capable for the maximum run-off or storm water which might occur in the project area every 5 years (At least) or longitudinal drainage, and 50 years for reinforced concrete bridge. Moreover, the Project has been design with Safety Factor of 1.2 or 120% of maximum run-off or storm water to ensure that the drainage system is sufficiently and appropriately.

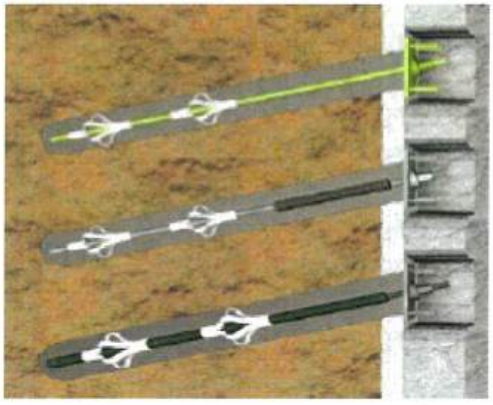
E. Slope Stability and Erosion Control for Two Lane Road Project

According to the Detailed Design Plan for Two Lane Road Project, the Project has proposed the mitigation measures on slope stability and erosion control as follow;

Where the road passes through mountainous area, deep cut and high fill is unavoidable. When the road embankment is higher than 3 meters or cut slope is higher than 5 meters, those slopes shall encounter of slope stability and erosion problems. Even though the design of slope follows the specified safety slope for particular soil conditions, it still also encounters erosion problems of the slope surfaces unless those slopes are well protected by erosion control system, such as sodding, hydro seeding, grassing or other special protection systems. The slope surface may be eroded, particularly during the rainy season, the high erosion of slope surface and the instability of the slopes may lead the slope surface collapse.

In addition, if it is very deep cut or very high fill, the road also needs a wide right of way causing the problem of forest destruction and environmental impacts. To avoid these problems, the designs of the side slope and back slope are steeper than the specified safety slope rate of the particular soils. The problems of right of way and environmental impact can be avoided by increasing slope stability with special techniques depending upon soil conditions and height of cut or fill. For example, soil nailing system is proper for deep cut (***Figure 4.2-16***) and the Geogrid or MSE wall soil reinforcement is proper for high fill. The Gabion Wall can be applied both side slope and back slope (***Figure 4.2-17***).

Soil Nailing Construction Techniques



Soil Nailing Reinforcement Details

Soil Nailing Application

FIGURE 4.2-16 : EXAMPLE OF SOIL NAILING SYSTEM

Gabion Retaining Wall of Back Slope

Gabion Retaining of Side Slope

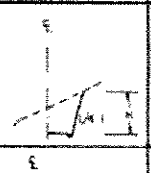
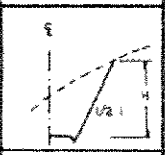
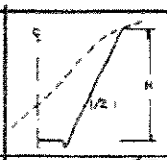
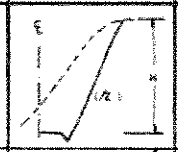
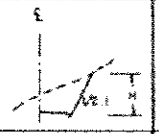
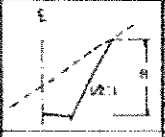
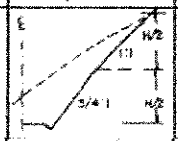
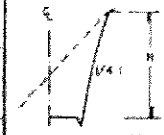
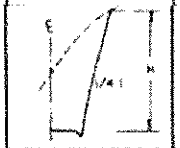
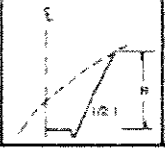
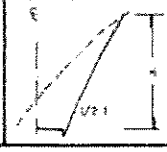
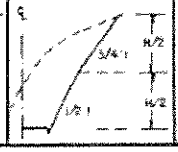
Gabion Wall Together with Grassing

FIGURE 4.2-17 : EXAMPLE OF GABION RETAINING WALL FOR SIDE AND BACK SLOPE

The additional criterion to make the preliminary unstructured slope cuts is developed as seen in ***Table 4.2-2***. It is based on 40-m wide roadway, the estimated general thickness of soil, completely weathered zone and thickness of highly to moderately weathered zone. The actual conditions may vary from place to place which shall be determined during construction.

TABLE 4.2-2

RECOMMENDED SLOPE
(HORIZONTAL DISTANCE, VERTICAL DISTANCE)

TYPE OF MATERIAL	RECOMMENDED SLOPE (HORIZONTAL DISTANCE, VERTICAL DISTANCE)				OBSERVATIONS
	Up to 5 m	From 5 m to 10 m	From 10 m to 15 m	Greater than 15 m	
Slightly weathered tuffs and brecciated, rhyolitic, andesitic or basaltic tuffs					Removal of the upper part of the crest at ¾:1 is recommended if there is intense fracturing or weathering
Highly weathered tuffs and brecciated, rhyolitic, basaltic or andesitic tuffs.					Change in slope half way up cuts deeper than 15 m
Fractured limestone with thick or poorly defined stratification dipping toward the cut					Removal of the weathered or very fractured upper portion of the crest at 1:1 is recommended.
Sound limestones with thin horizontal stratification dipping toward the cut					Remove to 1:1 the upper portion

Cut shall be limited not higher than 30 m except for during peak time. Cut is to be made with neither retaining structures nor reinforcement. Actual cut slope gradient varies with type of earth material existing along height of cut. It is to be determined in the field during construction.

Typical cut slope gradient and height for slope with no retaining structures can be designed as seen in ***Figure 4.2-18***.

Typical cross sections of Two Lane Road both back slope (cut section) and toe slope (fill section) are shown in ***Figure 4.2-19***. In case of back slope section, concrete receptor shall be constructed as shown in ***Figure 4.2-19*** while toe slope section would cover with grass planting in order to alleviate soil erosion problem.

In addition, cut shall be limited not higher than 30 m. Cut is to be made with neither retaining structures nor reinforcement. Actual cut slope gradient varies with type of earth material existing along height of cut. It is to be determined in the field during construction.

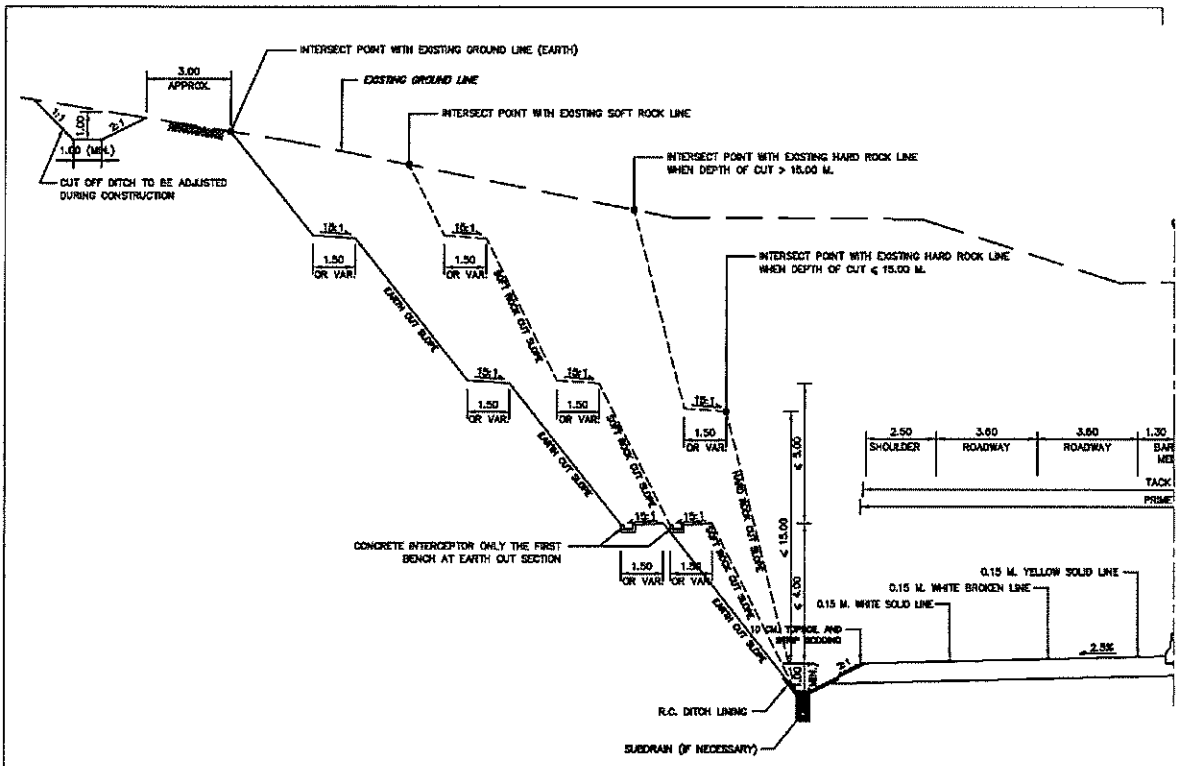


FIGURE 4.2-18 : TYPICAL CUT SLOPE WITH NO STRUCTURES DESIGN

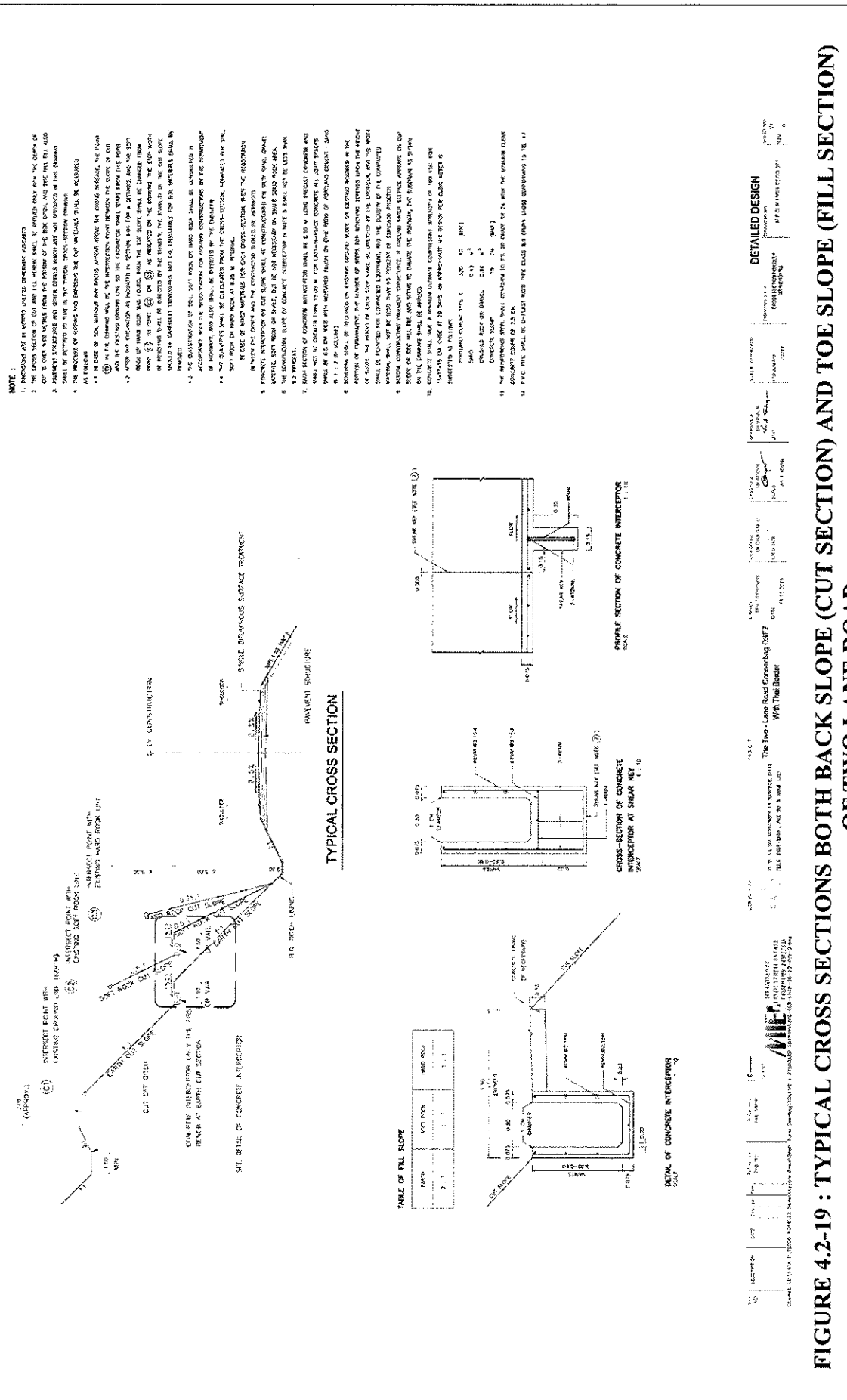


FIGURE 4.2-19 : TYPICAL CROSS SECTIONS BOTH BACK SLOPE (CUT SECTION) AND TOE SLOPE (FILL SECTION) OF TWO LANE ROAD

Cross section for turbulence area is shown in ***Figure 4.2-20*** while gabion wall which adapt for toe slope section of Two Lane Road Project is shown ***Figures 4.2-21***.

In addition, cut shall be limited not higher than 30 m except for during peak time. Cut is to be made with neither retaining structures nor reinforcement. Actual cut slope gradient varies with type of earth material existing along height of cut. It is to be determined in the field during construction.

Location of deep cut and high fill which use grass plantation as strip sodding is presented in ***Table 4.2-3***.

Erosion Control

Where the road passes through mountainous area, deep cut and high fill are unavoidable the protection against erosion and slope collapse is needed. The well protection slope cannot only to prolong the road lifetime but also to lessen the accidents, maintenance cost and environmental impacts. The erosion control system is mainly to control the surface water which a big cause of the erosion. Generally, the erosion control systems are composed of: concrete ditch lining longitudinally, interceptor ditch on back slope berms, and concrete head wall for pipe converts, bridge slope protection, sodding, various types of slope protection i.e. concrete cribs work mixed with grassing, etc.

Drainage System for Erosion Control

Both surface water and underground water are the major causes of highway erosion and slope stability problem. To control the surface water along the slope surface in both back slope and side slope, Interceptor Ditch shall be installed on cut berm, concrete curb on outside edge shoulder of high embankment, as well as horizontal Drain or Subdrain to control underground water.

- A.C. Outlet Drain Chute for Culvert on Fill slope to control surface erosion on full slope in case of culvert outlet end is above the toe of slope
- Concrete Curb on High Fill with Drain Chute to control surface erosion on fill slope.
- Longitudinal Ditch Lining shall be concrete ditch lining, mortar rip-rap to control of side slope erosion and road bed stability tog after with ditch check and drop inlet.
- Head Walls of Pipe Culverts to protect the side slope erosion due to strong flow of cross drain.
- Bridge Slope Protection, usually shall be concrete or mattress in order to protect the bridge abutment and fill at approach due to strong river flows; otherwise, the bridge abutment shall collapse.
- Slope Surfaces Protection, in case of deep cut (more than 5 meters) and high fill (more than 3 meters), the slope surfaces will be eroded by surface water at both back slopes and side slopes, particularly when the soil condition is erodible soil. If there is no slope protection, the gully may occur and finally the slope stability will fail. This phenomenon can be avoided by using the slope protection system.

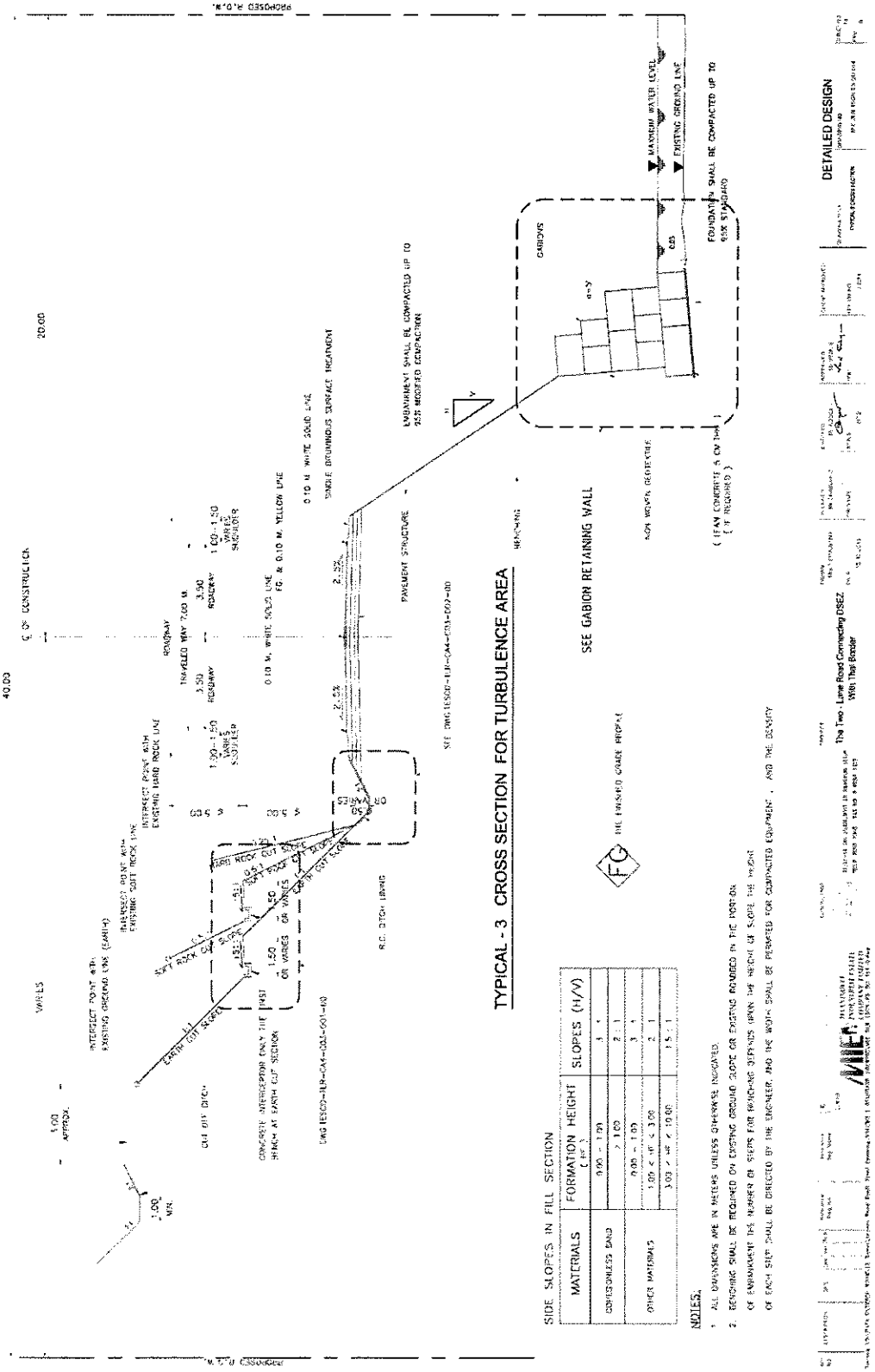


FIGURE 4.2-20 : CROSS SECTION FOR TURBULENCE AREA OF TWO LANE ROAD PROJECT

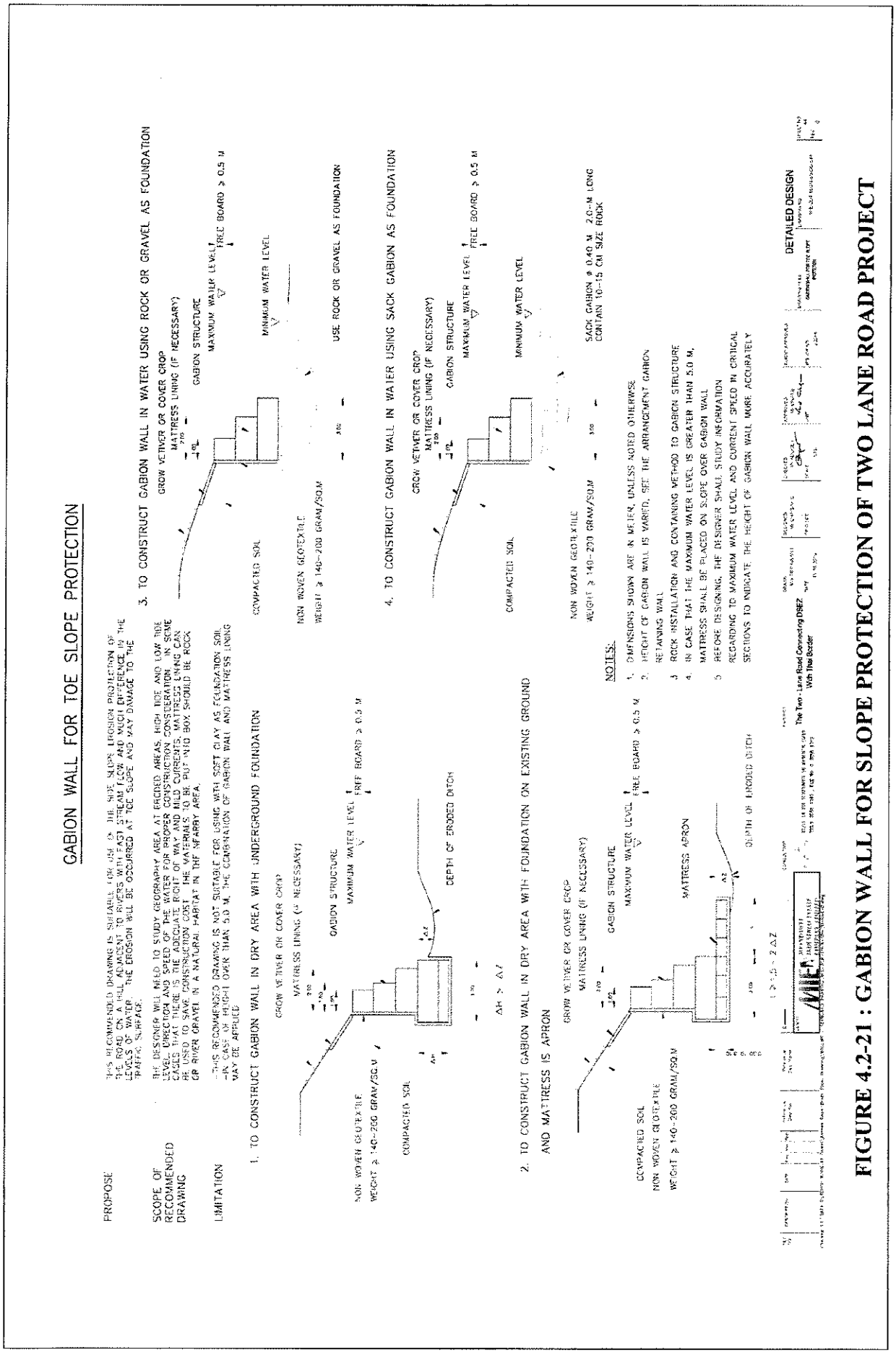


FIGURE 4.2-21 : GABION WALL FOR SLOPE PROTECTION OF TWO LANE ROAD PROJECT

TABLE 4.2-3

LOCATION OF DEEP CUT AND HIGH FILL WHICH USE GRASS PLANTATION AS STRIP SODDING OF TWO LANE ROAD PROJECT

Item	Description	Length (m.)	Total High (m.)	High		Area (m.2)	Remark
				LT. (m.)	RT. (m.)		
1	**Strip Sodding (Section 1)**						
1	16+458 to 16+750 /LT,RT	292	26	13	13	7,688	High Fill
2	17+025 to 17+325 /LT,RT	300	16	8	8	4,800	"
3	19+225 to 19+300 /LT,RT	75	24	12	12	1,824	"
4	19+300 to 19+775 /LT,RT	475	11	5	5	5,193	"
5	21+750 to 22+075 /LT,RT	300	17	5	11	5,065	"
6	24+900 to 25+000 /LT,RT	100	31	20	11	3,086	"
7	26+200 to 26+350 /LT,RT	150	31	16	16	4,689	"
8	26+550 to 26+625 /LT,RT	75	42	21	21	3,166	"
9	26+700 to 26+800 /LT,RT	100	22	11	11	2,213	"
10	26+925 to 27+100 /LT,RT	175	23	11	11	4,002	"
11	27+450 to 27+500 /LT,RT	50	9	5	5	471	"
12	30+125 to 30+200 /LT,RT	75	15	7	7	1,121	"
13	30+650 to 30+700 /LT,RT	50	16	8	8	823	"
14	31+250 to 31+425 /LT,RT	175	17	8	8	2,939	"
15	32+125 to 32+150 /LT,RT	25	16	8	8	404	"
16	32+650 to 32+850 /LT,RT	200	19	9	9	3,748	"
17	34+675 to 34+725 /LT,RT	50	14	7	7	715	"
18	35+125 to 35+325 /LT,RT	200	14	7	7	2,730	"
19	36+550 to 36+650 /LT,RT	100	22	11	11	2,238	"
20	37+125 to 37+200 /LT,RT	75	35	18	18	2,635	"
21	42+425 to 42+725 /LT,RT	300	12	6	6	3,510	"
22	43+425 to 43+475 /LT,RT	50	11	6	6	554	"
23	45+275 to 45+500 /LT,RT	225	9	4	4	1,980	"
24	49+650 to 49+725 /LT,RT	75	27	13	13	2,019	"
25	49+775 to 49+825 /LT,RT	50	14	7	7	684	"
26	50+025 to 50+075 /LT,RT	50	29	14	14	1,430	"
27	50+225 to 50+250 /LT,RT	25	22	11	11	560	"
28	42+425 to 42+725 /LT,RT	75	27	13	13	2,019	"
29	50+500 to 50+525 /LT,RT	25	20	10	10	508	"
30	50+600 to 50+700 /LT,RT	100	34	17	17	3,416	"
31	51+500 to 51+600 /LT,RT	100	37	18	18	3,688	"
32	53+300 to 53+400 /LT,RT	100	22	11	11	2,176	"
33	53+500 to 53+625 /LT,RT	125	17	9	9	2,184	"
34	53+975 to 54+000 /LT,RT	25	28	14	14	708	"
35	54+225 to 54+325 /LT,RT	100	13	6	6	1,299	"
36	54+775 to 54+975 /LT,RT	200	14	7	7	2,774	"
37	55+750 to 55+775 /LT,RT	25	20	10	10	499	"
38	56+025 to 56+075 /LT,RT	50	32	16	16	1,620	"
39	56+550 to 56+600 /LT,RT	50	23	11	11	1,127	"
40	59+725 to 59+900 /LT,RT	175	21	10	10	3,653	"
41	60+300 to 60+375 /LT,RT	75	16	8	8	1,167	"
42	62+150 to 62+275 /LT,RT	125	13	7	7	1,635	"
	Total					**98,761**	
2	**Strip Sodding (Section 1)**						
1	73+000 to 99+000 /RT	26,000	3	0	3	71,500	Beside The River
	Total					**71,500**	
3	**Strip Sodding (Section 3)**						
1.1	112+500 to 113+250 / LT	750	15	15		11,250	High Cut & Fill
1.2	120+300 to 120+350 / LT , RT	100	6	3	3	600	
1.3	121+400 to 121+600 / RT	200	10		10	2,000	
1.4	124+500 to 124+600 / LT , RT	100	20	10	10	2,000	
1.5	129+000 to 129+050 / LT , RT	100	6	3	3	600	
1.6	137+500 to 137+600 / LT	100	10	10		1,000	
1.7	137+700 to 137+800 / RT	100	10		10	1,000	
1.8	138+000 to 138+200 / LT	200	10	10		2,000	High Cut & Fill
1.9	138+400 to 138+500 / LT	100	10	10		1,000	
1.10	139+000 to 139+400 / RT	400	10		10	4,000	High Cut & Fill
1.11	139+600 to 139+650 / LT , RT	50	20	10	10	1,000	
1.12	139+950 to 140+100 / LT , RT	100	6	3	3	600	
1.13	142+500 to 144+000 / RT	1,500	20		20	30,000	Pubpa Hill / High Cut & Fill
1.14	146+100 to 146+200 / LT ,RT	100	20	10	10	2,000	
1.15	146+500 to 146+600 / RT	100	10		10	1,000	
1.16	150+600 to 150+700 / LT , RT	100	6	3	3	600	
1.17	151+500 to 151+750 / LT , RT	250	12	6	6	3,000	Base 1 Hill / High Cut & Fill
1.18	152+500 to 152+550 / LT , RT	50	10	5	5	500	
1.19	153+500 to 153+550 / LT , RT	50	10	5	5	500	
1.20	154+600 to 154+600 / LT , RT	100	6	3	3	600	
1.21	155+100 to 155+200 / LT , RT	100	20	10	10	2,000	
1.22	155+200 to 155+700 / RT	100	10		10	1,000	
1.23	156+300 to 156+500 / LT , RT	195	20	10	10	3,900	
	Total					**72,150**	
	Grand Total					**242,411**	

There are many types of slope protections: generally sodding (Strip sodding or Block sodding). The hydro seeding shall be applied for deep cut and high fill. Grassing or Bio Engineering shall also be applied; especially the Vetiver Grassing which needs special method of grassing but perfect results can be achieved. The other techniques shall also be utilized, such as shotcrete or ferro cement but this method shall apply only wherever particularly needed because the method does not conform to environmental mitigation. Nowadays, many beautiful concrete crib works are used by mixed with sodding or grassing. In case of side fill is closed to the stream or river with high meter level, the rook rip rap will be considered for toe of slope protection.

F. Realignments

There will be ten major sections, with a total length of approximately 31 km (around 22% of the total length of 138 km), which will be realigned to improve their geometry. They are shown in ***Figure 4.2-22*** and detailed in ***Table 4.2-4***.

G. Bridge and Cross Drain Structure Improvements

The Project will construct 19 bridges with an approximate total length of 1,100 m. Their locations are shown in ***Figure 4.2-23***. ***Table 4.2-5*** lists all the 19 bridges and their design features. The longest elevated structure will be at Dawei River with a total length of 239.5 m, where a 7 spans arrangement will be adopted. The bridge design will adopt a span arrangement of 20 + 37.5 + 3 × 45 + 37.5 + 20. The bridges will have peer heights varying from about 4 m to 50 m, and the height of their abutment walls will also vary and a maximum height of about 14 meters is expected.

Based on the survey data of existing bridges along the project alignment in Sections 1, 2, and 3, most of the bridges will cross moderately narrow rivers with widths between 15 to 30 m, few rivers wider than 50 m are also expected.

All the bridges will be reinforced concrete I-girder structure considering its low maintenance and low construction cost. Types of bridge will be precast I-girder generally with span lengths of 15, 20, and 30 m. Pre-tensioned and post-tensioned system can also be adopted for precast I-girder in the project area. Typical structural designs of the bridges are shown in ***Figures 4.2-24*** to ***4.2-27***.

TABLE 4.2-4

THE PROPOSED ROAD DEVIATION FROM THE EXISTING ACCESS ROAD OF TWO LANE ROAD PROJECT

NO.	STATION	DESCRIPTION
Section 1		
1.	KM 19+876-25+000	Improved design for better geometry & Change alignment to frontage road (4 lane ROW) from KM 19+876 to KM 25+000
2.	KM 29+500-35+000	Realignment KM30 from KM 29+500 to KM 35+000
3.	KM 38+500-39+500	Improved design for better geometry from KM 28+500 to KM 39+500
4.	KM 40+500-46+000	Improved design for better geometry from KM 40+500 to KM 46+000
5.	KM 53+700-55+000	Realignment KM54 from KM 53+700 to KM 55+000
6.	KM 59+500-62+000	Improved design for better geometry & Change alignment to frontage road (4 lane ROW) from KM 59+500 to KM 62+000
7.	KM 64+000-66+000	Improved design for better geometry & Change alignment to frontage road (4 lane ROW) from KM 64+000 to KM 66+000
8.	KM 70+500-73+500	Improved design for better geometry & Change alignment to frontage road (4 lane ROW) from KM 70+500 to KM 73+500
Section 2		
9.	KM 105+000-108+500	Realignment KM105 from KM 105+000 to KM 108+500
Section 3		
10.	KM 140+500-142+000	Improved design for better geometry & Change alignment to apparel access road (4 lane ROW) from KM 140+500 to KM 142+000

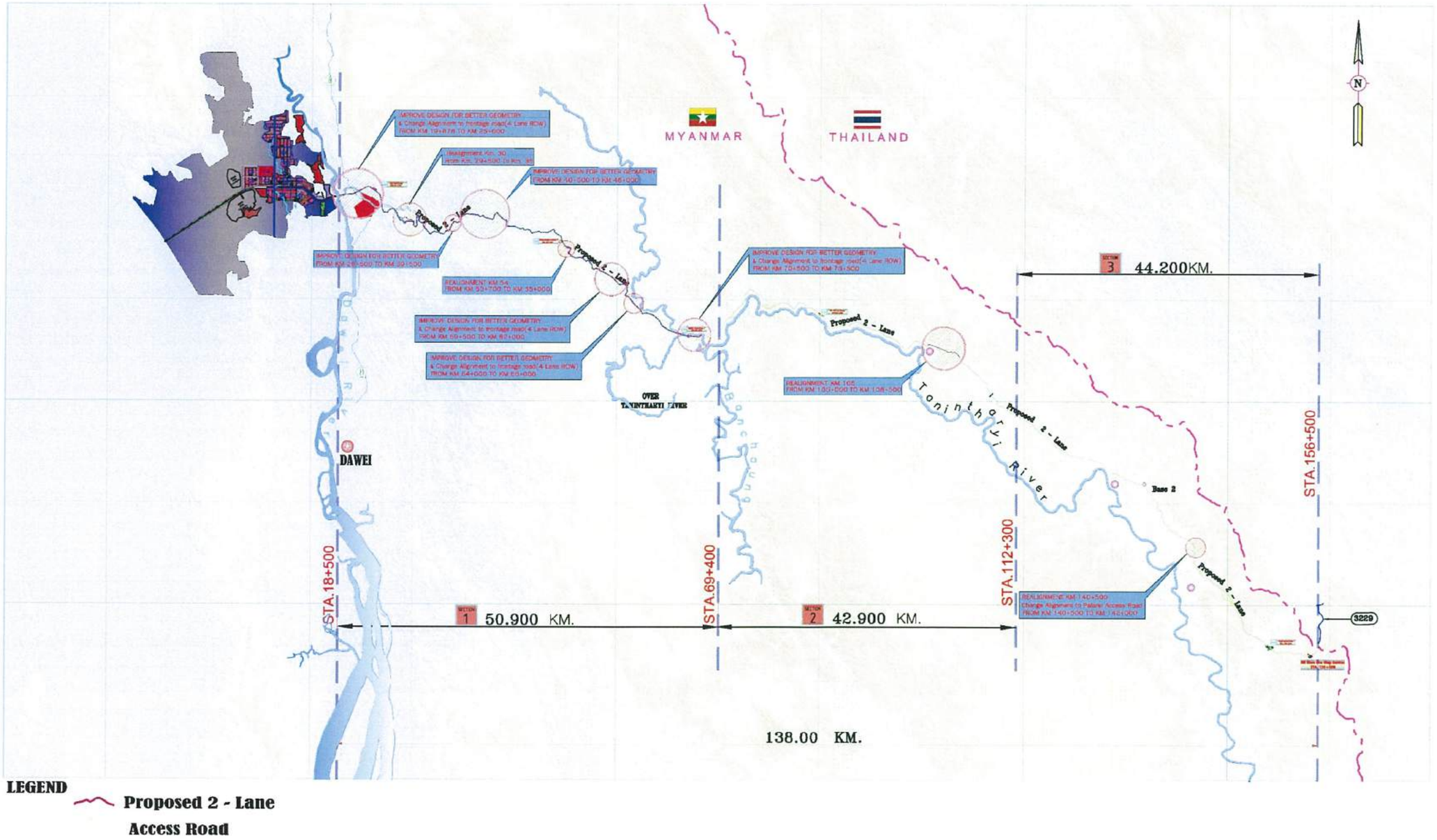


FIGURE 4.2-22 : DEVIATED ALIGNMENT FROM EXISTING ACCESS ROAD OF TWO LANE ROAD PROJECT

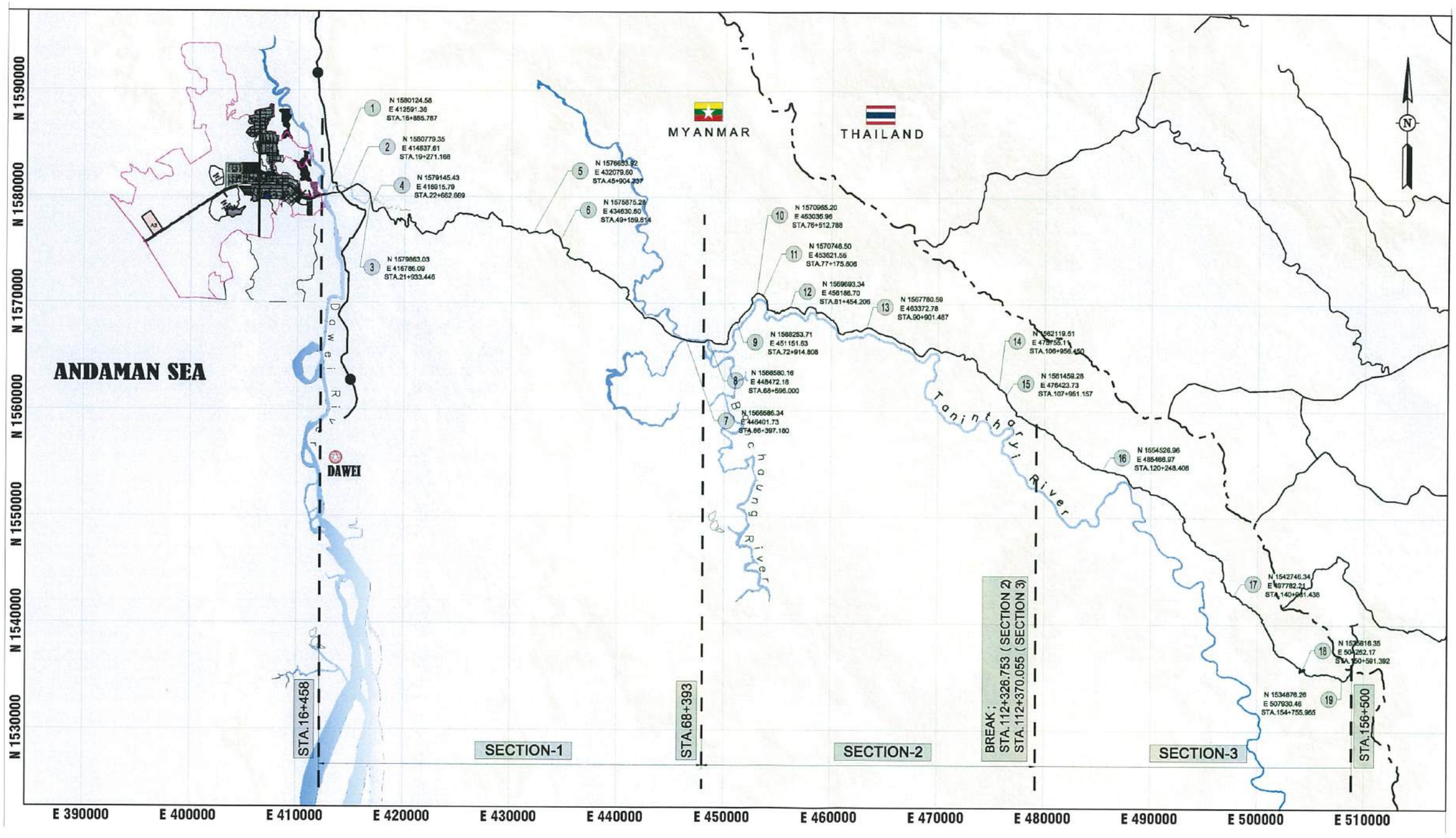


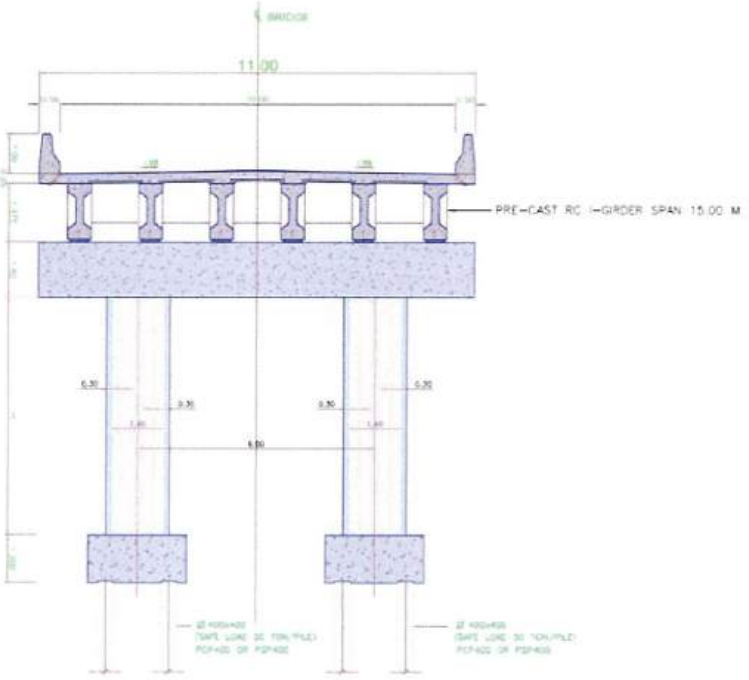
FIGURE 4.2-23 : LOCATION OF 21 BRIDGES OF TWO LANE ROAD PROJECT

TABLE 4.2-5

LIST OF 19 BRIDGES FOR TWO LANE ROAD PROJECT

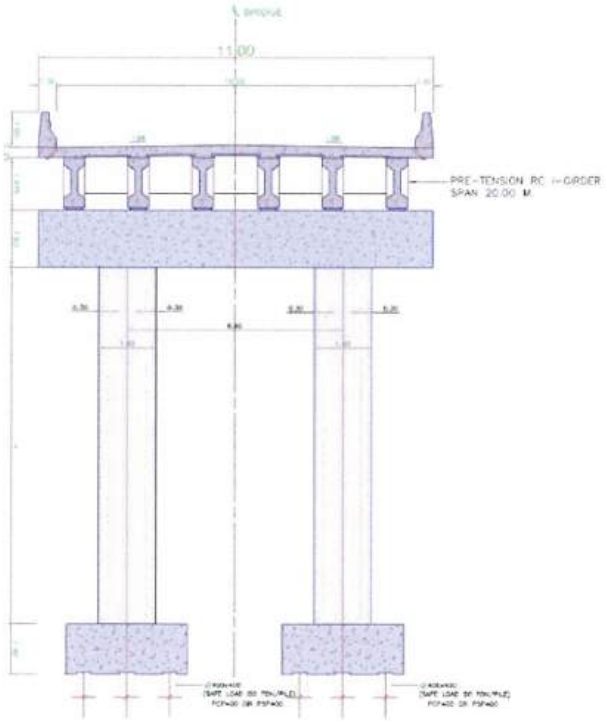
LIST OF BRIDGES

BRIDGE No.	STATION	BRIDGE DESCRIPTION				STRUCTURE DESCRIPTION	
		BRIDGE WIDTH (M.)	No. of Span	LENGTH OF EACH SPAN	TOTAL LENGTH (M.)	SUB STRUCTURE	SUPER STRUCTURE
							MAIN GIRDER / DECK SLAB
1	16+885.787	11	7	(1X32.25)+(5x35.00)+(1x32.25)	239.50	RC.	POST-TENSIONED RC. I-GRDER 0.60X1.70X30.00M. / RC.
2	19+271.168	11	5	(1x29.65+3x30.00+1x29.65)	149.30	RC.	POST-TENSIONED RC. I-GRDER 0.60X1.70X30.00M. / RC.
3	21+933.446	11	5	(1x29.65+3x30.00+1x29.65)	149.30	RC.	POST-TENSIONED RC. I-GRDER 0.60X1.70X30.00M. / RC.
4	22+660.669	11	3	(1x14.70+1x15.00+1x14.70)	44.40	RC.	POST-TENSIONED RC. I-GIRDER 0.60X1.20X15.00M. / RC.
5	45+904.237	11	3	(1x14.70+1x15.00+1x14.70)	44.40	RC.	POST-TENSIONED RC. I-GIRDER 0.60X1.20X15.00M. / RC.
6	49+159.614	11	3	(1x14.70+1x15.00+1x14.70)	44.40	RC.	POST-TENSIONED RC. I-GIRDER 0.60X1.20X15.00M. / RC.
7	66+397.180	11	4	(1x14.70+3x15.00+1x14.70)	59.40	RC.	POST-TENSIONED RC. I-GIRDER 0.60X1.20X15.00M. / RC.
8	68+596.000	11	5	(1x29.65+3x30.00+1x29.65)	149.30	RC.	POST-TENSIONED RC. I-GRDER 0.60X1.70X30.00M. / RC.
9	72+914.808	11	1	(1x15)	15	RC.	POST-TENSIONED RC. I-GIRDER 0.60X1.20X15.00M. / RC.
10	76+512.788	11	3	(3x15)	45	RC.	POST-TENSIONED RC. I-GIRDER 0.60X1.20X15.00M. / RC.
11	77+175.806	11	3	(3x15)	45	RC.	POST-TENSIONED RC. I-GIRDER 0.60X1.20X15.00M. / RC.
12	81+454.206	11	3	(3x15)	45	RC.	POST-TENSIONED RC. I-GIRDER 0.60X1.20X15.00M. / RC.
13	90+901.487	11	3	(3x15)	45	RC.	POST-TENSIONED RC. I-GIRDER 0.60X1.20X15.00M. / RC.
14	106+956.450	11	3	(3x15)	45	RC.	POST-TENSIONED RC. I-GIRDER 0.60X1.20X15.00M. / RC.
15	107+951.157	11	1	(1x15)	15	RC.	POST-TENSIONED RC. I-GIRDER 0.60X1.20X15.00M. / RC.
16	120+248.408	11	1	(1x15)	15	RC.	POST-TENSIONED RC. I-GIRDER 0.60X1.20X15.00M. / RC.
17	140+081.438	11	1	(1x15)	15	RC.	POST-TENSIONED RC. I-GIRDER 0.60X1.20X15.00M. / RC.
18	150+591.392	11	1	(1x15)	15	RC.	POST-TENSIONED RC. I-GIRDER 0.60X1.20X15.00M. / RC.
19	154+755.965	11	1	(1x15)	15	RC.	POST-TENSIONED RC. I-GIRDER 0.60X1.20X15.00M. / RC.



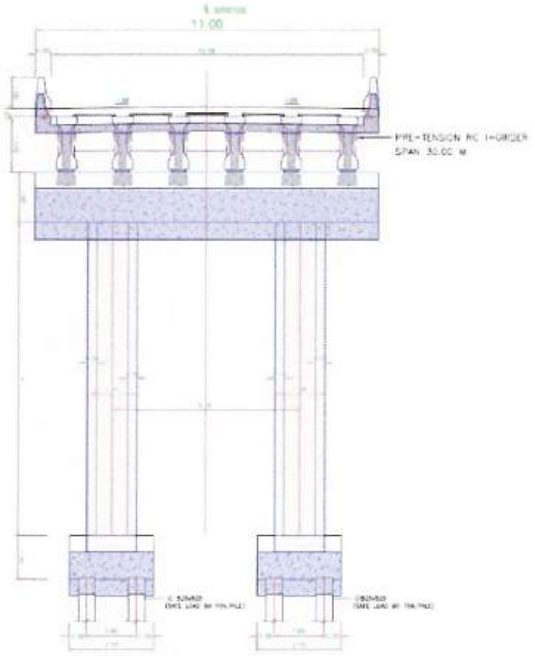
TYPICAL SECTION FOR BRIDGE SPAN 15-15 M.

FIGURE 4.2-24 : STRUCTURAL SCHEME PRECAST RC I-GIRDER 15 M SPAN BRIDGE



TYPICAL SECTION FOR BRIDGE SPAN 20 M.

FIGURE 4.2-25 : STRUCTURAL SCHEME PRECAST RC I-GIRDER 20M SPAN BRIDGE



TYPICAL SECTION FOR BRIDGE SPAN 30 M. (H≤10 M.)

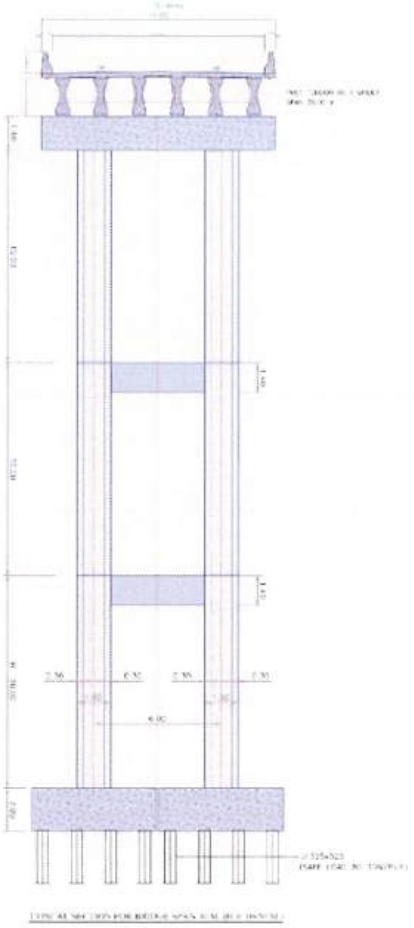
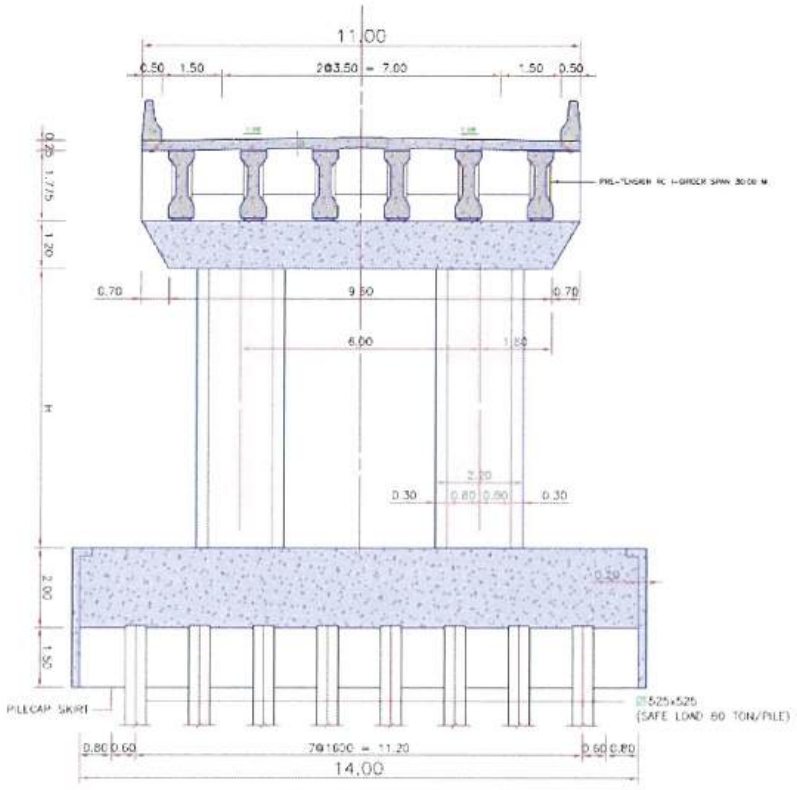


FIGURE 4.2-26 : STRUCTURAL SCHEME PRECAST RC I-GIRDER 30M SPAN BRIDGE



TYPICAL SECTION FOR BRIDGE SPAN 37.5-45.0 M. (DAWEI BRIDGE)

FIGURE 4.2-27 : STRUCTURAL SCHEME AT DAWEI RIVER BRIDGE

4.2.3 Project Alternatives

The project has no alignment alternatives as it will upgrade the existing road. The two lane road is adopted to suit expected traffic demand during the initial phase development of DSEZ and to keep the investment low.

The alignments of the realigned sections are dictated by topography and geometric design consideration.

Regarding allowance of land owner and related government ministries, the project must inform land owners and ask for permission and there must be payment of compensation prior to project development as stated in RAP report via compensation committee.

4.3 PROJECT CONSTRUCTION AND IMPLEMENTATION

4.3.1 Key Construction Tasks

The project construction will consist of several key construction tasks. The tasks and their construction methods are presented in ***Appendix 4B***.

4.3.2 Construction Schedule

A tentative construction schedule is shown in ***Table 4.3-1***. The Project will be completed in 37 months. The construction is scheduled to commence in April 2015. This schedule will need to be periodically updated during the course of project implementation.

TABLE 4.3-1

TENTATIVE SCHEDULE FOR TWO-LANE ROAD PROJECT CONSTRUCTION ACTIVITIES

TABLE 4.3-1

TENTATIVE SCHEDULE FOR TWO-LANE ROAD PROJECT CONSTRUCTION ACTIVITIES (CONT'D)

4.3.3 Manpower and Equipment Requirements

Tables 4.3-2 and ***4.3-3*** present estimates of manpower and equipment requirements over the construction period, respectively.

4.3.4 Construction Materials

(1) Materials for Embankment, Subgrade, Sub-base and Base Course

These materials will be laterite, soil, and gravels. They can be obtained from borrow pits along the existing road. The locations of material sources for Section 1, Section 2 and Section 3 are shown in ***Figures 4.3-1 to 4.3-3***. The base course materials will be sourced from quarries at two locations, KM 43900 and KM 145000. The subgrade, sub base and base course layers will need filling and leveling to meet the elevation requirement. Compaction and grading work must be achieved for the CBR at 80% compaction as shown in specified requirement.

(2) Materials for Asphaltic Concrete

Aggregate materials will be sourced from quarries at KM 43+900 and KM 145+000 where asphaltic plants should be located. Asphaltic material will be imported from Thailand in order to assure that its quality will meet the proposed standard.

(3) Materials for Concrete

Cement will be imported from Thailand to ensure quality standards and the supply from sources in Thailand is nearer than the supply sources in Myanmar.

Fine and coarse aggregates are easily obtained from the nearby areas but some treatments will be required before their use. Course aggregate for concrete production as well as large stone for embankment rip raps for side slope stability are planned to be obtained from the designated quarries located at KM 145+000 beside the access road and KM 43+900, respectively. The quarries have been proved to yield good quality rock, and sufficient quantities for base course and asphaltic concrete construction. Unfortunately, these two quarries have not yet been in operation due to delay in obtaining licenses for explosive imports. The construction timeline can be achieved only when the quarries is licensed to operate at the earliest time.

Reinforced steel bars will be imported from Thailand.

Formwork will also be imported from Thailand.

RC pipes will be locally produced at a production Plant to be located at KM 18+000.

RC box culverts will be cast in place.

Stone for rip rap will be sourced from nearby river areas KM 43+900 or 145+000

TABLE 4.3-2

TENTATIVE MANPOWER SCHEDULE FOR PROJECT CONSTRUCTION

MANPOWER SCHEDULE

ITALIAN THAI DEVELOPMENT PCL.

PROJECT NAME : TWO-LANE ROAD UPGRADING TO ASPHALTIC CONCRETE PROJECT

PRELIMINARY WORK

Manpower	2015									2016												2017												2018				
	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	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Direct																																						
1 Foreman	32	32	33	33	33	33	33	34	40	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	18	18	18	10	10	10	10	10
2 Skill Worker	39	39	66	66	66	66	66	79	85	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	14	14	14	14	14	14	14	14
3 Operator	24	25	39	39	39	39	39	40	102	115	115	115	115	115	115	115	115	115	115	115	115	115	115	115	115	82	50	36	36	36	36	36	35	34	34	34	34	34
4 Driver	10	10	10	10	10	10	10	20	137	139	139	139	139	139	139	139	139	139	139	139	139	139	139	139	127	86	66	66	66	63	63	59	55	55	55	55	55	
5 Local Worker	39	42	133	133	133	133	133	193	230	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	26	26	20	20	20	20	20	20
Indirect																																						
1 Project Manager	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2 Project Engineer	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
3 Engineer	25	25	27	27	27	27	27	32	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40
4 Accounting	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
5 Office, Store, Clerk	63	63	63	63	63	63	63	69	85	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65
6 Technician	4	4	6	6	6	6	6	8	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
7 Surveyer, Lab	25	25	34	34	34	34	34	45	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	17	17	17	17	17	17	17	17
8 Mechanic, Oiler, Electrician	49	49	52	52	52	52	52	64	64	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	40	40	40	40	40	40	40	40
9 Safety Supervisor	3	3	3	3	3	3	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
10 Driver(Services truck)	14	14	14	14	14	14	14	14	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31
11 House Keeper	15	15	15	15	15	15	15	15	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
12 Security	3	3	3	3	3	3	3	3	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
13 Worker	3	3	3	3	3	3	3	3	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40

TABLE 4.3-3

TENTATIVE EQUIPMENT SCHEDULE FOR PROJECT CONSTRUCTION

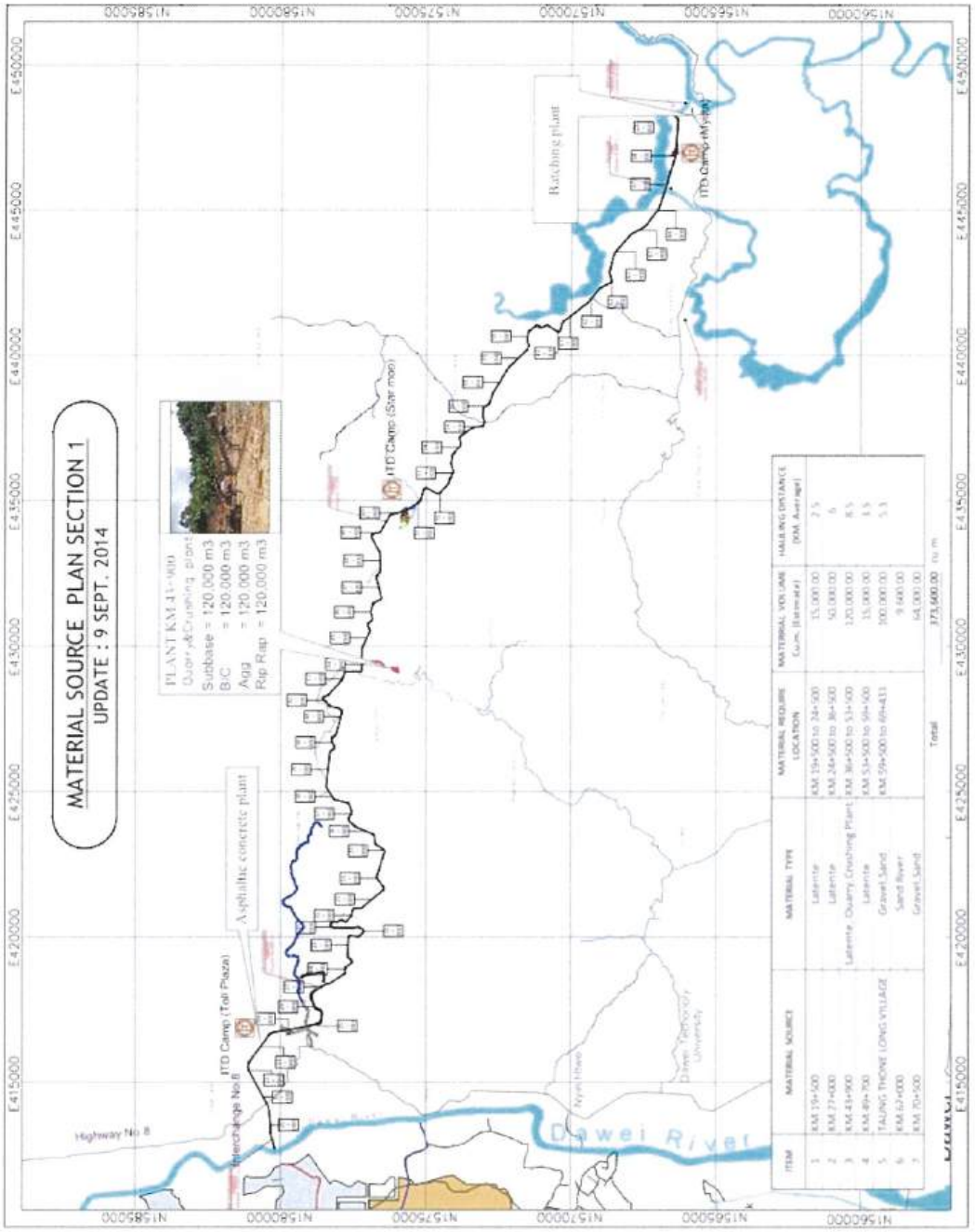
EQUIPMENT SCHEDULE

ITALIAN THAI DEVELOPMENT PCL

PROJECT NAME : TWO-LANE ROAD UPGRADING TO ASPHALTIC CONCRETE PROJECT

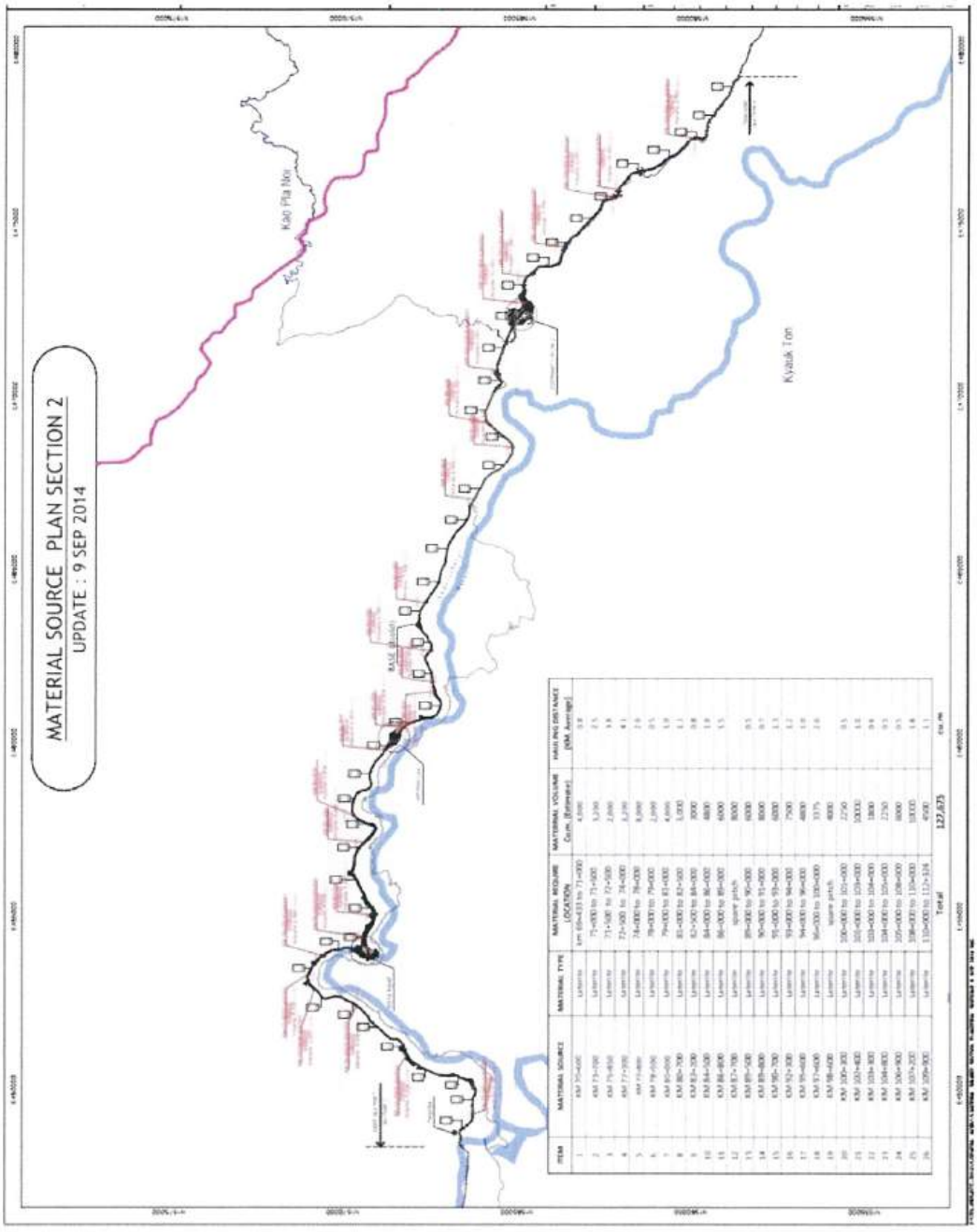
PRELIMINARY WORK

Item	Equipment	2015									2016												2017												2018				
		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	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
	Main equipment																																						
1	Backhoe Volvo EC210 , PC200 , EX200 , CAT320	15	15	15	15	15	30	35	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	9	9	9	9	8	8	8	8	8
2	Backhoe Volvo EC360 , EX360	2	2	2	2	2	4	6	6	6	6	6	6	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3										
3	Backhoe Breaker EC210	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2										
4	Bulldozer D4 , D5 , D6	9	9	9	9	9	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13												
5	Bulldozer D7 , D9 , D9	1	1	1	1	3	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4												
6	Vibratory Compactor / SD100 , SD200	3	3	3	3	3	9	9	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
7	Rough terrain crane 25 T Up	1	1	1	1	1	2	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	3	3	3	2	2	2	2	2	2
8	Dump Truck	30	30	30	30	30	30	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	20	20	20	20	20	20	20	20	20	20	20
9	JCB																																1	1	1	1	1	1	1	1
10	Motor Grader	2	2	2	2	3	5	7	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	3	3	3	3	3	3	3	3	3	3	3
11	Water Truck	2	2	2	2	2	4	4	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	6	6	3	1	1	1	1	1	1	1	1
12	Wheel Loader					1	1	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	2	2
13	Transit Mixer	1	1	1	1	1	2	4	8	8	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	6	6	6	6	6	4	4	4	4	4	4
14	Truck with crane					1	1	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	3	3	3	2	2	2	2	2	2
	Support Equipment																																						
15	Pick Up / 2W,4WD,SUV	20	20	20	20	25	30	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	30	30	30	30	25	25	25	25	25
16	Mechanic Field (Pick Up)	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
17	Flat Bed 6W, 10W (passenger & Transport)	10	10	10	10	10	10	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	14	14	14	10	10	10	10	10
18	Trailer 10W	2	2	2	2	2	2	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	3	3	3	3	3	3	3	3
19	Trailer 16W (Low Bed & Flat Bed)	1	1	1	1	1	1	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	2	2
20	Oiler Field	3	3	3	3	3	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
21	Fuel Truck 6W (Field)	3	3	3	3	3	3	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	5	4	4	4	4	4	4	4
22	Fuel Truck 10W	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Asphaltic Equipment																																						
23	Asphalt Distributer Truck			-	-	-	-	-	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
24	Asphalt Paver			-	-	-	-	-	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
25	3 Steel Roller (Static 10 Ton)			-	-	-	-	-	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
25	2 Steel Roller (Vibration / DD70)			-	-	-	-	-	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
27	Rubber Tire Roller			-	-	-	-	-	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
28	Power Broom			-	-	-	-	-	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
29	FarmTractor			-	-	-	-	-	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3



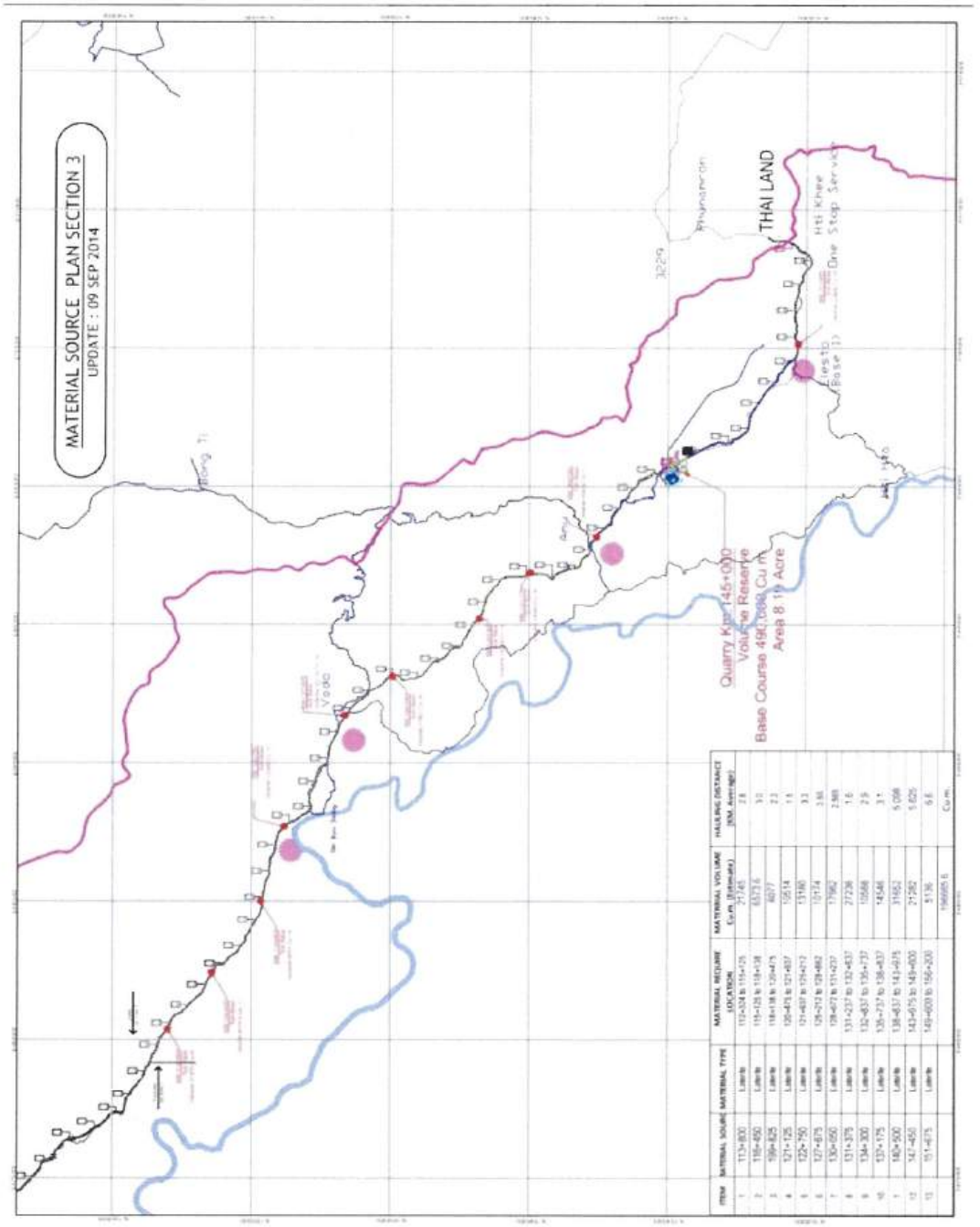
Section 1 Material reserve for sub-base 373,600 Cu.m

FIGURE 4.3-1 : LOCATION OF MATERIAL SOURCE FOR SECTION 1



Section 2 Material reserve for sub-base 127,675 Cu.m

FIGURE 4.3-2 : LOCATION OF MATERIAL SOURCE FOR SECTION 2



Section 3 Sub base Material Reserve about 200,000 Cu.m

FIGURE 4.3-3 : LOCATION OF MATERIAL SOURCE FOR SECTION 3

4.4 EXISTING STATUS OF PROJECT IMPLEMENTATION

The Project Proponent, Myandawei Industrial Estate Company Limited ("MIE"), has engaged TESCO Ltd., to prepare detailed design of the Project. The design drawings and report will be completed in August 2015.

As of 7 July 2015, the Project Proponent has conducted preliminary works as follows;

1) Section 1: Excavation and slope cutting at Saddle Hill-total volume of excavation and cutting about 105,000 m^3.

2) Section 2: Excavation and slope cutting at Elephant Cry Hill-total volume of excavation and cutting about 160,000 m^3.

3) Section 3: Excavation and slope cutting at Base 1 Hill-total volume of excavation and cutting about 18,400 m^3.

4) Construction of No.19 Bridge: Excavation for abutment at KM 154+738.

Figure 4.4-1 shows pictures of these preliminary works in progress.

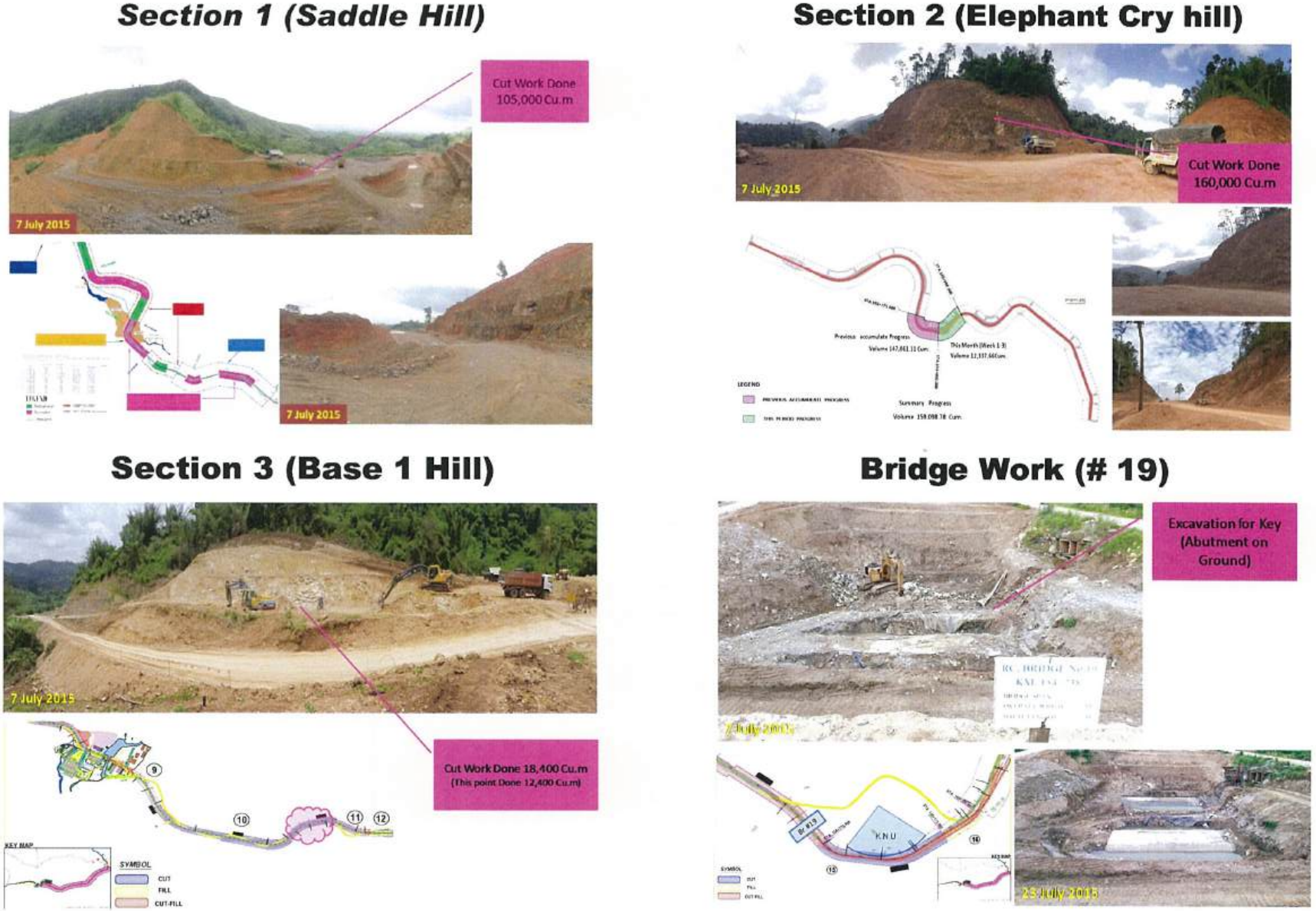


FIGURE 4.4-1 : THE PROGRESS OF WORK AS OF 7 JULY 2015

CHAPTER 5

DESCRIPTION OF ENVIRONMENT

CHAPTER 5

DESCRIPTION OF ENVIRONMENT

5.1 SETTING THE STUDY LIMITS

In the Environmental Impact Assessment (EIA) study, it is necessary to establish baseline information on the environmental and socio-economic settings of an area which could receive directly 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 environment, the study limits are to consist of geographical limit and contextual limit to guide the baseline information collection.

5.1.1 Geographical Study Limit

The geographical study limit is defined as an area along the project alignment which the baseline information collection should be collected. In this Scoping Study, the geographical study limit approximately 500 m wide on both sides of the center line where defined as project study area. This geographical study limit covers 138 km^2 of rectangular area along the project alignment as shown in a map in ***Figure 5.1-1***. This area is referred to in subsequent sections of this Draft Final 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 Guidelines defines the contextual study limit to consist of five groups of components: (i) physical components; (ii) biological components; (iii) socio-economic components; (iv) cultural components; and (v) visual components. Considering the nature of this Project and its potential environmental issues, the composition of each main component is presented below:

(1) Physical Components

- Climate and Meteorology
- Geology
- Seismology
- Soils
- Hydrology
- Air Quality
- Noise and Vibration
- Surface Water Quality

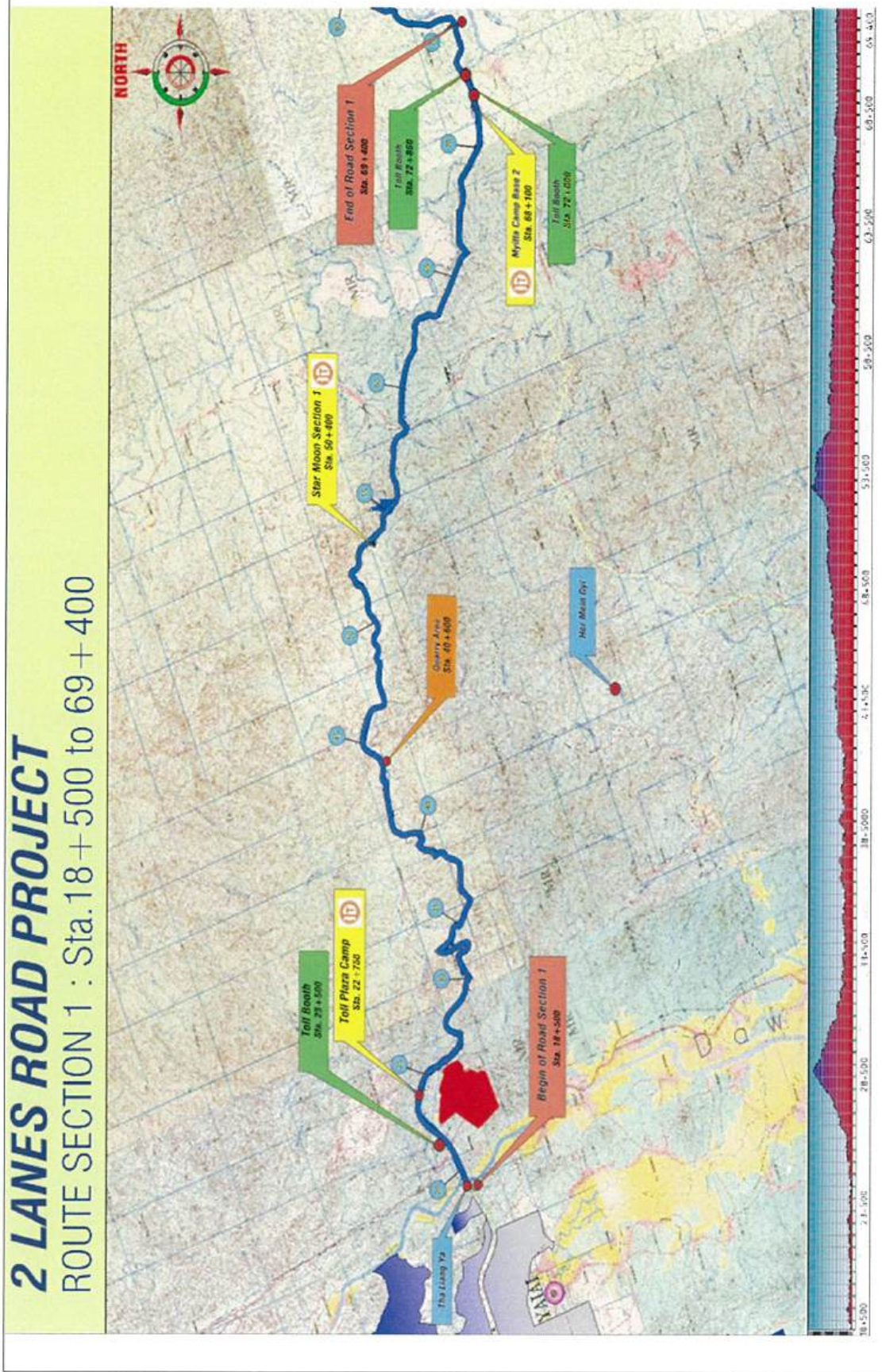


FIGURE 5.1-1: PROJECT STUDY AREA OF TWO LANE ROAD LINKING THE DSEZ AND THAI BORDER PROJECT

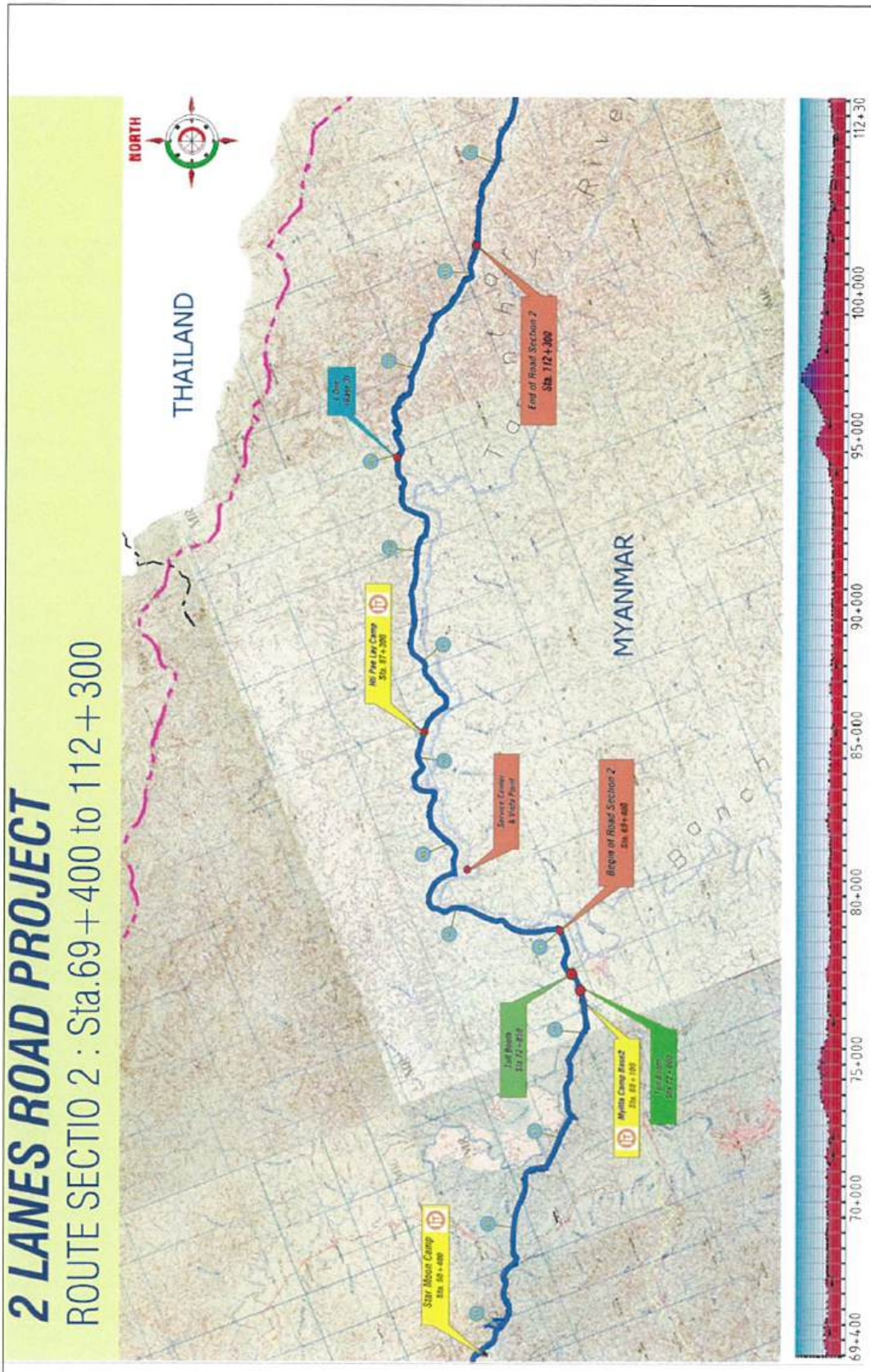


FIGURE 5.1-1: PROJECT STUDY AREA OF TWO LANE ROAD LINKING THE DSEZ AND THAI BORDER PROJECT (CONT'D)

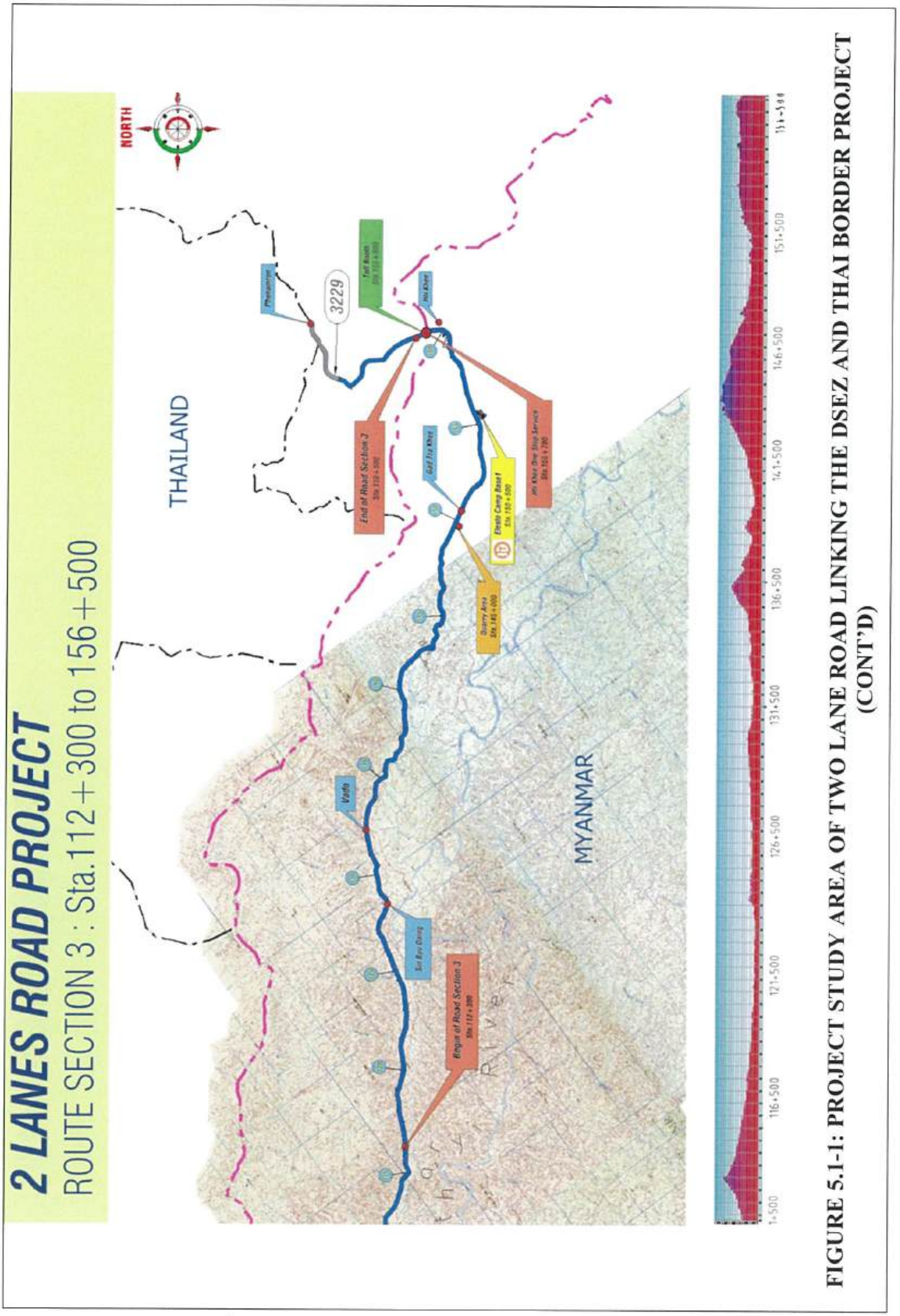


FIGURE 5.1-1: PROJECT STUDY AREA OF TWO LANE ROAD LINKING THE DSEZ AND THAI BORDER PROJECT (CONT'D)

(2) Biological Components
- Terrestrial Ecology (Forestry and Wildlife)
- Aquatic Ecology

(3) Socio-economic Components
- Land Use
- Social Profile
- Economic Profile
- Health Profile
- Infrastructure Facilities
  - Road Transportation
  - Water Use and Water supply
  - School and Religious Facilities
  - Electricity

(4) Cultural Components

(5) Visual Components

The following sections briefly describe each component with details in appendices as appropriate. The methods of information collection are also described as deemed necessary.

5.2 PHYSICAL COMPONENTS

5.2.1 Overview of the Study Area

A. Tanintharyi Region in a Nutshell

The study area is located in Dawei District (Yebyu Township and Myitta Sub-Township) in the area of Tanintharyi Region (see map in ***Figure 5.1-1***). A brief regional profile is presented below:

Capital	Dawei
Number of districts	3
Number of townships	10
Number of wards	83
Number of village tracts	264
Number of villages	1,250
Total population (Est.2012)	1,713,447
Area	43,328 km^2. There are many islands off the coast, the large Mergui Archipelago in the southern and central coastal areas and the smaller Moscos Islands off the northern shores
Borders	
- North:	Mon State
- East	Thailand
- West	Andaman Sea
- South	Ranong Province, Thailand
Latitude	14° 5'2.98"N
Longitude	98° 12'E5.67"E
Ethnicities	Bamar, Rakhine, Mon, Shan, Karen, Salone, Malay (Bashu)
Main economic activities	Fishing, Forestry, Mining, Agriculture

Source: Tanintharyi Region Profile, updated June 2014, UNHCR, South-East Myanmar Information Management Unit (*data.unhcr.org/thailand/download.php?id=221*)

The districts and townships of the Region are showns in ***Figure 5.2-1***. The Region sparsely populated as indicated by its overall population density of 39.6 persons/ km^2.

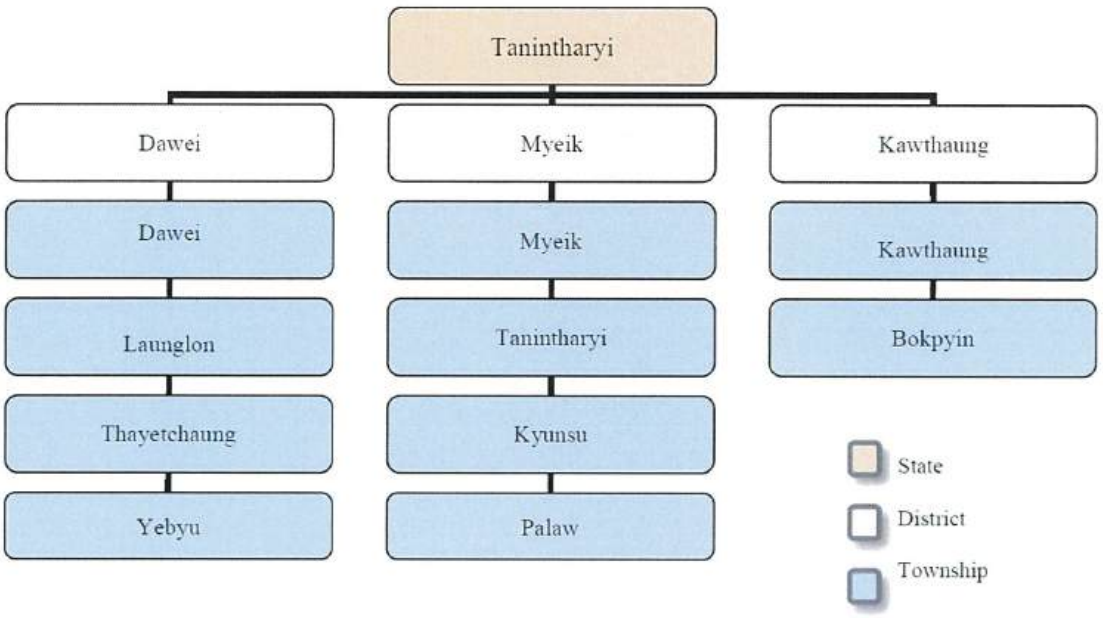


FIGURE 5.2-1: DISTRICTS AND TOWNSHIPS OF TANINTHARYI REGION

Dawei District has four townships. The total population of Dawei District[1] was estimated at 492,277 in 2014, consisting of 146,271 in Dawei Township, 118,301 in Launglon Township, 105,599 in Thayetchaung Township, and 122,106 in Yebyu Township.

On most social development indicators, Tanintharyi Region fares comparably to the national average, but access to basic services in remote islands is noted as a concern. Although the Region has significant reserves of natural resources (mainly natural gas and metals), poverty incidence (at 33 percent) is higher than the national average (26 percent).

B. The Study Area

The study area as defined in **Section 5.1** has a total area of about 34,031.35 acres covers fifteen villages in Yebyu township as shown in ***Figure 5.1-1***. ***Table 5.2-1*** provides names of the villages along the Project alignment.

[1]Source: www.citypopulation.de/php/myanmar-admin.php?adm1id=0601

TABLE 5.2-1

VILLAGES IN THE STUDY AREA

Township	Village	No. of Household
Yebyu and Myitta Sub-Township	Dauk Lauk	27
	Ta Laing Ya	45
	Pa Dao Geou	49
	Tha Loat Htar	188
	Tha Khat Done	33
	Ye Bouk	27
	Tha Byu Chaung	70
	Pyin Tha Daw	74
	Myitta	350
	Taung Thone Long	566
	Sin Byu Daing	70
	Va Do	53
	Amu	150
	Gad Tra Khee	66
	Hti Hkee	32
	15 Villages	**1,810**

5.2.2 Climate and Meteorology

(1) Methodology

Due to the project aligns on the mountainous areas and valley. There is no meteorological station at the project site. The Consultant collected data on wind speeds and directions in the project area over a 72 hours period during the dry season in January 2015. The wind data collected during this period would only provide as snapshot of wind conditions in the project area.

Wind data was collected at three stations:

Station 1: Located at Toll Plaza Base Camp nearby Dauk Lauk village, Yebyu Township (UTM (WGS84) 47P 0416058 E, 1580846 N)

Station 2: Located at Myitta Base Camp, Myitta Sub-Township (UTM (WGS84) 47P 0446883 E, 1566471 N)

Station 3: Located at Elasto Base 1 Camp nearby Hti Hkee village, Yebyu Township (UTM (WGS84) 47Q 0504125 E, 1535845 N)

Figure 5.2-2 is a map showing the locations of the three wind data collection stations. Concurrently with the collection of wind data, noise, vibration and ambient air quality were also monitored at these three stations. ***Photo 5.2-1*** shows photographs of equipment set up at the three stations.

The measurement of wind speeds and directions was made at 10 meters above ground using anemometer.

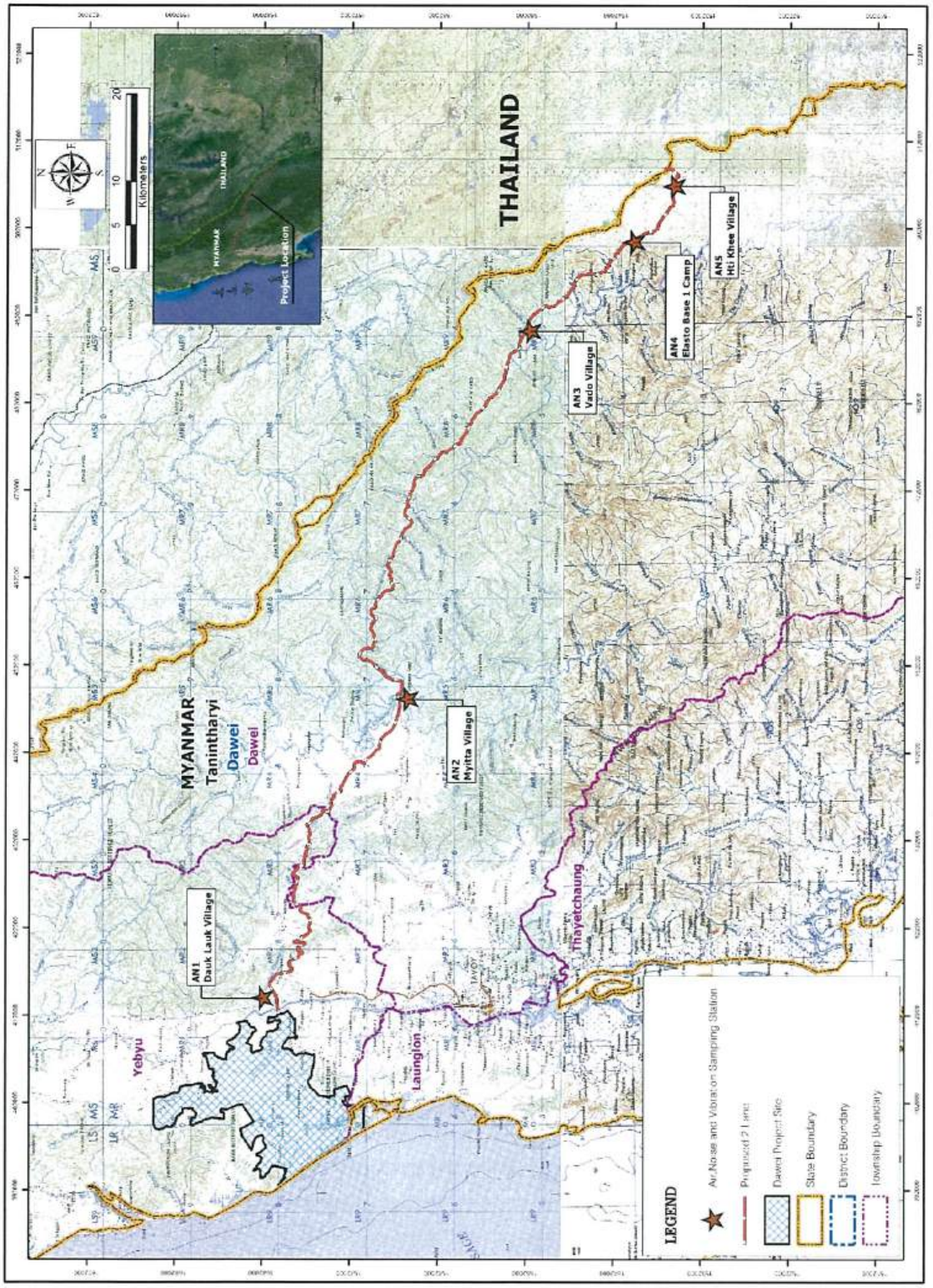


FIGURE 5.2-2 : LOCATION OF AIR QUALITY, NOISE AND VIBRATION SAMPLING STATIONS

Equipment for Wind and Air Quality Data Collection at Station 1: Toll Plaza Base Camp

Equipment for Noise and Vibration Measurement at Station 1: Toll Plaza Base Camp

Equipment for Wind and Air Quality Data Collection at Station 2: Myitta Base Camp

Equipment for Noise Measurement at Station 2: Myitta Base Camp

Equipment for Vibration Measurement at Station 2: Myitta Base Camp

Equipment for Wind and Air Quality Data Collection at Station 3: Elasto Base 1 Camp

Equipment for Noise Measurement at Station 3: Elasto Base 1 Camp

Equipment for Vibration Measurement at Station 3: Elasto Base 1 Camp

PHOTO 5.2-1 : AIR QUALITY, NOISE AND VIBRATION MEASUREMENT AT THE THREE SAMPLING STATIONS

(2) Climatic Conditions

In general, the regional climate is significantly influenced by the south-west and north-east monsoons as shown in ***Figure 5.2-3***. The south-west monsoon from the Indian Ocean and Andaman Sea passes through the south peninsula around mid-May, bringing with it moisture-laden winds and causing heavy rain and air humidity. The north-east monsoon from the main land starts to pass through the region from November to February.

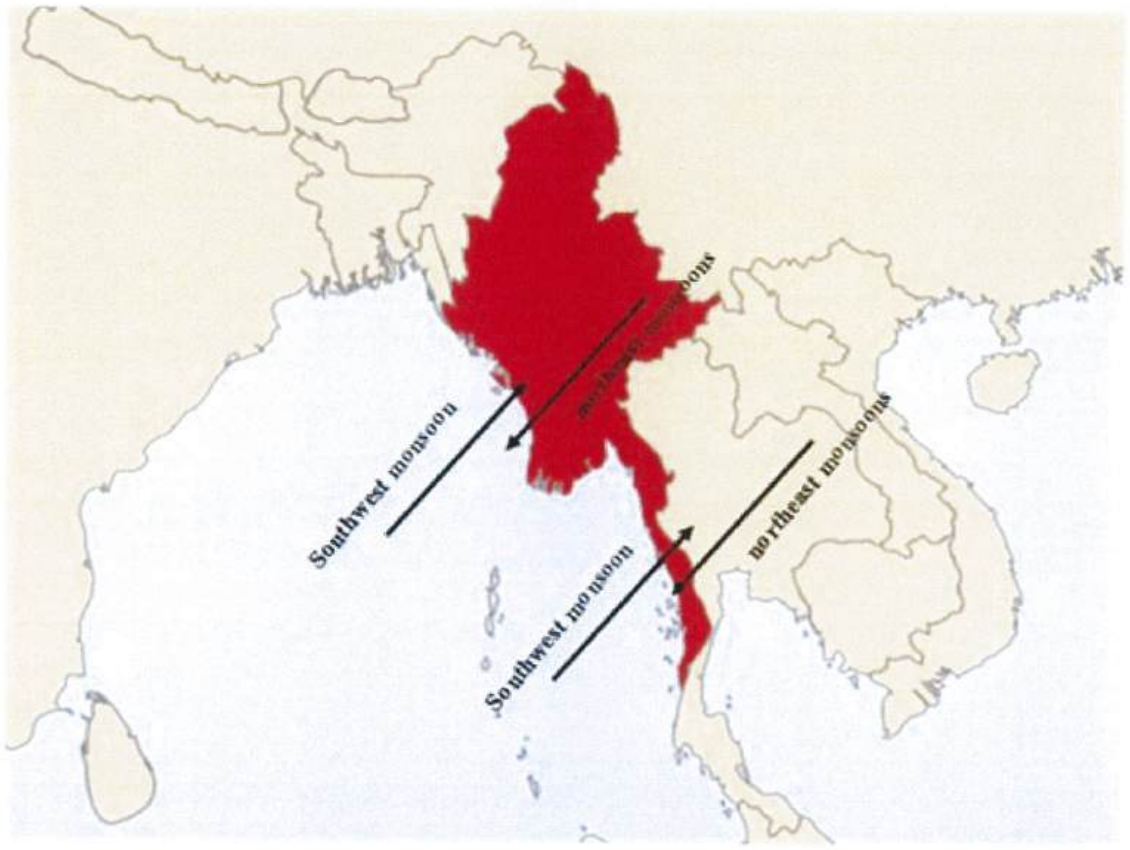


FIGURE 5.2-3: MONSOON WIND DIRECTION PASSING THROUGH MYANMAR

The study area has tropical monsoon climate characterized by three seasons.

The winter season normally begins in November and lasts until February. During this period, the weather is relatively cold and dry due to the northeast monsoon. The monthly mean minimum temperatures are normally in the range 13.5-19.7°C.

The summer season follows the winter season, normally from March to April. The climate in this period is relatively warm and humid with average temperatures between 27.0-29.2°C and the monthly mean maximum temperatures are between 35.3-36.9°C. During March and April, a transition period prevails during which the northeast monsoon begins to withdraw and the air mass movements bring warm air to the region from southeast directions. Some light rainfalls, known as the pre-monsoon rain, could be expected during this period.

The rainy season normally begins in April and lasts until the end of November. Intense rainfalls normally occur in May until October as indicated by the monthly amount of rainfalls. The total annual rainfall from 1999 to 2014 was between 3,068 to 6,816 mm with significant annual variation.

(3) Wind Speed and Wind Direction

Table 5.2-2 presents summarized results of wind measurements at the three stations. Details are given in ***Appendix 5A***.

TABLE 5.2-2

RESULTS OF WIND SPEED AND DIRECTION MEASUREMENTS

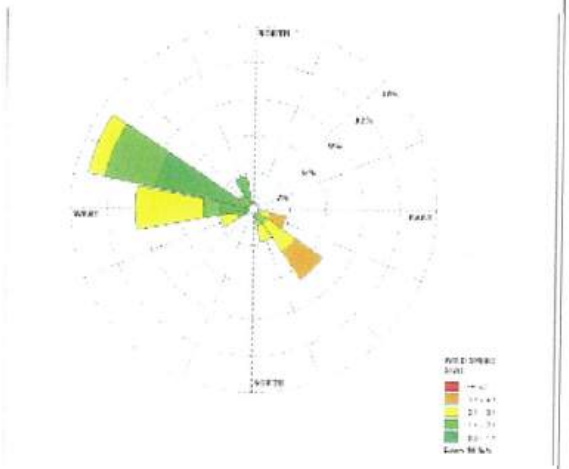
Station	Measurement Date	Distance from Project Alignment (m)	Wind Speed (m/s)	Prevailing Winds Direction	% Calm Wind
Station A1: Toll Plaza Base Camp, Yebyu Township, Dawei District, Tanintharyi Region	January 21-24, 2015	50	0.0-4.0	WNW	56.94
Station A2: Myitta Base Camp, Yebyu Township, Dawei District, Tanintharyi Region	January 25-28, 2015	30	0.0-3.1	NNW	37.5
Station A3: Elasto Base 1 Camp, Yebyu Township, Dawei District, Tanintharyi Region	29 January – 1 February, 2015	30	0.0-1.8	NNE, ENE, E	58.33

Source: Field Survey by TEAM Consulting Engineering and Management Co., Ltd., January 2015.

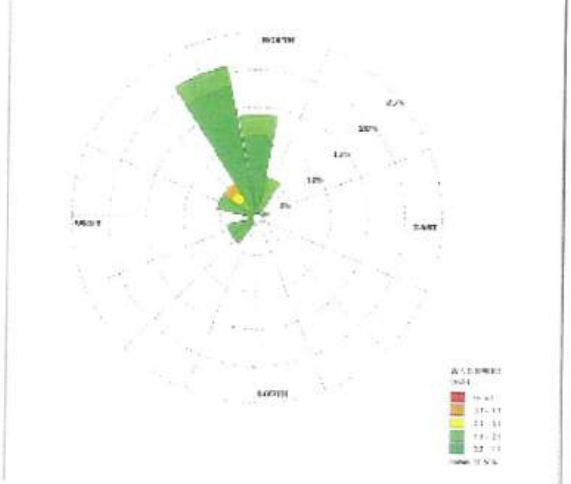
The results can be summarized as follows:

The prevailing wind direction was West-northwest (WNW) at Station A1, North-northwest (NNW) at station A2 and North-northeast (NNE), East-northeast (ENE) and East (E) at Station A3. These data sets indicate that the local wind directions at Station 1 are consistent with the south-east monsoon direction occurred during the measurement period in January. The wind speeds were between 0.0-4.0 m/s at Station A1 and 0.0-3.1 m/s at Station A2 and 0.0-1.8 m/s at Station A3.

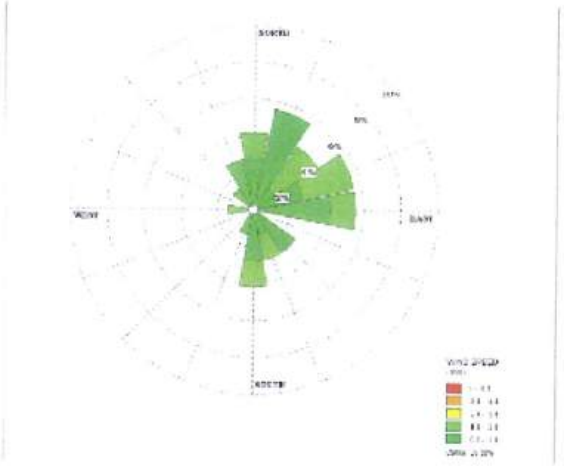
The measurement of wind speeds and directions was made at 10 meters above ground level. The results of measurements are summarized in ***Table 5.2-2***. The wind rose profiles of the three stations are shown in ***Figure 5.2-4***.



Station A1:
Wind Speed/Direction Measurement at Toll Plaza Base Camp during January 21-24, 2015



Station A2:
Wind Speed/Direction Measurement at Myitta Base Camp during January 25-28, 2015



Station A3:
Wind Speed/Direction Measurement at Elasto Base 1 Camp during 29 January-1 February, 2015

FIGURE 5.2-4: WIND ROSE FROM WIND SPEED AND WIND DIRECTION MEASUREMENT OF THE PROJECT

5.2.3 Geology

The Tanintharyi region is in the southern part of the eastern most geotectonic belt of Myanmar, which refers to the Shan-Tanintharyi Massif or the Karen-Tanintharyi Unit in the Geological Map of Myanmar (scale 1: 1,000,000 by National Stratigraphic Committee for IGCP, 1977) and map of Burma Rock Types (published in 1990 by Army Geospatial Center, US Army Corps of Engineers and US Geological Survey) (***Figure 5. 2- 5***). During the Carboniferous Period- Upper Paleozoic Era, it was formed as the basement, composing of thick sequence of folded argillite, greywacke and slate, with lesser amount of limestone, quartzite, agglomerate and conglomerate.

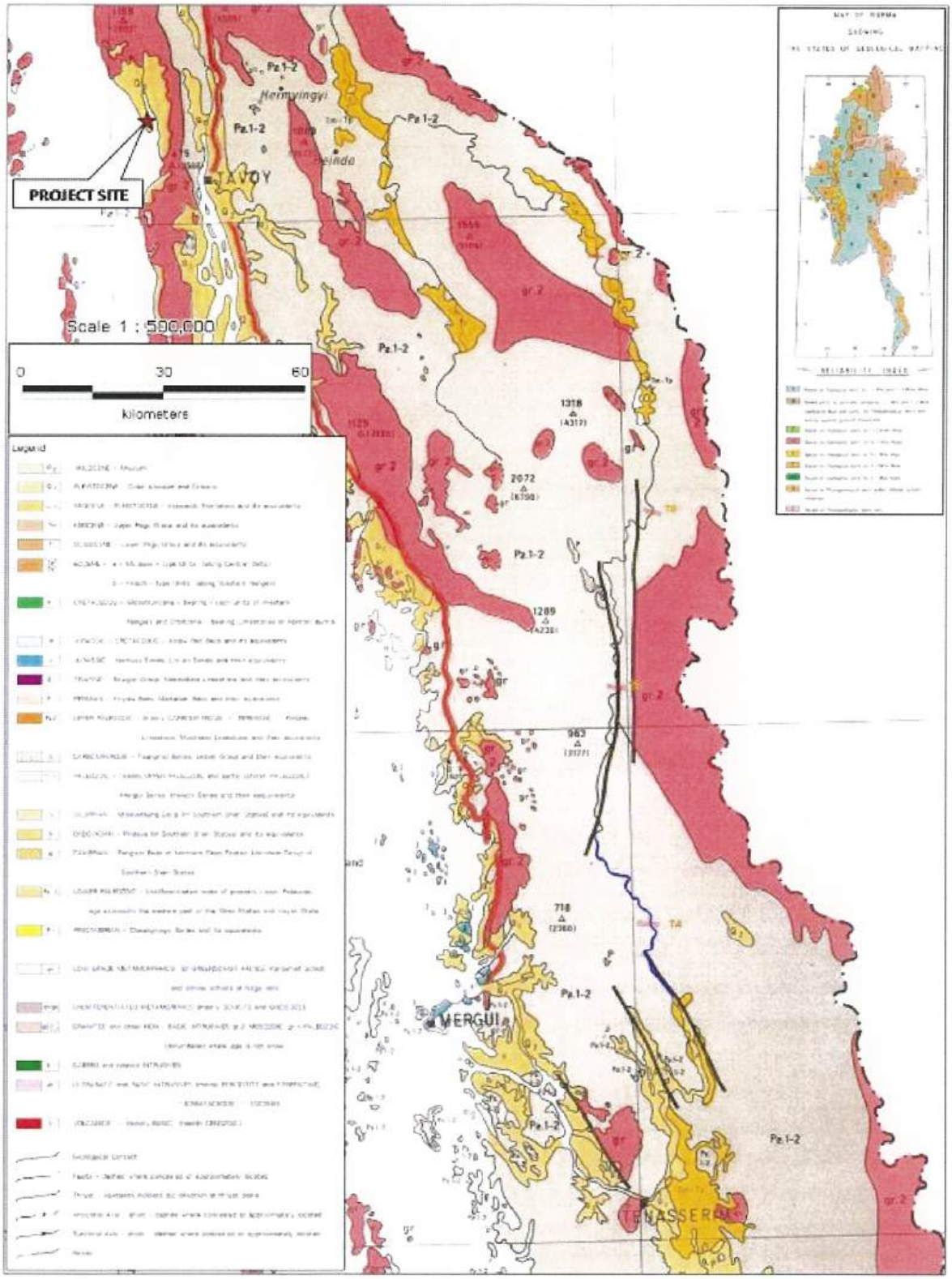
The name Mergui Series was given by T.Oldhem in 1856 to the unfossilliferous strata, composing of crushed shale, agglomerate, limestone and quartzite, which are found widely in the Region. The Mergui Series is pre-Carboniferous in age and underlies the Moulmein limestone. This Mergui series should be equivalent to Kaeng Krachan Group in Thailand and interpreted to be a turbidite deposit on the continental shelf.

The predominant rock type of the Mergui Series in Dawei District is argillite, fine grained rock of blue gray to black color at fresh, with obscure bedding and only incipient cleavage. The Carboniferous argillite composes of small crystals of andalusite and sillimanite, with finely divided graphite.

The next major rock type is dark grey or almost black "greywacke" which has weathered to an ashy brown color. This rock lacks bedding and is composed of sub angular fragments of fine-grained rock in matrix identical to the argillites.

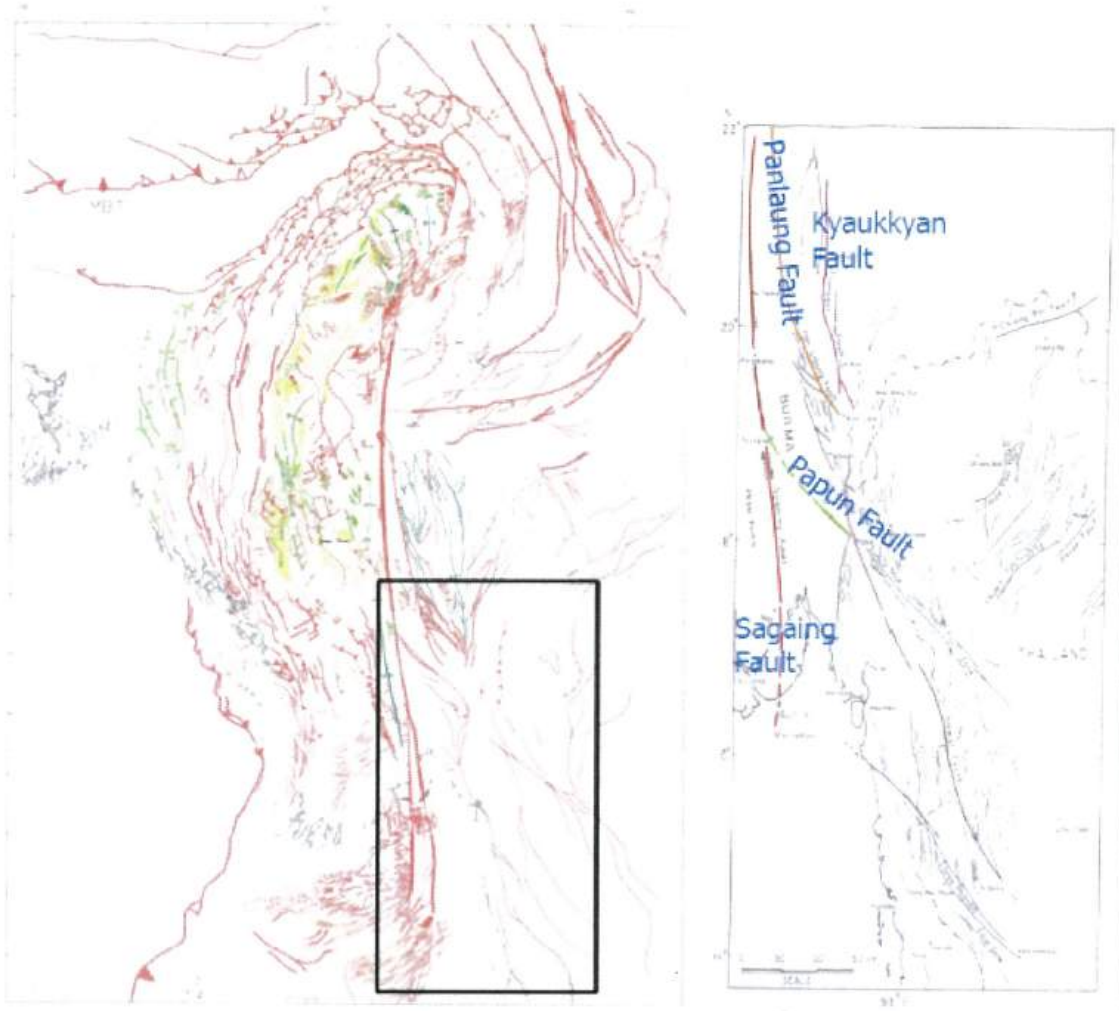
In 2010, Dr. Ir. Subagyo Pramumijoyo of the Department of Geological Engineering, Faculty of Engineering, Gadjah Mada University studied the structural geology of Myanmar and found that the Sagaing Fault is one of the major active geological features controlling the structural geology of Myanmar as shown in ***Figure 5.2-6***.

The Sagaing fault is a continental transform fault between the India and Sunda plates that connects spreading centers in the Andaman Sea and the continental convergence zone along the Himalayan front. Several $M>7$ earthquakes occurred along the fault in the last century, and Global Positioning System campaigns revealed a right-lateral slip rate of 18 mm/yr, about half of the total India–Sunda displacement rate of 35 mm/yr. It passes through just east of Bago and enter western Gulf of Martaban. The combined slip on the Sagaing and Sumatra-W Andaman faults has absorbed the full opening of Andaman Sea The Sagaing fault had been dextrally moving since 11 Ma at a average rate of 18.5 mm/yr (after Myint Thein et. al, January, 1991). The cities such as Bago, Swa, Phyu, Pyinmana were severely affected by earthquakes generated from the movement of Sagaing fault. The fault zone is quite wide (about 20 km) south of Bago, and rather narrow (< 2km) in many other areas, and the locking depth is estimated to be about 15 km.



Source: Army Geospatial Center, US Army Corps of Engineers and US Geological Survey (1990)

FIGURE 5.2-5: GEOLOGICAL MAP OF TANINTHARYI REGION



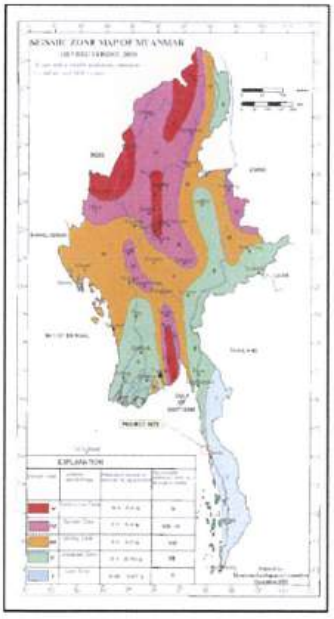
Source: Report on Regional Geology of Myanmar, Department of Geological Engineering, Faculty of Engineering, Gadjah Mada University, April 2010

FIGURE 5.2-6: STRUCTURAL GEOLOGICAL MAP OF MYANMAR

Kyaukkyan fault is one of the prominent seismotectonic feature (Lat. 22° 18′N -Long. 96° 44′E). (after Win Swe, 1980). The large earthquake of 23rd May, 1912 (8.0 RM) with many foreshocks and aftershocks, seems to be associated with that fault. It runs nearly north-south direction. Pan Laung fault run into the Shan Scarp accompanied by a zone of NNW-SSE subparallel faults towards the north. This zone has been reactivated due to Late Mesozoic and Cenozoic block movements (after Bender, 1983). Small lineament, branching from Pan Laung fault in NW-SE direction at about Lat. 20° N is displayed as major active fault (after Le Dain et. al.,). The name Papun Fault was first described by Le Dain, et. Al., 1984 and it extends for about 400 km in NW-SE direction passing Papun City in Myanmar. The different sense of lateral motion pattern along Papun Fault controls the crustal thickening, relaxation and thinning of Shan Plateau region (after Win Naing, 2006). Papun fault has sinistral sense of motion between 33 Ma to 30 Ma and dextral sense of motion about 23 Ma. Younger Sagaing Fault cut across this fault at Lat. 19.3°N - Long. 96.3 E° (after Win Naing, 2006).

5.2.4 Seismology

The seismic zone map of Myanmar is presented in ***Figure 5.2-7***. The five seismic zones are demarcated and named (from low to high). A probable maximum range of ground acceleration in g values and equivalent Modified Mercalli Scale classes are given for each zone.



EXPLANATION

SEISMIC ZONE	GENERAL DESCRIPTION	PROBABLE RANGE OF GROUND ACCELERATION	EQUIVALENT MODIFIED MERCALLI SCALE CLASSES
V	Destructive Zone	0.4 - 0.5 g	IX
IV	Severe Zone	0.3 - 0.4 g	VIII - IX
III	Strong Zone	0.2 - 0.3 g	VIII
II	Moderate Zone	0.1 - 0.15 g	VII
I	Low Zone	0.05 - 0.07 g	VI

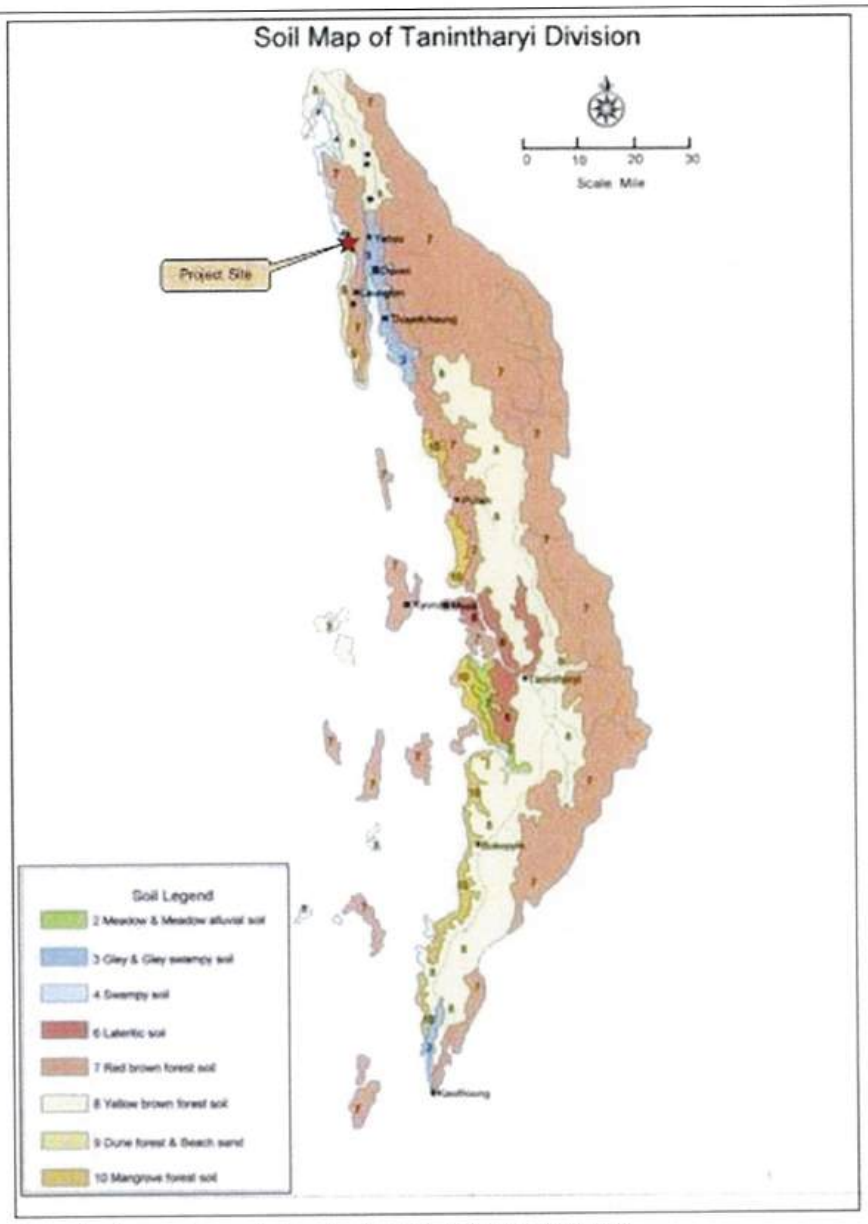
Source: Meteorological and Hydrological Department, Yangon, Myanmar.

FIGURE 5.2-7: SEISMIC HAZARD MAP OF TANINTHARYI REGION

Tanintharyi Region is located in the lowest seismic hazard zone in Myanmar. No major earthquakes have been recorded in the study area. The Project site is located in the moderate zone II with a probable maximum range of ground acceleration from 0.1-0.15 g.

5.2.5 Soils

Figure 5.2-8 is a soil map of Myanmar showing 11 types of soils in the country. Acrisol is the dominant type of soil in a most all of the Region, including the study areas. Visually, sand top soil is evident in the Project site.



Source:http://www.apipnm.org/swlwpnr/reports/y_ta/z_mm/mmmp222.htm#506

FIGURE 5.2-8 : SOIL MAP IN TANINTHARYI REGION

5.2.6 Hydrology

According to the data in the recent EIA of Transborder Road Link (Dawei-Phu Nam Ron), December 2014 and the results of field survey in February 2015, the Project alignment rely on mountainous and forest area. The area receives precipitation and rainfall during wet season and originates courses of water. These water courses flow down slopes and form up permanent rivers. The main river and their tributaries which cross over and run along project alignment as follows;

- Dawei River : locate around the west end of project alignment. The river flow from north to south direction and cross with project alignment around KM 19+000 as shown in ***Figure 5.2-9***.

- Ta Laing Ya River **:** it located in Section 1 and cross with project alignment around KM 24+000 as shown in ***Figure 5.2-10***.

- Kamaug Twe River : it located in Section 2. It flow along the project alignment from KM 60+000 to 69+500 and join with Ban Chaung River around KM 69+600 and discharge to Tanintharyi River around KM 69+600 as shown in ***Figure 5.2-11*** and ***Figure 5.2-12***, respectively.

- Ban Chaung River : it flows from southwest to northeast direction and join with Ka Maug Twe River around KM 69+600 as shown in ***Figure 5.2-12***.

- Tanintharyi River : it located in Section 2 around KM 69+600 in the west to east direction until KM 99+650 and met with project alignment again around KM 122+000 in Section 3 as shown in ***Figure 5.2-13*** and ***Figure 5.2-14***.

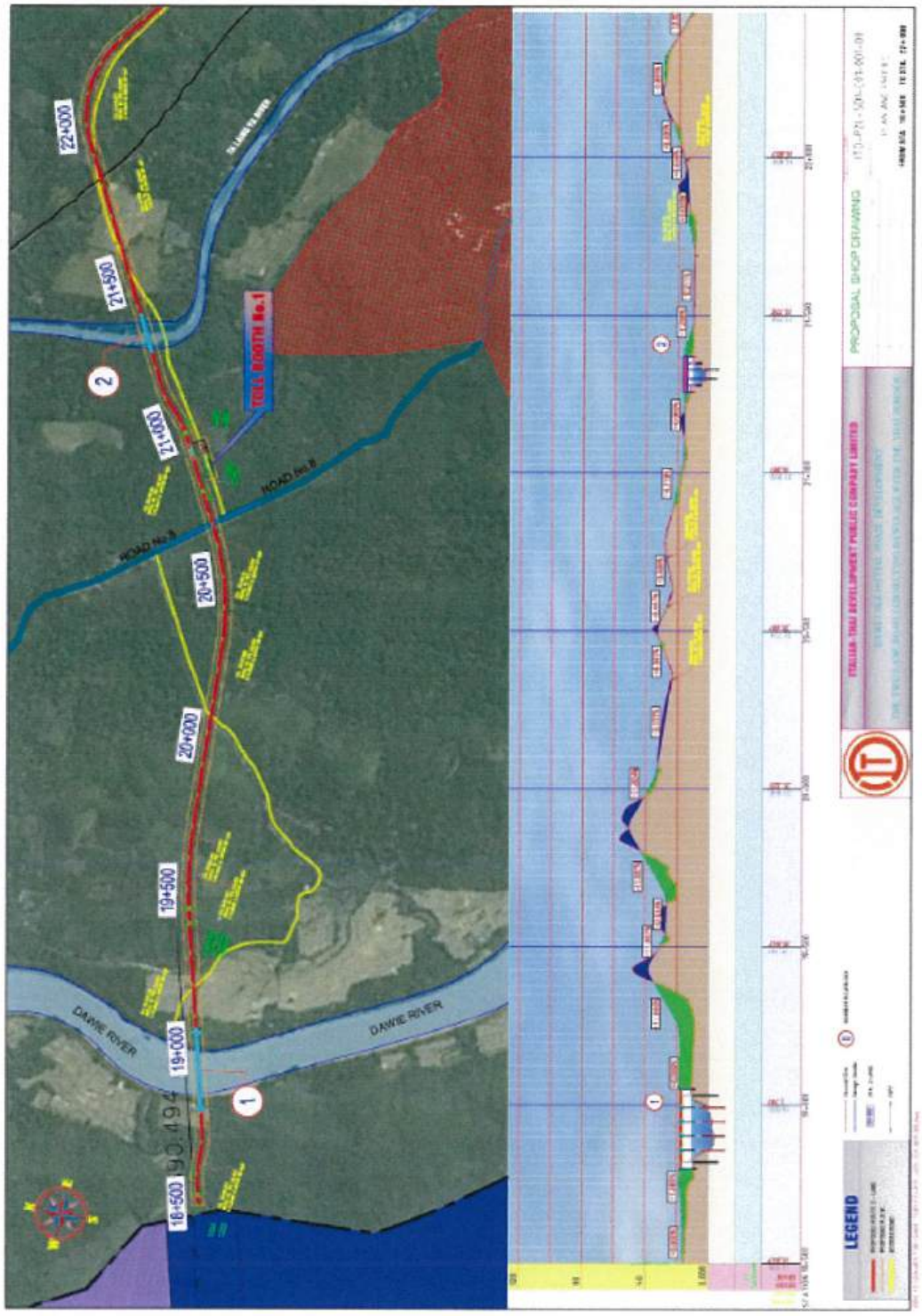


FIGURE 5.2-9 : LOCATION OF DAWEI RIVER WHERE CROSS THE PROJECT ALIGNMENT

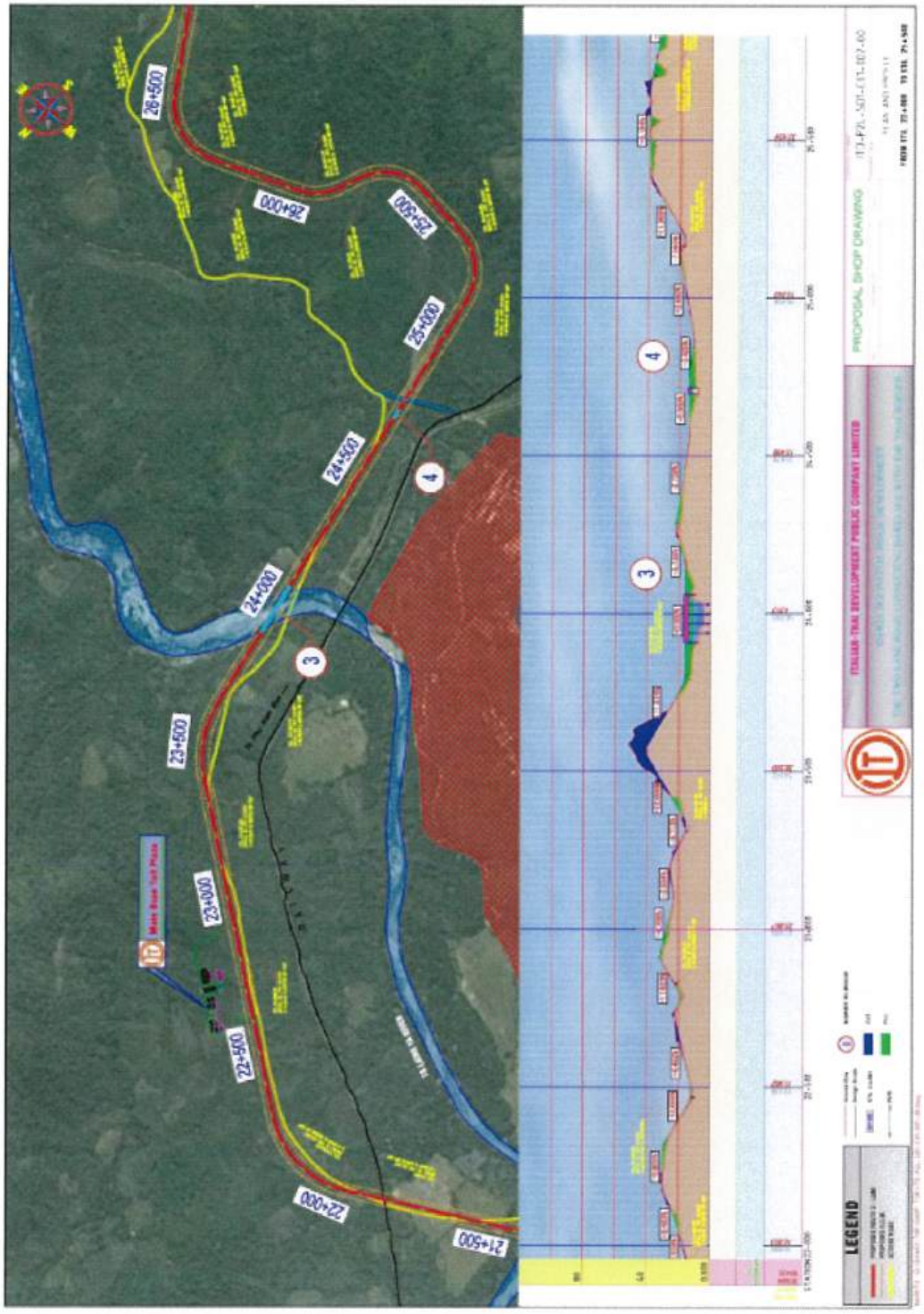


FIGURE 5.2-10 : LOCATION OF TA LAING YA RIVER WHERE CROSS THE PROJECT ALIGNMENT

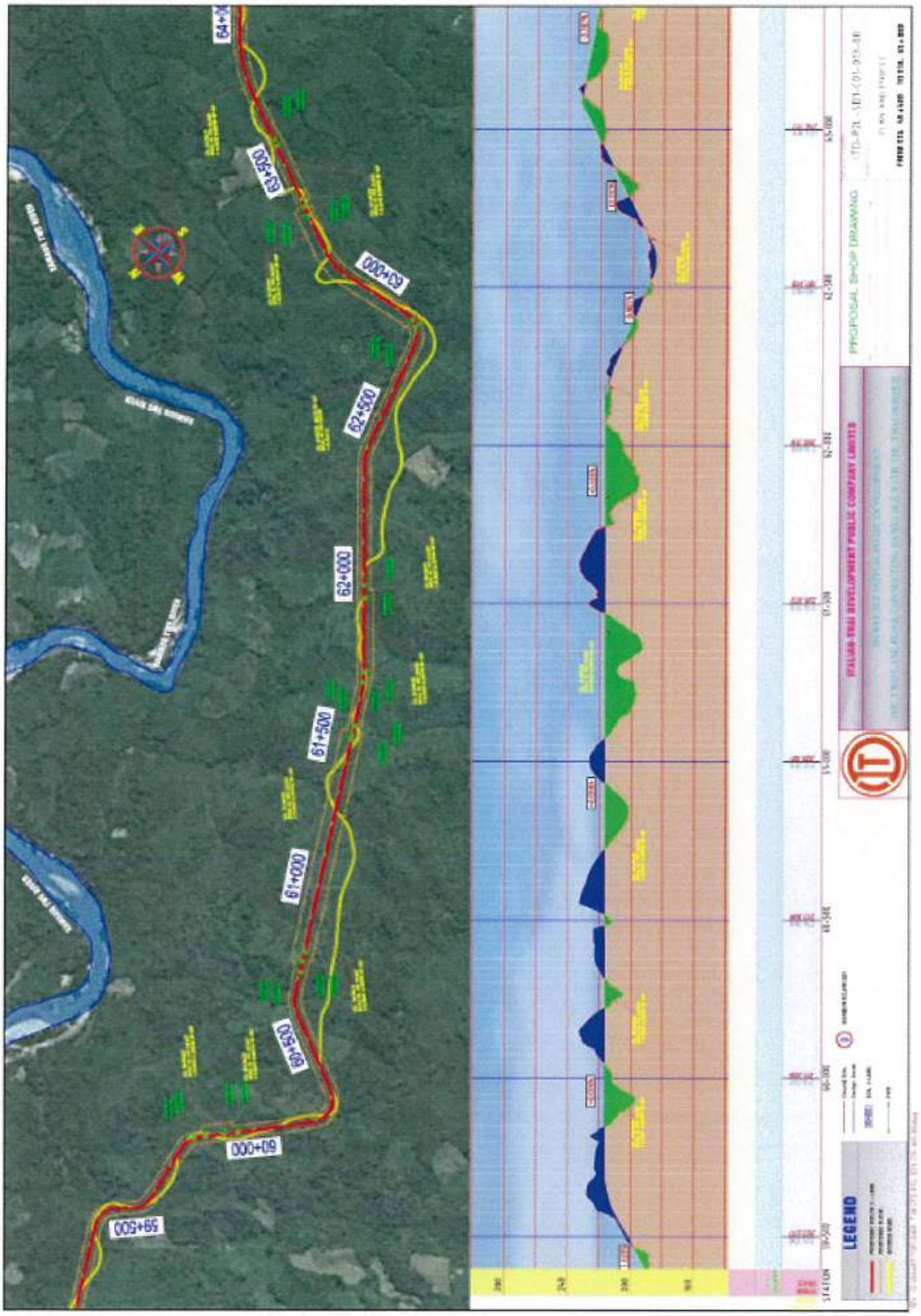


FIGURE 5.2-11 : LOCATION OF KAMAUG TWE RIVER NEARBY THE PROJECT ALIGNMENT

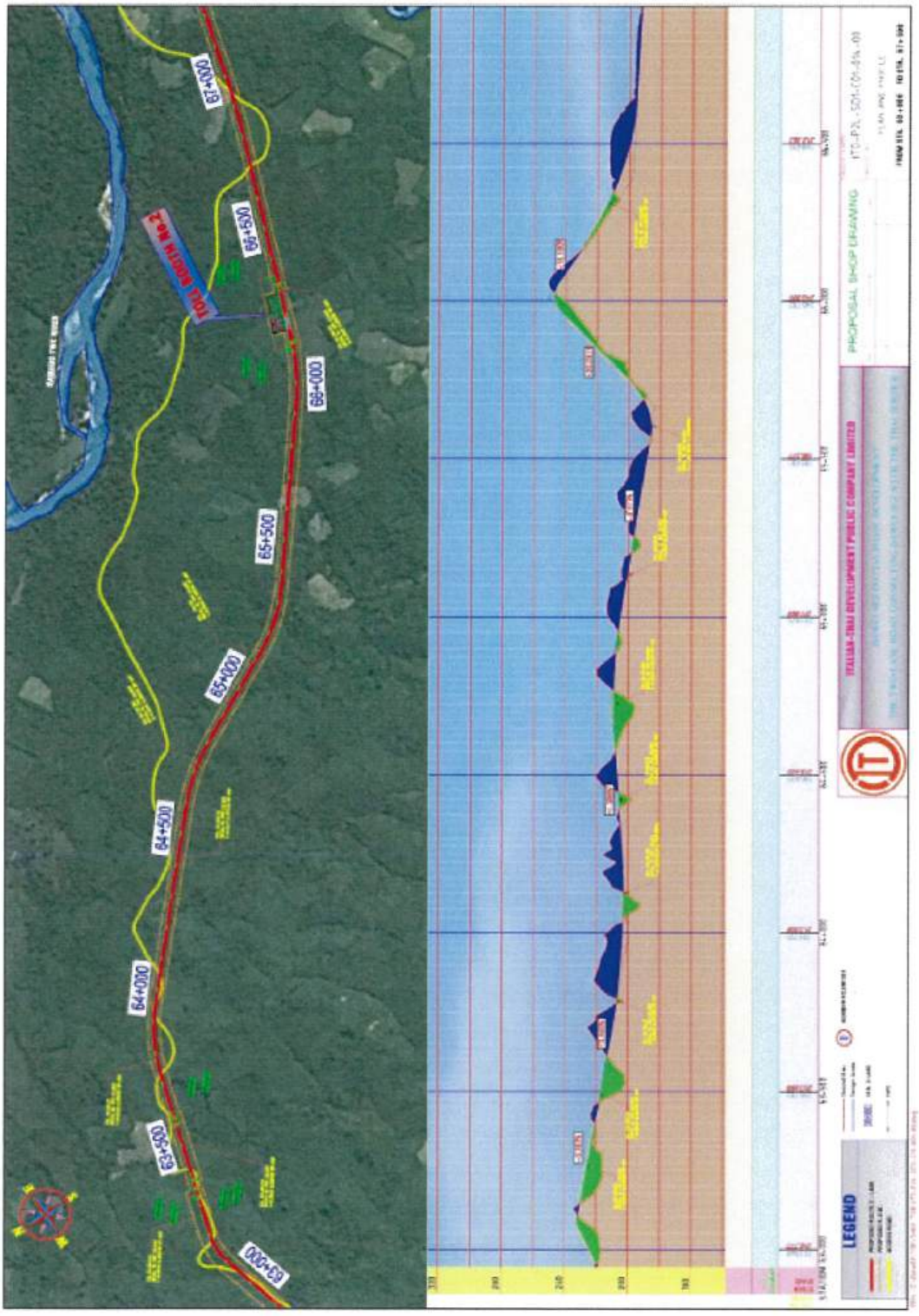


FIGURE 5.2-11 : LOCATION OF KAMAUG TWE RIVER NEARBY THE PROJECT ALIGNMENT (CONT'D)

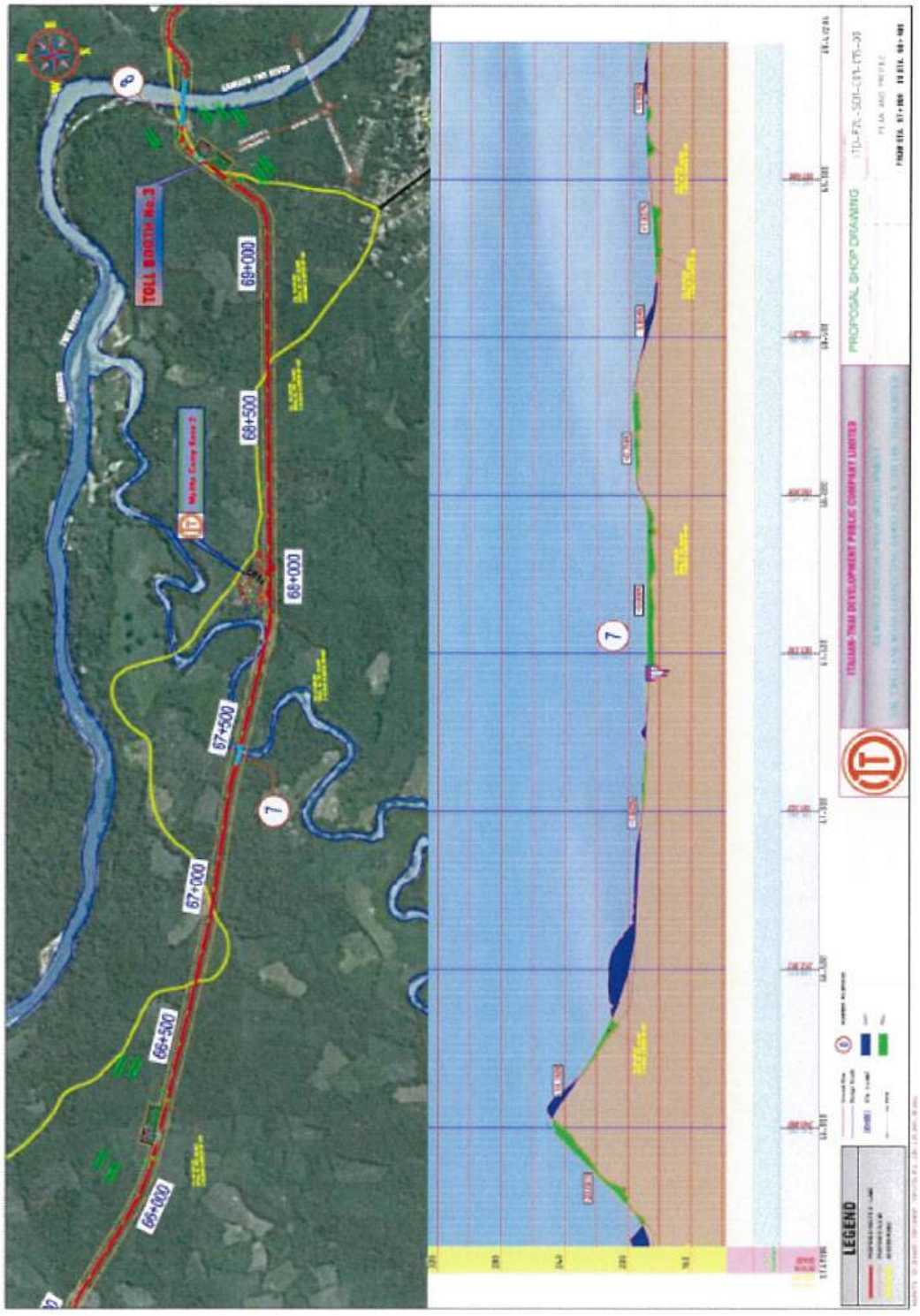


FIGURE 5.2-11 : LOCATION OF KAMAUG TWE RIVER NEARBY THE PROJECT ALIGNMENT (CONT'D)

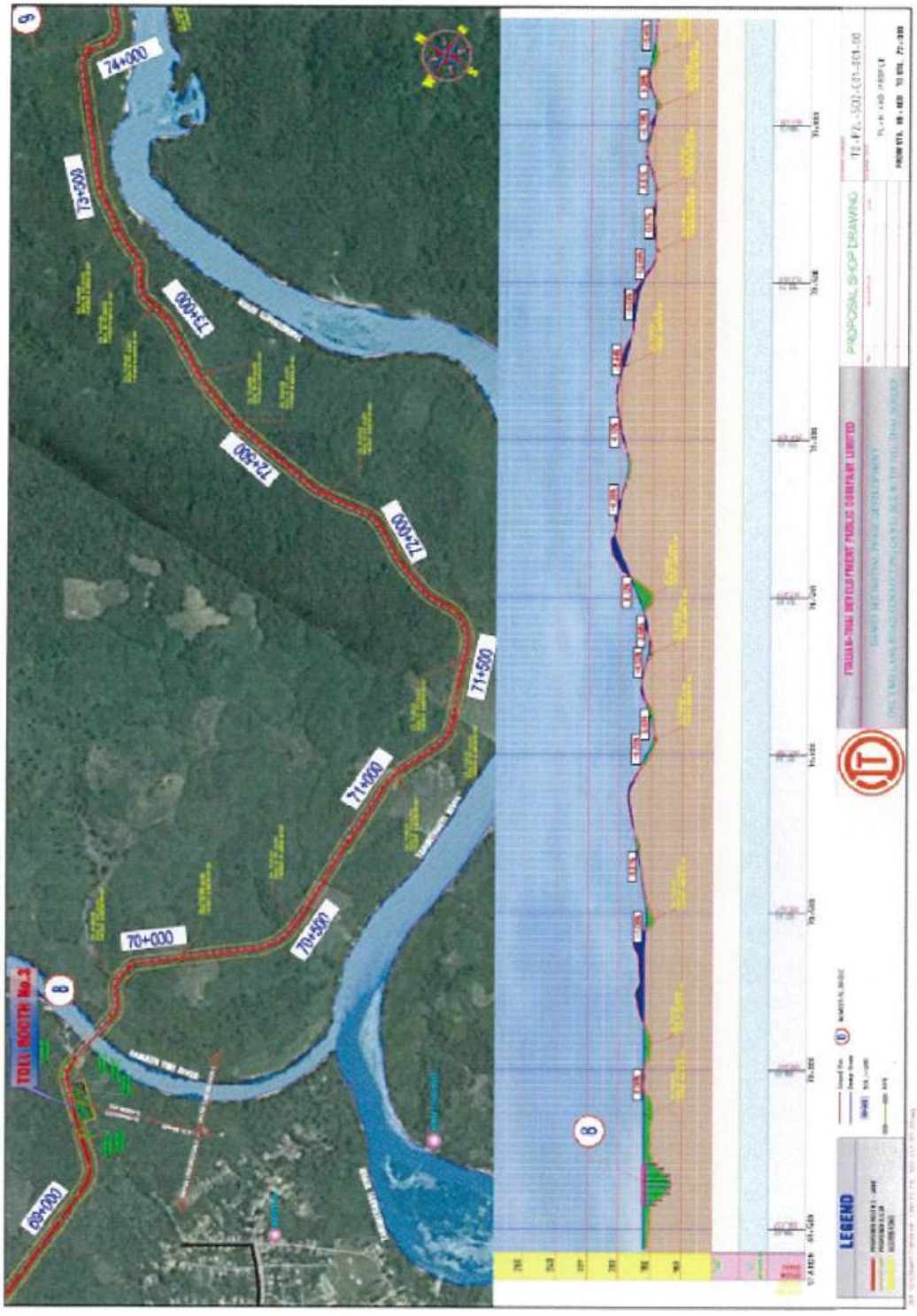


FIGURE 5.2-12 : LOCATION OF KAMAUG TWE RIVER JOIN WITH BAN CHAUNG RIVER AT KM 69+600

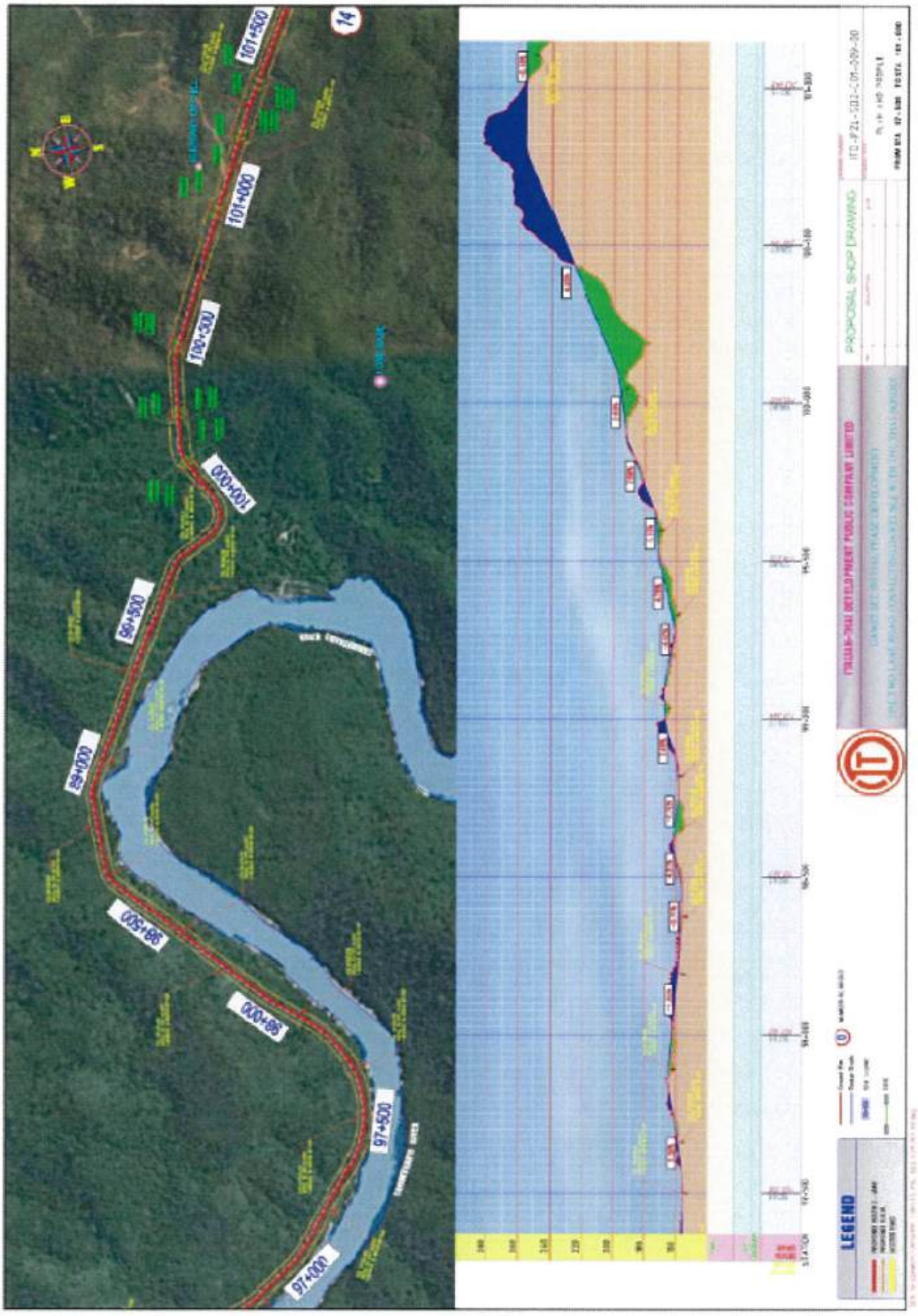


FIGURE 5.2-13 : LOCATION OF TANINTHARYI RIVER AT KM 99+650

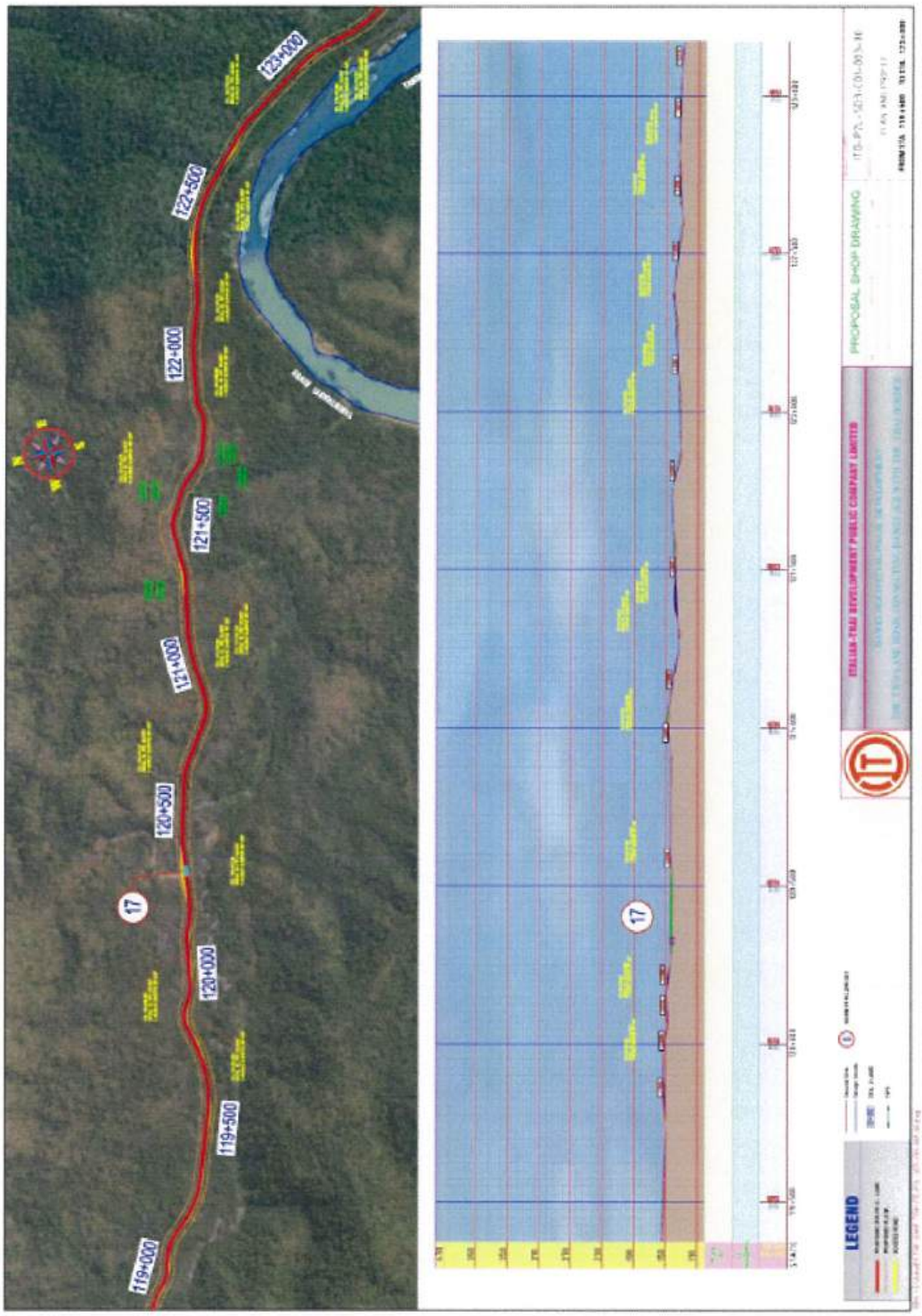


FIGURE 5.2-14 : LOCATION OF TANINTHARYI RIVER AT KM 122+000

5.2.7 Air Quality

Air quality surveys were conducted during January 21-24, 2015 (Station A1), January 25-28, 2015 (Station A2) and 29 January-1 February 2015 (station A3). Field measurements were carried out for 3 consecutive days at each station, as shown in ***Photo 5. 2- 1*** and ***Figure 5. 2- 2***. The air quality parameters measured included TSP (Total suspended particle), PM-10, SO_2, and NO_x. The sampling and analysis methods used were those recommended by USEPA as follows:

Pollutant	Sampling/ Analysis Method	Sampling Period
TSP (Average 24 Hour)	High-Volume Air Sampler/ Gravimetric Method	72-hours
PM-10 (Average 24 Hour)	High-Volume Air Sampler (PM-10) / Gravimetric Method	72-hours
SO_2 (Average 24 Hour)	Cheiluminescence Analyser	72-hours
NO_x (Average 1 Hour and 24 Hour)	UV-Fluorescence	72-hours
Wind Speed and Wind Direction	Cup Anemometer and Wind Vane	72-hours

Results of the air quality surveys at the three stations are summarized in ***Table 5.2-3*** and details are given in ***Appendix 5B.***

Station A1 (Toll Plaza Base Camp) : The concentration of TSP (Avg. 24 hr.) ranged from 70.00-80.00 $\mu g/m^3$, PM-10 (Avg. 24 hr.) from 46.00-49.00 $\mu g/m^3$, NO_2 (Avg. 1 hr.) from 20.70-30.86 $\mu g/m^3$ and NO_2 (Avg. 24 hr.) from 7.92-9.22 $\mu g/m^3$ and CO (Avg. 1 hr.) from 458.24-572.80 and CO (Avg. 24 hr.) from 343.68-458.24 $\mu g/m^3$. The values of NOx were much below the permissible maximum values prescribed in the Myanmar National Environmental Quality (Emission) Guidelines, Final Draft (2015) and Ambient Air Quality Standards of World Bank (2007) but PM-10 values were over than permissible maximum values due to existing condition of project alignment is dirt road and this existing road has been used since 5 years ago (***Table 5.2-3.***).

Station A2 (Myitta Base Camp) : The concentration of TSP (Avg. 24 hr.) ranged from 43.00-58.00 $\mu g/m^3$, PM-10 (Avg. 24 hr.) from 25.00-34.00 $\mu g/m^3$, NO_2 (Avg. 1 hr.) from 6.40-8.28 $\mu g/m^3$ and NO_2 (Avg. 24 hr.) value is 4.52 $\mu g/m^3$, and CO (Avg. 1 hr.) value is 343.68 $\mu g/m^3$ while CO (Avg. 24 hr.) value is 458.24 $\mu g/m^3$. The values of NOx were much below the permissible maximum values prescribed in the Myanmar National Environmental Quality (Emission) Guidelines, Final Draft (2015) and Ambient Air Quality Standards of World Bank (2007) (***Table 5.2-3***).

Station A3 (Elasto Base 1 Camp) : The concentration of TSP (Avg. 24 hr.) ranged from 158.00-186.00 $\mu g/m^3$, PM-10 (Avg. 24 hr.) from 80.00-100.00 $\mu g/m^3$, NO_2 (Avg. 1 hr.) from 9.22-13.74 $\mu g/m^3$ and NO_2 (Avg. 24 hr.) from 5.46-6.59 $\mu g/m^3$, and CO (Avg. 1 hr.) is 572.80 $\mu g/m^3$ while CO (Avg. 24 hr.) from 458.24-572.80 $\mu g/m^3$. The values of NOx were much below the permissible maximum values prescribed in the Myanmar National Environmental Quality (Emission) Guidelines, Final Draft (2015) and Ambient Air Quality Standards of World Bank (2007) but PM-10 values were over than permissible maximum values due to existing condition of project alignment is dirt road and this existing road has been used since 5 years ago (***Table 5.2-3***). In addition, this section of existing road has too many traffic from project vehicles and local transportation.

TABLE 5.2-3

RESULTS OF THE AIR QUALITY MEASUREMENTS (21 JANUARY-1 FEBRUARY 2015)

Station	Sampling Date	Results of Measurement (μg/m³)					
		TSP	PM-10	NO_2		CO	
		Average 24 Hour	Average 24 Hour	Average 24 Hour	Average 1 Hour	Average 24 Hour	Average 1 Hour
Station A1: Toll Plaza Base Camp, Yebyu Township, Dawei District, Tanintharyi Region	21-22 Jan. 2015	70	46	8.09	25.03	458.24	572.80
	22-23 Jan.2015	74	48	9.22	30.86	458.24	572.80
	23-24 Jan.2015	80	49	7.90	20.70	343.68	458.24
	Min-Max	**70-80**	**46-49**	**7.90-9.22**	**20.70-30.86**	**343.68-458.24**	**458.24-572.80**
Station A2: Myitta Base Camp, Yebyu Township, Dawei District, Tanintharyi Region	25-26 Jan.2015	43	25	4.52	7.53	343.68	458.24
	26-27 Jan. 2015	49	32	4.52	6.40	343.68	458.24
	27-28 Jan.2015	58	34	4.52	8.28	343.68	458.24
	Min-Max	**43-58**	**25-34**	**4.52**	**6.40-8.28**	**343.68**	**458.24**
Station A3: Elasto Base 1 Camp, Yebyu Township, Dawei District, Tanintharyi Region	29-30 Jan.2015	164	91	6.59	13.74	458.24	572.80
	30-31 Jan.2015	186	100	5.46	12.42	458.24	572.80
	31 Jan.-1 Feb. 2015	158	80	6.02	9.22	572.80	572.80
	Min-Max	**158-186**	**80-100**	**5.46-6.59**	**9.22-13.74**	**458.24-572.80**	**572.80**
National Environmental Quality (Emission) Guidelines, Final Draft (2015) [1/]		-	**50**	-	**200**	-	-
Ambient Air Quality Standards of IFC, World Bank Group (2007)[2/]		-	**50**	-	**200**	-	-

Remark: [1/] Myanmar National Environmental Quality (Emission) Guidelines, Final Draft (2015).

[2/] WHO Ambient Air Quality Guidelines stated on Environmental, Health, and Safety Guidelines: Environmental Air Emissions and Ambient Air Quality of International Finance Corporation-IFC (April 30, 2007).

Source: Field survey by TEAM Consulting Engineering and Management Co., Ltd., 21 January - 1 February 2015.

5.2.8 Noise and Vibration

(1) Noise

The Consultant conducted noise measurements during January 21-24, 2015 (Station A1), January 25-28, 2015 (Station A2) and 29 January-1 February, 2015 (station A3). The three stations were set in the same location for air quality sampling as shown in ***Photo 5.2-2*** and ***Figure 5.2-2***. Information on the three stations is summarized below:

Particulars	Station N1: Toll Plaza Base Camp, Yebyu Township, Dawei District, Tanintharyi Region	Station N2: Myitta Base Camp, Yebyu Township, Dawei District, Tanintharyi Region	Station N3: Elasto Base 1 Camp, Yebyu Township, Dawei District, Tanintharyi Region
Reference Coordinates	UTM (WGS84) 47P 0416013 E, 1580839 N	UTM (WGS84) 47P 0446903 E, 1566509 N	UTM (WGS84) 47P 0504107 E, 1535858 N
District	Dawei District	Dawei District	Dawei District
Nearest village	Dauk Lauk	Myitta	Hti Hkee
Nearest noise sources	Project road and camp	Project road and camp	Project road and camp
Weather condition	-	-	-

The noise level was measured and recorded continuously for 72 hours using a sound level meter. The results are summarized in ***Table 5.2-4*** and details of the measurements are presented in ***Appendix 5C***. US.EPA. standards and Myanmar National Environmental Quality (Emission) Guidelines, Final Draft (2015) are also compared with the background noise levels in ***Table 5.2-4***. Major finding are:

- The average background noise levels expressed in Leq (24 hr.) were significantly below the maximum limit set by Myanmar National Environmental Quality (Emission) Guidelines and U.S. EPA noise standard.

TABLE 5.2-4

NOISE LEVEL MEASUREMENT AT 3 SAMPLING STATIONS DURING 21 JANUARY-1 FEBRUARY 2015

Sampling Location	Sampling Date	Noise Level (dB(A))			
		Leq 24 hr	Lmax	Ldn	L_{90}
N1: Toll Plaza Base Camp, Yebyu Township, Dawei District, Tanintharyi Region	21-22 Jan. 2015	50.9	92.7	55.2	48.0
	22-23 Jan.2015	51.2	80.7	55.4	47.7
	23-24 Jan.2015	53.0	84.6	56.4	47.9
Min-Max		**50.9-53.0**	**80.7-92.7**	**55.2-56.4**	**47.7-48.0**
N2: Myitta Base Camp, Yebyu Township, Dawei District, Tanintharyi Region	25-26 Jan.2015	48.1	85.6	52.1	39.2
	26-27 Jan. 2015	47.9	88.6	53.2	38.8
	27-28 Jan.2015	46.1	90.3	50.7	37.4
Min-Max		**46.1-48.1**	**85.6-90.3**	**50.7-53.2**	**37.4-39.2**
N3: Elasto Base 1 Camp, Yebyu Township, Dawei District, Tanintharyi Region	29-30 Jan.2015	51.1	82.8	54.9	44.1
	30-31 Jan.2015	50.0	88.8	54.8	43.0
	31 Jan.-1 Feb. 2015	53.4	87.7	56.4	44.9
Min-Max		**50.0-53.4**	**82.8-88.8**	**54.8-56.4**	**43.0-44.9**
National Environmental Quality (Emission) Guidelines, Final Draft (2015) [1/]		**70.0**	-	-	-
U.S. EPA Standard		**70.0**	-	-	-

Remark : [1/]Myanmar National Environmental Quality (Emission) Guidelines, Final Draft (2015).
Source : Field survey by TEAM Consulting Engineering and Management Co., Ltd., 21 January - 1 February 2015.

(2) Vibration

Background vibration measurements were carried out at the three noise measurement stations concurrently with the noise measurements in January 2015. At each station, the ground vibration was recorded over a 72 hour period using a vibration meter in terms of peak particle velocity (PPV) in mm/s in 3 mutually perpendicular directions (transverse, vertical and longitudinal) and frequency (Hz).

Results of the vibration measurement in January 2015 are given in ***Table 5.2-5*** and details are provided in ***Appendix 5D***. Major findings are:

- **Station N1-** the magnitudes of vibration or PPV measured over a 72-hour period varied over a narrow range between 0.190-0.349 mm/s (at 24-34 Hz frequency). The vibration was caused by moving vehicles on the nearby road.

- **Station N2-** the magnitudes of vibration or PPV measured over a 72-hour period is 0.905 mm/s with over than 100 Hz frequency on 25-26 Jan. 2015. The vibration was caused by moving vehicles on the nearby road as same as Station N1.

- **Station N3-** the magnitudes of vibration or PPV measured over a 72-hour period is 0.603 mm/s with 64 Hz frequency on 29-30 January.2015. The vibration was caused by moving vehicles on the nearby road as same as Station N1.

- The magnitudes of background vibration levels at three stations were still much below the perceptible level of 2.0 mm/s prescribed in German Vibration Guideline Values (Din4150-3, 1999) given in ***Table 5.2-6***.

TABLE 5.2-5

RESULTS OF THE VIBRATION MEASUREMENTS DURING 21 JANUARY-1 FEBRUARY 2015

Station	Sampling date	Results			
		Time of Vibration	Peak particle velocity* (mm/s)	Frequency (Hz)	Sources of Vibration
N1: Toll Plaza Base Camp, Yebyu Township, Dawei District, Tanintharyi Region	21-22 Jan. 2015	10:29:46 PM	0.333(Vert)	34	vehicles
	22-23 Jan.2015	9:08:33 PM	0.190 Vert)	24	vehicles
	23-24 Jan.2015	10:31:17 PM	0.349 (Vert)	32	vehicles
N2: Myitta Base Camp, Yebyu Township, Dawei District, Tanintharyi Region	25-26 Jan.2015	11:48:27 AM	0.905 (Vert)	>100	vehicles
	26-27 Jan. 2015	-	<0.300	N/A	-
	27-28 Jan.2015	-	<0.300	N/A	-
N3: Elasto Base 1 Camp, Yebyu Township, Dawei District, Tanintharyi Region	29-30 Jan.2015	7:56:24 AM	0.603 (Vert)	64	vehicles
	30-31 Jan.2015	-	<0.300	N/A	-
	31 Jan.-1 Feb. 2015	-	<0.300	N/A	-

Remark: * Peak Particle Velocity; Vert = Vertical, Long = Longitudinal, Trans=Transverse.

TABLE 5.2-6

EFFECT OF VIBRATION ON PEOPLE AND BUILDINGS

PPV[a] (mm/s)	Human Reaction	Effect on Buildings[c]
0-0.15	Imperceptible	Unlikely to cause damage of any type
0.15-0.3[b]	Threshold of perception	Unlikely to cause damage of any type
2.0	Vibrations perceptible	Recommended upper level to which ruins and ancient monument should be subjected
2.5	Continuous exposure to vibrations begins to feel annoy[d]	Virtually no risk of "architectural" damage to normal buildings
5	Vibrations annoying people in buildings	Threshold for risk of "architectural" damage in houses with plastered walls and ceilings
10-15	Continuous vibrations, unpleasant and unacceptable	Would cause "architectural" and possibility minor structural damage

Remark: a Peak Particle Velocity in the vertical direction. For human reaction, the value applies at the point at which the person is situated. For buildings, the value refers to the ground motion (but without an allowance for the amplifying effect of structural components). It is assumed that the frequency of vibration is in the range of 5 to 20 Hz.
b This level appliers to a continuous sinusoidal vibration. However, truck induced vibration is of sorter duration (about 2 to 3 seconds) and thus higher levels appear to be applicable.
c This criteria for buildings recognize that the building damage will result from a fatigue failure over a long period of time (not from a one-time event).
d Vibration levels causing annoyance may be lower for occurrences during right time and for occurrences that are very frequent (1).

Source: Deutsches Institut für Normung, Berlin, Germany, DIN 4150-3, Structural Vibration Part 3: Effects of Vibration on Structures, 1999.

5.2.9 Surface Water Quality

From the reviewing of proposed project alignment, eleven (11) stations which cross natural water courses were designated as water quality sampling stations. Coordinates of surface water sampling stations are shown in ***Table 5.2-7***.

TABLE 5.2-7

COORDINATES OF THE SURFACE WATER QUALITY SAMPLING STATIONS

Sampling station	Sampling code	Projected coordinates (Datum WGS 84)		
		UTM	East (X)	North (Y)
Dawei River	SW 1	47P	0412573	1580210
Tha Laing Ya shaung	SW 2	47P	0414869	1580749
Tha Laing Ya shaung, Mia Phyu	SW 3	47P	0416722	1579778
Yebouk Shaung	SW 4	47P	0430045	1577120
Tha Byu Shaung	SW 5	47P	0437858	1573480
Henda Shaung	SW 6	47P	0446790	1566758
Kamoethway River	SW 7	47P	0448452	1636184
Bridge No.11	SW 8	47P	0456180	1569677
Bridge No.13 (Ya Pla Shaung)	SW 9	47P	0463294	1567908
Bridge No.18 (Vado Shaung)	SW 10	47P	0497784	1542766
Bridge No.19 (Base 1)	SW 11	47P	0504130	1535665

The study of surface water quality was conducted on 24 January and 2 February 2015. Surface water sample were collected at eleven stations within RoW of project alignment as indicated in a map in ***Figure 5.2-15***.

The QA/QC of ISO/IEC 17025:2005 accreditation for laboratory was performed prior to water sampling in order to avoid contamination of water samples, i.e. collector have to put on flour free rubber gloves all the time while collecting samples, rinse sample bottles with sampling water be for collect it.

At each sampling station, a sample was taken at the mid depth of the water body. Conductivity, dissolved oxygen, and pH were measured *in situ*. All collected sample bottles were labeled, sample information was recorded in a chain of custody. All collected water sample bottles were labeled and their information was recorded and kept for tracing. The collected water samples were preserved at 4°C in a storage box and were sent to the assigned laboratory in Thailand for analysis of various quality parameters. Details of preservation method, analysis method and detection limit for each parameter are shown in ***Table 5.2-8***. Results of surface water quality measurement from each station were compared with Thailand's Surface Water Quality Standards as detailed in ***Table 5.2-9***.

The result of water quality analysis which is shown in ***Table 5.2-10*** *and* detailed in ***Appendix 5E***, indicates that water quality of all sampling station can be categorized in class 2 or class 3 of Thailand surface water quality standard and the ECE (Economic Commission for Europe) Standard Statistical Classification of Surface freshwater for the Maintenance of Aquatic Life (UN ECE, 1996) (see ***Table 5.2-11 and Table 5.2-12***) depending on concentration of dissolve oxygen and BOD_5. Heavy metal and coliform bacteria are within Thailand surface water quality standard. The key results can be summarized below:

- Dissolved oxygen of all station range from 5.95 to 7.47 mg/l which is generally above the level required for protection of the aquatic fauna.
- Conductivity, total solids, total dissolve solid and turbidity in SW1 are higher than others indicating intrusion of sea water and tidal current.
- Heavy metals which include lead (Pb) and cadmium (Cd) are generally within Thailand's Surface Water Quality except lead in **SW1** which is higher. This may be due to SW1 is located downstream and act as receiving basin of contaminated water from upstream.
- Total coliform especially in **SW1**, **SW9**, and **SW11** are relatively high, this is the result from untreated effluent of communities waste.

TABLE 5.2-8

SUMMARY OF PRESERVATION AND ANALYSIS METHODS AND DETECTION LIMIT FOR SURFACE WATER SAMPLING

Parameter	Unit	Preservation Method 1/	Analysis Method 1/	Detection Limit
Depth	m.	Measure at Site		- -
pH	- -	Measure at Site	*In situ*/pH meter	1.0
Temperature	°c	Measure at Site	*In situ*/ Thermometer	- -
Transparency	m	Measure at Site	Secchi disc	- -
Conductivity	µmho/cm	Measure at Site	*In situ*/ Electrical Conductivity Meter	0
Salinity	ppt	Measure at Site	*In situ*/ Salino meter	0.1
Dissolved oxygen	mg/L	Measure at Site	*In situ*/ DO Meter	0.5
Turbidity	NTU	Refrigerate in Cooling Container	Nephelometric Method	0.1
Suspended Solids	mg/L	Refrigerate in Cooling Container	Dried at 103-105°C, Gravimetric method	2.5
Total Dissolved Solids	mg/L	Refrigerate in Cooling Container	Dried at 180°C, Gravimetric method	50
Total Solids	mg/L	Refrigerate in Cooling Container	Dried at 103-105°C, Gravimetric method	2.5
Oil and grease	mg/L	Add H_2SO_4 to pH<2 and refrigerate	Soxhlet Extraction Method	- -
BOD_5	mg/L	Refrigerate in Cooling Container	Azide Modification Method	1.0
Lead	mg/L	Add HNO_3 to pH<2 and refrigerate	Inductively Couple Plasma Method	0.01
Cadmium	mg/L	Add HNO_3 to pH<2 and refrigerate	Inductively Couple Plasma Method	0.003
Total Iron	mg/L	Add HNO_3 to pH<2 and refrigerate	Inductively Couple Plasma Method	0.01
Total Coliform Bacteria	(MPN/100 ml)	Refrigerate in Cooling Container	Standard Total Coliform Fermentation Technique	<1.8
Fecal Coliform Bacteria	(MPN/100 ml)	Refrigerate in Cooling Container	Fecal Coliform Procedure	<1.8

Remark: 1/ American Public Health Association (APHA), American Water Works Association (AWWA) and Water Pollution Control Federation (WEF). 2005. Standard Methods for the Examination of Water and Wastewater. 21st Edition. Washington, DC: American Public Health Association.

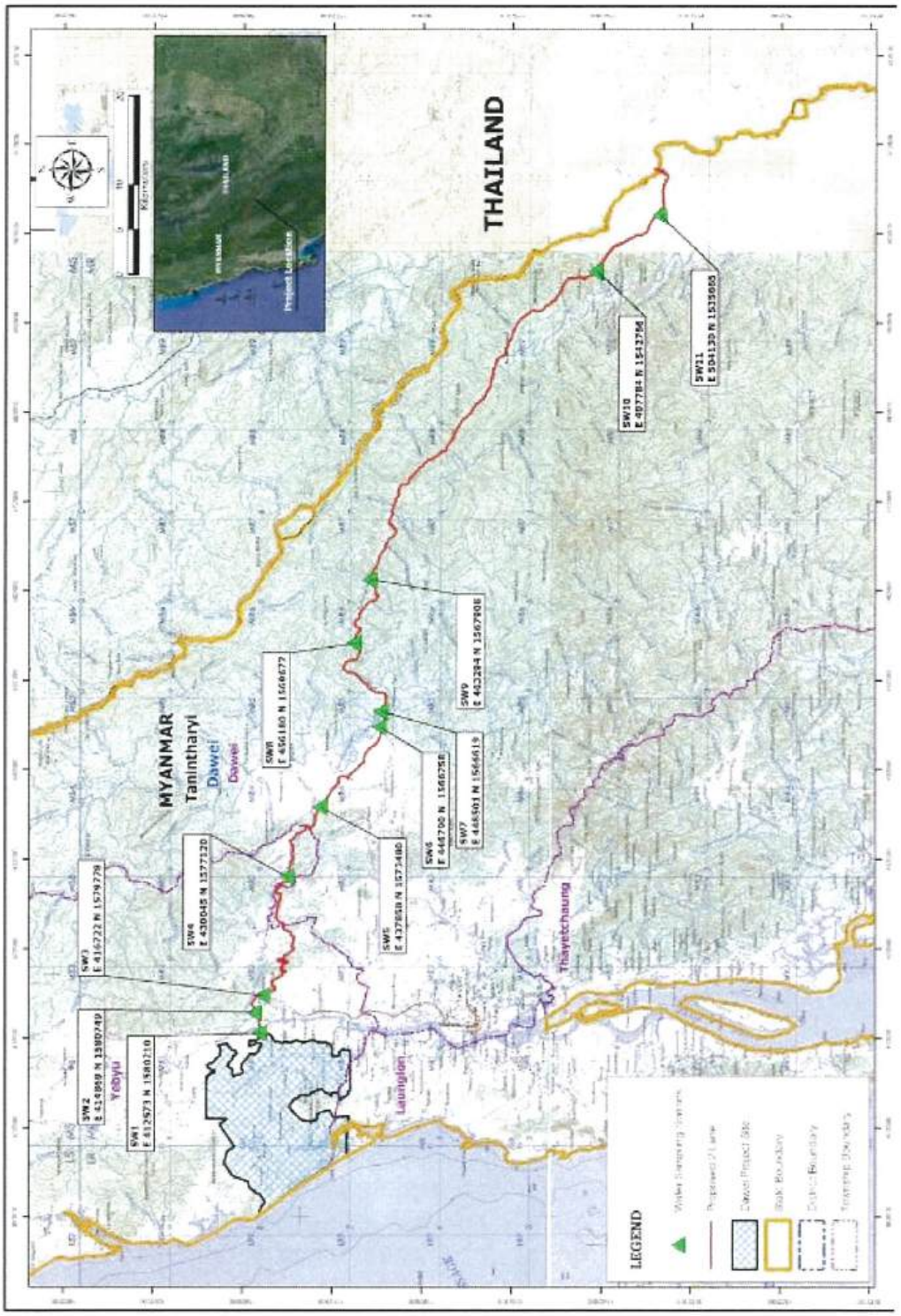


FIGURE 5.2-15 : LOCATION OF SURFACE WATER SAMPLING STATIONS

TABLE 5.2-9
THAILAND SURFACE WATER QUALITY STANDARDS

Parameter	Units	Standard values for class***				
		1	2	3	4	5
1. Colour,Order and Taste	-	n	n	n	n	-
2. Temperature	°C	n	n'	n'	n'	
3. pH value	-	n	5-9	5-9	5-9	-
4. Dissolved Oxygen	mg/l	n	≤ 6	≤ 4	≤ 2	-
5. BOD (5 days, 20 °C)	mg/l	n	≥ 1.5	≥ 2.0	≥ 4.0	-
6. Total Coliform Bacteria	MPN/100 ml	n	≥ 5000	≥ 20000	-	-
7. Faecal Coliform Bacteria	MPN/100 ml	n	≥ 1000	≥ 4000	-	-
8. NO_3-N	mg/l	n	Not more than		5.0	-
9. NH_3-N	mg/l	n	Not more than		0.5	-
10. Phenol	mg/l	n	Not more than		0.005	-
11. Cu	mg/l	n	Not more than		0.1	-
12. Ni	mg/l	n	Not more than		0.1	-
13. Mn	mg/l	n	Not more than		1.0	-
14. Zn	mg/l	n	Not more than		1.0	-
15. Cd	mg/l	n	Not more than 0.005*		0.5**	-
16. Cr (hexavalent)	mg/l	n	Not more than		0.05	-
17. Pb	mg/l	n	Not more than		0.05	-
18. Hg (total)	mg/l	n	Not more than		0.002	-
19. As	mg/l	n	Not more than		0.01	-
20. CN	mg/l	n	Not more than		0.005	-
21. Radioactivity	mg/l	n	Not more than		0.1	-
- Gross α	Becquerel/l	n			1.0	
- Gross β	Becquerel/l	n			0.05	
22. Total Organo Chloride Pesticides	µg/l		Not more than			
23. DDT	µg/l	n	Not more than		1.0	-
24. α BHC	µg/l	n	Not more than		0.02	-
25. Dieldrin	µg/l	n	Not more than		0.1	-
26. Aldrin	µg/l	n	Not more than		0.1	-
27. Heptachlor & Heptachlor epoxide	µg/l	n	Not more than		0.2	-
28. Endrin	µg/l	n	----------none----------			-

Note : P = Percennle value
n = naturally
n' = naturally but changing not more than 3 °C
* = when water hardness not more than 100 mg/l as $CaCO_3$
** = when water hardness more than 100 mg/l as $CaCO_3$
*** = water classification

TABLE 5.2-10

RESULT OF SURFACE WATER ANALYSIS AT EACH STATION

Parameter	Unit	SW1	SW2	SW3	SW4	SW5	SW6	Standard*		Standard**	
								Class 2	Class 3	Class 2	Class 3
Sampling Date		28/1/2015	28/1/2015	24/1/2015	24/1/2015	24/1/2015	24/1/2015				
Depth	m.	3.80	1.90	1.50	0.30	0.30	0.30	-	-	-	-
pH	- -	6.91	6.99	7.33	6.50	6.84	6.93	5.0–9.0	5.0–9.0	6.5–6.3	6.3–6.0
Water temperature	°c	27.1	27.9	28.3	23.8	23.2	26.5	-	-	-	-
Transparency	m	<0.01	0.50	1.00	0.30	0.30	0.30	-	-	-	-
Conductivity	µmho/cm	52.10	21.10	17.90	23.70	30.30	46.30	-	-	-	-
Salinity	ppt	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-
Dissolved oxygen	mg/L	6.19	6.99	6.98	6.89	7.30	7.06	</6.0	</4.0	6.0–7.0	6.0-4.0
Turbidity	NTU	605.1	6.8	7.3	0.2	0.5	4.2	-	-	-	-
Suspended Solids	mg/L	780.0	5.2	5.6	<5.0	<5.0	<5.0	-	-	-	-
Total Dissolved Solids	mg/L	107.1	45.7	67.9	16.7	33.3	42.4	-	-	-	-
Total Solids	mg/L	914.3	51.7	75.0	20.0	35.7	44.4	-	-	-	-
Oil and grease	mg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	-	-	-	-
BOD_5	mg/L	<0.5	0.7	1.5	1.4	1.8	1.7	1.5	2.0	-	-
Lead	mg/L	0.095	<0.005	<0.005	<0.005	<0.005	<0.005	>/0.05	>/0.05	0.0001–0.001	0.0016–0.003
Cadmium	mg/L	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	>/0.005	>/0.005	0.00007–0.0053	0.0053–0.001
Total Iron	mg/L	47	0.85	0.41	0.07	0.14	0.59	-	-	-	-
Total Coliform Bacteria	(MPN/100 ml)	930	240	240	93	93	750	>/5,000	>/20,000	-	-
Fecal Coliform Bacteria	(MPN/100 ml)	150	93	23	23	43	20	>/1,000	>/4,000	-	-

Remark : Station SW1 : Dawei River SW2 : Tha Laing Ya Shaung SW3 : Tha Laing Ya Shaung, Mia Phyu
SW4 : Ye Bouk Shaung SW5 : Tha Byu Shaung SW6 : Hen Da Shaung

* Thailand's Surface Water Quality Standard (Notification of the National Environmental Board No. 8 B.E.2537 (1994)),

* * Economic Commission for Europe) Standard Statistical Classification of Surface freshwater for the Maintenance of Aquatic Life (UN ECE, 1996)

TABLE 5.2-10

RESULT OF SURFACE WATER ANALYSIS AT EACH STATION (CONT'D)

Parameter	Unit	SW7	SW8	SW9	SW10	SW11	Standard*		Standard**	
							Class 2	Class 3	Class 2	Class 3
Sampling Date		24/1/2015	1/2/2015	1/2/2015	2/2/2015	2/2/2015				
Depth	m	1.20	0.50	1.10	0.50	1.50	-	-	-	-
pH	- -	6.99	6.64	6.87	7.58	7.25	5.0 – 9.0	5.0 – 9.0	6.5 – 6.3	6.3 – 6.0
Water temperature	°c	26.0	23.7	23.2	19.0	24.3	-	-	-	-
Transparency	m	1.20	0.50	1.10	0.50	1.00	-	-	-	-
Conductivity	µmho/c m	52.80	81.00	68.00	373.20	479.50	-	-	-	-
Salinity	ppt	<0.1	<0.1	<0.1	0.2	0.2		-	-	-
Dissolved oxygen	mg/L	7.10	7.47	7.20	7.34	5.95	</4.0	</4.0	6.0 – 7.0	6.0 - 4.0
Turbidity	NTU	1.4	1.0	1.5	1.3	1.6	-	-	-	-
Suspended Solids	mg/L	<5.0	<5.0	5.8	<5.0	<5.0	-	-	-	-
Total Dissolved Solids	mg/L	62.5	64.7	80.8	258.3	329.0	-	-	-	-
Total Solids	mg/L	70.4	67.9	90.0	263.0	332.1		-	-	-
Oil and grease	mg/L	<5.0	<5.0	<5.0	<5.0	<5.0	-	-	-	-
BOD_5	mg/L	1.6	0.7	0.9	0.9	<0.5	1.5	2.0	-	-
Lead	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	>/0.05	>/0.05	0.0001 – 0.0016	0.0016 – 0.0032
Cadmium	mg/L	<0.003	<0.003	<0.003	<0.003	<0.003	>/0.005	>/0.005	0.00007 – 0.0053	0.0053 – 0.0011
Total Iron	mg/L	0.37	0.30	0.22	0.10	0.12	-	-	-	-
Total Coliform Bacteria	(MPN/100 ml)	93	240	930	430	930	>/5,000	>/20,000	-	-
Fecal Coliform Bacteria	(MPN/100 ml)	15	93	430	240	14	>/1,000	>/4,000	-	-

Remark : Station SW7 : Kamoethway River SW8 : Bridge No.11 SW9 : Bridge No.13, Ya Pla Shaung
SW10 : Bridge No.18, Vado Shaung SW11 : Bridge No.19 (Base 1)

* Thailand's Surface Water Quality Standard (Notification of the National Environmental Board No. 8 B.E.2537 (1994)).

* * Economic Commission for Europe) Standard Statistical Classification of Surface freshwater for the Maintenance of Aquatic Life (UN ECE, 1996)

TABLE 5.2-11

CLASSIFICATION OF SURFACE WATER QUALITY STANDARD

Classifications	Objectives/Condition & Beneficial Usages
Class 1	Extra clean fresh surface water resources using for : (1) consumption which requires ordinary water treatment processes before use. (2) conservation, not necessary pass through water treatment processes requiring only Ordinary process for pathogenic destruction. (3) Ecosystem conservation where basic organisms can breed naturally
Class 2	Very clean fresh surface water resources used for : (1) consumption which requires ordinary water treatment processes before use. (2) aquatic organism conservation. (3) Fisheries. (4) Recreation.
Class 3	Medium clean fresh surface water resources used for : (1) consumption, but passing through an ordinary treatment process before using. (2) Agriculture.
Class 4	Fairly clean fresh surface water resources used for : (1) consumption but requires special water treatment process before use. (2) Industry.
Class 5	The resources which are not classified in class 1-4 and using for navigation

Source: Thailand's Surface Water Quality Standards according to the Notification of the National Environmental Board No. 8, 1994 (B.E. 2537).

TABLE 5.2-12

ECE (ECONOMIC COMMISSION FOR EUROPE) STANDARD STATISTICAL CLASSIFICATION OF SURFACE FRESHWATER FOR THE MAINTENANCE OF AQUATIC LIFE (UN ECE, 1996)

		Class I	Class II	Class III	Class IV	Class V
Oxygen regime						
DO (%)	epilimnion (stratified waters)	90-110	70-90, 110-120	50-70, 120-130	30-50, 130-150	<30, >150
	hypolimnion (stratified waters)	90-70	70-50	50-30	30-10	<10
	unstratified waters	90-70	70-50, 110-120	50-30, 120-130	30-10, 130-150	<10, >150
DO (mg/l)		>7	7-6	6-4	4-3	<3
COD-Mn (mg O_2/l)		<3	3-10	10-20	20-30	>30
COD-Cr (mg O_2/l)		-	-	-	-	-
Eutrophication[a]						
Total P (µg/l)		<10 (<15)	10-25 (15-40)	25-50 (40-75)	50-125 (75-190)	>125 (>190)
Total N (µg/l)		<300	300-750	750-1,500	1,500-2,500	>2,500
Chlorophyll a (µg/l)		<2.5 (<4)	2.5-10 (4-15)	10-30 (15-45)	30-110 (45-165)	>110 (>165)
Acidification						
pH (values <9.0 only)[b]		9.0-6.5	6.5-6.3	6.3-6.0	6.0-5.3	<5.3
Alkalinity (mg $CaCO_3$/l)		>200	200-100	100-20	20-10	<10
Metals						
Aluminium (µg/l: pH 6.5)		<1.6	1.6-3.2	3.2-5	5-75	>75
Arsenic (µg/l)[c]		<10	10-100	100-190	190-360	>360
Cadmium (µg/l)[d]		<0.07	0.07-0.53	0.53-1.1	1.1-3.9	>3.9
Chromium (µg/l)[c]		<1	1-6	6-11	11-16	>16
Copper (µg/l)[d]		<2	2-7	7-12	12-18	>18
Leader (µg/l)[d]		<0.1	0.1-1.6	1.6-3.2	3.2-82	>82
Mercury (µg/l)[c]		<0.003	0.003-0.007	0.007-0.012	0.012-2.4	>2.4
Nickel (µg/l)[d]		<15	15-87	87-160	160-1400	>1400
Zinc (µg/l)[d]		<45	45-77	77-110	110-120	>120
Chlorinated micropollutants and other hazardous substances						
Dieldrin (µg/l)		n.a.	n.a.	<0.0019	0.0019-2.5	>2.5
DDT and metabolites (µg/l)		n.a.	n.a.	<0.001	0.001-1.1	>1.1
Endrin (µg/l)		n.a.	n.a.	<0.0023	0.0023-0.18	>0.18
Heptachlor (µg/l)		n.a.	n.a.	<0.0038	0.0038-0.52	>0.52
Lindane (µg/l)		n.a.	n.a.	<0.08	0.08-2.0	>2.0
Pentachlorophenol (µg/l)		n.a.	n.a.	<13	13-20	>20
PCBs (µg/l)		n.a.	n.a.	<0.014	0.014-2.0	>2.0
Free ammonia (NH_3)		n.a.	n.a.	-	-	-
Radioactivity						
Gross-alpha activity (mBq/l)		<50	50-100	100-500	500-2500	>2500
Gross-beta activity (mBq/l)		<200	200-500	500-1000	1000-2500	>2500

Note: measures falling on the borderline between classes are to be classified in the lower numbered class

a bracketed data refer to flowing water
b Values > 9.0 are disregarded in classification
c Applicable for hardness from abut 0.5 meq/l to 8 meq/l. Arsenic V (chromium III) to be converted to arsenic III (chromium VI)
d Applicable to hardness from about 0.5 meq/l to 8 meq/l
n.a. not applicable

Source : Economic Commission for Europe) Standard Statistical Classification of Surface freshwater for the Maintenance of Aquatic Life (UN ECE, 1996)

5.3 BIOLOGICAL COMPONENTS

5.3.1 Terrestrial Resource

The surveys of terrestrial resources covered area within 500 m strips on both sides of the project alignment, focusing on the natural forest areas.

The land uses in the study area consists of natural vegetation cover, idle land and agricultural areas. The natural vegetation covers could be categorized as mixed deciduous forest, dry evergreen forest and Fresh water swamp forest. The agricultural land consists of rubber plantation, palm plantation, cashew plantation, paddy field and orchard.

A. Forest Resource

The Consultant conducted forest resource survey during March 16-22, 2015 to collect information on existing conditions of forest areas, vegetation types, and land use patterns. There were 23 sample plots within the project right-of-way and additional study within 500 m strips on both sides of center line. The suitable temporary sampling plots for the forest area within South-Eastern of Asia Region are Stratified Random Sampling. The three sizes of temporary sampling plots were used, with the following purposes:

- The rectangular sampling plot of 10 x 10 m. (area of 100 m^2) was used for collecting data on tree diameter with over 1.30 m (for terrestrial forest) and 20 cm. for mangrove forest or girth over 30 cm at breast height (DBH or GBH respectively).
- The rectangular sampling plot of 4 x 4 m. (area of 16 m^2) covered with sampling plot of 10 x 10 m was used for studying the sampling which are those small trees higher than 1.30 m and having the GBH less than 30 cm. Species and number were recorded for sapling density and other natural generation.
- The rectangular sampling plot of 1 x 1 m. (area of 1 m^2) covered with sampling plot of 4 x 4 m was used for studying the seedling which comprising these lower than 1.30 m in height and underground tree (annual, creeper, and climbing plants). They were used as an indicator of the natural regeneration of the ecosystem.

The survey identified three types of natural forest areas in the study area as shown in ***Photo 5.3-1*** and plant species list within project right-of-way is shown in ***Table 5.3-1***. The survey results are summarized below:

(1) The Ecological Characteristics

(a) within The Project Right-of-Way

The Project Area (Road Link) has been the forest areas, idle and agricultural area still existing. The field survey identified at least 242 plant species along the road link area. Plant species and forest types in and adjacent to the road link area are as follows:

Mixed Deciduous Forest

Dominant plant species found in the mixed deciduous forest are listed in botanical names as follows: *Lagerstroemia calyculata* Kurz., *Crypteronia paniculata Blume., Sterculia pexa* Pierre, *Mitragyna rotundifolia* (Roxb.) Kuntze, *Markhamia stipulata* (Wall.) Seem. var. kerrii Sprague, *Microcos tomentosa* Sm., *Croton persimilis* Müll. Arg., *Dillenia obovata* (Blume) Hoogland and *Schoepfia fragrans* Wall. Pictures of some dominant plant species are shown in ***Photo 5.3-1***. The results of forest ecology and diversity analysis can be described as follows:

TABLE 5.3-1

THE PLANT SPECIES LIST FOUND WITHIN THE RIGHT-OF-WAY OF PROJECT AND STUDY AREA (IN 500 M STRIPS FROM CENTER LINE OF ROAD)

No.	Botanical Name	Family Name	Plant Habit	Proje	R.O.W	500 m Strips	Status
1	*Asystasiella neesiana* (Wall.) Lindau	Acanthaceae	US	x	x	x	-
2	*Hydnocarpus ilicifolia* King	Achariaceae	ST	x	x	x	-
3	*Achyranthes aspera* L.	Amaranthaceae	H	x	x	x	-
4	*Anacardium occidentale* L.	Anacardiaceae	ExST	x	x	x	-
5	*Bouea oppositifolia* (Roxb.) Meisn.	Anacardiaceae	T	x	x	x	-
6	*Gluta compacta* Evrard	Anacardiaceae	T	x	x	x	-
7	*Holigarna albicans* Hook. f.	Anacardiaceae	T	x	x	x	-
8	*Lannea coromandelica* (Houtt.) Merr.	Anacardiaceae	T	x	x	x	-
9	*Mangifera caloneura* Kurz	Anacardiaceae	T	-	x	x	-
10	*Swintonia floribunda* Griff.	Anacardiaceae	T	x	x	x	-
11	*Ancistrocladus tectorius* (Lour.) Merr.	Ancistrocladaceae	C	x	x	x	-
12	*Desmos chinensis* Lour.	Annonaceae	C	x	x	x	-
13	*Monoon viride* (Craib) B. Xue & R. M. K. Saunders	Annonaceae	T	x	x	x	-
14	*Uvaria rufa* Blume	Annonaceae	C	x	x	x	-
15	*Alstonia scholaris* (L.) R. Br.	Apocynaceae	T	x	x	x	-
16	*Chonemorpha verrucosa* (Blume) D. J. Middleton	Apocynaceae	C	x	x	x	-
17	*Holarrhena pubescens* Wall. ex G. Don	Apocynaceae	S/T	x	x	x	-
18	*Hoya kerrii* Craib	Apocynaceae	C	x	x	x	-
19	*Streptocaulon juventas* (Lour.) Merr.	Apocynaceae	C	x	x	x	-
20	*Willughbeia edulis* Roxb.	Apocynaceae	C	x	x	x	-
21	*Wrightia arborea* (Dennst.) Mabb.	Apocynaceae	ST	x	x	x	-
22	*Colocasia esculenta* (L.) Schott	Araceae	H	x	x	x	-
23	*Colocasia gigantea* (Blume) Hook. f.	Araceae	H	x	x	x	-
24	*Epipremnum giganteum* (Roxb.) Schott	Araceae	C	-	x	x	-
25	*Lasia spinosa* (L.) Thwaites	Araceae	H	x	x	x	-
26	*Philodendron sp.*	Araceae	ExECrH	x	x	x	-
27	*Areca triandra* Roxb. ex Buch.-Ham.	Arecaceae	P	x	x	x	-
28	*Arenga westerhoutii* Griff.	Arecaceae	P	x	x	x	-
29	*Borassodendron machadonis* (Ridl.) Becc.	Arecaceae	P	x	x	x	VU
30	*Borassus flabellifer* L.	Arecaceae	P	x	x	x	-
31	*Calamus diepenhorstii* Miq.	Arecaceae	CP	x	x	x	-
32	*Calamus sp.*	Arecaceae	CP	x	x	x	-
33	*Caryota mitis* Lour.	Arecaceae	P	x	x	x	-
34	*Licuala paludosa* Griff.	Arecaceae	P	x	x	x	-
35	*Livistona speciosa* Kurz	Arecaceae	P	x	x	x	-
36	*Oncosperma tigillarium* (Jack) Ridl.	Arecaceae	P	x	x	x	-
37	*Aristolochia tagala* Cham.	Aristolochiaceae	C	x	x	x	-
38	*Ageratum conyzoides* L.	Asteraceae	H	x	x	x	-
39	*Chromolaena odorata* (L.) R. M. King & H. Rob.	Asteraceae	ExH	x	x	x	-
40	*Cyanthillium cinereum* (L.) H. Rob.	Asteraceae	H	x	x	x	-
41	*Emilia sonchifolia* (L.) DC. ex Wight	Asteraceae	H	x	x	x	-
42	*Symphyotrichum cordifolium* (L.) G. L. Nesom	Asteraceae	ExH	x	x	x	-
43	*Tridax procumbens* L.	Asteraceae	ExH	x	x	x	-
44	*Markhamia stipulata* (Wall.) Seem. var. kerrii Sprague	Bignoniaceae	T	x	x	x	-
45	*Oroxylum indicum* (L.) Benth. ex Kurz	Bignoniaceae	ST	x	x	x	-
46	*Radermachera glandulosa* (Blume) Miq.	Bignoniaceae	T	x	x	x	-
47	*Stereospermum fimbriatum* (Wall. ex G. Don) A. DC.	Bignoniaceae	T	x	x	x	-
48	*Stereospermum neuranthum* Kurz	Bignoniaceae	T	x	x	x	-
49	*Stereospermum tetragonum* DC.	Bignoniaceae	T	x	x	x	-
50	*Stenochlaena palustris* (Burm. f.) Bedd.	Blechnaceae	CF	x	x	x	-
51	*Canarium subulatum* Guillaumin	Burseraceae	T	x	x	x	-
52	*Garuga pinnata* Roxb.	Burseraceae	T	x	x	x	-
53	*Trema angustifolia* (Planch.) Blume	Cannabaceae	ST	x	x	x	-
54	*Trema orientalis* (L.) Blume	Cannabaceae	ST	x	x	x	-
55	*Garcinia cowa* Roxb. ex Choisy	Clusiaceae	ST	x	x	x	-
56	*Terminalia calamansanay* (Blanco) Rolfe	Combretaceae	T	x	x	x	-
57	*Terminalia glaucifolia* Craib	Combretaceae	T	x	x	x	-
58	*Terminalia nigrovenulosa* Pierre	Combretaceae	T	x	x	x	-
59	*Terminalia pierrei* Gagnep.	Combretaceae	T	x	x	x	-
60	*Murdannia spirata* (L.) G. Brückn	Commelinaceae	H	x	x	x	-
61	*Ipomoea alba* L.	Convolvulaceae	HC	x	x	x	-
62	*Cheilocostus speciosus* (J. Koenig) C. D. Specht	Costaceae	H	x	x	x	-
63	*Cryptocoma panciulata* Blume	Cryptoconiaceae	T	x	x	x	-
64	*Cycas pectinata* Buch.-Ham.	Cycadaceae	ST	x	x	x	VU
65	*Cycas simplicipinna* (Smitinand) K. D. Hill	Cycadaceae	S	x	x	x	-
66	*Actinoscirpus grossus* (L. f.) Goetgh. & D. A. Simpson	Cyperaceae	H	x	x	x	-
67	*Carex baccans* Nees	Cyperaceae	H	x	x	x	-
68	*Carex cryptostachys* Brongn.	Cyperaceae	H	x	x	x	-
69	*Dillenia obovata* (Blume) Hoogland	Dilleniaceae	T	x	x	x	-
70	*Dillenia ovata* Wall. ex Hook. f. & Thomson	Dilleniaceae	T	x	x	x	-
71	*Dioscorea birmanica* Prain & Burkill	Dioscoreaceae	HC	x	x	x	-
72	*Dipterocarpus chartaceus* Symington	Dipterocarpaceae	T	x	x	x	CR
73	*Dipterocarpus obtusifolius* Teijsm. ex Miq.	Dipterocarpaceae	T	x	x	x	-
74	*Dipterocarpus turbinatus* C. F. Gaertn.	Dipterocarpaceae	T	-	x	x	CR
75	*Hopea odorata* Roxb.	Dipterocarpaceae	T	x	x	x	VU
76	*Hopea siamensis* F. Heim.	Dipterocarpaceae	T	x	x	x	-
77	*Shorea roxburghii* G. Don	Dipterocarpaceae	T	x	x	x	EN
78	*Vatica odorata* (Griff.) Symington	Dipterocarpaceae	T	x	x	x	-
79	*Diospyros areolata* King & Gamble	Ebenaceae	T	x	x	x	-
80	*Diospyros defectrix* H. R. Fletcher	Ebenaceae	T	x	x	x	-
81	*Diospyros montana* Roxb.	Ebenaceae	T	x	x	x	-
82	*Polyosma integrifolia* Blume	Escalloniaceae	T	x	x	x	-
83	*Baliakata baccata* (Roxb.) Esser	Euphorbiaceae	T	x	x	x	-
84	*Cleidion javanicum* Blume	Euphorbiaceae	S/T	x	x	x	-

TABLE 5.3-1

THE PLANT SPECIES LIST FOUND WITHIN THE RIGHT-OF-WAY OF PROJECT AND STUDY AREA (IN 500 M STRIPS FROM CENTER LINE OF ROAD) (CONT'D)

No.	Botanical Name	Family Name	Plant Habit	Project area	Right of Way 500 m.	Plant Status
85	*Croton persimilis* Müll. Arg.	Euphorbiaceae	S/ST	x	x	-
86	*Elaeriospermon tapos* Blume	Euphorbiaceae	T	x	x	-
87	*Euphorbia cyathophora* Murray	Euphorbiaceae	ExH	x	x	-
88	*Hevea brasiliensis* (Kunth) Müll. Arg.	Euphorbiaceae	ExT	x	x	-
89	*Macaranga gigantea* (Rchb. f. & Zoll.) Müll. Arg.	Euphorbiaceae	S/ST	x	x	-
90	*Macaranga triloba* (Thunb.) Müll. Arg.	Euphorbiaceae	T	x	x	-
91	*Mallotus paniculatus* (Lam.) Müll. Arg.	Euphorbiaceae	S/T	x	x	-
92	*Mallotus philippensis* (Lam.) Müll. Arg.	Euphorbiaceae	S/T	x	x	-
93	*Sauropus multiflora* (A. Juss.) Baill.	Euphorbiaceae	S/T	x	x	-
94	*Abrus precatorius* L.	Fabaceae	C	x	x	-
95	*Adenanthera pavonina* L.	Fabaceae	T	x	x	-
96	*Albizia lebbekoides* (DC.) Benth.	Fabaceae	T	x	x	-
97	*Albizia odoratissima* (L. f.) Benth.	Fabaceae	T	x	x	-
98	*Albizia procera* (Roxb.) Benth.	Fabaceae	T	x	x	-
99	*Bauhinia saccocalyx* Pierre	Fabaceae	ST	x	x	-
100	*Callerya atropurpurea* (Wall.) Schot	Fabaceae	T	x	x	-
101	*Dalbergia dongnaiensis* Pierre	Fabaceae	T	x	x	-
102	*Dalbergia rimosa* Roxb. var. foliacea (Wall. ex Benth.) Thoth.	Fabaceae	C	x	x	-
103	*Entada rheedii* Spreng.	Fabaceae	C	x	x	-
104	*Erythrina subumbrans* (Hassk.) Merr.	Fabaceae	T	x	x	-
105	*Flemingia sootepensis* Craib	Fabaceae	S	x	x	-
106	*Millettia brandisiana* Kurz	Fabaceae	T	-	x	-
107	*Millettia leucantha* Kurz var. buteoides (Gagnep.) P. K. Lôc	Fabaceae	T	x	x	-
108	*Parkia leiophylla* Kurz	Fabaceae	T	x	x	-
109	*Parkia speciosa* Hassk.	Fabaceae	T	x	x	-
110	*Phanera glauca* Benth. subsp. tenuiflora (C. B. Clarke) A. Schmitz.	Fabaceae	C	x	x	-
111	*Pterocarpus macrocarpus* Kurz	Fabaceae	T	x	x	-
112	*Senna timoriensis* (DC.) H. S. Irwin & Barneby	Fabaceae	ST	x	x	-
113	*Xylia xylocarpa* (Roxb.) W. Theob. var. xylocarpa	Fabaceae	T	x	x	-
114	*Castanopsis cerebrina* (Hickel & A. Camus) Barnett	Fagaceae	T	x	x	-
115	*Castanopsis diversifolia* (Kurz) King ex Hook. f.	Fagaceae	T	x	x	-
116	*Castanopsis wallichii* King ex Hook. f.	Fagaceae	T	x	x	-
117	*Lithocarpus cirtusii* (King ex Hook. f.) A. Camus	Fagaceae	T	x	x	-
118	*Lithocarpus sp.*	Fagaceae	T	x	x	-
119	*Lithocarpus vestitus* (Hickel & A. Camus) A. Camus	Fagaceae	T	x	x	-
120	*Quercus brandisiana* Kurz	Fagaceae	T	x	x	-
121	*Flagellaria indica* L.	Flagellariaceae	HC	x	x	-
122	*Fagraea fragrans* Roxb.	Gentianaceae	T	x	x	-
123	*Cratoxylum cochinchinense* (Lour.) Blume	Hypericaceae	T	x	x	-
124	*Cratoxylum formosum* (Jacq.) Benth. & Hook. f. ex Dyer subsp. pruniflorum (Kurz) Gogelein	Hypericaceae	T	x	x	-
125	*Callicarpa arborea* Roxb.	Lamiaceae	S/ST	x	x	-
126	*Clerodendrum glandulosum* Lindl.	Lamiaceae	S	x	x	-
127	*Clerodendrum infortunatum* L.	Lamiaceae	S	x	x	-
128	*Congea tomentosa* Roxb.	Lamiaceae	C	x	x	-
129	*Gmelina arborea* Roxb.	Lamiaceae	T	x	x	-
130	*Vitex limonifolia* Wall. ex Walp.	Lamiaceae	T	x	x	-
131	*Vitex quinata* (Lour.) F. N. Williams	Lamiaceae	ST	x	x	-
132	*Cinnamomum iners* Reinw. ex Blume	Lauraceae	T	x	x	-
133	*Dehaasia candolleana* (Meisn.) Kosterm.	Lauraceae	T	x	x	-
134	*Dehaasia kurzii* King ex Hook. f.	Lauraceae	T	x	x	-
135	*Phoebe paniculata* (Nees) Nees	Lauraceae	T	x	x	-
136	*Barringtonia macrocarpa* Hassk.	Lecythidaceae	T	x	x	-
137	*Barringtonia racemosa* (L.) Spreng.	Lecythidaceae	S/ST	x	x	-
138	*Careya arborea* Roxb.	Lecythidaceae	T	x	x	-
139	*Linderina aculeata* (Bonati) T. Yamaz.	Lindernlaceae	H	x	x	-
140	*Lygodium salicifolium* C. Presl	Lygodiaceae	CF	x	x	-
141	*Duabanga grandiflora* (DC.) Walp.	Lythraceae	T	x	x	-
142	*Lagerstroemia calyculata* Kurz	Lythraceae	T	x	x	-
143	*Magnolia baillonii* Pierre	Magnoliaceae	T	x	x	-
144	*Bombax ceiba* Pierre	Malvaceae	T	x	x	-
145	*Firmiana colorata* (Roxb.) R. Br.	Malvaceae	T	x	x	-
146	*Malvastrum coromandelianum* (L.) Garcke	Malvaceae	ExH	x	x	-
147	*Microcos tomentosa* Sm.	Malvaceae	T	x	x	-
148	*Muntingia calabura* L.	Malvaceae	ExST	x	x	-
149	*Pterocymbium tinctorium* (Blanco) Merr.	Malvaceae	T	x	x	-
150	*Pterospermum cinnamomeum* Kurz	Malvaceae	T	x	x	-
151	*Pterospermum diversifolium* Blume	Malvaceae	T	x	x	-
152	*Pterospermum semisagittatum* Buch.-Ham. ex Roxb.	Malvaceae	T	x	x	-
153	*Pterygota alata* (Roxb.) R. Br.	Malvaceae	T	x	x	-
154	*Sida rhombifolia* L. subsp. rhombifolia	Malvaceae	US	x	x	-
155	*Sterculia foetida* L.	Malvaceae	T	x	x	-
156	*Sterculia guttata* Roxb.	Malvaceae	T	x	x	-
157	*Sterculia pexa* Pierre	Malvaceae	ST/T	-	x	-
158	*Clenanthe burle-marxii* H. A. Kenn.	Marantaceae	ExH	x	x	-
159	*Melastoma malabathricum* L. subsp. malabathricum	Melastomataceae	S	x	x	-
160	*Memecylon geddesianum* Craib	Melastomataceae	S/ST	x	x	-
161	*Memecylon scutellatum* (Lour.) Hook. & Arn. var. scutellatum	Melastomataceae	S/ST	x	x	-
162	*Aglaia spectabilis* (Miq.) S. S. Jain & Bennet	Meliaceae	T	x	x	-
163	*Chukrasia tabularis* A. Juss.	Meliaceae	T	x	x	-
164	*Melia azedarach* L.	Meliaceae	ST/T	x	x	-
165	*Toona ciliata* M. Roem.	Meliaceae	T	x	x	-
166	*Artocarpus chama* Buch.-Ham.	Moraceae	T	x	x	-
167	*Artocarpus lacucha* Roxb. ex Buch.-Ham.	Moraceae	T	x	x	-
168	*Broussonetia papyrifera* (L.) L'Hér. ex Vent	Moraceae	ST	x	x	-
169	*Ficus camptodica* Gagnep.	Moraceae	T	x	x	-

TABLE 5.3-1

THE PLANT SPECIES LIST FOUND WITHIN THE RIGHT-OF-WAY OF PROJECT AND STUDY AREA (IN 500 M STRIPS FROM CENTER LINE OF ROAD) (CONT'D)

No.	Botanical Name	Family Name	Plant Habit	Project area	Right of Way 500 m.	Plant Status
170	*Ficus carica* L.	Moraceae	ExST	x	x	–
171	*Ficus geniculata* Kurz var. geniculata	Moraceae	T	x	x	–
172	*Ficus heteropleura* Blume	Moraceae	CrS/ST	x	x	–
173	*Ficus hispida* L. f.	Moraceae	ST	x	x	–
174	*Streblus asper* Lour.	Moraceae	T	x	x	–
175	*Streblus ilicifolius* (S. Vidal) Corner	Moraceae	S/T	x	x	–
176	*Streblus macrophyllus* Blume	Moraceae	T	x	x	–
177	*Streblus taxoides* (B. Heyne ex Roth) Kurz	Moraceae	S/T	x	x	–
178	*Musa acuminata* Colla subsp. acuminata	Musaceae	H	x	x	–
179	*Horsfieldia amygdalina* (Wall.) Warb. var. amygdalina	Myristicaceae	T	x	x	–
180	*Horsfieldia crassifolia* (Hook. f. & Thomson) Warb.	Myristicaceae	T	x	x	–
181	*Knema globularia* (Lam.) Warb.	Myristicaceae	T	x	x	–
182	*Syzygium antisepticum* (Blume) Merr. & L. M. Perry	Myrtaceae	ST/T	x	x	–
183	*Syzygium attenuatum* (Miq.) Merr. & L. M. Perry subsp. circumscissum (Gagnep.) Chantar. & J. Par	Myrtaceae	T	x	x	–
184	*Syzygium cumini* (L.) Skeels	Myrtaceae	T	x	x	–
185	*Syzygium grande* (Wight) Walp.	Myrtaceae	T	x	x	–
186	*Syzygium megacarpum* (Craib) Rathakr. & N. C. Nair	Myrtaceae	T	x	x	–
187	*Syzygium siamense* (Craib) Chantar. & J. Parn.	Myrtaceae	T	x	x	–
188	*Tristaniopsis burmanica* (Griff.) Peter G. Wilson & J. T. Waterh. var. rufescens (Hance) J. Parn. & I	Myrtaceae	ST	x	x	–
189	*Tristaniopsis merguensis* (Griff.) Peter G. Wilson & J. T. Waterh.	Myrtaceae	ST	x	x	–
190	*Schoepfia fragrans* Wall.	Olacaceae	ST	x	x	–
191	*Jasminum scandens* (Retz.) Vahl	Oleaceae	C/ScanS	x	x	–
192	*Urobotrya siamensis* Hiepko	Opiliaceae	S/ST	x	x	–
193	*Aerides multiflora* Roxb.	Orchidaceae	EO	x	x	–
194	*Aerides odorata* Lour.	Orchidaceae	EO	x	x	–
195	*Ascocentrum curvifolium* (Lindl.) Schltr.	Orchidaceae	EO	x	x	–
196	*Bulbophyllum sp.*	Orchidaceae	EO	x	x	–
197	*Cymbidium aloifolium* (L.) Sw.	Orchidaceae	EO	x	x	–
198	*Dendrobium chrysotoxum* Lindl.	Orchidaceae	EO	x	x	–
199	*Dendrobium dixanthum* Rchb. f.	Orchidaceae	EO	x	x	–
200	*Dendrobium draconis* Rchb. f.	Orchidaceae	EO	x	x	–
201	*Dendrobium lindleyi* Steud.	Orchidaceae	EO	x	x	–
202	*Pomatocalpa maculosum* (Lindl.) J. J. Sm. subsp. andamanicum (Hook. f.) Watthana	Orchidaceae	EO	x	x	–
203	*Pomatocalpa spicatum* Breda, Kuhl & Hasselt	Orchidaceae	EO	x	x	–
204	*Rhynchostylis retusa* (L.) Blume	Orchidaceae	EO	x	x	–
205	*Pandanus kaido* Kurz	Pandanaceae	S/ST	x	x	–
206	*Adinandra laotica* Gagnep.	Pentaphylacaceae	T	x	x	–
207	*Eurya acuminata* DC.	Pentaphylacaceae	S/ST	x	x	–
208	*Phyllanthus emblica* L.	Phyllanthaceae	ST/T	x	x	–
209	*Acroceras munroanum* (Balansa) Henrard	Poaceae	G	x	x	–
210	*Arundo donax* L.	Poaceae	G	x	x	–
211	*Bambusa bambos* (L.) Voss	Poaceae	B	x	x	–
212	*Bambusa nutans* Wall. ex Munro	Poaceae	B	x	x	–
213	*Bambusa sp.*	Poaceae	B	x	x	–
214	*Cephalostachyum pergracile* Munro	Poaceae	B	x	x	–
215	*Cyrtococcum patens* (L.) A. Camus var. patens	Poaceae	G	x	x	–
216	*Dendrocalamus strictus* (Roxb.) Nees	Poaceae	B	x	x	–
217	*Dinochloa malayana* S. Dransf.	Poaceae	ScanB	x	x	–
218	*Gigantochloa hasskarliana* (Kurz) Backer	Poaceae	B	x	x	–
219	*Imperata cylindrica* (L.) Raeusch.	Poaceae	G	x	x	–
220	*Ischaemum rugosum* Salisb.	Poaceae	G	x	x	–
221	*Saccharum spontaneum* L.	Poaceae	G	x	x	–
222	*Setaria parviflora* (Poir.) Kerguélen	Poaceae	G	x	x	–
223	*Thysanolaena latifolia* (Roxb. ex Hornem.) Honda	Poaceae	G	x	x	–
224	*Platycerium grande* (J. Sm. ex Fée) Kunze	Polypodiaceae	ExEF	x	x	–
225	*Putranjiva roxburghii* Wall.	Putranjivaceae	T	x	x	–
226	*Carallia brachiata* (Lour.) Merr.	Rhizophoraceae	T	x	x	–
227	*Prunus ceylanica* (Wight) Miq.	Rosaceae	T	x	x	–
228	*Aidia wallichii* Steud.	Rubiaceae	T	x	x	–
229	*Gardenia sootepensis* Hutch.	Rubiaceae	ST	x	x	–
230	*Mitragyna rotundifolia* (Roxb.) Kuntze	Rubiaceae	T	x	x	–
231	*Neolamarckia cadamba* (Roxb.) Bosser	Rubiaceae	T	x	x	–
232	*Oxyceros horridus* Lour.	Rubiaceae	ScanS	x	x	–
233	*Zanthoxylum rhetsa* (Roxb.) DC.	Rutaceae	T	x	x	–
234	*Lepisanthes rubiginosa* (Roxb.) Leenh.	Sapindaceae	S/ST	x	x	–
235	*Nephelium hypoleucum* Kurz	Sapindaceae	T	x	x	–
236	*Paranephelium xestophyllum* Miq.	Sapindaceae	ST/T	x	x	–
237	*Schleichera oleosa* (Lour.) Merr.	Sapindaceae	T	x	x	–
238	*Madhuca esculenta* H. R. Fletcher	Sapotaceae	T	x	x	–
239	*Smilax lanceifolia* C. Presl	Smilacaceae	C	x	x	–
240	*Stemonurus malaccensis* (Mast.) Sleumer	Stemonuraceae	T	x	x	–
241	*Symplocos cochinchinensis* (Lour.) S. Moore var. laurina (Retz.) Noot.	Symplocaceae	S/ST	x	x	–
242	*Tetrameles nudiflora* R. Br.	Tetramelaceae	T	x	x	–
243	*Schima wallichii* (DC.) Korth.	Theaceae	T	x	x	–
244	*Typha angustifolia* L.	Typhaceae	ExAqH	x	x	–
245	*Alpinia malaccensis* (Burm. f.) Roscoe var. malaccensis	Zingiberaceae	H	x	x	–
246	*Alpinia oxymitra* K. Schum.	Zingiberaceae	H	x	x	–
247	*Etlingera littoralis* (J. Koenig) Giseke	Zingiberaceae	H	x	x	–
	TOTAL	69	–	242	247	6

Remark: Plant Habits

AqF : Aquatic Fern	ST : Shrubbby Tree	H : Herb
B : Bamboo	T : Tree	S : Shrub
C : Climber	TerF : Terrestrial Fern	S/ST : Shrub/Shrubby Tree
CF : Climbing Fern	TerO : Terrestrial Orchid	ScanS : Scandent Shrub
CP : Climbing Palm	ExT : Exotic Tree	
ExC : Exotic Climber	EF : Epiphyte Fern	
ExH : Exotic Herb	EO : Epiphyte Orchid	
ExS : Exotic Shrub	F : Fern	
ExST : Exotic Shrubby Tree	G : Grass	

Dry Evergreen Forest [1, 2]

Mixed Deciduous Forest [1, 2]

Dry Dipterocarp Forest [2]

Freshwater Swamp Forest [1, 2]

Orchard and Para Rubber Plantation were Found in Right of Way the Road Link [1, 2]

The Idle Land Mostly were Found Along the Road Link [1, 2]

Remark: [1] Type of forest within the project area

[2] Type of forest within 500 m strips from center line of road

PHOTO 5.3-1: THE EXISTING FOREST WITHIN RIGHT-OF-WAY STUDY AREA 500 M STRIPS FROM CENTER LINE OF ROAD

The forest ecological relationship can be described by density and IVI. The average tree density is moderate at 452.00 individual/acre, the species with the highest density is *Lagerstroemia calyculata* Kurz with 40.00 individuals/acre. The average sapling density is 2,825.00 individuals/acre, the highest sapling species density is *Microcos tomentosa* Sm. with 325.00 individuals/acre. And the average density of seedlings is 34,000.00 individuals/acre, the highest seedling species density is *Croton persimilis* Müll. Arg. with 4,800.00 individuals/acre.

The highest IVI of tree species is *Lagerstroemia calyculata* Kurz with 41.63 and the highest IVI of sapling species is *Lagerstroemia calyculata* Kurz with 18.82, while the highest IVI of seedling species is *Croton persimilis* Müll. Arg. with 22.12. It can be described that three species are success in natural competition more than other flora species within the project area. The species diversity index of plants of the forest is high at 5.15, 4.78 and 4.49 of trees, saplings and seedlings respectively.

Dry Evergreen Forest

Dominant plant species found in the dry evergreen forest are listed in botanical names as follows: *Castanopsis cerebrina* (Hickel & A. Camus) Barnett, *Pterocymbium tinctorium* (Blanco) Merr., *Ficus heteropleura* Blume, *Dipterocarpus turbinatus* C. F. Gaertn., *Tetrameles nudiflora* R. Br., *Duabanga grandiflora* (DC.) Walp., *Parkia leiophylla* Kurz, *Phoebe paniculata* (Nees) Nees and *Barringtonia macrocarpa* Hassk. The forest type along road link is mostly the dry evergreen forest. Pictures of some dominant plant species are shown in ***Photo 5.3-1***.

The forest ecological relationship can be described by density and IVI. The average tree density is moderate at 494.55 individual/acre, the species with the highest density is *Castanopsis cerebrina* (Hickel & A. Camus) Barnett with 43.64 individuals/acre. The average sapling density is 3,681.82 individuals/acre; the highest sapling species density is *Castanopsis cerebrina* (Hickel & A. Camus) Barnett with 340.91 individuals/acre. And the average density of seedlings is 41,454.55 individuals/acre, the highest seedling species density is *Castanopsis cerebrina* (Hickel & A. Camus) Barnett with 2,909.09 individuals/ acre.

The highest IVI of tree species is *Castanopsis cerebrina* (Hickel & A. Camus) Barnett with 20.33 and the highest IVI of sapling species is *Castanopsis cerebrina* (Hickel & A. Camus) Barnett with 12.79, while the highest IVI of seedling species is *Barringtonia macrocarpa* Hassk. with 11.84. It can be described that three species are success in natural competition more than other flora species within the project area. The species diversity index of plants of the forest is high at 5.52, 5.28 and 5.16 of trees, saplings and seedlings respectively.

Freshwater Swamp Forest

Dominant plant species found in the freshwater swamp forest are listed in botanical names as follows: *Syzygium antisepticum* (Blume) Merr. & L. M. Perry, *Lithocarpus vestitus* (Hickel & A. Camus) A. Camus, *Syzygium siamense* (Craib) Chantar. & J. Parn., *Barringtonia racemosa* (L.) Spreng. and *Garcinia cowa* Roxb. ex Choisy. Pictures of some dominant plant species are shown in ***Photo 5.3-1***.

The forest ecological relationship can be described by density and IVI. The average tree density is low at 120.00 individual/acre, the species with the highest density is *Syzygium antisepticum* (Blume) Merr. & L. M. Perry with 40.00 individuals/acre. The average sapling density is 1,000.00 individuals/acre, the highest sapling species density is *Syzygium antisepticum* (Blume) Merr. & L. M. Perry with 375.00 individuals/acre. And the average density of seedlings is 10,000.00 individuals/acre, the highest seedling density two species are *Syzygium antisepticum* (Blume) Merr. & L. M. Perry and *Syzygium siamense* (Craib) Chantar. & J. Parn. with 4,000.00 individuals/acre.

The highest IVI of tree species is *Syzygium antisepticum* (Blume) Merr. & L. M. Perry with 100.74 and the highest IVI of sapling species is *Syzygium antisepticum* (Blume) Merr. & L. M. Perry with 90.00, while the highest IVI of seedling species is *Syzygium antisepticum* (Blume) Merr. & L. M. Perry with 77.55. It can be described that three species are success in natural competition more than other flora species within the project area. The species diversity index of plants of the forest is moderate to low at 2.25, 1.90 and 1.52 of trees, saplings and seedlings respectively.

(b) Study Area in 500 m Strips on Both Sides of Center Line of Road

The area within 500 m strips cover four types of forests i.e. Mixed deciduous forest, Dry evergreen forest, dry Dipterocarp forest and Freshwater swamp forest. At least 247 plant species were identified as shown in ***Table 5.3-1.***

Mixed Deciduous Forest

Dominant plant species found in the mixed deciduous forest are listed in botanical names as follows: *Lagerstroemia calyculata* Kurz., *Crypteronia paniculata Blume., Sterculia pexa* Pierre, *Mitragyna rotundifolia* (Roxb.) Kuntze, *Markhamia stipulata* (Wall.) Seem. var. kerrii Sprague, *Dillenia obovata* (Blume) Hoogland and *Schoepfia fragrans* Wall. *Cratoxylum cochinchinense* (Lour.) Blume, *Nephelium hypoleucum* Kurz, *Bombax ceiba* Pierre, *Garuga pinnata* Roxb., *Spondias pinnata* (L. f.) *Canarium subulatum* Guillaumin and *Microcos tomentosa* Sm. Pictures of some dominant plant species are shown in ***Photo 5.3-1 and Photo 5.3-2***.

Dry Dipterocarp Forest

Dominant plant species found in the dry dipterocarp forest are listed in and botanical names as follows: *Dipterocarpus obtusifolius* Teijsm. ex Miq., *Aporusa villosa* (Wall. ex Lindl.) Baill, *Xylia xylocarpa* (Rxob.) Taub., *Ochna integerrima* (Lour.) Merr. and *Croton oblongifolius* Roxb. Pictures of some dominant plant species are shown in ***Photo 5.3-1 and Photo 5.3-2***.

Dry Evergreen Forest

Dominant plant species found in the dry evergreen forest are listed in botanical names as follows: *Pterocymbium tinctorium* (Blanco) Merr., *Ficus heteropleura* Blume, *Dipterocarpus turbinatus* C. F. Gaertn., *Dipterocarpus chartaceus* Symington, *Tetrameles nudiflora* R. Br., *Duabanga grandiflora* (DC.) Walp., *Hopea odorata* Roxb., *Vatica odorata* (Griff.) Symington, *Artocarpus lacucha* Roxb. ex Buch.-Ham., *Parkia leiophylla* Kurz, *Phoebe paniculata* (Nees) Nees and *Barringtonia macrocarpa* Hassk. Pictures of some dominant plant species are shown in ***Photo 5.3-1*** and ***Photo 5.3-2***.

(a) *Microcos tomentosa* Sm.

(b) *Crypteronia paniculata* Blume

(c) *Careya arborea* Roxb.

(d) *Lagerstroemia calyculata* Kurz

(e) *Erythrina subumbrans* (Hassk.) Merr.

(f) *Borassodendron machadonis* (Ridl.) Becc.

(g) *Tetrameles nudiflora* R. Br.

(h) *Pterocymbium tinctorium* (Blanco) Merr.

(i) *Syzygium antisepticum* (Blume) Merr. & L. M. Perry

PHOTO 5.3-2: PLANT SPECIES WITHIN RIGHT-OF-WAY STUDY AREA AND 500 M STRIPS FROM CENTER LINE OF ROAD

Freshwater Swamp Forest

Dominant plant species found in the freshwater swamp forest are listed in botanical names as follows: *Syzygium antisepticum* (Blume) Merr. & L. M. Perry, *Syzygium siamense* (Craib) Chantar. & J. Parn., *Barringtonia racemosa* (L.) Spreng., *Lithocarpus vestitus* (Hickel & A. Camus) A. Camus, *Garcinia cowa* Roxb. ex Choisy, *Oncosperma tigillarium* (Jack) Ridl. and *Pandanus kaida* Kurz. Pictures of some dominant plant species are shown in ***Photo 5.3-1*** and ***Photo 5.3-2***.

The Plant species list and plant status (IUCN,2013) found within project area and study area of 500 m strips from center of road are shown in ***Table 5.3-1***.

(2) Tree Number

The calculations related to numbers of trees to be lost can be made based on the forest inventory data collected. For the whole project area along road link, forest covers 149.37 acres. Tree numbers are showns in ***Table 5.3-2***.

TABLE 5.3-2

THE TREE NUMBERS OF THE FOREST IN THE RIGHT-OF-WAY OF PROJECT

Study Area	Tree Numbers (individual) [2]		
	Trees	Saplings	Seedlings
Dry Evergreen Forest	37,022.01	275,621.04	3,103,287.61
Mixed Deciduous Forest	32,711.24	204,445.25	2,460,580.00
Freshwater Swamp Forest	256.80	21,400.00	21,400.00
Total	**69,990.05**	**501,466.29**	**5,585,267.61**

Remark: 1. Timber volume calculated from trees with DBH over 10 cm
2. Tree means any tree with DBH over 10 cm, Sapling means any tree with DBH under 10 cm and height over 1.30 m, and Seedling means any tree with height under 1.30 m.

(3) Timber Volume

The calculations related to loss timber volumes can be in each forest type with found in project area for three timber grade (class A, B and C) are distinguished, with class C as fuel wood. The calculation of sawing timber in the project area can be described as ***Table 5.3-3***, and the total timber volume is shown in ***Table 5.3-4***.

TABLE 5.3-3

AVERAGE TREE VOLUME WITHIN PROPOSED PROJECT RIGHT-OF-WAY

Unit m^3/acre

Forest Type	Areas (acre)	Timber Quality					Timber Grade			
		TQ 1.1	TQ 1.2	TQ 1.3	TQ 2	TQ 3	A	B	C	Total
Dry Evergreen Forest	74.86	15.36	65.57	20.73	14.24	1.87	15.36	79.81	22.60	117.76
Mixed Deciduous Forest	72.37	7.80	50.37	8.88	11.49	1.88	7.80	61.85	10.76	80.41
Freshwater Swamp Forest	2.14	0.00	0.00	0.00	0.24	0.10	0.00	0.24	0.10	0.33
Total	**149.37**	**23.15**	**115.93**	**29.61**	**25.97**	**3.84**	**23.15**	**141.90**	**33.45**	**198.50**

Remark: 1. Timber Grade A = TQ1.1 2. Timber Grade B = TQ1.2 + TQ2 3. Timber Grade C = TQ1.3 + TQ3

TABLE 5.3-4

TOTAL TIMBER VOLUME WITHIN PROPOSED PROJECT RIGHT-OF-WAY

Unit m^3

Forest Type	Areas (acre)	Timber Quality					Timber Grade			
		TQ 1.1	TQ 1.2	TQ 1.3	TQ 2	TQ 3	A	B	C	Total
Dry Evergreen Forest	74.86	1,149.85	4,908.57	1,551.85	1,066.01	139.99	1,149.85	5,974.58	1,691.84	**8,816.26**
Mixed Deciduous Forest	2.37	564.49	3,645.28	642.65	831.53	136.06	564.49	4,476.08	778.70	**5,819.05**
Freshwater Swamp Forest	2.14	0.00	0.00	0.00	0.51	0.21	0.00	0.51	0.21	**0.72**
Total	**149.37**	**1,714.34**	**8,553.85**	**2,194.50**	**1,898.05**	**276.26**	**1,714.34**	**10,451.17**	**2,470.75**	**14,636.03**

Remark: 1. Timber Grade A = TQ1.1 2. Timber Grade B = TQ1.2 + TQ2 3. Timber Grade C = TQ1.3 + TQ3

(4) Plant Status

Of the 242 plant species found in the R.O.W area and 247 plant species found within study area in 500 m strips from center line of road, 6 species are listed as Threatened Species in the IUCN Red List (2013) (see ***Table 5.3-1***). The threatened species are:

The Project Right-of-Way

Critically Endangered Species (CR)–one species found in this area is namely *Dipterocarpus chartaceus* Symington.

Endangered Species (EN)–one species found in this area is namely *Shorea roxburghii* G. Don

Vulnerable Species (VU)-three species were found, namely *Borassodendron machadonis* (Ridl.) Becc., *Cycas pectinata* Buch.-Ham. and *Hopea odorata* Roxb.

The Study Area in 500 m Strips from Center Line of Road

Critically Endangered Species (CR)–two species found in this area are namely *Dipterocarpus chartaceus* Symington and *Dipterocarpus turbinatus* C. F. Gaertn.

Endangered Species (EN)–one species found in this area is namely *Shorea roxburghii* G. Don

Vulnerable Species (VU)–three species were found, namely *Borassodendron machadonis* (Ridl.) Becc., *Cycas pectinata* Buch.-Ham. and *Hopea odorata* Roxb.

B. Wildlife Resource

The survey of wildlife resources in the project site and the outer area was carried out simultaneously with the forest resource surveys during March 16-22, 2015.

Field survey was conducted using two methods, direct searching method and indirect inquiring method. The direct searching method was carried out in the selected sample areas by line transects and point count. Binocular was used to detect the diurnal squirrels and other day-active small mammals. More ground searches were conducted to detect tracks and other signs of existing wildlife resources such as track in soft soils and crew marks, feeding signs, dropping and quills, etc. Indirect inquiring method is carried out by interviewing local people to obtain information and exact representative of each habitat.

As the terrestrial ecosystem in the study area has long been disturbed, most of wildlife species found in the surveys were small animals which had adapted to thrive well in disturbed and poor habitats. A total of 152 wildlife species was recorded in the surveys consisting of 23 mammals, 88 birds, 27 reptiles and 14 amphibians. The species list of wildlife found in right of way and study area are shown in ***Table 5.3-5***.

TABLE 5.3-5

THE SPECIES LIST OF WILDLIFE FOUND WITHIN PROPOSED PROJECT AREA AND STUDY AREA (IN 500 M STRIPS FROM CENTER LINE OF ROAD)

No.	Order, Family, Common Name (Scientific Name)	Method for Survey		IUCN Red Data List				Migration		Abundance					
										Project Site In Right of Way			Study Area 500 m. Strip		
		Direct Searching	Indirect Searching	CR	EN	VU	NT	R	M	Ve	Co	Ue	Ve	Co	Ue
	Mammalia-Mammal														
	Primates														
	Hylobatidae														
1	Common Gibbon (*Hylobates lar*)	x	-	-	x	-	-	x	-	-	-	-	-	-	x
	Cercopithecidae														
2	Dusky Leaf Monkey (*Trachypithecus obscurus*)	-	x	-	-	-	x	x	-	-	-	-	-	-	x
	Carnivora														
	Viverridae														
3	Mask Palm Civet (*Paradoxurus hermaphroditus*)	x	-	-	-	-	-	x	-	-	-	x	-	-	x
	Felidae														
4	Asian Golden Cat (*Pardofelis temminckii*)	-	x	-	-	-	x	x	-	-	-	x	-	-	x
	Herpestidae														
5	Small Asian Mongoose (*Herpestes javanicus*)	x	-	-	-	-	-	x	-	-	-	x	-	-	x
	Artiodactyla														
	Suidae														
6	Wild Boar (*Sus scrofa*)	x	-	-	-	-	-	x	-	-	-	x	-	x	-
	Cervidae														
7	Sambar Deer (*Cervus unicolor*)	-	x	-	-	x	-	x	-	-	-	-	-	-	x
8	Barking Deer (*Muntiacus muntjak*)	x	-	-	-	-	-	x	-	-	-	x	-	x	-
	Bovidae														
9	Serow (*Capricornis Sumatraensis*)	-	x	-	-	x	-	x	-	-	-	x	-	-	x
	Tragulidae														
10	Lesser mouse-deer (*Tragulus kanchil*)	-	x	-	-	-	-	x	-	-	-	-	-	-	x
	Rodentia														
	Sciuridae														
11	Himalayan Striped Squirrel (*Tamops mcclellandii*)	x	-	-	-	-	-	x	-	-	-	x	-	-	x
12	Variable Squirrel (*Callosciurus finlaysoni*)	x	-	-	-	-	-	x	-	-	x	-	x	-	-
13	Grey-bellied Squirrel (*Callosciurus caniceps*)	x	-	-	-	-	-	x	-	-	-	x	-	x	-
14	Indochinese Ground Squirrel (*Menetes berdmorei*)	x	-	-	-	-	-	x	-	-	x	-	-	x	-
15	Black Giant Squirrel (*Ratufa bicolor*)	-	x	-	-	-	x	x	-	-	-	-	-	-	x
	Muridae														
16	House Mouse (*Mus musculus*)	x	-	-	-	-	-	x	-	-	x	-	x	-	-
17	Roof Rat (*Rattus rattus*)	x	-	-	-	-	-	x	-	x	-	-	x	-	-
18	Great Bandicoot Rat (*Bandicota indica*)	x	-	-	-	-	-	x	-	-	x	-	x	-	-
	Hystricidae														
19	Common porcupine (*Hystrix brachyura*)	-	x	-	-	-	-	x	-	-	-	-	-	-	x
	Spalacidae														
20	Lesser Bamboo Rat (*Cannomys badius*)	x	-	-	-	-	-	x	-	-	-	x	-	x	-
21	Bamboo Rat (*Rhizomys sumatrensis*)	x	-	-	-	-	-	x	-	-	-	x	-	x	-
	Scandentia														
	Tupaiidae														
22	Treeshrew (*Tupaia belangeri*)	x	-	-	-	-	-	x	-	-	x	-	-	x	-
	Lagomorpha														
	Leporidae														
23	Burmese hare (*Lepus peguensis*)	-	x	-	-	-	-	x	-	-	-	x	-	-	x
	Total (23 species, 22 Genus, 15 Families, 6 Orders)	15	8	0	1	2	3	23	0	1	5	11	4	7	12
	Percentage	65.22	34.78	0.00	4.35	8.70	13.04	100.00	0.00	4.35	21.74	47.83	17.39	30.43	52.17
	Aves-Bird														
	Pelecaniformes														
	Anhingidae														
1	Snakebird (*Anhinga melanogaster*)	x	-	-	-	-	x	x	-	-	-	x	-	-	x
	Phalacrocoracidae														
2	Little cormorant (*Microcarbo niger*)	x	-	-	-	-	-	x	-	-	-	x	-	-	x
	Psittaciformes														
	Psittacidae														
3	Red-breasted Parakeet (*Psittacula alexandri*)	x	-	-	-	-	x	x	-	-	-	x	-	x	-
	Ciconiiformes														
	Ardeidae														
4	Little Egret (*Egretta garzetta*)	x	-	-	-	-	-	x	-	-	x	-	-	x	-
5	Chinese Pond-Heron (*Ardeola bacchus*)	x	-	-	-	-	-	-	x	-	x	-	-	x	-
6	Intermediate Egret (*Mesophoyx intermedia*)	x	-	-	-	-	-	x	-	-	-	x	-	-	x
7	Cattle Egret (*Bubulcus ibis*)	x	-	-	-	-	-	x	-	-	-	x	-	x	-
	Falconiformes														
	Accipitridae														
8	Crested Serpent-Eagle (*Spilornis cheela*)	x	-	-	-	-	-	x	-	-	-	x	-	-	x
9	Shikra (*Accipiter badius*)	x	-	-	-	-	-	-	x	-	x	-	-	x	-
10	Hird hawk (*Accipiter soloensis*)	x	-	-	-	-	-	-	x	-	-	x	-	-	x
11	Changeable Hawk Eagle (*Nisaetus limnaeetus*)	x	-	-	-	-	-	x	-	-	-	x	-	-	x
	Falconidae														
12	Eurasian Kestrel (*Falco tinnunculus*)	x	-	-	-	-	-	-	x	-	-	x	-	-	x
13	Oriental Honey-Buzzard (*Pernis ptilorhynchus*)	x	-	-	-	-	-	-	x	-	x	-	-	x	-
	Galliformes														
	Phasianidae (Pheasants)														
14	Red Junglefowl (*Gallus gallus*)	x	-	-	-	-	-	x	-	-	-	x	x	-	-
15	Siamese Fireback (*Lophura diardi*)	-	x	-	-	-	-	x	-	-	-	-	-	-	x
16	Kalij Pheasant (*Lophura leucomelanos*)	-	x	-	-	-	-	x	-	-	-	-	-	-	x
17	Silver Pheasant (*Lophura nycthemera*)	-	x	-	-	-	-	x	-	-	-	x	-	-	x
18	Rain Quail (*Coturnix coromandelica*)	x	-	-	-	-	-	x	-	-	x	-	-	x	-
19	Green-legged Partridge (*Arborophila chloropus*)	-	x	-	-	-	-	x	-	-	-	x	-	-	x
	Charadriiformes														
	Charadriidae														
20	Red-wattled Lapwing (*Vanellus indicus*)	x	-	-	-	-	-	x	-	-	x	-	x	-	-

TABLE 5.3-5

THE SPECIES LIST OF WILDLIFE FOUND WITHIN PROPOSED PROJECT AREA AND STUDY AREA (IN 500 M STRIPS FROM CENTER LINE OF ROAD) (CONT'D)

No.	Order, Family, Common Name (Scientific Name)	Method for Survey		IUCN Red Data List				Migration		Abundance					
		Direct Searching	Indirect Searching	CR	EN	VU	NT	R	M	Project Site In Right of Way			Study Area 500 m. Strip		
										Ve	Co	Uc	Ve	Co	Uc
	Columbiformes														
	Columbidae (Doves, Pigeons)														
21	Spotted Dove (*Streptopelia chinensis*)	x	-	-	-	-	-	x	-	x	-	-	x	-	-
22	Thick-billed Pigeon (*Treron curvirostra*)	x	-	-	-	-	-	x	-	-	-	x	-	x	-
	Cuculliformes														
	Cuculidae														
23	Greater Coucal (*Centropus sinensis*)	x	-	-	-	-	-	x	-	x	-	-	x	-	-
24	Lesser Coucal (*Centropus toulouc*)	x	-	-	-	-	-	x	-	-	-	x	-	x	-
	Strigiformes														
	Tytonidae														
25	Collared Owlet (*Glaucidium brodiei*)	x	-	-	-	-	-	x	-	-	-	x	-	x	-
26	Asian Barred Owlet (*Glaucidium cuculoides*)	x	-	-	-	-	-	x	-	-	-	x	-	x	-
27	Spotted Owlet (*Athene brama*)	x	-	-	-	-	-	x	-	-	-	x	-	x	-
	Apodiformes														
	Hemiprocnidae														
28	Crested Treeswift (*Hemiprocne coronata*)	x	-	-	-	-	-	x	-	-	-	x	-	x	-
	Coraciiformes														
	Alcedinidae														
29	Black-capped Kingfisher (*Halcyon pileata*)	x	-	-	-	-	-	-	x	-	-	x	-	-	x
30	White-throated Kingfisher (*Halcyon smyrnensis*)	x	-	-	-	-	-	x	-	x	-	-	x	-	-
31	Common Kingfisher (*Alcedo atthis*)	x	-	-	-	-	-	-	x	-	-	x	-	x	-
	Meropidae														
32	Green Bee-eater (*Merops orientalis*)	x	-	-	-	-	-	x	-	x	-	-	x	-	-
33	Chestnut-headed Bee-eater (*Merops leschenaulti*)	x	-	-	-	-	-	x	-	-	-	x	-	-	x
	Coraciidae														
34	Indian Roller (*Coracias benghalensis*)	x	-	-	-	-	-	x	-	-	-	x	-	x	-
35	Dollar Roller (*Eurystomus orientalis*)	x	-	-	-	-	-	x	-	-	-	x	-	-	x
	Bucerotidae														
36	Great Hornbill (*Buceros bicornis*)	x	-	-	-	-	x	x	-	-	-	x	-	-	x
37	Oriental Pied Hornbill (*Anthracoceros albirostris*)	x	-	-	-	-	-	x	-	-	-	x	-	-	x
	Upupidae														
38	Hoopoe (*Upupa epops*)	x	-	-	-	-	-	x	-	-	-	x	-	-	x
	Piciformes														
	Megalaimidae														
39	Coppersmith Barbet (*Megalaima haemacephala*)	x	-	-	-	-	-	x	-	-	x	-	x	-	-
40	Lineated Barbet (*Megalaima lineata*)	x	-	-	-	-	-	x	-	x	-	-	x	-	-
41	Green-eared Barbet(*Megalaima faiostricta*)	x	-	-	-	-	-	x	-	x	-	-	x	-	-
42	Blue-throated barbet (*Megalaima asiatica*)	x	-	-	-	-	-	x	-	-	x	-	x	-	-
	Picidae														
43	Greater Yellownape (*Picus flavinucha*)	x	-	-	-	-	-	x	-	-	-	x	-	-	x
44	Bamboo Woodpecker (*Gecinulus viridis*)	x	-	-	-	-	-	x	-	-	-	x	-	-	x
45	Grey-capped pygmy woodpecker (*Dendrocopos canicapillus*)	x	-	-	-	-	-	x	-	-	-	x	-	x	-
46	Fulvous-breasted Woodpecker (*Dendrocopos macei*)	x	-	-	-	-	-	x	-	-	-	x	-	x	-
	Passeriformes														
	Hirundinidae														
47	Barn Swallow (*Hirundo rustica*)	x	-	-	-	-	-	-	x	x	-	-	x	-	-
48	Red-rumped Swallow (*Hirundo daurica*)	x	-	-	-	-	-	-	x	x	-	-	x	-	-
	Motacillidae														
49	Richard's Pipit (*Anthus richardi*)	x	-	-	-	-	-	-	x	-	x	-	x	-	-
50	White Wagtail (*Motacilla alba*)	x	-	-	-	-	-	-	x	-	x	-	x	-	-
51	Grey Wagtail (*Motacilla cinerea*)	x	-	-	-	-	-	-	x	-	-	x	-	x	-
52	Yellow Wagtail (*Motacilla flava*)	x	-	-	-	-	-	-	x	-	-	x	-	-	x
	Chloropseidae														
53	Lesser Green Leafbird (*Chloropsis cyanopogon*)	x	-	-	-	-	x	x	-	-	-	x	-	-	x
54	Golden-fronted Leafbird (*Chloropsis aurifrons*)	x	-	-	-	-	-	x	-	-	x	-	x	-	-
	Irenidae														
55	Asian Fairy Bluebird (*Irena puella*)	x	-	-	-	-	-	x	-	-	-	x	-	-	x
	Oriolidae														
56	Black-naped Oriole (*Oriolus chinensis*)	x	-	-	-	-	-	x	-	-	-	x	-	x	-
	Pycnonotidae														
57	Stripe-throated Bulbul (*Pycnonotus finlaysoni*)	x	-	-	-	-	-	x	-	-	-	x	-	x	-
58	Black-crested Bulbul (*Pycnonotus melanicterus*)	x	-	-	-	-	-	x	-	x	-	-	x	-	-
59	Sooty-headed Bulbul (*Pycnonotus aurigaster*)	x	-	-	-	-	-	x	-	x	-	-	x	-	-
60	Puff-throated Bulbul (*Alophoixus pallidus*)	x	-	-	-	-	-	x	-	-	x	-	x	-	-
	Dicruridae														
61	Balck Drongo (*Dicrurus macrocercus*)	x	-	-	-	-	-	x	-	x	-	-	x	-	-
62	Bronzed Drongo (*Dicrurus aeneus*)	x	-	-	-	-	-	x	-	-	x	-	x	-	-
63	Greater Racket-tailed Drongo (*Dicrurus paradiseus*)	x	-	-	-	-	-	x	-	-	-	x	-	x	-
	Corvidae														
64	Large-billed Crow (*Corvus macrorhynchos*)	x	-	-	-	-	-	x	-	-	-	x	-	x	-
65	Red-billed Blue Magpie (*Urocissa erythrorhyncha*)	x	-	-	-	-	-	x	-	-	-	x	-	-	x
	Campephagidae														
66	Scarlet Minivet (*Pericrocotus flammeus*)	x	-	-	-	-	-	x	-	-	x	-	x	-	-
67	Ashy Minivet (*Pericrocotus divaricatus*)	x	-	-	-	-	-	x	-	-	x	-	-	x	-
	Sylviidae														
68	Plain Prinia (*Prinia inornata*)	x	-	-	-	-	-	x	-	x	-	-	x	-	-
69	Common Tailorbird (*Orthotomus sutorius*)	x	-	-	-	-	-	x	-	x	-	-	x	-	-
70	Dark-necked Tailorbird (*Orthotomus atrogularis*)	x	-	-	-	-	-	x	-	x	-	-	x	-	-
71	Inornate Warbler (*Phylloscopus inornatus*)	x	-	-	-	-	-	-	x	x	-	-	x	-	-
	Turdidae														
72	Oriental Magpie Robin (*Copsychus saularis*)	x	-	-	-	-	-	x	-	-	x	-	x	-	-
	Muscicapidae														
73	Asian Brown Flycatcher (*Muscicapa dauurica*)	x	-	-	-	-	-	-	x	-	-	x	-	x	-
74	White-rumped shama (*Copsychus malabaricus*)	x	-	-	-	-	-	x	-	-	-	x	-	x	-

TABLE 5.3-5

THE SPECIES LIST OF WILDLIFE FOUND WITHIN PROPOSED PROJECT AREA AND STUDY AREA (IN 500 M STRIPS FROM CENTER LINE OF ROAD) (CONT'D)

No.	Order, Family, Common Name (Scientific Name)	Method for Survey		IUCN Red Data List				Migration		Abundance					
										Project Site In Right of Way			Study Area 500 m. Strip		
		Direct Searching	Indirect Searching	CR	EN	VU	NT	R	M	Vc	Co	Uc	Vc	Co	Uc
75	Blue Rockthrush (*Monticola solitarius*)	x	-	-	-	-	-	x	-	-	-	x	-	x	-
	Leiothrichidae														
76	Black-throated Laughingthrush (*Garrulax chinensis*)	x	-	-	-	-	-	x	-	-	-	x	-	x	-
77	White-crested Laughingthrush (*Garrulax leucolophus*)	x	-	-	-	-	-	x	-	x	-	-	x	-	-
	Sturnidae														
78	Common Myna (*Acridotheres tristis*)	x	-	-	-	-	-	x	-	x	-	-	x	-	-
79	Jungle Myna (*Acridotheres fuscus*)	x	-	-	-	-	-	x	-	-	-	x	-	x	-
80	Hill Myna (*Gracula religiosa*)	x	-	-	-	-	-	x	-	-	x	-	x	-	-
	Nectariniidae														
81	Olive-backed Sunbird (*Nectarinia jugularis*)	x	-	-	-	-	-	x		x	-	-	x	-	-
82	Little Spiderhunter (*Arachnothera longirostra*)	x	-	-	-	-	-	x	-	-	x	-	x	-	-
	Dicaeidae														
83	Scarlet-backed Flowerpecker (*Dicaeum cruentatum*)	x	-	-	-	-	-	x	-	x	-	-	x	-	-
84	Plain Flowerpecker (*Dicaeum concolor*)	x	-	-	-	-	-	x	-	x	-	-	x	-	-
	Passeridae														
85	Eurasian Tree-Sparrow (*Passer montanus*)	x	-	-	-	-	-	x	-	x	-	-	x	-	-
	Sittidae														
86	Chestnut-bellied Nuthatch (*Sitta castanea*)	x	-	-	-	-	-	x	-	-	-	x	-	-	x
	Gruiformes														
	Rallidae														
87	White-breasted Waterhen (*Amaurornis phoenicurus*)	x	-	-	-	-	-	x	-	-	-	x	-	-	x
	Caprimulgiformes														
	Caprimulgidae														
88	Large-tailed Nightjar (*Caprimulgus macrurus*)	x	-	-	-	-	-	x	-	-	-	x	-	-	x
	Total (88 species, 64 Genus, 39 Families, 15 Orders)	84	4	0	0	0	4	73	15	23	18	47	34	28	26
	Percentage	95.45	4.55	0.00	0.00	0.00	4.55	82.95	17.05	23.86	20.45	53.41	38.64	31.82	29.55
	Reptilia-Reptiles														
	Squamata - Suborder Sauria (Lacertilia)														
	Gekkonidae														
1	Garnot's House Gecko (*Hemidactylus garnotii*)	x	-	-	-	-	-	x	-	x	-	-	x	-	-
2	Common Frilly Gecko (*Cosymbotus platyurus*)	x	-	-	-	-	-	x	-	x	-	-	x	-	-
3	Common House Gecko (*Hemidactylus frenatus*)	x	-	-	-	-	-	x	-	-	x	-	x	-	-
4	Tokay Gecko (*Gekko gecko*)	x	-	-	-	-	-	x	-	-	-	x	-	-	x
	Agamidae														
5	Forest Lizard (*Calotes emma*)	x	-	-	-	-	-	x	-	-	-	-	-	-	x
6	Garden Lizard (*Calotes mystaceus*)	x	-	-	-	-	-	x	-	-	-	x	-	-	x
7	Red-headed Lizard (*Calotes versicolor*)	x	-	-	-	-	-	x	-	-	-	x	-	-	x
8	Masked Spiny Lizard (*Acanthosaura crucigera*)	x	-	-	-	-	-	x	-	-	-	x	-	-	x
	Scincidae														
9	Variable Skink (*Mabuya macularia*)	x	-	-	-	-	-	x	-	-	x	-	x	-	-
10	Malayan Sun Skink (*Mabuya multifasciata*)	x	-	-	-	-	-	x	-	-	x	-	x	-	-
11	Common Forest Skink (*Sphenomorphus maculatus*)	x	-	-	-	-	-	x	-	x	-	-	x	-	-
	Varanidae														
12	Marble Monitor Lizard (*Varanus nebulosus*)	x	-	-	-	-	-	x	-	-	-	x	-	-	x
	Squamata - Suborder Serpentes (Ophidia)														
	Pythonidae														
13	Reticulated Python (*Python reticulatus*)	-	x	-	-	-	-	x	-	-	-	x	-	-	x
	Colubridae														
14	Copperhead Racer (*Elaphe radiata*)	x	-	-	-	-	-	x	-	-	-	x	-	x	-
15	Indo-chinese Rat Snake (*Ptyas korros*)	x	-	-	-	-	-	x	-	x	-	-	x	-	-
16	Plumbeous Water Snake (*Enhydris plumbea*)	x	-	-	-	-	-	x	-	-	-	x	x	-	-
17	Oriental whipsnake (*Ahaetulla prasina*)	x	-	-	-	-	-	x	-	-	-	x	-	x	-
18	Red-necked Keelback (*Rhabdophis subminiatus*)	x	-	-	-	-	-	x	-	-	-	x	-	x	-
19	Golden Tree Snake (*Chrysopelea ornata*)	x	-	-	-	-	-	x	-	-	-	x	x	-	-
	Elapidae														
20	Monocellated Cobra (*Naja sp.*)	-	x	-	-	-	-	x	-	-	-	x	-	x	-
21	King Cobra (*Ophiophagus hannah*)	-	x	-	-	x	-	x	-	-	-	-	-	-	x
	Viperidae														
22	White-lipped Pit-viper (*Trimeresurus albolabris*)	-	x	-	-	-	-	x	-	-	-	x	-	x	-
23	Pope's Pit Viper (*Trimeresurus popeiorum*)	-	x	-	-	-	-	x	-	-	-	x	-	x	-
	Testudines														
	Trionychidae														
24	Asiatic softshell turtle (*Amyda cartilaginea*)	-	x	-	-	x	-	x	-	-	-	-	-	-	x
	Testudinidae														
25	Elongated tortoise (*Indotestudo elongata*)	-	x	-	x	-	-	x	-	-	-	-	-	-	x
	Emydidae														
26	Asian Giant Tortoise (*Manouria emys phayrei*)	-	x	-	x	-	-	x	-	-	-	-	-	-	x
	Platysternidae														
27	Big-headed Turtle (*Platysternon megacephalum*)	-	x	-	x	-	-	x	-	-	-	-	-	-	x
	Total (27 species, 22 Genus, 12 Families, 3 Orders)	18	9	0	3	2	0	27	0	4	3	14	9	6	12
	Percentage	66.67	33.33	0.00	11.11	7.41	0.00	100.00	0.00	14.81	11.11	51.85	33.33	22.22	44.44
	Amphibia (Amphibians)														
	Anura														
	Pelobatidae														
1	Variegated Toad-frog (*Leptobrachium hasseltii*)	-	x	-	-	-	-	x	-	-	-	-	-	-	x
	Bufonidae														
2	Common Black-spotted Toad (*Duttaphrynus melanostictus*)	x	-	-	-	-	-	x	-	-	-	x	-	x	-
	Microhylidae														
3	Common Narrowing Frog (*Kaloula pulchra*)	x	-	-	-	-	-	x	-	-	-	x	-	-	x
4	Painted Chorus Frog (*Microhyla pulchra*)	x	-	-	-	-	-	x	-	x	-	-	x	-	-
5	Ornated Chorus Frog (*Microhyla ornata*)	x	-	-	-	-	-	x	-	x	-	-	x	-	-
6	Berdmore Chorus Frog (*Microhyla berdmorei*)	x	-	-	-	-	-	x	-	-	-	x	-	x	-
	Ranidae														
7	Paddyfield Paddle Frog (*Occidozyga lima*)	x	-	-	-	-	-	x	-	x	-	-	x	-	-

TABLE 5.3-5

THE SPECIES LIST OF WILDLIFE FOUND WITHIN PROPOSED PROJECT AREA AND STUDY AREA (IN 500 M STRIPS FROM CENTER LINE OF ROAD) (CONT'D)

No.	Order, Family, Common Name (Scientific Name)	Method for Survey		IUCN Red Data List				Migration		Abundance					
		Direct Searching	Indirect Searching	CR	EN	VU	NT	R	M	Project Site In Right of Way			Study Area 500 m. Strip		
										Vc	Co	Uc	Vc	Co	Uc
8	Pearl-tapped Pustled Puddle Frog (*Occidozyga magnapustulosus*)	x	-	-	-	-	-	x	-	-	-	x	x	-	-
9	Paddy field Green Frog (*Rana erythraea*)	x	-	-	-	-	-	x	-	-	-	x	-	x	-
10	Lowland Frog (*Hoplobatrachus rugulosa*)	x	-	-	-	-	-	x	-	-	-	x	-	x	-
11	Marsh Frog (*Fejervarya limnocharis*)	x	-	-	-	-	-	x	-	x	-	-	x	-	-
12	Giant asian river frog (*Limnonectes blythi*)	-	x	-	-	-	x	x	-	-	-	-	-	-	x
13	Kuhl's Stream Frog (*Limnonectes kuhli*)	-	x	-	-	-	x	x	-	-	-	-	-	-	x
	Rhacophoridae														
14	Common Treefrog (*Polypedates leucomystax*)	x	-	-	-	-	-	x	-	-	x	-	x	-	-
	Total (14 species, 10 Genus, 5 Families, 1 Orders)	11	3	0	0	0	2	14	0	4	1	6	6	4	4
	Percentage	78.57	21.43	0.00	0.00	0.00	14.29	100.00	0.00	28.57	7.14	42.86	42.86	28.57	28.57
	Total (152 species, 118 Genus, 73 Families, 35 Orders)	128	34	0	4	4	9	137	15	30	27	78	53	45	54
	Percentage	84.21	15.79	0.00	2.63	2.63	5.92	90.13	9.87	19.74	17.76	51.32	34.87	29.61	35.53

Source : Team Consulting Engineering and Management Co., Ltd., March 2015.

Remark : IUCN Red List (2013)
CR : Critically Endangered Species
EN : Endangered Species
VU : Vulnerable Species
NT : Near Threatened Species

Migration Animals
R : Resident Species
M : Migration Species

Abundance
Vc : Very common
Co : Common
Uc : Un common

Findings in the two surveyed areas are summarized below:

(1) The Project Area (Right of Way)

In total, 135 wildlife species were found in the right of way, consisting of 17 mammal species, 86 bird species, 21 reptile species, and 11 amphibian species. Pictures of some of the species are shown in ***Photo 5.3-3***.

Details of species diversity, species abundance and wildlife status of the 4 wildlife groups in the right of way area are as follows:

(a) Species Diversity and Habitats of wildlife

Mammals

17 mammal species, 16 Genus, 10 families from 5 order of this group found the living at forest, idle land and agricultural land in the right of way comprised rats, shrews, squirrels, civet, barking deer, serow and wild boar, namely *Rattus rattus*, *Tupaia belangeri*, *Callosciurus finlaysoni, Paradoxurus hermaphroditus*, *Muntiacus muntjak, Capricornis Sumatraensis and Sus scrofa*.

Birds

Birds can migrate rapidly searching for habitats and food sources. The distribution ranges of birds are very wide, especially for the arboreal birds. Some birds require specific habitats and ecological conditions, while many species can live and feed in diverse ecosystems.

In the right of way area, there were at least 86 species of birds 64 Genus, 39 families from 15 order in open areas, mixed deciduous forests, dry evergreen forests, freshwater swamp forests, agricultural areas, and sparse forest. Some observed species included: *Microcarbo niger*, *Psittacula alexandri, Egretta garzetta*, *Nisaetus limnaeetus*, *Pernis ptilorhynchs, Gallus gallus, Vanellus indicus*, *Centropus sinensis, Halcyon smyrnensis, Merops orientalis*, *Buceros bicornis*, *Megalaima faiostricta*, *Picus flavinucha*, *Pycnonotus melanicterus*, *Pericrocotus flammeus*, *Garrulax leucolophus*, *Gracula religiosa*, and *Nectarinia jugularis*. The migration bird were found within the right of way and vicinities during season change about 15 species include *Motacilla alba*, *Phylloscopus inornatus*, *Hirundo rustica*, *Pernis ptilorhynchs*, *Accipiter soloensis* and *Ardeola bacchus*.

Remark: [1]Wildlife species within the right of way

[2]Wildlife species within study area in 500 m. strip from center

PHOTO 5.3-3 : WILDLIFE SPECIES WITHIN THE RIGHT OF WAY AND STUDY AREA (IN 500 M STRIPS FROM CENTER LINE OF ROAD)

Reptiles

About 21 species, 17 Genus, 8 families from 2 order of this wildlife group were found in the right of way area, all are species distributed widely in Myanmar. The reptiles found living in mixed deciduous forests, dry evergreen forests, freshwater swamp forests, idle land and communities were: *Acanthosaura crucigera, Sphenomorphus maculates, Enhydris plumbea, Ptyas korros* and *Cosymbotus platyurus.*

Amphibians

About at least 11 species, 8 Genus, 4 families from 1 order of this group were found the living at wetland, river, swamp and stream in the right of way areas, including *Microhyla pulchra, Microhyla ornate, Fejervarya limnocharis, Polypedates leucomystax and Duttaphrynus melanostictus.*

(B) Species Abundance

The Very Common species regarded as abundant were found living in the right of way area in large flying flocks or in great concentrations, and being seen in every survey. Only 30 wildlife species were Very Common species, comprising 21 birds species, 4 reptiles, 4 amphibians species and 1 mammals species, Very common birds species include *Streptopelia chinensis, Centropus sinensis, Merops orientalis, Hirundo rustica* and *Pycnonotus melanicterus*. The Very Common for mammal was *Rattus rattus.* While the Very Common reptiles and amphibians included *Cosymbotus platyurus, Ptyas korros, Microhyla pulchra* and *Fejervarya limnocharis.*

The Common abundant species were totally 27 species comprising 5 species of mammals, 18 birds species, 3 reptiles species and 1 amphibians species. The common species recorded in the right of way area included *Callosciurus finlaysoni, Menetes berdmorei, Bandicota indica, Egretta garzetta, Vanellus indicus, Motacilla alba, Chloropsis aurifrons, Hemidactylus frenatus, Mabuya multifasciata* and *Polypedates leucomystax.*

For the last level of Uncommon in relative abundance, 78 wildlife species were classified as occurring in a very low numbers, and many of them were found only once during the surveys. Their rather high numbers comprise 11 mammals, 47 bird, 14 reptiles and 6 amphibians species. The *Pardofelis temminckii, Muntiacus muntjak, Capricornis Sumatraensis and Lepus peguensis* was exceedingly low in number; which was probably due to heavy hunting pressure and loss living habitat along the project area. Some Uncommon birds of prey, such as the *Nisaetus limnaeetus, Falco tinnunculus, Accipiter soloensis*, and all 3 recorded owl species, were hard to find and themselves naturally occur in low numbers. Bird species considered to food delicacies by the villagers were also Uncommon, with resident bird species such as the *Amaurornis phoenicurus, Lophura nycthemera, Gallus gallus* and *Treron curvirostra*, being observed only as a few individuals at a time and quite wary and difficult to approach for better observation. Some bird species popularly kept as pets were noticed to present in the project area in quite small flocks of 3-7 birds, for example, the *Psittacula alexandri, Gracula religiosa, Garrulax chinensis* and *Copsychus malabaricus* (***Table 5.3-5***).

(C) Wildlife Status

Status for Conservation Concern: Based on IUCN (2013), at least 6 threatened species were found within the right of way as shown in ***Table 5.3-5***. Most species were classified as Least Concern Species (LC). The threatened species were:

Vulnerable Species (VU) - one species were found, namely *Capricornis Sumatraensis*.

Near Threatened Species (NT)–five species were found, namely *Pardofelis temminckii*, *Anhinga melanogaster*, *Psittacula alexandri*, *Buceros bicornis* and *Chloropsis cyanopogon*.

(2) The Study Area (In 500 m Strips from Center Line)

In total, 152 wildlife species were found in this outer area, consisting of 23 mammal species, 88 bird species, 27 reptile species, and 14 amphibian species as shown in ***Photo 5.3-3***.

Details of species diversity, species abundance and wildlife status of the 4 wildlife groups are as follows:

(a) Species Diversity and Habitats of Wildlife

Mammals

23 mammal species, 22 Genus, 15 families from 6 order were found the living at communities, forest, idle land, and agricultural land comprising several kinds of rat, Gibbon, squirrel, Mongoose, Mice, and hare, namely *Mus musculus*, *Hylobates lar*, *Callosciurus caniceps, Herpestes javanicus, Cannomys badius and Lepus peguensis*.

Birds

The distribution ranges of birds are very wide, because the birds adjust oneself to the conditions and birds can migrate rapidly searching for habitats and food sources. while many species can live and feed in diverse ecosystems.

The study area in 500 m strips from center line, there were at least 88 species of birds 64 Genus, 39 families from 15 order. Birds could live in open areas, mixed deciduous forests, dry evergreen forests, freshwater swamp forests, agricultural areas, sparse forest, wetland and communities. Some observed species included: *Ardeola bacchus*, *Bubulcus ibis*, *Pernis ptilorhynchs, Coturnix coromandelica, Glaucidium cuculoides*, *Alcedo atthis, Coracias benghalensis*, *Megalaima haemacephala*, *Dendrocopos canicapillus*, *Anthus richardi*, *Pycnonotus aurigaster*, *Dicrurus macrocercus*, *Dicrurus paradiseus*, *Acridotheres tristis*, *Dicaeum concolor* and *Orthotomus sutorius*. The migration bird found during season change were about 15 species including *Motacilla alba*, *Motacilla cinerea, Phylloscopus inornatus*, *Hirundo rustica*, *Pernis ptilorhynchs*, *Accipiter soloensis*, *Muscicapa dauurica* and *Ardeola bacchus*.

Reptiles

About 27 species, 22 Genus, 12 families from 3 order of wildlife group were found in the study area, all are species which distribute widely in Myanmar. The reptiles found living in mixed deciduous forests, dry evergreen forests, freshwater swamp forests, idle land, agricultural land and communities comprised several kinds of Geckos, Agamid Liazrds, Skinks, Monitor Lizards, Snakes and Turtle namely *Gekko gecko, Calotes mystaceus, Mabuya macularia, Varanus nebulosus*, *Ahaetulla prasina* and *Manouria emys phayrei.*

Amphibians

14 species, 10 Genus, 5 families from 1 order found living in marsh area, wetland, river, swamp and stream in the study areas were mostly wildlife in order Anura namely *Occidozyga lima, Microhyla pulchra*, *Microhyla ornate, Fejervarya limnocharis, Limnonectes kuhli, Polypedates leucomystax and Duttaphrynus melanostictus.*

(b) Species Abundance

The Very Common species can be regarded as abundant found living in the study area during field survey were 53 wildlife species comprising 34 birds species, 9 reptiles, 6 amphibians species and 4 mammals species. Birds species included *Gallus gallus, Vanellus indicus, Megalaima asiatica, Dicrurus aeneus, Pericrocotus flammeus, Phylloscopus inornatus, Garrulax leucolophus*, and *Acridotheres tristis*. The Very Common for reptiles and amphibians included *Hemidactylus garnotii, Mabuya multifasciata, Enhydris plumbea,* and *Chrysopelea ornata*. While the Very Common amphibians were *Microhyla pulchra*, *Microhyla ornate*, *Occidozyga magnapustulosus*, *Fejervarya limnocharis* and very common mammals were *Callosciurus finlaysoni*, *Mus musculus*, *Rattus rattus* and *Bandicota indica.*

The Common abundant species were totally 45 species comprising 28 species of birds, 7 mammals species, 6 reptiles species and 4 amphibians species. The Common wildlife species recorded in the study area includes birds namely *Egretta garzetta, Accipiter badius, Treron curvirostra, Glaucidium brodiei and Oriolus chinensis*. Common mammals species included *Sus scrota*, *Muntiacus muntjak* and *Tupaia belangeri* reptile namely *Elaphe radiate*, *Rhabdophis subminiatus* and *Trimeresurus albolabris*. Common Amphibians were namely *Duttaphrynus melanostictus*, *Microhyla berdmorei*, *Rana erythraea* and *Hoplobatrachus rugulosa*.

For the last level of Uncommon in relative abundance, 54 wildlife species were classified as occurring in a very low numbers, and many of them were found during the surveys comprising 12 mammals, 26 birds, 12 reptiles and 4 amphibians species. The *Hylobates lar, Tragulus kanchil, Ratufa bicolor, Capricornis Sumatraensis and Hystrix brachyura* were exceedingly low in number; which was probably due to heavy hunting pressure and loss living habitat along the study area. Some Uncommon birds were namely *Anhinga melanogaster, Mesophoyx intermedia, Spilornis cheela, Nisaetus limnaeetus, Lophura diardi, Buceros bicornis, Anthracoceros albirostris, Upupa epops, Picus flavinucha* and *Chloropsis cyanopogon*. Bird species considered to food delicacies by the villagers were also Uncommon, with resident bird species such as the *Amaurornis phoenicurus, Lophura nycthemera*, *Lophura leucomelanos,* and *Gallus gallus* (***Table 5.3-5***).

(c) Wildlife Status

Status for Conservation Concern: Based on IUCN (2013), 17 species were found as threatened species within the study area in 500 m strips from center line as shown in ***Table 5.3-5.*** Most species were classified as Least Concern Species (LC). The threatened species were:

Endangered Species (EN)-four species were found, namely *Hylobates lar*, *Indotestudo elongate*, *Manouria emys phayrei* and *Platysternon megacephalum.*

Vulnerable Species (VU)–four species were found, namely *Cervus unicolor, Capricornis Sumatraensis*, *Ophiophagus hannah* and *Amyda cartilaginea.*

Near Threatened Species (NT)–Nine species were found, namely *Trachypithecus obscurus, Pardofelis temminckii*, *Ratufa bicolor, Anhinga melanogaster*, *Psittacula alexandri*, *Buceros bicornis*, *Chloropsis cyanopogon*, *Limnonectes blythii* and *Limnonectes kuhli.*

In addition, The project is concerned about the project impacts in terms of habitat fragmentation and loss of connectivity for wildlife. Previous study results and concerned documents on wildlife movement in the project area have been reviewed, field surveys on wildlife and existing land uses is conducted. Detailed survey and literature review on wildlife species found at the location of wildlife crossing along Two Lane Road alignment is presented in ***Appendix 5F.***

5.3.2 Aquatic Ecology

The study of aquatic ecological survey was conducted during 24 January to 1 February 2015 covering 11 stations as same as water sampling stations. Planktons were collected at the same time with water samples for analysis of species and quantified to determine Species Diversity Index. Likewise, benthos organisms were also identified and quantified.

Plankton sampling at each station was performed by collecting 20 liters of water and pouring the collected water sample through plankton net with 70 micron mesh size. The retained plankton was transferred into a storage bottle and was preserved with 5% neutral formalin solution. Species composition and abundance determinations were identified at Kasetsart University laboratory, Bangkok, Thailand.

Benthic samples were collected using Eckman dredge with a grabbing area of 0.25 ft^2. Three grab samplings (0.75 ft^2) were undertaken at each station. Each collected sample was observed to identify the texture and composition of sediments. The information was recorded accordingly. The sediments were washed through a series of wire sieves with mesh size of 1,000 and 500 μm. The retained fauna was kept in a plastic bottle and preserved in 5% formalin- seawater solution. All samples were sent to laboratory at Kasetsart University (Thailand) for identification. Aquantic ecological sampling activites are shown in ***Photo 5.3-4.***


PHOTO 5.3-4 : AQUATIC ECOLOGICAL SAMPLING ACTIVITIES

Detailed results of the plankton and benthos sampling during 24 January to 1 February 2015 are presented in ***Table 5.3-6*** and ***Table 5.3-7*** respectively. The following major conclusions can be drawn:

- At station SW1, where the sampling area is influenced by saltwater, 4 species of phytoplankton in 2 divisions were found. The most abundant phytoplankton was centric diatom, *Coscinodiscus* sp. As for zooplankton, 5 species from 2 phylum of Arthropoda and Rotifera were identified. Unidentified cyclopoid copepod and copepod larva were found. The highest abundant zooplankton was unidentified cyclopoid copepod.
- At station SW11, water course here receives effluent from ITD-Elasto Base 1 camp and waterway was blocked by temporary check dam. Composition of plankton here was quite different from others, 14 species of phytoplankton in 3 divisions were found. The most abundant phytoplankton was diatom, *Synedra ulna*. As for zooplankton, 10 species from 3 phylum of Arthropoda, Protozoa and Rotifera were identified. Unidentified cyclopoid copepod, harpacticoid copepod and copepod larva were found. The highest abundant zooplankton was unidentified copepod larva.
- For station SW2- SW10, Twenty nine species of phytoplankton in 3 divisions and nineteen taxa of zooplankton from 3 phyla were found. Composition of both phytoplankton and zooplankton varied among station. It can be concluded that main group of phytoplankton was diatom due to its appearance in all station while main group of zooplankton was rotifer.
- The density of phytoplankton was higher than zooplankton, this is considered as normal in aquatic food chain. The phytoplankton to zooplankton ratio was higher than 1 indicating that food for 2nd consumer are sufficient.
- Composition and density of benthic fauna varied among sampling station, common taxas were *Chiromonus* sp. and *Macrobrachium* sp. Number of species found in each station were between 1-4 species. There was no benthic organism in sample from SW6.
- The species diversity index (SDI) of plankton was in range of 1.17-2.45 while SDI of benthic was between 0.23-1.26. This indicates the high diversity of the aquatic ecology in the project area.
- The presence of diatom as the dominant species in some station indicates high productivity of aquatic organisms. But the presence of *Oscillatoria* (blue-green algae) in some station indicates high levels of nutrients in such waterway during survey period.

TABLE 5.3-6

RESULTS OF PLANKTON SAMPLINGS AND ANALYSIS

Plankton						Sampling Station										Total
Division	Class	Order	Suborder	Family	Species	SW1	SW 2	SW 3	SW 4	SW 5	SW 6	SW 7	SW 8	SW 9	SW 10	SW 11	
PHYTOPLANKTON																	
Division Cyanophyta																	
	Class Cyanophyceae (Blue-Green Algae)																
		Order Nostocales															
				Family Oscillatoriaceae													
					Lyngbya sp.							4,000					4,000
					Oscillatoria sp.	12,800	5,300		7,100		8,100			7,400	13,400	400,500	454,600
					Spirulina laxissima								7,600		6,700		14,300
				Family Nostocaceae													
					Rhaphidiopsis sp.	12,800										48,950	61,750
Division Chlorophyta																	
	Class Chlorophyceae (Green Algae)																
		Order Oedogoniales															
				Family Oedogoniaceae													
					Oedogonium crispum				3,550	4,250						8,900	16,700
		Order Zygnematales															
				Family Desmidiaceae													
					Closterium acerosum							4,000	3,800			8,900	16,700
					C. gracile		5,300				4,050						9,350
					C. moniliferum						4,050					22,250	26,300
					C. tumidum						8,100						8,100
					C. setaceum						16,200						16,200
				Family Zygnemataceae													
					Mougeotia scalaris				3,550		8,100						11,650
					Spirogyra crassa				7,100		12,150			7,400	20,100	396,050	442,800
					S. weberi											284,800	284,800
		Order Ulothrichales															
				Family Ulothrichaceae													
					Ulothrix aequalis			3,300	3,550								6,850
					U. variabilis										13,400	53,400	66,800

TABLE 5.3-6

RESULTS OF PLANKTON SAMPLINGS AND ANALYSIS (CONT'D)

Plankton						Sampling Station											Total
Division	Class	Order	Suborder	Family	Species	SW1	SW 2	SW 3	SW 4	SW 5	SW 6	SW 7	SW 8	SW 9	SW 10	SW 11	
Class Euglenophyceae (Euglenoid)																	
	Order Euglenales																
				Family Euglenaceae													
					Lepocinclis ovum			6,600	3,550								10,150
					Trachelomonas crebea			3,300							6,700	8,900	18,900
					T. volvocina				3,550							4,450	8,000
Division Chromophyta																	
	Class Bacillariophyceae (Diatom)																
		Order Bacillariales (Pennate Diatom)															
			Suborder Fragilariineae														
				Family Fragilariaceae													
					Fragilaria capucina							4,000	3,800	7,400	6,700		21,900
					Synedra ulna								3,800			778,750	782,550
					S. acus											124,600	124,600
			Suborder Bacillarineae														
				Family Naviculaceae													
					Frustulia vulgaris		5,300										5,300
					Pinnularia sp.		5,300										5,300
				Family Bacillariaceae													
					Nitzschia longissima		10,600	3,300			44,550						58,450
					N. sigma						16,200						16,200
				Family Rhopalodiaceae													
					Rhopalodia gibba									3,700		200,250	203,950
				Family Eunotiaceae													
					Eunotia sp.												
			Suborder Bacillarineae														
				Family Surirellaceae													
					Surirella elegans		10,600	3,300	3,550	4,250				3,700			25,400
					S. robusta									14,800	6,700		21,500
					S. striatula	6,400	10,600				4,050			37,000			58,050

TABLE 5.3-6

RESULTS OF PLANKTON SAMPLINGS AND ANALYSIS (CONT'D)

Plankton						Sampling Station											Total
Division	Class	Order	Suborder	Family	Species	SW1	SW 2	SW 3	SW 4	SW 5	SW 6	SW 7	SW 8	SW 9	SW 10	SW 11	
		Order Biddulphiales (Centric Diatom)															
			Suborder Coscinodiscineae														
				Family Coscinodiscaceae													
					Coscinodiscus sp	371,200	15,900			4,250	4,050						395,400
		Order Melosirales															
				Family Melosiraceae													
					Melosira sp.							4,000					4,000
	Class Dinophyceae (Dinoflagellates)																
		Order Peridiniales															
				Family Peridiniaceae													
					Peridinium sp.				3,550		8,100	4,000			13,400	8,900	37,950
ZOOPLANKTON																	
Phylum Arthropoda																	
	Class Crustacea (Crustaceans)																
		Subclass Brachiopoda															
			Order Diplostraca														
				Family Chydoridae													
					Alona affinis	6,400											6,400
		Subclass Copepoda (Copepods)															
			Order Calanoida														
					*Copepod larva (Nauplius)	19,200				4,250	12,150					142,400	178,000
			Order Cyclopoida (Cyclopoids)														
					*Unidentified Cyclopoids	51,200										26,700	77,900
			Order Harpacticoida (Harpacticoids)														
					*Unidentified Harpacticoids											8,900	8,900
Phylum Protozoa																	
	Class Sarcodina																
		Subclass Rhizopoda															
			Order Testacida														
				Family Arcellidae													
					Arcella vulgaris	12,800											12,800
					A. megastoma				3,550					3,700		8,900	16,150

TABLE 5.3-6

RESULTS OF PLANKTON SAMPLINGS AND ANALYSIS (CONT'D)

Plankton						Sampling Station											Total
Division	Class	Order	Suborder	Family	Species	SW1	SW 2	SW 3	SW 4	SW 5	SW 6	SW 7	SW 8	SW 9	SW 10	SW 11	
				Family Difflugiidae													
					Centropyxis ecornis	12,800	5,300	3,300					11,400	11,100		8,900	52,800
					C. aculeata					4,250						4,450	8,700
					Difflugia acuminata					4,250	4,050	4,000			6,700		19,000
	Class Ciliata																
		Subclass Holotricha															
			Order Gymnostomatida														
				Family Heterotrichida													
					Paramecium sp.				3,550						6,700	4,450	14,700
Phylum Rotifera (Rotifer)																	
	Class Monogononta																
			Order Ploima														
				Family Lecannidae													
					Lecane ungulata						4,050					13,350	17,400
					L. stichaea											4,450	4,450
				Family Asplanchnidae													
					Asplanchna priodonta			3,300									3,300
				Family Gastropodidae													
					Ascomorpha ecaudis			3,300									3,300
				Family Brachionidae													
					Anuraeopsis fissa					4,250			3,800				8,050
					A. navicula				3,550								3,550
					Brachionus angularis						4,050					4,450	8,500
					B. calyciflorua												
					Keratella tropica	6,400											6,400
				Family Trichocercidae													
					Trichocerca capucina		5,300								6,700		12,000
				Family Synchaetidae													
					Polyarthra vulgaris	6,400		3,300								40,050	49,750
					Synchaeta oblonga									3,700		4,450	8,150

TABLE 5.3-6

RESULTS OF PLANKTON SAMPLINGS AND ANALYSIS (CONT'D)

Plankton						Sampling Station										Total
Division	Class	Order	Suborder	Family	Species	SW1	SW 2	SW 3	SW 4	SW 5	SW 6	SW 7	SW 8	SW 9	SW 10	SW 11	
Order Floscullariacea																	
Family Testudinellidae																	
Filinia terminaris							5,300		3,550								8,850
Family Hexarthridae																	
Hexarthra mira																4,450	4,450
Individual																	
Phytoplankton						403,200	68,900	19,800	39,050	12,750	137,700	20,000	19,000	81,400	87,100	2,349,600	3,238,500
Zooplankton						115,200	15,900	13,200	14,200	17,000	24,300	4,000	15,200	18,500	20,100	275,900	533,500
Total						518,400	84,800	33,000	53,250	29,750	162,000	24,000	34,200	99,900	107,200	2,625,500	3,772,000
Species																	
Phytoplankton						4	8	5	9	3	12	5	4	7	8	14	32
Zooplankton						7	3	4	4	4	4	1	2	3	3	13	23
Total						11	11	9	13	7	16	6	6	10	11	27	55
Ratio of phytoplankton : Zooplankton						**3.50 : 1**	**4.33 : 1**	**1.50 : 1**	**2.75 : 1**	**0.75 : 1**	**5.67 : 1**	**5.00 : 1**	**1.25 : 1**	**4.40 : 1**	**4.33 : 1**	**8.52 : 1**	
Diversity index						**1.17**	**2.31**	**2.16**	**2.52**	**1.94**	**2.45**	**1.79**	**1.68**	**1.96**	**2.31**	**2.21**	

Remark : *unidentified
Density: Natural Unit / M^3
For phytoplankton, Natural Unit is cell, filament or colony / For Zooplankton, Natural Unit is cell, colony or individual

Source : Field survey by TEAM Consulting Engineering and Management Co. Ltd., January 2015

TABLE 5.3-7

RESULTS OF BENTHOS SAMPLINGS AND ANALYSIS

Benthic Organism	Sampling Station											Total
	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	SW9	SW10	SW11	
PHYLUM ANNELIDA												
Class Oligochaeta (Fresh water worm)												
Order Plesciora												
Family Tubificidae												
Tubifex sp.		242									22	**264**
PHYLUM ARTHROPODA												
Class Insecta												
Order Diptera												
Family Chironomidae												
Chironomus sp.	44			66	110			3256	66		22	**3564**
Family Ceratopogonidae												
Culicoides sp.					22			132	44			**198**
Family Tipulidae												
Pedicaia sp.			132	22						110		**264**
Order Ephemeroptera												
Family Baetidae												
Beatis sp.											88	**88**
Family Caenidae												
Caenis sp.											22	**22**
Family Ephemeridae												
Ephemera sp.					66			22	198			**286**
Order Odonata												
Family Lubellulidae												
Plathemis sp.										22		**22**
Class Crustacea												
Order Decapoda												
Family Palaemonidae												
Macrobrachium sp.	66		22	154	110							**352**
PHYLUM MOLLUSCA												
Class Gastropoda												
Order Mesogastropoda												
Family Thiaridae												
Tarebia sp.							22					**22**
Melanoides sp.										506		**506**
Family Stenothyridae												
Stenothyra sp.		22										**22**
Density (individual / M^2)	**110**	**264**	**154**	**242**	**308**	**0**	**22**	**3,410**	**308**	**638**	**154**	**5,610**
Total Species	**2**	**2**	**2**	**3**	**4**	**0**	**1**	**3**	**3**	**3**	**4**	**12**
Species Diversity Index	**0.68**	**0.27**	**0.41**	**0.86**	**1.26**	**0**	**0**	**0.23**	**0.90**	**0.60**	**1.16**	

Remark : *unidentified

Source : Field survey by TEAM Consulting Engineering and Management Co. Ltd., January 2015.

5.4 SOCIO-ECONOMIC COMPONENTS

5.4.1 Land Use

The study was carried out by conducting a land use field survey and compiling data from concerned authorities. Also, conducting an interview with the people living nearby and in the project vicinity and associated stakeholders was applied. The details are described as follows:

- Compiled data by using satellite imagery (Google Earth) and topographic maps (scale 1:250,000)
- Compiled data by using Geographic Information System (GIS) to investigate administrative boundaries at regional, township and sub-township levels of the Republic of the Union of Myanmar.
- Conducted a land use field survey to investigate types of existing land use and update the current status.
- After land use field survey, up-to-date land use maps were prepared and produced. Also, types and sizes of land use were provided, as shown in legends of land use maps.

The secondary information was verified and supplemented by field investigation conducted during 16-23 March 2015. Result of land use investigation can be divided into 2 parts as 1) project study area within 500 m on both sides of project alignment, and 2) project road RoW within 20 m strips on both sides of project alignment. Land use classification results can be demonstrated as follows (see ***Table 5.4-1*** and ***Figure 5.4-1***):

TABLE 5.4-1

LAND USE TYPE IN PROJECT STUDY AREA

Land Use Type	40 m RoW area		500 m strips area	
	Area (acres)	%	Area (acres)	%
Establishment or Enterprise area	8.01	0.52	201.41	0.59
Urban and residential area	6.32	0.41	215.58	0.63
Religious place area	-	-	6.35	0.02
Paddy field area	6.32	0.41	66.65	0.20
Oil Palm plantation area	6.52	0.43	127.88	0.38
Betel palm garden area	42.11	2.75	802.78	2.36
Para rubber plantation area	84.36	5.51	1,638.96	4.82
Orchards and perennial crops plantation area	352.11	22.98	7,328.89	21.54
Degraded and abandoned forest area	94.25	6.15	1,784.8	5.24
Forest area	711.83	46.46	18,313.16	53.81
Bamboo forest area	85.55	5.58	1,118.22	3.29
Grassland area	49.58	3.24	1,101.3	3.24
Agricultural and abandoned area	72.40	4.73	1,043.12	3.07
Water bodies area	7.98	0.52	177.23	0.52
Road area	4.73	0.31	105.02	0.31
Total Area	**1,532.07**	**100.00**	**34,031.35**	**100.00**

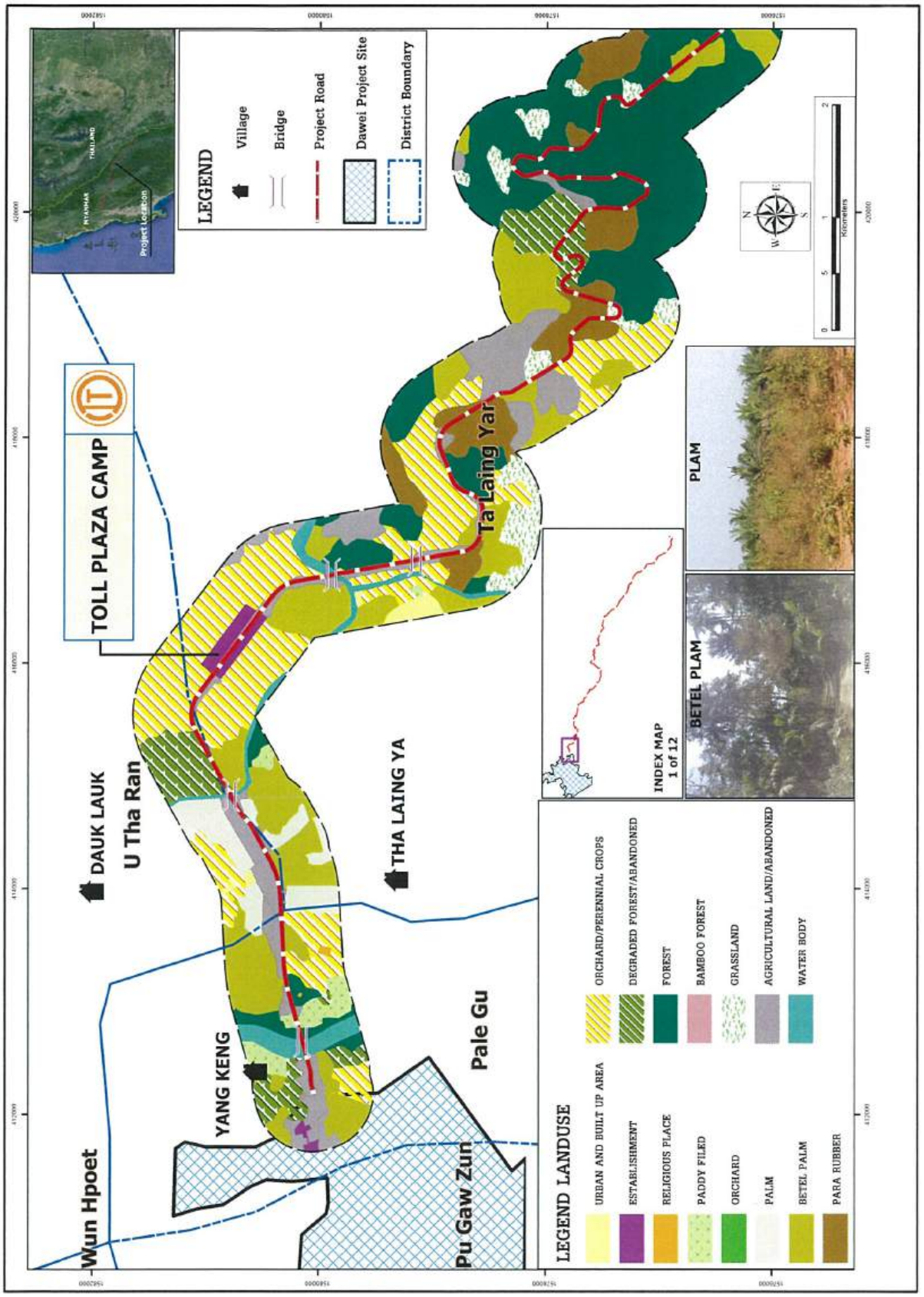


FIGURE 5.4-1 : EXISTING LAND USES WITHIN PROJECT STUDY AREA

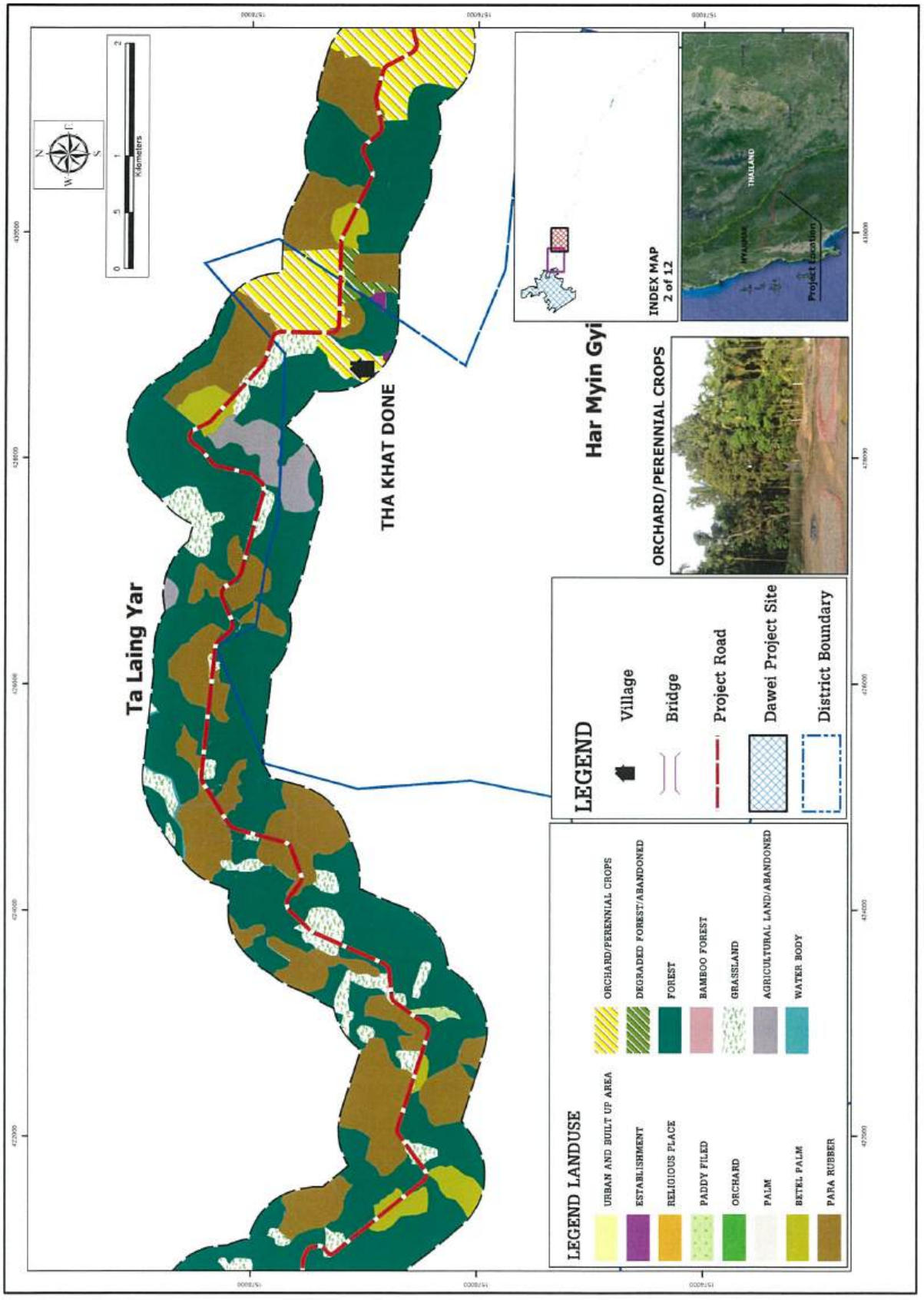


FIGURE 5.4-1 : EXISTING LAND USES WITHIN PROJECT STUDY AREA (CONT'D)

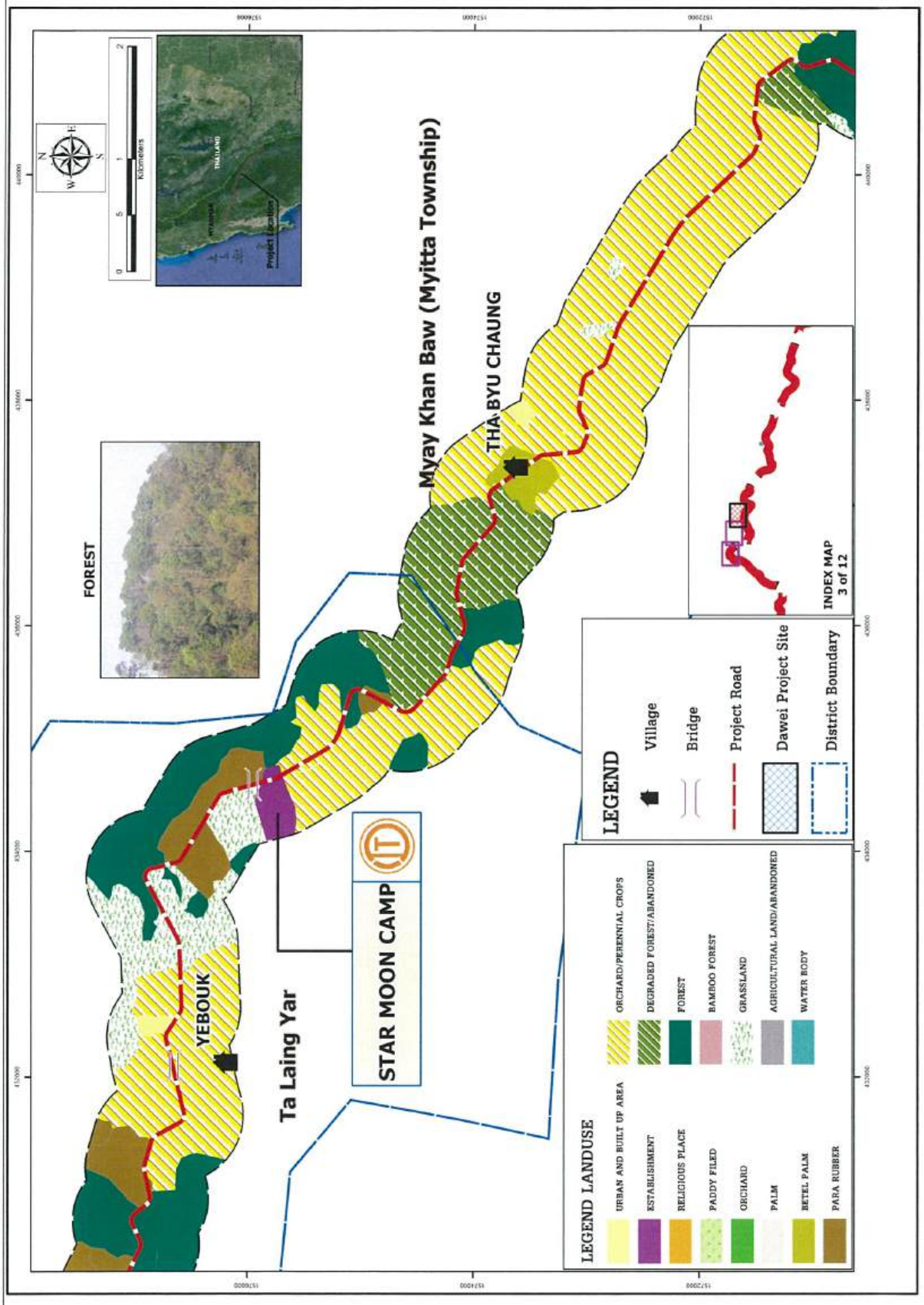


FIGURE 5.4-1 : EXISTING LAND USES WITHIN PROJECT STUDY AREA (CONT'D)

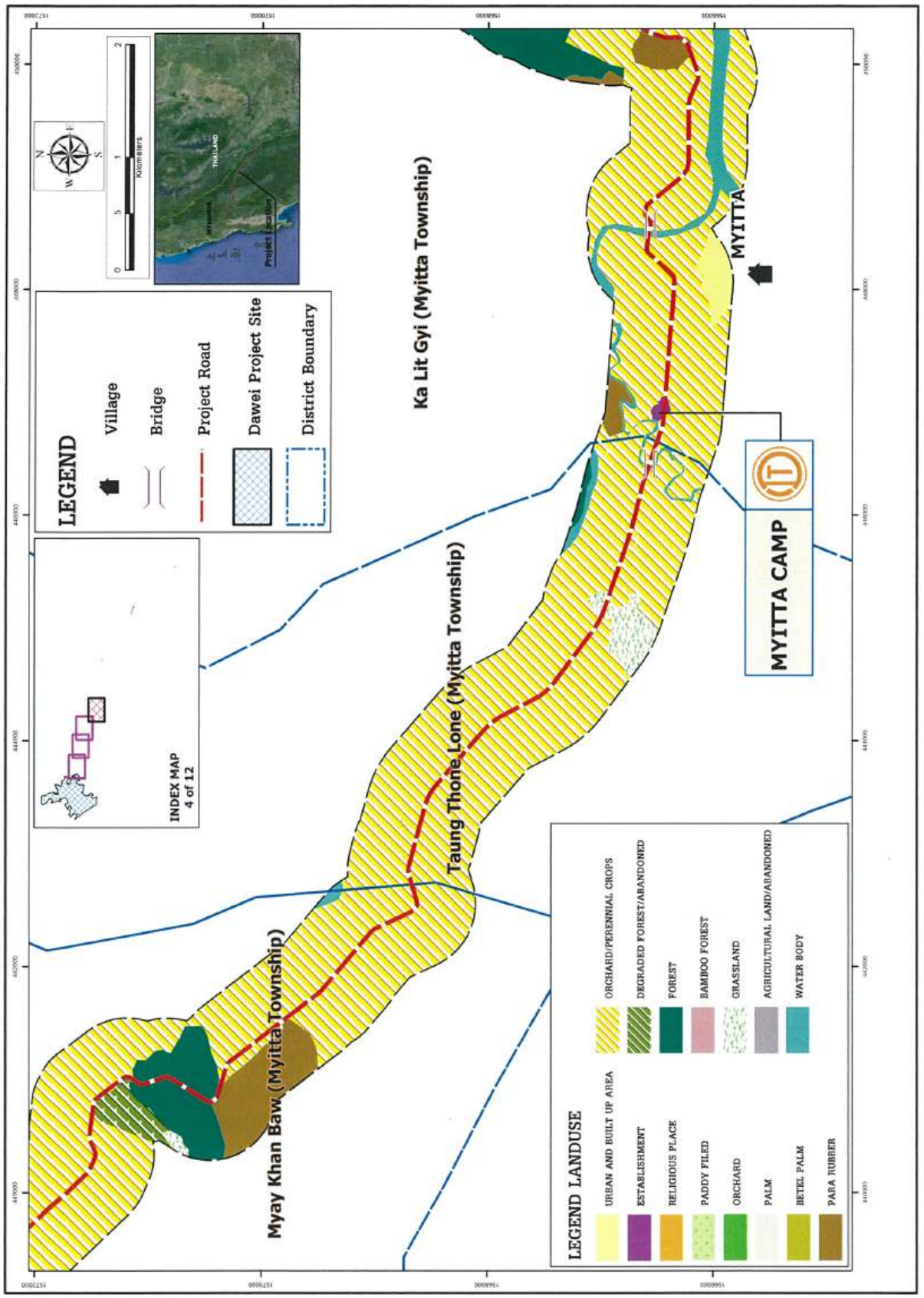


FIGURE 5.4-1 : EXISTING LAND USES WITHIN PROJECT STUDY AREA (CONT'D)

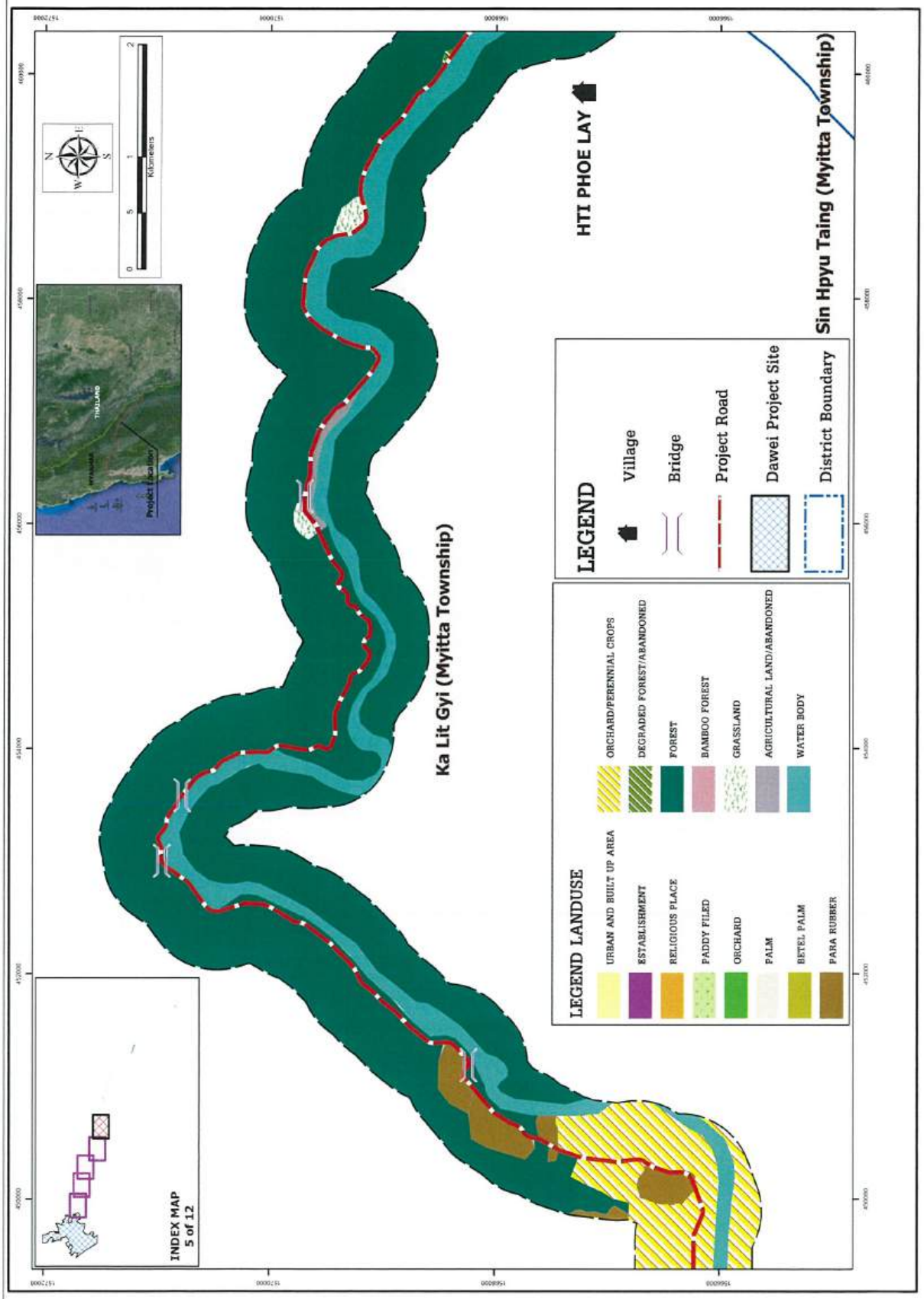


FIGURE 5.4-1 : EXISTING LAND USES WITHIN PROJECT STUDY AREA (CONT'D)

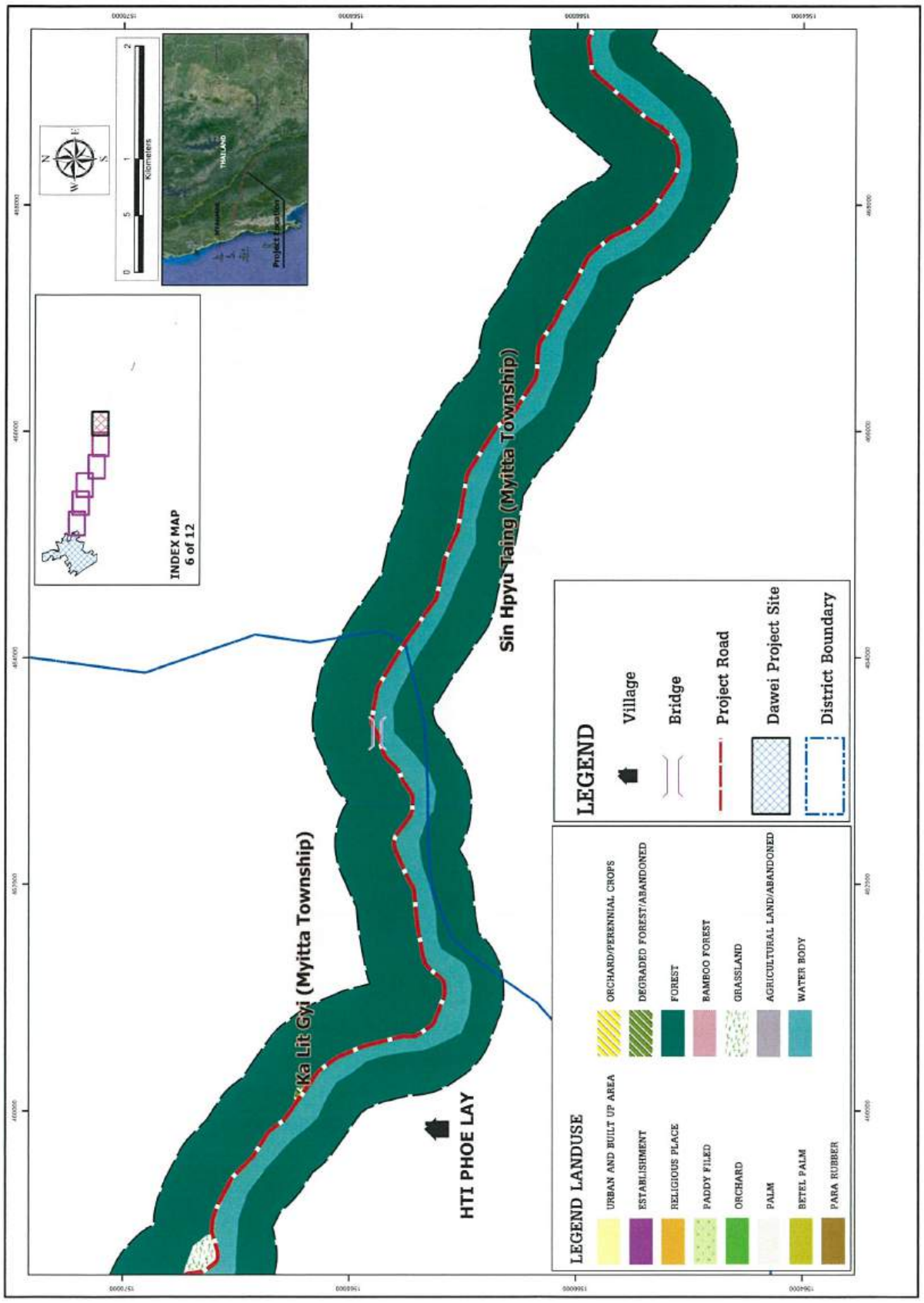


FIGURE 5.4-1 : EXISTING LAND USES WITHIN PROJECT STUDY AREA (CONT'D)

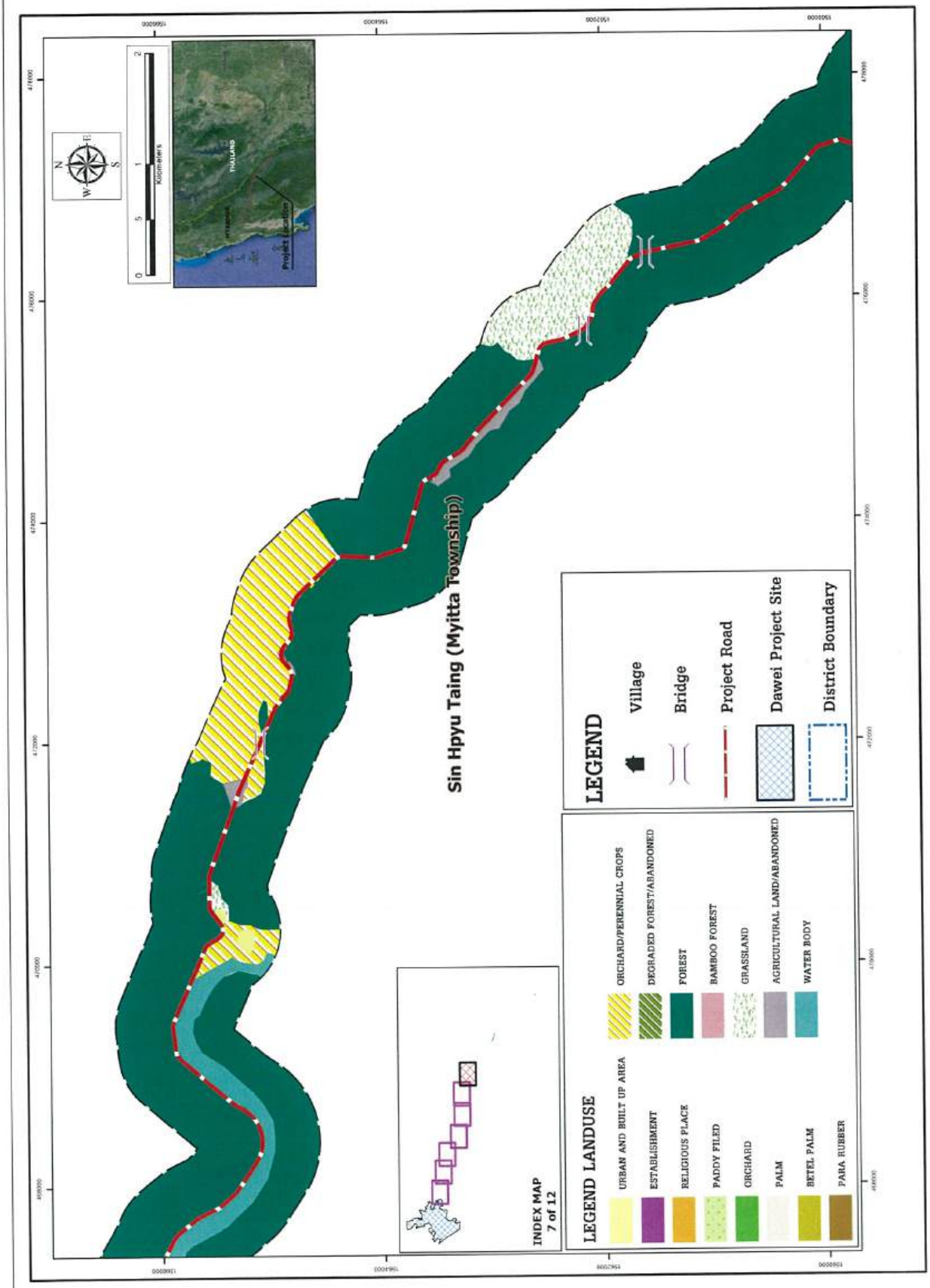


FIGURE 5.4-1 : EXISTING LAND USES WITHIN PROJECT STUDY AREA (CONT'D)

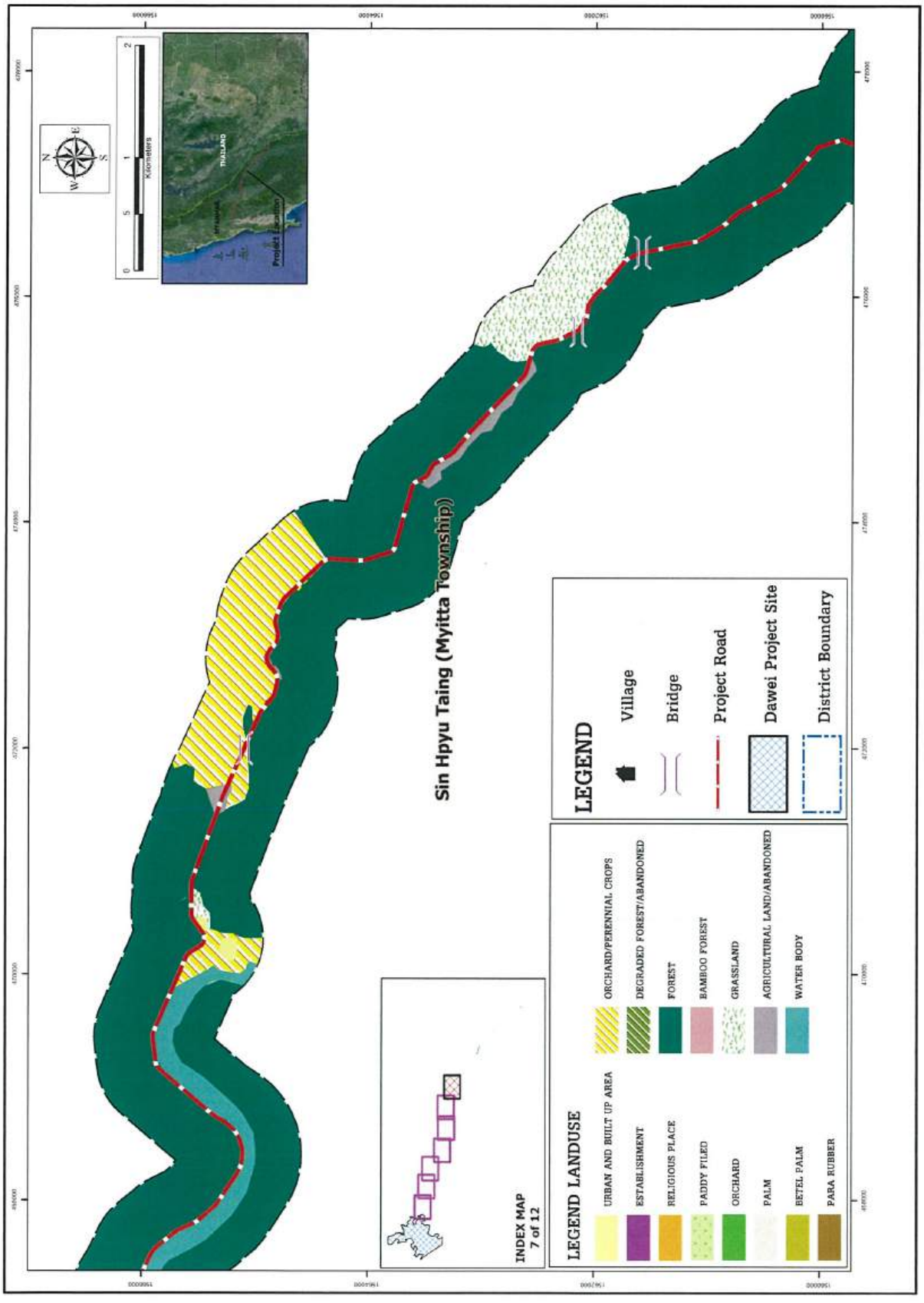


FIGURE 5.4-1 : EXISTING LAND USES WITHIN PROJECT STUDY AREA (CONT'D)

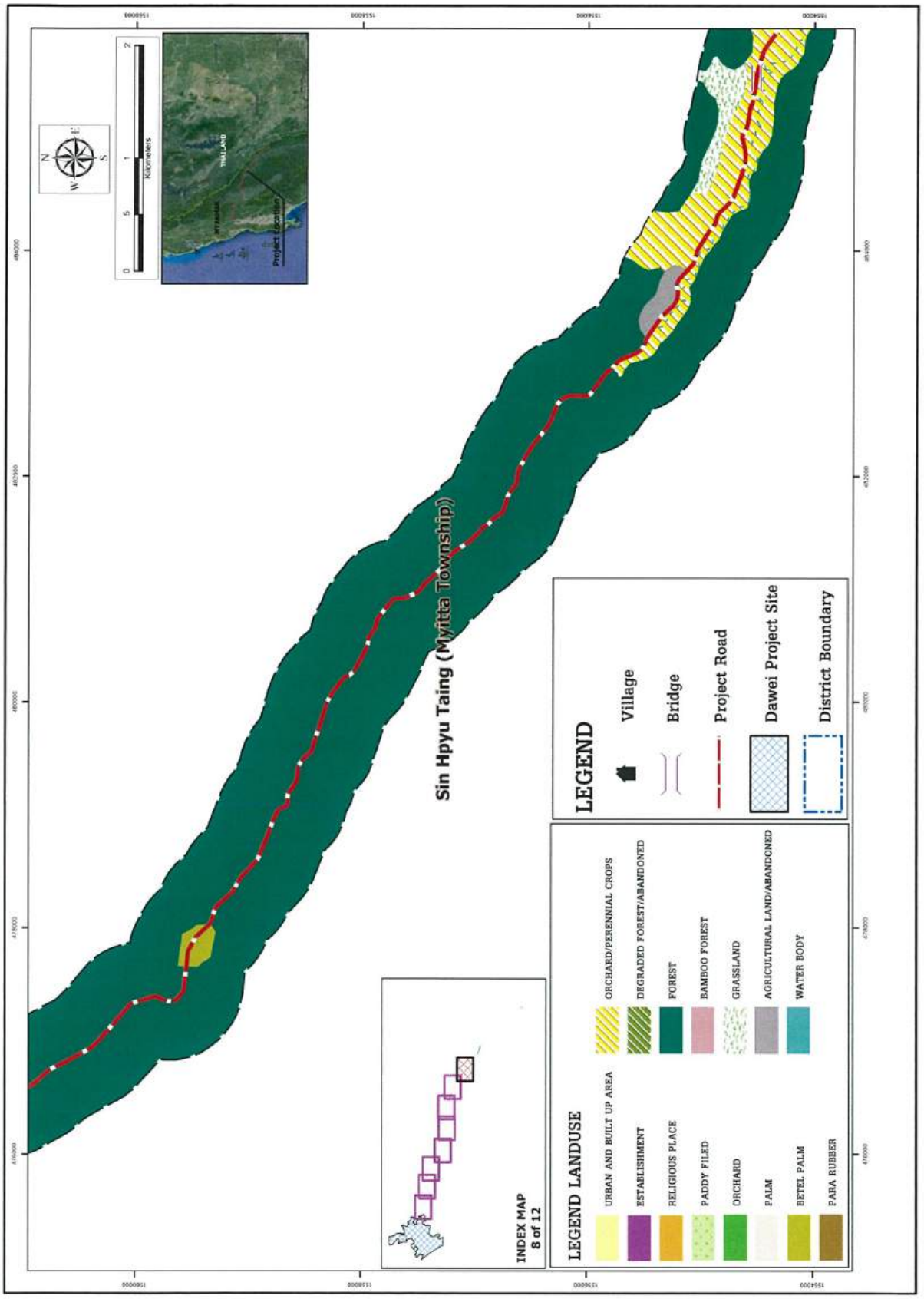


FIGURE 5.4-1 : EXISTING LAND USES WITHIN PROJECT STUDY AREA (CONT'D)

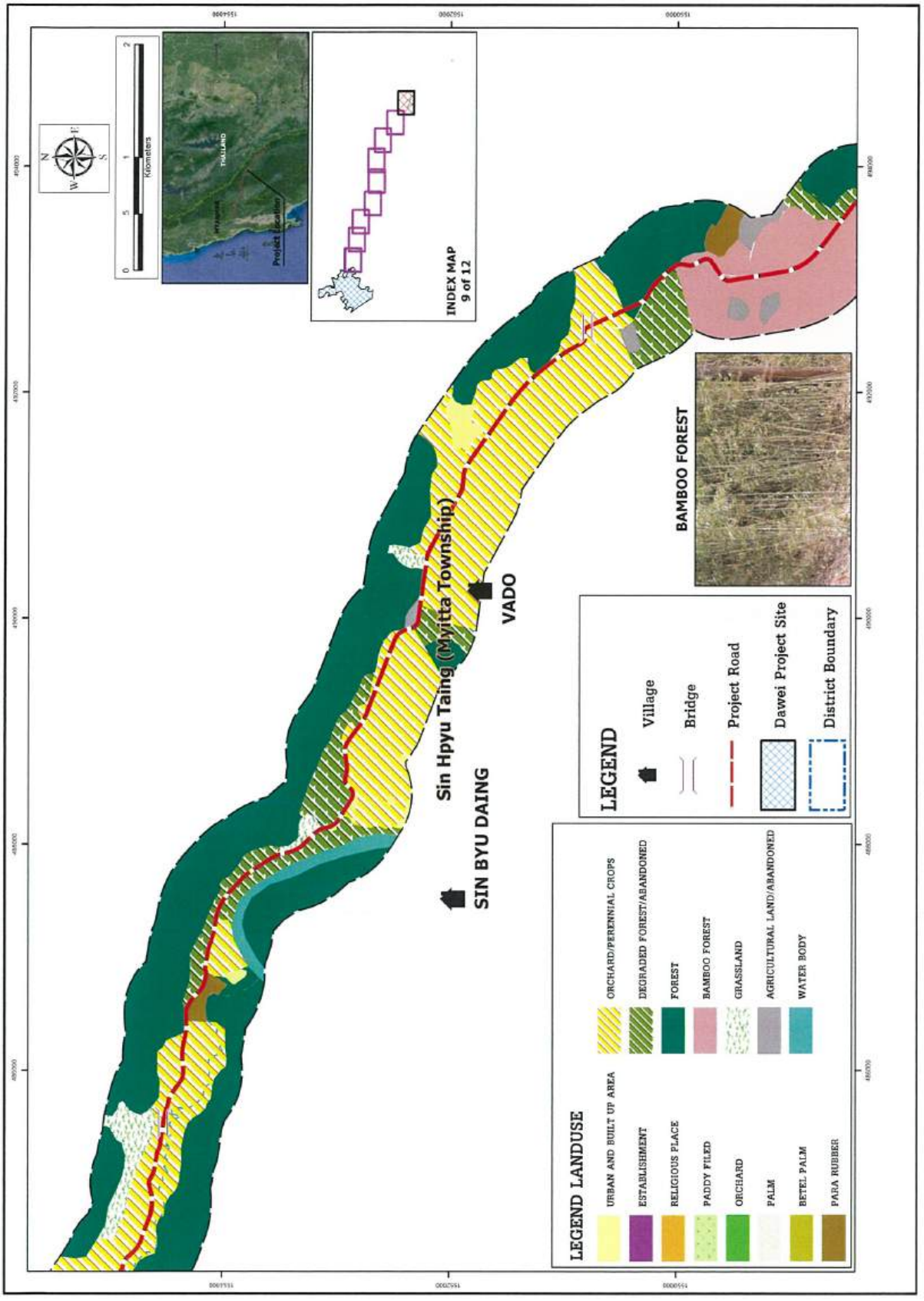


FIGURE 5.4-1 : EXISTING LAND USES WITHIN PROJECT STUDY AREA (CONT'D)

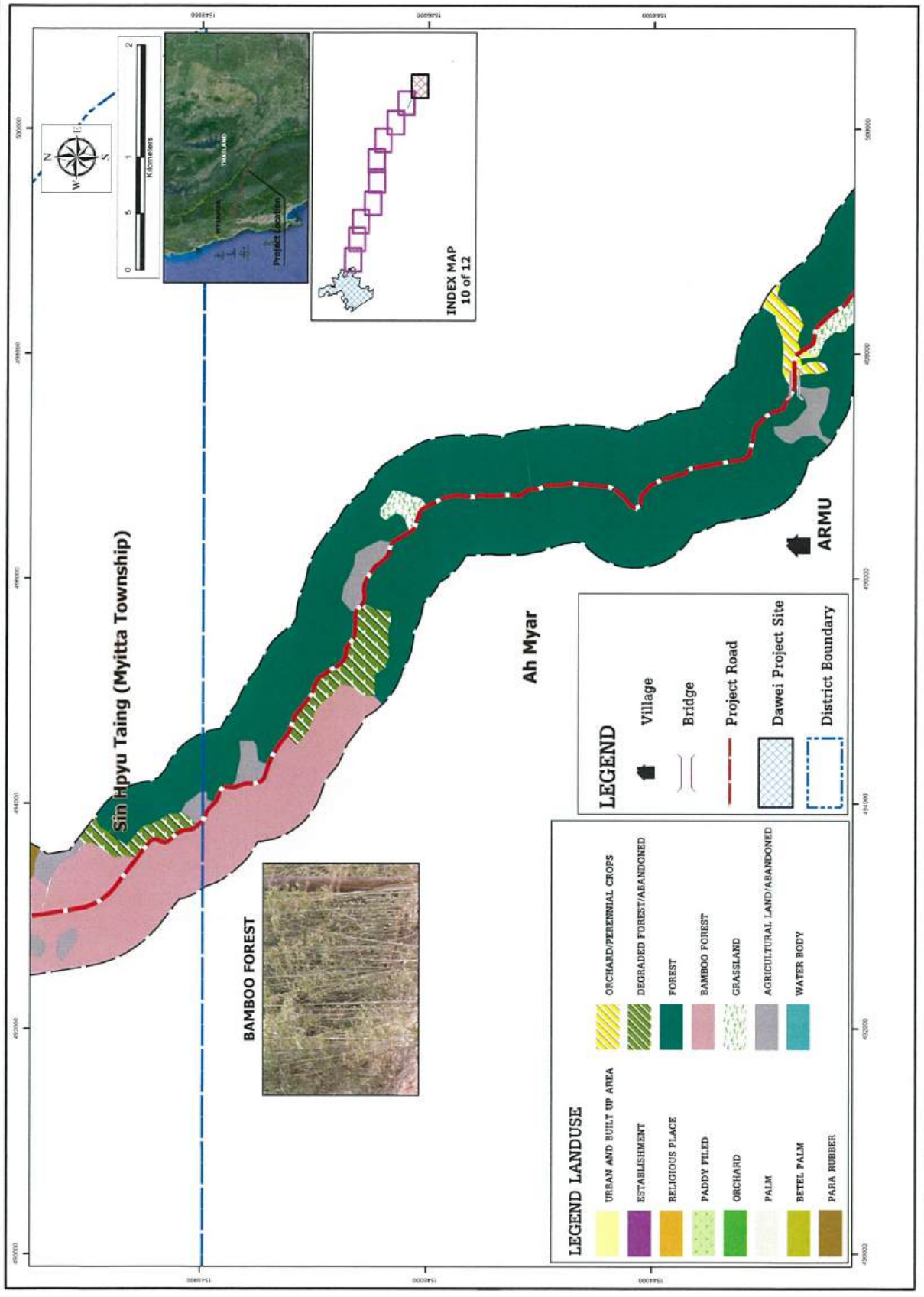


FIGURE 5.4-1 : EXISTING LAND USES WITHIN PROJECT STUDY AREA (CONT'D)

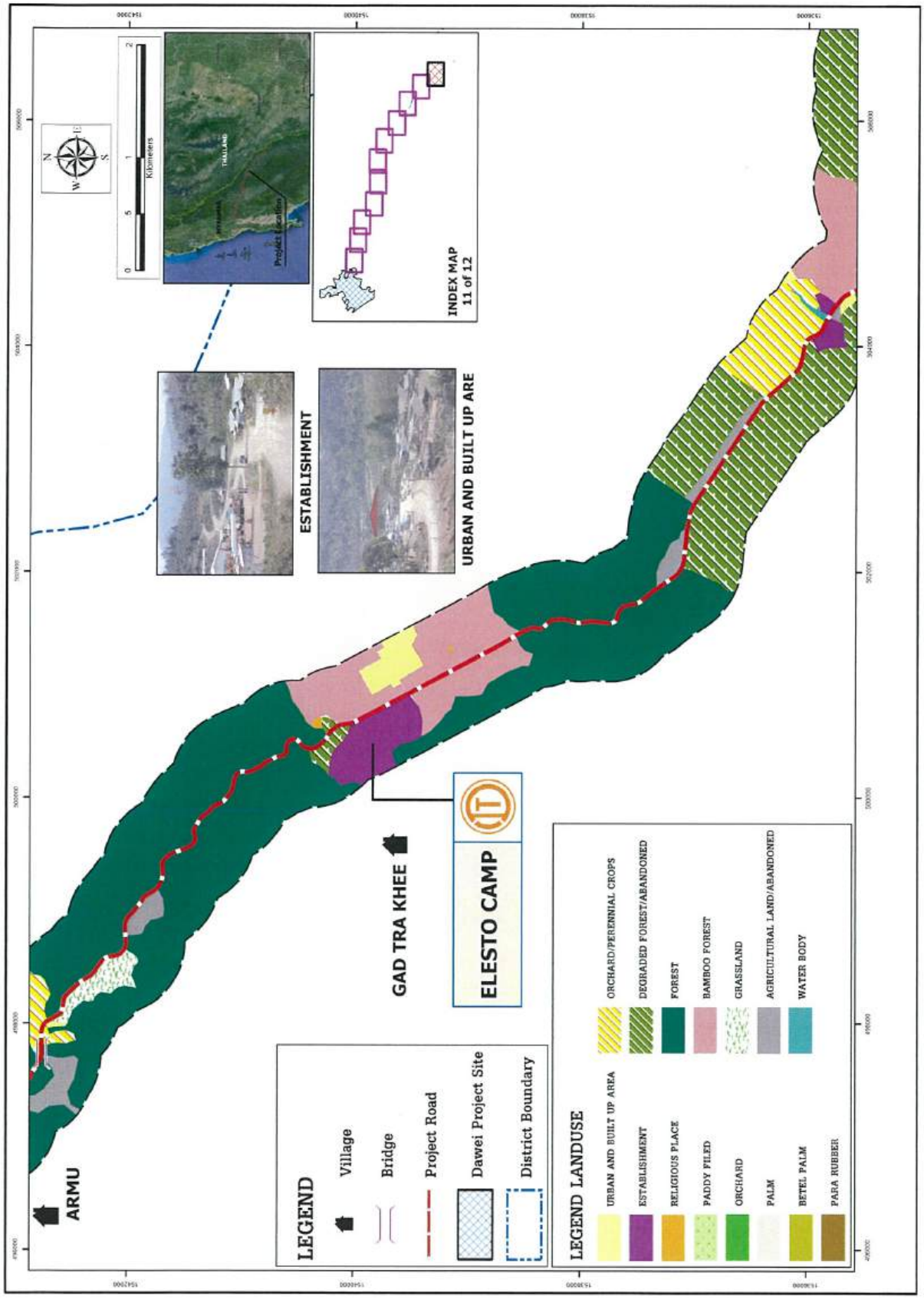


FIGURE 5.4-1 : EXISTING LAND USES WITHIN PROJECT STUDY AREA (CONT'D)

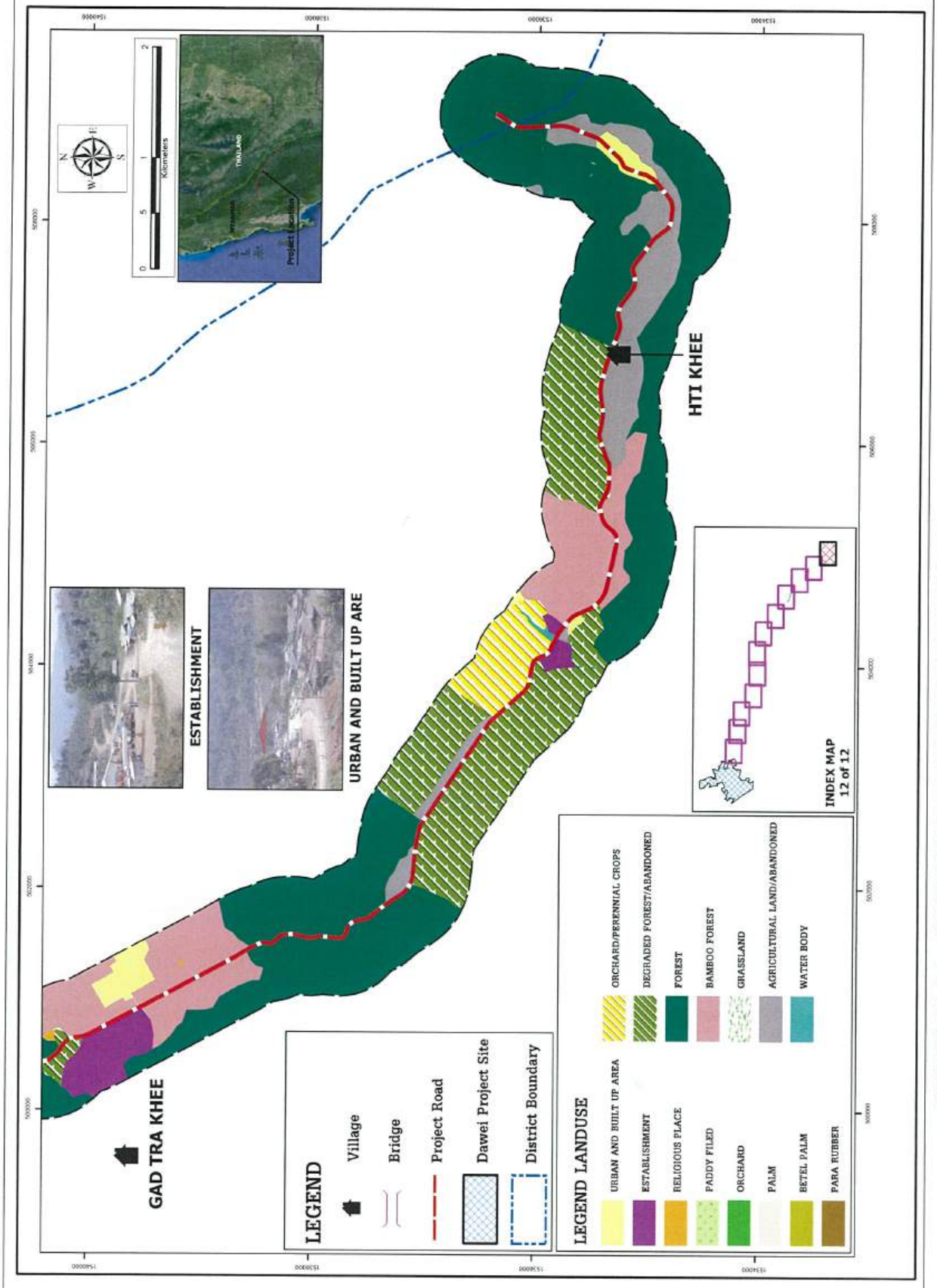


FIGURE 5.4-1 : EXISTING LAND USES WITHIN PROJECT STUDY AREA (CONT'D)

- **Agricultural and abandoned area** : covers 1,043.12 acres (accounted for 3.07% of total study area).

- **Water bodies area** : covers 177.23 acres (accounted for 0.52% of total study area).

- **Road area** : covers 105.02 acres (accounted for 0.31% of total study area).

(1) Project road RoW (20 m strips on both sides of project alignment) : The study area covers 1,532.07 acres of which land use type can be classified as follows;

- **Establishment or Enterprise area**: covers 8.01 acres (accounted for 0.52% of total study are). The study reveals that there is a public company (establishment/ enterprise) which belongs to Italian-Thai Development Public Company Limited.

- **Urban and residential area** : covers 6.32 acres (accounted for 0.41% of total study area). The study reveals that there is a traditional residential area; mostly there are agricultural areas situated around the residential area. Also, within the community, there are several types of perennial and fruit trees.

- **Paddy field area** : covers 6.32 acres (accounted for 0.41 % of total study area). The study reveals that there is mostly agricultural area in the project vicinity. This area is appropriate, especially, for cultivating rice.

- **Oil Palm plantation area** : covers 6.52 acres (accounted for 0.43% of total study area). The study reveals that oil palm is the main economic fast grown perennial tree, which is a significant source of natural oil with high productive yield. Nevertheless, its production cost is relatively high. At first stage of palm oil plantation, it will take a long period of time to be harvested. In order to obtain well grown oil palm with high productive yield gained, it is suggested that palm oil should not be planted in the area that is higher than 300 m. above mean sea level (MSL).

- **Betel palm garden area** : covers 42.11 acres (accounted for 2.75% of total study area).

- **Para rubber plantation area** : covers 84.36 acres (accounted for 5.51% of total study area). The study reveals that para rubber tree should not be planted at the area that is higher than 200 m. above mean sea level (MSL). The angle of slope should not be more than 45 degree, technically, it is suggested that if the angle of slope is more than 15 degree, para rubber terrace plantation should be applied.

- **Orchards and perennial crops plantation area** : covers 352.11 acres (accounted for 22.98% of total study area). The study reveals that there are fruit and perennial trees in the project vicinity, such as cashew nut tree, etc.

- **Degraded and abandoned forest area** : covers 94.25 acres (accounted for 6.15% of total study area). The study reveals that, mostly, there are degraded and abandoned forest which were damaged and trespassed for shifting cultivation. It can be noticed that there is a trace of original forestland.

- **Forest area** : covers 711.83 acres (accounted for 46.46% of total study area). The study reveals that there are 3 types of forest found: (1) dry evergreen forest, (2) mixed deciduous forest and (3) fresh water swamp forest.

- **Bamboo forest area** : covers 85.55 acres (accounted for 5.58% of total study area).

- **Grassland area** : covers 49.58 acres (accounted for 3.24% of total study area).
- **Agricultural and abandoned area** : covers 72.40 acres (accounted for 4.73% of total study area).
- **Water bodies area** : covers 7.98 acres (accounted for 0.52% of total study area).
- **Road area** : covers 4.73 acres (accounted for 0.31% of total study area).

5.4.2 Social Profile

5.4.2.1 Studied Villages

The socio-economic study was focused on establishing baseline information on socio-economic components of communities within the study area. The information was collected from primary source at the village level, by obtaining through interviewing village headmen and key informants in the fifteen villages of the study area ; namely Dauk Lauk, Ta Laing Ya, Pa Dao Geou, Tha Loat Htar, Tha Khat Done, Ye Bouk, Tha Byu Chaung, Pyin Tha Daw, Myitta, Taung Thone Long, Sin Byu Daing, La Or,Va Do, Amu, Gad Tra Khee and Hti Hkee of Yebyu Township and Myitta Sub-township, Dawei District. The locations of sixteen villages are indicated in a map in ***Figure 5.4-2***.

Questionnaires were used to guide the interviews. At the village level, the interviewed persons were key-informants, including the village headmen and elders of the villages. At the household level, the interviews covered 456 samples out of a total of 1,810 households. The sampling number and its distribution are shown in ***Table 5.4-2***

Results of the interviews are used to describe the local socio-economic conditions presented in subsequent sections.

TABLE 5.4-2

DISTRIBUTION OF SAMPLE SITE FOR THE SOCIO-ECONOMIC SURVEY

Township	Village	No. of Household	Sample size (household)		
			Direct	Indirect	Total
Yebyu and Myitta Sub-Township	Dauk Lauk	27	4	1	5
	Ta Laing Ya	45	4	9	13
	Pa Dao Geou	49	8	14	22
	Tha Loat Htar	188	43	6	49
	Tha Khat Done	33	3	2	5
	Ye Bouk	27	15	11	26
	Tha Byu Chaung	70	3	4	7
	Pyin Tha Daw	74	10	1	11
	Myitta,	350	7	67	74
	Taung Thone Long	566	55	20	75
	Sin Byu Daing	70	15	31	46
	Va Do	53	14	11	25
	Amu	150	5	3	8
	Gad Tra Khee	66	8	17	25
	Hti Hkee	32	51	14	65
	16 Villages	**1,810**	**245**	**211**	**456**

Source : Key Informant Interview by TEAM Consulting Engineering and Management Co., Ltd, February 2015

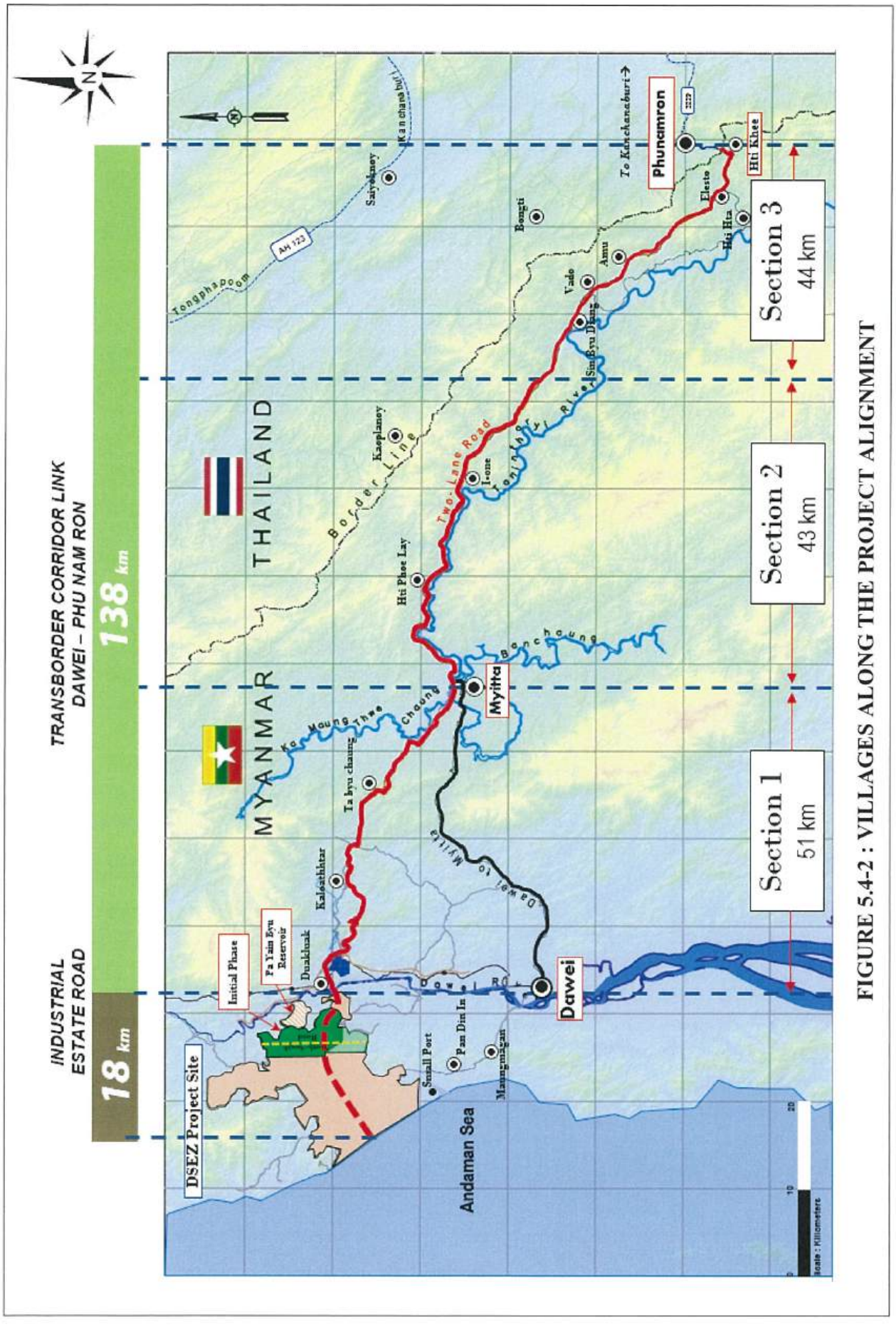


FIGURE 5.4-2 : VILLAGES ALONG THE PROJECT ALIGNMENT

Environmental and Social Staff

Key Informant Interview at Gad Tra Khee Village

Household Interview at Myitta Village

Household Interview at Taung Thone Long Village

Key Informant Interview at Tha Loat Htar Village

Key Informant at Dauk Lauk Village

Household Interview at Dauk Lauk Village

Household Interview at Hti Hkee Village

PHOTO 5.4-1 : SOCIO-ECONOMIC SURVEY DURING 6-18 FEBRUARY 2015

5.4.2.2 Demography

The population and number of households in the fifteen studied villages are presented in ***Table 5.4-3***. The total population is 8,183 living in 1,810 households. This gives an average household size of about 4-5 persons. The population in the study area is accounted for only about 6.67% of the total population of the Yebyu Township.

At the village level, Myitta is the largest village in term of population. It has a population of 1,800. The smallest village are Dauk Lauk and Ye Bouk, with 27 households each. Their population are 136 and 125 respectively.

TABLE 5.4-3

HOUSEHOLDS AND POPULATION IN FIFTEEN VILLAGES OF THE STUDY AREA

Township	Village	No. of Household	Population		
			Male	Female	Total
Yebyu and Myitta Sub-Township	Dauk Lauk	27	57	79	136
	Ta Laing Ya	45	111	104	215
	Pa Dao Geou	49	115	133	248
	Tha Loat Htar	188	511	478	989
	Tha Khat Done	33	100	67	167
	Ye Bouk	27	50	75	125
	Tha Byu Chaung	70	184	224	408
	Pyin Tha Daw	74	252	252	504
	Myitta	350	887	913	1,800
	Taung Thone Long	566	833	863	1,696
	Sin Byu Daing	70	207	163	370
	Va Do	53	135	115	250
	Amu	150	394	406	800
	Gad Tra Khee	66	163	167	330
	Hti Hkee	32	76	69	145
	15 Villages	**1,810**	**4,075**	**4,108**	**8,183**

Sources: Key Informant Interview by TEAM Consulting Engineering and Management Co., Ltd, February 2015

5.4.2.3 Education

The majority of villagers in these fifteen villages completed only primary education. Only few people had secondary and higher education. Some elders received only informal rudimentary education from monks in temples. ***Table 5.4-4*** gives information on education of the villagers in each village.

5.4.2.4 Vulnerable Groups

Vulnerable groups in these fifteen villages are small in number. Their number is estimated at about 12 % of the total village population respectively. These include disable persons, household heads who are over sixty year old, head of household who are women, one person living alone and homeless people. The majority of them are household heads who are over sixty year old. According to the key informants, there is no special program to support these people in this area. By social structure, they are taken care of by their families, relatives and neighbors. This social safety network enables them to stay in the communities without difficulties. ***Table 5.4-5*** gives information on identified vunerable groups in each village.

TABLE 5.4-4

EDUCATION IN THE PROJECT STUDY AREA

Name of Village	Population			Student	
	Total Population	Age 0-18 years	Age > 18 years	Number of Student	% of pop.age 0-18 yrs.
1. Dauk Lauk	136	59	77	55	93.22
2. Ta Laing Ya	215	88	127	45	51.14
3. Pa Dao Geou	248	84	164	52	61.90
4. Tha Loat Htar	989	366	623	153	41.80
5. Tha Khat Done	167	63	104	25	39.68
6. Ye Bouk	125	62	63	18	29.03
7. Tha Byu Chaung	408	157	251	100	63.69
8. Pyin Tha Daw	504	194	310	100	51.55
9. Myitta	1,800	720	1080	636	88.33
10. Taung Thone Long	1,696	607	1089	488	80.40
11. Sin Byu Daing	370	148	222	42	28.38
12. Va Do	250	90	160	44	48.89
13. Amu	800	320	480	120	37.50
14. Gad Tra Khee	330	132	198	35	26.52
15. Hti Hkee	145	58	87	20	34.48
Total	**8,183**	**3148**	**355**	**1,834**	**61.40**

Source : Key Informant Interview by TEAM Consulting Engineering and Management Co., Ltd, February 2015

TABLE 5.4-5

IDENTIFIED VULNERABLE GROUP IN THE PROJECT STUDY AREA

Name of Village	Population	Vulnerable Group (person)			
		Disabled	Head of hh. >60 years	Head of hh. are women	One person in hh.
1.Dauk Lauk	136	0	6	4	0
2.Ta Laing Ya	215	1	7	5	0
3. Pa Dao Geou	248	0	8	5	0
4.Tha Loat Htar	989	5	103	13	0
5.Tha Khat Done	167	3	2	0	2
6.Ye Bouk	125	1	2	0	1
7.Tha Byu Chaung	408	2	15	0	0
8.Pyin Tha Daw	504	1	15	0	0
9.Myitta	1,800	1	250	30	5
10.Taung Thone Long	1,696	10	300	82	10
11. Sin Byu Daing	370	4	10	10	12
12. Va Do	250	2	10	2	3
13. Amu	800	1	6	5	7
14. Gad Tra Khee	330	3	7	0	4
15. Hti Hkee	145	1	3	2	0
Total	**8,183**	**35**	**744**	**158**	**44**

Source : Key Informant Interview by TEAM Consulting Engineering and Management Co., Ltd, February 2015

5.4.2.5 Gender Situation

As shown in ***Table 5.4-6***, female population in the fifteen villages is slightly higher than male with the female to male population ratio of 1.008 to 1.

In general, men and women are equal in Myanmar, thus there are no gender issues as in some countries. Roles, work division and decision making between men and women are usually determined by physical conditions, social structure and norm. Decision making on some aspects are on a joint or sharing basis by both male and female. Although some decisions are made by one side, the decisions made are respected by the other. For example, men and women make decisions together on house purchasing and communities/ religious activities.

In the study area, men play a major role on farming, communication with the others and political interest while women dominate in cooking and children's education. However women also play role on some farming activities such as weeding, harvesting and selling products. ***Table 5.4-6*** gives information on gender issues in each village.

TABLE 5.4-6

GENDER ISSUES IN THE PROJECT STUDY AREA

Name of Village	Childrens education	Cooking	Political	Communicate /Negotiation	Aactivity in community	Activity in religion	Purchase property
1. Dauk Lauk	M&Fm	Female	M&Fm	M&Fm	M&Fm	M&Fm	M&Fm
2. Ta Laing Ya	Male	Female	M&Fm	M&Fm	M&Fm	M&Fm	M&Fm
3. Pa Dao Geou	Male	Female	M&Fm	M&Fm	M&Fm	M&Fm	M&Fm
4. Tha Loat Htar	Female	Female	Male	Male	M&Fm	M&Fm	M&Fm
5. Tha Khat Done	Female	Female	Male	Male	M&Fm	M&Fm	M&Fm
6. Ye Bouk	Female	Female	Male	Male	Male	M&Fm	M&Fm
7. Tha Byu Chaung	Female	Female	Male	Male	M&Fm	M&Fm	M&Fm
8. Pyin Tha Daw	Female	Female	Male	Male	Female	M&Fm	M&Fm
9. Myitta	M&Fm	M&Fm	M&Fm	M&Fm	M&Fm	M&Fm	M&Fm
10. Taung Thone Long	M&Fm	M&Fm	M&Fm	M&Fm	M&Fm	M&Fm	M&Fm
11. Sin Byu Daing	M&Fm	Female	Male	Male	Male	Male	M&Fm
12. Va Do	Female	Female	Male	M&Fm	M&Fm	M&Fm	M&Fm
13. Amu	Male	Female	Male	Male	M&Fm	M&Fm	M&Fm
14. Gad Tra Khee	Male	Female	Male	Male	M&Fm	M&Fm	M&Fm
15. Hti Hkee	Male	Female	Male	Male	M&Fm	M&Fm	M&Fm

Source: Key Infonnant Interview by TEAM Consulting Engineering and Management Co., Ltd, February 2015

5.4.2.6 Religion

There are 3 ethnic groups in the study area. Burmese and Mon are Buddhist and Karen are Christian. (see ***Table 5.4-7***)

TABLE 5.4-7

ETHNIC GROUPS

Name of Village	Ethnicity	Religion
1. Dauk Lauk	Burmese	
2. Ta Laing Ya	Burmese	Buddhism
3. Pa Dao Geou	Burmese	Buddhism
4. Tha Loat Htar	Burmese	Buddhism
5. Tha Khat Done	Burmese, Karen	Buddhism,Christian
6. Ye Bouk	Karen,Burmese	Christian
7. Tha Byu Chaung	Karen	Christian
8. Pyin Tha Daw	Karen	Christian
9. Myitta	Karen,Burmese,Mon	Christian, Buddhism
10. Taung Thone Long	Burmese,Karen,Mon	Buddhism,Christian
11. Sin Byu Daing	Burmese,Karen,Mon	Buddhism,Christian
12. Va Do	Karen,Burmese,Mon	Christian, Buddhism
13. Amu	Karen,Burmese	Christian, Buddhism
14. Gad Tra Khee	Karen,Burmese	Christian, Buddhism
15. Hti Hkee	Burmese,Karen,Mon	Buddhism,Christian

Source: Key Informant Interview by TEAM Consulting Engineering and Management Co., Ltd, February 2015

5.4.2.7 Political and Social Organizations

Villages in Myanmar have a number of social groups set up for the purposes of community development and improvement of income and quality of life. Outside civil groups or NGOs also encourage villagers to learn to collaborate and participate. Key social groups in villages are: mother and child group, women group, youth group, funeral group, social-welfare group, saving groups, religious group, health fund, environmental, water quality and health group; malaria prevention group, and TB prevention group. However, the villages in the project area have no formal social groups and community based organizations. Villagers meet to form a group when required for particular activities. For example, they meet to respond to local needs related to religious and funeral activities. Each informal and ad-hoc group consists of members who have the same interest and are normally led by the village elders. These groups are usually active, occasionally

5.4.3 Economic Profile

5.4.3.1 Occupations

Economy of these fifteen communities are land based, relying on growing perennial crops, mainly cashew nut, betel nut and rubber.

Besides major occupations of farming, some villagers are engaged in other occupations, mainly as waged labours outside their villages. Some of them are working in Dawei city and, for the majority, in Thailand.

Small businesses exist in every village. Most common in the communities are small shops selling foods, drink and household supplies.

Table 5.4-8 gives information on holders Occupation in each village.

TABLE 5.4-8

HOUSEHOLD OCCUPATION IN THE PROJECT STUDY AREA

Name of Village	Occupation 1/							
	Agriculture		Trade 2/		Government official		Wage labor	
	No. of hh	% of hh	No. of hh	% of hh	No. of hh	% of hh	No. of hh	% of hh
1.Dauk Lauk	27	100.00	4	14.81	1	3.70	0	0.00
2.Ta Laing Ya	45	100.00	1	2.22	1	2.22	2	4.44
3. Pa Dao Geou	49	100.00	6	12.24	0	0.00	4	8.16
4.Tha Loat Htar	188	100.00	20	10.64	0	0.00	90	47.87
5.Tha Khat Done	33	100.00	6	18.18	0	0.00	20	60.61
6.Ye Bouk	27	100.00	1	3.70	0	0.00	20	74.07
7.Tha Byu Chaung	70	100.00	5	7.14	2	2.86	10	14.29
8.Pyin Tha Daw	74	100.00	5	6.76	1	1.35	10	13.51
9.Myitta	280	80.00	70	20.00	10	2.86	100	28.57
10.Taung Thone Long	300	53.00	100	17.67	10	1.77	200	35.34
11. Sin Byu Daing	10	14.29	10	14.29	0	0.00	60	85.71
12. Va Do	53	100.00	1	1.89	0	0.00	0	0.00
13. Amu	160	100.00	4	2.67	0	0.00	10	6.67
14. Gad Tra Khee	66	100.00	3	4.55	0	0.00	20	30.30
15. Hti Hkee	7	21.88	25	78.13	0	0.00	7	21.88
Total	**1,379**	**76.61**	**261**	**14.50**	**25**	**1.39**	**553**	**30.72**

Remarks : 1/ Some household have more than on occupation
2/ Grocery shop, Purchase of agricultural products etc.

Source : Key Informant Interview by TEAM Consulting Engineering and Management Co., Ltd, February 2015

In line with the occupations, most villagers are self-employed in their farms or small businesses (see ***Table 5.4-8***). Most of casual workers in the villages are unskilled labors and skilled labors are few. Daily wages paid to casual workers are not significantly difference between male and female adults, and between boys and girls (see ***Table 5.4-9***). Boys and girls get less wages than adults which could be considered normal.

TABLE 5.4-9

EMPLOYMENT IN THE PROJECT STUDY AREA

Gender	Wage/day	
	Skilled labor (USD)	Unskilled labor(USD)
Boy	3.38-3.49	1.74
Girl	3.38-3.49	1.74
Male	5.23-8.72	5.23
Female	5.23-6.10	3.48

Remark: Rate of exchange 1,147 kyat = 1 USD

Source: Key Informant Interview by TEAM Consulting Engineering and Management Co., Ltd, February 2015

5.4.3.2 Household Income and Cost of Livings

Based on the occupations mentioned above, major sources of income of villagers is farming while the other sources are wages and small businesses. The annual household incomes in these fifteen villages an average of 5,283 USD equivalent per year or 176 USD equivalent per month. Average household expenses are slightly lower than the earnings. The annual household expense an average of about 4,853 USD equivalent. Nearly all of the earnings was spent, mostly on foods, followed by education, communication, health and house repair (see ***Table 5.4-10***).

TABLE 5.4-10

MAJOR HOUSEHOLD EXPENDITURE

Expenditure	% of Expenditure
Food	51.24
Culthure/religion	3.71
Religion/donation	4.67
Education	11.30
Medical Fee	6.52
Cooking Fuel	2.14
Social activities	1.67
Transportation Cost e.g. Fuel	0.49
House repair	6.17
Communication e.g. Mobile Phone	9.00
Tax	2.14
Other	0.96

Source: Household Interview by TEAM Consulting Engineering and Management Co., Ltd, February 2015

Therefore, most households in the villages would have no saving and households with debt would be common. The data in ***Table 5.4-11*** shows that 64.49% of households were in debt and 4.90 % had some saving.

TABLE 5.4-11

AVERAGE ANNUAL HOUSEHOLD INCOME AND EXPENDITURE, USD EQUIVALENT

Items	USD/hh/year
Average household income	**5,283**
Farm income	2,114
Off farm income	3,169
Average household expenditure	**4,853**
Farm expenditure	678
Household expenditure	4,175
Sufficient (% of household)	42.45
Insufficient (% of household)	57.55
Debt (% of household)	64.49
Saving (% of household	4.90

Remark : Rate of exchange 1,147 kyat = 1 USD

Source : Household Interview by TEAM Consulting Engineering and Management Co., Ltd, February 2015

5.4.3.3 Unemployment

Unemployment in the fifteen villages was very low as family members of working age worked in farming, general wage labors, trading and working in Thailand.

5.4.3.4 Land Ownership

Land in the fifteen villages is used for farming and housing. Farm land accounts for three quarters of the total land area while residential area accounts for the remaining quarter. The average land holding per household is around 7 to 14 acres which are higher than the national average figure of 2.7 acres per household. Land ownership documents are Land Holding Document or Tax Receipt for agricultural land. ***Table 5.4-12*** gives information on village area and land holding in each village.

TABLE 5.4-12

VILLAGE AREA AND LAND HOLDING

Name of Village	Farm area (acre)	Residential area (acre)	Total Area (acre)	Area/ household (acre)
1. Dauk Lauk	190	80	270	10.00
2. Ta Laing Ya	370	80	450	10.00
3. Pa Dao Geou	440	50	490	10.00
4. Tha Loat Htar	1,127	163	1290	6.86
5. Tha Khat Done	330	100	430	13.03
6. Ye Bouk	250	20	270	10.00
7. Tha Byu Chaung	700	20	720	10.29
8. Pyin Tha Daw	740	20	760	10.27
9. Myitta	3,050	50	3100	8.86
10. Taung Thone Long	3,800	50	3850	6.80
11. Sin Byu Daing	800	200	1000	14.29
12. Va Do	500	100	600	11.32
13. Amu	1,700	300	2000	13.33
14. Gad Tra Khee	700	150	850	12.88
15. Hti Hkee	172	20	192	6.00

Source: Key Informant Interview by TEAM Consulting Engineering and Management Co., Ltd, February 2015

5.4.3.5 Local Businesses

Local businesses are small grocery shops in the villages. Clients are people in the villages. Some household of fifteen villagers purchase of agricultural product from the villagers and collect for sale to merchants in Dwei.

5.4.3.6 Agriculture

Main agricultural activities within the fifteen villages are betel palm, cashew nut and rubber tree. Average land size per household about 2-5 acre (see ***Table 5.4-13***). Banana yield fruits all year round while the rests are seasonal. These agricultural activities are for commercial purpose for household income generation.

TABLE 5.4-13

AGRICULTURE ACTIVITY

Type of Plants	Seeding-Harvest Period	Land Size (acre/hh)
Betel Palm	Oct.-Feb.	5
Rubber Tree	Aug-April	2
Cashew Nut	Jan-Jul.	3

Source: Key Informant Interview by TEAM Consulting Engineering and Management Co., Ltd, February 2015

Apart from growing crops and fruit trees, all households in the fifteen villages also engage in livestock raising such as pig, poultry and cattle. Every household raises chicken from 5 to 50 heads mainly for household consumption. Some households raise pigs from 1 to 5 heads for sale. Cattle are raised for various purposes including use in farm activities, sale and household consumption. Some pictures of agricultural land are showns in ***Photo 5.4-2***.

Cashew Nut

Betel Palm

Rubber Tree

PHOTO 5.4-2: MAIN AGRICULTURAL ACTIVITIES

5.4.4 Health Profile

According to information derived from the interviews of village headmen and key informants, there are no serious health problems in the fifteen villages in the study area. The mortality and morbidity rates are low. Common cold is identified as the most common illness, followed by hypertension and malaria.

As there is no serious illness, most of ill-persons go for treatment at health care center within village or nearest health care center and private clinic. Some villager bought medicine for their own treatment while some go for the service at Mitta Hospital and Yebyu Hospital.

5.4.5 Infrastructure Facilities

5.4.5.1 Road Transportation

(1) Road Condition

Major road which cross and adjacent with project alignment is National Road No.8. This road is paved road, about 7 m wide with two traffic lanes. Most of the local roads can be used all year round. ***Figure 5.4-3*** is a map showing existing roads in the study area. Existing road conditions at several locations are shown in ***Photo 5.4-3.***

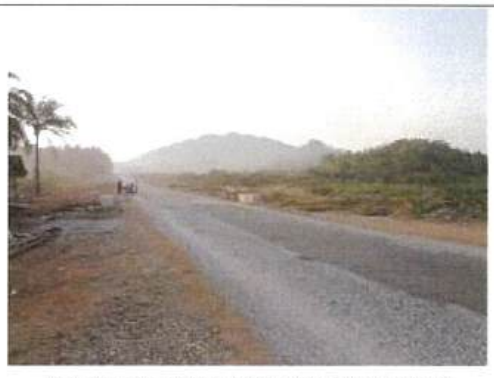
(2) Traffic Counting

To establish base line data on traffic conditions, traffic counting was carried out at 1 stations within the project study area from 6.00 am to 6.00 pm on 23 and 24 January,2015, covering one working day and one holiday. The traffic counting (TC1) station is at the junction of National Road No.8 crossing with project alignment.

The location of the traffic counting station is indicated on a map in ***Figure 5.4-3*** and ***Photo 5.4-3.***

Traffic counting was done manually by two observers. The number and types of vehicles passing the station were recorded. The traffic counting data were used to calculate the V/C ratios.

Traffic condition is normally assessed in terms of road capacity relative to traffic volume, V/C ratio is commonly used for this purpose. This ratio is considered as a baseline traffic flow condition and will be further utilized to evaluate the consequences of the Project's impact on local traffic.



Existing condition of National Road No.8

Traffic counting at the junction of National Road No.8

PHOTO 5.4-3: TRAFFIC COUNTING AND EXISTING CONDITION OF ROAD WITHIN PROJECT STUDY AREA

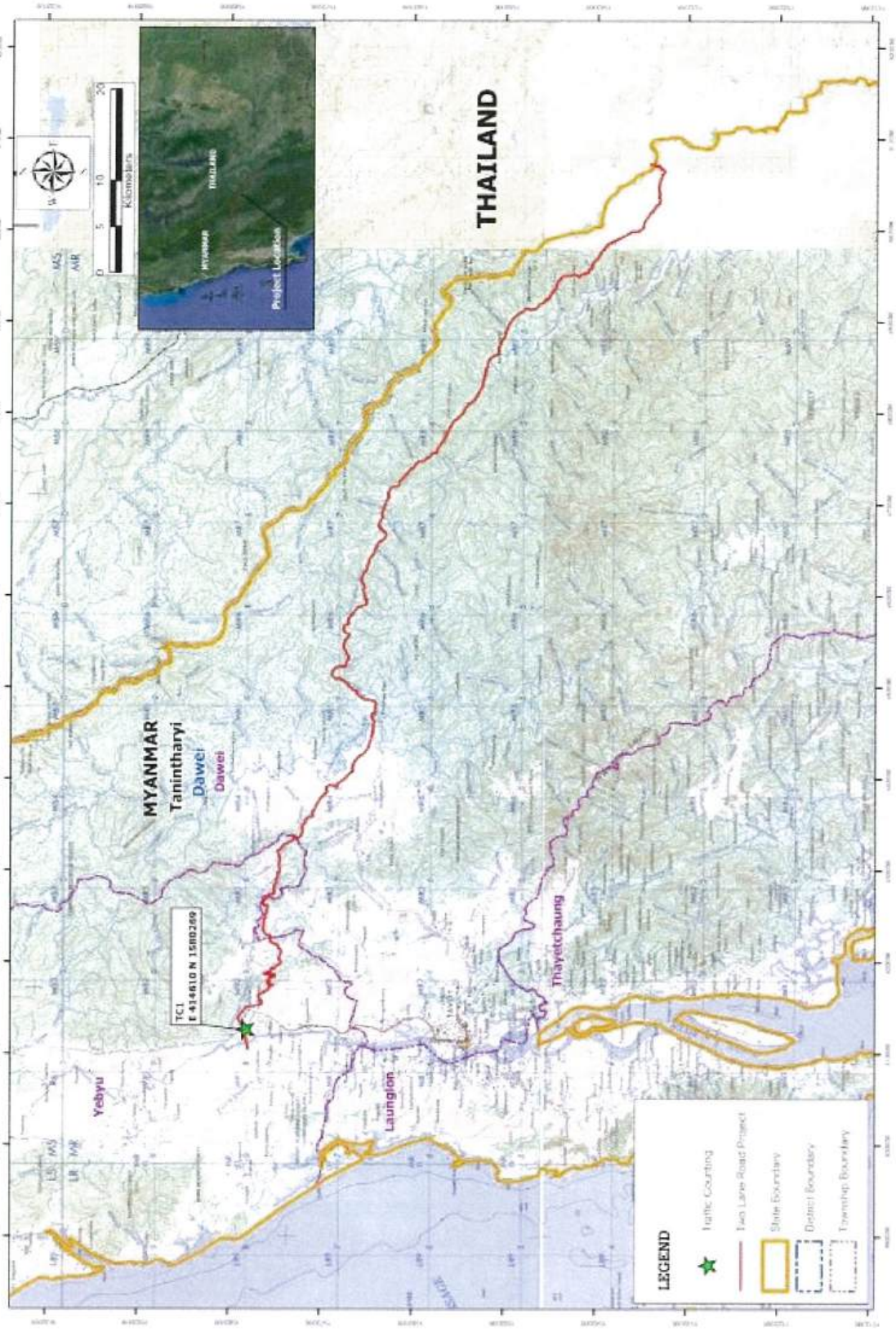


FIGURE 5.4-3 : LOCATION OF TRAFFIC COUNTING STATION

The calculation of V/C ratios follows the following steps:

1) Convert the number of vehicles from observation to Passenger Car Unit (PCU) by using Passenger Car Equivalents (PCE) factors specified for each type of vehicles as indicated in ***Table 5.4-14***. This is used as "Traffic Volume" or "V".

2) Select an applicable carrying capacity or "C" for the road (***Table 5.4-15***). The capacity can be estimated following the highway capacity manual (HCM, 2000).

3) Ratio of V/C can be calculated using the following formula

$$\text{V/C ratio} = \frac{\text{TrafficVolume}}{\text{Carrying Capacity of Respective Road}}$$

V/C ratio can be used to compare with the values defined by the Division of Traffic Engineering, Department of Highways (Thailand) as shown in ***Table 5.4-16*** for indication of present traffic condition.

TABLE 5.4-14
PASSENGER CAR EQUIVALENT FACTOR OF EACH VEHICLE

Types of Vehicles	Passenger Car Equivalents Factor (PCE)
Passenger Car and Taxi	1.00
Light bus	1.50
Medium bus	1.50
Light truck	1.00
Crane and grader	2.10
Medium truck (6 wheeled truck)	2.10
Heavy truck (10 wheeled truck)	2.50
Heavy truck including trailer	2.50
Bicycle, Tricycle	0.33
Motorcycle	0.33

Source: Paopong, 1997 and DOH of Thailand, 2011.

TABLE 5.4-15
TRAFFIC CARRYING CAPACITY AND HIGHWAY TYPES

Highway Types	Carrying Capacity of Traffic Volume (PCU/hr.)
2 way road with more than 2 traffic lanes/multi-traffic lanes	2,000 (per 1 traffic lane)
2 way road with 2 traffic lanes	2,000 (for both directions)
2 way road with 3 traffic lanes	4,000 (for both directions)

Source: Paopong, 1997

TABLE 5.4-16
RANGE OF V/C RATIO FOR TRAFFIC CONDITION CLASSIFICATION

Range of V/C Ratio	Classification of Traffic Condition
0.88 – 1.00	Severe traffic congestion
0.67 – 0.88	Heavy traffic congestion
0.52 – 0.67	Satisfactorily traffic flow
0.36 – 0.52	Good traffic flow
0.20 – 0.36	Very good traffic flow

Source: Paopong, 1997

(c) Results of Traffic Counting

The results of traffic counting are presented in four tables in ***Appendix 5G***. The data show traffic volume of 10 categories of vehicles as follows: (i) passenger car; (ii) light bus; (iii) medium bus; (iv) crane and grader; (v) light truck: (vi) six-wheeled truck; (vii) ten-wheeled truck; (viii) heavy truck including trailer; (ix) bicycle and tricycle; and (x) motorcycle.

The traffic volume observed at TC1 can be summarized as follows.

The number of vehicles passing the National Road No.8 on Friday 23th and Saturday 24th January 2015 was 1,402 and 1,163 units/day, respectively. The majority of vehicles were motorcycles. The hourly traffic volume was relatively consistent over the counting period. For working day (Friday) and holiday (Saturday) the traffic volume was highest during evening (during 8.00 am-9.00 am) about 216 units/hour for working day and 145 units/hour for holiday, respectively.

(d) Traffic Conditions

Table 5.4-17 shows the highest V/C ratios calculated for the traffic condition during the field survey. The V/C ratio of the working day at Station TC1 was 0.0476 while V/C ratio of the holiday was 0.0380. However, the ratios were much lower within the range of 0.20-0.36. These figures indicated that very good traffic flow condition at the National Road No.8.

TABLE 5.4-17

EXISTING TRAFFIC CONDITION AT THE JUNCTION OF NATIONAL ROAD NO.8

Description	TC1		
	Friday, 23th	Saturday, 24th	Average*
Total Traffic volume (PCU/day)	1,142.8	913.06	1,027.93
Traffic volume per 12 hours*(PCU/hours)	95.23	76.09	85.66
Carrying capacity (C) (PCU/hours)	2,000	2,000	2,000
V/C ratio	0.0476	0.0380	0.0428
Traffic Condition	Very good traffic flow		

Remark: * Average of 23 and 24 January 2015 Values
** Traffic volume per 12 hours according to Traffic counting during field investigation on 23 and 24 January 2015
TC1: The junction at National Road No.8 crossing with project alignment

Source: Traffic survey by TEAM Consulting Engineering and Management Co., Ltd., January 2015

5.4.5.2 Water Use and Water Supply

Thirteen villages have no piped water supply system. Ta Laing Ya and Tha Khat Done have Mountain tap water. Ground water and stream water are two supply sources which adequately provide water of good quality for domestic consumption. Ground water is accessed through bore wells or dug wells. About 5 to 80 private groundwater wells exist in fifteen villages.

5.4.5.3 School and Religious Facilities

The fifteen villages have religious facilities. There are temples in the Buddhist villages and churches in the Christian villages.

All fifteen villages have kindergarten and primary schools. Secondary schools exist only in Mitta and Taung Thone Long villages.

5.4.5.4 Electricity

Most of the villages in the project area have no electricity. Households in Taung Thone Long village and Hti Hkee village are supplied with electricity. Currently, some households in Dauk Lauk, Pa Dao Geou and Myitta villages have small generators and battery for lighting only during nighttime.

5.5 CULTURAL COMPONENTS

Based on the information from the recent EIA Report of Transborder Road Link (Dawei-Phu Nam Ron) Project, December 2014 and result of field survey along the project alignment in February 2015, there are some evidences and monasteries along the project alignment as summarized below :

Section 1 (Sta. 18+500 - Sta. 69+400)

(1) Artifacts

- Stone Tool: At Dauk Lauk village, a shoulder stone axe (late Stone Age period) with 4 cm width and 6.7 cm length, was found by chief of the village at grid point 0414000 E, 1580000 N. This location is approximately 800 m to the south of the project right-of-way (Sta. 20+500).
- Terracotta Pipe: A terracotta pipe was found at the foot of the hill at grid point 0413250 E, 15798000 N. Many other pipes were found around nearby area not deep from ground surface. This location is approximately 500 m to the south of the project right-of-way (Sta. 19+850).

(2) Religious Monuments

At Dauk Lauk village, three unnamed Stupas were observed on the top of the hill at the elevation of 40 m MSL.

- Stupa No.1: situated at grid point 0413400 E, 1580100 N. It has 5x5 m. square base, built by stones carried from nearby area. Its hemispherical vase was constructed by bricks but unfortunately that we could not tell it is exactly shape as it was seriously reined. A damaged Metal Crown, the decoration on the top of the stupa, was found at its base. This place is located 500 m. to the south of the project right-of-way at Sta. 19+900.
- Stupa No.2: situated at grid point 0413500E, 1579990N. It has 5×5 m. square base, was made with stones from nearly area. The hemispherical dome was bricked

as round shape. Its top was destroyed. The location is 650 m. to the south of the project right-of-way at Sta.19+950.

- Stupa No.3: located at grid point 0413507E, 1579990N. It based is 5×5 m. square. Material used is as same as the 2 stupas mentioned above. But its body was mended as octagon based like ordinary Mon style stupa. This stupa is 10 m. tall. The monument is located 650 m. to the south of the project right-of-way at Sta.19+950.

Another three miniature stupas were constructed in rows about 15 m. way from Stupa No.3. Some stupas have niche for placing Buddha image. The location is the same place as Stupa No.3.

(3) Monasteries

- **Ye Phyu Monastery:** Buddhist monastery situated in Kan-Ywe village. It is located 500 m. to the north of the project right-of-way at Sta.19+200. This place was built around 50 years ago. Edifices in the monastery include a small vihara (Buddha image hall), a large wooded pavilion (sala) and one pavilion.

- **Duak-Lauk Monastery:** a Buddhist monastery in Dauk Lauk village. It is located approximately 1,000 m. to the south of the project right-of-way at Sta.20+600. This place was founded around 80 years ago. In the monastery area, situated a large wooded pavilion and one big under construction pavilion.

- **Sasana Chetaya-pura Monastery:** it is situated in a small hill in Ta Laing Ya village around 900 m. to the south of the project right-of-way at Sta.24+000. This site was constructed around 80 years. Go. Buildings in the monastery consist of Phra Ubosot (a hall of temple), a large-wooded pavilion, a four-meter square-base stupa which is 10 meters high. In front of the stupa situated an aedicule which placed the Buddha image inside. The edifices on the top of the hill including the stairs were recently reconstruction.

Section 2 (Sts.69+400 to Sta.112+300)

The project alignment passes through steep and rolling areas. No archaeological and historical sites found but there exists an old settlement namely Myitta. It is located about 500 m. to the south of the project right-of-way.

Myitta is a large community. It is a sub-district (Nei Khwe) situated on the mound near the convergence's place of Kamoung Thwe River and Ban River which is the beginning of Tanintharyi River. This area was a port where operated the navigation between Sinbyu-dain and Myitta. However, the port lasted until 2008.

This community was established around the beginning of the 18th centuries under the name of "Maita", a Karen word means work hard. The people living in Maita were Karen and believed in Animism. Since the middle of 18th centuries Maita has always been destroyed by passing by troops. Moreover, during 100 years later, there were many battles which has direct and indirect impact to the community.

In 1835, a Baptist Missionary, Francis Mason, came to Maita. After that all Karen in this village converted to Protestantism. Then, Mason changed the name of the community from Maita, which contains bad meaning, to Myitta or City of Love.

At the end of 1942, Japanese troops entered to Myitta from Thai-Myanmar border in Kanchanaburi to pass over to Dawei. They also constructed a road for military purpose and shipping tin from nearby tin mine via Thailand to Japan. Although WWII ended in 1945, but there had been continuously battles in the area.

In 1982 all villagers migrated to other place and had a permission to come back again in 1993. But the community was totally destroyed; even the church, only a bell was left over. Anyway, after harshly battles in 1995 and 1997, Myitta became a peaceful place and all villagers can begin their new life again.

The result of many battles and migration are that the community's historical evidences were destroyed, and the villagers lost their private properties that they brought with them during migration period. Thus, the history of the community is incoherently. Even though, there stand two monasteries which situated 800-1,000 m. away from the alignment of the right handed side as the following:

- Maha-bew-kata-u Monastery (800 m. from the project alignment): a Buddhist monastery, built in 1999. In the past, there was not any Buddhist monastery in this community since all of villagers was Protestantism. But, there were some Buddhists migrated to Myitta afterwards, thus, this monastery was founded. All buildings in this site consist of a five-meters based width and ten-meters high stupa, and one wooden pavilion.
- Myitta Church (1,000 m. from the alignment): it is aged around over 100 years. The present structure composes of the large building, the bell tower with a big bell inside. The bell was engraved that it was made by "THE C.S. BELL CO. NO. 30 YOKE 9113 PP HILLSBORO". It is around 150+160 years old (assumed from the 175th anniversary of missionaries of Myitta Church in the year 2010).

Section 3 (Sta.112+300 to the end of the project at Sta.156+500)

- Hti Hkee Monastery : it is a new monastery located at Hti Hkee Checkpoint near Thailand-Myanmar border. The stupa was built around 3 years ago. The temple building had been constructed a little bit earlier than that.

5.6 VISUAL COMPONENTS

According to the data in the recent EIA of Transborder Road Link (Dawei-Phu Nam Ron), December 2014 and the results of field survey in February 2015, the Two-Lane road alignment passes through areas with various landscape characters which contain different types of landscape features such as landforms, water features, plant communities and land uses.

Most of landforms along the project route are rolling hills and mountain ranges interspersed with valleys. There are only a small portion of flat terrain near Dawei River between Sta.19+500-Sta.21+500.

Along the project alignment, there are 3 significant areas where water features can be observed from the road:

(1) At Sta.19+600, the road crosses the Dawei River;

(2) At Sta.69+900, the road crosses the Tanintharyi River;

(3) From Sta.73+000 to Sta.101+000, the road runs parallel with the Tanintharyi River.

The study area is covered with various plant communities since majority of the road alignment passes through forest areas. Nearly entire plant communities are evergreen vegetation, so that they are similar in color and continue to be green all year round.

Flat terrain areas close to the Dawei River are agricultural land i.e., palm plantation and paddy fields. Although there are some villages along the road alignment. They are small and very low in density.

The landscape characters of the study area can be summarized in ***Table 5.6-1.***

The section with scenic quality is between Sta. 70+000 and Sta. 101 which the project alignment runs parallel with Tanintharyi River. The visual sequences in this section are mountains with riverside that create beautiful open spaces on the side facing to the river while another side is enclosed by the mountain. Where the river has extensive width or the road is close to river, the water feature would be dominant in landscape scenery because it is clearly seen.

TABLE 5.6-1

THE CHARACTERISTICS OF LANDSCAPE ALONG THE PROJECT ALIGNMENT

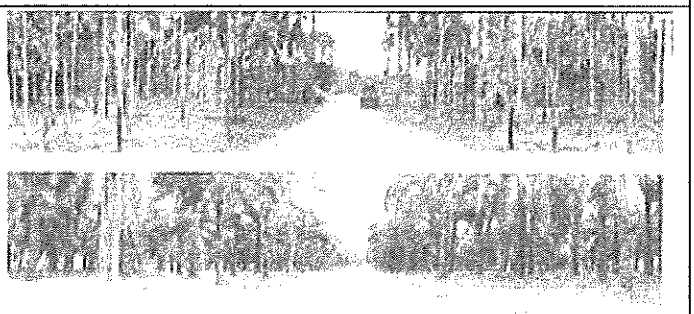
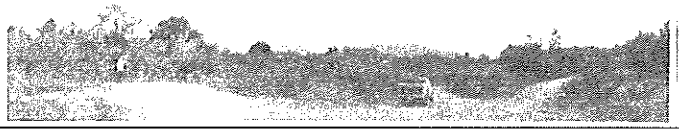
Location (Sta.)	Representing Landscape Type	Photos
17.5 - 28	Cultivated land in flat terrain	
	Paddy field in flat terrain	
	Low density of vegetation on flat terrain	

TABLE 5.6-1

THE CHARACTERISTICS OF LANDSCAPE ALONG THE PROJECT ALIGNMENT (CONT'D)

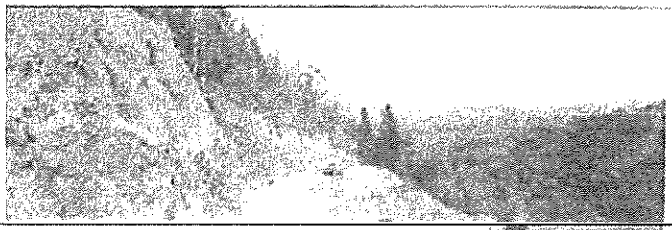
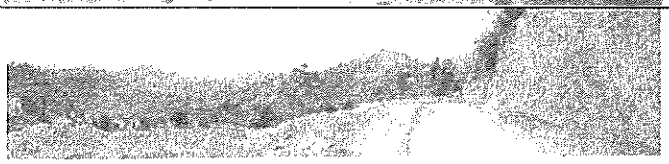
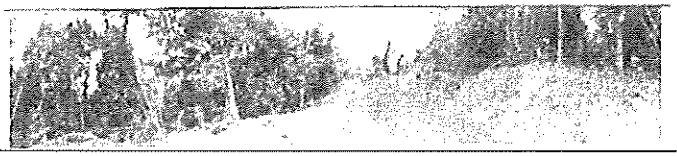
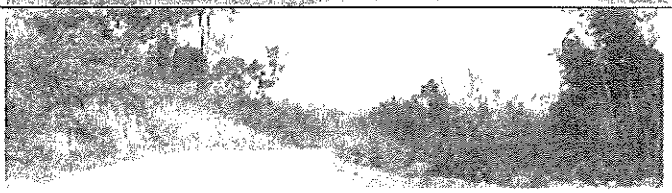
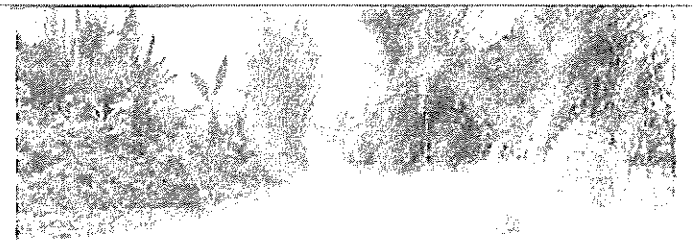
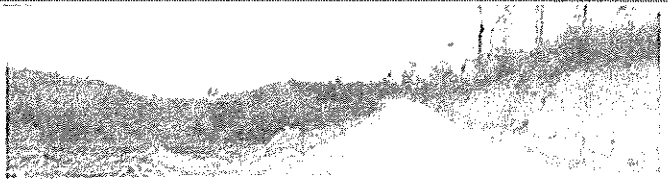
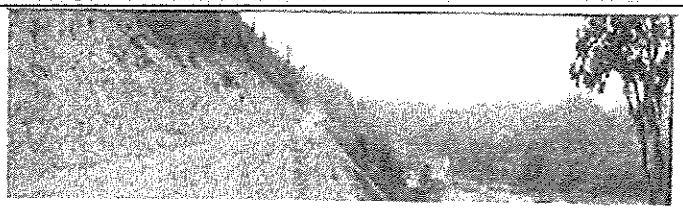
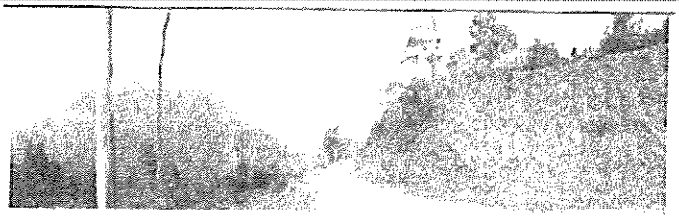
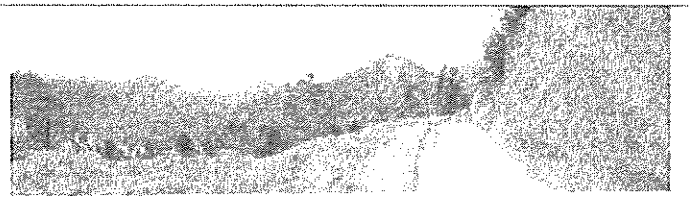
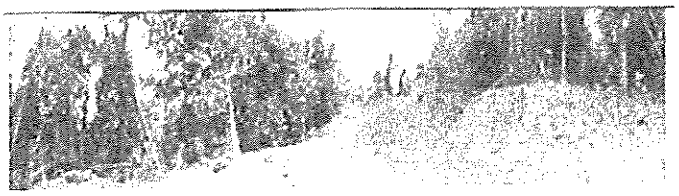
Location (Sta.)	Representing Landscape Type	Photos
28 - 39	Mountain area with some water feature	 
39 - 55	Hill and mountain open/enclose space	 
55 - 65	Grass land in rolling terrain	
55 - 65	High density of vegetation on rolling terrain	
65 - 69 +400	High density of vegetation on flat terrain	
69 + 400 - 73	Low density of vegetation on rolling terrain	

TABLE 5.6-1

THE CHARACTERISTICS OF LANDSCAPE ALONG THE PROJECT ALIGNMENT (CONT'D)

Location (Sta.)	Representing Landscape Type	Photos
73 - 101	Mountain and water features	 
101 - 118	Hill and mountain open/enclose space	
118 - 128	High density of vegetation on rolling terrain	
18 - 165 + 500	Hill and mountain	 

(1) Project study area (500 m strips on both sides of project alignment) : The study area covers 34,031.35 acres of which land use type can be classified as follows;

- **Establishment or Enterprise area**: covers 201.41 acres (accounted for 0.59% of total study area). The study revealed that there is a public company (establishment/ enterprise), mostly belongs to Italian-Thai Development Public Company Limited.

- **Urban and residential area** : covers 215.58 acres (accounted for 0.63% of total study area). The study reveals that there is a traditional residential area; mostly there are agricultural areas situated around the residential area. Also, within the community, there are several types of perennial and fruit trees.

- **Religious place area** : covers 6.35 acres (accounted for 0.02% of total study area).

- **Paddy field area** : covers 66.65 acres (accounted for 0.20% of total study area). The study reveals that, there is mostly agricultural area in the project vicinity. This area is especially appropriate for cultivating rice.

- **Oil Palm Plantation area** : covers 127.88 acres (accounted for 0.38% of total study area). The study reveals that oil palm is the main economic fast grown perennial tree, which is a significant source of natural oil with a high productive yield. Nevertheless, its production cost is relatively high. At first stage of palm oil plantation, it will take a long period of time to be harvested. In order to obtain well grown oil palm with high productive yield, it is suggested that palm oil should not be planted in the area that is higher than 300 m. above mean sea level (MSL).

- **Betel palm garden area** : covers 802.78 acres (accounted for 2.36% of total study area).

- **Para rubber plantation area** : covers 1,638.96 acres (accounted for 4.82% of total study area). The study reveals that para rubber tree should not be planted at the area that is higher than 200 m. above mean sea level (MSL). The angle of slope should not be more than 45 degree, technically, it is suggested that if the angle of slope is more than 15 degree, para rubber terrace plantation should be applied.

- **Orchards and perennial crops plantation area** : covers 7,328.89 acres (accounted for 21.54% of total study area). The study reveals that there are fruit and perennial trees in the project vicinity such as cashew nut tree, etc.

- **Degraded and abandoned forest area** : covers 1,784.8 acres (accounted for 5.24% of total study area). The study reveals that, mostly, there are degraded and abandoned forests which were damaged and trespassed for shifting cultivation. It can be noticed that there is a trace of original forestland.

- **Forest area** : covers 18,313.86 acres (accounted for 53.81% of total study area). The study reveals that there are 3 types of forest found: (1) dry evergreen forest, (2) mixed deciduous forest and (3) fresh water swamp forest.

- **Bamboo forest area** : covers 1,118.22 acres (accounted for 3.29% of total study area).

- **Grassland area** : covers 1,101.30 acres (accounted for 3.24% of total study area).

CHAPTER 6

IMPACT AND RISK ASSESSMENT AND MITIGATION MEASURES

CHAPTER 6

IMPACT AND RISK ASSESSMENT AND MITIGATION MEASURES

6.1 IMPACT ASSESSMENT METHODOLOGY

6.1.1 Impact Assessment

6.1.1.1 Scope of Assessment

Environmental Social Impact Assessment (ESIA) of a proposed development project is now recognized that it is essentially environmental management planning. In this regard, impact and risk assessment and formulation of mitigation measures are the first stage of environmental management planning. Consequently, the context of ESIA reports is now required by MONREC in its ESIA Procedure and Draft ESIA Guideline to expand beyond the impact assessment and mitigation measures to include a detailed environmental management plan (EMP) covering both the project construction and operation phases. The EMP will be implemented during project construction and operation to ensure acceptable environmental performance of the project during its construction and operation.

It should be noted that the term "environmental impact" is now generally used to cover not only the natural environment but also social environment or social impacts as well as occupational health and safety. This scope of environmental impact is adopted in the ESIA Procedure as shown below:

Environmental Impact means the probable effects or consequence on the natural environment and people of a proposed Project or businesses or activities or undertaking. Impacts can be direct or indirect, cumulative, and positive or adverse or both. For purposes of this Procedure, Environmental Impacts include occupational, social, socio-economical, community health, and safety issues.

6.1.1.2 Geographical Scope: Study Area Boundaries

The study areas have already been identified and defined in **Section 5.1**. The impact area of each issue is defined in ***Table 6.1.1-1***.

6.1.1.3 Temporal Scope

The assessment of impacts of each ES issue is based on the temporal scope presented in ***Table 6.1.1-2***.

TABLE 6.1.1-1
DEFINITIONS OF THE IMPACT AREAS

ES Issue	Impact Area
Noise	Area from the noise source to a point at which the noise will attenuate to an acceptable level
Vibration	Area from the vibration source to a point at which the energy wave will attenuate to an acceptable level
Fugitive dust on the construction site	Area around the construction site to a point at which the dust level returns to the level before the construction
Fugitive dust caused by materials transportation	Area along the road to a point at which the dust level returns to the level before the construction
Quarrying operation Sites for disposal of construction wastes	Area around the quarry site to be determined by noise or vibration, whichever is greater The area covering the disposal site area and the sensitive receptors
Fish ecosystem	In waterways to be closed by the project alignment.
Terrestrial ecosystem	The area is about 20 m from both side of center line of the alignment or construction corridor.
Water quality	In waterways to be crossed by project alignment.
Background ambient air quality	In the villages near the construction sites along the project alignment.
Background ambient noise level	In the villages near the construction sites along the project alignment.
Land acquisition	The entire areas of affected land due to project implementation.
Visual quality degradation	Along the project alignment.
Archeological impacts	Archeological and historical site near the project alignment.
Cultural impacts	In the villages near the construction sites along the project alignment.
Cultural heritage	Within RoW along the project alignment.
Environmental management areas	The entire construction site during construction.

TABLE 6.1.1-2
TEMPORAL SCOPE

ES Issue	Impact Area
Noise	Over the construction duration, hourly and daily average noise level
Vibration	Over the construction duration, peak particle velocity mm/s
Fugitive dust on the construction site	Over the construction duration, hourly and daily average dust level
Fugitive dust caused by transport of materials	Over the construction duration, hourly and daily average dust level
Soil contamination	Over the project life
Terrestrial ecosystem	Over the construction and operation periods
Water quality	Over the construction and operation periods
Background ambient air quality	Over the construction period, hourly and daily averages of air quality parameters
Land acquisition	During the site preparation period.
Visual quality degradation	Over the construction and operation periods
Archeological impacts	Over the construction and operation periods
Cultural impacts	Over the construction and operation periods
Environmental management areas	Over the construction and operation periods

6.1.1.4 Conceptual Framework

A. Impact Analysis

The first major step in conducting an ESIA is "Impact Analysis" as shown in a diagram in ***Figure 6.1.1-1***. The Impact Analysis is essentially a cause-effect analysis based on the following logics.

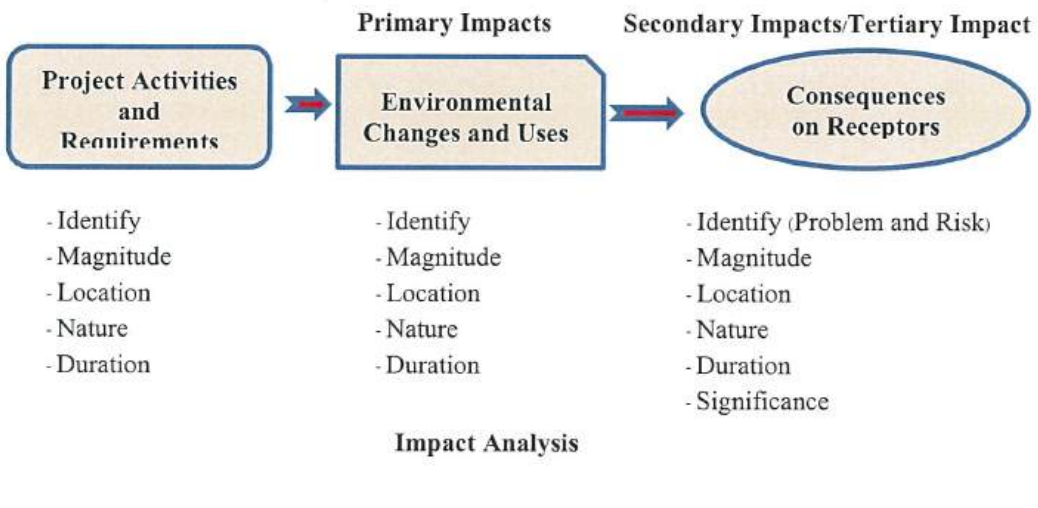


FIGURE 6.1.1-1 : IMPACT ANALYSIS LOGIC

(1) Project construction and operations involve various physical activities and require use of environmental resources as inputs. Examples:

- Construction activity- clearing and grubbing, dredging, excavation and grading activities.
- Operational activity-operation of road.

(2) Project activities and requirements consume and emit mass and energy to the environments. They are the sources or root causes of environmental impacts since they will, if not adequately controlled or managed, certainly cause ***significant changes*** or conflicting use of the environmental components. Examples:

- Changes during construction-change in ambient noise level and ambient air quality nearby project construction site caused by clearing and grubbing, dredging, excavation and grading activities.
- Changes during operation-change in ambient noise level and ambient air quality along the road alignment due to increase of vehicles.

(3) Direct impacts of project activities and requirements on the environment could be considered as ***primary impacts***. Ambient environmental standards are applied to the primary impacts while source or emission standards are applied to project activities.

(4) The magnitude, nature, and duration of the environmental changes or primary impacts will be governed by the location, magnitude, nature, and duration of project activities or requirements. Most primary impacts caused by construction activities and requirements are transient and reversible. Few impacts are permanent and irreversible. Examples'

- Transient environmental changes-increased ambient noise levels and fugitive dust during construction.

- Irreversible and permanent environmental changes-conversion of forest and plantation area into road area.

(5) The primary impacts caused by project activities and requirements could have consequences on ***receptors*** which could be ecosystems, communities, or workers in geographical areas that the primary impacts occur. The consequences could be considered as ***secondary impacts***. In some cases, the secondary impacts could have consequences on other receptors. For example, degradation of the aquatic ecosystem (secondary impact) caused by blockage of river flow (primary impact) could have impacts on livelihood of local fishermen. The consequences of the secondary impacts could be considered as ***tertiary impacts***.

(6) Secondary and tertiary impacts are ***problems*** that need to be solved by reducing the primary impacts through measures applied to causative project activities or requirement. They are considered problems, since based on existing knowledge and experience, they will certainly occur. Example-fugitive dust from clearing and grubbing, dredging, excavation and grading activities will certainly pollute the ambient air. If primary or secondary impacts are uncertain, they are considered as ***risks***.

(7) A risk in environmental management could also be an undesirable event which may occur, and if it occurs will render an impact mitigation measure ineffective.

(8) The level of significance of a secondary impact is assessed from its extent and severity in terms of its magnitude and value of loss. The extent and severity of secondary impacts will depend on: (i) nature and magnitude of the primary impacts; and (ii) sensitivity of the receptors which depends on their nature and characteristics.

(9) The environmental problems and risks will have to be evaluated to assess their significance. Measures and resources to be allocated to address the problems and manage the risks should follow their significance. However, impact sources and primary impacts need to be addressed regardless of the significance of secondary impacts due to the legal requirements for projects to comply with applicable source and ambient standards.

B. Formulation of Measures to Address the Problems

This step is to formulate measures to address the problems. Measures are to be directed at the causes of the problems, i.e. project activities and requirements. Measures could be:

- Engineering measures to be incorporated in the design for implementation by the contractors.

- Management measures to be implemented in construction management or operational management of project facilities during the operation phase.

It is necessary to design effective implementation arrangements of the measures. Mitigation measures during the construction phase will have to be implemented by the contractors under supervision of construction supervision engineers engaged by the project proponent. The project proponent will oversee the implementation of mitigation measures through its project manager. Mitigation measures during the operation phase will be implemented as part of the operational management by the operational organization to be set up by the project proponent.

It should be noted that the measures will be applied to the project activities and requirements to reduce the primary impacts resulting in reduced secondary impacts. Some measures could be applied directly to the receptors to minimize the impacts on the receptors.

Figure 6.1.1-2 is a diagram showing the mitigation measure concept.

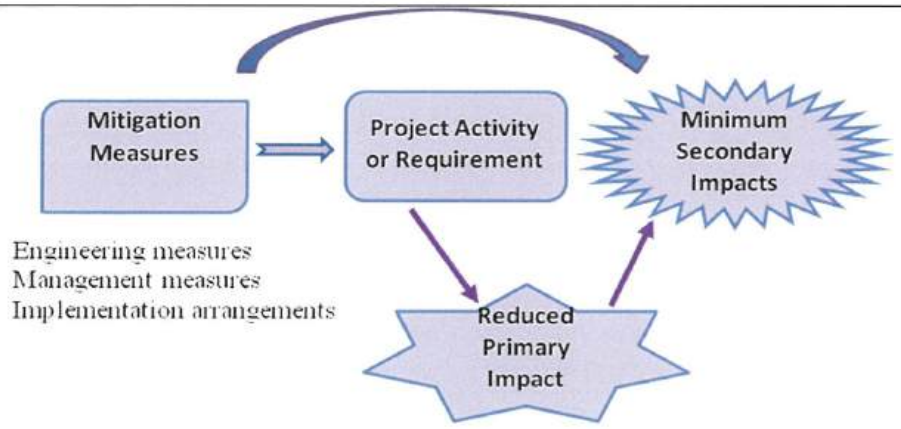


FIGURE 6.1.1-2 : MITIGATION MEASURE CONCEPT

6.1.1.5 Methodology for the Impact Assessment of Each Environmental Issue

A. Compliance with Source Environmental Standards

The assessment of impacts of this Project is premised on a requirement that the design, construction, and operation of Project will adopt or implement best practicable measures to minimize the magnitude of resource consumption and wastes discharged into the natural environment. Therefore, the assessment will be on the severity of the residual impacts to determine the need for additional measures to further reduce the residual impacts. For example, if the residual dust levels will cause health risk and discomfort to people in the villages proximate to the construction site, additional measures will be needed to reduce the dust levels at the receptors.

The above principle indicates that all Project activities must comply with applicable source or emission standards or environmental guidelines.

The assessment of impacts will cover (i) impacts on the ambient environment; and (ii) impacts on the receptors.

B. Impact on Ambient Environment

The impacts on the relevant ambient environment will be predicted, if possible, using an appropriate mathematical model.

C. Impacts on Receptors

Each environmental issue will have an impact area. Receptors in the impact area could be people, ecosystem, and properties depending on the nature of the issue.

Impacts on the receptors are consequences of the impacts on ambient environment. For example, excessive dust concentration in the ambient air could adversely affect health and daily living of peoples living near the noise sources. The significance of the impact will be determined by severity and extent of the impacts which, in turn, will depend on the magnitude of the issue, and natural and socio-economic characteristics of the impact area. For example, the impact of fugitive dust during construction will depend on the amount of dust released into the air, wind speed and direction, and land use and population density of the impact area.

Normally, if the ambient air quality is complied with standard the impacts on receptors should be negligible.

D. The Methodology

Based on the above conceptual framework, the Consultant has developed a general impact assessment methodology for the impact assessment of each environmental issue. ***Figure 6.1.1-3*** shows a diagram of the methodology. The methodology is explained below:

(1) Estimate Magnitude of the Environmental Issue

The first step is to estimate the magnitude of the environmental issue from information on the Project construction and operation presented in ***Chapter 4***. The measurement of the magnitude of an environmental issue depends on the nature of the issue.

Examples: (i) the magnitude of the construction waste disposal issue is the total amount of construction waste that will have to be disposed of; and (ii) the magnitude of the traffic issue is the number of truck loads to be generated during the construction phase.

(2) Identify Best Practicable Measures to Minimize the Magnitude of the Issue

Regardless of the level of its impact, the magnitude of the environmental issue must be minimized through best practicable measures to be implemented through design, construction method, or good construction practices.

Examples: the construction site will be frequently sprayed with water to suppress fugitive dust.

(3) Estimate the Remaining Magnitude of the Issue

The remaining magnitude of the issue can be estimated from the efficiency of the mitigation measures reported in various references.

Examples: the remaining amount of fugitive dust after water spraying can be calculated from reported efficiency of water spraying in suppressing fugitive dust.

(4) Compare the Remaining Magnitude of the Issue with Applicable Source Standards

Environmental issues related to pollution such as wastewater issues can be referred to applicable source standards, such as effluent quality standard for the wastewater issue.

If the remaining magnitude of the issue does not meet the applicable source standards, additional measures will be required to further reduce the remaining magnitude of the issue.

Some environmental issues, such as fugitive dust and construction wastes, have no source standards. In this case, the assessment can proceed to the next step.

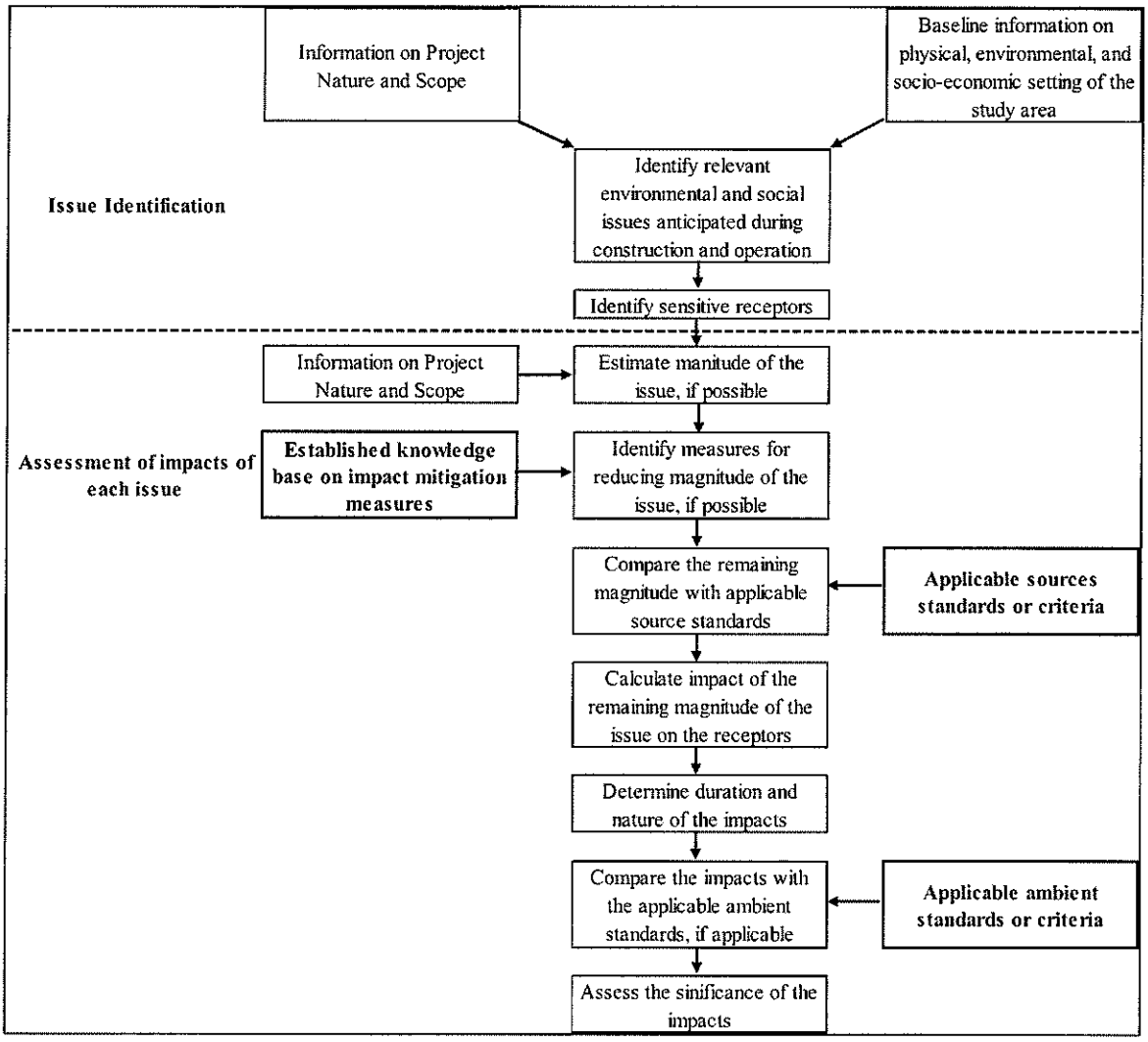


FIGURE 6.1.1-3 : METHODOLOGY FOR THE IMPACT ASSESSMENT OF EACH ENVIRONMENTAL ISSUE

(5) Calculate or Estimate the Impact of the Remaining Magnitude of the Issue on Ambient Environmental Quality

A good example is the air pollution issue. This step will calculate the dispersion of the remaining amount of TSP or PM-10 in the ambient air around the project construction site and quarry site. The results will be increases in TSP or PM-10 value in the ambient air at various locations around the project construction site and quarry site.

(6) Compare the Resulting Ambient Environmental Quality with the Applicable Ambient Environmental Quality Standard.

An example is the construction noise issue. If the resulting ambient noise levels at the sensitive receptors exceed the maximum permissible noise limits prescribed in the ambient noise standard, it will be necessary to implement measures for noise blocking at the sensitive receptors.

It is also possible that the ambient environment is so severely polluted that the ambient environmental quality standard cannot be met. If this is the case, the project could worsen the pollution problem. Pollution from other sources will need to be reduced or the project moves to other locations.

6.1.1.6 Methodology for the Determination of Significance

In environmental management, it is necessary to prioritize key environmental issues. Significance in this context is therefore related to priority that the project environmental management will accord to the issue.

The impact of an environmental issue is divided into 5 levels based on six criteria or considerations as shown in ***Table 6.1.1-3***. The criteria will need to be modified to make them specific and relevant to each environmental issue.

TABLE 6.1.1-3

LEVELS OF IMPACT OF THE ISSUE IN ENVIRONMENT MANAGEMENT

Consideration	Level of Impact or Significance of the Issue in Environmental Management				
	Critical	Major	Moderate	Minor	Insignificant
Magnitude of the issue	Very large	Large	Medium	Small	Very small
Nature of the issue '	Irreversible	Irreversible	Reversible	Reversible	Reversible
Duration of the issue	Permanent	Long	Relatively short	Short	Very short
After implementing best available measures					
-the remaining magnitude can meet the source standards	No	No	Yes	Yes	Yes
Impacts of the remaining magnitude on ambient env quality					
-resulting ambient env quality can meet the ambient standards	No	Yes	Yes	Yes	Yes
Sensitivity of the impacted area	Very High	High	Medium	Low	Relatively Low

The impact assessment will be made for the impact without control and the impact with control or residual impact. The five impact levels are:

- ***Level 5- Critical***- the impact is irreversible with extensive and severe ecological damages or socio-economic damages.The issue cannot be resolved. The project plan will need to be changed, relocated or abandoned.

- ***Level 4- Major***- the impact will be substantial but it can be effectively reduced using both engineering and management measures. The residual impact will be minor.

- ***Level 3-Moderate***- the impact is moderate in terms of extent and severity and it can be effectively reduced using simple measures. The residual impact will be insignificant.

- ***Level 2-Minor***- the impact is small in magnitude and confined to a small area. It can be easily managed through good construction practices. The residual impact will be negligible.

- ***Level 1-Insignificant***-the impact is very small compared to Level 2 impact and can be easily mitigated through good construction practices. The residual impact will be negligible.

6.1.1.7 Monitoring

In environmental management, monitoring of results of the implementation of mitigation measures will have to be carried out during the pre-construction, construction, operational, and decommissioning phases. Parameters to be monitored, frequency of monitoring, method of monitoring, and geographical location of monitoring will have to be clearly stated. The monitoring must be relevant and adequate to provide reliable and accurate data and information as feed back to the management system for taking corrective actions. It should be noted that the proposed monitoring for each key valued environmental component will have to be consolidated and presented in the environmental management plans.

6.1.1.8 Mapping

Maps are used in this ESIA Report to support narrative description of various subjects. They were obtained from various secondary sources, including: (i) site maps prepared by the technical consultant for using in the Final Design Report; (ii) regional maps presented in various documents; and (iii) Google earth. The available maps are in various scales and they are selectively used to suit the illustration purposes. No attempts were made in this ESIA study to prepare its own maps based on field surveys.

6.1.1.9 Key Issues and Selection of Valued Environmental Components

Valued Environmental Components (VECs) for the Project are those environmental and social attributes associated with the development of the proposed Project which have been identified to be of concern by the public, government or professional community. The ESIA will cover VECs to be identified based on consideration of Government's ESIA requirements, nature of the Project, construction activities, existing environmental and socio-economic and cultural settings of the areas impacted by the Project, and ongoing and future developments of road projects in the region. The identified VECs and issues of concern will need to be presented to stakeholders and finalized based on comments from the stakeholders.

The preliminary environmental impact assessment made in the scoping study has identified key issues and VECs to be covered in the ESIA as presented below in ***Table 6.1.1-4***. For each VEC, one or more parameters will be selected to facilitate quantitative or qualitative measurement of potential project impacts and cumulative impacts. Results of the measurement will be used to determine the level or magnitude of incremental change in the VEC. If possible, thresholds or standards will be identified for each measurable parameter. For example, a measure of total suspended solids could be chosen as the measurable parameter for sedimentation effects in watercourses and on fish habitat and condition. The level of change, the applicable standard, and the nature of change (reversible or irreversible) will be the basis for determining the level of significance of the impact.

The ESIA will cover direct impacts of the Project on these VECs and also on direct impacts of the Project coupled with future impacts of planned projects on the VECs, or cumulative impacts.

TABLE 6.1.1-4

VECs DURING PRE-CONSTRUCTION, CONSTRUCTION AND OPERATION PHASES

VEC	Main Concern During Construction
Pre-Construction and Construction Phase	
Land Acquisition	Village who living within the right of way will be relocated to proposed resettlement area.
Air quality	Increases in air pollutants caused by fugitive dust from heavy equipment, clearing and grubbing, and material transportation.
Noise	Increase ambient noise level at the construction site, quarry site and communities near the material transport routes.
Vibration	Increase vibration at the construction site, quarry site and communities near the material transport routes.
Surface water quality	Increased turbidity of river water due to in-river bridge construction activities and river bed excavation or dredging.
Aquatic ecology, fish and fish habitat	Loss of benthic organisms and impeding fishing activities due to in-river construction activities and river bed excavation or dredging.
Soil	Increases soil erosion caused by the clearing and grubbing.
Forest and wildlife	Reduced wildlife habitat and removed vegetation caused by clearing and grubbing.
Traffic and Road Safety	Increases in traffic load and safety along the material transport routes
Compensation	Compensation is acceptable to affected persons
Land use	Change in land use and land ownership due to land acquisition for project construction.
Waste	Degradation of the disposal sites due to inappropriate management of construction wastes at disposal site.
Cultural heritage	Within RoW along the project alignment.
Operation Phase	
Air quality	Increases in air pollutants caused by gas emissions from traffic volume.
Noise	Increase ambient noise level at the communities closed to the project road.
Vibration	Increased vibration at the communities close to the project road.
Waste	Increased waste at the rest area (service center)
Forest	Destruction of forest area along project road and undisturbed area.
Community health and safety	Increased of traffic accident during construction.

6.1.1.10 Modeling Requirements

- ***Air Quality***

Methodology

As the Project impact on air quality is only fugitive dust generate from construction activities; for example, top soil opening, drilling, and excavation activities only ground level concentrations of fugitive dust at the construction sites will be calculated using the Box Model. The model is described in the relevant section on the assessment of impacts of fugitive dust during project construction.

Results

The impacts of fugitive dust will be calculated as average concentrations of Total Suspended Particles and PM-10 at the nearby receptors. Concentration contour lines are not necessary.

Mapping

The impacts of fugitive dust will be presented in a table and also on a project site map at scale 1:5,000, if necessary.

- ***Noise***

Methodology

Ambient noise levels at the nearby receptors will be calculated using a simple noise propagation equation to be presented in the relevant section on noise impact assessment.

Results

The calculated noise levels will be expressed as Leq-1 hour in dB(A) and Nuisance Noise.

Mapping

The impacts of noise at the nearby receptors will be presented in a table and also on a project site map at scale 1:5,000, if necessary.

- ***Vibration***

Vibration impacted at the nearby receptors will be calculated using a simple equation to be presented in the relevant section on vibration impact assessment.

Results

The calculated vibration levels will be expressed as Leq- 1 hour in dB(A) and Nuisance Noise.

Mapping

The impacts of vibration at the nearby receptors will be presented in a table and also on a project site map at scale 1:5,000, if necessary.

- ***Others***

Modeling is not relevant for other impacts of this Project.

6.1.1.11 Project Phases Covered in the EIA

The EIA results for each key valued environmental component will be presented for each project phase as follows: construction phase and operational phase.

The decommissioning/closure/post closure phase is not covered in the EIA as explained in the Scoping Report. This terminal project phase is applicable to projects with definite working life such as mining and nuclear power plant projects. For a road project, there is no have the working life of the road although most road equipment will need to be replaced during the life of the road. The chance that the road will be demolished for ecological reason is extremely unlikely in the context of Myanmar.

6.1.1.12 Subjects Covered in Each Project Phase

For each key valued environmental component the EIA results for each project phase are presented in four subjects: (i) potential impacts; (ii) proposed mitigation measures; (iii) residual impacts; and (iv) proposed monitoring. It should be noted that the proposed monitoring for each key valued environmental component will have to be consolidated and presented in the environmental management plans in ***Chapter 8***.

6.1.2 Risk Assessment

6.1.2.1 Context of the Qualitative Risk Assessment

A. Concept and Definition of Environmental Risk

In most documents on environmental risk assessment, an 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 could be easily confused with risks if the risk context is not clearly established. In the above example, if toxic and hazardous wastes are not properly disposed of 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 ESIA not in the context of 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 project construction phase and the project operational phase in parallel with other categories of project risks.

A project risk is variously defined in risk management documents but all definitions share three key words: ***event, likelihood of occurrence of the 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, based 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 requirements prescribed by MONREC and other authorities, and as agreed or committed with the stakeholders, particularly the surrounding communities."

B. Objectives of Environmental Risk Assessment

In line with the objectives of ESIA, the objectives of environmental risk assessment (ERA) are to: (i) identify and assess environmental risks 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 methodology or the process for environmental risk management (ERM) planning 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 operational phase. The project risk management planning is different from the environmental risk management planning only in the 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 MONREC and other authorities and as agreed or committed with the key stakeholders. Such events would consist of external events and internal events.

(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 6.1.2-1*** shows an example of a simple risk classification matrix[1]. In this example, risks are classified into minor, moderate and major risks.

- 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.

[1] **Modified from the matrix in NASA Risk Management Presentation - Imsworld.org** www.imsworld.org/.../NASA%20risk%20managemnt%20power%20poin...

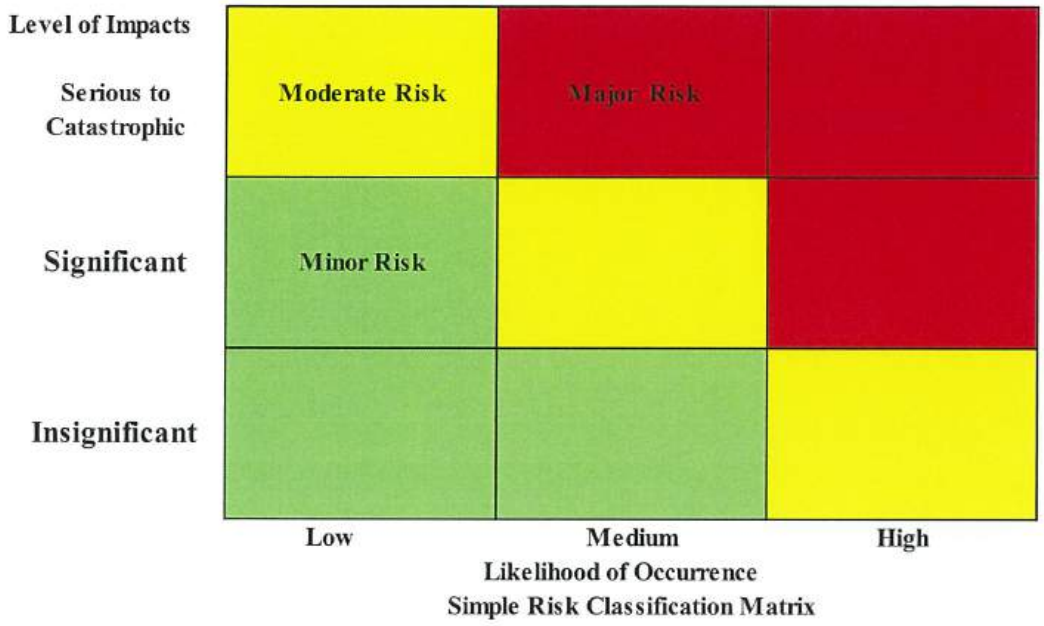


FIGURE 6.1.2-1 : SIMPLE RISK CLASSIFICATION MATRIX

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;
- 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 a major earthquake, risk mitigation measures will either aim at protection or minimizing the impacts or both. For example, a risk mitigation for earthquake in this Project is to incorporate required safety measures in the road and bridge design and to prepare an emergency plan for implementation should the earthquake is stronger than the design earthquake.

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. ***Figure 6.1.2-2*** is a diagram showing the risk management logic. 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.

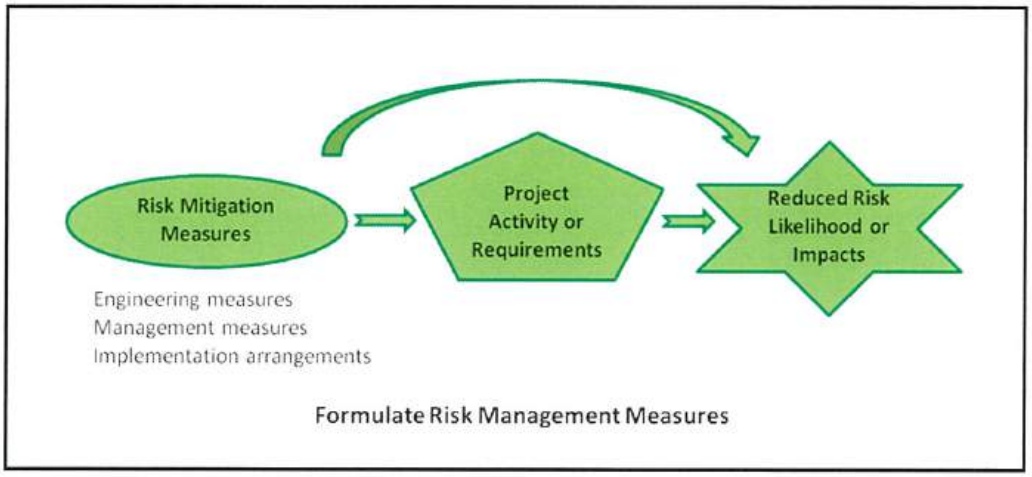


FIGURE 6.1.2-2 : ENVIRONMENTAL RISK MANAGEMENT LOGIC

(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 (ERMP) will need to be linked with the environmental management plan (EMP) 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.

6.2 PRE-CONSTRUCTION PHASE - IMPACT IDENTIFICATION, ASSESSMENT AND MITIGATION

6.2.1 Pre-Construction Phase Activities

Pre-Construction activities will include land acquisition, clearing and grubbing. The activities in pre-construction phase are carried out as follows:

Land Acquisition: Land acquisition will be necessary for the construction of 10 new realigned sections, the service area, and the administration and rescue buildings. The 10 realigned sections will have a total length of 30.92 km. With the 40-m ROW, the total area required will be about 306 acres (=30.92 x 1,000/4,047). Currently, some areas in Section 1 (Saddle Hill), Section 2 (Elephant Cry Hill), and Section 3 (Base 1 Hill) are currently being cleared and filled to prepare for construction of the realigned sections.

Clearing and Grubbing: All new construction sites will need to be cleared of natural vegetation. As the construction will take place in at least 12 locations and on narrow corridors for the realigned sections, environmental disturbances in general would be low.

The loss of forest land for construction of the 10 realigned sections under the Project will be only about 306 acres as already indicated above. It should be noted that in the construction of the existing road, about 1,514 acres of land, mostly forest, were cleared (=153.2 km × 1,000 m × 40 m/4,047 m^2).

6.2.2 Impact Assessment

During the clearance period, operations of heavy equipment such as bulldozers, excavators, and graders will pollute the ambient air, and create noise and vibration. For the mountainous zone, soil erosion will occur along steep slope where vegetation is cleared and lead to sedimentation in water.

6.2.2.1 Land Acquisition

Land acquisition by the project will have impacts on economic activities of the Project Affected Persons (PAPs) with adverse consequences on their livelihood.

The project will acquire about 340.5 acres of additional the project will acquire about 340.5 acres of additional land outside the existing right-of-way for construction of all project components. Information on land and perennial trees to be affected by the project development can be summarized as follows:-

(1) The Survey Results and Estimated Cost for Compensation

According to the previous surveys (2014 and 2015), by ITD and TEAM respectively, and it was highlighted and confirmed that about 340 acres of land along the existing road (forest land, idle land, plantation areas and some residential areas) will be acquired and expropriated. The results are illustrated shown in ***Table 6.2.2-1***.

TABLE 6.2.2-1

LAND ACQUISITION FOR TWO-LANE ROAD PROJECT

Section	Location		Distance (km.)	Area (acre)
	from	to		
1	KM18+500	KM69+000	50.5	140.61
2	KM69+000	KM104+000	35.0	43.20
3	KM104+000	KM149+800	45.8	156.70
Total			**131.3**	**340.51**

Remark : 1 acre = 4,047 sqm

Source : Compensation Proposal for Building Two-Lanes Road Upgrade from Thailand's Border (Phu-Nam-Ron) Kanchanaburi Province to DSEZ Myanmar Dawei, ITD 2014.

Land acquisition and compensate item required for Two-Land Road Project in Section 1 to section are shown in ***Table 6.2.2-2 to 6.2.2-4***. Cost estimate for land and compensation item in section 1 to section 3 are shown in ***Table 6.2.2-5 to 6.2.2-7***.

(2) Proposed Mitigation Measures

a. Proposed Mitigation Measures

The mitigation measures will be compensation for the loss of land and crops, and livelihood development assistance. The measures are presented in the ***Resettlement Action Plan (RAP) Report***. The RAP will include the following:

- A detailed compensation plan identifying individuals/families, which will lose their land due to project development.
- An adequate compensation package to be developed in close collaboration with all stakeholders.
- Compensation should be for both land and crops as well as for other properties such as valuable trees.
- The compensation should be done according to international standards and with the overall objectives of improving the standard of living for those who will be affected.All crops, valuable trees should be compensated. Cash compensation is the mode agreed with the people in project affected village during consultations.
- Set up grievance redress mechanism for project affected people.
- Arrange vocational extension activities in accordance with peoples' need and site condition especially agricultural production, marketing and supplementary occupational support to compensate for reduced agricultural production.
- Cooperation with local and district authorities regarding improved infrastructural development could enhance mitigation measures dealing with health, drinking water supply education, electricity supply and general social uplift. This means the project could become development opportunity with long-term, positive implications for the project area and the region as a whole.

TABLE 6.2.2-2

LAND ACQUISITION AND COMPENSATE ITEM REQUIRED FOR TWO-LANE ROAD PROJECT (SECTION 1)

Section 1:

KM.	Compensate Item	Spacing	Area (acre)	Est. Quantity	Remark
Remaining Access Road					
37+500 to 42+000	-	-	13.76	-	
Total			**13.76**		
Remaining to pay on 4 lanes ROW incase obstruct 2 lanes road					
62+200	Land	-	3.2	-	
	Rubber Tree	-		860	
66+000	Land	-	5.41	-	
	Danyin	-		7	
	Pomelo	-		5	
	Caschew Plant	-		450	
	Hilly Palm	-		6	
	Rubber	-		1,146	
	Banana	-		669	
	Agar Wood	-		800	
	Betel	-		5	
66+400	Land	-	0.43	-	
	Rubber	-		94	
	Cashew	-		3	
Total			**9.04**		
Critical Points					
30+500 to 33+800	Rubber	3x3 m.	32.62	15,000	
44+850 to 46+840	Rubber	3x3 m.	19.67	9,000	
54+000 to 55+200	Betel	3x3 m.	11.86	6,000	
Total			**64.15**		
Widening					
35+675 to 35+850	Rubber	4x3 m.	0.17	57	
	Betel	3x3 m.	0.24	108	
36+225 to 36+325	Betel	3x3 m.	0.47	211	
36+825 to 36+950	Rubber	3x3 m.	0.30	135	
40+075 to 40+225	Betel	3x3 m.	0.36	165	
46+500 to 46+705	Land	3x3 m.	0.54	-	
	Betel	-	0.54	245	
47+725 to 47+825	Land	-	0.31	-	
	Betel	3x3 m.	0.31	140	
57+700 to 58+525	Land	-	4.11	-	
	Betel	5x5 m.	4.11	665	
Total			**6.50**		
MOAI (Ministry of Agriculture and Irrigation)					
20+000	Oil Palm	10x10 m.	47.16	2,878	
Total			**47.16**		
Grand Total			**140.61**		

Source : Compensation Proposal for Building Two-Lanes Road Upgrade from Thailand's Border (Phu-Nam-Ron) Kanchanaburi Province to DSEZ Myanmar Dawei, ITD 2014.

TABLE 6.2.2-3

LAND ACQUISITION AND COMPENSATE ITEM REQUIRED FOR TWO-LANE ROAD PROJECT (SECTION 2)

Section 2:

KM.	Compensate Item	Spacing	Area (acre)	Est. Quantity	Remark
Widening					
65+800 to 66+000	Rubber	3x5 m.	3.56	960	
66+500 to 66+650	Rubber	3x5 m.	1.28	347	
66+600 to 67+500	Rubber	3x5 m.	3.21	867	
	Banana	8x8 m.		203	
67+500 to 68+000	Rubber	3x5 m.	1.17	316	
113+000 to 113+030	Betel	2.5x2.5 m.	0.15	110	
Total			**9.37**		
Realignment 2 lanes					
66+830 to 67+000	Toddy Palm	-	0.84	1	
	Banana	3x3 m.		378	
	Cashew	4x4 m.		213	
67+140 to 67+270	Coconut	-	0.64	4	
	Banana	-		289	
69+000 to 69+200	Rubber	5x3 m.	2.20	594	
	Banana	3x3 m.		989	
	Hilly Palm	8		8	
Total			**3.68**		
Vistapoint (KM.73)					
73+000 to 73+400	-	-	30.15	-	
Total			**30.15**		
Grand Total			**43.20**		

Source : Compensation Proposal for Building Two-Lanes Road Upgrade from Thailand's Border (Phu-Nam-Ron) Kanchanaburi Province to DSEZ Myanmar Dawei, ITD 2014.

TABLE 6.2.2-4

LAND ACQUISITION AND COMPENSATE ITEM REQUIRED FOR TWO-LANE ROAD PROJECT (SECTION 3)

KM.	Compensate Item	Spacing	Area (acre)	Est. Quantity	Remark
Realignment 2 lanes road (Shin Byu Daing Area)					
116+600	Land	-	5.70	-	
115+000	Land	-	1.56	-	
114+500	Land	-	2.30	-	
111+500	Land	-	3.27	-	
110+400	Land	-	1.81	-	
109+100	Land	-	4.57	-	
119+900	Land	-	1.95	-	
112+300	Land	-	4.48	-	
112+700	Land	-	0.47	-	
108+300	Land	-	0.88	-	
108+200	Land	-	0.78	-	
107+700	Land	-	0.78	-	
107+500	Land	-	0.39	-	
107+200	Land	-	0.31	-	
106+700	Land	-	0.30	-	
105+800	Land	-	3.35	-	
109+900	Land	-	4.12	-	
116+300	Land	-	2.59	-	
116+000	Land	-	4.14	-	
113+600	Land	-	1.58	-	
113+100	Land	-	0.90	-	
Total			**49.23**	-	
Realignment 2 lanes road (Vado Area)					
117+900	Land	-	6.96	-	
117+000	Land	-	1.62	-	
117+300	Land	-	6.02	-	
118+200	Land	-	1.96	-	
118+850	Land	-	5.52	-	
119+000	Land	-	2.66	-	
117+300	Land	-	5.10	-	
118+100	Land	-	1.16	-	
118+750	Land	-	3.34	-	
119+400	Land	-	15.34	-	
119+900	Land	-	7.04	-	
120+200	Land	-	6.98	-	
120+450	Land	-	2.06	-	
120+400	Land	-	3.08	-	
120+900	Land	-	4.60	-	
121+100	Land	-	2.56	-	
121+600	Land	-	2.68	-	
121+700	Land	-	2.36	-	
122+200	Land	-	1.00	-	
122+800	Land	-	4.28	-	
122+100	Land	-	2.28	-	
122+900	Land	-	0.16	-	
123+100	Land	-	2.70	-	
123+150	Land	-	3.10	-	
123+550	Land	-	2.36	-	
124+100	Land	-	4.02	-	
125+600	Land	-	1.58	-	
120+900	Land	-	2.08	-	
124+800	Land	-	2.80	-	
124+900	Land	-	2.52	-	
125+100	Land	-	6.18	-	
Total			**58.05**		
Realignment 2 lanes road (Vado to Amu)					
127+000 to 132+000	-	-	49.42	-	
Total			**49.42**		
Grand Total				**156.70**	

Source : Compensation Proposal for Building Two-Lanes Road Upgrade from Thailand's Border (Phu-Nam-Ron) Kanchanaburi Province to DSEZ Myanmar Dawei, ITD 2014.

TABLE 6.2.2-5

COST ESTIMATE FOR LAND AND COMPENSATION ITEM (SECTION 1)

Compensate Item	Area (acre) Section 1	Quantity	Unit Price (Kyats/acre)	Calculation	Cost Estimate (MKyats)
Land					
- Land (remaining access road)	13.76	-	N/A	-	139.30
- Land (remaining to pay on 4 lanes ROW increase obstruct 2 lanes road)	9.04	-	500,000 [a]	9.04 x ($5x10^5$)	4.52
- Land (critical point)	64.15	-	-	-	-
- Land (widening)	6.50	-	500,000 [a]	4.96 x ($5x10^5$)	2.48
- Land (Ministry of Agriculture and Irrigation)	47.16	-	-	-	-
House					
9 Households		9	20,000,000		**180**
Tree					
-Dayin (medium)	-	7	35,000 [a]	7 x (35,000)	0.245
-Pamelo (medium)	-	5	20,000 [a]	5 x (20,000)	0.100
-Cashew plant (medium)	-	53	75,000 [a]	53 x (75,000)	3.975
-Cashew plant (small)	-	400	15,000 [a]	400 x (15,000)	6.000
-Coconut (large)	-	-	-	-	
-Hilly Palm (large)	-	6	30,000 [a]	6 x (30,000)	0.180
-Rubber (small)	-	24,000	30,000 [b]	24,000 x 30,000)	720
-Rubber (medium)	-	1,146 192	100,000 [a] 70,000 [b]	$1,146 \times 10^5$ 193 x 70,000	114.6 13.44
-Rubber (large)	-	94	300,000 [a]	94 x 300,000	28.2
-Banana (large)	-	669	10,000 [a]	699×10^4	6.69
-Agar wood	-	800	-	-	-
-Betal (small)	-	-	-	-	-
-Betal (medium)	-	6,250 108	60,000 [a] 30,000 [b]	6,250 x 60,000 108 x 30,000	375 3.24
-Betal (large)	-	376 805	40,000 [b] 120,000 [a]	376 x 40,000 805 x 120,000	15.04 96.6
-Oil palm (large)	-	2,878	150,000 [a]	2,878 x 150,000	431.7
-Toddy palm (large)	-	-	-	-	-
Grand Total	**140.61**	-	-	-	**2,183.98**

Remark : a = Myitta Price, b = Regional Government Price

Source : Compensation Proposal for Building Two-Lanes Road Upgrade from Thailand's Border (Phu-Nam-Ron) Kanchanaburi Province to DSEZ Myanmar Dawei, ITD 2014

TABLE 6.2.2-6

COST ESTIMATE FOR LAND AND COMPENSATION ITEM (SECTION 2)

Compensate Item	Area (acre) Section 2	Quantity	Unit Price (Kyats/acre)	Calculation	Cost Estimate (MKyats)
Land					
- Land (widening)	9.37	-	-	-	-
- Land (realignment 2 lanes)	3.68	-	-	-	-
- Land (vista point)	30.15	-	-	-	60.30
Total	**43.20**				**60.30**
Tree					
- Dayin (medium)	-	-	35,000 [a]	-	-
- Pomelo (medium)	-	-	20,000 [a]	-	-
- Cashew plant (medium)	-	213	80,000	213 x 80,000	17.04
- Cashew plant (small)	-	-	15,000 [a]	-	-
- Coconut (large)	-	4	150,000 [a]	4 x 150,000	0.6
- Hilly Palm (large)	-	8	30,000 [a]	8 x 30,000	0.24
- Rubber (small)	-	-	30,000 [b]	-	-
- Rubber (medium)	-	3,084	100,000 [a]	3,084 x 10^5	308.4
	-	-	70,000 [b]	-	-
- Rubber (large)	-	-	300,000 [a]	-	-
- Banana (large)	-	1,859	10,000 [a]	1,850 x 10^4	18.5
- Agar wood	-	-	-	-	-
- Betel (small)	-	110	20,000 [a]	110 x 20,000	2.2
- Betel (medium)	-	-	60,000 [a and c]	-	-
		-	30,000 [b]	-	-
- Betel (large)	-	-	40,000 [b]	-	-
		-	120,000 [c]	-	-
- Oil palm (large)	-	-	150,000 [a]	-	-
- Toddy palm (large)	-	1	70,000 [a and b]	1 x 70,000	0.07
Grand Total	**43.20**	-	-	-	**406.29**

Remark : a = Myitta Price, b = Regional Government Price
Source : Compensation Proposal for Building Two-Lanes Road Upgrade from Thailand's Border (Phu-Nam-Ron) Kanchanaburi Province to DSEZ Myanmar Dawei, ITD 2014

TABLE 6.2.2-7

COST ESTIMATE FOR LAND AND COMPENSATION ITEM (SECTION 3)

Compensate Item	Area (acre) Section 3	Quantity	Unit Price (Kyats/acre)	Calculation	Cost Estimate (MKyats)
Land					
- Land (realignment 2 lane road) Shin byu Daing Village area	58.05	-	2,000,000	58.05 x ($2x10^6$)	116.10
- Land (realignment 2 lane road) Vado village area	49.23	-	2,000,000	49.23 x ($2x10^6$)	98.46
- Land (realignment 2 lane road) Vado to amu	49.42	-	2,000,000	49.42 x ($2x10^6$)	98.84
House					
26 Registered Household		26		26 x ($12x10^6$)	312
82 Non-registered Household		82		82 x ($6x10^6$)	492
Total	**156.7**				**1,117.4**

Remark : a = Myitta Price, b = Regional Government Price
Source : Compensation Proposal for Building Two-Lanes Road Upgrade from Thailand's Border (Phu-Nam-Ron) Kanchanaburi Province to DSEZ Myanmar Dawei, ITD 2014.

b. Residual Impacts

1) Level of Residual Impacts

The compensation and livelihood development assistance will minimize the impacts to a level that the residual impacts will be acceptable to the Affected People.

2) Evaluation of the Significance of Impact

The impact on livelihood is evaluated as follows:

Impact category	Direct impact from land acquisition
Impact duration	During pre-construction period
Impact magnitude	Significant if not adequately compensated. Livelihood shall be restored to the level before the Project.
Impact severity	Minor, residual impacts acceptable to the affected persons
Control priority	Medium

The land acquisition issue should receive medium control priority.

c. Proposed Monitoring

The implementation of RAP will be closely monitored throughout its implementation period. Details are presented in the RAP.

6.2.2.2 Environmental Disturbances Caused by Fugitive Dust

Impacts of the Project on air quality will be an issue of concern only during the pre-construction phase. The project emits major air pollution that is Particulate matter 10 micron (PM-10) and Total Suspended Particulate (TSP). PM-10 and TSP are considered as impermanent impact or short period effect which causes from pre-construction activities; for example, top soil opening, excavation, drilling and etc. As pre-construction activities, top soil opening is considered as the highest impact and spends time period the most.

(1) Potential Impacts

a. Sources

Potential sources of fugitive dust in this Project include:

- Site clearing including removal of vegetation and top soil;
- Excavation works, soil stripping and re-grading;
- Blasting activities at quarry site;
- Handling and transportation of excavated materials;
- Movement of heavy vehicles on unpaved roads and surfaces; and
- Deposition of dust from haulage trucks onto local roads.

Fugitive dust is expected in the construction of the project road, associated facilities; and in transportation of materials. However, the largest source of fugitive dust would be the areas of construction. However, measures for fugitive dust control will also be necessary at the project road and associated facilities to ensure no public complaints.

In addition to the control at the construction sites, efforts will need to be made to minimize fugitive dust generated by construction trucks along the transport routes.

b. Sensitivity of Receptors

The receptors of fugitive dust will be the same receptors of construction noise. They will be workers on site and communities near the project road alignment.

c. Magnitude of Fugitive Dust Emission at Sources

The amount of fugitive dust generated in the construction will depend primarily on the nature of construction works, soil characteristics, soil moisture content, types of construction equipment, and wind speeds.

In principle, the magnitude of fugitive dust emission could be calculated for each step of the construction process. However, considering the lack of detailed information on the construction steps, a global estimate has to be adopted using the Emission Factor in construction area established by the US.EPA (AP-42, US EPA 2005). The emission factor for TSP is 1.2 tons per acre (about 2.693 metric tons/ha) while PM 10 emission factor taken from California Air Resources Board (2013) is about 0.19 ton/acre/month of the construction area per month during the construction period.

(2) Proposed Mitigation Measures

a. Fugitive Dust Control Targets

The fugitive dust control target will be based on the World Bank's ambient air quality standard. This standard prescribes the concentration of TSP not exceeding 230 $\mu g /m^3$. The TSP level at the receptors will not exceed this limit.

b. Proposed Mitigation Measures at the Construction Sites

At all the construction sites, measures should be implemented to reduce fugitive dust emission. The most common measures are:

- Spray water at and around the construction areas during site preparation and grading.
- Enforce a speed limit for vehicles and trucks in the construction sites not to exceed 40 km/hr. Construction activities shall be kept as planned so that the disturbed areas will be minimized at any time.
- Restore, resurface, and rehabilitate the disturbed areas as soon as practicable after completion of construction or disturbance.
- Prohibit the open burning of waste in the construction area.
- Dust masks should be provided (where applicable) to all construction workers.

These measures especially water spraying twice a day together with strict implementation of other dust suppression measures should be able to reduce fugitive dust emission as much as 75% (US.EPA (2006), AP 42, chapter 13.2.2).

It should be noted that the dust suppression efficiency of water spraying will depend on the volume of water use per unit area and the frequency of spraying. A 75% efficiency could be expected.

c. Proposed Mitigation Measures Offsite

Fugitive dust along the transport routes should be minimized. Measures to be implemented by the EPC contractor should include:

- Enforce speed limit for trucks not to exceed 40 km/hr when passing the communities.
- Cover construction materials by tarpaulin sheet during transportation, materials should be dampened, if necessary, before transportation.
- Establish a vehicle washing facilities to minimize the quantity of material deposition on public roads.
- Establish a checkpoint at project gate to ensure the vehicles leaving the project site are following the measures prescribed to reduce dust emissions.

(3) Residual Impacts

a. Predicted TSP and PM-10 Levels at the nearby receptors from project road alignment

The dispersion of fugitive dust can be calculated using the Box Model recommended by Hanna, Briggs and Hosker (Handbook on Atmospheric Diffusion, 1987).

The Box Model is represented by the following formula:

$$C = \frac{Q}{d \times w \times m}$$

Where: C = concentration of dust (mg/m^3)

d = width of the project construction area perpendicular to wind direction (meteorological data period)

= 300 m.

w = average wind speed = 1.8 m/s.

m = average Daytime Mixing Height = 930 m

Q = the quantity of dust dispersion into ambient air

As literature review, the length of area which is perpendicular to wind direction is 500 meter (road length). The lowest wind speed collected 72 hrs continuous, 3 stations in dry season; January 2015 is 1.8 m/s. Project site does not have meteorological station so mixing height is not be collected on that area. We found that Bangna Meteorological Station in Thailand was the closest station to project site which has mixing height data so mixing height at day time (2010) on average was about 930 meter. PM-10 emission factor taken from California Air Resources Board (2013) is about 0.19 ton/acre/month while TSP emission factor taken from US.EPA (AP-42, US EPA 2005) is about 1.2 ton/acre/month. In this case, the Consultant assumed that the length of construction is limited to 500 meter length per day so the excavation area is 250,000 m^2 or 61.75 acre per day. If the number of construction days is assigned 30 day per month and 8 hour per day therefore PM 10 and TSP emission rate are 13,579.28 and 85,763.89 mg/s respectively. However, mitigation measure (i.e. spraying water) is applied during construction period. According to DSEWPC (2012), watering can reduce dust dispersion approximately 75%, so PM 10 and TSP emission can be left over 3,394.82 and 21,440.97 mg/s.

$$\text{PM 10} = \frac{3{,}394.82 \text{ mg/s}}{500 \text{ m} \times 1.8 \text{ m/s} \times 930 \text{ m}} = 4.06 \ \mu g/m^3$$

$$\text{TSP} = \frac{21{,}440.97 \text{ mg/s}}{500 \text{ m} \times 1.8 \text{ m/s} \times 930 \text{ m}} = 25.62 \ \mu g/m^3$$

PM-10 and TSP concentration from construction activity are found to be 4.06 and 25.62 $\mu g/m^3$ respectively. When it is added by the highest PM-10 and TSP 24 hr of background concentration (25-100 and 43-186 $\mu g/m^3$ at 3 stations including Toll Plaza, Myitta and Elasto Base 1 camp) so the overall PM-10 and TSP concentration will affect to sensitive area about 29.06-104.06 and 68.62-211.62 $\mu g/m^3$ respectively as shown ***Table 6.2.2-8***. According to National Environmental Quality (Emission) Guidelines (December 22, 2015), PM-10 (24 hr average) ambient standard is assigned to be less than 50 $\mu g/m^3$ so overall PM-10 concentration is not meet the standard. If PM-10 emission from construction activity is only considered, it will meet the standard. It means that without this project now PM-10 concentration at ambient air quality at Elasto Base 1 camp is above standard. In addition, it is due to no Myanmar TSP ambient air quality standards, so this study will use Thai ambient air quality standard for comparison. This concentration meets to Thai ambient air quality standard (330 $\mu g/m^3$) so the effect of TSP concentration from construction activity to ambient air quality is considered as low level. During construction period, project, however, prepares mitigation measures such as spraying water on ground to reduce the impact to ambient air quality.

It can be seen that even without control the total ambient TSP and PM-10 level will be much lower than the control target of not exceeding 330 and 50 $\mu g/m^3$, respectively.

Some of these maximum values are predicted to occur at Elasto Base 1 Camp. In order to evaluate the significance of the impact of TSP and PM-10, the calculated concentrations are compared with Thai ambient air quality standard due to there is no standard value for TSP in National Environmental Quality (Emission) Guidelines (Final Draft) of Myanmar. As a result of this comparison daily TSP concentration with control 75% suppression measures is under the limit value of the Thai ambient air quality standard.

TABLE 6.2.2-8

PM-10 AND TSP CONCENTRATION FROM CONSTRUCTION ACTIVITIES WITH BACKGROUND CONCENTRATION

Receptor	Unit	Emission from construction activities				Background concentration*		Overall concentration	
		Uncontrolled		Control 75% suppression					
		PM-10	TSP	PM-10	TSP	PM-10	TSP	PM-10	TSP
1.Toll Plaza Base Camp	µg/m^3	16.22	102.47	4.06	25.62	46-49	70-80	50.06-53.06	95.62-105.62
2.Myitta Base Camp	µg/m^3	16.22	102.47	4.06	25.62	25-34	43-58	29.06-38.06	68.62-83.62
3.Elasto Base 1 Camp	µg/m^3	16.22	102.47	4.06	25.62	80-100	158-186	84.06-104.06	183.62-211.62
Air quality Standards **		**50**	**330**	**50**	**330**	**50**	**330**	**50**	**330**

Remark * Result from air quality sampling during 21-31 January 2015 by ERTC.

** PM-10 standard is referred from National Environmental Quality (Emission) Guidelines (Final Draft), December 22, 2015. TSP standard is taken from Thai ambient air quality standards.

b. Evaluation of the Significance of Fugitive Dust Impact

The impact of fugitive dust impact on the nearby communities is evaluated as follows:

Impact category	Direct impact
Impact duration	Throughout the construction period of about 38 months. More visible during the site preparation duration.
Impact extent	Local air pollution mainly confined to communities nearby project alignment route.
Impact magnitude	Medium magnitude with control at sources
Impact severity	Medium, cause annoyance, insignificant impact on the receptors
Control priority	Medium

The fugitive dust issue should receive medium control priority.

(4) Proposed Monitoring

Levels of fugitive dust should be monitored quarterly during the construction at the major construction sites and along the major transport routes. Details are provided in the environmental management plan for the construction phase.

6.3 CONSTRUCTION PHASE- IMPACT AND RISK IDENTIFICATION, ASSESSMENT AND MITIGATION

6.3.1 Construction Phase Activities

During the construction period of about 37 months, the contractor will erect temporary facilities such as worker camps, office buildings, fence, water supply, drainage, canteen, toilets, etc. The construction would require about 1,200 workers/month at peak time. The worker camps would be located near the construction site or in each road section, and will be served with temporary water and electricity supply systems. Drinking water would be served by potable water from private sector within the vicinity project area. Electricity would be obtained from diesel generators.

Construction activities will include land acquisition, clearing and grubbing, transport of construction materials, transport of machineries and equipment, road construction, construction of bridges, culverts, and road side drains, and construction of service area and buildings. The activities in construction phase are carried out as follows:

Transport of Construction Materials: Soil, crushed rock and pipes for temporary drainage would be obtained from local sources and would be transported by trucks to various construction sites along the existing road. Reinforced steel and formwork will be transported from Thailand.

Transport of Machineries and Equipment: Most of the machineries and equipment for the construction will be transported from Thailand.

Road Construction: The road construction will involve upgrading the existing road and construction of the 10 new aligned sections. The upgrading work will involve grading, compacting, and asphaltic paving of the existing road. The construction of the realigned sections will involve grading, and compaction of sub-base and base layers, and asphaltic paving. These works will be carried out by heavy road construction equipment such as excavators, roller, pressure distributor, rotary brooms and blowers or air compressor.

Construction of Bridges, Culverts, and Road Side Drains: Construction of road side drains will be carried out as part of the road construction. Considering narrow spans of these bridges and the environment surrounding the sites, the construction would not create significant disturbances to the local traffic and the environment. The construction in the rainy period will be avoided to minimize erosion.

Construction of Service Area and Buildings: Some environmental disturbances would be expected at all the construction site, particularly at the service area sites, during the construction period of about 7 months. Piling may be required for foundation works subject to soil engineering survey and designs of the buildings.

6.3.2 Impact Identification

Table 6.3.2-1 presents a summary of identification of environmental and social issues anticipated during project construction based on technical information in the final design report, the Consultant's appreciation of the environmental and social ES settings of the project area, baseline information on existing ES condition in the project area, experience of the Consultant in ES impact assessment, and established knowledge of typical ES issues of road projects. These identified issues have also been presented in the Scoping Report.

TABLE 6.3.2-1

IDENTIFICATION OF ES ISSUES OF THE PROJECT

Project Activities	Disturbances on Physical Environment	Generic Impacts on Receptors	Likely Level of Significance in this Project
Construction of the road On-site Activities			
1. Clearing and Grubbing	- Noise, vibration and dust	- Discomfort and health risks to communities near the construction site	- Medium, 16 communities exists near the construction of the road.
2. Operation of trucks and heavy construction materials, machinery and equipment	- Noise, vibration and dust	- Discomfort and health risks to communities near the construction site	- Medium, 16 communities exists near the construction of the road.
3. Vegetation clearing along the alignment (40 m R.O.W)	- Land use change	- Impacts on terrestrial ecology	- Insignificant, deteriorated dry dipterocarp forests exist along the alignment route
4. Bridge construction, including river bed excavation or dredging	- Increased turbidity of river water, loss of benthic organisms - Impeding fishing activities	- Impacts on fish ecosystem, decreased fish catch - Impacts on water users - Public inconveniences, livelihood of fisherman - Impacts on livelihood	- Insignificant, poor fishery resource - Medium, villagers use river water - Medium, villagers use river for fishing activities.
5. Disposal of waste vegetation	- Noise and dust	- Discomfort and health risks to communities near the alignment	- Insignificant, only 2 communities near the end of alignment
6. Disposal of construction wastes	- Degradation of the disposal sites	- Soil contamination, impacts on terrestrial ecosystems (depending on characteristics of the disposal sites)	- Low, would not be difficult to find poor land for disposal site.
7. Land acquisition	- Change in land use and land ownership	- Affected communities, loss of properties and livelihood, relocation	- Medium, some part of agricultural land would be taken for construction site, no relocation.
Off-site Activities			
1. Transport of materials into and out of the quarry sites	- Noise, vibration, dust, and emissions Increased truck traffic on the roads	- Discomfort and health risks to communities along the transport routes - Traffic safety and community safety	- Significant, some communities exist along the road - Significant, some communities exist along the road

6.3.3 Impact Assessment

6.3.3.1 Gaseous Emissions

(1) Potential Impacts

a. Sources

Diesel-powered heavy construction equipment, vehicles and generator sets are the major sources of gaseous emissions during the construction. The emissions will include typical pollutants such as NO_x, SO_2, CO, and particulate in the exhaust gases discharged from the engines.

b. Sensitivity of Receptors

Gaseous emissions during the construction phase will create local air pollution confined within the construction sites. The receptors will be construction personnel.

Even though the nearest community (some house of Gad Tra Khee village) is only 40 m away from the project alignment, it is unlikely that this community will be affected by the gaseous emissions during the construction considering the small magnitude of the emissions and open space condition of the area.

c. Estimates of Emission Loads

Emission loads of various pollutants could be estimated from information on the number and type of diesel-engine construction equipment and their hours of operation. At this stage of project planning, such information is not completed in the Final Design Report. Besides, the pollution load would not be large.

d. Mitigation Measures for Emission Reduction at Sources

The EPC contractor will be required to adopt best practices to minimize gaseous emissions at sources through the following management measures:

- Adopt procedures to avoid construction vehicles idling for excessive periods (e.g. more than 5 minutes) if required to queue to enter the construction sites;
- Maintain all construction equipment in proper working conditions according to the manufacturer's specifications. The engines of the construction equipment fleet must be routinely maintained by qualified mechanics to ensure their proper conditions during operations.
- Provide adequate training to the equipment operators in the proper use of equipment.
- Use the proper size of equipment for the job.
- Use the equipment fitted engines with latest low emission technologies (repowered engines, electric drive trains). For example, the diesel generator set to be used must be equipped with modern pollution control equipment.

- Perform on-site material hauling with trucks equipped with on-road engines (if determined to be less emissive than the off-road engines).

- Take measures to manage the movement of construction vehicles entering and leaving the construction sites to avoid, or mitigate and manage the potential for vehicle emissions impacting on adjacent properties, except where such residential or sensitive activities front an arterial road to be used for access to or from the construction site. Measures for construction fleet management are to be provided in the construction vehicle management plan and the construction traffic management plan. Such measures may include avoiding or minimizing queuing on streets approaching the worksites or adjacent to other sensitive activities;

- For stationary plant and equipment powered by diesel motors, take measures to avoid or mitigate and manage the potential impacts of exhaust emissions on adjacent residential or other sensitive activities. For example, ensure all construction vehicles and stationary plant and equipment powered by diesel motors are fitted with emission control measures, and are regularly maintained to manufacturers' specifications.

(2) Proposed Mitigation Measures

a. Emission Control Targets

Ambient air quality at the construction site will comply with the applicable ambient air quality standards.

b. Impact Mitigation Measures

No additional mitigation measures apart from the source reduction measures would be necessary. However, heavy equipment operators could be provided with masks, if deemed necessary, to minimize the impact of particulates.

(3) Residual Impacts

a. Predicted Impacts on Receptors

Considering the low emission loads, the impact of gaseous emission during the construction phase on the construction personnel is expected to be insignificant.

b. Evaluation of the Significance of Impacts

The significance of the impact of gaseous emissions was evaluated as shown below. The issue is considered low priority during the construction period.

Impact category	Direct impact
Impact duration	Throughout the construction period of about 38 months.
Impact extent	Local, confined to communities nearby project alignment route.
Impact magnitude	Small, short term
Impact severity	Insignificant
Control priority	Low

Gaseous emissions during construction will not create significant air pollution problem. Nevertheless, best management practices must be adopted to minimize gaseous emissions during construction.

Overall the impact from gaseous emission during the construction phase is local in extent, short-term in duration and low in magnitude. The significance of impact from gaseous emissions during construction can be considered low, once mitigation measures are implemented.

(4) Proposed Monitoring

Ambient air quality at the communities nearby project alignment should be measured quarterly starting when the construction becomes intensive. If the air quality is found to meet the control target, the monitoring should be terminated or the frequency reduced. Details are provided in the environmental management plan for the construction phase.

6.3.3.2 Noise

Excessive noise at the sensitive receptors will be an issue of concern only during the construction phase. Noise could be associated with vibration such as noise from drilling, heavy construction equipment, and vehicles is normally not high enough to create vibration.

In this Project, the noise issue will be mostly felt at the main construction site. The problem is localized and will cease to exist after the noise generating activities are completed.

(1) Potential Impacts

a. Sources

Noise impact during construction period is mainly depended on the activities and equipment. Construction machines include backhoe, dozer, paver, air compressor, compactor, crane (mobile), pile driver (impact), truck, roller and grader. Actually, working time of construction period is assigned at 8 hr/day. The main activities of construction periods consist of two activities; 1) road construction and 2) bridge construction.

b. Sensitivity of Receptors

Receptors are considered as along with the road side. The receptor points are assigned at 15, 50, 100, 250, 500, 1,900, 2,400, 4,200 and 5,350 meter from noise source.

c. Magnitude of Noise Levels at Sources

Table 6.3.3-1 compiles data on noise levels of various construction equipment relevant to the construction of this Project. As a standard, noise levels for construction equipment are referred to the levels measured at 15 m from the sources.

TABLE 6.3.3-1

NOISE LEVELS OF CONSTRUCTION EQUIPMENT RELATED TO THE PROJECT

Equipment	Typical Noise Level (dBA) at 15 m (50 ft)	Acoustical Usage Factor (%)
1) Road construction		
Backhoe	80	40
Dozer	85	40
Paver	89	40
Air Compressor	81	40
Compactor	82	40
Total noise level	**91.7**	
2) Bridge construction		
Crane (Mobile)	83	40
Pile Driver (Impact)	101	20
Backhoe	80	40
Truck	88	40
Roller	74	40
Grader	85	40
Total noise level	**101.4**	

Source : U.S EPA, "Noise from Construction Equipment and Operations, Building Equipment and Home Appliances", NTID300.1, December 31, 1971

The data in ***Table 6.3.3-1*** shown that total noise levels of road construction and bridge construction calculated by total noise **Equation 1.1** are of 91.7 and 101.4 dBA at 15 m respectively. However, working time of construction activities is assigned at 8 hr/day, so the noise level of 1 hr can be calculated by **Equation 1.2**. The noise levels of both at 1 hr are of 96.9 and 104.0 dBA at 15 m respectively.

$$Lp_{Total} = 10\log\left(\sum_{i=1}^{N} 10^{Lp_i/10}\right) \quad \text{..... (Equation 1.1)}$$

Where; Lp_{Total} = Total noise level (dBA)

L_{pi} = Noise level of each types of equipment at 50 ft or 15 m.

$$Leq_T = Lp + 10\log\frac{t}{T} \quad \text{..... (Equation 1.2)}$$

Where; Leq_T = Noise level at desired period (T)

Lp = Noise level of each types of equipment (dBA)

T = Working time of equipment or activities (hr)

T = Desired period (hr)

(2) Proposed Mitigation Measures

a. Noise Control Targets

The targets of construction noise control at the receptors are dictated by the adopted noise standards. For the Project, the construction noise control will be designed to achieve two conditions:

- The maximum background noise level expressed in Leq-1 hr. exceeded the limit set by Myanmar National Environmental Quality (Emission) Guidelines and the IFC Standard during both daytime (55 dBA) and nighttime (45 dBA).
- The increase in the ambient noise level is not more than 3 dB(A) Leq-1 hour (Myanmar National Environmental Quality (Emission) Guidelines).

b. Proposed Measures

Physical Measures

Possibilities are limited for reduction of noise levels of construction equipment. The EPC contractor and the subcontractors may rent construction equipment from suppliers and would not be at liberty to improve them. It is difficult to design practicable noise retrofit kits to endure the environment of the construction sites. Therefore, the EPC contractor and his subcontractors should be required to use equipment that has best noise performance.

In addition, workers will need to be provided with ear plugs or ear muffs operating in the excessive noise areas.

Management Measures

The following management measures should be implemented to complement the physical measures.

- Major construction activities which generate loud noise should be limited to only during the day time. Activities that are necessary to be carried out at night time will need approval of the site engineers, and will need to have adequate noise control equipment or measures.
- Speeds of vehicles in the construction site will not be more than 40 km/hr.
- Noise performance requirements of construction equipment will need to be clearly stated in contract specifications.
- The EPC contractor will be required to regularly monitor ambient noise levels at the receptors, particularly during the noise generation period.
- The construction environmental management plan will need to include an efficient complaints redress procedure and an efficient corrective action procedure to address the non-compliance of noise performance.

(3) Residual Impacts

a. Predicted Noise Levels at the Receptors from the Construction Site

Noise impact levels from construction activities are assessed according to distances from noise source by noise equation referred to Roadway Construction Noise Model User's Guide (FHWA, 2006). Noise level in **Equation 1.3** will be decreased by adding the distance between source and receptor. This project will not provide noise barrier during construction period due to intermittent noise impact so shielding value is zero. Time-averaging equipment usage factors (U.F.%) are approximately 20-40%.

$$L_{eq} = L_{max\ at\ source} - 20 \log (D/50) + 10 \log (U.F.\% /100) - Shielding \quad \textbf{(Equation 1.3)}$$

Where L_{eq} = Noise level at distances from source

$L_{max\ at\ source}$ = Noise level of source at 15 m (50 ft)

D = Distance between source and receptor (m)

U.F. % = Time-averaging equipment usage factor, in percent

Shielding = Barriers or mitigation (dBA)

Noise impact level results of road and bridge constructions at various distances shown in ***Table 6.3.3-2*** are of 48.0-96.9 and 55.0-104.0 dBA at 1 hr respectively. The safe zones during road and bridge constructions which meet noise standard (55.0 dBA at 1 hr) are at 1,900 and 4,200 m respectively.

TABLE 6.3.3-2

NOISE IMPACT LEVEL AT VARIOUS DISTANCES FROM SOURCE

Construction machines	Typical Noise Level (dBA) at 15 m (50 ft)	Acoustical Usage Factor (%)	Noise level at distance from source						
			15 m	50 m	100 m	250 m	500 m	1,900 m	4,200 m
			49 ft	164 ft	328 ft	820 ft	1,640 ft	6,232 ft	13,776 ft
1.Road Construction									
Backhoe	80	40	76.2	65.7	59.7	51.7	45.7	34.1	27.2
Dozer	85	40	81.2	70.7	64.7	56.7	50.7	39.1	32.2
Paver	89	40	85.2	74.7	68.7	60.7	54.7	43.1	36.2
Air Compressor	81	40	77.2	66.7	60.7	52.7	46.7	35.1	28.2
Compactor	82	40	78.2	67.7	61.7	53.7	47.7	36.1	29.2
Total noise level (8 hr/day)*			**87.9**	**77.4**	**71.4**	**63.5**	**57.4**	**45.9**	**39.0**
Noise level at 1 hr (Leq 1 hr)**			**96.9**	**86.5**	**80.5**	**72.5**	**66.5**	**54.9**	**48.0**
Noise standard (1 hr)			**55.0**						

TABLE 6.3.3-2

NOISE IMPACT LEVEL AT VARIOUS DISTANCES FROM SOURCE (CONT'D)

Construction machines	Typical Noise Level (dBA) at 15 m (50 ft)	Acoustical Usage Factor (%)	Noise level at distance from source						
			15 m	50 m	100 m	250 m	500 m	1,900 m	4,200 m
			49 ft	164 ft	328 ft	820 ft	1,640 ft	6,232 ft	13,776 ft
2.Bridge Construction									
Crane (Mobile)	83	40	79.2	68.7	62.7	54.7	48.7	37.1	30.2
Pile Driver (Impact)	101	20	94.2	83.7	77.7	69.7	63.7	52.1	45.2
Backhoe	80	40	76.2	65.7	59.7	51.7	45.7	34.1	27.2
Truck	88	40	84.2	73.7	67.7	59.7	53.7	42.1	35.2
Roller	74	40	70.2	59.7	53.7	45.7	39.7	28.1	21.2
Grader	85	40	81.2	70.7	64.7	56.7	50.7	39.1	32.2
Total noise level (8 hr/day)*			**94.9**	**84.5**	**78.5**	**70.5**	**64.5**	**52.9**	**46.0**
Noise level at 1 hr (Leq 1 hr)**			**104.0**	**93.5**	**87.5**	**79.5**	**73.5**	**61.9**	**55.0**
Noise standard (1 hr) ***			**55.0**						

Remark: * Total noise levels are calculated by **Equation 1.1**
** Noise levels at 1 hr are calculated by **Equation 1.2**
*** National Environmental Quality (Emission) Guidelines (Final Draft), December 22, 2015

b. Nuisance noise

Nuisance noise level can be calculated by **Equation 1.4** which uses correcting total noise level at 1 hr from construction machines subtracting to background noise level (L90) at 1 hr. As ***Table 6.3.3-3***, nuisance noise level results of road and bridge construction at 15-5,350 m are of 3.4-53.8 and 10.0-60.9 dBA respectively. Nuisance noise levels from road and bridge construction which meet nuisance noise standard are at 2,400 and 5,350 m from noise source.

Nuisance noise level =
Noise level from project – Background noise level (L90).....**(Equation 1.4)**

c. Evaluation of the Significance of Noise Impact

The impact of construction noise on the nearby communities is evaluated as follows:

Impact category	Direct impact
Impact duration	Throughout the construction period of about 38 months. More significant during the site preparation.
Impact extent	Local confined to areas around the construction sites
If no control - **Impact magnitude**	Resulting ambient noise levels fully met the applicable standard
- **Severity**	Negligible
Control priority	Medium

The construction noise issue deserves medium control priority.

(4) Proposed Monitoring

A proposed noise monitoring program is proposed in the construction phase EMP.

TABLE 6.3.3-3

NUISANCE NOISE LEVEL (dBA)

Description	Nuisance noise level at various distances from source								
	15 m	50 m	100 m	250 m	500 m	1,900 m	2,400 m	4,200 m	5,350 m
	49 ft	164 ft	328 ft	820 ft	1,640 ft	6,232 ft	7,872 ft	13,776 ft	17,548 ft
1.Road construction									
1.1 Noise level from source at 1 hr	96.9	86.5	80.5	72.5	66.5	54.9	52.9	48.0	45.9
1.2 Baseline noise level at 1 hr	45.0								
1.3 Total noise level 1 hr	96.9	86.5	80.5	72.5	66.5	55.3	53.5	49.8	48.5
1.4 Difference between total and baseline noise level	51.9	41.5	35.5	27.5	21.5	10.3	8.5	4.8	3.5
1.5 Correcting factor	0	0	0	0	0	0.5	0.5	1.5	2.0
1.6 Total noise subtracting to correcting factor	96.9	86.5	80.5	72.5	66.5	54.8	53.0	48.3	46.5
1.7 Background noise level (L90)	43.1								
1.8 Nuisance noise level	53.8	43.4	37.4	29.4	23.4	11.7	9.9	5.2	3.4
Nuisance noise standard (dBA)*	**10**								
2.Bridge construction									
2.1 Noise level from source at 1 hr	104.0	93.5	87.5	79.5	73.5	61.9	59.9	55.0	52.9
2.2 Baseline noise level at 1 hr	45.0								
2.3 Total noise level 1 hr	104.0	93.5	87.5	79.5	73.5	62.0	60.0	55.4	53.6
2.4 Difference between total and baseline noise level	59.0	48.5	42.5	34.5	28.5	17.0	15.0	10.4	8.6
2.5 Correcting factor	0	0	0	0	0	0	0	0.5	0.5
2.6 Total noise subtracting to correcting factor	104.0	93.5	87.5	79.5	73.5	62.0	60.0	54.9	53.1
2.7 Background noise level (L90)	43.1								
2.8 Nuisance noise level	60.9	50.4	44.4	36.4	30.4	18.9	16.9	11.8	10.0
Nuisance noise standard (dBA)*	**10**								

Remark: * Thailand's National Environment Board Notification No.29 (2007): Nuisance noise standards.

6.3.3.3 Vibration

Impacts of the Project on vibration will be an issue of concern only during the construction phase. Major of vibration is heavy machines using.

(1) Potential Impacts

a. Sources

Vibration impact from both road and bridge construction activities can be generated from heavy machines especially pile driver (impact), vibratory roller, loaded trucks, and small bulldozer as shown in ***Table 6.3.3-4***. Vibration from construction is; however, considered as temporary impact to surrounding sensitive areas but it can cause annoying to vicinity.

b. Sensitivity of Receptors

Receptors are considered as along with the road side. The receptor points are assigned at 50 m (164 ft), 100 m (328 ft), 250 m (820 ft) and 500 m (1,640 ft). from source.

c. Predicted of Vibration Levels at the Receptors

Vibration impact from source to receptor can be calculated by **Equation 1.1**. This equation is dependent on the equipment types and distance between source and receptors.

$$PRV_{at\ receptor} = PRV_{equipment} * (25/D)^{1.5} \quad \text{.....Equation 1.1}$$

Where; $PRV_{at\ receptor}$ = Peak particle velocity in in/sec of the equipment adjusted for distance

$PRV_{equipment}$ = The reference vibration level in in/sec at 25 ft, see in ***Table 1.1***

D = Distance between equipment and receptors in ft

TABLE 6.3.3-4

VIBRATION LEVEL OF EACH EQUIPMENT

Equipment	Vibrating velocity at 25 ft from source (in/s)
Pile Drive (impact)	0.644 (typical)
Vibratory Roller	0.210
Loaded Trucks	0.076
Small Bulldozer	0.003

Source: Transit Noise and Vibration Impact Assessment, 2006.

The vibration effects on human health and buildings can be explained in ***Table 6.3.3-5***. As ***Table 6.3.3-6***, the vibration impact results at 50-500 m from source are found to be 0.97-0.0002 mm/s (0.03833-0.00001 in/s), so when comparing to ***Table 6.3-15*** the highest vibration impact levels of construction equipment at 50 m can feel vibration and may destroy ancient monuments. However, at 50 m from centerline of road is in the right of way which does not include any ancient monuments. All distances are safe for human health which can just be sensed the vibration. While, the safe zone of building (at 0.3 mm/s or 0.012 in/s) is found to be more than 100 meter from source of vibration.

TABLE 6.3.3-5

HEALTH AND BUILDING EFFECT FROM EACH VIBRATION LEVEL

Peak Particle Velocity (PPV) mm/s (in/s) 1/	Health effect	Building effect 2/
0 - 0.15 (0-0.006)	Imperceptible	Unlikely to cause damage of any type.
0.15 - 0.3 (0.006-0.012)	Threshold of perception	Unlikely to cause damage of any type.
2.0 (0.079)	Vibrations perceptible	Recommended upper level to which ruins and ancient monuments should be subjected.
2.5 (0.098)	Continuous exposure to vibrations begins to annoy	Virtually no risk of "architectural" damage to normal buildings.
5 (0.197)	Vibrations annoying to people in buildings	Threshold for risk of "architectural" damage in houses with plastered walls and ceilings.
10-15 (0.394-0.591)	Continuous vibrations unpleasant and unacceptable	Would cause "architectural" and possibly minor structural damage.

Remark: 1/ Peak Particle Velocity in the vertical direction. Frequency of vibration is assumed in the range of 5-20 Hz
2/ The criteria for buildings recognize that the building damage will result from a fatigue failure over a long period of time (not from a one-time event)

Source: Whiffin, A.C., and Leonard, D.R., A Survey of Traffic Induced Vibration, Eng., 1971.

TABLE 6.3.3-6

VIBRATION IMPACT RESULTS

Unit: mm/s (in/s)

Equipment	Distance between equipment and receptors			
	50 m (164 ft)	100 m (328 ft)	250 m (820 ft)	500 m (1,640 ft)
Pile Drive (impact)	0.97 (0.03833)	0.34 (0.01355)	0.09 (0.00343)	0.03 (0.00121)
Vibratory Roller	0.32 (0.01250)	0.11 (0.00442)	0.03 (0.00112)	0.01 (0.00040)
Loaded Trucks	0.115 (0.00452)	0.041 (0.00160)	0.010 (0.00040)	0.004 (0.00014)
Small Bulldozer	0.0045 (0.00018)	0.0016 (0.00006)	0.0004 (0.00002)	0.0001 (0.00001)

(2) Proposed Mitigation Measures

a. Vibration Control Targets

The targets of construction vibration control at the receptors are dictated by the adopted vibration standard. For the Project, the construction vibration control will be designed to achieve as follow:

- The Peak Particle Velocity value at the distance from the source between 301-500 ft not greater than 1 inch/s set by US Bureau of Mines (USBM), 1971.

b. Proposed Measures

- Major construction activities which generate vibration should be limited to only during the day time. Activities that are necessary to be carried out at night time will need approval of the site engineers.
- Speeds of vehicles in the construction site will not be more than 40 km/hr.
- Noise performance requirements of construction equipment will need to be clearly stated in contract specifications.
- The EPC contractor will be required to regularly monitor ambient vibration levels at the receptors.
- The construction environmental management plan will need to include an efficient complaints redress procedure and an efficient corrective action procedure to address the non-compliance of vibration performance.

6.3.3.4 Surface Water Quality

(1) Potential Impacts

The project may impact on surface water quality during construction through accidental contamination and increased turbidity of water courses, particularly during the construction of the 10 major new road sections, construction of 21 bridges and cross drain structure, and the vista point at KM 79+700 near the Tanintharyi River. The longest bridge will be at Dawei River with a total length of about 250 m. Details of the impacts from the project construction activities on water quality are described as follows:

- **Increase of Turbidity**

Concerning the increase of turbidity due to the bridge construction of the road alignment crossing water courses. Based on the survey data of existing bridges along the project alignment in Sections 1, 2, and 3, most of the bridges will cross moderately narrow rivers with widths between 15 to 30 m, few rivers wider than 50m are also expected. It is expected that the impact on downstream water users will be minimal because most of bridge construction will be accelerated in dry season with enforcement of soil erosion prevention measures and suitable construction method to avoid disturbing the downstream water users. In addition, the water turbidity will be diluted as it extends downstream. Finally, the water turbidity will return to the natural level. Thus, the impact is in low level.

- **Wastewater Contamination Caused by the Camp Site**

During construction phase, there are about 1,200 employees in construction site (including office employees and construction workers in the project site). Each of the camp site

will accommodate about 400 persons whose water consumption rate should be 50 m^3/d or 200 litre/person/day and the wastewater produced should be 64 m^3/d or approximate 80 percentage of water consumption. Most of wastewater produced from worker camps and office buildings in each camp area are related to daily/routine activities such as showering, washing, cooking, cleaning and sewage etc. These activities increase more contamination in forms of grease & oil contamination, more BOD, nitrogen and phosphorus etc. contents in watercourses nearby worker camps and office buildings. However, it is contractor's responsibility to provide sufficient sanitary toilets, septic tanks as designed with 15:1 ratio (15 persons per 1 toilet) and 8:1 ratio in every 8 persons more or at least not less than 30 toilet. Besides, the contractor has also to set up a grease & oil trap / pond at least one kitchen with carrying capacity of not less than 64 m^3; and provide drinking water for 120 litre/person/day. Through these facilities and mitigation measures, wastewater contamination can be diluted prior to being drained into watercourses nearby the project area. Therefore, the said impact is regarded low.

(2) Proposed Mitigation Measures

The EPC Contractor will be required to implement best management practices in reducing the impacts on water turbidity and wastewater contamination caused by road construction, bridge construction and camp site.

Mitigation measures will consist of operational controls and engineered controls are described below:

- Retain as much natural vegetation cover as possible during excavation.
- No materials will be stored within 50 m of a water course.
- Provide temporary drainage to ensure that any storm water running off construction areas will be controlled around permanent water bodies.
- Install water collection basins and sediment traps in all areas where construction equipment is washed.
- Place at fuel storage, maintenance shop and vehicle cleaning areas at least 300 m away from the nearest water body.
- The bridge and cross drain construction should be conducted in dry season.
- Provide an adequate number of latrines and other sanitary arrangements at the site and work areas, and ensure that they are cleaned and maintained in a hygienic state.

(3) Residual Impacts

If the proposed mitigation measures are strictly implemented, the turbidity increase in the river would be reduced and would not affect river water users downstream. The water would still be of acceptable quality for domestic consumption except drinking with no boiling or other treatments.

(4) Proposed Monitoring

River water quality will need to be monitored during the bridge construction particularly in the dry season. A water quality monitoring program is proposed in the construction phase EMP.

(5) Evaluation of the Significance of Water Quality Impact

The impact of increased water turbidity on the nearby communities is evaluated as follows:

Impact category	Direct impact
Impact duration	More significant during the bridge construction at the wide river (more than 30 m) such as Dawei river, Tha Laing Ya Shaung, Tha Laing Ya Shaung (Mia Phyu), Tha Byu Shaung and Kamoethway River
Impact extent	A river section downstream of the construction site. The length and magnitude of impacts will depend on river flows.
If no control - **Impact magnitude**	Increased water turbidity in the river near the construction site and bridge construction in the rivers
- **Severity**	Moderate
Control priority	Medium

The water quality issue deserves medium control priority.

6.3.3.5 Aquatic Ecology

Results of the aquatic ecology surveys, presented in ***Section 5.3.2 of Chapter 5-Description of the Environment***, established that the 11 water sampling stations which the bridges cross the. River such as Dawei River, Tha Laing Ya Shaung, Tha Laing Ya Shaung (Mia Phyu), Tha Byu Shaung and Kamoethway River and etc. The results found that the phytoplankton to zooplankton ratio was higher than 1 indicating that food for 2nd consumer are sufficient. The species diversity index (SDI) of plankton was in range of 1.17-2.45 while SDI of benthic was between 0.23-1.26. This indicates the high diversity of the aquatic ecology in the project area.

Main impacts upon aquatic ecosystem caused by the road project construction phases is described as follows:

(1) Potential Impacts

- **Increasing Amount of SS in Watercourses**

Watercourses expected to encounter with aquatic ecological impacts are watercourses that located nearby construction sites and river where the bridge construction including 19 bridges. Based on the prediction, for the worst case, of SS being brought down into the 11 representative rivers in the road alignment cut across, the measured suspended solids (SS) values in the 10 representative rivers are in the range of less than 5-5.80 mg/l ***(See Table 5.2-10)*** which are regarded as less turbidity (< 25 mg/l) whereas the SS recorded in Dawei River is 780 mg/l which is regarded as high turbidity [>100 mg/l (Boyd, 1979)].

High turbidity prevents the light from penetrating into deeper water layers resulting in an inadequate amount of light for photosynthesis. This phenomena is unfavorable condition for phytoplankton growth and yields a decreasing amount of phytoplankton which may follow by decreasing number of zooplankton and benthos since zooplankton feed on phytoplankton and most benthic animals feed on small zooplankton and organic substances along waterbed. To mitigate aquatic ecological impacts, the project construction should be proceeded during dry season in as shortest period as possible. In addition, the bridge crossing will be expedited by appropriate technology which should be completed within the short time. All of the concerned areas e.g., river bed, and banks will be stabilized to original condition. In addition, the benthic organisms can transferring/migrating themselves from unfavorable conditions such as high SS or turbidity. due to their mobile nature. Therefore, impact on plankton and benthic organisms will be minimum.

- **Wastewater Contamination Generating from Camp Sites**

Wastewater being generated by employees in each camp site, approximately 64 m^3/day, are from routine activities such as bathing, washing, cleaning etc. This wastewater may affect water quality in receiving water sources due to quite a few contaminants including grease & oil, phosphorus, nitrogen and organic substances whose amount of these contaminants in watercourses nearby camp sites will be increased and leading to aquatic ecosystem impacts. However, according to construction contract, it is contractor's responsibility to provide an adequate number of sanitary toilets for all employees at each camp site. Wastewater and sewage will go to septic tank system with no directly draining into water sources directly. Besides, locations of camp sites have to be placed at least 50 meters away from any watercourses. Therefore, it is anticipated that water quality impacts upon the related aquatic ecosystems would be low.

(2) Proposed Mitigation Measures

- Apply the same mitigation measures as for controlling the water turbidity and wastewater contamination are already presented in ***Section 6.3.4*** surface water quality.
- Inform the construction schedule of bridge to local fishermen living near the river where the road alignment cut across.

(3) Residual Impacts

If the proposed mitigation measures are strictly implemented, the turbidity increase in the river would be reduced and would not affect plankton and benthic organism.

(4) Proposed Monitoring

Aquatic ecology will need to be monitored during the bridge construction particularly in the dry season. Aquatic ecology monitoring program is proposed in the construction phase EMP.

(5) Evaluation of the Significance of Aquatic Ecology Impact

The impact of on aquatic ecology is evaluated as follows:

Impact category	Indirect impact
Impact duration	More significant during the bridge construction at the wide river (more than 30 m) such as Dawei river, Tha Laing Ya Shaung, Tha Laing Ya Shaung (Mia Phyu), Tha Byu Shaung and Kamoethway River
Impact extent	A river section downstream of the construction site. The length and magnitude of impacts will depend on river flows.
If no control - **Impact magnitude**	Medium due to high diversity of the aquatic ecology in the rivers
- **Severity**	Moderate
Control priority	Low

The issue deserves low priority.

6.3.3.6 Soil Erosion and Soil Contamination

(1) Potential Impacts

- **Soil Erosion**

The construction of the road alignment will pass of rolling areas, mountain areas, plantation areas and forest areas. The impact mostly occurs in the construction site is erosion at slop areas of rolling and mountain areas. The erosion rates will increase in construction site on slope areas in rainy season. However, the project design has given a suitable ratio for slide slope whereas the embankment will be compacted hardly and adjusted to very less slope. In addition, the project design will also follow applicable international standards such as those prescribed in AASHTO Standard "A Policy on Geometric Design of Highways and Street" 2004, Class II of ASEAN Highway design standards and Class IV of the Highway Design Standards of the Department of Highways (DOH), Thailand. Therefore, it is anticipated that the amount of sediment being eroded will slowly flow to the original land and flat land, before gradually flow into water sources. Thus, the impact will be in medium level.

- **Soil Contamination**

Contamination of soil in the construction phase may result from the inappropriate transfer, storage, and disposal of petroleum products, lubricants, chemicals, hazardous materials, liquids and solid waste. These impacts are particularly associated with construction camps where the majority of potentially contaminating chemicals are stored, and during refueling of plant and equipment.

(2) Proposed Mitigation Measures

Mitigation Measures for Soil Erosion

- Grass planting covering on side slope immediately after completion of embankment construction as detailed in ***Appendix 6A***.
- Minimizing the area of soil clearance.
- Construction in erosion and flood-prone areas will be mainly restricted to the dry season where possible.

- Properly stabilize slopes and re-vegetate disturbed surfaces using locally available indigenous grass species.

- Use of temporary berms or other appropriate temporary drainage provisions at construction sites.

Mitigation Measures for Soil Contamination

- Store chemicals/hazardous products and waste on impermeable surfaces in secure, covered areas with clear labeling of containers and with a tray or bund to contain leaks.

- Regularly remove all construction wastes from the site to approved waste disposal sites.

(3) Evaluation of the Significance of Soil Impact

The impact of soil erosion and soil contamination are evaluated as follows:

Impact category	Direct impact
Impact duration	Soil erosion: Throughout the construction period. More significant during the construction at the slope areas of rolling and mountain areas in the rainy season. Soil contamination : Throughout the construction period,
Impact extent	Soil erosion : Mainly the cultivated areas and rivers near the construction of slope areas Soil contamination : Local soil , mainly confined to within the disposal sites
If no control - **Impact magnitude**	Medium
- **Severity**	Significant
Control priority	Medium

The soil erosion and soil contamination issues deserve medium control priority.

6.3.3.7 Forest and Wildlife

(1) Potential Impacts

- **Loss of Forest Area and Forest Ecology**

The project road will has a total length of about 138 km. The Right Of Way (R.O.W.) will be 40 m. The road construction will necessary cause the loss of trees which are currently within the Right Of Way (RoW). For the worst case (138 km.), about 1,364 acres of land, mostly forest, were cleared (=138 km x 1000 m x 40 m/4,047 m^2). The 1,364 acres of land can be categorized as 69,990 trees, 501,466 saplings and 5,585,267 seedlings (***See Section 5.3.1***). However, the construction of the existing road, about 1,514 acres of land, mostly forest, were cleared (=153.2 km x 1000 m x 40 m/4,047 m^2). In addition, the loss of forest land for construction of the 10 realigned sections (about 31 km) under the Project will be only about 306 acres (=31 km x 1000 m x 40 m/4,4047 m^2). Therefore, impacts of the Project on the forest area due to additional forest clearing would be less than impacts of the existing road.

Existing forest resource within the Right Of Way along the road alignment identified at least 242 plants species in dry evergreen forest, mixed delicious forest and freshwater swamp forest *(*see ***Section 5.3.1).*** Of the 242 plants species, 6 species are listed as threated species in the IUCN Red List (2013) namely *Dipterocarpus*

chartaceus Symington in Critically Endangered Species (CR), *Shorea roxburghii* G. Don in Endangered Species (EN), and *Borassodendron machadonis* (Ridl.) Becc., *Cycas pectinata* Buch.-Ham. and *Hopea odorata* Roxb in Vulnerable Species (VU). Therefore, impact on forest ecology is the permanent changes and diversity will not be decreased.

- **Wildlife**

During construction phase, the tree and shrubs standing within the Right Of Way area will be removed for constructing access roads, bridges and road. These activities may effect wildlife as following:

- Habitats of some wildlife species are altered through clearing tree and shrubs in the Right Of Way area and in the access road area.

- Feeding areas and food sources, both direct and indirect, of wildlife are diminished. This is due to a variety of forage plant species will be removed from the Right Of Way area and in the access road. The decreasing of various plant species in the area means the diminishing of indirect food source of wildlife.

- Wildlife may be disturbed by noise of construction machines, engines and the crowd of construction workers and vehicles.

- Features of natural habitat in some areas may be changed due to and filling by residual soil getting from the road area and bridge construction vicinity areas.

Based on the existing wildlife resource within the Right Of Way along the road alignment, there are 135 species of wildlife consisting of 17 mammal species, 86 bird species, 21 reptile species, and 11 amphibian species. One species is classified as Vulnerable Species (VU), namely *Capricornis Sumatraensis*. Five species are classified as Near Threatened Species (NT), namely *Pardofelis temminckii*, *Anhinga melanogaster*, *Psittacula alexandri*, *Buceros bicornis* and *Chloropsis cyanopogon*. ***(See Section 5.3.1).*** However, most of the wildlife species found in the right of way area were small animals which had adapted to thrive well in disturbed and poor habitats. In addition, during the upgrading of existing road, some wildlife species would flee from the construction areas due to the loss of habitats and loud noise from road improvement activities. Thus, the impact on wildlife

(2) Proposed Mitigation Measures

Mitigation Measures for Forest

- Protect vegetation adjacent to the working area and/or materials storage.

- Contractors to label all trees deemed necessary to be removed for construction before they are removed.

- Avoid disturbing vegetation in areas outside the construction zone.

- Replacement of trees where they are removed; for every tree removed tree will be replanted.

Mitigation Measures for Wildlife

- Construction workers and site foremen will watch for wildlife that may be harmed and take avoidance action as required.
- Prior to commencing work each day, any open ditches will be searched for trapped wildlife. Any trapped wildlife will be salvaged and returned to a safe location as soon as possible.
- Control the movement of construction traffic by marking access tracks and restricting traffic to these areas.
- Identify locations where preservation of habitat is not possible and employ suitably qualified personnel to capture and relocate any wildlife found in these locations.

(3) Proposed Monitoring

Tree cutting and timbers in the clearing forest areas will need to be monitored during throughout construction period. The monitoring program is proposed in the construction phase EMP.

(4) Evaluation of the Significance of Forest and Wildlife Impact

The impact of forest and wildlife are evaluated as follows:

Impact category	Direct impact
Impact duration	Forest: Throughout the construction period. More significant during the construction at the clearing forest areas Wildlife: Throughout the construction period,
Impact extent	Forest: Mainly the R.O.W. of the forest areas Wildlife: Mainly the habitat of wildlife near the construction areas
If no control - **Impact magnitude**	Increase the loss of forest area and disturbing wildlife in areas outside the construction zone
- **Severity**	Significant
Control priority	Medium

The forest and wildlife issues deserve medium control priority.

6.3.3.8 Socio-Economic

(1) Potential Impacts

- The Project will employ about 1,200 people at peak during project construction. Most of the workers will be local, therefore, socio-cultural changes induced by the construction workers will be significant. Assuming an average wage of about US$ 250 equivalent per month, and about 20% would be injected into the village economy, about US$ 60,000 equivalent per month would be spent for buying village services. Assuming a velocity of money of 2.5, the village economy will involve about US$ 150,000 equivalent of transactions. This level of economic stimulant would be large enough to induce significant socio-cultural changes which could threaten the community fabric.

- Exposure of the affected communities to new social norms, value, traditions, practices, and new economic opportunities brought about by an influx of external workers and cash inflow into the village economy through project spending and employment.

- Conflict between immigrated worker and local people.

(2) Proposed Mitigation Measures

- Inform the community before proceeding any activity in construction area.

- Hire construction workers from local sources as many as possible.

- Initiate livelihood development programs designed to make the best use of new economic opportunities that will come with the project spending and employment.

- Village headmen and the responsible authorities should establish local rules and regulations for control of alcoholic abuse and sexually transmitted diseases.

- Stay on-site workers should be accommodated in more than one camp to be located far from the villages

- Closely control workers behavior to not disturb people nearby construction area.

- Provide communication access between communities and project developer to receive requests and to listen to the needs and problem of communities including to respond to the requests and to solve the problem e.g. establishing complaint centre, informing communities about project address and telephone number.

(3) Monitoring

A social monitoring program should be designed and implemented to monitor undesirable socio-cultural changes in the villages. The monitoring program is proposed in the construction phase EMP.

6.3.3.9 Land Use

(1) Potential Impacts

During construction period, the land use pattern will be permanently changed to be road right of way. The existing land use are agriculture area, forest area, residential area, road area and other areas ***(See Section 5.4.1).*** The permanently changed areas comprise a strip of 40 meters of width along the road alignment, rest areas (service center) and vista points. The existing land use along the 40 m ROW areas comprise:

- Agricultural areas consist of paddy field, para rubber plantation, oil palm plantation, orchards and perennial crops plantation as presented in
- Forest area about 711.83 acres
- Residential areas consist of establishment or enterprise area and urban and residential area
- Road area 4.37 acres
- Other areas consist of water body area and grass land area about 57.56 acres.

Impact on loss of the areas are limited to the required Right Of Way which does not exceed 40 meters of width. Moreover the road project will also realign some sections of the existing road to improve it, therefore, some areas within the R.O.W. of the road project alignment are the same areas along the existing road.

During construction period, the land use pattern will be temporarily changed due to construction activities, i.e. being temporary construction office, campsite, machine and equipment area, etc. The contractor will hire private land for those construction works. Thus, the impact on land use pattern will occur only during construction period.

(2) Proposed Mitigation Measures

- Declare the actual R.O.W as soon as possible after detail design is accomplished
- Limit width of route as necessary to minimize the lost of agricultural and residential area.
- Inform the schedule and construction process in order to reduce conflict on land
- Use between project proponent and land owners

TABLE 6.3.3-7

EXACT AGRICULTURAL AREA THAT TO BE USED FOR PROJECT IMPLEMENTATION

Item	Description		In of ROW.						Out of ROW.								Remark
			Wide			Length	Area		LT.			RT.			Total Area		
			LT	RT	ROW. (m.)	(m.)	(m.2)	acres	Wide (m.)	Length (m.)	Area (m.2)	Wide (m.)	Length (m.)	Area (m.2)	(m.2)	acres	
	Agricultural Land (Section 1)																
1	16458.000	16826.140	40	35	75	368	27,611	6.82									
2	16826.140	17526.140	30	30	60	700	42,000	10.37									
3	17526.140	18690.171	30	35	65	1,164	75,662	18.68									
	18690.171	18940.950	30	56.27	86.27	250	21,557	5.32									
	18940.050	21826.140	30	35	65	2,886	187,596	46.32									
	21826.140	22126.140	35	35	70	300	21,000	5.19									
	22126.140	23851.140	30	35	65	1,725	112,125	27.69									
	23851.140	24726.140	50	35	85	875	74,375	18.36									
	24726.140	24976.140	30	40	70	250	17,500	4.32									
	24976.140	26151.140	40	40	80	1,175	94,000	23.21									
	26151.140	28376.140	55	45	100	2,225	222,500	54.94									
	28376.140	30222.843	44.35	45	89.35	1,847	165,003	40.74									
	30222.843	31001.140	59.35	45	104.35	778	81,215	20.05									
	31001.140	31408.619	50	45	95	407	38,711	9.56									
	31408.619	32034.240	35	45	80	626	50,050	12.36									
	32034.240	33734.240	35	35	70	1,700	119,000	29.38									
	33734.240	34539.850	25	35	60	806	48,337	11.93									
	34539.850	35125.000	35	45	80	585	46,812	11.56									
	35125.000	40525.000	35	35	70	5,400	378,000	93.33									
	40525.000	42325.000	35	45	80	1,800	144,000	35.56									
	42325.000	45325.000	35	35	70	3,000	210,000	51.85									
	45325.000	45525.000	35	55	90	200	18,000	4.44									
	45525.000	49500.000	35	35	70	3,975	278,250	68.70									
	49500.000	51600.000	50	55	105	2,100	220,500	54.44									
	51600.000	52204.700	55	35	90	605	54,423	13.44									
	52204.700	53220.450	35	35	70	1,016	71,103	17.56									
	53220.450	53450.000	50	35	85	230	19,512	4.82									
	53450.000	53787.500	35	35	70	338	23,625	5.83									
	53787.500	54359.520	50	35	85	572	48,622	12.01									
	54359.520	57700.000	35	35	70	3,340	233,834	57.74									
	57700.000	57975.990	50	35	85	276	23,459	5.79									
	57975.990	59400.000	35	35	70	1,424	99,681	24.61									
	59400.000	59875.000	50	35	85	475	40,375	9.97									
	59875.000	62100.000	35	35	70	2,225	155,750	38.46									
	62100.000	63793.200	50	35	85	1,693	143,922	35.54									
	63793.200	68393.050	35	35	70	4,600	321,990	79.50									
		Total					3,930,096	970									

Item	Description		In of ROW.						Out of ROW.								Remark
			Wide (avg.)			Length	Area		LT.			RT.			Total Area		
			LT	RT	ROW. (m.)	(m.)	(m.2)	acres	Wide (m.)	Length (m.)	Area (m.2)	Wide (m.)	Length (m.)	Area (m.2)	(m.2)	acres	
	Agricultural Land (Section 2)																
1	68393.05	112326.753				43,934	3,151,143	778									
		Total					3,191,643	778									

Item	Description		In of ROW.						Out of ROW.								Remark
			Wide			Length	Area		LT.			RT.			Total Area		
			LT	RT	ROW. (m.)	(m.)	(m.2)	acres	Wide (m.)	Length (m.)	Area (m.2)	Wide (m.)	Length (m.)	Area (m.2)	(m.2)	acres	
	Agricultural Land (Section 3)																
1	115+000 to 126+000 / LT , RT				30	11,000	75,000	18.52	30	11,000	330,000	30	11,000	330,000	660,000	162.96	Sin Bya Dain Village
2	126+000 to 136+000 / LT , RT				30	10,000	75,000	18.52	50	10,000	500,000	50	10,000	500,000	1,000,000	246.91	Wado Village
3	139+500 to 142+000 / LT , RT				30	2,500	75,000	18.52	30	2,500	75,000	30	2,500	75,000	150,000	37.04	Amu Village
4	144+500 to 146+000 / LT , RT				30	1,000	30,000	7.41	40	1,000	40,000	40	1,000	40,000	80,000	19.75	Gad Tra Khee Village
5	152+000 to 154+750 / LT , RT				30	2,750	82,500	20.37	50	2,750	137,500	50	2,750	137,500	275,000	67.90	Hti Khee Village
		Total					337,500	83								535	618

(3) Evaluation of the Significance of Land Use Impact

The impact of land use is evaluated as follows:

Impact category	Direct impact
Impact duration	Throughout the construction period.
Impact extent	Mainly the R.O.W. of the road alignment
If no control - **Impact magnitude**	Medium due to some agriculture area and residential areas within the R.O.W. as the same areas along the existing road.
- **Severity**	Significant
Control priority	Medium

The land use issue deserve medium control priority.

6.3.3.10 Cultural Heritage

Cultural heritage resources may be identified during construction or accidently exposed. The initial procedures to be followed to avoid any further damage comprise the following steps:

1) The person or group (identifier) who identified or exposed the burial ground must cease all activity in the immediate vicinity of the site;

2) The identifier must immediately inform his/her supervisor of the discovery;

3) The supervisor must ensure that the site is secured and control access; and

4) The supervisor must then inform the relevant personnel responsible included local and government cultural heritage administrative department.

5) Potential significance of the remains will be assessed and mitigate options will be identified.

6) If the significance of the remains is judged to be sufficient to warrant further action and they cannot be avoided, then the project archaeologist in consultation with the government cultural heritage administrative department and representatives of local communities will determine the appropriate course of action.

6.3.4 Risk Assessment

6.3.4.1 Environmental Risk Management Context

For this Project, the EPC contractor would be contractually responsible for: (i) preparation of detailed designs and specifications of all equipment and facilities; (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 ESIA Report and accepted by the Project Proponent and MONREC will be implemented by the EPC contractor and his subcontractors under the supervision of construction supervision consultants of the Project Proponent. Monitoring of environmental performance of the EPC contractor will be carried out by the Project Management Team of the Project Proponent.

Environmental risk management during project construction will be carried out by the Project Management Team as part of the overall project risk management. Environmental risk mitigation measures will be implemented by the project management team within the scope of and procedures for project risk management.

6.3.4.2 Risk Identification

During the construction phase, two uncertain events or two environmental risks would be of concern to the Project Proponent:

1) The Project may not be able to comply with environmental requirements prescribed by MONREC or other concerned authorities.

2) The Project may be opposed to by stakeholders, especially the nearby communities.

6.3.4.3 Risk Analysis

The two identified risk events could be caused by the following:

A. Failure to comply with the environmental requirements

Consequences:

- The authorities may order the Project to suspend the construction or in the worst case they may revoke the construction permit.
- Public complaints could be filed against the Project and could lead to litigations.
- Bad publicity to the Project
- Physical damages or body damages on-site or off-site with cost to be incurred by the Project

Underlying Causes:

- the EPC contractor and subcontractor have inadequate understanding of the environmental performance requirements of the Project
- the EPC 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 EPC Contractor and subcontractors
- changes in designs or construction methods without revising the originally proposed mitigation measures
- changes in the environmental requirements during the construction without the revision of the originally proposed mitigation measures

Likelihood of Occurrence

The likelihood of occurrence of minor incompliance with environmental management requirements would be medium.

B. Public opposition to the Project

Consequences

- The Project could be delayed.
- Public complaints could be filed against the Project and could lead to litigations, or bad publicity to the Project
- The authorities may order the Project to suspend the construction or in the worst case they may revoke the construction permit.

Underlying Causes:

- misunderstanding or misinformed of the nature, severity and extent of impacts of the Project
- rough relationship between the Project and the surrounding communities
- most of the affected people are not satisfied with the compensation for losses of land, properties, or livelihood.

Likelihood of Occurrence

The likelihood of occurrence of this risk will be low if the affected people are fairly compensated, the Project Management Team maintains good relation with the surrounding communities, representatives of the communities participate in project monitoring, and grievance redress process is effective.

6.3.4.4 Risk Classification

Figure 6.3.4-1 shows a risk matrix for the construction phase.

Risk A is considered moderate risk as it would have a medium level of likelihood of occurrence and a significant level of impacts.

Risk B is considered minor risk as it would have a low level of likelihood of occurrence and a high level of impacts.

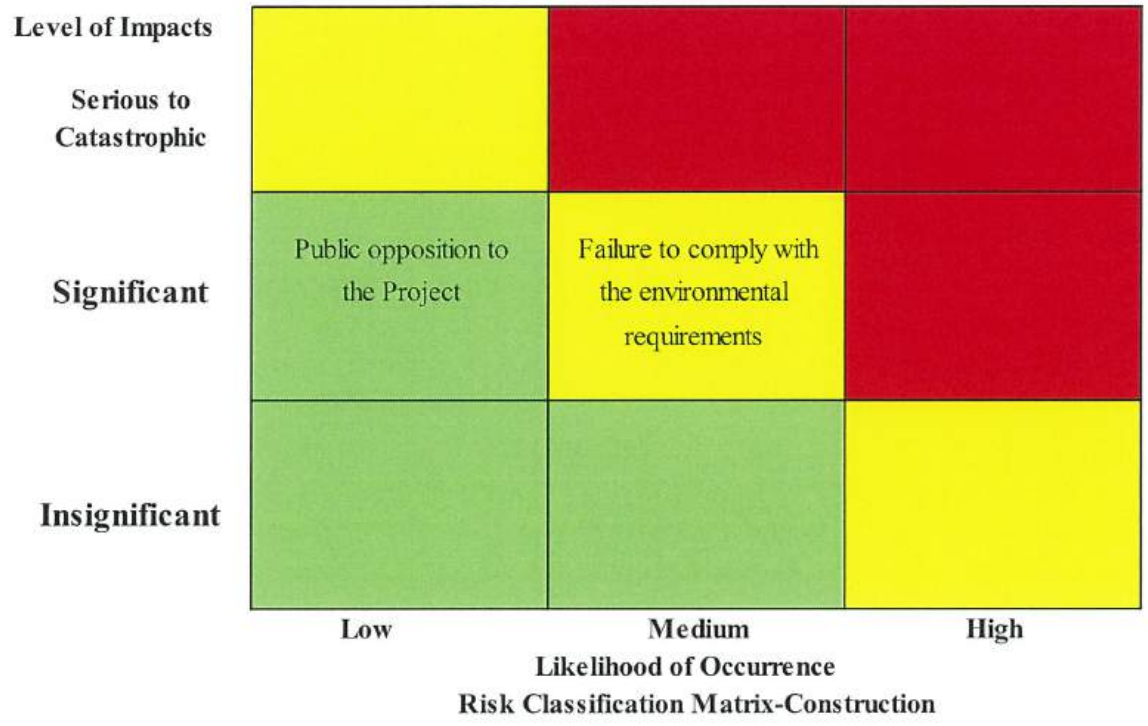


FIGURE 6.3.4-1: RISK MATRIX FOR THE CONSTRUCTION PHASE

6.3.4-5 Risk Mitigation Measures

Risk mitigation measures need to address the identified causes of the risk. Mitigation measures for the two identified risks correspond to the identified causes are presented in ***Table 6.3.4-1***. The measures will be implemented through contractual arrangements and stakeholder engagement.

TABLE 6.3.4-1

MITIGATION MEASURES FOR ENVIRONMENTAL RISK MANAGEMENT DURING CONSTRUCTION PHASE

Cause	Mitigation Measures
EPC contractor and subcontractor have inadequate understanding of the environmental performance requirements of the Project.	1.Require the EPC contractor to: --prepare a CEMP based on the ESIA report and the associated CEMP, detailed design and construction plan and schedule. The CEMP must clearly define: --the Project's environmental requirements and obligations --physical measures that are needed to comply with the requirements and obligations --construction measures that are needed to comply with the requirements and obligations --assignment of responsibilities to each subcontractors 2. Require the EPC contractor to clearly incorporate environmental requirements and mitigation measures in the Project Understanding, the Statement of Criteria, and the Basis of Designs-these three documents would be required by the Project Proponent as part of the design risk management.
Ambiguity of environmental requirements in the EPC contract.	1. TOR for procurement of the EPC contract must clearly state the Project's environmental requirements during the construcion phase that the EPC contractor must ensure that the Project construction will meet the requirements. 2. The EPC contract must clearly prescribes environmental management responsibility of the EPC contractor
Inadequate supervision and monitoring of environmental mitigation activities of the EPC 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 would be part of an overall project supervision and monitoring plan. 2. Weekly and monthly reviews of the EPC contractors 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 accordingly.	Changes in designs or construction methods may be initiated by the EPC 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 accomodated by an analysis of environmental implications and revised mitigation measures.
Changes in the environmental requirements during the construction without revising the originally proposed mitigation measures.	Changes in the environmental requirements may be initiated by MONREC or the Project Proponent with approval of MONREC. The changes must be subject to the change procedure in project management. The EPC contractor will analyse environmental implications of the changes and revise the originally proposed mitigation measures accordingly.
Misunderstanding or misinformed of the nature, severity and extent of impacts of the Project.	1. Pay attention to the clarity and adequacy of the information on impacts of the Project using non-technical language that could be easily understood by villagers. Information in audio visual forms should also be prepared. 2. Design an effective public information program to ensure the intended information reaches the target groups. 3. Ensure that the tripartite committee (proposed in the CEMP has a clear understanding of the Project's impacts).
Rough relationship between the Project and the surrounding communities	1. Establish a village development fund. Representatives of the villages should participate in the management of the fund. 2. CSR activities should be initiated as soon as possible in the construction phase. 3. The Project management team should visit as often as possible the villages located within the area of influence of the Project.

6.3.4.6 Implementation Arrangements

A. 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 CEMP will also implement the environmental risk mitigation measures in cooperation with the construction supervision manager.

B. 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 the 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.

Failure to comply with the environmental requirements

The monitoring and evaluation should cover the following risk triggers:

- inadequacies of the CEMP prepared by the EPC contractor and the timeliness in correcting deficiencies in the CEMP found by the Project Management Team;
- trend of the EPC Contractor and subcontractors not conform with the construction requirements related to the CEMP;
- response of the EPC Contractor to the instructions of the supervision engineers and the EHS manager regarding the implementation of environmental impact mitigation measures and monitoring of the environmental management performance.

Public opposition to the Project

The monitoring and evaluation should cover the following risk triggers:

- Trend of public complaints-the increasing trend would suggest the increasing likelihood of occurrence of the risk event; and
- Twice a year of public views and opinions on the Project-the frequency of surveys would be reduced if the public opinions are positive.

C. 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 OPERATION PHASE-IMPACT AND RISK IDENTIFICATION, ASSESSMENT AND MITIGATION

During the operation phase, the motor vehicles will increase and will emit pollutants such as NO_x, hydrocarbons, CO, SO_2, PM to the ambient air environment along the project road. The traffic will generate noise and vibration as traffic increase. In addition, the project road will make it easy for people to access undisturbed areas along the road.

6.4.1 Summary of Identified Issues

Table 6.4.1-1 presents a summary of identification of environmental and social issues anticipated during project operation based on technical information in the final design report, the Consultant's appreciation of the environmental and social ES settings of the project area, baseline information on existing ES condition in the project area, experience of the Consultant in ES impact assessment, and established knowledge of typical ES issues of road projects. These identified issues have also been presented in the Scoping Report.

TABLE 6.4.1-1

IDENTIFICATION OF ES ISSUES OF THE PROJECT

Project Activities	Disturbances on Physical Environment	Generic Impacts on Receptors	Likely Level of Significance in this Project
Operation of the road			
1. Maintenance of the road alignment	- Obstruction to traffic	- Increased time	-
Operation of the facilities			
1. Maintenance of the rest area (service area) and tool booth	- Obstruction to traffic	- Nuisance to people living near the corridor	- Significant, some communities near the tollbooth and service area.

6.4.2 Impact Assessment

6.4.2.1 Gaseous Emissions

(1) Potential Impacts

a. Sources

During operation period there would be more vehicles using the road. There would be impact on ambient air quality due to exhaust emission from motor vehicles.

b. Sensitivity of Receptors

Gaseous emissions during the operation phase will create local air pollution to community nearby the project road. The receptors will be local people nearby project road at 50, 100, 250 and 500 meters from the center line of project alignment.

c. Estimates of Emission Loads

1) Traffic volume forecast

The traffic volume (vehicle trip per year) is forecast from 2015 to 2040 (see ***Final Design Report, October 2015***). There are 3 sources of traffic volumes including Industrial Estates, Border Industrial Free Zone (BIFZ) and Cross-Border Trade from Thailand to Myanmar. According to traffic forecast, both Industrial Estates and BIFZ are anticipated only truck volume while Cross-Border Trade from Thailand to Myanmar is predicted in all vehicle types. As a result of traffic counting during June-September 2013 which conducted by ITD, it was found that the proportions of 3 vehicle types including motorcycle, passenger car and truck were 0.42 0.48 and 0.10 respectively. These proportions are applied in Cross-Border Trade from Thailand to Myanmar so the volumes of 3 types of vehicle are classified in ***Table 6.4.2-1***. The construction will be finished by August 2018, so air pollution assessment of operation period will start from 2018.

TABLE 6.4.2-1

TRAFFIC VOLUME FORECAST

Classification	2018	2019	2020	2025	2030	2035	2040
Industrial Estates							
1.Motorcycle	-	-	-	-	-	-	-
2.Passenger car	-	-	-	-	-	-	-
3.Truck	353,210	451,214	530,473	614,299	615,785	620,274	627,776
Border Industrial Free Zone (BIFZ)							
1.Motorcycle	-	-	-	-	-	-	-
2.Passenger car	-	-	-	-	-	-	-
3.Truck	100,225	224,060	263,418	305,043	305,781	308,009	311,735
Cross-Border Trade from Thailand to Myanmar							
1.Motorcycle	15,483	19,354	23,224	31,582	41,649	53,521	67,402
2.Passenger car	17,983	22,479	26,974	36,682	48,374	62,163	78,286
3.Truck	3,663	4,579	5,495	7,473	9,855	12,664	15,948
Sum (vehicles/yr)	**490,564**	**721,686**	**849,585**	**995,079**	**1,021,444**	**1,056,631**	**1,101,147**
Sum (vehicles/hr)	**56.00**	**82.38**	**96.98**	**113.59**	**116.60**	**120.62**	**125.70**

As ***Table 6.4.2-1***, the forecast volumes of motorcycle, passenger car and truck from 2018 to 2040 are approximately 15,483-67,402 17,983-78,286 and 457,098-955,459 vehicles per year or 1.77-7.69 2.05-8.94 and 52.18-109.07 vehicles per hour. The overall volume of vehicle forecast between 2018 and 2040 is approximately 490,564-1,101,147 vehicles/year or 56.00-125.70 vehicles/hr.

2) Emission factors

According to Ministry of Transport study, Thailand (2012), emission factors of motorcycle, passenger car and truck are collected in various speeds. This air pollution assessment assumes that the vehicle speeds of 3 vehicle types are 70 km/hr all so average emission factors of CO, NO_x and PM as shown in ***Table 6.4.2-2*** are 4.21, 0.91 and 0.13 g/mile/vehicle.

TABLE 6.4.2-2

EMISSION FACTORS OF VEHICLE IN ASSIGNED SPEED

Parameters	Unit	Motorcycle @ 70 km/hr	Passenger car @ 70 km/hr	Truck @ 70 km/hr	Average
CO	g/mile/vehicle	9.78	2.26	0.58	4.21
NO_x	g/mile/vehicle	0.32	1.05	1.35	0.91
PM	g/mile/vehicle	-	-	0.13	0.13

Source: Ministry of Transport study, Thailand (2012)

Remark: "-"means that data are not available.

3) Meteorological conditions

According to climate data collection on 3 stations including Toll Plaza Base Camp, Myitta Base Camp and Elasto Base 1 Camp during January 2015, the lowest wind speed value which is detectable is 1.8 m/s. Wind direction is 225° due to the prevailing of the south-west monsoon from the Indian Ocean and Andaman Sea. Stability class of atmosphere is assigned in worst cast that is F class. Average temperature during winter season approximately 19.7°C is used as representative because low temperature may cause high risk to health.

4) CALINE 4 Model

CALINE 4 developed by California Highway Authority is mathematic simulation of air pollution assessment on the basis of Gaussian equation, especially line source such as local road and highway. Meteorological data collected from study area can be applied to simulate close to reality.

5) Results of emission load

CO, NO_2 and PM-10 concentrations generated from operation activity simulated by CALINE4 (shown in ***Table 6.4.2-3*** to ***6.4.2-5***) are of 0 ppm, 30-60 ppb and 0.04-0.12 μg/m^3 respectively which meet National Environmental Quality (Emission) Guidelines (Final Draft) (December 22, 2015) and WHO Air Quality Guidelines (AQG). The highest background concentrations of 3 pollutants measured at 3 monitoring stations on January 2015 are of 0.6 ppm, 16.4 ppb and 100.0 μg /m^3, respectively. Now background concentrations of CO and NO_2 are lower than air quality standards while PM-10 is considered to have higher than ones. So the overall CO, NO_2 and PM-10 concentrations affecting to sensitive areas (at 50, 100, 250 and 500 m from the center line of Two Lane road alignment) are of 0.6 ppm, 46.4-76.4 ppb and 100.1-100.3 μg /m^3 respectively. Both overall CO and NO_2 concentrations meet National Environmental Quality (Emission) Guidelines (Final Draft) (December 22, 2015) but PM-10 is found to have higher than standard concentration due to high background concentrations.

(2) Proposed Mitigation Measures

- Establish speed limit along the road especially areas near communities.
- Providing good traffic management to avoid traffic congestion in populated areas.
- Planting tall, leafy and dense vegetation between roads and human settlements to filter pollutants.
- Install roadside air quality monitoring program.

(3) Residual Impacts

Considering the low emission loads, the impact of gaseous emission during the operation phase on the vehicles is expected to be insignificant.

(4) Proposed Monitoring

Ambient air quality at the community nearby project road should be measured quarterly or twice a year when the project road being in use at least first 3 years of operation phase. Details are provided in the environmental management plan for the operation phase.

TABLE 6.4.2-3

CO CONCENTRATION 1 HR AVERAGE WITH BACKGROUND CONCENTRATION ON ROUTE SECTION 1 TO 3

unit: ppm

No.	Distance (meter)	Emission from vehicles							Highest background concentration*	Overall concentration						
		2018	2019	2020	2025	2030	2035	2040		2018	2019	2020	2025	2030	2035	2040
1	50	0	0	0	0	0	0	0	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
2	100	0	0	0	0	0	0	0	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
3	250	0	0	0	0	0	0	0	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
4	500	0	0	0	0	0	0	0	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
WHO Standard (ppm) **		24.3														

Remark;* Result from air quality sampling during 21-31 January 2015 by ERTC.
** WHO Air Quality Guidelines (AQG).

TABLE 6.4.2-4

NO_2 CONCENTRATION 1 HR AVERAGE WITH EXISTING DATA ON ROUTE SECTION 1 TO 3

unit: ppb

No.	Distance (meter)	Emission from vehicles							Highest background concentration*	Overall concentration						
		2018	2019	2020	2025	2030	2035	2040		2018	2019	2020	2025	2030	2035	2040
1	50	50	50	50	60	60	60	60	16.4	66.4	66.4	66.4	76.4	76.4	76.4	76.4
2	100	40	40	40	50	50	50	50	16.4	56.4	56.4	56.4	66.4	66.4	66.4	66.4
3	250	30	30	30	40	40	40	40	16.4	46.4	46.4	46.4	56.4	56.4	56.4	56.4
4	500	30	30	30	30	30	30	30	16.4	46.4	46.4	46.4	46.4	46.4	46.4	46.4
Standard (ppb) **		98.7														

Remark;* Result from air quality sampling during 21-31 January 2015 by ERTC.
** NO_2 standard is referred from National Environmental Quality (Emission) Guidelines (Final Draft), December 22, 2015.

TABLE 6.4.2-5

PM10 CONCENTRATION 24 HR AVERAGE WITH EXISTING DATA ON ROUTE SECTION 1 TO 3

unit: µg /m^3

No.	Distance (meter)	Emission from vehicles							Highest background concentration *	Overall concentration						
		2018	2019	2020	2025	2030	2035	2040		2018	2019	2020	2025	2030	2035	2040
1	50	0.1	0.2	0.2	0.3	0.3	0.3	0.3	100.0	100.1	100.2	100.2	100.3	100.3	100.3	100.3
2	100	0.1	0.2	0.2	0.2	0.2	0.2	0.2	100.0	100.1	100.2	100.2	100.2	100.2	100.2	100.2
3	250	0.1	0.1	0.1	0.1	0.1	0.1	0.1	100.0	100.1	100.1	100.1	100.1	100.1	100.1	100.1
4	500	0.1	0.1	0.1	0.1	0.1	0.1	0.1	100.0	100.1	100.1	100.1	100.1	100.1	100.1	100.1
Standard (ug/m^3) **		50														

Remark;* Result from air quality sampling during 21-31 January 2015 by ERTC.

** PM10 standard is referred from National Environmental Quality (Emission) Guidelines (Final Draft), December 22, 2015.

6.4.2.2 Noise

Increase in traffic volume on the road would cause increase of ambient noise level resulting in degrading of human welfare and disrupting wildlife. Chronic noise exposure can be source of annoyance, creating communication problems and leading to elevated stress levels as well as associated behavioral and health effect. It can cause auditory fatigue, temporary and permanent lessening of hearing ability and sleep disorders.

Noise may prevent many animal species from approaching or crossing road corridor because they are afraid. As a result, road corridors become barriers to regular wildlife travel route, effectively rendering roadside habitat areas in accessible to some species. Such disturbance reduces the success of these species and contributed to ecological alteration.

However, since the development of the Two-Lane road is to be done on existing road corridor being in use, the above mentioned impacts have already occurred. The project development would cause little incremental impacts due to increase of traffic volume induced by related economic development and better condition of transportation route.

(1) Potential Impacts

a. Sources

Noise impact during operation period is mainly depended on traffic volume on the road.

b. Sensitivity of Receptors

Receptors are considered as along with the road side. The receptor points are assigned at 50 m (164 ft), 100 m (328 ft), 250 m (820 ft), 500 m (1,640 ft) and 620 m (2,034 ft) from centerline of project alignment.

c. Predicted Noise Levels at the Receptors from the project road

1) Traffic volume forecast

The volume of traffic forecast by mathematic models is major impact on ambient noise during operation period. The traffic volumes i.e. motorcycle, passenger car and truck are found to increase in every year (2015-2040). The construction will be finished by August 2020, so noise impact assessment of operation period will start from 2018 (shown in ***Table 6.4.2-6***).

2) Mathematic noise model

This study will use mathematic noise model developed by Federal Transit Administration (FTA, 2006), USA. The required input data and assumption are explained below;

- Traffic volume forecast ***Table 6.4.2-6***. Therefore the FTA model is assigned only 4 types of vehicles including 1) Automobiles and Vans, 2) Buses (diesel-powered), 3) Buses (electric) and 4) Buses (hybride) so motorcycle will be assumed that it generates noise impact same as passenger car (***Table 6.4.2-7***).

- Vehicle speed of all types is assigned at 70 km/hr or 43.5 mile/hr all line.
- Vehicle volume rate (Vehicle per hour) is constant in every hour.

TABLE 6.4.2-6

TRAFFIC VOLUME FORECAST

Classification	2018	2019	2020	2025	2030	2035	2040
Industrial Estates							
1.Motorcycle	-	-	-	-	-	-	-
2.Passenger car	-	-	-	-	-	-	-
3.Truck	353,210	451,214	530,473	614,299	615,785	620,274	627,776
Border Industrial Free Zone (BIFZ)							
1.Motorcycle	-	-	-	-	-	-	-
2.Passenger car	-	-	-	-	-	-	-
3.Truck	100,225	224,060	263,418	305,043	305,781	308,009	311,735
Cross-Border Trade from Thailand to Myanmar							
1.Motorcycle	15,483	19,354	23,224	31,582	41,649	53,521	67,402
2.Passenger car	17,983	22,479	26,974	36,682	48,374	62,163	78,286
3.Truck	3,663	4,579	5,495	7,473	9,855	12,664	15,948
Sum (vehicles/yr)	490,564	721,686	849,585	995,079	1,021,444	1,056,631	1,101,147
Sum (vehicles/hr)	56.00	82.38	96.98	113.59	116.60	120.62	125.70

Source: Final Design Report, October 2015.

TABLE 6.4.2-7

PASSENGER CAR AND TRUCK VOLUME FROM 2018 TO 2040

Vehicle	Unit	Traffic volume in each forecast year						
		2018	2019	2020	2025	2030	2035	2040
Passenger car and Motorcycle	vehicle/yr	33,466	41,833	50,199	68,264	90,023	115,684	145,688
	vehicles/hr	3.8	4.8	5.7	7.8	10.3	13.2	16.6
Truck	vehicle/yr	457,098	679,853	799,386	926,815	931,421	940,947	955,459
	vehicles/hr	52.2	77.6	91.3	105.8	106.3	107.4	109.1

3) Noise assessment results

a) Ambient noise level

Noise impact levels from traffic forecast volume during operation period at 50-620 m from centerline during 2018-2040 are approximately of 41.7-61.4 dBA as shown in ***Table 6.4.2-8***. The traffic volume forecast in 2040 is considered as the highest one, so safe zone of this forecast year will be considered. Noise ambient level

standard at night time is assigned by National Environmental Quality (Emission) Guidelines (Final Draft (April, 2015)) less than 45 dBA in 1 hr, so distance between centerline of road and receptor at 620 m meets this standard.

b) Nuisance Noise

Nuisance noise level can be calculated by **Equation 1.4** which uses correcting total noise level at 1 hr from traffic volume forecast subtracting to background noise level (L90) at 1 hr. As ***Table 6.4.2-9***, nuisance noise level results of operation period at 50-620 m are of 2.1-21.4 dBA. Nuisance noise levels from traffic volume forecast in 2040 which meet nuisance noise standard are at 250 m from centerline

(2) Proposed Mitigation Measures

- Reduction of speed limit in settlement areas.
- Always maintain road surface in good condition.

TABLE 6.4.2-8

NOISE IMPACT LEVEL FROM TRAFFIC VOLUME FORECAST FROM 2018-2040

Unit: dBA

Year	Noise impact level as various distances				
	50 m	**100 m**	**250 m**	**500 m**	**620 m**
	164 ft	**328 ft**	**820 ft**	**1,640 ft**	**2,034 ft**
2020	58.1	53.6	47.6	43.1	41.7
2021	59.8	55.3	49.3	44.8	43.4
2022	60.5	56.0	50.0	45.5	44.1
2025	61.2	56.7	50.7	46.2	44.8
2030	61.2	56.7	50.7	46.2	44.8
2035	61.3	56.8	50.8	46.3	44.9
2040	61.4	56.9	50.9	46.4	45.0

TABLE 6.4.2-9

NUISANCE NOISE LEVEL (dBA)

Year	Nuisance noise level as various distances				
	50 m	**100 m**	**250 m**	**500 m**	**620 m**
	164 ft	**328 ft**	**820 ft**	**1640 ft**	**2034 ft**
2018	18.2	13.6	7.9	2.6	2.1
2019	19.8	15.1	9.1	4.8	2.7
2020	20.5	15.7	9.6	5.2	4.5
2025	21.2	16.4	10.6	6.6	4.8
2030	21.2	16.4	10.6	6.6	4.8
2035	21.3	16.5	10.7	6.6	4.9
2040	21.4	16.6	10.8	6.7	4.9
Nuisance noise standard (dBA)*	**10**				

Remark: * Thailand's National Environment Board Notification No.29 (2007): Nuisance noise standards.

(3) Residual Impacts

Considering the low noise level of estimated ambient noise and nuisance noise during road operation, the impact of noise during the operation phase is expected to be insignificant.

(4) Proposed Monitoring

A proposed noise monitoring program is proposed in the operation phase EMP.

6.4.2.3 Vibration

The major sources of vibration in operation period are only vehicles including motorcycles, passenger cars, and trucks. The vibration impact depends on the magnitude of Peak Particle Velocity (PPV) of vehicles and distance between vehicles and receptors. Truck is considered as the most vibration impact because of its high load bearing. According to vibration monitoring results at 3 stations (Toll plaza, Myitta and Elasto Base 1) on 21-31 January 2015, it was in the range of <0.3-0.91 mm/s (>100 Hz) causing from vehicles. The highest vibration level of monitoring data is just perceptible level and not significantly damages of any type of buildings. The magnitude of Peak Particle Velocity (PPV) of vehicles of operation period is considered same as the monitoring period but the number of vehicles on the road is more than that period. So, the vibration impact of operation period of this project may not cause significant effect to human health and buildings too.

6.4.2.4 Surface Water Quality

(1) Potential Impacts

During operation phase of this project there are activities going on such as road traffic along the road alignment, wastewater from public toilets and food shops where located at service areas and vista points. Therefore, expected impacts upon water quality arisen from the project can be listed and described as follows:

- **Wastewater Contamination from Service Areas**

The wastewater are taken from food shops and various shops at service areas and vista points, and garage where lubricated oil leaks out. However, in the service area and there exists central wastewater treatment system (WWT) and treated wastewater can be met with the effluent standards. Besides the WWT system, oil & grease trap or pond for trapping solid wastes out from wastewater prior to enter the central WWT of the highway service area. At the service area, public toilets are provided separately for men and women at the same ratio of 15 persons per 1 unit; and again sewage from toilets will pass through septic tanks prior to enter the central WWT of the service area. Based on these mitigation measures, it can ensure that possibility of direct contamination on water quality in watercourses nearby the service area is probable insignificant. As such, the impact upon water quality during the project operation phase lies at low level.

- **Water Quality Contamination from Leachate of Over Road Runoff**

During operation phase, leachate of rainwater over road alignment is drained into watercourses and may be contaminated with dust, emission gases, oil and heavy metals etc. whose most of these contaminants are created by exhausted gases from vehicles, deterioration of tyres and various materials being spilled from vehicles as shown in ***Table 6.4.2-10.*** However, the existing dust and exhausted gases can be leached out and diluted in rainy season; and some amount of runoff flowing over road alignment may leach into soil. These pathways have as treatment process for the runoff being contaminated with pollutants therefore, possibility of direct contamination on water quality in watercourses nearby the project is few. As such, the impact upon water quality during the project operation phase is in low level.

TABLE 6.4.2-10

POSSIBLE EXISTING POLLUTANTS IN RUNOFF LEACHATE

Pollutants	Sources of Pollutants
Dust	fragmented soil, exhausted gases, air
Asbestos	deteriorated cloth breaker and cloth sheet braker, clutch plate
Bacteria	animal waste, garbage
Bromide	emission / exhausted gases
Chromium	sheet breaker, fragmented parts of engine, chromium coated parts of a car
Nitrogen and Phosphate	fertilizers being used to grow roadside plants
Lead	deteriorated tyre
Zinc	deteriorated tyre
Cadmium	deteriorated tyre
Nickle	exhausted gases, engine oil, cloth sheet braker, alphatic road surface
Oil	oil leak
Pesticides	pesticides being used to spray over roadside plants

Source : Final Report, No.6 : EIA Practical Guidelines / Manual for Highway Project; OEPP, MOSTE (2001).

(2) Proposed Mitigation Measures

- Regular monthly check up wastewater treatment system with carrying capacity within the wastewater treatment area of the service areas.
- Continuous weekly check up and maintenance the project drainage system.
- Provide adequate numbers of sanitary toilets (with septic tanks) at ratio of 15 persons/room (separated between men and women) at service areas and the toll Booths.
- Grease & oil trap to collect grease & oil and wastewater from food shops at service areas must be installed before all wastes and waste water being drained into the central wastewater treatment system.

(3) Evaluation of the Significance of Water Quality Impact

The impact of increased water turbidity on the nearby communities is evaluated as follows:

Impact category	Direct impact
Impact duration	Throughout the operational life of the service areas
Impact extent	Mainly on the water course near the service areas
If no control - **Impact magnitude**	Small
- **Severity**	Insignificant
Control priority	Medium

The water quality issue deserves medium control priority.

6.4.2.5 Aquatic Ecology

Results of the aquatic ecology surveys, presented in ***Section 5.3.2 of Chapter 5-Description of the Environment***, established that the 11 water sampling stations which the bridges cross the. River such as Dawei River, Tha Laing Ya Shaung, Tha Laing Ya Shaung (Mia Phyu), Tha Byu Shaung and Kamoethway River and etc. The results found that the phytoplankton to zooplankton ratio was higher than 1 indicating that food for 2nd consumer are sufficient. The species diversity index (SDI) of plankton was in range of 1.17-2.45 while SDI of benthic was between 0.23-1.26. This indicates the high diversity of the aquatic ecology in the project area.

Main impacts upon aquatic ecosystem caused by the road project operation phases is described as follows:

(1) Potential Impacts

After completion of the road construction, there will be no additional aquatic ecological impacts in the watercourses being intercepted by the road alignment since the amount of wastewater arisen at the service areas will be drained into the central wastewater treatment system within the service area. Besides, domestic wastewater will be primarily treated in grease & oil trap and so wastewater from toilet and sewage will be passed into septic tank system before being drained into the central wastewater treatment system. As such, there will be no increasing amounts and other contaminants in the watercourses generating by the road operation.

(2) Proposed Mitigation Measures

Apply the same mitigation measures as for wastewater contamination is already presented in ***Section 6.3.4***.

(3) Evaluation of the Significance of Aquatic Ecology Impact

The impact of on aquatic ecology is evaluated as follows:

Impact category	Indirect impact
Impact duration	Throughout the operational life of the service areas
Impact extent	Mainly on the water course near the service areas
If no control - **Impact magnitude**	Small
- **Severity**	Insignificant
Control priority	Low

The issue deserves low priority.

6.4.2.6 Soil Erosion and Soil Contamination

There will be no impact on soil erosion because the project has set up erosion prevention measures during construction period and efficient measures for soil conservation after construction is completed.

6.4.2.7 Forest and Wildlife

(1) Potential Impacts

There are several impacts on flora and fauna that can be attributed to the operation of the two-lane road:-

- Increased vehicle derived pollutants
- Vehicle/wildlife collisions
- Increased edge effects
- Deterioration of habitat

Since the two-lane road would be developed in the same corridor with the existing access road all of these impact have already existed. There would be some incremental impacts due to more vehicles.

(2) Proposed Mitigation Measures

- Keep an updated and accurate record of all rare flora and fauna species in close proximity of the Two-Lane road
- Ensure all operation workers are aware of the location of important flora and fauna species.
- Monitor fauna habitats and patterns near the Two-Lane road Alignment.
- Protect vegetation alongside the Two-lane road by undertaking maintenance regularly and vegetation if needed.
- Minimize removal of vegetation, dead tree trunks or hollows at the edge of the two-lane road that may provide habitat refuge.

- Plant native species to provide additional habitats and migration routes for local animals.
- Reduce speed limit at night and in area of frequent animal crossing.
- Install signs warning motorists of the presence of animals in areas of frequent animal crossings.
- Install roadside reflectors to scare animals away from the roadway when vehicle approach at night.

6.4.2.8 Social Economic

(1) Potential Impacts

After the construction is completed, the road will become a permanent infrastructure affecting socio-economic development in areas along the alignment i.e.

- Change in land use from agricultural area into residential area and shops.
- Increase in price of land along both sides of the road.
- In-migration of people from outside.
- Alteration of way of living and way of thinking due to innovations and technology.

(2) Proposed Mitigation Measures

- Provide space in vista site (Rest area) for local people to sell local products/handicraft.
- Related government agencies should support the communities to sustainably exist with ability to adapt to changes and innovations.

(3) Monitoring

The monitoring program is proposed in the construction phase EMP.

6.4.2.9 Land Use

It is expected that during the road operation period value of land around the project alignment would increase due to the transport network development and more convenience in travelling. The impact on land uses would be in terms of expansion of community and commercial area (positive impact) and termination of communities within the Right Of Way along the road alignment. Land use map which presents existing land use compared with the future project development and prone areas for environmental and social impacts are presented in ***Figure 6.4.2-1***.

6.4.2.10 Infrastructure Facilities

The only major infrastructure in the project area is National Road No.8. This road is paved road, about 7 m wide with two traffic lanes. Most of the local roads can be used all year round.

The Project will increase traffic load on the roads during the construction phase. This will cause inconvenience to users of the roads.

(1) Potential Impacts

The Project will increase traffic load on the roads during the construction phase. This will cause inconvenience to users of the roads. However, the traffic load measured on January 2015 was only about 85.66 pcu/hour on average at the junction of National Road No.8 crossing with project alignment. Results of traffic count are given in ***Appendix 5F***.

- **Estimates of Traffic Loads**

According to data on tentative equipment schedule for project construction period as shown in ***Table 4.3-2***. The peak number of trucks which might occur in June 2016 can be summarized as follows;

1) 45 Back hoes;
2) 17 Bulldozers'
3) 12 Vibratory compactors;
4) 4 Rough terrain cranes;
5) 80 Dump trucks;
6) 9 Motor graders;
7) 10 Wheel trucks;
8) 3 Wheel loaders;
9) 10 Transit mixers;
10) 6 Trucks with crane;

Totally is 196 trucks.

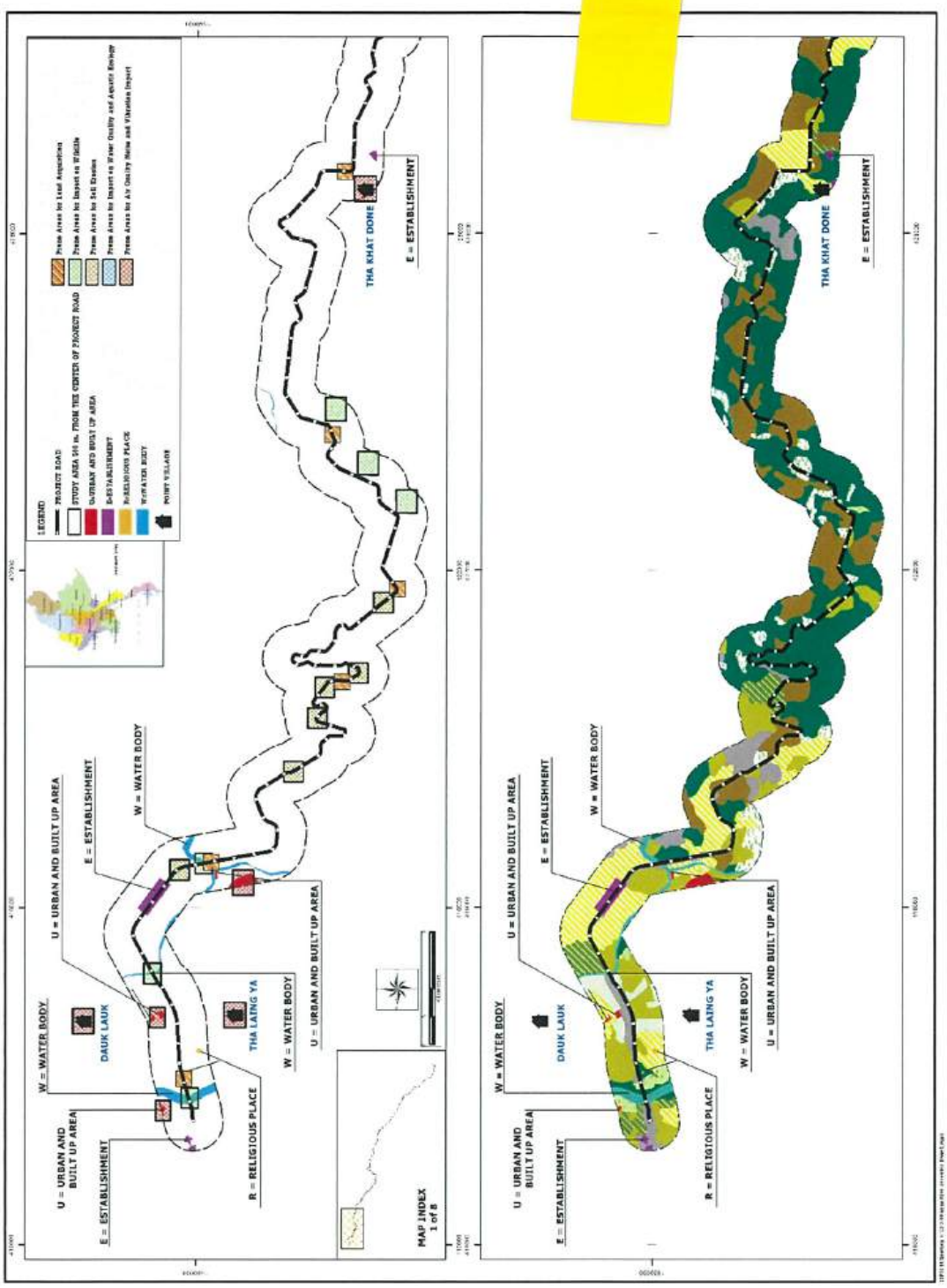


FIGURE 6.4.2-1 : LAND USE MAP WHICH PRESENTS EXISTING LAND USE COMPARED WITH THE FUTURE PROJECT DEVELOPMENT AND PRONE AREAS FOR ENVIRONMENTAL AND SOCIAL IMPACTS

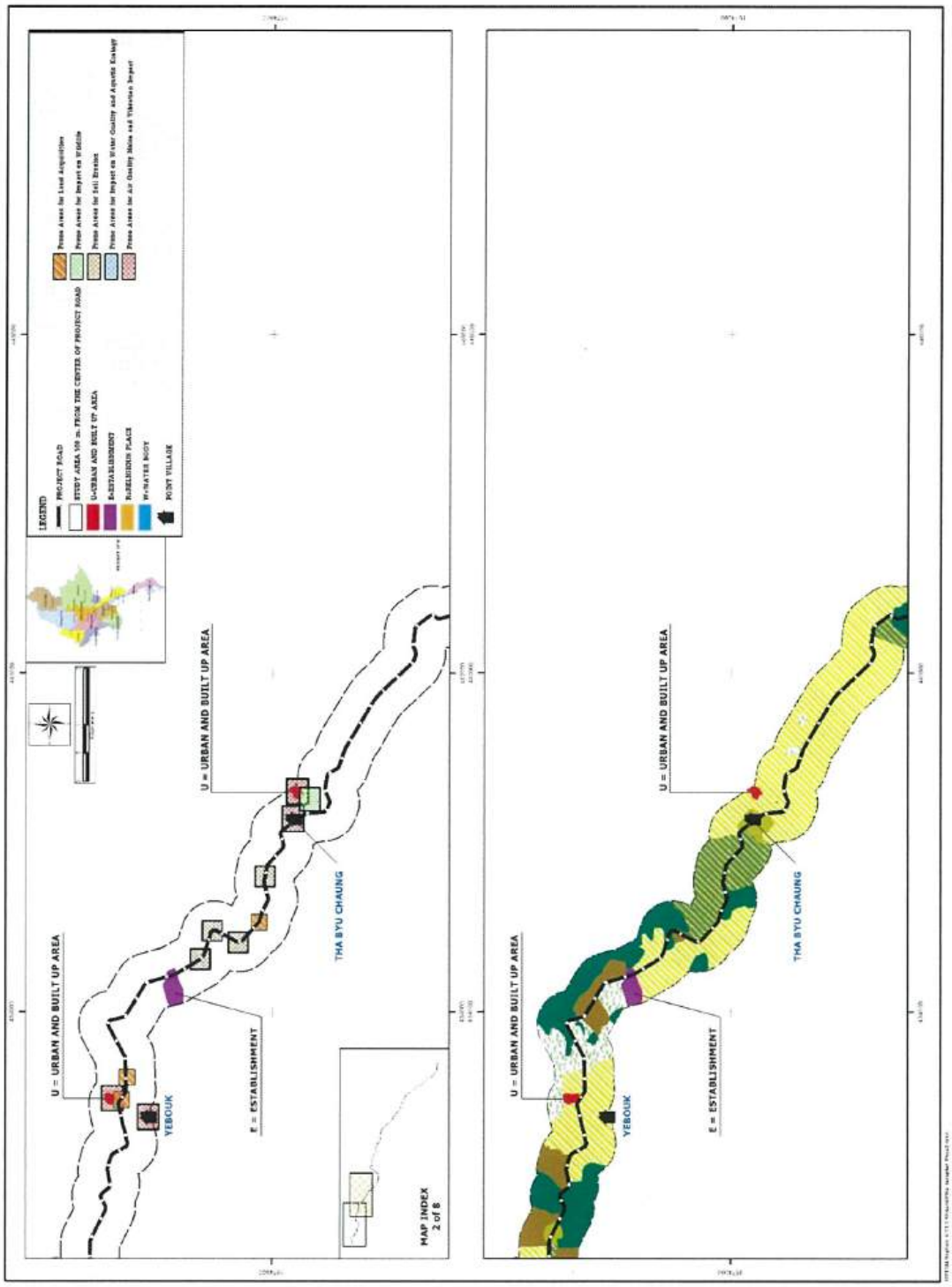


FIGURE 6.4.2-1 : LAND USE MAP WHICH PRESENTS EXISTING LAND USE COMPARED WITH THE FUTURE PROJECT DEVELOPMENT AND PRONE AREAS FOR ENVIRONMENTAL AND SOCIAL IMPACTS (CONT'D)

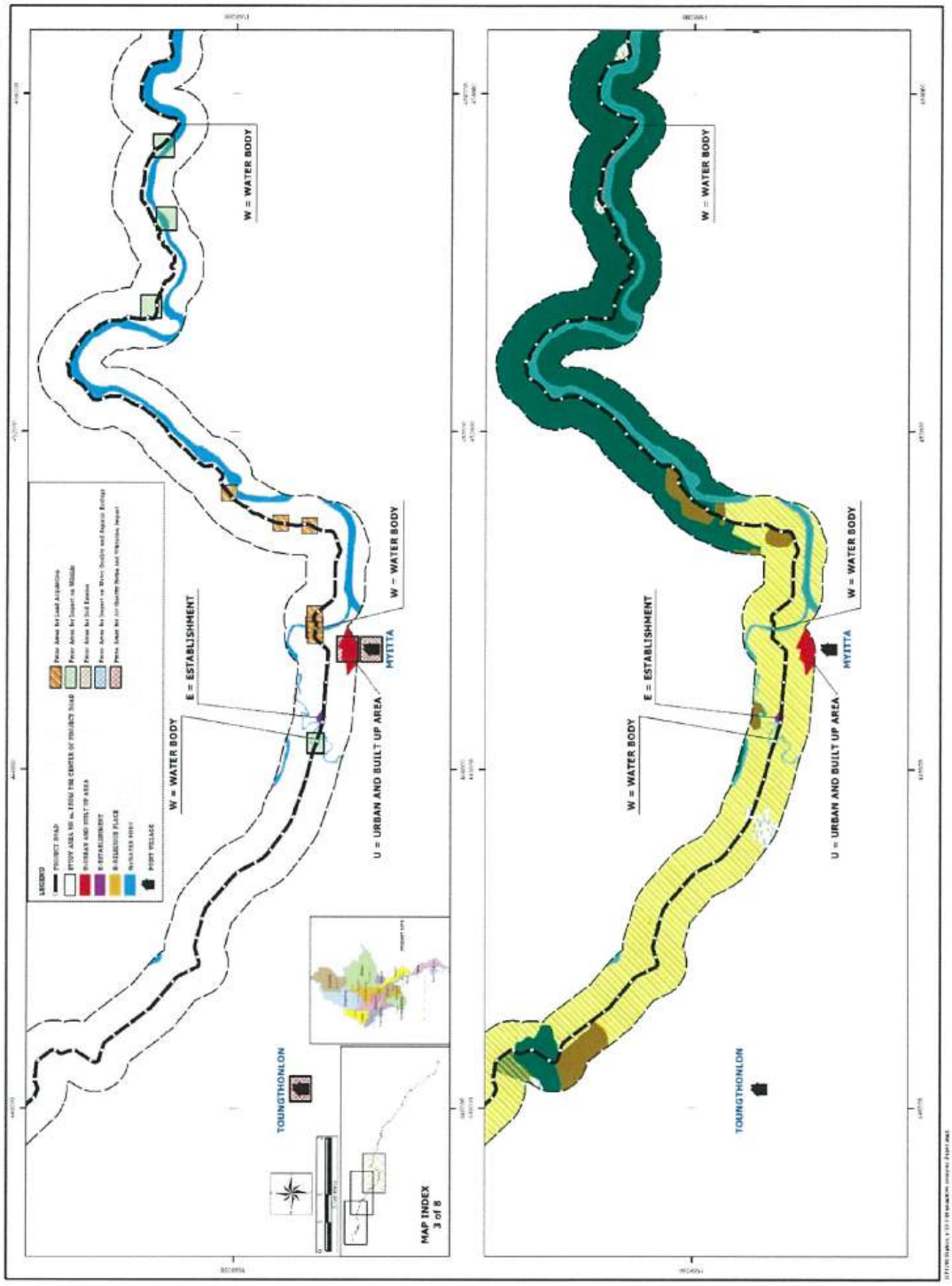


FIGURE 6.4.2-1 : LAND USE MAP WHICH PRESENTS EXISTING LAND USE COMPARED WITH THE FUTURE PROJECT DEVELOPMENT AND PRONE AREAS FOR ENVIRONMENTAL AND SOCIAL IMPACTS (CONT'D)

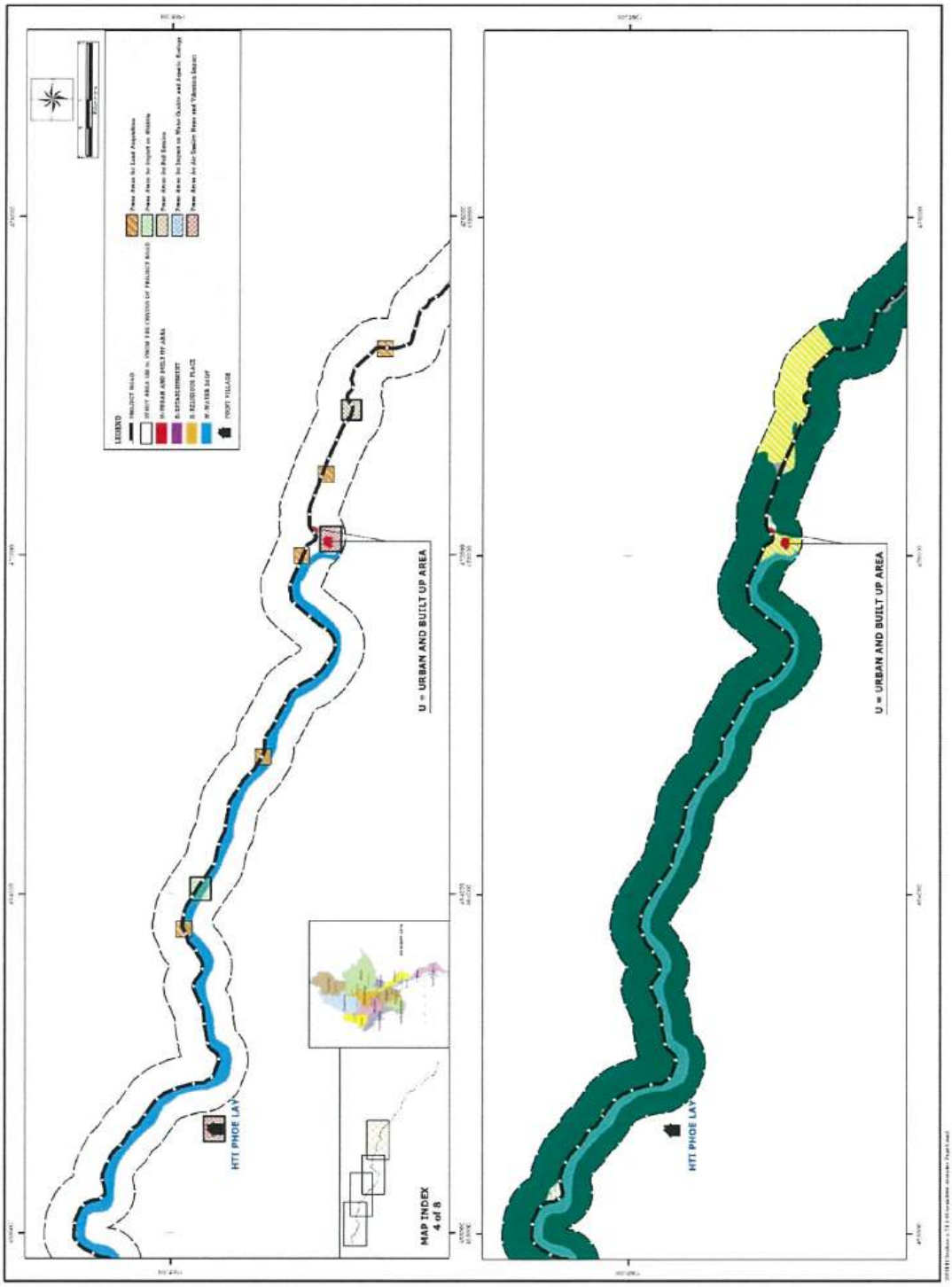


FIGURE 6.4.2-1: LAND USE MAP WHICH PRESENTS EXISTING LAND USE COMPARED WITH THE FUTURE PROJECT DEVELOPMENT AND PRONE AREAS FOR ENVIRONMENTAL AND SOCIAL IMPACTS (CONT'D)

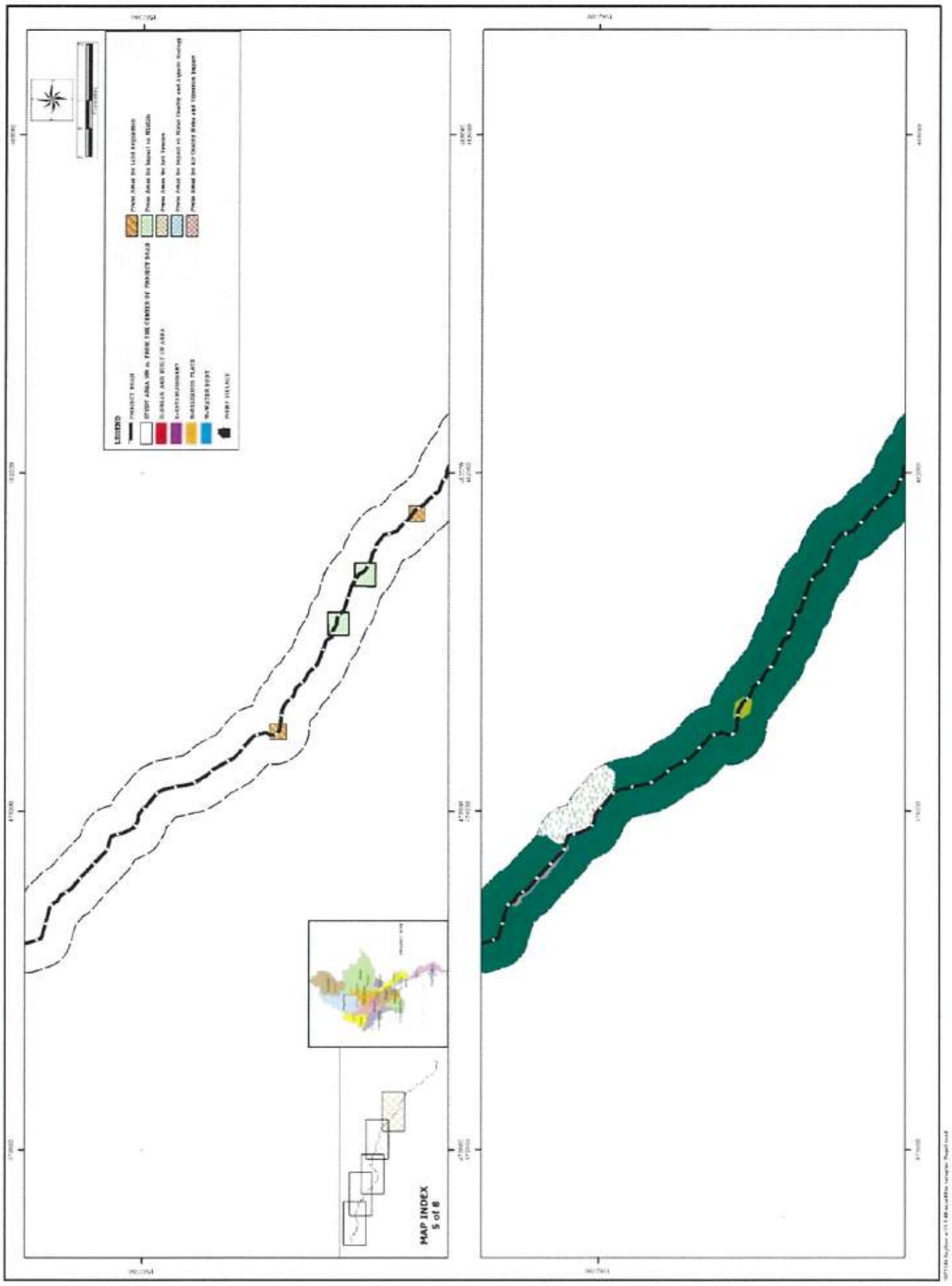


FIGURE 6.4.2-1: LAND USE MAP WHICH PRESENTS EXISTING LAND USE COMPARED WITH THE FUTURE PROJECT DEVELOPMENT AND PRONE AREAS FOR ENVIRONMENTAL AND SOCIAL IMPACTS (CONT'D)

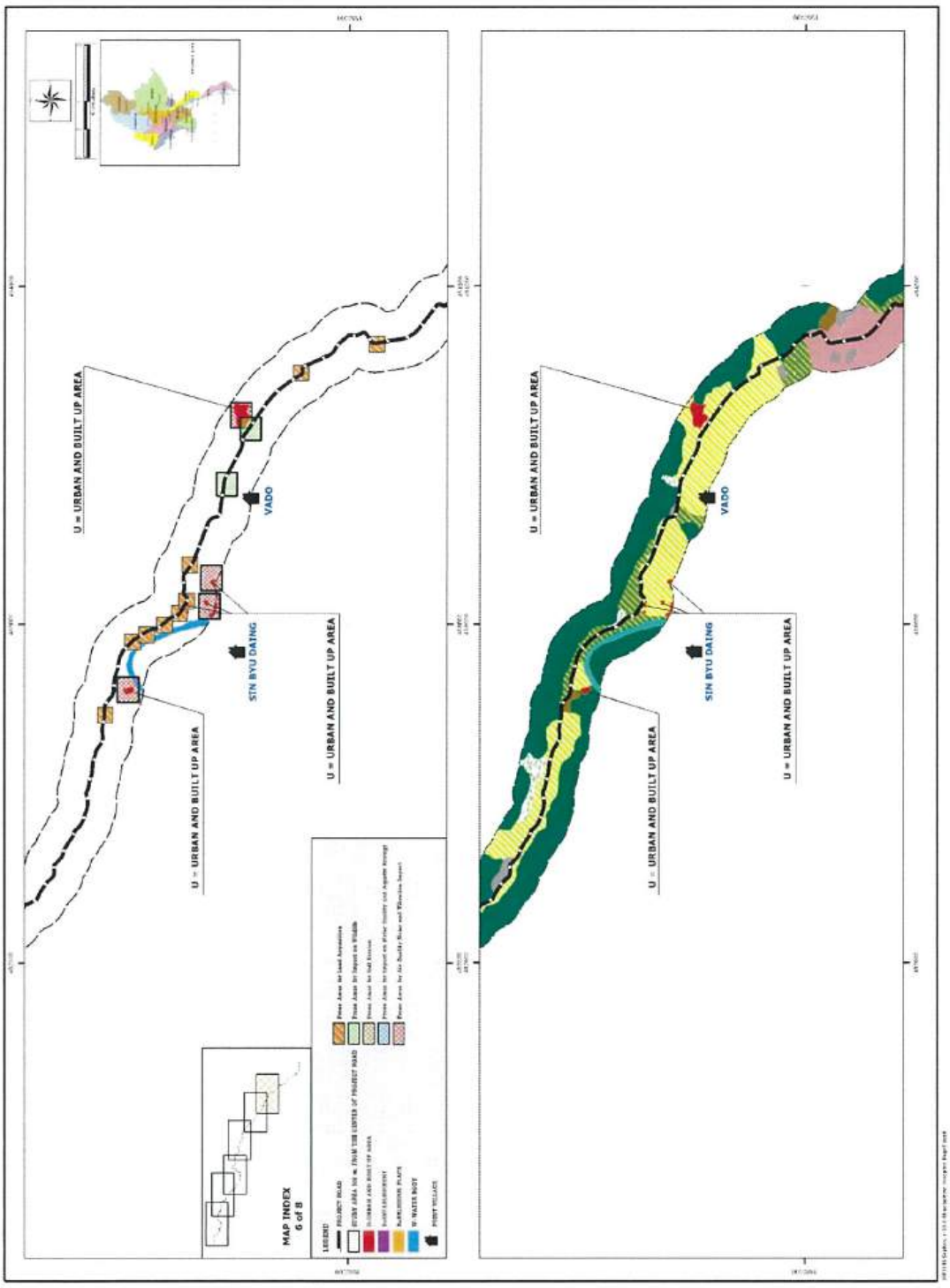


FIGURE 6.4.2-1: LAND USE MAP WHICH PRESENTS EXISTING LAND USE COMPARED WITH THE FUTURE PROJECT DEVELOPMENT AND PRONE AREAS FOR ENVIRONMENTAL AND SOCIAL IMPACTS (CONT'D)

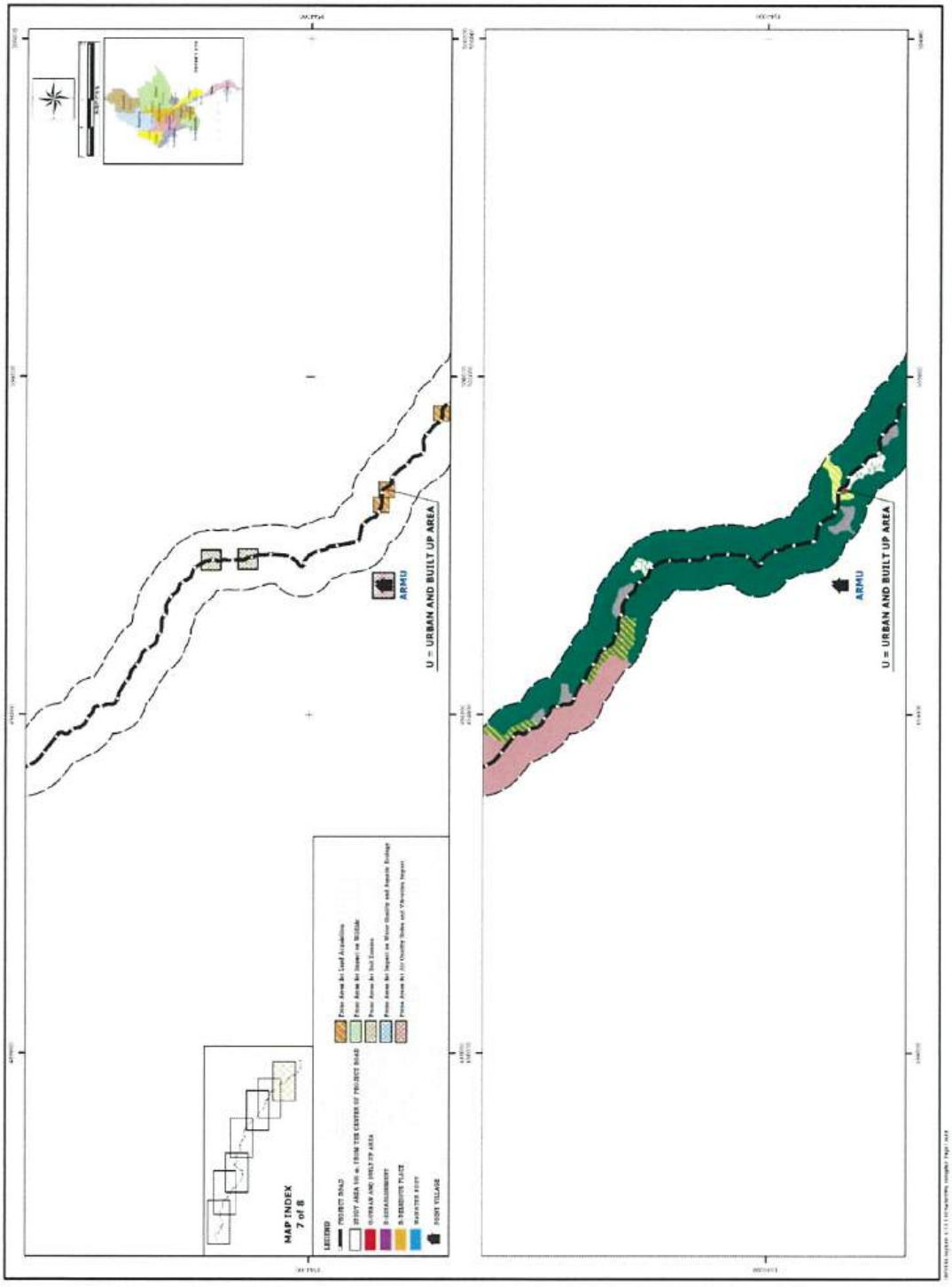


FIGURE 6.4.2-1 : LAND USE MAP WHICH PRESENTS EXISTING LAND USE COMPARED WITH THE FUTURE PROJECT DEVELOPMENT AND PRONE AREAS FOR ENVIRONMENTAL AND SOCIAL IMPACTS (CONT'D)

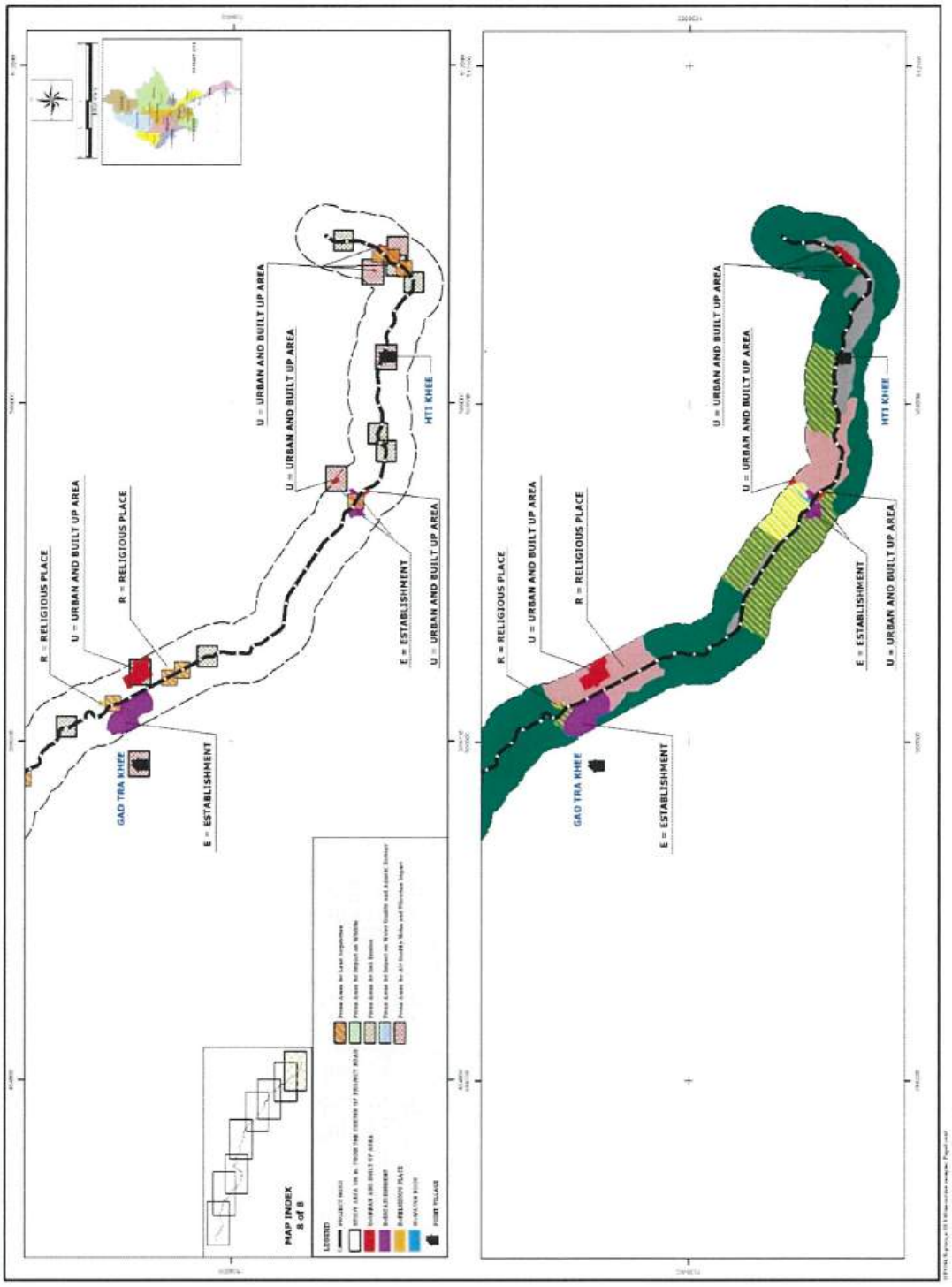


FIGURE 6.4.2-1: LAND USE MAP WHICH PRESENTS EXISTING LAND USE COMPARED WITH THE FUTURE PROJECT DEVELOPMENT AND PRONE AREAS FOR ENVIRONMENTAL AND SOCIAL IMPACTS (CONT'D)

Based on the above data, the total number of truck will be about 196 trucks. The Consultant assumed that the truck to be used during construction phase will be about 10 trips/truck/hr (worst case scenario). Therefore, number of truck trips will be equal to 1,960 truck trips (= 196x10). The traffic load will be about 1,960 trips per day or 245 trips/hr (8 work hours/day). Additional traffic volumes during project construction period is equal to 1,225 pcu/hr (245x2.5x2), when PCE for heavy truck is 2.5 and calculated per round-trip. The results of additional traffic volumes during project construction period is shown in ***Table 6.4.2-11***. It is then clear that the traffic loads created by the construction works will be not much greater than existing traffic load of small vehicles. Therefore, the traffic impacts will be negligible during construction period.

TABLE 6.4.2-11

EXISTING TRAFFIC CONDITION AT THE JUNCTION OF NATIONAL ROAD NO.8 AND ADDITIONAL TRAFFIC VOLUMES DURING CONSTRUCTION PERIOD

Description	TC1 (Existing Condition)		
	Friday, 23th	Saturday, 24th	Average*
Total Traffic volume (PCU/day)	1,142.8	913.06	1,027.93
Traffic volume per 12 hours*(PCU/hours)	95.23	76.09	85.66
Carrying capacity (C) (PCU/hours)	2,000	2,000	2,000
V/C ratio	0.0476	0.0380	0.0428
Traffic Condition (Existing condition)	Very good traffic flow		
	TC1 (Construction Period)		
Additional PCU/day from construction activities	1,225	1,225	1,225
Additional Traffic volume per 12 hours*(PCU/hours) during construction period	102	102	102
Traffic volume per 12 hours*(PCU/hours) during construction period	197.23	178.09	187.66
V/C ratio during construction period	0.0986	0.0890	0.0938
Traffic Condition (Construction Period)	Very good traffic flow		

Remark: * Average of 23 and 24 January 2015 Values
** Traffic volume per 12 hours according to Traffic counting during field investigation on 23 and 24 January 2015
TC1: The junction at National Road No.8 crossing with project alignment

Source: Traffic survey by TEAM Consulting Engineering and Management Co., Ltd., January 2015

(2) Proposed Mitigation Measures

Mitigation measures will be proposed to improve road safety rather than to improve traffic flow. The measures are included in the EMP.

6.4.2.11 Cultural Impact Assessment

A. Potential Impacts:

Construction Period:-

Considering artifacts, religious monuments and monasteries within the project study area, it can be concluded that the project development would cause no impacts on those cultural resources for the following reasons:

Section 1:
1) The stone tool at Duak Luak village and the terracotta pipe are located beyond the zone of impacts from construction activities i.e. approximately 500 m to the south of the project right-of-way.
2) The three stupas at Duak Lauk village are located approximately 500-650 m from the project right-of-way which is beyond the zone of vibration impact from construction activities.
3) Ye Phyu Monastery, Duak Luak Monastery and Sosana Chetaya-pura Monastery are located 500 m, 1,000 m and 900 m respectively from the project right-of way and beyond the zone of influence of impact from vibration due to the construction activities.

Section 2:
1) Maha-bew-Kata-U Monastery is located 800 m from the project alignment (very far beyond the zone of impact)
2) Myitta Church is located 1,000 m from the project alignment (very far beyond the zone of impact)

Section 3: Hti Hkee Monastery is not located in the area to be used for construction.

The cultural resources have not been included in valued Environmental Components and Receptor in item 6.2.2 of the Scoping Report

Operation Period:-

There are no any impact due to project road operation.

B. Mitigation Measure

In case that Cultural heritage or previously unknown heritage resources may be exposed or found during construction of the project. In order to alleviate and mitigate the impacts on cultural heritage resources, chance find procedures shall be implemented as following steps;

1) The person or group (identifier) who identified or exposed the burial ground must cease all activity in the immediate vicinity of the site;
2) The identifier must immediately inform his/her supervisor of the discovery;
3) The supervisor must ensure that the site is secured and control access; and
4) The supervisor must then inform the relevant personnel responsible included local and government cultural heritage administrative department.

5) Potential significance of the remains will be assessed and mitigate options will be identified.

6) If the significance of the remains is judged to be sufficient to warrant further action and they cannot be avoided, then the project archaeologist in consultation with the government cultural heritage administrative department and representatives of local communities will determine the appropriate course of action.

6.4.2.12 Visual Impact Assessment

A. Potential Impacts:-

The Two-Lane road alignment pass through forest area with various landscape characters, some of which possess aesthetic value. The project development would cause adverse and positive impacts on visual aspects as follows.

Construction Period:-

- The project construction could cause some alteration on natural relief and morphology of the landscape due to cut and fill. However the project alignment has been designed in harmony with the natural reliefs, the impact in this aspect has been minimized.
- Since the project alignment is mostly in forest area, the visual pollution due to dirtiness and untidiness of construction sites would be observed by very few viewers, moreover the contractor would be controlled to keep construction sites clean can tidy, the impact can be expected as low.

Operation Period:-

The project development would also cause positive visual impact i.e. road sections between km 73-km 101 which possess aesthetic quality with beautiful views of river and mountains could be scenic route for tourists.

B. Mitigation Measures:-

Due to low negative impacts, mitigation measures are not needed.

6.4.3 Risk Assessment

6.4.3.1 Environmental Risk Management Context

During the operational phase, the project proponent will routinely implement, as part of the road operations, all environmental mitigation measures recommended in this Final ESIA Report and accepted by the Project Proponent and MONREC. It is essential that the environmental performance requirements of the operational phase will need to be adequately incorporated in the designs, specifications, and construction. Monitoring of the environmental performance of the project operation will be carried out by the third party.

Environmental risk management during the operational phase will be carried out by the EHS unit. The environmental risk mitigation measures will be implemented by the project proponent within the scope of and procedures for the hydropower plant risk management.

6.4.3.2 Risk Identification

During the operational phases, the major risk of this project will be the concern on traffic accidents.

6.4.3.3 Risk Analysis

Traffic Accident

Consequences

In case of traffic accidents, there would be loss of life and properties.

Underlying Causes

Traffic accidents would be increased due to the increase of traffic volume during road operation.

Likelihood of Occurrence

The likelihood of occurrence of traffic accidents will be low if: (i) design specifications and technical requirements for road safety clearly prescribed in the design; (ii) strict control on road safety is implemented throughout the road operation.

6.4.3.4 Risk Classification

A simple risk matrix for the operational phase is shown in ***Figure 6.4.3-1***. All the three risks are classified as minor risks.

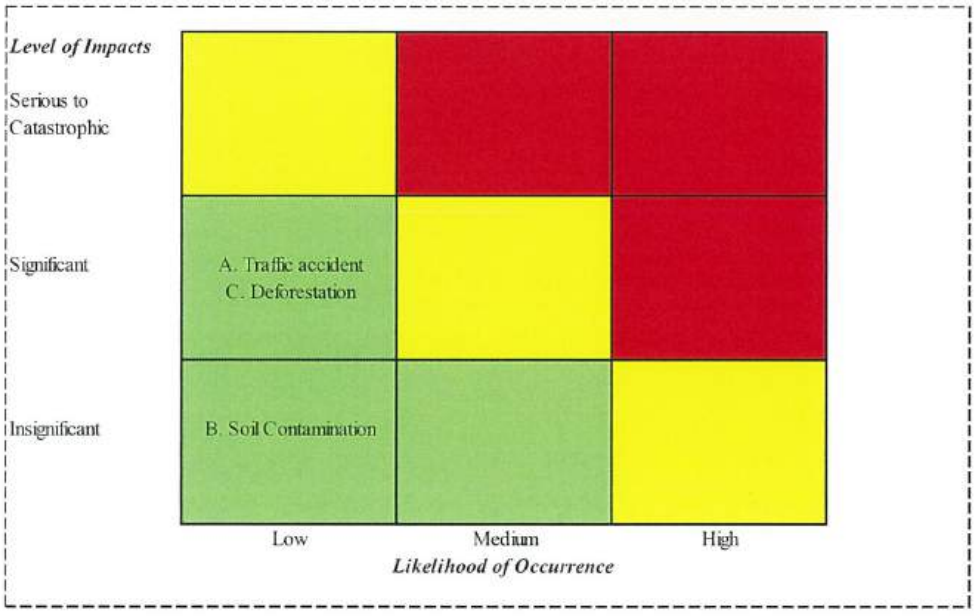


FIGURE 6.4.3-1: RISK CLASSIFICATION MATRIX-OPERATIONAL PHASE

6.4.3.5 *Risk Mitigation Measures*

(1) Planners and contractors involved in the design of a road should: (a) examine road design standards, safety equipment, specifications and training to ensure that design details take account of safety concerns and that specific safety features are correctly designed and installed; (b) require that road design audits be done at the preliminary and final design stages by specialists in road safety and traffic operations; and (c) draft traffic management plans, including details of signs, marketing, intersection layouts, channelization of flows, access restrictions, footpaths, bus stops, and provisions for non-motorized vehicles.

(2) The following safety policies are strongly recommended: (a) mandatory use of seat belts; (b) compulsory driver training and testing; (c) prohibition and punishment of driving while impaired by drugs or alcohol; (d) traffic safety education for children; and € testing and inspection of all vehicles for compliance with safety standards.

(3) There should be a parallel improvement in road safety features for non-motorized vehicles. The provision of rest areas on heavily-traveled roads is also important for ensuring the safety of all road users. These allow drivers to leave the busy road safely, rest, and use toilet facilities.

6.4.3.6 Implementation Arrangements

A. Responsible Persons and Organization

Environmental risk management during the operational phase will need to be an integral element of environmental management and risk management and operations of road. Therefore, the organization for environmental management proposed in the OEMP will also be responsible for environmental risk management.

However, the proposed measures for managing road safety risks will also need to be implemented by the Project Management Team during the design and construction phase.

B. Risk Monitoring and Evaluation

Risk monitoring and evaluation during the operational phase will be focused on road safety.

C. Reporting and Corrective Actions

The process for reporting and corrective actions in environmental management will also be applied to the environmental risk management. The main concern will be on road safety. The road safety monitoring results will be reviewed by the risk management committee for taking corrective actions.

CHAPTER 7

CUMULATIVE IMPACT ASSESSMENT

CHAPTER 7
CUMULATIVE IMPACT ASSESSMENT

7.1 CONCEPTUAL FRAMEWORK FOR CUMULATIVE IMPACT ASSESSMENT FOR THIS PROJECT

The EIA Guideline requires an EIA investigation to consider cumulative impact (Article 53).

Numerous definitions of cumulative impacts (CIA) or effects exist with slight differences in meaning. The EIA Guideline gives the following definition of cumulative impacts:

> Cumulative impacts can be defined as "*the impact or impacts of a project that in itself or themselves may not be significant but may become significant when added to the existing and potential impacts eventuating from similar or diverse projects or undertakings in the same geographic area or region.*"

In general, cumulative impacts can be defined as

"The changes to the environment caused by a proposed project in combination with other past, present, and reasonably foreseeable projects or human activities".

It should be noted that baseline environmental quality of the EIA study area, such as baseline ambient air quality, is the results of existing activities of road which is already in operation. Therefore, the impacts of this Project discussed in Chapter 6 are actually cumulative impacts of the Project and other existing activities in the study area. For example, the predicted noise level caused by the Project is the incremental part on top of the already increased noise level. The impact is the net noise level i.e. ambient noise level and the predicted increase in noise level. ***Figure 7.1-1*** illustrates the cumulative impact of the Project and other existing activities.

For this Project, Two-lane road is to be constructed upon the existing dirt access road being in use. The existing air quality, noise and vibration levels are the impacts of existing road operation and maintenance, the impacts of this Project are therefore cumulative impacts.

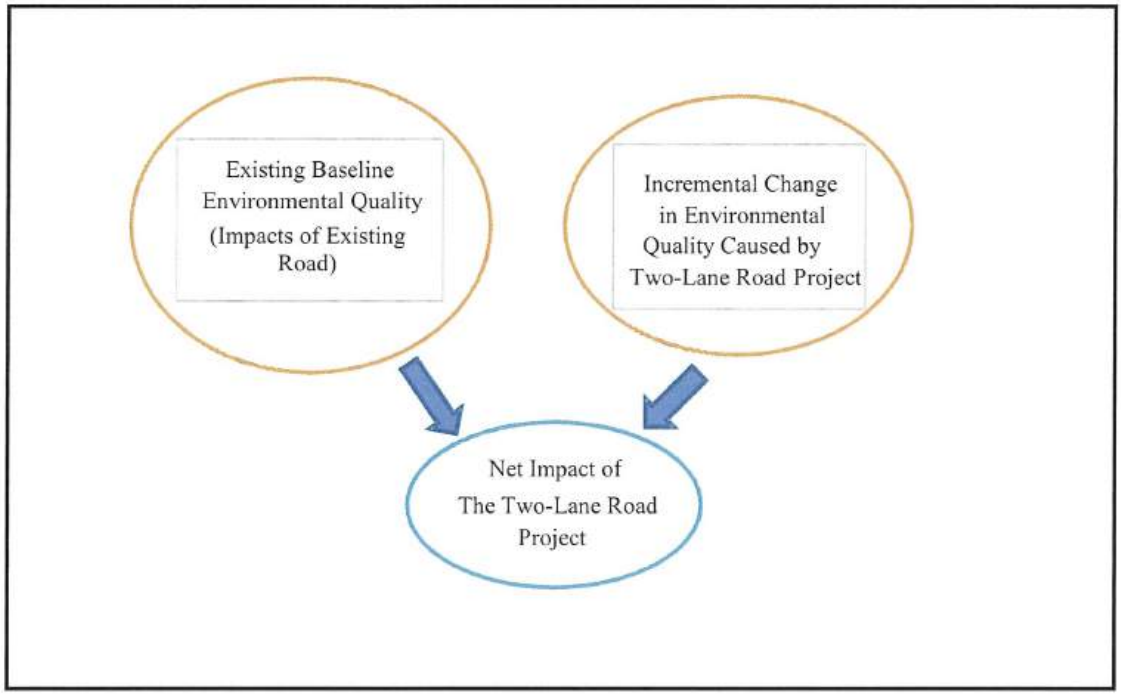


FIGURE 7.1-1 : CUMULATIVE IMPACT OF TWO-LANE ROAD PROJECT AND EXISTING ROAD

7.2 NEED FOR CUMULATIVE IMPACT ASSESSMENT FOR THIS PROJECT

As this Project can be defined as a road improvement project, there have been already environmental impacts due to construction and operation of existing access road linking the Dawei Special Economic Zone with Thai Border. The development of the Two-Lane road would cause some incremental impact on almost all of environmental aspects due to the expanded traffic lanes, more cuts and fills, more complicated construction activities, more workers and machineries involved.

The ESIA study Team has already considered all existing environmental impacts in combination with the expected impacts from the new development as presented in ***Chapter 6***.

Therefore, there is no need for a separated chapter for elaboration of the cumulative environmental impact assessment.

MIE has a plan to construct telecommunication landline in form of optical fiber cable within ROW of Two-Lane road alignment in the near future. Initially, temporary telecommunication landline supporting poles will be installed on the remaining open space within Two-Lane road right-of-way during construction period of the Two-Lane road. After Power Transmission Line construction is completed the telecommunication landline will be relocated to be attached with the transmission line supporting towers. It is expected there would be no additional or cumulative impact on the environment due to installation of the temporary poles.

CHAPTER 8

ENVIRONMENTAL MANAGEMENT PLANS

CHAPTER 8

ENVIRONMENTAL MANAGEMENT PLANS

For convenience in the use of EMPs during Project implementation and as prescribed in the Environmental Impact Assessment Procedure (2015), the construction phase EMP and the operational phase EMP are presented in Volume 2 of this Final EIA Report. This Chapter presents the conceptual framework of EMPs and a summary of each EMP.

8.1 THE CONCEPTUAL FRAMEWORK

8.1.1 Scope of Environmental Management Plans

The results of EIA investigation will not lead to any results if they are not translated into two implementable environmental management plans (EMPs): one EMP for implementing in the construction phase of the Project and another EMP for implementing in the operational phase of the Project. Recognizing this fact, the EIA Procedure requires the Final EIA Report to include two environmental management plans - a construction phase environmental management plan (CEMP) and an operational phase environmental management plan (OEMP).

The two EMPs are defined in the EIA Procedure 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 images, site layout plans, environmental management and monitoring sub-plans for each construction site, thematic sub-plans, and management procedures as appropriate.*

Operational Phase EMP *means 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. The plan shall include a description of the Project operations, installations, and infrastructure, and shall present an overview of Adverse Impacts, present mitigation measures together with time schedules, overview maps, images, aerial photos, satellite images, site layout plans, environmental management and monitoring sub-plans for each Project 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 EIA practices in developed countries.

It 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 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 EMPs after the EIA during project implementation.

8.1.2 Application of the Owner-EMPs

The Project Proponent will require in the EPC contract (Contract) the Contractor to prepare a detailed CEMP in due course before commencing the construction. The Contractor will use the Owner- CEMP as the basis for preparing a detailed Contractor-CEMP. The Contractor-CEMP will be based on the Contractor's final designs, construction methods, and construction schedule. The scope and content of the Contractor-CEMP will not be less than the scope and content of the Owner- CEMP. The Contractor-CEMP shall be contractually binding. During the construction, the Contractor will implement the Contractor-CEMP under the supervision of a Project Manager to be appointed by the Project Proponent.

As the Contractor will also be responsible for the design, supply and construction of road and bridge and its associated facilities, the Project Proponent will require in the Contract the Contractor to prepare a detailed Contractor-OEMP in due course before the operation. The Contractor will use the Owner- OEMP as the basis for preparing the Contractor-OEMP based on the actual construction and final operational procedures to be prepared by the Contractor. The Owner's Road Operation Team will review and revise the Contractor-OEMP as appropriate to prepare the Final OEMP for implementation in the operational phase.

For clarity, the application of the Owner- EMPs as above described is shown as a diagram in ***Figure 8.1-1***.

8.1.3 Scope of Project Environmental Management

Environmental management during the construction and operational phases of the Project is based on the same basic principle of management known as the PDCA cycle (see ***Figure 8.1-2***). Environmental management in each project phase thus consists of four related tasks:

(i) Plan (P)-what need to be done to minimize the anticipated impacts;

(ii) Do (D)-implement the plan;

(iii) Check (C)-monitor and evaluate the results of implementation

(iv) Act (A)-taking corrective actions to improve the results, if found inadequate

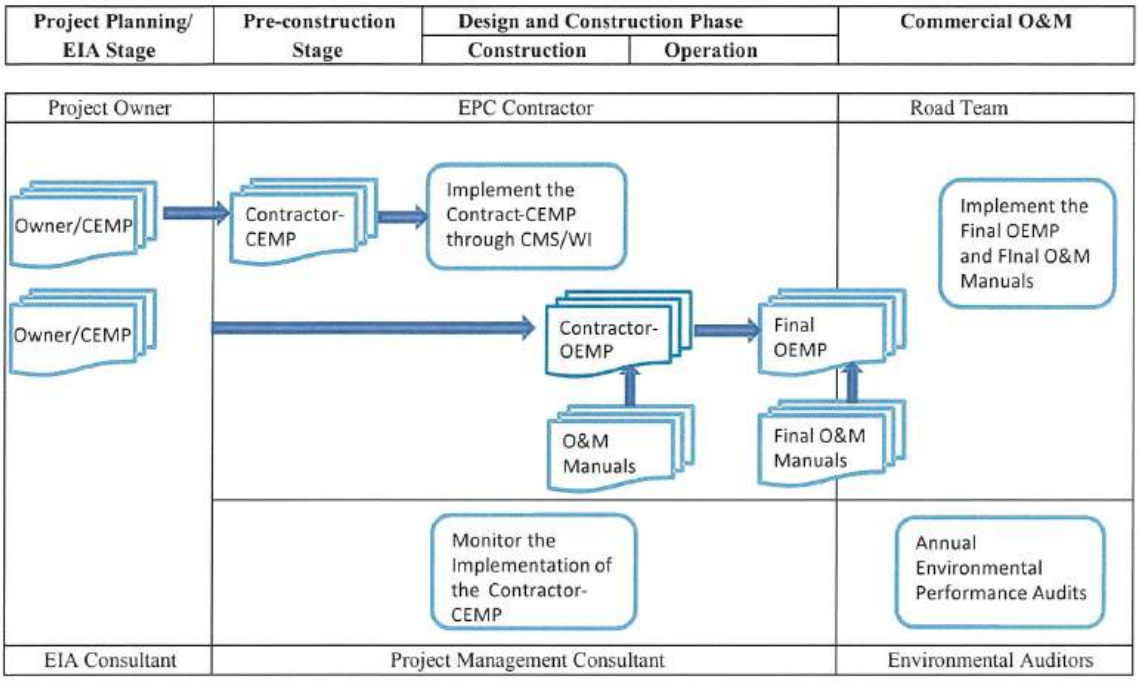


FIGURE 8.1-1 : APPLICATION OF THE EIA-EMP

FIGURE 8.1-2 : PDCA CYCLE FOR ENVIRONMENTAL MANAGEMENT

Therefore, the CEMP and OEMP will need to cover the following subjects: (i) mitigation measures to be implemented; (ii) arrangements for the implementation of mitigation measures; (iii) monitoring, evaluating and reporting of the implementation of mitigation measures to provide feedback information on whether the environmental performance deviates from the prescribed benchmarks; (iv) corrective actions process if the environmental performance below the benchmarks, environmental incident response, and emergency plan; (v) arrangements for operating the EMS, including organizational structure, responsibilities, documentation, training, communication, and management review; and (vi) involvement of stakeholders or affected people in environmental management, including public grievance redress mechanism.

8.2 PROJECT'S EHS POLICY AND COMMITMENTS, AND LEGAL REQUIREMENTS

The Owner's EHS policy and commitments and legal requirements will set the levels and targets of environmental performance of the Project both during construction and operation.

8.2.1 Owner's Policy and Commitments

Environmental management of the Project will follow the EHS policy of the Project Proponent as stated in ***Section 3.1 of Chapter 3.*** The policy will be similar to the one of the developer (Myandawei Industrial Estate Company Limited-MIE), which adopts for its existing development projects in Thailand as shown below:

Environmental Policy

A. Will comply with relevant environmental laws and regulations.

B. Will manage our business with the goal to alleviate the adverse effects on the environment, undertake appropriate reviews and evaluations of our performance to measure and to ensure compliance with this environmental policy,

C. Will encourage employees to have strong concern and be responsible for the clean environment, and

D. Will educate the employees on the environment including exchanging the knowledge with other agencies in order to continuously and regularly maintain good environment and to improve the working practice appropriate to the environment.

Safety and Health Policy

A. Will strive to prevent accident, injury and occupational illnesses through the active participation of every employee.

B. Commit to continuous efforts to identify and eliminate or manage safety risks associated with our activities.

C. Will strictly comply with all applicable laws and regulations. In case that no enforceable body of law exists, we will apply reliable standards of our own.

D. Will arrange for the proper design of tool and equipment, regulations, training and the control tools in a manner that safeguards workers, property and the communities in which we operate from machine, working procedures and occupational

illnesses.

E. Employees who report to work with illegal drugs in their system or report with level of alcohol or other chemical substances that could impair performance are subject to disciplinary action.

In line with this policy, the Project will commit to the following:

During Construction: The Project will endeavor to minimize environmental impacts and meet all EHS requirements during the construction. This will be achieved through adopting designs, construction methods, construction management practices, and impact mitigation measures.The Project EHS performance will be measured and evaluated against applicable national or international standards and guidelines prescribed by MONREC or proposed in the CEMP. In addition, the Project will establish an environmental management system (EMS) for the Project construction.

During Operation: The Project will endeavor to minimize environmental impacts and meet all EHS requirements of the road's operation and maintenance (O&M). This be achieved through adopting: (i) best available techniques in the road design and operation; and (ii) effective impact mitigation measures proposed in the EIA. The Project EHS performance will be measured and evaluated against applicable national or international standards and guidelines prescribed by MONREC or proposed in the OEMP. The Project will also establish an EMS specific for the road operation, which will follow principles and good practices in environmental management of roads.

Form of Confirmation and Letter of Undertaking for EIA& EMMP in order to state that the Project Proponent will fully implementation for environmental impact reduction process and plans need to state in the report is presented in **Appendix 8A**.

8.2.2 Legal Requirements

Environmental management of the Project will comply with legal requirements pertinent to the EMP prescribed in the Environmental Conservation Rule 2013, and the Environmental Impact Assessment Procedure (2015).

A. Environmental Conservation Rules, 2013

Chapter IX, Articles 41 to 46 prescribes the tasks regarding waste management under the control of MONREC and the Environmental Conservation Department. Waste management covers hazardous wastes, solid wastes, wastewater and emissions.

B. Environmental Impact Assessment Procedure, 2015

Articles in the EIA Procedure relevant to the preparation and implementation of the EMPs are summarized in ***Table 8.2-1***. Preparation and implementation of the two EMPs will need to comply with relevant articles in the table.

TABLE 8.2-1

CONTENT OF THE EIA PROCEDURE RELEVANT TO THE EMPS

Subject	Relevant Articles
Content of the EMPs	60
Project Approval Requirements	
- Issuance of an ECC	67
- Conditions of the ECC	77, 78, 80, 81, 82, 83, 84, 86, 87, 88
- Submission of an CEMP and OEMP	82, 84
Revision and updating the EMPs	84, 87, 88, 89
Implementing the EMPs	93, 94
Monitoring and Reporting	
- Responsibility for Monitoring	95, 96
- Content of Monitoring Report	98
- Submission of Monitoring Report	97
- Disclosure of Monitoring Report	99
- Inspection by MONREC	100-111

8.3 SUMMARY OF CEMP

As discussed in ***Chapter 6***, the Project is not expected to have major environmental impacts during construction apart from environmental disturbances normally experienced in dam 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 dam, powerhouse, and its associated facilities, construction methods, and specifications.

The content of the Owner-CEMP presented in Volume 2 follows the basic elements of environmental management as discussed in ***Section 8.1.3***. Major aspects of the Owner-CEMP are summarized as follows:

8.3.1 Impacts and Management Plans

The construction activities will cause some environmental disturbances which will be transient and will not have significant irreversible impacts. Types, magnitudes, durations, and locations of environmental impacts during the construction will vary as the construction progresses. ***Table 8.3-1*** shows anticipated environmental impacts at various months of the construction period.

The following issues will be managed during the construction phase: (i) air quality; (ii) noise; (iii) vibration; (iv) surface water quality; (vi) aquatic ecology; (vi) soil erosion protection; (vii) forest and wildlife; (viii) land acquisition; (ix) socio-economic; (x) land use; and (xi) cultural heritage.

TABLE 8.3-1

ANTICIPATED IMPACTS AT VARIOUS MONTHS OF THE CONSTRUCTION

Construction Activities	Duration (months)	Impacts
1. Preparatory works	8	Dust, Noise, Vibration
2. Removing of existing structures	18	Dust, Noise, Vibration
3. Earth works		
3.1 Clearing and grubbing	12	Dust, Noise, Vibration, Water Quality, Forest and wildlife, Land acquisition, Socio-economic
3.2 Roadway excavation	16	Dust, Noise, Vibration, Water Quality
3.3 Embankment	14	Dust, Noise, Vibration, Water Quality, Soil Erosion
4. Subbase and base course works	15	Water Quality, Soil Erosion
5. Surface course works	16	Dust, Noise, Vibration, Water Quality
6. Structure works		Dust, Noise, Vibration, Water Quality
5.1 Construction bridges section 1	15	
5.2 Construction bridges section 2	20	
5.3 Construction bridges section 3	20	
7. Drainage works	24	Water Quality, Soil Erosion
8. Miscellaneous work		
8.1 Slope protection	9	Water Quality, Soil Erosion
8.2 Subsurface drain	15	Water Quality, Soil Erosion
8.3 Concrete curbs and gutter	15	Noise, Vibration, Water Quality
8.4 Sodding	9	Water Quality, Soil Erosion
8.5 Topsoil and clay	9	Dust, Noise, Vibration, Water Quality
8.6 Guardrail	8	Traffic and safety
8.7 Marker and guide post	4	Traffic and safety
8.9 Traffic signs	5	Traffic and safety
8.10 Markings	6	Traffic and safety
9. Facilities works	30	Dust, Noise, Vibration , Water Quality
10. Traffic Management during construction	30	Dust, Noise, Vibration, Water Quality, Traffic and safety

Note : Duration of activities based on project construction schedule presented in ***Table 4.3-1 in Chapter 4***

8.3.2 Arrangements for the Implementation of Mitigation Measures

The Contractor will elaborate and update the Owner-CEMP to prepare a Contractor-CEMP for approval by the Owner's Project Manager. The Contractor will then implement the Contractor-CEMP under supervision of the Owner's Project Manager through the Construction Supervision Consultant. The Contractor will field an EHS manager to be in charge of all aspects of the implementation of the Contractor-CEMP.

8.3.3 Monitoring, Evaluating and Reporting

Monitoring, evaluating, and reporting (MER) of the environmental performance of the Contractor will include scheduled monitoring of the indicators related to each impact issue. In addition, the Contractor's and the Owner's EHS managers will conduct daily, weekly, and monthly site inspection programs to observe environmental performance of the construction. The Contractor will submit two monthly monitoring reports-one for internal use and another for reporting to MONREC. These two types of reports are discussed in details in the CEMP.

In addition to the scheduled MER, environmental incidents, if occurred, will be recorded, registered and reported.

8.3.4 Corrective Actions

The Contractor will be instructed by the Owner's Project Manager to take corrective actions for any identified non-compliance with prescribed environmental indicators. Taking corrective actions in the context of CEMP will have to be a part of project management and will use the same procedure for taking corrective actions in project management. The procedure proposed in the CEMP will therefore have to be reviewed and revised as necessary to make it similar to the procedure for project management. A single procedure for taking corrective actions should be used in project management.

The Contractor is required to establish own procedure for corrective actions related to EHS non-compliances. The CEMP proposes several categories of non-compliance, levels of non-compliance, and responsibilities and process for taking corrective actions based on the level of non-compliance. The Contractor will be required to conduct an investigation of the non-compliance to determine its root causes and formulate effective actions to correct the root causes. The Contractor will report to the Project Manager the results of taking corrective actions. The Contractor will also be required to prepare an emergency response plan and establish adequate capacity for implementing the emergency response plan.

8.3.5 Organization

Environmental management during the project construction will involve the Project Proponent, the Contractor, and MONREC through ECD, and other government agencies at the regional, township and community levels.

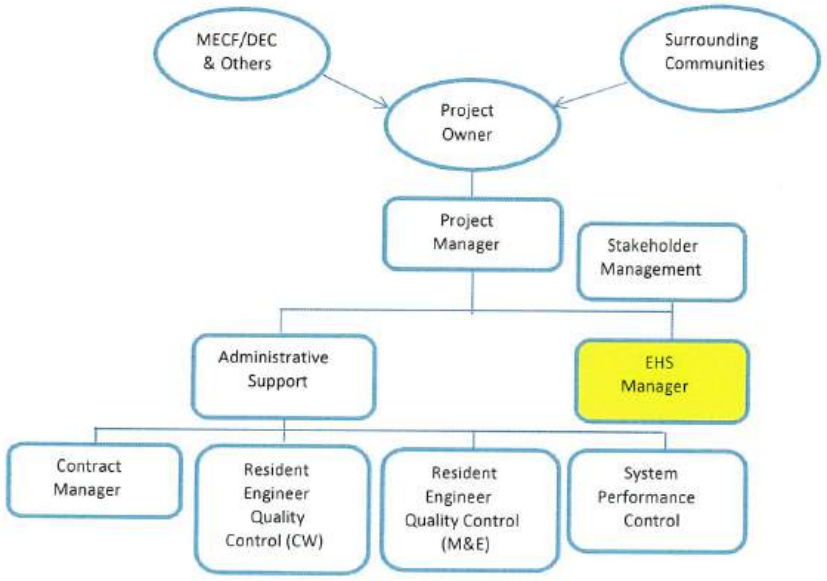
As environmental management will be carried out as part of the Project management, it will be a functional unit in the project management organization. ***Figure 8.3-1*** shows a tentative organizational structure for Project construction consisting of an organizational structure of the Project Proponent and an organizational structure of the Contractor. The two organizational structures will need to be revised as appropriate as the Project moves from the planning stage to the design stage.

8.3.6 Public Consultation and Disclosure

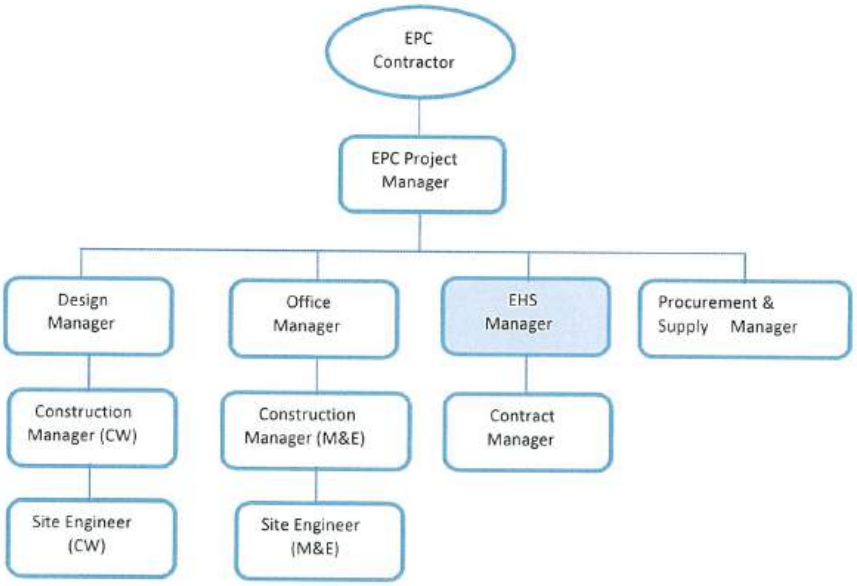
The CEMP proposes a tripartite committee as the main mechanism for public consultation and disclosure. The components and responsibilities of the tripartite committee are defined. A grievance redress process is proposed as mechanism for ensuring that public complaints and concerns related to the construction will be effectively addressed as soon as possible.

8.3.7 Audit

An audit is proposed at the end of the first year of construction and another audit at project completion.



PROJECT MANAGEMENT STRUCTURE



EPC CONTRACTOR'S PROJECT MANAGEMENT STRUCTURE

FIGURE 8.3-1 : ORGANIZATION FOR PROJECT CONSTRUCTION

8.4 SUMMARY OF OEMP

As discussed in ***Chapter 6***, the operation of the project will not create any significant environmental impacts. Therefore, the OEMP will require much less activities and a much simpler EMS compared to those of the CEMP. A summary of the Owner-OEMP is presented below:

8.4.1 Mitigation Measures and Plans

A sub-management plan for each of the identified issue is prepared and presented in ***EMP Report.***

8.4.2 Environmental Management System (EMS)

The project management organization will set up a simple EMS for its O&M activities. This EMS will focus more on occupational health and safety of project workers which is about 1,200 persons.

8.4.3 Monitoring, Evaluating and Reporting

The MER will include scheduled monitoring of air quality, noise, surface water quality, aquatic ecology, forest and wildlife and socio-economic. Annual environmental reports will be prepared for submission to MONREC and other concerned authorities.

8.4.4 Corrective Actions

Corrective actions are described as part of the management of the implementation of the five sub plans in operation period.

8.4.5 Organization

As environmental management will be carried out as part of the road management, it is a functional unit in the road management organization. ***Figure 8.4-1*** shows a tentative organizational structure for road management, including the EHS unit. The organizational structure will be revised as appropriate in due course by the Project Proponent before the commissioning.

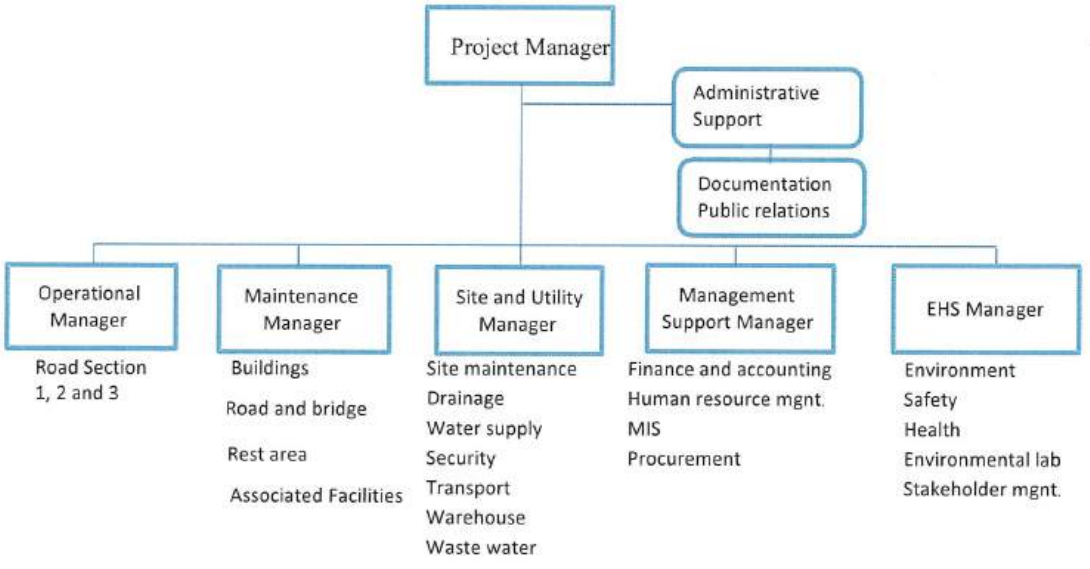


FIGURE 8.4-1 : TENTATIVE ORGANIZATION FOR ROAD O&M AND ENVIRONMENTAL MANAGEMENT

8.4.6 Public Consultation and Disclosure

The tripartite committee established during the construction phase should be maintained. However, its role would be more on providing advice in the implementation of the community support plan. The components and responsibilities of the tripartite committee are defined. A grievance redress process is proposed as mechanism for ensuring that public complaints and concerns related to the road operation will be effectively addressed as quick as possible.

8.4.7 Audit

An audit is proposed at the end of the first year of operation and every three years thereafter, if necessary.

CHAPTER 9

PUBLIC CONSULTATIONS AND DISCLOSURE

CHAPTER 9

PUBLIC CONSULTATIONS AND DISCLOSURE

9.1 INTRODUCTION

The EIA Procedure prescribes requirements for public consultations and disclosure (PCD) in the EIA investigation in Articles 50 and 51 as copied below for ready reference.

> *50. The EIA shall consider the views, concerns, and perceptions of stakeholders, communities and individuals that could be affected by the Project or who otherwise have an interest in the Project. The EIA should include the results of public consultations and negotiations with the affected populations on the environmental and social issues. Public concerns should also be taken into account in assessing impacts, designing mitigation measures, and selecting monitoring parameters.*
>
> *51. As part of the EIA investigations, the Project Proponent shall undertake the following consultation process:*
>
> *a) timely disclosure of all relevant information about the proposed Project and its likely Adverse Impacts to the public and civil society through local and national media, the website of the Project Proponent, at public places such as libraries and community halls and sign boards at the Project site visible to the public.*
>
> *b) arrange consultation meetings at national, state and local level with PAPs, authorities, community based organizations, and civil society;*
>
> *c) consultations with concerned government organizations including the Ministry, the concerned sector ministry, regional government authorities, and others; and*
>
> *d) field visits for the Ministry and concerned government organizations*

The EIA Guideline requires PCD to be conducted during project scoping, during the preparation of EIA report and during EIA review.

This chapter presents results of the two PCD. The first PCD was conducted during the scoping stage from 20 to 30 January, 2015 and 6 to 18 February, 2015, the second PCD during the preparation of the draft EIA report from 1 to 11 December 2015, the third PCD was conducted on 28 March, 2018 at Dawei Special Economic Zone Meeting Hall and the last PCD was conducted at 5 May, 2018 at Myitta GAD Meeting Hall. The chapter is structured as prescribed in the EIA Guideline.

9.2 METHODOLOGY AND APPROACH

The Consultant planned, organized and conducted the two PCD in consultation with the Tanintharyi Region Office of the Environmental Conservation Department. It should be noted that PCD is essentially the primary level of public participation in project development and implementation. The approach and methodology adopted in the PCD for this Project follows principles and practices in public participation, and is briefly described as follows.

9.2.1 Identification of Stakeholders and Groups Affected by the Project

Considering the project scope and the legal and institutional framework for environmental and social impact management applicable to the Project, the Project stakeholders could be identified and classified into three categories:

(1) Government Authorities Involved in EIA Administration

The Project's stakeholders in this category are key officials or representatives of the national, state/ regional, district and local authorities who have direct responsibilities for the administration of the EIA process for environmental and social clearance and issuing operation permits for proposed development projects particularly power projects.

For this Project, relevant key offices at the national level are: (i) Ministry of Environmental Conservation and Forestry; (ii) Environmental Conservation Department and (iii) Ministry of Social Welfare, Relief and Resettlement.

Relevant key offices at the regional level are: (i) Tanintharyi Region Office of the Environmental Conservation Department; (ii) Tanintharyi Region Office of Social Welfare, Relief and Resettlement; (iii) Tanintharyi Region Office of the Ministry of Transport; (iv) Tanintharyi Region of the Ministry of Electricity and Industry; (v) Tanintharyi Region Office of Planning and Economic; and (vi) Chairman of Hluttaw.

Relevant key offices at the local level are: (i) Yebyu Township Administration; and (ii) Myitta Sub-Township Administration.

The DSEZ Management Committee (DSEZMC) and the Supporting Working Body (SWB)-Support Working Group of DSEZ-are two key organizations responsible for facilitating resolving issues between the Government, the Central Body and developers/ investors in DSEZ. Their responsibilities are wide-ranging including, but not limited to, supervising and inspecting matters regarding implementation of proposed investment and establishment plans, land-use, environmental conservation, waste control, health, education, finance and taxation, development, communication, security, infrastructure and coordination among the relevant governmental departments.

SWB is involved in development activities in the project area. It comprise 14 representatives of relevant government agencies and organizations from various ministries.

(2) Other Interested Parties

The Project's stakeholders in this category are various government departments responsible for development of various sectors, and community based organizations as listed below:

- Department of Health
- Planning Department
- Forestry Department
- Agriculture Department
- Department of Transport
- Electric Power Department
- Land Record Department
- Karen National Union (KNU)
- Dawei Development Association (DDA)
- Medecins Sans Frontieres, Dawei Office (MSF)

(3) Potentially Affected People

The Project's stakeholders in this category are village committees and individual villagers in the Sixteen villages in the study area namely Dauk Lauk, Tha Laing Ya, Pa Dao Geon, Tha Loat Htar, Tha Khat Done, Ye Bouk, Tha Byu Chaung, Pyin Tha Daw, Myitta, Taung Thone Long, Sin Byu Daing, La Or, Va Do, Armu, Gad Tra Khee and Hti Khee in Yebyu Township of Dawei District. Residents in these villages would have concerns on various potential impacts of the Project during construction and operations such as noise, fugitive dust, water turbidity, traffic safety, degradation of forest resources, and loss of farmlands together with relocation of home plots in particular.

9.2.2 Conducting Public Consultations

(1) Purposes of Public Consultation and Disclosure

PCD conducted as part of the Scoping Stage and EIA investigation of this Project has three purposes:

(i) informing the stakeholders about the Project, environmental and social issues related to Project construction and operation, and preliminary mitigation measures to minimize environmental and social impacts;

(ii) seeking views of the stakeholders on the Project and mitigation measures; and;

(iii) ensuring participation and partnership where the stakeholders and the Project jointly discussed and assessed relevant issues and needs raised by the stakeholders.

Results of the public consultation are useful to the EIA investigation and public consultation during the remaining course of the EIA process, including implementation of the environmental management plan (EMP).

(2) Methods of Consultations

The main method used in the public consultation was public meeting. This method is generally used in EIA. It is most effective in achieving the informing purpose, followed by the seeking views purpose, and the participation and partnership purpose.

The public meeting method was complemented by disclosure of project information through presentation in the meetings. This would serve the informing purpose.

In addition, the public meeting method was also complemented by the household surveys and one-on-one interviews used in collecting socio-economic information on communities in the study area. These two methods would serve the informing and seeking views purposes of the public consultation.

Before the meetings with villagers, announcement poster was posted at the well-known visible places in the communities; e.g. school, temple, tea shop, etc in order to inform about venue and schedule for public consultation meeting in each village as shown in ***Photo 9.2-1***.

These methods are generally used in EIA. It is most effective in achieving the public consultation and information disclosure purpose. The results would be utilized to formulate environmental and social management plans for the Project.

(3) Approach to the Public Meetings

The following approach to the public meetings was adopted:

- Each meeting was organized with assistance of the Township Administration Department and village headmen in identifying participants to be invited, in making arrangements for the meeting venue, and in issuing the invitations.
- Representatives of the Project Proponent and the Consultant jointly conducted the meeting. The Project Proponent's representatives were responsible for briefing on Project information including Project development plan, and answering questions from the meeting or clarifying points raised in the meeting regarding the Project development plan. The Consultant was responsible for providing information on the EIA, and clarifications on issues related to impacts of the Project. The two parties worked as a Project team.
- Each meeting was chaired by a district chief and village headman. The meeting began by informing the participants of the objectives of the meeting and expected outcome. After that the Project Proponent team gave information on the Project and the EIA.
- Each meeting provided an open forum for the participants to express their concerns, offer their views and suggestions, and raise questions or points that they needed response from the Project team. The Project team responded to their concerns, views and suggestions as appropriate. The meeting was interactive, i.e. the Project team and the participants engaged in constructive and relevant discussions.

Dauk Lauk Village

Myitta Village

Tha Loat Htar Village

Tha Khat Done Village

Poster on Invitation to Attend Public Consultation Meeting during Scoping Stage

Sin Byu Daing village

Taung Thone Long Village

Tha Khat Done village

Tha Khat Done Village

Poster on Invitation to Attend Public Consultation Meeting during EIA Preparation Stage

PHOTO 9.2-1 : DISCLOSURE OF PUBLIC CONSULTATION MEETING IN EACH VILLAGE

9.2.3 Disclosure

Project information was disclosed to the government authorities though slide presentation and brochures in the meetings. Project information was provided in the meetings with local villagers in handouts in Burmese language and Karen language including supporting maps.

9.3 SUMMARY OF CONSULTATION ACTIVITIES UNDERTAKEN

9.3.1 PCD during the Scoping Stage

9.3.1.1 Overview of Consultation Activities

(1) Persons Met and Meeting Dates

Public consultations with the three identified categories of stakeholders were held on several occasions from 20 to 30 January, 6 to 18 February, 2015, 28 March, 2018 and 7 May, 2018. The meeting dates, names of persons met, and the agencies they represented are given in ***Table 9. 3-1***. Names of villagers in the sixteen villages who attended the consultation meetings are listed for the record in ***Appendix 9A***.

(2) Project Information Disclosure

Slides used in the presentations and the brochures provided to the government authorities and local people are shown in ***Appendix 9B***.

The project information disclosed in the meetings can be summarized as follows:-

- Project background
- Project features such as road alignment, Right of Way, toll booth location, rest area and vista point location.
- Environmental Impact Assessment Process
- Preliminary Impact Assessment and Mitigation Measures
- Public Consultation During Scoping Report

TABLE 9.3-1
MEETINGS WITH PROJECTS STAKEHOLDERS

Meeting Dates	Organization/Name	Position
20 January 2015	**SWB-Support Working Group**	
	1. Mr. U Than Shwe	Secretary
	2. Mr. U Linn Zaw Htwg	Member
	3. Mr. U Thet Oo	Member
	4. Mr. U Aye Lwin	Member
	5. Mr. U Khin My Zaw	Member
22 January 2015	**Government Authorities at National, Regional and Local Levels**	
	1. H.E. U Phone Swe	Deputy Minister of Social Welfare, Relief and Resettlement.
	2. Mr. U Win Swe	Minister of Electricity and Industry for Tanintharyi Region
	3. Mr. U Thein Lwin	Minister of Planning and Economic for Tanintharyi Region
	4. Mr. Htin Aung Kyaw	Chairman of Hluttaw
	5. Head of Yebyu Township Administration	
28 January 2015	6. Mr. U Win Naing,	Deputy Director of Forestry Department Tanintharyi Division (Act in place of Environment Conservation Department for Tanintharyi Region)
	Other Interested Parties	
29 January 2015	1. Mr. U Soe Min	Staff of Medecins Sans Frontieres (MSF) Dawei Office
30 January 2015	2. Mr. U Lay Lwin,	Coordinator of Dawei Development Association (DDA)
	The General Public : Local Community Groups	
6 February 2015	Dauk Lauk Tha Laing Ya Pa Dao Geou	Village headman, village committee, community leaders and villagers (total of 39 persons)
8 February 2015	Tha Loat Htar	Village headman, village committee, community leaders and villagers (total of 128 persons)
9 February 2015	Tha Khat Done and Ye Bouk	Village headman, village committee, community leaders and villagers (total of 75 persons)
10 February 2015	Tha Byu Chaung and Pyin Tha Daw	Village headman, village committee, community leaders and villagers (total of 64 persons)
11 February 2015	Taung Thone Long	Village headman, village committee, community leaders and villagers (total of 70 persons)
13 February 2015	Myitta	Village headman, village committee, community leaders and villagers (total of 63 persons)
15 February 2015	Sin Byu Daing	Village headman, village committee, community leaders and villagers (total of 67 persons)
16 February 2015	Va Do	Village headman, village committee, community leaders and villagers (total of 55 persons)
17 February 2015	Gad Tra Khee and Armu	Village headman, village committee, community leaders and villagers (total of 53 persons)
18 February 2015	Hti Hkee	Village headman, village committee, community leaders and villagers (total of 87 persons)
28 March 2018	Dawei Special Economic Zone, Meeting Hall	Government/Local Media, other interested parties, villagers and NGO (total of 207)
7 May 2018	Myitta GAD Meeting Hall	Government, other interested parties, villagers (total of XX)

9.3.1.2 Summary Results of Public Consultation during Scoping Report

Issues identified by the stakeholders during the public consultation meetings can be summarized by group as follows:

A. Government Authorities

Issues identified by the SWB and government authorities at the national and regional levels:

- **Participation in the Environmental Impact Assessment :** The Project must inform the district, township officials about the schedule of the public consultation, including environmental and social survey activities.
- **Land acquisition :** Compensation for land acquisition must follow official guidelines and practices.
- **Submitting the EIA results :** The Consultant has to submit an official letter to inform the Environment Conservation Department at Naypyitaw directly about the conduct of EIA study.

B. Other Interested Parties

Issues identified by the community based organizations:

- **Correct project information :** Accurate information about the Project plan and situation should be provided to the peoples;
- **Employment opportunities :** Provision of job opportunity to the locals, including relevant vocational training;
- **Compensation :** Fair compensation rate for the project affected people;
- **Environmental management :** The Project must be aware of environmental impact. Best practices should be employed for environmental management. Environmental monitoring should be conducted by a third party acceptable to the Government authority and NGOs;
- **Roles of NGOs :** The NGOs should have opportunity to contribute to the EIA report.

C. Local Community Groups

Issues identified by villagers in Dauk Lauk, Tha Laing Ya, Pa Dao Geou, Tha Loat Htar, Tha Khat Done, Ye Bouk, Tha Byu Chaung, Pyin Tha Daw, Myitta, Taung Thone Long, Sin Byu Daing, Va Do, Armu, Gad Tra Khee and Hti Khee communities:

- **Additional information requirement :** The Project should provide accurate information about:

- Operation of heavy equipment on the road and clearing the forest,
- Precise ROW demarcation line in relation to cultivation area,
- Implementation schedule of the Project,
- Opinions/voices of villagers as inputs in EIA report;
- Expansion of two-lane road to four-lane road;
- EIA of railroad

- **Forest ecology :** The Project should assess existing situation and potential impacts on forest and ecology along the road;

- **Pollution :** Concerns on pollutions from soil residues and dust from construction and transportation;

- **Previous impacts :** Concern on negative impacts from previous project;

- **Compensation :** Concern on fair compensation for land acquisition;

- **New settlement area :** The Project should provide new settlement site which facilitates to their social connectivity, earnings and religious activities;

- **Employment opportunities :** The Project should provide employment opportunities to the locals;

- **Use of road and safety :** The Project should provide guidelines and regulations regarding traffic, so that the locals can use road safety;

- **Recognition of sensitive areas :** The Project should recognize preservation areas for natural resources and religious of villagers;

- **Support from the Project:** The Project should provide CSR programme to the villages, especially on:

  - Assistant on relocation
  - Drinking water sources;
  - Road improvement between villages

- **Additional request :** Suggestion the Project to listen to locals' voices

Minutes of the meetings with participants from the sixteen villages are presented in ***Appendix 9C***, and ***Photo 9.3-1*** shows some pictures of the meetings.

Meeting with Government Authorities at National and Regional Levels

Meeting with SWB of DSEZ

Consultation Meeting at Sin Byu Daing Village

Consultation Meeting at Dauk Lauk Village

Consultation Meeting at Gad Tra Khee and Armu Villages

Consultation Meeting at Hti Khee Village

PHOTO 9.3-1 : MEETING WITH CONCERNED AGENCIES AND THE LOCALS DURING SCOPING REPORT

9.3.2 PCD during the EIA Preparation

9.3.2.1 Overview of Consultation Activities

(1) Persons Met and Meeting Dates

Public consultations during the EIA preparation were held on several occasions between 1 to 11 December, 2015. The meeting dates, group of agencies, and number of participants are given in ***Table 9.3-2***. Names of relevant officers and villagers in the sixteen villages who attended the consultation meetings are listed for the record in ***Appendix 9D***.

(2) Project Information Disclosure

Slides used in the presentations and the brochures provided to the government authorities are shown in ***Appendix 9E***.

The project information disclosed in the meetings can be summarized as follows:-

- Project background
- Project features such as road alignment, Right of Way, toll booth location, rest area and vista point location.
- Environmental Impact Assessment Process
- Preliminary Impact Assessment and Mitigation Measures
- Public Consultation During Preparation of EIA Report

9.3.2.2 Summary Results of Public Consultation during the EIA Preparation

Issues identified by the stakeholders during the public consultation meetings can be summarized by group as follows:

A. Government Authorities

- Wonder whether villagers can access and cross the two lane road or not?
- The project should consider on provision of access road to link village and the two lane road
- Villagers are willing to maintain the road constructed by the developer in case they can use as well.
- Project features and toll booth management.

B. Other Interested Parties

Issues identified by the NGOs and the press

- Villagers should have opportunity to participate in baseline environmental condition survey.
- There should be disclosures of EIA Report

TABLE 9.3-2

MEETINGS WITH PROJECTS STAKEHOLDERS DURING THE EIA PREPARATION

Meeting Date/time	Name	Position and Organization	Venue
2 October 2015	**Government Authorities at Regional and Local Levels (total of 20 persons)**		
9.00-11.00 hrs.	1. Mr. U Khin Maung Cho	Directory of General Administration Department of Dawei District (7 persons)	ITD Meeting Hall
	2. Mr. U Htun Wai Oo	Electric Power Corporation of Dawei District (1 person)	
	3. U Aung Hom Than	SWB: General Administration Department (1 person)	
	4. U Thet Oo	SWB: Department of Labor (2 persons)	
	5. U Khin Maung Win	SWB: Myanmar Port Authority (1 person)	
	6. U Kyaw Maw Htun	SWB: Immigration (2 persons)	
	7. Mr. U Aung Khine Soe	Deputy Director of Environmental Conservation Department for Tanintharyi Region (3 persons)	
	8. U Htun Win Myint	Director of Regional Fishery Officer (2 persons)	
	9. U Kyaw Naing	General Administration Department of Yebyu Township (2 persons)	
1 December 2015 9.00-12.00 hrs.	**The General Public : Local Community Groups**		
	Dauk Lauk Tha Laing Ya Pa Dao Geou	Village headman, village committee, community leaders and villagers (total of 48 persons)	
3 December 2015 9.00-12.00 hrs.	Tha Loat Htar	Village headman, village committee, community leaders and villagers (total of 33 persons) + 3 reporters and 6 NGOs representatives	
4 December 2015 9.00-12.00 hrs.	Tha Byu Chaung and Pyin Tha Daw	Village headman, village committee, community leaders and villagers (total of 29 persons)	
5 December 2015 9.00-12.00 hrs.	Tha Khat Done and Ye Bouk	Village headman, village committee, community leaders and villagers (total of 61 persons)	
6 December 2015 9.00-12.00 hrs.	Taung Thone Long	Village headman, village committee, community leaders and villagers (total of 145 persons)	
7 December 2015 9.00-12.00 hrs.	Myitta	Village headman, village committee, community leaders and villagers (total of 53 persons)	
8 December 2015 9.00-12.00 hrs.	Sin Byu Daing and La Or	Village headman, village committee, community leaders and villagers (total of 91 persons)	
9 December 2015 9.00-12.00 hrs.	Va Do	Village headman, village committee, community leaders and villagers (total of 63 persons)	
10 December 2015 9.00-12.00 hrs.	Gad Tra Khee and Armu	Village headman, village committee, community leaders and villagers (total of 52 persons)	
11 December 2015 9.00-12.00 hrs.	Hti Khee	Village headman, village committee, community leaders and villagers (total of 89 persons)	

C. Local Communities

C1.Engineering Issues

- When will the construction begin?
- Will the project be normal two-lane road or motorway or highway?
- The whole 40-meter width of the right of way would be used for construction or not?
- Local people, religious leader and teachers who need to go to Dawei every week have to pay toll fee or not?
- The exact alignment of road to be constructed is the yellow on red one?
- What is to be done with shops on both sides of the project alignment?
- What does the red flags symbol stand for?
- How many percent has the project construction been completed?
- Would it be possible to adjust the project alignment to avoid impact on house?
- During road construction where will people be moved to? What supports would they receive?
- What would be the support for the initial 26 households of Hti Khee village?
- What would be the support for newly immigrated households?
- The project should equally support both the initial 26 households and the newly immigrated households of Hti Khee village. How would the project manage with this issue?
- Why the households who have been living in this area since 2013 are not included in the list of initial households but some new comers are included in the initial list?

C2. Environmental and Social Issues

- The procedures for ESIA study. The consultant who conduct EIA and compliance with EIA regulations.
- Mitigation measures to alleviate impact from dust dispersion during road construction phase.
- Mitigation measures to alleviate impacts on water quality, soil erosion, land slide, falling of rock and soil into residential area and farm land.
- Impacts on wildlife/aquatic animal and mitigation measures.
- Problems in communities such as water for consumption, health impact, fish catching in natural water resources.
- Compensation for land, perennial trees and building (method, rate and schedule)

- Would there be compensation for newly-planted trees in the right-of-way?
- How would the project compensate for farmland and residential land?

C3. Recommendation

Engineering Issues

- Project construction schedule should be informed to communities prior to construction.
- Consider drainage issue to avoid flood problem. There should be special channel for motorcycle to pass toll gate without paying toll fee.
- There should be footbridge/underpass in community area for safety of students. Bridges and big size underpass should be provided.
- There should be clear demarcation of the project right-of-way
- Villages should be clearly informed about the project right-of-way

Environment and Social Issues

- Villagers should have opportunity to participate in baseline environmental condition survey.
- Villagers should be educated/trained to know about traffic signs, prohibition signs and signals.
- Support on water resources for communities use.
- Support on construction of access road for communities.
- There should be measures for safety of people and children
- Besides poster, invitation letter should be provided to individual households.
- Impact on water turbidity should be avoided.
- During construction and operation phases, local people should be recruited to work in the project.
- Villagers should be informed in advance.
- Impact on Burmese and Karen communities should be concerned.
- Newly immigrated households should have equal right to the initial 26 households of Hti Khee village.
- There should be school and health station in resettlement site.

The clarification of main issues are presented in ***Table 9.3-3***. Minutes of the meetings with participants from the sixteen villages are presented in ***Appendix 9F***, and ***Photo 9.3-2*** shows some pictures of the meetings.

TABLE 9.3-3

THE CLARIFICATION OF MAIN ISSUES RAISED IN THE MEETING DURING EIA PREPARATION STAGE

Main Issues	Clarifications by the Project Proponent and Consultant
1. Engineering Issues	
1) When will the construction begin?	The construction will begin after the detailed design is completed and EIA is approved by ECD.
2) Will the project be normal 2-lane road or motorway or highway?	The project has been designed with 2 traffic lanes and 3 toll gates.
3) Can people use the road? Do they need to pay toll fee?	For long distance travelling from the beginning to the end point of the road or travelling past toll gates, people have to pay toll fee. For short distance travelling on the section between toll gates, people do not have to pay toll fee.
4) The whole 40-meter width of the right of way would be used for construction or not?	The project right-of way is 40 meters wide. Each of the 2 traffic lanes is 3.5 meters wide. Each road shoulder is 1 meter.
5) Would it be possible to adjust the project alignment to avoid impact on house?	The project alignment has been designed to minimize the displacement of houses and structures. If it is inevitable to avoid the impact, there would be individual negotiation.
6) What would be the support for the initial 26 households of Hti Khee village?	The compensation would be fair and suitable according to related laws and regulations. A compensation committee would be responsible for detailed inventory of project affected land and properties and designation of method and rate for compensation.
7) What would be the support for newly immigrated household at Hti Khee village?	The project would manage in accordance with the government policy.

TABLE 9.3-3

THE CLARIFICATION OF MAIN ISSUES RAISED IN THE MEETING DURING EIA PREPARATION STAGE (CONT'D)

Main Issues	Clarifications by the Project Proponent and Consultant
2. Environmental and Social Issues	
1) They want to have the EIA report of the project.	During EIA study the project summarized the EIA study results in the project information document to be disseminated among people and stakeholders in the consultation meetings. After EIA approval by ECD the EIA report will be open to the public. (if required)
2) Mitigation measures to alleviate impact from dust dispersion during road construction.	The mitigation measures to alleviate dust dispersion impact from construction activities have be incorporate in the EIA report. The consultant will included the recommendation and suggestion from the consultation meeting to improve the mitigation measures.
3) Mitigation measures to alleviate impacts on water quality, soil erosion, land slide, falling of rock and soil into residential area and farm land.	The mitigation measures to alleviate all impacts have been already put in the EIA report. The consultant will incorporate the recommendation and suggestion from the consultation meeting to improve the mitigation measures.
4) Impacts on wildlife/aquatic animal and mitigation measures.	The mitigation measures to alleviate all impacts on wildlife and aquatic animal have been already put in the EIA report. The consultant will incorporate the recommendation and suggestion from the consultation meeting to improve the mitigation measures.
5) Problems in communities such as water for consumption, health impact, fish catching in natural water resources.	The mitigation measures to alleviate all impacts have been already put in the EIA report. The consultant will incorporate the recommendation and suggestion from the consultation meeting to improve the mitigation measures.
6) Compensation for land, perennial trees and building (method, rate and schedule)	The compensation would be fair and suitable according to related laws and regulations. A compensation committee would be responsible for detailed inventory survey of project affected land and properties and designation of method and rate for compensation.

Public consultation activities with government authorities

Public consultation activities at Dauk Lauk village

Public consultation activities at Tha Loat Htar village

Public consultation activities at Tha Byu Chaung village

PHOTO 9.3-2 : MEETING WITH CONCERNED AGENCIES AND THE LOCALS DURING PREPARATION OF EIA REPORT


Public consultation activities at Tha Khat Done village


Public consultation activities at Taung Thone Long village


Public consultation activities at Myitta village


Public consultation activities at Sin Byu Daing village

PHOTO 9.3-2 MEETING WITH CONCERNED AGENCIES AND THE LOCALS DURING PREPARATION OF EIA REPORT (CONT'D)

Public consultation activities at Vado village

Public consultation activities at Grad Tra Khee village

Public consultation activities at Hti Khee village

PHOTO 9.3-2 : MEETING WITH CONCERNED AGENCIES AND THE LOCALS DURING PREPARATION OF EIA REPORT (CONT'D)

9.3.3 The Third PCD

9.3.3.1 Overview of Consultation Activities

(1) Persons Met and Meeting Dates

Public consultation for disclosure of EIA was held on Dawei Special Economic Zone, Meeting Hall at 28 March, 2018. The meeting dates, group of agencies, and number of participants are given in ***Table 9.3-4***. Names of relevant officers, other interested parties and villagers in the sixteen villages who attended the consultation meetings are listed for the record in ***Appendix 9G***.

(2) Project Information Disclosure

Slides used in the presentations which provided to the participants are shown in ***Appendix 9H***.

The project information disclosed in the meetings can be summarized as follows:-

- Project background and features such as road alignment, Right of Way, toll booth location, rest area and vista point location.
- Impact Assessment and Mitigation Measures such as wild life crossing and biodiversity action plan.
- Commitments of EIA Report.








PHOTO 9.3-3 : THIRD PCD MEETING WITH CONCERNED GOVERNMENTS, INTERESTED AGENCIES AND THE LOCALS

TABLE 9.3-4

THIRD TIME MEETING WITH PROJECTS STAKEHOLDERS

Meeting Date/Time	Name	Position & Organization	Venue
28 March, 2018	Mr.Phyo Min Tun	Deputy Chairman of DSEZ Committee	Dawei Special Economic Zone, Meeting Hall
	Dr.Myint San	Vice Chairman-2 of DSEZ Committee	
	Organizations		
	Environmental Conservation Department (Naypyitaw and Dawei)		
	Dawei Special Economic Zone Management Committees		
	Ministry of Construction, Naypyitaw (Department of Highways)		
	Karen National Union		
	Representatives from project affected villages		
	NGOs (WWF, TWU, DDA, ERZ)		
	Media (Dawei Watch, Hinn Thar)		
	Government/Local Media – 38, Villagers – 157, NGO – 12 Total - 207		

TABLE 9.3-5

THE CLARIFICATION OF MAIN ISSUES RAISED IN THE MEETING DURING EIA DISCLOSURE

No.	Main Issues	Clarifications by the Project Proponent and Consultant
1.	- Need more public consultation meeting to villagers to explain detail about project. - KNU have wildlife data of WWF and KNU will monitor in project development process.	
2.	- In Padauk Kone and Ta Line Yar villages, land compensation is already paid. However, house compensation is not finish yet. When they can get compensation?	- Project Proponent explained about resettlement and compensation steps including Compensation and Resettlement Committee.
3.	- Is there any EIA for whole DSEZ? - How many times for the public consultation meeting? Is this the last one for EIA Report? - Need to describe more about finding results and impacts.	**ECD responded** - There is no EIA for whole DSEZ but there is EIA for each individual project. - However, for approval, the review team considers not only the impact of one project but also the whole cumulative impacts for all projects. **Consultant** replied - Today meeting is the last meeting for EIA process. However, additional public consultation meeting will be conducted at pre-construction, construction phase at every village for distributing project information (schedule, impact and mitigation measure, etc).
4.	- Who will construct 18 km to 0 km?	- Km 0 to km 18 is the road section within DSEZ, it will be constructed by Myandawei Industrial Estate Company Limited.

9.3.4 The Fourth PCD

9.3.4.1 Overview of Consultation Activities

(1) Persons Met and Meeting Dates

Public consultation for disclosure of EIA was held on Myitta GAD Meeting Hall at 7 May, 2018. The meeting dates, group of agencies, and number of participants are given in ***Table 9.3-6***. Names of relevant officers, other interested parties and villagers in the sixteen villages who attended the consultation meetings are listed for the record in ***Appendix 9I***.

TABLE 9.3-6

FOURTH TIME MEETING WITH PROJECTS STAKEHOLDERS

Meeting Date/Time	Name	Position & Organization	Venue
7 May, 2018 1:00 PM	Mr.Phyo Win Tun	Finance Minister, VC-1, Ministry of Planning and Finance, TRG	Myitta GAD Meeting Hall
	Dr.Myint San	VC-2, Dawei SEZ MC	
	Mr.Aung Win	National Hluttaw Senator, Pyitthu Hluttaw	
	Mr.Han Win Thein	Yeybyu Hluttaw Representative, Yebyu	
	Mr.Thet Naing Oo	Pyittu Hluttaw Regpresentative, Yebyu	
	Mr.Saw Lu Kar	Minister of Karen Native Affairs, Thanintharyi Regional Government	
	Mr.Saw Thuya	KNU Chairman, Dawei & Myeik District	
	Mr.Saw L Nar	KNU District Secretary, Dawei & Myeik District	
	Members of Dawei SEZ Managemnet Committee		
	Village Administrator and Residents		

TABLE 9.3-7

THE CLARIFICATION OF MAIN ISSUES RAISED IN THE MEETING DURING EIA DISCLOSURE

No.	Main Issues	Clarifications by the Project Proponent and Consultant
1.	Does Two Lane road be built to Myitta to Dawei SEZ?	It will be built Hti Khee to Dawei SEZ.
2.	Besides of Two Lane road, will other implements be in future, as 4-Lane road? Do you give compensation on Two Lane road to the resident who come and stay on the land an did not have land evidence document? Because of local-war, somebody did not stay in one place for long time.	It only decided taking the lone money for Two Lane road. So, it will only build Two Lane road. We will give training to Compensation Committee not to happen problem again like previous.
3.	In previous, survey teams surveyed Two Lane road and 4-Lane road again, then 6-Lane road again. So we were confusing on their survey many times. Does it happen again like that in future?	It happened in previous because of weakness of meeting and discussion between the government and the residents. Nowaday, we will carry on it openly.
4.	How to solve previous problems damaging by ITD Company?	Now, some resident has been including in Compensation Committee. If you got any damage, please come and submit Dawei SEZ MC your damages.
5.	KNU has formed Monitoring Team to watch all matter on Two Lane road project, as well as the government has formed Government Compensation Committee. Do we follow KNU Monitoring Team or Government Compensation Committee? How does the different be between those 2 teams?	We are welcome any teams to cooperate together. We have just known that, it has KNU Monitoring Team. We all are Myanmar National.
6.	Do Government undertake all of matters concerning with Two Lane road projects?	Absolutely Yes. We will undertake.
7.	In future, if the Government make meeting like this, please inform one week in advance.	Yes, we will do.

PHOTO 9.3-4 : FOURTH PCD MEETING WITH CONCERNED GOVERNMENTS, INTERESTED AGENCIES AND THE LOCALS

9.3.5 How These Issues are taken into Account

The EIA team and the technical study team will give due consideration of the issues and requirements expressed by the stakeholders in the conduct of the EIA and further works on project designs.

9.4 RECOMMENDATIONS FOR ONGOING CONSULTATIONS

In order to gain full understanding and support from PAPs and stakeholders and interested parties in project implementation, it is vital to have full participation from them from the beginning and through the entire process of project development. The program activities are aimed for;

(1) Group of Stakeholders

The Project stakeholders could be identified and classified into three categories:

1) Government Authorities

For this Project, relevant key offices at the national level are: (i) Ministry of Environmental Conservation and Forestry; (ii) Ministry of Transport, (iii) Ministry of Rail Transport, (iv) Ministry of Construction and (v) Ministry of Social Welfare, Relief and Resettlement.

Relevant key offices at the regional level are: (i) Tanintharyi Region Office of the Environmental Conservation Department; (ii) Tanintharyi Region Office of Social Welfare, Relief and Resettlement; (iii) Tanintharyi Region Office of the Ministry of Transport; (iv) Tanintharyi Region of the Ministry of Rail Transport; (v) Tanintharyi Region of the Ministry of Construction; (vi) Tanintharyi Region Office of Planning and Economic; and (vii) Chairman of Hluttaw.

Relevant key offices at the local level are: (i) Yebyu Township Administration; and (ii) Myitta Township Administration.

The DSEZ Management Committee (DSEZMC) and the Supporting Working Body (SWB)-Support Working Group of DSEZ-are two key organizations responsible for facilitating resolving issues between the Government, the Central Body and developers/ investors in DSEZ.

SWB is involved in development activities in the project area. It comprise 14 representatives of relevant government agencies and organizations from various ministries.

2) Other Interested Parties

The Project's stakeholders in this category are various government departments responsible for development of various sectors, and community based organizations as listed below:

- Department of Health
- Planning Department
- Forestry Department
- Agriculture Department
- Department of Transport
- Electric Power Department
- Land Record Department
- Dawei Development Association (DDA)
- Medecins Sans Frontieres, Dawei Office (MSF)

3) Potentially Affected People

The Project's stakeholders in this category are village committees and individual villagers in the Sixteen villages in the study area namely Dauk Lauk, Tha Laing Ya, Pa Dao Gon, Tha Loat Htar, Thi Khat Done, Ye Bouk, Tha Byu Chaung, Pyin Tha Daw, Myitta, Taung Thone Long, Sin Byu Daing, La Or, Va Do, Armu, Gad Tra Khee and Hti Khee in Yebyu and Myitta Townships of Dawei District. Residents in these villages would have concerns on various potential impacts of the Project during construction and operations.

(2) Dissemination of information

The information dissemination for PAPs are as follows;

- Project components.
- Schedule for start-up of the project.
- Detailed information on project policies and implementation procedures.
- Compensation Plan and Entitlements.
- The grievance mechanism and the appeals process.
- Rights to participate and be consulted.
- Program for quality of life improvement and social development plan.
- Organizational responsibilities.

(3) Consultation with PAPs

(a) Informing PAPs about Compensation Payment with letter of notification. The PAPs should also be informed in advance on the relevant documents (e.g. identification card, land title, etc.) that they are required to bring with them for compensation payment purpose.

(b) Consultation with PAPs to confirm preferences for rehabilitation assistances measures.

(c) Informing PAPs about site clearance prior to start-up to civil works.

(d) Informing PAPs about the beginning and ongoing schedule for physical works.

(e) Consultation and confirmation with PAPs on their participation in Income Restoration measures.

(f) Consultation with PAPs on Community/Social Development program.

(g) Informing PAPs on monitoring and supervision activities to be conducted during project implementation.