Transmission Line for the LNG Power Plant (Ahlone) Project in Yangon, Myanmar

Initial Environmental Examination (IEE) Report

11 May 2021

Project No.: 0439461

The business of sustainability

ERM

Document details	
Document title	Transmission Line for the LNG Power Plant (Ahlone) Project in Yangon, Myanmar
Document subtitle	Initial Environmental Examination (IEE) Report
Project No.	0439461
Date	11 May 2021
Version	1.0
Author	Vincent Lecat, Monthat Suwannakarn, Pobai Tang
Client Name	TTCL Power Myanmar Company Limited

Document history

				ERM approval to issue		
Version	Revision	Author	Reviewed by	Name	Date	Comments
Draft	00	As above	Kamonthip Ma-oon	Kamonthip Ma-oon	27.05.2019	
Final	1.0	As above	Kamonthip Ma-oon	Kamonthip Ma-oon	11.05.2021	Issue to ECD

Signature Page

11 May 2021

Transmission Line for the LNG Power Plant (Ahlone) Project in Yangon, Myanmar

Initial Environmental Examination (IEE) Report

Kamonthip Ma-oon

Partner

ERM-Siam

179 Bangkok City Tower 24th Floor | South Sathorn Road,

Thungmahamek, Sathorn, Bangkok 10120 | Thailand |

CONTENTS

ာ အကျဉ်းချုပ် အစီရင်ခံစာ 1
ာ.ာ နိဒါန်း 1
ာ.ျ စီမံကိန်းနောက်ခံအနေအထား 3
ာ.ာ မူဝါဒ နှင့် ကြီးကြပ်ရေးဆိုင်ရာ မူဘောင် 4
ာ.ှ စီမံကိန်းအကြောင်းအရာဖော်ပြချက် 4
ာ.ှ.ာ စီမံကိန်းတည်နေရာ 4
ာ.ှ.ျ စီမံကိန်း၏ အဓိက အစိတ်အပိုင်းများ 6
ာ.ှ.ာ တည်ဆောက်ရေးအဆင့် 6
ာ.ှ.ှ လည်ပတ်ရေးအဆင့် 6
ာ.ှ.ဈ တည်ဆောက်ရေးအချိန်ဇယား 6
ာ.ှ.ဖ လုပ်သားများ 7
ာ.ှ.ဂ ထည့်သွင်းစဉ်းစားခဲ့သည့် အခြားဆောင်ရွက်နိုင်သောနည်းလမ်းများ 7
ာ.ဈ စီမံကိန်းဆိုင်ရာ ပတ်ဝန်းကျင်၊ ဇီဝ နှင့် လူမှုအခြေအနေများ 9
ာ.ဈ.ာ ရူပပတ်ဝန်းကျင်အခြေခံအချက်အလက်များ - အဓိကအရေးကြီးသောတွေ့ရှိချက်များ အနှစ်ချုပ် 11
ာ.ဈ.ျ ဇီဝအခြေခံအချက်အလက်များ - အဓိကအရေးကြီးသောတွေ့ရှိချက်များအနှစ်ချုပ် 12
ာ.ဈ.ာ လူမှုအခြေခံအချက်အလက်များ - အဓိကအရေးကြီးသောတွေ့ရှိချက်များ အနှစ်ချုပ် 14
ာ.ဖ ထိခိုက်နိုင်မှုများ နှင့် ၎င်းနှင့်ဆက်နွယ်သော လျော့ပါးရေး အစီအမံများ 16
ာ.ဂ အများပြည်သူနှင့်တိုင်ပင်ဆွေးနွေးခြင်း နှင့် ထုတ်ဖော်တင်ပြခြင်း 27
ာ.ဂ.ာ အများပြည်သူနှင့် တိုင်ပင်ဆွေးနွေးခြင်းလုပ်ငန်းများအနှစ်ချုပ် 28
ာ.စ နိဂုံး 29

1. EXECUTIVE SUMMARY 31
1.1 Introduction 31
1.2 Context of the Project 33
1.3 Policy and Regulatory Framework 33
1.4 Project Description 34
1.4.1 Project Location 34
1.4.2 Project Key Components 36
1.4.3 Construction Phase 36
1.4.4 Operation Phase 36
1.4.5 Construction Schedule 36
1.4.6 Workforce 37
1.4.7 Alternative Considered 37
1.5 Project Environmental, Biological and Social Context 39
1.5.1 Physical Environment Baseline: Summary of Main Findings 41
1.5.2 Biological Baseline: Summary of Main Findings 42
1.5.3 Social Baseline: Summary of Main Findings 43
1.6 Impacts and Associated Mitigation Measures 45
1.7 Public Consultation and Disclosure 56
1.7.1 Summary of Public Consultation Activities 56
1.8 Conclusion 58
1.9 Statement of Commitments 58

2. INTRODUCTION 59
2.1 Project Background and Overview 59
2.2 Presentation of the Project Proponent 59
2.2.1 Name of the Project 59
2.2.2 The Project Proponent 59
2.3 Project Site and Location 62
2.4 Purposes and Objective of this IEE Report 66
2.5 Presentation of Environmental, Social and Health Experts 66

2.6 Structure of this IEE Report 68

3. OVERVIEW OF POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK 70

3.1 Introduction 70
3.2 TPMC Health, Safety, and Environment (HSE) Plan Procedure 70
3.3 Overview of Myanmar Regulatory Framework 70
3.3.1 Administrative Divisions of Myanmar 70
3.3.2 Myanmar Regulatory Authorities 73
3.3.3 Myanmar Legislation Potentially Relevant 74
3.4 National Administrative Requirements 76
3.4.1 Overview of Myanmar Legislation 76
3.4.2 Rules on Protection of Wildlife, and Protected Area Conservation Law (2003) and the Protection of Wildlife, and Wild Plant and Conservation of Natural Areas Rules (2002) 86
3.4.3 Government Administration of Myanmar Electricity and Energy 86
3.4.4 Other Project-Relevant Legislation in Myanmar 89
3.4.5 Institutional Framework 98
3.5 International Agreements and Conventions 102
3.6 International Standards and Guidelines 102
3.6.1 International Finance Corporation (IFC) and World Bank Performance Standards 102
3.6.2 International Finance Corporation (IFC)/World Bank Environmental, Health, and Safety (EHS) Guidelines 106
3.7 International Conventions 109
3.7.1 The Kyoto Protocol on Climate Change (UNFCC) 109
3.7.2 United Nations Framework Convention on Climate Change 1994 109
3.7.3 Montreal Protocol on Substances that Deplete the Ozone Layer 1989 109
3.7.4 Ramsar Convention on Wetland 1971 109
3.7.5 International Convention on Standards of Training Certification and Watch-keeping for Seafarers 1978 109
3.7.6 Vienna Convention for the protection of the Ozone layer 1988 110
3.7.7 United Nations Convention on Biological Diversity 1992 110
3.7.8 Basel Convention 1989 110
3.7.9 International Labour Organisation (ILO) 1919 110

4. DESCRIPTION OF THE PROJECT AND ALTERNATIVES 114

4.1 Project Background 114
4.2 Project Location 114
4.2.1 Study Area 114
4.3 Project Key Components and Tentative Project Schedules 122
4.3.1 Project Components 122
4.3.2 Project Schedule 129
4.4 Project Phases 131
4.4.1 Construction Phase 131
4.4.2 Operation and Maintenance Phase 141
4.4.3 Electric and Magnetic Fields 141
4.4.4 Decommissioning Phase 142
4.5 Project Alternatives 143
4.5.1 Alternative Layout and Route 143

5. DESCRIPTION OF THE SURROUNDING ENVIRONMENT 146

5.1 Introduction 146
5.1.1 Project Site Setting 148
5.2 Physical Environment 148
5.2.1 Ambient Air Quality 148

5.2.2 Climate and Meteorology 149
5.2.3 Noise 152
5.2.4 Surface Water 152
5.2.5 Soil 152
5.2.6 Groundwater 154
5.2.7 Landscape and Visual 154
5.2.8 Waste 157
5.2.9 Seismicity 158
5.2.10 Summary 161
5.3 Biological Environment 161
5.3.1 EcoRegion Description 161
5.3.2 Key Biodiversity Areas 162
5.3.3 Protected Areas 162
5.3.4 Species of Conservation Significance 162
5.3.5 Biodiversity Survey 165
5.3.6 Area of Influence for Biodiversity Value 171
5.3.7 Summary 178
5.4 Socio-economic Baseline 179
5.4.1 Social Receptors 179
5.4.2 Data Collection 181
5.5 Overview of Project Area and Study Area 182
5.5.1 Demographic Profile 185
5.5.2 Livelihood and Economy 192
5.5.3 Utilities 207
5.5.4 Transportation 217
5.5.5 Cultural Heritage 218
5.5.6 Education 221
5.5.7 Health, Health-Related Facilities, and Security 223
5.5.8 Infrastructure, and Amenities 227
6. IMPACT ASSESSMENT METHODOLOGY 232
6.1 Introduction 232
6.2 Screening Process 232
6.3 Scoping Process 233
6.4 Project Description 234
6.5 Baseline Condition 234
6.6 Stakeholder Engagement 235
6.7 Impact Assessment Process 235
6.7.1 Prediction of Impacts 236
6.7.2 Evaluation of Impacts 236
6.7.3 Identification of Mitigation and Enhancement Measures 239
6.7.4 Residual Impact Evaluation 240
6.8 Management, Monitoring and Audit 240
7. IMPACT ASSESSMENT 241
7.1 Air Quality Impact Assessment 241
7.1.1 Introduction 241
7.1.2 Assumptions and Limitations 241
7.1.3 Assessment Methodology 241
7.1.4 Baseline Summary 241
7.1.5 Receptor Identification and Sensitivity 242
7.1.6 Project Activity 242
7.1.7 Assessment of Impacts 243
7.2 GHG Impact Assessment 246
7.2.1 Introduction 246

7.2.2 Assumptions and Limitations 246
7.2.3 Assessment Methodology 247
7.2.4 Baseline Summary 247
7.2.5 Receptor Identification and Sensitivity 247
7.2.6 Project Activity 248
7.2.7 Assessment of Impacts 248
7.3 Noise Impact Assessment 251
7.3.1 Introduction 251
7.3.2 Assumptions and Limitations 252
7.3.3 Assessment Methodology 252
7.3.4 Baseline Summary 252
7.3.5 Receptor Identification and Sensitivity 252
7.3.6 Summary of Project Activities 252
7.3.7 Assessment of Impacts 253
7.4 Soil and Groundwater Impact Assessment 256
7.4.1 Introduction 256
7.4.2 Assumptions and Limitations 256
7.4.3 Assessment Methodology 256
7.4.4 Baseline Summary 256
7.4.5 Receptor Identification and Sensitivity 257
7.4.6 Summary of Project Activities 257
7.4.7 Assessment of Impacts 258
7.5 Surface Water Impact Assessment 262
7.5.1 Introduction 262
7.5.2 Assumptions and Limitations 262
7.5.3 Assessment Methodology 262
7.5.4 Baseline Summary 262
7.5.5 Receptor Identification and Sensitivity 263
7.5.6 Summary of Project Activities 263
7.5.7 Assessment of Impacts 264
7.6 Waste Impact Assessment 268
7.6.1 Introduction 268
7.6.2 Assumptions and Limitations 268
7.6.3 Assessment Methodology 269
7.6.4 Baseline Summary 269
7.6.5 Receptor Identification and Sensitivity 269
7.6.6 Summary of Project Activities 270
7.6.7 Assessment of Impacts 271
7.7 Visual Impact Assessment 277
7.7.1 Introduction 277
7.7.2 Assumptions and Limitations 278
7.7.3 Assessment Methodology 278
7.7.4 Baseline Summary 278
7.7.5 Receptor Identification and Sensitivity 278
7.7.6 Summary of Project Activities 279
7.7.7 Assessment of Impacts 279
7.8 Biodiversity Impact Assessment 283
7.8.1 Introduction 283
7.8.2 Assumption and Limitations 283
7.8.3 Assessment Methodology 283
7.8.4 Summary of Project Activities 286
7.8.5 Permanent and Temporary Habitat Loss 287
7.8.6 Temporary Disturbance or Displacement of Fauna and Flora 289
7.8.7 Temporary and Permanent Barrier Creation, Edge Effects and Fragmentation 291
7.8.8 Degradation of Habitats 294

7.8.9 Mortality of Resident Species ... 297
7.8.10 Mortality of Avifauna ... 299
7.9 Social Impact Assessment ... 302
7.9.1 Introduction ... 302
7.9.2 Assumption and limitations ... 302
7.9.3 Assessment methodology ... 302
7.9.4 Impact on Employment ... 305
7.9.5 Impacts from Economical Displacement ... 306
7.9.6 Impacts to Traffic and Transport ... 309
7.9.7 Impacts from Environmental Emissions (noise, dust, vibration) ... 310
7.9.8 Impacts on Community Health and Safety ... 312
7.9.9 Impacts on Occupational Health and Safety ... 316
7.9.10 Impacts to Cultural Heritage ... 319

8. SUMMARY OF IMPACT ASSESSMENT ... 321

9. CUMULATIVE IMPACT ASSESSMENT ... 323

9.1 Introduction ... 323
9.2 Objectives and Scope ... 323
9.3 Methodology ... 323
9.3.1 Definitions of Key Terminology in CIA ... 323
9.3.2 Overall CIA Approach ... 324
9.3.3 Limitation ... 325
9.3.4 Determination of Spatial and Temporal Boundaries ... 325
9.3.5 Identification of VECs, Other Projects, and External Drivers ... 326
9.3.6 Description of VEC Conditions ... 326
9.3.7 Assessment of Cumulative Impacts on VECs ... 326
9.3.8 Cumulative Impact Management Framework ... 327
9.4 Other Projects and External Drivers ... 327
9.4.1 Other Projects ... 327
9.4.2 External Drivers ... 329
9.5 VEC Selection and Description ... 330
9.5.1 Selection of VECs ... 330
9.5.2 VEC Baseline Status ... 330
9.6 Assessment of Cumulative Impacts on VECs ... 333
9.7 Cumulative Impacts Management Framework ... 336

10. ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN ... 337

10.1 Objectives ... 337
10.2 Scope of this ESMP ... 337
10.3 Summary of Impacts and Mitigation / Management Measures ... 341
10.4 Detailed Management Plan ... 341
10.5 Environmental and Social Monitoring Program ... 342
10.5.1 Performance Indicators and Monitoring Schedule ... 342
10.5.2 Reporting Mechanism for Environmental and Social Monitoring Program ... 343
10.6 Institutional Setting and Implementation Arrangements ... 361
10.6.1 Construction Phase ... 361
10.6.2 Operation Phase ... 362
10.7 Training ... 362
10.7.1 Construction Phase ... 362
10.7.2 Operation Phase ... 362
10.8 Plans for Construction and Operation Phase of the Project ... 365
10.8.1 Construction Phase ... 365
10.8.2 Operation Phase ... 366

10.8.3 Budget 366
10.9 Updating of ESMP 366

11. PUBLIC CONSULTATION AND DISCLOSURE 367

11.1 Methodology and Approach 367
11.1.1 Purpose of the Consultation 367
11.1.2 Identification of Relevant Stakeholders and Potential Issues 367
11.1.3 Overall Approach and Scope of Engagement for the Impact Assessment 368
11.1.4 Format and Content of Consultation Meetings 371
11.2 Summary of Consultation Activities Undertaken for the IEE Process 374
11.3 Result of Consultation 375
11.4 Ongoing Consultations 385

12. CONCLUSION AND RECOMMENDATIONS 386

13. STATEMENT OF COMMITMENT 388

APPENDIX A PROJECT PROPOSAL REPORT SUBSMISSION LETTER
APPENDIX B ERM TRANSITIONAL CONSULTATION REGISTRATION SUBSMISSION
APPENDIX C TPMC'S HSE PLAN AND PROCEDURES
APPENDIX D NOTICE TO PROCEED
APPENDIX E LIST OF INVASIVE SPECIES
APPENDIX F PRESENTATION SLIDES
APPENDIX G SIGNED SHEET FROM THE ENGAGMENT MEETINGS
APPENDIX H STAKEHOLDER ENGAGEMENT MINUTES OF MEETING
APPENDIX I COMMITMENT LETTER

List of Tables

Table 1.1: Tentative Project Schedule 36
Table 1.2: Estimated Number of Workers Expected On-site 37
Table 1.3: Areas of Natural Habitat and Modified Habitat within the AoI 43
Table 1.4: Summary of Impacts and Mitigation Measures for the Transmission Line 46
Table 1.5: Environmental and Social Monitoring Programme for the Transmission Line 53
Table 1.6: Consultation Activities Undertaken during IEE 56
Table 1.7: Key Concerns and Questions Raised during Public Consultation 57
Table 2.1: Key Facts of TTCL 60
Table 2.2: ERM Key Personnel involved in Preparation of the IEE Study 67
Table 3.1: Administrative Regions of Myanmar 71
Table 3.2: Articles in the Constitution Relevant to Environmental Protection 73
Table 3.3: Key Ministries, Agencies and State-Owned Enterprises Involved in HSE for this Project 73
Table 3.4: Myanmar Legislation Relevant to the Project 74
Table 3.5: Section 42 of the Environmental Conservation Law 79
Table 3.6: Ambient Air Quality Guidelines 82
Table 3.7: Critical Levels for the Protection of Vegetation 82
Table 3.8: Myanmar NEQ and IFC General EHS Guidelines for Noise Levels at Receptors 83
Table 3.9: Project-Relevant Legislation in Myanmar 90
Table 3.10: IFC Performance Standards (PS) 103
Table 3.11: Applicable IFC General EHS Guidelines 106
Table 3.12: IFC/World Bank EHS Guidelines for Electric Power Transmission and Distribution 108
Table 3.13: International Conventions Ratified by Myanmar 111

Table 4.1: Transmission Line Distance in Each Area 115
Table 4.2: Transmission Line Proposed Specifications 123
Table 4.3: Main components of a Typical Transmission Tower 125
Table 4.4: Transmission Tower Spatial Characteristics 125
Table 4.5: Potential Route Crossings 128
Table 4.6: Clearance to Ground and Obstacles 128
Table 4.7: Tentative Project Schedule 130
Table 4.8: Construction Activities and Requirements 130
Table 4.9: Expected Vehicle Used During Construction 135
Table 4.10: Estimated Number of Workers Expected On-site 137
Table 4.11: Estimated Solid Waste Generated from Workers On-site 137
Table 4.12: Estimated Wastewater Generated from Workers On-site 137
Table 4.13: Operation and Maintenance Activities 141
Table 4.14: Exposure Limits for General Public Exposure to Electric and Magnetic Fields 142
Table 5.1: Road Side Air Quality Monitoring in Yangon 149
Table 5.2: Major Landfill Sites in Yangon 158
Table 5.3: Species of Conservation Significance (IBAT species grid) 162
Table 5.4: Flora Species Recorded 167
Table 5.5: Bird Species Identified within Sample Areas 168
Table 5.6: Herpetofauna Species Recorded 169
Table 5.7: Invasive Species Identified within the Area of Influence 171
Table 5.8: Land Class Descriptions within the Project AoI 172
Table 5.9: Areas of Land Class within the Project Area of Influence 175
Table 5.10: Natural and Modified Habitats within the Project Area of Influence 175
Table 5.11: Areas of Natural Habitat and Modified Habitat within the AoI 176
Table 5.12 Number of Townships and Villages in the Study Area 181
Table 5.13: Population in Yangon Region 185
Table 5.14: Population Sizes, Categorized by Age 186
Table 5.15: Marital Status in Yangon Region 186
Table 5.16: Numbers of Citizens in Conventional Households and Institutional Households in Yangon Region 187
Table 5.17: Housing Units of Conventional Households in Yangon Region 187
Table 5.18: Material for House Structures in Yangon Region 187
Table 5.19: Population in Seikgyikanaungto, Ahlone, Twantay and Hlaingthayar 190
Table 5.20: Marital Status in Seikgyikanaungto, Ahlone, Twantay and Hlaingthayar 190
Table 5.21: Ethnicity in Seikgyikanaungto and Ahlone Townships 190
Table 5.22: Numbers of Citizens in Conventional Households and Institutional Households 191
Table 5.23: Housing Units of Conventional Households in Seikgyikanaungto, Ahlone, Twantay and Hlaingthayar 191
Table 5.24: Materials for House Structures in Seikgyikanaungto, Ahlone, Twantay and Hlaingthayar 191
Table 5.25: Vulnerabilities of Households in Seikgyikanaungto and Ahlone (2018) 192
Table 5.26: Average Household's Income per Year in Seikgyikanaungto, and Ahlone Townships 194
Table 5.27: Average Household's Expense per Year in Seikgyikanaungto, and Ahlone Townships 194
Table 5.28: Labour Force Participation and Unemployment 201
Table 5.29: Job Industries in Yangon Region 202
Table 5.30: Types of Occupation in Seikgyikanaungto, Ahlone, Twantay and Hlaingthayar Townships 203
Table 5.31: Specific Occupations 204
Table 5.32: Formal Vocational Training and Qualification 206
Table 5.33: Skills and Experiences 206
Table 5.34: Sources of Energy for Lighting 208
Table 5.35: Sources of Energy for Cooking 209

Table 5.36: Current Water Sources of Yangon City Water Supply System 210
Table 5.37: Sources of Non-Drinking Water of Households in Yangon, Seikgyikanaungto, Ahlone, Twantay, and Hlaingthayar Townships 211
Table 5.38: Sources of Drinking Water of Households in Yangon Region, Based on Seasonality 212
Table 5.39: Sources of Drinking Water of Households in Seikgyikanaungto, Ahlone, Twantay and Hlaingthayar Townships 213
Table 5.40: Toilet Facilities 216
Table 5.41: Types of Transportation in Seikgyikanaungto, Ahlone, Twantay and Hlaingthayar Townships 218
Table 5.42: Types of Transportation in Seikgyikanaungto and Ahlone Townships 218
Table 5.43: Levels of Education Completed by Populations (2014) 222
Table 5.44: Level of Education Completed by Population (2018) 223
Table 5.45: Causes of Hospitalization in Yangon Region 224
Table 5.46: Disabilities 225
Table 5.47: Diseases in the Last 6 Months 227
Table 5.48: Amenities in Yangon 231
Table 5.49: Amenities in Seikgyikanaungto, Ahlone, Twantay and Hlaingthayar Townships 231
Table 6.1: Resources/Receptors and its Respective Potential Impacts Considered in the PPR of this Project 233
Table 6.2: Impact Characteristics Terminology, Definition and Designations 236
Table 6.3: Definition of Designation Type 237
Table 6.4: Definition of Likelihood Type 237
Table 6.5: Significance of Impact 238
Table 7.1: Expected Vehicle Used During Construction 243
Table 7.2: Summary of Dust Risk from the Transmission Line Construction 243
Table 7.3: Impact Assessment Table for Human Health and Nuisance Relating to Transmission Line Construction 244
Table 7.4: Impact Assessment Table for Ecology Relating to Transmission Line Construction 244
Table 7.5: Expected Vehicles and Machineries and its GHG Emission 249
Table 7.6: Road Transport Default Emission and Uncertainty Range 249
Table 7.7: Impact Assessment Table for GHG Emissions during Construction Phase 250
Table 7.8: Expected Vehicles and Machineries Used During Construction 253
Table 7.9: Impact Assessment Table for Noise Emission during Construction Phase 254
Table 7.10: Impact Assessment Table for Soil during Construction Phase 258
Table 7.11: Impact Assessment Table for Groundwater during Construction Phase 259
Table 7.12: Estimated Wastewater Generated from Workers On-site 265
Table 7.13: Impact Assessment Table for Surface Water during Construction Phase 266
Table 7.14: Major Landfill Sites in Yangon 270
Table 7.15: Estimated Solid Waste Generated from Workers On-site 271
Table 7.16: Estimated Wastewater Generated from Workers On-site 271
Table 7.17: Impact Assessment Table for Impact from Inappropriate Storage of Waste during Construction Phase 272
Table 7.18: Impact Assessment Table for Impacts of Waste Generation on Existing Waste Management Network and Facilities during Construction Phase 275
Table 7.19: Impact Assessment Table for Visual Component during Construction Phase 279
Table 7.20: Impact Assessment Table for Visual Component during Operation Phase 282
Table 7.21: Sensitivity Criteria for Biodiversity – Habitat 284
Table 7.22: Magnitude Criteria for Impacts to Biodiversity – Habitat 284
Table 7.23: Sensitivity Criteria for Biodiversity – Species 284
Table 7.24: Magnitude Criteria for Impacts to Biodiversity – Species 285
Table 7.25: Types of Threats to Biodiversity Values 285
Table 7.26: Scoping of Potential Impacts during Construction and Operational Phases 286
Table 7.27: Natural Habitat and Modified Habitat within the AoI and Project Area 287

Table 7.28: Impact Assessment Table on Habitat Loss 287
Table 7.29: Summary of Number of Species per Different Red List Category 289
Table 7.30: Impact Assessment Table on Disturbance and Displacement of Fauna and Flora 290
Table 7.31: Natural Habitat and Modified Habitat within the AoI and Project Area 292
Table 7.32: Land Use within the AoI and Project Area 292
Table 7.33: Impact Assessment Table on Temporary and Permanent Barrier Creation, Edge Effects and Fragmentation 293
Table 7.34: Invasive species within the Ahlone LNG Power Plant Project Area 295
Table 7.35: Impact Assessment Table for Degradation of Habitats 296
Table 7.36: Impact Assessment Table of Mortality of Resident Species 298
Table 7.37: Bird Species Identified for LNG Power Plant (Ahlone) Project Located (Located Nearby to the proposed Project) 299
Table 7.38: Impact Assessment Table of Mortality of Avifauna 300
Table 8.1: Summary of the Significance of Impact for Physical, Biodiversity and Social Receptors 321
Table 9.1: Project Areas of Influence 326
Table 9.2: Selected VECs for Inclusion in CIA 330
Table 9.3: Natural Habitat and Modified Habitat within the AoI and Project Area 331
Table 9.4: Criticality of Bird Losses due to Electrocution or Collisions with Transmission Line 331
Table 9.5 Cumulative Impact Assessment 334
Table 10.1: Environmental and Social Management Plans for the Transmission Line 344
Table 10.2: Environmental and Social Monitoring Programme for the Transmission Line 359
Table 10.3: Roles and Responsibilities of Project Proponent and EPC Contractor 361
Table 11.1: List of Project Stakeholders 368
Table 11.2: Consultation Activities Undertaken during IEE 374
Table 11.3: Key Concerns and Question Raised during Public Consultation 376

List of Figures

Figure 1.1: Project Location in Myanmar 32
Figure 1.2 Proposed Transmission Line Alignment 35
Figure 1.3: Alternative and Proposed Transmission Route 38
Figure 1.4 Project Study Area 40
Figure 2.1: TPMC Project Organization Chart 61
Figure 2.2: Hlaingthayar Substation Expansion and Connection to Transmission Line 63
Figure 2.3: Proposed Project Location within Myanmar 64
Figure 2.4: Indicative Project Locations in Yangon Region 65
Figure 3.1: Myanmar States/Regions and Townships 72
Figure 3.2: Protected Areas in Myanmar and Project Location 85
Figure 3.3: IEE Investigations, Review and Approval Process 101
Figure 4.1: Proposed Transmission Line Route 116
Figure 4.2: Proposed Transmission Line Study Area 117
Figure 4.3: Proposed Transmission Line with Milestone (Kilometers) 118
Figure 4.4: Photos of Existing (solid line) and Proposed (dotted line) Transmission Line 119
Figure 4.5: Layout of Existing and Proposed Transmission Line 121
Figure 4.6: Photos of Existing Transmission Line nearby 230 kV Hlaingthayar Sub-Station (at KM 22+000) 122
Figure 4.7: Typical Conductor Design 124
Figure 4.8: Transmission Line Tower Layout 126
Figure 4.9: Transmission Tower Erection Method (Example Design and Photo) 132
Figure 4.10: TESMEC Hydraulic Puller-Tensioner AFB616 Specifications 133
Figure 4.11: Conductor and Ground Wire Stringing Method (Example Photo and Design) 134
Figure 4.12: Anticipated Trucks Mobilization Route Used for Construction 136
Figure 4.13: Temporary Construction Camp Location 139

Figure 4.14: Temporary Construction Camp Layout 140
Figure 4.15: Alternative and Proposed Transmission Route 145
Figure 5.1: Transmission Line Study Area 147
Figure 5.2 Typical Existing Condition at the Project Area 148
Figure 5.3: Myanmar Climate 1900 – 2012 150
Figure 5.4: Yangon Climate 151
Figure 5.5: Myanmar Soil Profile 153
Figure 5.6: Topographic Map of Myanmar 155
Figure 5.7: Topographic Map of Myanmar Coastal Low Land Area 156
Figure 5.8: Elevation of Yangon City 157
Figure 5.9: Seismicity in Myanmar 159
Figure 5.10: Epicentres of earthquakes in Myanmar over the last 100 years 160
Figure 5.11: Biodiversity Areas of Interest around the Project Location 164
Figure 5.12: Biodiversity Survey Area 166
Figure 5.13: Land Classes within the Area of Influence and Project Area 174
Figure 5.14: Natural Habitat and Modified Habitat within the Project Area and Area of Influence 177
Figure 5.15: Social Receptors 180
Figure 5.16 Social Baseline Data Collection in Seikgyikanaungto Township 182
Figure 5.17: District Map of Yangon Region 184
Figure 5.18: Religions in Myanmar and Yangon Region 186
Figure 5.19: Housing Material (Dhani) 189
Figure 5.20: Underlying Reasons of Negative Net Income 195
Figure 5.21: Rice Paddy in the Project Area 196
Figure 5.22: Workers at Parboiled Rice Mill in Hlaingthayar Township 197
Figure 5.23: Products Purchased at the Market 199
Figure 5.24: Private Businesses 200
Figure 5.25: Location of Works of Citizens in Seikyikanaungto and Ahlone Townships 205
Figure 5.26: Duration of Accessibility to Grid Generation 208
Figure 5.27: Source of Drinking Water in Seikgyikanaungto, and Ahlone Townships 214
Figure 5.28: Period of Insufficiency of Drinking Water 215
Figure 5.29: Shwedagon Pagoda 219
Figure 5.30: Sule Pagoda 220
Figure 5.31: Cultural Heritages in Twantay 221
Figure 5.32: Health Status 226
Figure 5.33: Dirt Road in Twantay 229
Figure 5.34: Road Surface 230
Figure 6.1: Overall Impact Assessment Process 232
Figure 6.2: Impact Assessment Process 236
Figure 7.1: TPMC Transmission Line Social Area of Influence 304
Figure 9.1: ESIA vs CIA Perspective 325
Figure 9.2: Summary of IFC's Cumulative Impact Assessment Methodology 325
Figure 9.3: New Yangon City Layout 328
Figure 9.4: New Yangon end-state aspirations 329
Figure 10.1: TPMC's Overall Project Organisation Chart 364
Figure 11.1: Role of the Project Proponent on Stakeholder Engagement in the IEE Process as Defined by the EIA Procedure 370
Figure 11.2: Public Disclosure on Project Proponent Website 372
Figure 11.3: Public Consulation Press Release 373
Figure 11.4: Hlaingtharyar Public Consultation Photographs (Presentation by TPMC) 378
Figure 11.5: Hlaingtharyar Public Consultation Photographs (Presentation by ERM) 379
Figure 11.6: Hlaingtharyar Public Consultation Photographs (Meeting Attendees) 380
Figure 11.7: Twantay Public Consultation Photographs (Presentation by TPMC) 381
Figure 11.8: Twantay Public Consultation Photographs (Presentation by ERM) 382

Figure 11.9: Twantay Public Consultation Photographs (Meeting Attendees) 383
Figure 11.10: Twantay Public Consultation Photographs (Q&A Session) 384

Acronyms and Abbreviations

Name	Description
µg	Microgram
µT	Micro Teslas
A.I.P.T.	Ahlone International Port Terminal
ADB SPS	Asian Development Bank - Safeguard Policy Statement
AIDS	Acquired Immune Deficiency Syndrome
ALARP	As Low As Reasonably Practicable
ALGAS	Asia Least Cost Greenhouse Gas Abatement Strategy
AoI	Area of Influence
ASEAN	Association of Southeast Asian Nations
ASRs	Air Sensitive Receivers
AY	Academic Year
AZE	Alliance for Zero Extinction
BANCA	Biodiversity and Nature Conservation Association
BCG	Bacille Calmette Guerin
BOT	Build, Operate and Transfer
btu	British Thermal Unit
CCPP	Combined Cycle Power Plant
CDP	Community Development Plan
CEDAW	Convention on Elimination of All Forms of Discrimination against Women
CH4	Methane
CIA	Cummulative Impact Assessment
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CO	Carbon Monoxide
CO2	Carbon Dioxide
CR	Critically Endangered
CSO	Central Statistical Organization
CSR	Corporate Social Responsibility
DD	Data Deficient
DEPP	Department of Electrical Power Planning
DOC	Dissolved Organic Carbon
DPT	Diphtheria, Pertussis, Tetanus
DTN	Dissolved Total Nitrogen
EBA	Endemic Bird Area
ECC	Environmental Compliance Certificate
ECCDI	Ecosystem Conservation and Community Development Initiative
ECD	Environmental Conservation Department
ECLOF	Environmental Conservation and Livelihood Outreach Foundation

Name	Description
EHS	Environmental, Health and Safety
EIA	Environmental Impact Assessment
EMF	Electric and Magnetic Fields
EMP	Environmental Management Plan
EPC	Engineering, Procurement and Construction
EPGE	Electric Power Generation Enterprise
ERM	Environmental Resources Management
ERP	Emergency Response Plan
ESG	Environmental, Social and Governance
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
FGD	Focus Group Discussion
ft	Feet
GAD	General Administration Department
GCM	General Circulation Model
GHG	Greenhouse Gas
GIIP	Good International Industry Practice
GISD	Global Invasive Species Database
GN	Guidance Note
GPH	Gallon Per Hour
ha	Hectare
HIV	Human Immunodeficiency Virus
HPGE	Hydropower Generation Enterprise the Hydropower Generation Enterprise
HSE	Health, Safety and Environment
IA	Impact Assessment
IAQM	Institute of Air Quality Management
IBA	Important Bird Areas
IBAT	Integrated Biodiversity Assessment Tool
IEE	Initial Environmental Examination
IFC	International Finance Corporation
IFR	Incidence Frequency Rates
ILO	International Labour Organisation
IPA	Important Plant Areas
IPCC	Intergovernmental Panel on Climate Change
ISR	Incidence Severity Rates
ITD	Italian-Thai Development Public Company Limited
IUCN	International Union for Conservation of Nature
KBAs	Key Biodiversity Areas
km	kilometer

Name	Description
kN	Kilo Newton
kW	Kilowatt
kV	kilovolt
KVA	Kilovolt Amp
L&FS	Life and Fire Safety
LC	Least Concern
LNG	Liquefied Natural Gas
MALI	Ministry of Agriculture, Livestock and Irrigation
MERN	Myanmar Environment Rehabilitation-Conservation Network
mg	milligram
MIC	Myanmar Investment Commission
MIMU	Myanmar Information Management Unit
MIP	Myanmar Industrial Port
MITT	Myanmar International Terminal Thilawa
MLIP	Ministry of Labour, Immigration and Population
MNPED	Ministry of Planning and Finance
MOECAF	Ministry of Environmental Conservation and Forestry
MOEE	Ministry of Electricity and Energy
MONREC	Ministry of Natural Resources and Environmental Conservation
MPA	Myanmar Port Authority
MSWRR	Ministry of Social Welfare, Relief and Resettlements
MVA	Mega Volt Amp
MW	Megawatt
N2O	Nitrious Oxide
NCEA	National Commission for Environmental Affairs
NE	Not Evaluated
NEMC	National Energy Management Committee
NEP	National Environmental Policy
NEQ	National Emission Quality
nF	Nano Farad
NGOs	Non-Government Organizations
NL	Not Listed
NOx	Nitrogen Oxide
NRMN	Non-Road Mobile Machinery
NSDS	National Sustainable Development Strategy
NSRs	Noise Sensitive Receivers
NT	Near Threatened
NTP	Notice to Proceed
OCHA	Office for the Coordination of Humanitarian Affairs

Name	Description
OECD	Organization for Economic Cooperation and Development
OH&S	Occupational Health and Safety
OHGW	Overhead Ground Wires
OPGW	Optical Ground Wires
PAPs	Project Affected Persons
PM	Particulate Matters
POPs	Persistent Organic Pollutants
PPE	Personal Protective Equipment
PPM	Part Per Million
PPR	Project Proposal Report
PS	Performance Standards
RAI	Rural Access Index
ROW	Right of Way
SAoI	Social Area of Influence
SEM	Sustainable Environment Myanmar Co., Ltd.
SEP	Stakeholder Engagement Plan
SMS	Social Management System
SOx	Sulphur Oxide
STCW	Standards of Training Certification and Watch-keeping for Seafarers
TEC	Toyo Engineering Corporation
TJ	TeraJoule
TL	Transmission Line
TOR	Term of Reference
TPMC	TTCL Power Myanmar Company Limited
TSP	Total Suspended Particulates
UNCED	United Nations Conference on Environment and Development
UNDHR	Universal Declaration of Human Rights
UNEP	United Nations Environmental Programme
UNFCC	United Nations Framework Convention on Climate Change
UNICEF	United Nations International Children's Emergency Fund
USD	United States Dollar
UTM	Universal Transverse Mercator
VOC	Volatile Organic Compounds
WB	World Bank
WGS	World Geodetic System
WHO	World Health Organisation
WMP	Waste Management Plan
YCDC	Yangon City Development Committee
YESC	Yangon City Electric Supply Cooperation

Name	Description
Ω	Ohm

Glossary

Term	Definition
Administrative Boundaries	A sub-national entity, statoid, constituent unit, or country subdivision, is a portion of a country or other region delineated for the purpose of administration
Aeration	The introduction of air into a material
Asphyxiation	The state or process of being deprived of oxygen, which can result in unconsciousness or death; suffocation
Ballast	Heavy material, such as gravel, sand, iron, or lead, placed low in a vessel to improve its stability
Brownfield	An urban site for potential building development having had previous development on it
Bunded Area	Main area of a spill containment system, the whole system is colloquially
Capacitance	The ability of a system to store an electric charge
Conductor	A material or device that conducts or transmits electricity when regarded in terms of its capacity to do this
Decommissioning	Withdraw from service
Earthwork	A large artificial bank of soil, especially one used as a fortification
Emission	The production and discharge of something, especially gas or radiation
Engineering, Procurement and Construction	A particular form of contracting arrangement used in some industries where the EPC contractor is made responsible for all the activities from design, procurement, construction, commissioning and handover of the project to the end-user or owner
Epidemic	A widespread occurrence of an infectious disease in a community at a particular time
Foraging	A person or animal in search widely for food or provisions
Foundation Nominations	Process of digging trail puts at main foundation points
Fragmentation	The process or state of breaking or being broken into small or separate parts
Greenfield	Denoting or relating to previously undeveloped sites for commercial development or exploitation
Grievance	An official statement of a complaint over something believed to be wrong or unfair
Ground wire	A set of equipment reducing the high voltage of electrical power transmission to that suitable for supply to consumers

Impendence	The effective resistance of an electric circuit or component to alternating current, arising from the combined effects of ohmic resistance and reactance
Impermeable	Not allowing fluid to pass through
Infiltration	Permeation of a liquid into something by filtration
In-situ	In the original place
Insulation	A wire that has an electrical connection to the earth, either directly or through another grounded conductor
Landfill	A place to dispose of refuse and other waste material by burying it and covering it over with soil, especially as a method of filling in or extending usable land
Leachate	Water that has percolated through a solid and leached out some of the constituents
Mangrove	A tree or shrub that grows in chiefly tropical coastal swamps that are flooded at high tide. Mangroves typically have numerous tangled roots above ground and form dense thickets
Meteorological	Relating to the branch of science concerned with the processes and phenomena of the atmosphere, especially as a means of forecasting the weather
Mulch	Material (such as decaying leaves, bark, or compost) spread around or over a plant to enrich or insulate the soil
Nuisance	A person, thing, or circumstance causing inconvenience or annoyance.
Permeability	The state or quality of a material or membrane that causes it to allow liquids or gases to pass through it
Piling	Placing things one on top of another
Pollution	The presence in or introduction into the environment of a substance or thing that has harmful or poisonous effects
Receptor	A group or individual that may be impact by and event occurring
Resistance	The degree to which a substance or device opposes the passage of an electric current, causing energy dissipation. Ohm's law resistance (measured in ohms) is equal to the voltage divided by the current
Respiratory	Relating to or affecting respiration or the organs of respiration
Right of Way	The legal right, established by usage or grant, to pass along a specific route through grounds or property belonging to another
Sag-tension	Sag and tension is the distance perpendicular to the span of two transmission towers
Scaffolding	A temporary structure on the outside of a building, made usually of wooden planks and metal poles, used by workers while building, repairing, or cleaning the building

Stakeholder Engagement	Is the process by which an organization involves people who may be affected by the decisions it makes or can influence the implementation of its decisions
Standing Water	Is a pool of water of any size that does not flow
Stockpile	Accumulate a large stock of (goods or materials)
Sub-stations	A set of equipment reducing the high voltage of electrical power transmission to that suitable for supply to consumers
Switchyard	An enclosed area of a power system containing the switchgear
Tackifier	Chemical compounds used in formulating adhesives to increase the tack, the stickiness of the surface of the adhesive. They are usually low-molecular weight compounds with high glass transition temperature.
Terrestrial	An inhabitant of the earth
Topography	The arrangement of the natural and artificial physical features of an area
Tower Pegging	Process of setting out the footing of the pylons
Transmission Line	A conductor or conductors designed to carry electricity or an electrical signal over large distances with minimum losses and distortion
Trestles	A framework consisting of a horizontal beam supported by two pairs of sloping legs, used in pairs to support a flat surface such as a tabletop

၁ အကျဉ်းချုပ် အစီရင်ခံစာ

၁.၁ နိဒါန်း

TTCL Power Myanmar Company Limited ('TPMC' နှင့်/သို့မဟုတ် 'စီမံကိန်းအဆိုပြုသူ') သည် ရန်ကုန်တိုင်းဒေသကြီးအတွင်း အလုံမြို့နယ်ရှိ ၎င်း၏ ၃၈၈ မီဂါဝပ် ပေါင်းစပ်လည်ပတ် ဓာတ်အားစက်ရုံ (CCPP) နှင့် လှိုင်သာယာမြို့နယ်တွင် ရှိသည့် ဓာတ်အားခွဲရုံတို့ကို ချိတ်ဆက်လျက် ၂၅ ကီလိုမီတာအရှည် ရှိ ၂၃၀ ကေဗွီ ဓာတ်အားသွယ်ယူရေးလိုင်း ('စီမံကိန်း') ကို ဆောင်ရွက်ရန် စီစဉ်လျက် ရှိပါသည်။

၂၀၁၈ ဇန်နဝါရီလတွင်၊ လျှပ်စစ် နှင့် စွမ်းအင် ဝန်ကြီးဌာနက TPMC ထံသို့ LNG (အရည်ဖြစ်အောင်လုပ်ထားသော သဘာဝဓာတ်ငွေ့) ဓာတ်အားစက်ရုံ (အလုံ) စီမံကိန်းကို ဆက်လက်ဆောင်ရွက်ရန် အသိပေးစာပို့ပေးခဲ့ပါသည်။ သွယ်ယူရေးလိုင်း၏ ရည်ရွယ်ချက်မှာ မြန်မာနိုင်ငံ ဓာတ်အားပင်မလိုင်းသို့ လျှပ်စစ်ရောင်းရန် ဖြစ်သဖြင့် LNG ဓာတ်အားစက်ရုံအသစ် (အလုံ) မှ ထွက်ရှိသော လျှပ်စစ်များကို အနီးအနားရှိ ဓာတ်အားခွဲရုံသို့ လွှဲပြောင်းပေးရန် ဖြစ်ပါသည်။ ယခု ကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း (IEE) သည် သွယ်ယူရေးလိုင်းအတွက်သာ ဖြစ်ပြီး၊ LNG ဓာတ်အားစက်ရုံ (အလုံ) အတွက် စီမံကိန်းအဆိုပြုလွှာ (PPR)၊ နယ်ပယ်အတိုင်းအတာသတ်မှတ်ခြင်း၊ နှင့် ပတ်ဝန်းကျင် နှင့် လူမှု ထိခိုက်မှု ဆန်းစစ်ခြင်း (ESIA) တို့ကို သီးခြား စာတမ်းများဖြင့် ပြင်ဆင်ထားပါသည်။

LNG ဓာတ်အားစက်ရုံ (အလုံ) နေရာအဆောက်အအုံမှ ထွက်ရှိသော လျှပ်စစ်ကို မြန်မာနိုင်ငံ ပင်မဓာတ်အားလိုင်းသို့ ရောင်းချပေးသွားမည် ဖြစ်ပြီး၊ ဓာတ်အားစက်ရုံ ဓာတ်အားခွဲရုံ မှ လျှပ်စစ် နှင့် စွမ်းအင် ဝန်ကြီးဌာန (MOEE) ၏ အဆိုပြုထားသည့် မြန်မာနိုင်ငံ၊ ရန်ကုန်တိုင်းဒေသကြီး၊ လှိုင်သာယာမြို့နယ်ရှိ ဓာတ်အားခွဲရုံသို့ အရှည် ၂၅ ကီလိုမီတာရှိ ၂၃၀ ကေဗွီ သွယ်ယူရေးလိုင်းကို သုံးသွားမည် ဖြစ်ပါသည်။

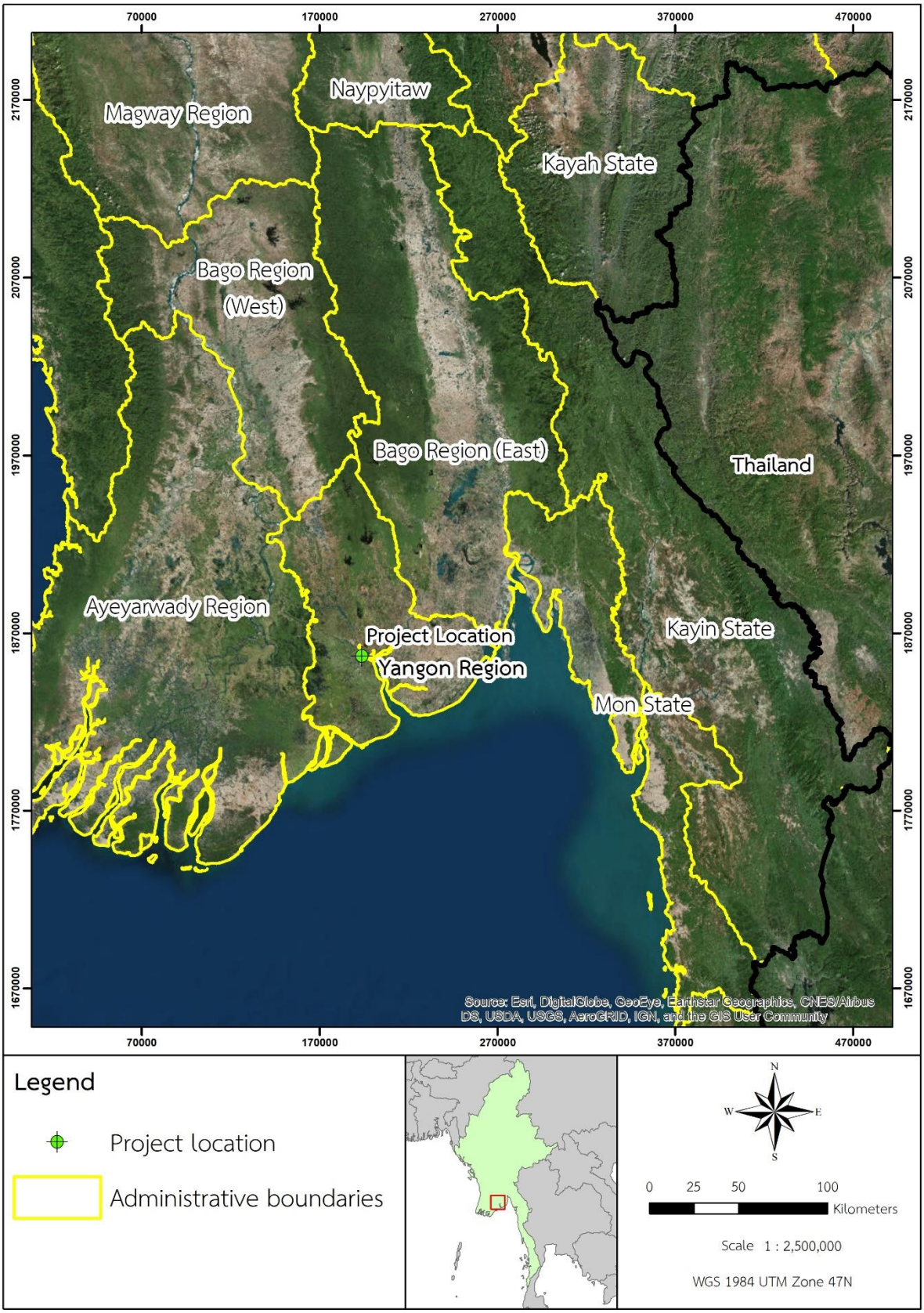
အဆိုပြုစီမံကိန်းအတွက် ပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း (ဆိုလိုသည်မှာ IEE သို့မဟုတ် EIA) နှင့်ပတ်သက်၍ လိုအပ်သည့် အဆင့်မှာ သဘာဝနှင့်သယံဇာတထိန်းသိမ်းရေးဝန်ကြီးဌာန (MONREC) က အတည်ပြုပေးမှုအပေါ် မူတည်ပါသည်။ *၂၀၁၅ ဒီဇင်ဘာလ ၂၉ ရက်နေ့တွင် ထုတ်ပြန်သည့် EIA လုပ်ထုံးလုပ်နည်း* ၏ *နောက်ဆက်တွဲ-၁* အရ၊ အဆိုပြု စီမံကိန်း၏ နယ်ပယ်အတိုင်းအတာမှာ *အမှတ်စဉ် ၂၄ - ၂၃၀ ကေဗွီနှင့်အထက် လျှပ်စစ်ဓာတ်အားလိုင်း သွယ်တန်းခြင်း (အမှတ်စဉ် ၂၃ ပါ အမျိုးအစားများကလွဲ၍)* အတွင်းကျရောက်ပြီး၊ IEE လေ့လာချက်ကိုသာ ဆောင်ရွက်ရန် လိုအပ်မည် ဖြစ်ပါသည်။

စီမံကိန်းအဆိုပြုသူသည် ၂၀၁၈ ဒီဇင်ဘာလ ၂၄ ရက်နေ့တွင် စီမံကိန်းအဆိုပြုလွှာ (PPR) ကို ပြင်ဆင်ရေးသား၍ MOEE နှင့် MONREC တို့ထံသို့ တင်သွင်းခဲ့ပါသည်။ TPMC သည် စီမံကိန်း၏ ကနဦးပတ်ဝန်းကျင် ဆန်းစစ်ခြင်း (IEE) လေ့လာချက်ဖြင့် ရှေ့ဆက်ဆောင်ရွက်သွားရန် နှင့် ပတ်ဝန်းကျင် နှင့် လူမှု လျော့ချရေး နှင့် စီမံခန့်ခွဲမှု အစီအမံများအတွက် ၎င်း၏ ကတိကဝတ်များကို ရှေ့ဆက်ဆောင်ရွက်ရန် ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ် (EMP) ကို ပြင်ဆင်သွားရန် PPR က အကြံပြုခဲ့ပါသည်။

စီမံကိန်းအဆိုပြုသူသည် စီမံကိန်းဆောင်ရွက်မှုလုပ်ငန်းအဆင့်အတွက် နိုင်ငံတကာက ရန်ပုံငွေကိုလည်း ရှာဖွေနေ သဖြင့်၊ ကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း (IEE) အတွက် နိုင်ငံတကာစံနှုန်းများကို လေးစားလိုက်နာရန်လည်း လိုအပ်ပါသည်။ IEE လေ့လာချက်ဖြစ်သည့် ယခုအစီရင်ခံစာကို မြန်မာနိုင်ငံ၏ IEE သတ်မှတ်ချက်များ (မြန်မာနိုင်ငံ၏ *EIA လုပ်ထုံးလုပ်နည်း - ၂၀၁၅* အရ) နှင့် IFC PS (အပြည်ပြည်ဆိုင်ရာ ဘဏ္ဍာရေးကော်ပိုရေးရှင်း၏ လုပ်ဆောင်မှု စံသတ်မှတ်ချက်များ) နှင့် ၎င်းနှင့်ဆက်နွယ်သော လမ်းညွှန်များဖြစ်ကြသည့် နိုင်ငံတကာ စံနှုန်းများနှင့်အညီ ပြင်ဆင် ဆောင်ရွက်ထားပါသည်။

TPMC က PPR အစီရင်ခံစာတွင် အဆိုပြုထားသည့် EIA လေ့လာချက်ကို ဆောင်ရွက်ရန် ERM-Siam Company Limited ('ERM' နှင့်/သို့မဟုတ် 'အတိုင်ပင်ခံ') အား တတိယပုဂ္ဂိုလ်အဖြစ် အဆိုပြုခဲ့ပြီး ဖြစ်ပါသည်။ ယခု IEE လေ့လာချက်သည် သွယ်ယူရေးလိုင်းအတွက် အလေးပေးထားပါသည်။ LNG လက်ခံရေးဂိတ်၊ သဘာဝဓာတ်ငွေ့ပိုက် လိုင်း၊ နှင့် LNG ဓာတ်အားစက်ရုံ (အလုံ) တို့အတွက် သီးခြား ESIA အစီရင်ခံစာကို ပြင်ဆင်ရေးသားပြီး ဖြစ်ပါသည်။

ပုံ (၁.၁) - စီမံကိန်းတည်နေရာပြပုံ



ကိုးကား - TPMC, 2019, modified by ERM, 2019

၁.၂ စီမံကိန်းနောက်ခံအနေအထား

TTCL Power Myanmar Company Limited ('TPMC' နှင့်/သို့မဟုတ် 'စီမံကိန်းအဆိုပြုသူ') သည် ရန်ကုန်တိုင်းဒေသကြီးအတွင်း အလုံမြို့နယ်ရှိ ၎င်း၏ ၃၈၈ မီဂါဝပ် ပေါင်းစပ်လည်ပတ် ဓာတ်အားစက်ရုံ (CCPP) နှင့် လှိုင်သာယာမြို့နယ်တွင် ရှိသည့် ဓာတ်အားခွဲရုံတို့ကို ချိတ်ဆက်လျက် ၂၅ ကီလိုမီတာအရှည် ရှိ ၂၃၀ ကေဗွီ သွယ်ယူရေးလိုင်း ('စီမံကိန်း') ကို ဆောင်ရွက်ရန် စီစဉ်လျက် ရှိပါသည်။

၂၀၁၈ ဇန်နဝါရီလတွင်၊ လျှပ်စစ် နှင့် စွမ်းအင် ဝန်ကြီးဌာနက TPMC ထံသို့ LNG (အရည်ဖြစ်အောင်လုပ်ထားသော သဘာဝဓာတ်ငွေ့) ဓာတ်အားစက်ရုံ (အလုံ) စီမံကိန်းကို ဆက်လက်ဆောင်ရွက်ရန် အသိပေးစာပို့ပေးခဲ့ပါသည်။ သွယ်ယူရေးလိုင်း၏ ရည်ရွယ်ချက်မှာ မြန်မာနိုင်ငံ ဓာတ်အားပင်မလိုင်းသို့ လျှပ်စစ်ရောင်းရန် ဖြစ်သဖြင့် LNG ဓာတ်အားစက်ရုံအသစ် (အလုံ) မှ ထွက်ရှိသော လျှပ်စစ်များကို အနီးအနားရှိ ဓာတ်အားခွဲရုံသို့ လွှဲပြောင်းပေးရန် ဖြစ်ပါသည်။ ယခု ကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း (IEE) သည် သွယ်ယူရေးလိုင်းအတွက်သာ ဖြစ်ပြီး၊ LNG ဓာတ်အားစက်ရုံ (အလုံ) အတွက် စီမံကိန်းအဆိုပြုလွှာ (PPR)၊ နယ်ပယ်အတိုင်းအတာသတ်မှတ်ခြင်း၊ နှင့် ပတ်ဝန်းကျင် နှင့် လူမှု ထိခိုက်မှု ဆန်းစစ်ခြင်း (ESIA) တို့ကို သီးခြား စာတမ်းများဖြင့် ပြင်ဆင်ထားပါသည်။

စီမံကိန်းအဆိုပြုသူ၏ အသေးစိတ်ဖော်ပြချက်ကို အောက်တွင် ပေးထားပါသည် -

ကုမ္ပဏီအမည်	TTCL Power Myanmar Company Limited (TPMC)
လိပ်စာ	၁၆ (ခ)၊ ၁၆ လွှာ၊ စင်တာပွိုင့်တာဝါ၊ အမှတ် (၆၅)၊ ဆူးလေဘုရားလမ်း နှင့် ကုန်သည်လမ်းထောင့်၊ ကျောက်တံတားမြို့နယ်၊ ရန်ကုန်၊ မြန်မာနိုင်ငံ
ဆက်သွယ်ရန်လူ	Ms. Nini San
တယ်လီဖုန်း	+95 [0] 9 254 311058
	+95 [0] 1 371 962
ဖက်စ် နံပါတ်	+95 [0] 1 371 963
အီးမေးလ်	nini.s@ttcl.com

အဆိုပြု စီမံကိန်းတည်နေရာသည် ပြည်ထောင်စုသမ္မတမြန်မာနိုင်ငံ၊ ရန်ကုန်တိုင်းဒေသကြီးရှိ အလုံ၊ ဆိပ်ကြီးခနောင်တို့၊ တွံတေး နှင့် လှိုင်သာယာတို့ဖြစ်ကြသည့် မြို့နယ် (၄) မြို့နယ်တွင် တည်ရှိပါသည်။

သွယ်ယူရေးလိုင်းသည် လက်ရှိဆောင်ရွက်နေသော အလုံဓာတ်အားစက်ရုံ၌ ရှိနေသော လက်ရှိသုံးနေသည့် ဓာတ်အားခွဲရုံမှ စတင်သည်။ အဆိုပြုသွယ်ယူရေးလိုင်းကို အလုံနေရာသစ် သုံး (၃) ခု (ယခုစီမံကိန်း၏ နယ်ပယ်အတိုင်းအတာသတ်မှတ်ခြင်းအတွင်း ရှိမနေပါ) နှင့် ချိတ်ဆက်ထားမည် ဖြစ်ပြီး၊ နေရာသစ်တစ်ခုကို လှိုင်သာယာ-အလုံ သွယ်ယူရေးလိုင်းဟုခေါ်သည့် ၂၃၀ ကေဗွီ သွယ်ယူရေးလိုင်းလိုင်းနှင့် ပူးတွဲထားပါသည်။ ထို့ပြင်၊ အခြား ၂၃၀ ကေဗွီ သွယ်ယူရေးလိုင်းမှာ ဓာတ်အားလွှဲပြောင်းမှုအားလုံလောက်စေရန် အထောက်အကူပြုမည့် နှစ်ခုပူးတွဲထားသည့်လျှပ်စီးပတ်လမ်းပုံစံဖြစ်ပါမည်။

ဤသွယ်ယူရေးလိုင်းကို လက်ရှိသုံးနေသော လှိုင်သာယာ-ကျိုက်လတ် သွယ်ယူရေးလိုင်းနှင့် လမ်းကြောင်း၏ ပထမတစ်ဝက်အထိ ပြိုင်၍ယူသွားပြီးနောက်၊ လက်ရှိသုံးနေသောလှိုင်သာယာ-အလုံသွယ်ယူရေးလိုင်းအတိုင်း ဆက်လက်လိုက်သွားမည် ဖြစ်ပါသည်။ တစ်ဖက်ချင်းမှ ခွါထားသောအကွာအဝေးမှာ (သွယ်ယူရေးလိုင်း/ တာဝါတစ်ခုအချင်း အကြားအကွာ) ၂၃ မီတာ ရှိပါမည်။ အလုံဓာတ်အားခွဲရုံသို့ မချိတ်ဆက်မီ၊ သွယ်ယူရေးလိုင်းသည် ရန်ကုန်မြစ်ကို ဖြတ်သွားရန် လိုအပ်ပါသည်။ လမ်းကြောင်းတွင်ပါဝင်မှု၏ အဓိကအစိတ်အပိုင်းမှာ အခြေချနေရာငယ်များရှိပြီး စိုက်ပျိုးရေး နှင့် ချုပုတ်နေရာများဖြစ်ကြပါသည်။

၁.၃ မူဝါဒ နှင့် ကြီးကြပ်ရေးဆိုင်ရာ မူဘောင်

ပြည်ထောင်စုသမ္မတ မြန်မာ နိုင်ငံတော်မှ ပြဋ္ဌာန်းထားသော ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဥပဒေ ၏ ပုဒ်မ ၇ နှင့် ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးနည်းဥပဒေများ ၏ ပုဒ်မ ၅၂ နှင့် ၅၃ တို့အရ၊ TPMC သည် အဆိုပြု စီမံကိန်းအတွက် ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဆိုင်ရာလိုက်နာဆောင်ရွက်မှု သက်သေခံ လက်မှတ် (ECC) ရရှိရန် ကနဦးပတ်ဝန်းကျင် ဆန်းစစ်ခြင်း (IEE) ကို ဆောင်ရွက်ရန် လိုအပ်ပါသည်။

ယခုစီမံကိန်းကို နိုင်ငံတော်အဆင့်နှင့် ဒေသအဆင့် စံနှုန်းများ ဥပဒေများနှင့်အညီ လုပ်ကိုင် ဆောင် ရွက်သွားမည် ဖြစ်ပါသည်။ ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း (EIA) နှင့်ပတ်သက်သည့် ဒေသ အဆင့်စံနှုန်းများတွင် ပတ်ဝန်း ကျင်ထိန်းသိမ်းရေးဥပဒေ (၂၀၁၂)၊ ပတ်ဝန်းကျင်ထိန်းသိမ်းရေး နည်းဥပဒေများ (၂၀၁၄)၊ အမျိုးသား ပတ်ဝန်းကျင် ဆိုင်ရာအရည်အသွေး(ထုတ်လွှတ်မှု) လမ်းညွှန်ချက်များ (၂၀၁၅) နှင့် ပတ်ဝန်းကျင် ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ထုံးလုပ်နည်း (၂၀၁၅) တို့ပါဝင်သည်။

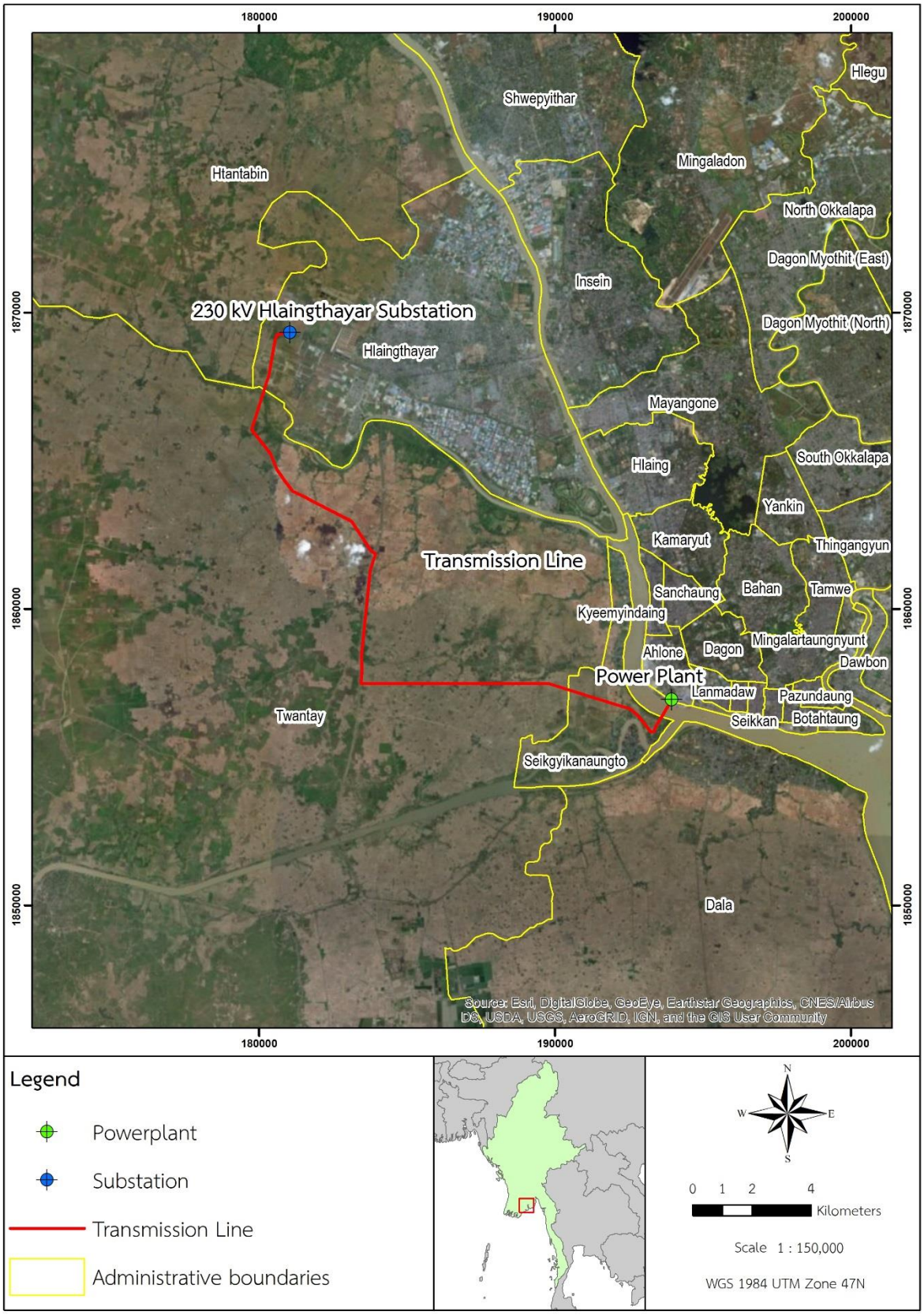
၂၀၁၅ ဒီဇင်ဘာလတွင် မြန်မာနိုင်ငံ၏ အပြီးသတ် EIA လုပ်ထုံးလုပ်နည်းထုတ်ပြန်မှုနှင့်အတူ၊ အမျိုးသား ပတ်ဝန်းကျင် အရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန်များကိုလည်း ထုတ်ပြန်ခဲ့ပါသည်။ ဤလမ်းညွှန်များသည် ညစ်ညမ်းမှုကို ကာကွယ်ရန်နှင့် ပတ်ဝန်းကျင် နှင့် အများပြည်သူကျန်းမာရေးတို့ကို ကြိုတင်ကာကွယ်ရန် စီမံကိန်းများမှ ဆူညံသံ နှင့် အခိုးအငွေ့ထုတ်လွှတ်မှုများ နှင့် ညစ်ညမ်းရေစွန့်ထုတ်မှုများကို ထိန်းချုပ်ရန် ကြီးကြပ်ရေးအတွက်အခြေခံများကို ပြဋ္ဌာန်းပေးပါသည်။ ၎င်းစံသတ်မှတ်ချက်များမှာ ကမ္ဘာ့ဘဏ်အုပ်စု အထွေထွေ ပတ်ဝန်းကျင် ကျန်းမာရေး နှင့် ဘေး ကင်းရေး (EHS) လမ်းညွှန်များ (၂၀၀၇) နှင့် တူညီပါသည်။

၁.၄ စီမံကိန်းအကြောင်းအရာဖော်ပြချက်

၁.၄.၁ စီမံကိန်းတည်နေရာ

စီမံကိန်းတည်နေရာသည် ပြည်ထောင်စုသမ္မတမြန်မာနိုင်ငံ၊ ရန်ကုန်တိုင်းဒေသကြီးရှိ အလုံ၊ ဆိပ်ကြီးခနောင်တို့၊ တွံတေး နှင့် လှိုင်သာယာတို့ဖြစ်ကြသည့် မြို့နယ် (၄) မြို့နယ်တွင် တည်ရှိပါသည်။ အဆိုပြုစီမံကိန်းတည်နေရာကို *ပုံ (၁.၁)* တွင် တင်ပြထားပြီး၊ သွယ်ယူရေးလိုင်းချိန်ညှိမှုကို *ပုံ (၁.၂)* တွင် တင်ပြထားပါသည်။

ပုံ(၁.၂) အဆိုပြုသွယ်ယူရေးလိုင်းချိန်ညှိမှုပြပုံ



၁.၄.၂ စီမံကိန်း၏ အဓိက အစိတ်အပိုင်းများ

သွယ်ယူရေးလိုင်းအစိတ်အပိုင်းများတွင် အောက်ပါတို့ ပါဝင်ပါသည် -

- သွယ်ယူရေးလိုင်း (လျှပ်ကူးပစ္စည်းများ)၊
- သွယ်ယူရေးတာဝါ၊
- အဖွင့်အပိတ်နေရာ နှင့် ဓာတ်အားခွဲရုံများ၊
- ချိတ်ဆက်မှု၊
- အသုံးပြုမည့်လမ်းကြောင်း (ROW) နှင့် ဖြတ်သန်းမှုများ၊ နှင့်
- လမ်းများဖောက်ခြင်း၊

၁.၄.၃ တည်ဆောက်ရေးအဆင့်

သွယ်ယူရေးလိုင်းတည်ဆောက်ရေးတွင် အောက်ပါလုပ်ငန်းများ ပါဝင်မည် ဖြစ်ပါသည်။

၁.၄.၃.၁ မြေမျက်နှာပြင်အရည်အသွေးထိန်းသိမ်းပြုရေးလုပ်ငန်းများ

မြေမျက်နှာပြင်အရည်အသွေးထိန်းသိမ်းပြုပြင်ရေးလုပ်ငန်းများတွင် အပင်များရှင်းလင်းခြင်း နှင့် စီမံကိန်းလုပ်ငန်းခွင်နေရာကို ညှိခြင်းတို့ ပါဝင်မည် ဖြစ်ပါသည်။ စီမံကိန်းလုပ်ငန်းခွင်နေရာမှ မြေသားများကို ခွာယူပြီး၊ မြေညှိခြင်း နှင့်/သို့မဟုတ် မြေဖို့ခြင်းတို့အတွက် အသုံးပြုသွားမည်ဟု တွက်ချက်ထားပါသည်။ တည်ဆောက်ရေးနေရာသည် မြစ်ကြီးကိုကျော်ဖြတ်ရန်လိုသဖြင့်၊ သွယ်ယူရေးတာဝါများ ထောင်ရာ နှင့် ရေကိုကျော်၍ သွယ်ယူရေးလိုင်းကို ချိတ်ဆက်ရာတို့တွင် အလေးထားဂရုပြုထည့်သွင်းစဉ်းစားရန်လိုပါသည်။

၁.၄.၃.၂ လမ်းများဖောက်လုပ်မှု

လက်ရှိအသုံးပြုနေသောလမ်းများသည် သွယ်ယူရေးလိုင်းတည်ဆောက်ရေးအတွက် လိုအပ်သည့် ယာဉ်အမျိုးအစားများကို ခံနိုင်အားမရှိပါ။ ထို့ကြောင့် တည်ဆောက်ရေးပစ္စည်းများ၊ ကိရိယာများ (စက်များ) နှင့် အလုပ်သမားများကို မစုရုံးမီ၊ လမ်းသစ်များဖောက်လုပ်ခြင်း နှင့် လမ်းများအရည်အသွေးမြှင့်တင်ခြင်းတို့ကို ဆောင်ရွက်ရန်လိုအပ်ပါသည်။

၁.၄.၃.၃ တည်ဆောက်ရေး (ယာယီ) စခန်း

သွားလာလည်ပတ်ရမှုကို အနည်းဆုံးဖြတ်စေရန်၊ တည်ဆောက်ရေးနေရာနှင့် သင့်တင့်လျောက်ပတ်သောအကွာအဝေးအတွင်း၌ လုပ်သားများ၏ ယာယီ တည်ဆောက်ရေးစခန်းကို ပြုလုပ်သွားမည် ဖြစ်ပါသည်။ သွယ်ယူရေးလိုင်းတိုးတက်ဖြတ်ထွန်းမှုနှင့်အတူ ဆက်လက်ရွှေ့သွားမည့် တည်ဆောက်ရေးနေရာသို့ မတူကွဲပြားသောအသင်းအုပ်စုများများသည် ပြိုင်၍ လည်ပတ်သွားမည် ဖြစ်ပါသည်။

၁.၄.၄ လည်ပတ်ရေးအဆင့်

ယေဘုယျအားဖြင့်၊ သွယ်ယူရေးလိုင်းစနစ်၏ လည်ပတ်ရေး နှင့် ထိန်းသိမ်းပြုပြင်ရေး လုပ်ငန်းများတွင် ပုံမှန်စစ်ဆေးမှုများ၊ စီမံခန့်ခွဲမှုစနစ် နှင့် ဖွဲ့စည်းမှုအစိတ်အပိုင်းများ နှင့် တာဝါတည်နေရာများ၌ ROW ရှင်းလင်းမှုတို့ ပါဝင်မည် ဖြစ်ပါသည်။ ဤအဆင့်တွင် လုပ်အားဖြင့်လည်ပတ်ဆောင်ရွက်ခြင်း သို့မဟုတ် လုပ်သားများအနည်းအကျဉ်းသာ လိုအပ်မည်ဟု တွက်ချက်ထားပါသည်။

၁.၄.၅ တည်ဆောက်ရေးအချိန်ဇယား

သွယ်ယူရေးလိုင်းကို ၂၅ လအတွင်း တည်ဆောက်ရန် ခန့်မှန်းထားပါသည်။ တည်ဆောက်ရေးအချိန်ဇယားအကြမ်းကို ***ဇယား (၁.၁)*** တွင် တင်ပြထားပါသည်။

ဇယား (၁.၁) - စီမံကိန်းအချိန်ဇယားအကြမ်း

စီမံကိန်းအချိန်ဇယား	အကြမ်းချထားသောနေ့စွဲများ
ဖြစ်နိုင်ခြေလေ့လာချက် ပြီးမြောက်ခြင်း	- ၃လမြောက် - ၁ လမြောက် (လုပ်ငန်းခွင်လုပ်ငန်းများမတိုင်မီ ကနဦးအချိန်)
သက်ဆိုင်သူများနှင့် တိုင်ပင်ဆွေးနွေးခြင်း	၁ လမြောက် – လမြောက်
အပြီးသတ် ကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း လေ့လာချက်	၁ လမြောက် –၃ လမြောက်
လုပ်ငန်းခွင်ပြင်ဆင်ခြင်း	၇ လမြောက် – ၁၀ လမြောက်
အသေးစိတ်စက်မှုဆိုင်ရာ လုပ်ငန်း	၁ လမြောက် –၁၀ လမြောက်
ဝယ်ယူခြင်း	၁၀ လမြောက် –၁၈ လမြောက်
တည်ဆောက်ခြင်း	၇ လမြောက် – ၂၄ လမြောက်

ကိုးကား - TPMC, 2018

အထက်ပါ စီမံကိန်းအချိန်ဇယားမှာ မူကြမ်းသာဖြစ်ပြီး၊ ပြောင်းလဲပြုပြင်နိုင်ခြေရှိကြောင်း မှတ်သားပါ။

၁.၄.၆ လုပ်သားများ

စီမံကိန်းအတွက် လုပ်ငန်းတစ်ခုချင်း၏ တည်ဆောက်ရေးအဆင့်ကာလအတွင်း လုပ်ငန်းခွင်နေရာတွင် အလုပ်လုပ်နေကြမည့် အလုပ်သမား ခန့်မှန်းခြေဦးရေကို ***ဇယား (၁.၂)*** တွင် ပြထားပါသည်။

ဇယား (၁.၂) - လုပ်ငန်းခွင်တွင် ရှိနေကြမည့် အလုပ်သမားခန့်မှန်းခြေဦးရေ

စဉ်	အလုပ်အမျိုးအစား	လုပ်သားများ အရေအတွက်	ဒေသခံ လုပ်သားများ	အခြားနေရာမှ လုပ်သားများ (အထူးပြုသူများ/ ကျွမ်းကျင်လုပ်သားများ)
၁	တာဝါထောင်ခြင်း	၄၀	၂၄	၁၆
၂	ကေဘယ်ကြိုးဆွဲခြင်း နှင့် တပ်ခြင်း	၇၅	၄၀	၃၅
၃	အုပ်မြစ်ချတည်ဆောက်ခြင်း	၆၀	၃၆	၂၄
	တည်ဆောက်ခြင်း (စုစုပေါင်း)	၁၇၅	၁၀၀	၇၅

ကိုးကား - TPMC, 2019

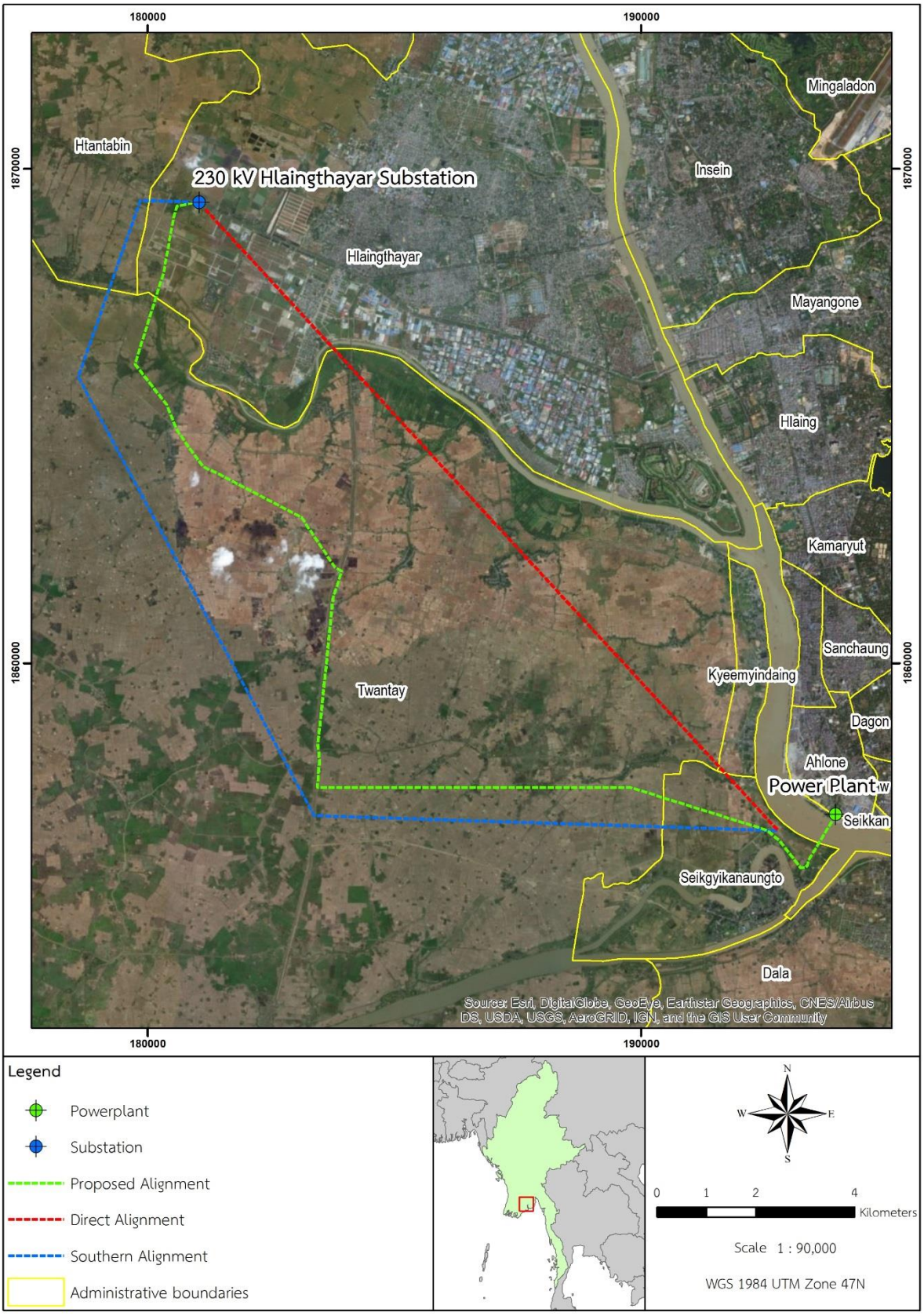
၁.၄.၇ ထည့်သွင်းစဉ်းစားခဲ့သည့် အခြားဆောင်ရွက်နိုင်သောနည်းလမ်းများ

လမ်းကြောင်းရွေးချယ်ရေးလေ့လာမှုအစိတ်အပိုင်းဖြစ်သည့် သွယ်ယူရေးလိုင်း လမ်းကောင်းရွေးချယ်မှု သုံး (၃) ကြောင်း ရှိခဲ့ပြီး၊ ၎င်းတို့ကို (***ပုံ ၁.၃*** တွင် ပြထားသည့်အတိုင်း) အောက်တွင် ဖော်ပြထားပါသည် -

- ဓာတ်အားခွဲရုံနှင့် တိုက်ရိုက်ညှိယူမှုလမ်းကြောင်း၊ အရှည် ၁၇.၄ ကီလိုမီတာ။
- အဆိုပြု ညှိယူမှုလမ်းကြောင်း၊ အရှည် ၂၅ ကီလိုမီတာ၊ နှင့်
- တောင်ပိုင်းညှိယူမှုလမ်းကြောင်း၊ အရှည် ၂၄.၄၇ ကီလိုမီတာ။

အဆိုပြုပြီး ရွေးချယ်ထားသော လမ်းကြောင်း နှင့် အသေးစိတ်အစီအစဉ်ကို ဘေးကင်းရေး၊ ပတ်ဝန်းကျင်၊ ဇီဝ နှင့် လူမှု-စီးပွား ထိခိုက်မှုကဏ္ဍတို့ကို ထည့်သွင်းစဉ်းစားလျက် ငွေကြေးအရဖြစ်နိုင်ခြေအရှိဆုံးအဖြစ် ဆန်းစစ်ထားပါသည်။

ပုံ (၁.၃) - အခြားနည်းလမ်းရွေးချယ်မှု နှင့် အဆိုပြု သွယ်ယူရေးလမ်းကြောင်း



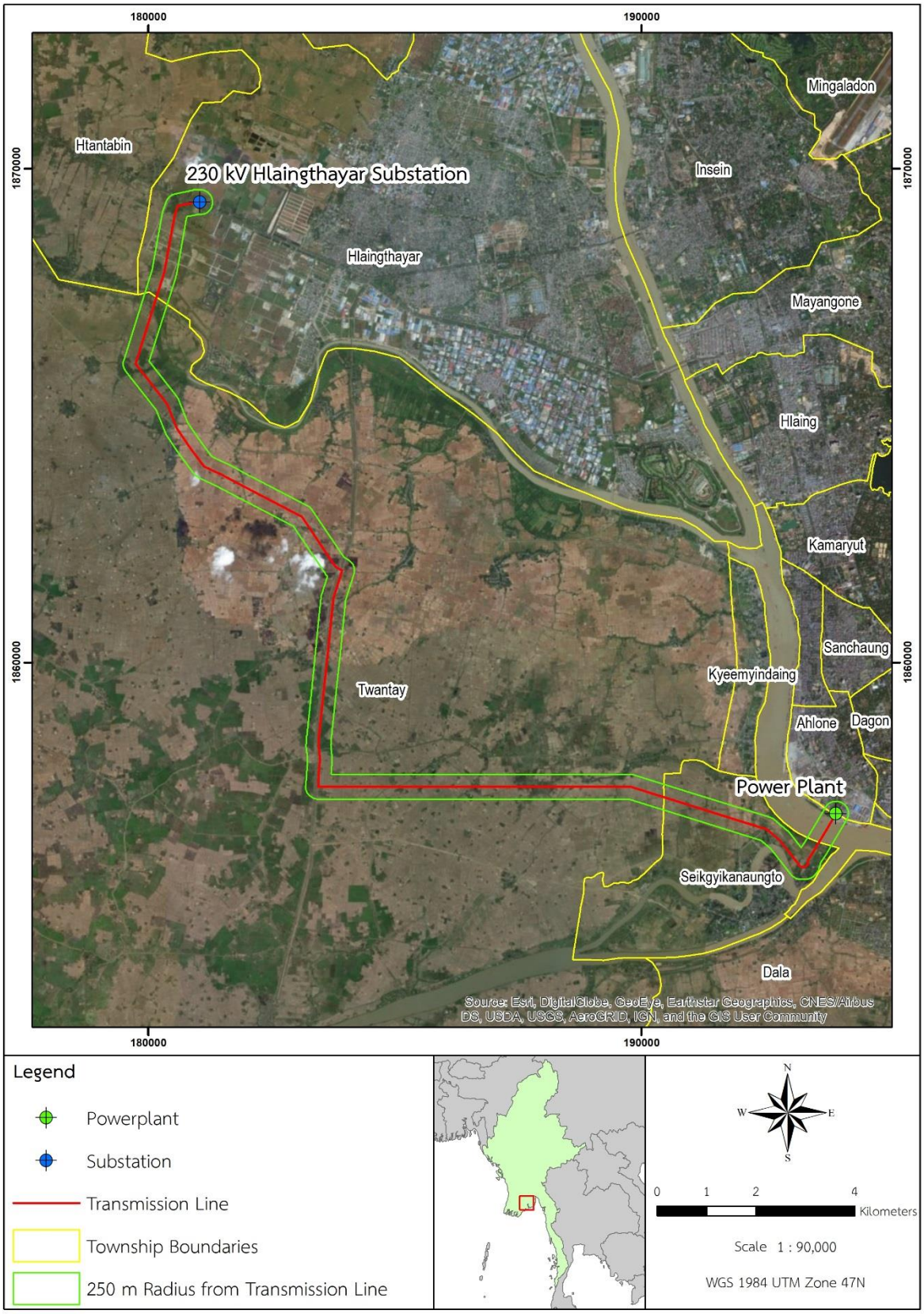
ကိုးကား - TPMC, 2019

၁.၅ စီမံကိန်းဆိုင်ရာ ပတ်ဝန်းကျင်၊ ဇီဝ နှင့် လူမှုအခြေအနေများ

ယခုစီမံကိန်း၏ လေ့လာမှုနယ်မြေဧရိယာသည် သွယ်ယူရေးလိုင်း၏တစ်ဖက်ခြမ်းစီကို ၂၅၀ မီတာ (၀.၂၅ ကီလိုမီတာ) ပါဝင်မည် ဖြစ်ပါသည်။ ၎င်းမှာ စက်မှုလုပ်ငန်းဆိုင်ရာ အကောင်းဆုံးအလေ့အကျင့်နှင့် ကိုက်ညီမှုရှိပြီး၊ စီမံကိန်းမှ သက်ရောက်မှုရှိနိုင်သည့် နေရာများအားလုံးကို ထည့်သွင်းရန် ဒီဇိုင်းရေးဆွဲထားပါသည်။ လေ့လာမှုနယ်မြေဧရိယာသည် ပတ်ဝန်းကျင် နှင့် ဇီဝဆိုင်ရာအစိတ်အပိုင်းများအတွက် စီမံကိန်း၏ သက်ရောက်မှုရှိစေမည့်နယ်မြေဧရိယာတစ်ခုလုံး (ဆိုလိုသည်မှာ စီမံကိန်းမှ သက်ရောက်နိုင်ခြေရှိသော နယ်မြေဧရိယာ) ပါဝင်သည်။ ၎င်းတွင် စီမံကိန်းကြောင့် တိုက်ရိုက်သက်ရောက်နိုင်သည့် လူမှုနေရာများအားလုံးလည်း ပါဝင်ပါသည်။ လူမှုရေးဆိုင်ရာ အခြေခံအချက်အလက်များကိုလည်း စီမံကိန်း၏ သက်ရောက်မှုရှိစေမည့်နယ်မြေဧရိယာ (AoI) အတွင်းရှိ ဖြစ်ပေါ်လာနိုင်သော လူမှု-စီးပွား၊ ကျန်းမာရေး နှင့် ယဉ်ကျေးမှုအမွေအနှစ် အစိတ်အပိုင်းများအားလုံး ပါဝင်စေရန် ပိုကြီးသောနယ်မြေဧရိယာလည်း ပါဝင်ပါသည်။ ***လေ့လာမှုနယ်မြေဧရိယာကို ပုံ (၁.၄) တွင် ဖော်ပြထားပါသည်။***

သွယ်ယူရေးလိုင်းကို LNG (အလုံ) ဓာတ်အားစက်ရုံက ထွက်ရှိသော လျှပ်စစ်ကို ဖြန့်ဝေရန် ဆောင်ရွက်ခြင်း ဖြစ်ပါသည်။ LNG (အလုံ) ဓာတ်အားစက်ရုံစီမံကိန်းအတွက် ပတ်ဝန်းကျင် နှင့် လူမှုထိခိုက်မှုဆန်းစစ်ခြင်း (ESIA) တစ်ရပ်ကို ပြင်ဆင်ပြုလုပ်ခဲ့ပြီး၊ ၎င်း ESIA အတွက် လေ့လာမှုနယ်မြေဧရိယာမှာ ဤကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း (IEE) အတွက် လေ့လာမှုနယ်မြေဧရိယာနှင့် အစိတ်အပိုင်းအားဖြင့် ထပ်တူကျပါသည်။ ESIA လေ့လာချက်အတွက် ကောက်ယူခဲ့သည့် မူလ နှင့် တစ်ဆင့်ခံ အချက်အလက်များကို ဤကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်းအတွက် အသေးစိတ်ကောက်ယူခဲ့သည့် တစ်ဆင့်ခံအချက်အလက်များကို အားဖြည့်ရန် ဤအစီရင်ခံစာတွင် ထည့်သွင်း ထားပါသည်။ ၎င်းမှာ ရူပ၊ ဇီဝ နှင့် လူမှုပတ်ဝန်းကျင်ဆိုင်ရာ အချက်အလက်များတွင် အကျုံးဝင်ပါသည်။ နယ်မြေ ဒေသတွင် တွေ့ရှိရသော ယခင်လေ့လာချက်များအပေါ် အခြေခံ၍ ERM ရုံးတွင်းရှိ အခြေခံအချက်အလက်များကို ဤအစီရင်ခံစာတွင် ထည့်သွင်းထားသည့် အခြေခံအချက်အလက်များအတွက်ဖြည့်စွက်ရန် သင့်လျော်သလို အသုံးပြု ထားပါသည်။

ပုံ (၁.၄) စီမံကိန်းလေ့လာမှုနယ်မြေရိယာ



၁.၅.၁ ရေပပတ်ဝန်းကျင်အခြေခံအချက်အလက်များ - အဓိကအရေးကြီးသောတွေ့ရှိချက်များ အနှစ်ချုပ်

ရေပပတ်ဝန်းကျင်ပါရာမီတာတစ်ခုချင်း၏ အဓိကအရေးကြီးသောတွေ့ရှိချက်များမှာ အောက်ပါတို့ဖြစ်ကြသည်။

၁.၅.၁.၁ အနီးပတ်ဝန်းကျင်လေထုအရည်အသွေး

အထက်ပါ LNG (အလုံ) ဓာတ်အားစက်ရုံ ESIA အတွက် ကောက်ယူခဲ့သည့် လေထုအရည်အသွေးအချက်အလက်များသည် အချို့နေရာများတွင် လေထုစောင့်ကြပ်ကြည့်ရှုစစ်ဆေးမှုသည် မိုးရာသီ နှင့် နွေရာသီနှစ်ခုလုံး၌ အနည်းဆုံး ပါရာမီတာ သုံးခု (PM2.5, PM10, နှင့် SO2) သည် မြန်မာနိုင်ငံ ထုတ် လွှတ်မှု အရည်အသွေးလမ်းညွှန် တန်ဖိုးများ (အမျိုးသား ထုတ်လွှတ်မှုအရည်အသွေး လမ်းညွှန်) ကို ကျော် လွန်ကြောင်း ဖော်ပြပါသည်။ ၎င်းမှာ အခြားဒေသတွင် ယခင်ဆောင်ရွက်ခဲ့သည့် လေထုအရည်အသွေး စောင့်ကြည့်မှု ရလဒ်များနှင့် ကိုက်ညီမှုရှိပါသည်။

၁.၅.၁.၂ ရာသီဥတု နှင့် မိုးလေဝသ

များသောအားဖြင့်၊ မြန်မာနိုင်ငံသည် ရာသီဥတုသုံးမျိုးဟု သတ်မှတ်ထားသော နွေ၊ မိုး နှင့် ဆောင်း ရာသီများရှိသည့် အပူပိုင်းမုတ်သုံရာသီဖြင့် ဖော်ပြသည့် အပူပိုင်းဒေသတွင် တည်ရှိပါသည်။ နွေရာသီလများသည် မတ်လ မှ မေလ လယ် အထိဖြစ်ပါသည်။ မိုးရာသီမှာ ပုံမှန်အားဖြင့် မေလလယ်မှ အောက်တိုဘာလကုန်ထိဖြစ်ပြီး၊ ဆောင်းရာသီမှာ နိုဝင်ဘာလမှ စတင်၍ ဖေဖော်ဝါရီလအထိ ဖြစ်ပါသည်။ ဤအချက်အလက်များမှာ လေ့လာမှုနယ်မြေဧရိယာအတွက် သင့်လျော်မှုရှိပါသည်။

၁.၅.၁.၃ ဆူညံသံ

အထက်ပါ LNG (အလုံ) ဓာတ်အားစက်ရုံ ESIA အတွက် ကောက်ယူခဲ့သည့် ဆူညံသံအဆင့်အချက်အလက်များသည် အောက်ပါ ဆူညံသံအခြေအနေများကို ဖော်ပြပါသည် -

- ဆူညံသံအခြေခံအချက်အလက်ရလဒ်များအရ၊ ဆူညံသံစောင့်ကြည့်သည့် စခန်း ဆယ်ခုအနက် ကိုးခုသည် အနည်းဆုံး အချိန်ကာလတစ်ခုတွင် မြန်မာနိုင်ငံစံနှုန်းကို ကျော်လွန်ခဲ့ပါသည်။
- ဆူညံသံမြင့်သည့်ဖြစ်နိုင်သောရင်းမြစ်များမှာ လက်ရှိ ရှိနေသော ဓာတ်အားစက်ရုံ၊ ယာဉ်အသွားမလာများ၊ လူများ၏လုပ်ငန်းများ နှင့် မိုး/ရာသီဥတု ဖြစ်ရပ်များပါဝင် ပါသည်။
- ESIA အတွက် အသုံးပြုသည့် ဆူညံသံ စောင့်ကြပ်စစ်ဆေးကြည့်ရှုမှုစခန်းများတည်နေရာ နှင့် IEE ၏ လေ့လာမှုနယ်မြေဧရိယာတို့အကြား ဆင်တူသော ပတ်ဝန်းကျင် နှင့် ထိစပ်မှုတို့ရှိသဖြင့် ဤရလဒ်များကို ဤလေ့လာချက်အတွက် သက်ဆိုင်သည်ဟု စဉ်းစားပါသည်။

၁.၅.၁.၄ မြေပေါ်ရေ

အထက်ပါ LNG (အလုံ) ဓာတ်အားစက်ရုံ ESIA အတွက် ကောက်ယူခဲ့သည့် မြေပေါ်ရေအရည်အသွေးအချက်အလက်များသည် အောက်ပါ မြေပေါ်ရေအရည်အသွေးကို ဖော်ပြပါသည် -

- နမူနာကောက်ယူသောနေရာများအားလုံး တွင် အစိုင်အခဲပါဝင်မှု (TDS) (4,052 – 12,760 mg/L) မှာ အမေရိကန်ပြည်ထောင်စု ပတ်ဝန်းကျင်ကာကွယ်ရေးအေဂျင်စီ (EPA) စံနှုန်း (250 mg/L) ကို ကျော်လွန်ပါသည်။ နမူနာကောက်ယူသည့် နေရာအားလုံးရှိ SW9 နှင့် SW10 လွဲ၍ မန်ဂနိပါဝင်မှု (0.22 – 1.40 mg/L) မှာ EPA စံနှုန်း (0.05 mg/L) ကို ကျော်လွန်ပါသည်။
- အခြားပါရာမီတာများအားလုံးမှာ မြန်မာနိုင်ငံ၊ IFC နှင့် EPA စံနှုန်းများအတွင်း ကျရောက်ကြောင်း တွေ့ရပါသည်။
- ESIA အတွက် အသုံးပြုသည့် မြေပေါ်ရေနမူနာစခန်းများတည်နေရာ နှင့် IEE ၏ လေ့လာမှု နယ်မြေဧရိယာတို့အကြား ဆင်တူသောပတ်ဝန်းကျင် နှင့် ထိစပ်မှုတို့ရှိသဖြင့် ဤရလဒ်များကို ဤလေ့လာချက် အတွက် သက်ဆိုင်သည်ဟု စဉ်းစားပါသည်။

၁.၅.၁.၅ မြေဆီလွှာ

အထက်ပါ LNG (အလုံ) ဓာတ်အားစက်ရုံ ESIA အတွက် ကောက်ယူခဲ့သည့် မြေဆီလွှာအရည်အသွေးအချက်အလက်များသည် အောက်ပါ မြေဆီလွှာအရည်အသွေးကို ဖော်ပြပါသည် -

- နမူနာနေရာတစ်ခု SO_2 သည် အပေါ်ပိုင်းမြေဆီလွှာရှိ ကြေးနီအတွက် ဦးတည်တန်ဖိုးထက် ကျော်လွန်ပြီး၊ နမူနာနေရာ SO_4 သည် အောက်ခံမြေဆီလွှာရှိ ကြေးနီအတွက် ဒက်ချ (Dutch) စံနှုန်း (37.44 နှင့် 38.29 mg/kg အကြား) ကို ကျော် လွန်ပါသည်။ နေရာ SO_2 ရှိ အောက်ခံမြေဆီလွှာ သည် ပြဒါးအတွက် ဦးတည်တန်ဖိုး (1.04 mg/kg) ကိုလည်း ကျော်လွန်ပါသည်။
- အခြားကျန်ရှိသော နမူနာနေရာများ နှင့် ပါရာမီတာများသည် Dutch စံနှုန်းအတွင်းကျရောက်ကြောင်း တွေ့ရပါသည်။

၁.၅.၁.၆ မြေအောက်ရေ

အထက်ပါ LNG (အလုံ) ဓာတ်အားစက်ရုံ ESIA အတွက် ကောက်ယူခဲ့သည့် မြေအောက်ရေအရည်အသွေးအချက်အလက်များသည် အောက်ပါ မြေအောက်ရေအရည်အသွေးကို ဖော်ပြပါသည် -

- လေ့လာမှုနယ်မြေဧရိယာအနီးရှိ ရေအောင်းလွှာ ထုတ်လွှတ်မှုမှာ “အားကောင်းသောရေစိမ့်ပေါက်” သို့မဟုတ် “အား နည်းသောရေပေါ်ကြား” အဖြစ် အမျိုးအစားသတ်မှတ်နိုင်ပြီး၊ မြေအောက်ရေအရည်အသွေးကို “မြေအောက်ရေချို” ဟု စဉ်းစားပါသည်။ မြေအောက်ရေအမျိုးအစားမှာ “စိမ့်ရေ” မှ “ပေါ်ကြားရေ” အထိ အပိုင်းအခြားရှိပါသည်။ မြေအောက် ရေအရင်းအမြစ်အမျိုးအစားများတွင် ၂၀၀၀၀၀ - ၅၀၀၀၀၀ m3/km2-yr အပိုင်းအခြားရှိ သဘာဝက ပြန်ဖြည့်သည့် “တောင်ကုန်းဧရိယာရှိ ပြတ်တောင်းရေအောင်းလွှာ” နှင့် “မြေညီ နှင့် တောင်ကြားချိုင့်ဝှမ်းတို့ရှိ ဆက်တိုက်ရှိသော ရေအောင်းလွှာ” တို့ ပါဝင်ကြပါသည်။
- သက်ဆိုင်ရာ စံနှုန်းများ/ လမ်းညွှန်များကို ကျော်သွားသည့် ပါရာမီတာတို့မှာ အစိုင်အခဲပါဝင်မှု (TDS)၊ နိုက်ထရိတ် (NO_3)၊ သံ (Fe)၊ မန်ဂနိ (Mn) နှင့် ကလိုရိုက် (Cl) တို့ဖြစ်ကြပါသည်။
- အခြားပါရာမီတာများအားလုံးသည် မြန်မာနိုင်ငံစံနှုန်းများ၊ EPA နှင့် WHO လမ်းညွှန်များအတွင်း ကျရောက် ကြောင်း တွေ့ရှိရပါသည်။

၁.၅.၂ ဇီဝအခြေခံအချက်အလက်များ - အဓိကအရေးကြီးသောတွေ့ရှိချက်များအနှစ်ချုပ်

ဇီဝအခြေခံကဏ္ဍတစ်ခုချင်း၏ အဓိကအရေးကြီးသောတွေ့ရှိချက်များကို အောက်တွင် တင်ပြထားပါသည် -

၁.၅.၂.၁ ဂေဟဒေသ (EcoRegion)

- စီမံကိန်းလေ့လာမှုနယ်မြေဧရိယာသည် မြန်မာနိုင်ငံ ကမ်းရိုးတန်းဒေသတော [IM1404] ဂေဟဒေအတွင်း ကျရောက်ပါသည်။ ဤဂေဟဒေသ၊ အထူးသဖြင့် ဧရာဝတီဒေသတောဒေသသည် သဘာဝ ဒေသတောအပင်များဖြင့် လွှမ်းခြုံနေခဲ့သော်လည်း၊ မကြာသေးမီကာလအထိ ဆိုးရွားစွာပျက်စီးသွားခဲ့သည်။ ဒေသတောသည် အငံဓာတ်ကိုခံနိုင်ရည်ရှိပြီး၊ မြစ်ဝကျွဲပင်လယ်ရေနုန်ရှိ ငံရိုရိုရေတွင် ရှင်သန်သည်။
- ဂေဟဒေသသည် လက်ရှိတွင် အထူးအရေးပါသော/ငြိမ်းခြောက်ခံနေရာသောအဆင့်အဖြစ်သတ်မှတ်ထားပါသည်။ သို့ရာတွင် ၎င်းမှာ ကြီးမားသောဧရိယာ (၂၁၂၃၉ စတုရန်းကီလိုမီတာ) ကို ခြုံငုံမှုဖြစ်ပြီး၊ ဧရိယာအတွင်းရှိ နေရင်းဒေအမျိုးအစားများ နှင့် အခြေအနေများရှိ အသေးစိတ်ခြားနားချက်များကို ကိုယ်စားမပြုနိုင်ပါ။ အဆိုပြု စီမံကိန်းသည် ၎င်းဂေဟဒေသ၏ ဝိသေသလက္ခဏာများကို မသတ်မှတ်နိုင်သော အရေးကြီးသည့် သဘာဝ နေရင်းဒေသများ ပါဝင်သည့် ဧရိယာများတွင် မတည်ရှိပါ။ ဧရိယာကို လူများ၏လုပ်ငန်းများကြောင့် သိသိသာသာအရည်အသွေး နိမ့်သည့် ဧရိယာဖြစ်သည်ဟု စဉ်းစားပါသည်။

၁.၅.၂.၂ အဓိကအရေးပါသော ဇီဝမျိုးစုံမျိုးကွဲ နယ်မြေဧရိယာများ (KBA)

- စီမံကိန်းလုပ်ငန်းနေရာမှ ကီလိုမီတာ ၃၀ အတွင်း အရေးပါသော ဇီဝမျိုးစုံမျိုးကွဲနယ်မြေဧရိယာ သုံး (၃) နေရာ တည်ရှိ ပါသည်။ ၎င်းနေရာများမှာ လှော်ကားဥယျာဉ်၊ မလက်တိုအင်း နှင့် ဘုရားကြီး KBA တို့ဖြစ်ကြပြီး၊ ၎င်းနေရာတို့၌ ထိန်း သိမ်းရေး နှင့် ပတ်သက်၍ အထူးအရေးပါသောပျောက်သုဉ်းလုဆဲ၊ ပျောက်သုဉ်းလုဆဲ နှင့် ထိခိုက်လွယ် မျိုးစိတ်များ ရှိကြ ပါသည်။ ၎င်းနေရာများသည် စီမံကိန်း၏ သက်ရောက်မှုရှိစေမည့်နယ်မြေဧရိယာမှ အလွန်ကွာဝေးသည့်နေရာတွင် ရှိပါသည်။

၁.၅.၂.၃ ထိန်းသိမ်းကာကွယ်ထားသည့် နယ်မြေဧရိယာများ (PA)

- လေ့လာမှုနယ်မြေဧရိယာ၏ ကီလိုမီတာ ၅၀ အတွင်းရှိသည့်၊ ထိန်းသိမ်းကာကွယ်ထားသည့် နယ်မြေဧရိယာ တစ် (၁) ခုဖြစ်သော လှော်ကားဥယျာဉ်သည် စီမံကိန်း၏ မြောက်ဘက် ၁၈ ကီလိုမီတာအကွာတည်ရှိပါသည်။

၁.၅.၂.၄ ထိန်းသိမ်းရေးဆိုင်ရာအရေးပါသည့် မျိုးစိတ်များ

စုပေါင်းဇီဝမျိုးစုံမျိုးကွဲဆန်းစစ်ခြင်းနည်းလမ်း (IBAT) မှ မျိုးစိတ်လိုင်းတည်နေရာအတွင်း တွေ့ရှိရသော ထိန်းသိမ်းရေး အတွက်အရေးပါသော မျိုးစိတ်များမှာ ငှက်မျိုးစိတ် ၁၉ မျိုး၊ ငါးမျိုးစိတ် ၁ မျိုး၊ နို့တိုက် သတ္တဝါ ၇ မျိုး၊ အပင်မျိုးစိတ် ၃ မျိုး နှင့် တွားသွားသတ္တဝါ ၃ မျိုးတို့ ပါဝင်ကြပါသည်။ ဤမျိုးစိတ်များကို IUCN အနီရောင်စာရင်း အရ ထိခိုက်လွယ် (VU)၊ ပျောက်သုဉ်းလုဆဲ (EN) သို့မဟုတ် အထူးအရေးပါသောပျောက်သုဉ်း လုဆဲ (CR) အဖြစ် သတ်မှတ်ထားပါသည်။

ဒေသရင်းအပင်များ

အထက်ပါ LNG (အလုံ) ဓာတ်အားစက်ရုံ ESIA အတွက် ကောက်ယူခဲ့သည့် ဇီဝမျိုးစုံမျိုးကွဲအချက်အလက်များသည် အောက်ပါ ဒေသရင်းအပင်အခြေအနေများကို ဖော်ပြပါသည် -

- စစ်တမ်းကာလအတွင်း ဒေသရင်းအပင်မျိုးစိတ် နှစ်ဆယ့်သုံး (၂၃) မျိုးကို ဖော်ထုတ်သတ်မှတ်ခဲ့ပါသည်။
- သတ်မှတ် ခဲ့သော အခြား ဒေသရင်းအပင်အများစုမှာ စိုးရိမ်ရမှုအနိမ့်ဆုံး (LC)၊ အချက်အလက်မပြည့်စုံမှု (DD) သို့မဟုတ် တွက်ချက်မှုထဲမပါဝင်မှု (NE) တို့အဖြစ် သတ်မှတ်ခဲ့ပါသည်။ အရေးပါသောနေရင်းဒေသဆန်းစစ်ခြင်း အစပျိုးမှု ဖြစ်စေသည့် ထိန်းသိမ်းရေးဆိုင်ရာ အရေးပါသော မျိုးစိတ်များကို မတွေ့ရှိခဲ့ရပါ။

ဒေသရင်း သက်ရှိသတ္တဝါများ

အထက်ပါ LNG (အလုံ) ဓာတ်အားစက်ရုံ ESIA အတွက် ကောက်ယူခဲ့သည့် ဇီဝအချက်အလက်များသည် အောက်ပါ ဒေသရင်းသက်ရှိသတ္တဝါများအားကို ဖော်ပြပါသည် -

- စစ်တမ်းကာလအတွင်း စုစုပေါင်း ငှက်မျိုးစိတ် ဆယ့်လေး (၁၄) မျိုးကို တွေ့ရှိခဲ့ရပါသည်။ မျိုးစိတ်များအားလုံးမှာ IUCN အနီရောင်စာရင်းတွင် စိုးရိမ်မှုအနိမ့်ဆုံးရှိသည့်အဆင့်အဖြစ် သတ်မှတ်ထားပါသည်။
- စစ်တမ်းကာလအတွင်း နို့တိုက်သတ္တဝါ မျိုးစိတ် တစ်မျိုးကို မှတ်တမ်းယူခဲ့ပါသည်။ ၎င်းမှာ လယ်ကြွက်မျိုး (Oligoryzomys nigripes) ဖြစ်ပါသည်။ မြွေပါ မျိုးစိတ် (Herpestes edwardsii) မှာ လုပ်ငန်းအနီးတွင်ရှိကြောင်း သိရှိရသော်လည်း၊ စစ်တမ်းကာလအတွင်း မှတ်တမ်းမတွေ့ရှိခဲ့ရပါ။ မျိုးစိတ်များမှာ ထိန်းသိမ်းရေးတွက် အရေးပါကြောင်း မသတ်မှတ်ပါ။ ထို့ကြောင့် အရေးပါ သော နေရင်းဒေသဆန်းစစ်ခြင်းကို အစပျိုးမည် ဖြစ်ပါသည်။
- စစ်တမ်းများကာလအတွင်း စုစုပေါင်း တွားသွားသတ္တဝါမျိုးစိတ် နှစ် (၂) မျိုးကိုတွေ့ရှိခဲ့ရပြီး၊ ကုန်းနေရေနေမျိုးစိတ်များကို မတွေ့ရှိခဲ့ရပါ။ မျိုးစိတ်များအားလုံးမျာ IUCN အနီရောင်စာရင်းအရ စိုးရိမ်မှုအနိမ့်ဆုံးရှိသည့်အဆင့် သို့မဟုတ် အကဲဖြတ်မတွက်ချက်သည့်အဆင့်အဖြစ် သတ်မှတ်ထားပါသည်။
- ERM ရုံးတွင်းရှိအချက်အလက်များမှ စီမံကိန်းလုပ်ငန်းခွင်နေရာအနီး ရေပြင်တို့တွင် ဇင်ယော်ငှက်မျိုး (*Chroicocephalus ridibundus*) ကို တွေ့ရှိခဲ့ကြောင်း သိရှိရပါသည်။ စီမံကိန်းလုပ်ငန်းနေရာအနီးရှိ ရေ နေရင်း ဒေသသည် မပြောပလောက်သော ဂေဟဆိုင်ရာတန်ဖိုးရှိသည်ဟု တွက်ချက်ပါသည်။

ထိုးဖောက်ဝင်ရောက်လာသော မျိုးစိတ်များ

- ထိုးဖောက်ဝင်ရောက် လာသော မျိုးစိတ်များသည် ဒေရင်းဒေသပြောင်းလဲမှု၊ ဂေဟစနစ်အရင်းအမြစ်များ နှင့် ညစ်ညမ်းမှုဆိုင်ရာ အလွန် အကျွံဆောင်ရွက်မှုတို့ကြောင့် ရာသီဥတုပြောင်းလဲမှုတို့ဖြစ်စေလျက် ပေါင်းစပ် ခြိမ်းခြောက်မှုများဖြင့် ဂေဟစနစ် အရည်အသွေးကျဆင်းမှုဌ သူတို့၏အခန်းကဏ္ဍကို ပိုမိုဆိုးရွားနိုင်စွမ်းရှိပြီး၊ ၎င်းမှ ဇီဝမျိုးစုံမျိုးကွဲ နှင့် လူမှုအနေအ ထားအပေါ် သူတို့၏ ခြိမ်းခြောက်မှုကို နောက်ထပ် တိုးမြင့်စေပါသည် (Emerton နှင့် Howard, 2008)။
- ကမ္ဘာလုံးဆိုင်ရာ ထိုးဖောက်ဝင်ရောက်လာသောမျိုးစိတ်အချက်အလက် (GISD) (2015) များအရ၊ မြန်မာနိုင်ငံတွင် မျိုးစိတ် ၉၇ မျိုးကို ထိုးဖောက်ဝင်ရောက်လာသော မျိုးစိတ်အဖြစ် ဖော်ထုတ်ထားပါသည်။

၁.၅.၂.၅ မြေအမျိုးအစားပုံဖော်ခြင်း

လေ့လာမှုနယ်မြေဧရိယာ နှင့် သက်ရောက်မှုရှိစေမည့်နယ်မြေဧရိယာတို့အတွင်း ဖော်ထုတ်ထားသော မြေအမျိုးအစား ကို ပုံဖော်ယူရန် ဂြိုဟ်တုဓာတ်ပုံများကို အသုံးပြုခဲ့ပါသည်။ ဖော်ထုတ်ခဲ့သည့် အဓိကမြေအမျိုးအစားများမှာ စိုက်ပျိုးမြေ၊ ဒီရေတော၊ ခြံထူမြေ နှင့် မြက်ခင်း၊ မြို့ပြ နှင့် လူနေသောမြေ၊ ရေသေ/ရေပြည့်နေရာများ နှင့် မြစ်ကမ်းပါးနေရာတို့ ပါဝင်ပါသည်။

၁.၅.၂.၆ သဘာဝ နေရင်းဒေသများ နှင့် ပြုပြင်ထားသော နေရင်းဒေသများ

IFC PS6 အရ၊ ထိခိုက်မှုဆန်းစစ်ခြင်းအဆင့်ကာလအတွင်း ဇီဝမျိုးစုံမျိုးကွဲတန်ဖိုးများအပေါ် အန္တရာယ်များ နှင့် လျော့ချ ရေးများကို ဖော်ထုတ်နိုင်ရန် သဘာဝနေရင်းဒေသ နှင့် ပြုပြင်ထားသော နေရင်းဒေတို့ ပျံ့နှံ့မှုဆိုင်ရာ ဆန်းစစ်ခြင်းကို ဆောင်ရွက်ရန်လိုအပ်ပါသည်။

လေ့လာမှုနယ်မြေဧရိယာ နှင့် သက်ရောက်မှုရှိစေမည့်နယ်မြေဧရိယာတို့အတွင်းရှိ သဘာဝ နေရင်းဒေသ နှင့် ပြုပြင် ထားသော နေရင်းဒေသတို့၏ စုစုပေါင်း နယ်မြေဧရိယာကို ***ဇယား ၁.၃*** တွင် ပြထားပါသည်။

ဇယား (၁.၃) - AoI အတွင်းရှိ သဘာဝနေရင်းဒေသ နှင့် ပြုပြင်ထားသော နေရင်းဒေသတို့၏ ဧရိယာများ

နေရင်းဒေသအမျိုးအစား	လေ့လာမှုနယ်မြေဧရိယာ (ဟက်တာ)	သက်ရောက်မှုရှိစေမည့် နယ်မြေဧရိယာ (ဟက်တာ)
သဘာဝနေရင်းဒေသ	၀	၄၉.၈၆
ပြုပြင်ထားသော နေရင်းဒေသ	၁.၇၀၅	၁၂၆၁.၆၉

ကိုးကား - ERM, 2019.

၁.၅.၃ လူမှုအခြေခံအချက်အလက်များ - အဓိကအရေးကြီးသောတွေ့ရှိချက်များ အနှစ်ချုပ်

လူမှုဆိုင်ရာ ကဏ္ဍများတစ်ခုချင်း၏ အဓိကအရေးကြီးသောတွေ့ရှိချက်များကို အောက်တွင် တင်ပြထားပါသည် -

၁.၅.၃.၁ လူဦးရေဆိုင်ရာ အခြေခံအချက်အလက်များ

- တိုင်းဒေသကြီးသည် ၁၀၁၇၁.၃၀ ကီလိုမီတာ[1] ခန့်ရှိပြီး၊ ခရိုင် (၄) ခု (မြောက်ရန်ကုန်၊ အရှေ့ရန်ကုန်၊ အနောက်ရန်ကုန် နှင့် တောင်ရန်ကုန်)၊ မြို့နယ် ၃၃ ခု၊ ရပ်ကွက် ၇၄၂ ခု နှင့် ကျေးရွာ ၂၁၇၀[2] အဖြစ် ခွဲထားပါသည်။ စုစုပေါင်းလူဦးရေမှာ ၇ သန်းရှိပြီး၊ အမျိုးသမီး ၅၂.၂% ရှိပါသည်။
- နိုင်ငံသားများ၏ အများစုအသက်ရွယ်မှာ ၁၅-၆၄ နှစ်ရှိသူများဖြစ်ပါသည်။
- လေ့လာမှုနယ်မြေဧရိယာရှိ လူဦးရေအများစုမှာ ဗမာလူမျိုးများဖြစ်ပြီး၊ ဗမာလူမျိုးများသည် မြန်မာနိုင်ငံတွင် လူများစု တိုင်းရင်းသားအုပ်စုဖြစ်ပါသည်။ လူဦးရေမှာ ၃၀၁၁၀၀၀ ကျော်ရှိပါသည်။ သို့ရာတွင်၊ လေ့လာမှုဧရိယာ အတွင်း ကရင်၊ မွန် နှင့် ရခိုင်အနည်းငယ် ရှိပါသည်။

၁.၅.၃.၂ အသက်မွေးဝမ်းကျောင်း နှင့် စီးပွားရေး

စိုက်ပျိုးရေးလယ်ကွင်းများတွင် ပဲတောင့်များ နှင့် ပဲများမှာ အဓိကကောက်ပဲသီးနှံထွက်ကုန်များဖြစ်ကြသည်။ အခြားစိုက်ပျိုးရေးလုပ်ငန်းများတွင် ဂုန်လျှော်၊ ရာဘာ၊ မြေပဲ နှင့် ကြံပင်များ ပါဝင်ကြပါသည်။ ရန်ကုန်မြစ်တစ်လျှောက်တွင် ဆန်စက်များ နှင့် သစ်စက်များကို တွေ့ရှိရပါသည်။

အသေးစားငါးဖမ်းလုပ်ငန်းများသည် စီမံကိန်းလုပ်ငန်းနေရာများအပါအဝင် ရန်ကုန်မြစ်အတွင်း ဆောင်ရွက်ကြပါသည်။ တံငါသည်များသည် ရိုးရာပိုက်ကွန်များအသုံးပြု၍ ငါးဖမ်းဆောင်ရွက်မှုမှ တစ်ရက်လျှင် ၂၀၀၀၀ ကျပ်ခန့် (အမေရိကန် ဒေါ်လာ ၁၇ ဒေါ်လာခန့်) ရရှိကြောင်း သိရှိရပါသည်။ မြန်မာနိုင်ငံ၌ ရန်ကုန်သည် စီမံကိန်းလုပ်ငန်းနေရာအနီးရှိ အလုံမြို့နယ်ရှိ စံပြတွင် ငါးစျေးတို့ဖြင့် ငါးအတင်အချပြုလုပ်လုပ်သည့် အဓိကနေရာဖြစ်ပါသည်။

ရန်ကုန်ရှိ အမျိုးသား (၄.၃%) နှင့် အမျိုးသမီး (၃.၉%) တို့အကြား အလုပ်လက်မဲ့နှုန်းမှာ တူညီမှုရှိသလောက်ဖြစ်ပြီး၊ လုပ်အားရှိ အမျိုးသားရာခိုင်နှုန်း (၈၁.၈%) သည် အမျိုးသမီးရာခိုင်နှုန်း (၄၆.၄%) ထက် သိသိသာသာ ပိုများပါသည်။ အကြောင်းမှာ ရန်ကုန်သည် မြန်မာနိုင်ငံတွင် နိုင်ငံခြားကုန်သွယ်မှုများစွာအတွက် ကိုင်တွယ်မှု နှင့် ကုန်သွယ်မှုအတွက် အဓိကဗဟိုဖြစ်သောကြောင့် ဖြစ်ပါသည်။

၁.၅.၃.၃ လူမှုအခြေခံအဆောက်အအုံများ

ရန်ကုန်တွင် ဆိပ်ကမ်း၊ သီလဝါရေနက်ဆိပ်ကမ်း၊ လေဆိပ်၊ လမ်းများ၊ တံတားများ၊ ကုန်းကျဉ်တံတားများ၊ အမြန် လမ်း၊ နှင့် ရန်ကုန်မြစ် နှင့် ဧရာဝတီမြစ်ကိုဆက်ထားသော တွဲတေးတူးမြောင်းတို့အပါအဝင် သယ်ယူပို့ဆောင်ရေးအ ခြေခံအဆောက်အအုံအမျိုးမျိုးရှိပါသည်။ အရေးကြီးသည်မှာ အမြန်လမ်းလိုင်းငါးခု၏ဂိတ်ဖြစ်သည်။ ရန်ကုန်တိုင်းဒေ သကြီးနှင့် မြန်မာနိုင်ငံရှိ အခြားဒေသတို့ကို ချိတ်ဆက်ထားသော လမ်းများစွာရှိပါသည်။ ထို့ပြင်၊ ရန်ကုန်သို့ကျေးလက် မှ လာရောက်နိုင်ကြသည်မှာ ၆၀% ရှိကြောင့် အစီရင်ခံစာအရသိရပါသည်။ အာဆီယံဖွံ့ဖြိုးရေးဘဏ်အရ၊ ကျေးလက်မှ လာရောက်နိုင်သည့်အညွှန်းကိန်း (RAI) သည် “ရာသီဥတုမရွေးအသုံးပြုနိုင်သောလမ်း၏ ၂ ကီလိုမီတာ အကွာအောက် နေထိုင်ကြသော ကျေးလက်လူဦးရေပမာဏဖြစ်ကြောင်းပြသည့် နိုင်ငံတကာအသုံးပြုသည့် အညွှန်း ကိန်း” ဖြစ်ပါ သည်။

၁.၅.၃.၄ ကျန်းမာရေး အခြေခံအဆောက်အအုံများ

၂၀၁၆ တွင်၊ ရန်ကုန်တိုင်းဒေသကြီး၌ ဆေးရုံ ၈၅ ရုံ၊ ခွင့်ပြုသည့်ကုတင် ၁၁၆၁၀ လုံး၊ ရှိသောကုတင် ၁၂၂၆၀ လုံး၊ ဝင်ခွင့်ပြုသူဦးရေ ၅၂၇၃၀၈ ဦး၊ ဆေးရုံမှဆင်းသူ နှင့် သေဆုံးသူ ၅၂၅၈၅၁ နှင့် လူနာရက်များ ၃၅၃၇၂၇၆၊ သေဆုံးမှုအရေအတွက် ၁၆၆၅၆ နှင့် ဆေးရုံတွင်းသေဆုံးမှုနှုန်း ၃.၂% နှင့် အပြင်လူနာ ၂၅၁၆၇၆၇ ဦးတို့ဖြစ်ကြပါသည်။ ခွင့်ပြုသည့်ကုတင်မှာ ဆေးရုံ၏ တရားဝင်ကုတင်ပမာဏဖြစ်ပါသည်။ ကျန်းမာရေးအဆောက်အအုံများ နှင့် ဆေးရုံများ

[1] ရန်ကုန်တိုင်းဒေသကြီး၊ ကလေးငယ်များကျန်းမာသန်စွမ်းမှုအကြောင်း။ ၂၀၁၈ အောက်တိုဘာ ၂၄ ရက်နေ့က ဝင်ကြည့်ခဲ့သည် - https://www.unicef.org/myanmar/Yangon_Region_Profile_30-07-15.pdf

[2] ၂၀၁၄ မြန်မာနိုင်ငံလူဦးရေ နှင့် အိမ်ထောင်စုသန်းခေါင်စာရင်း (ရန်ကုန်တိုင်းဒေသကြီး)။ ၂၀၁၈ အောက်တိုဘာ ၂၄ ရက်နေ့က ဝင်ကြည့်ခဲ့သည် - http://www.dop.gov.mm/sites/dop.gov.mm/files/publication_docs/yangon_region_census_report_-_english.pdf

နှင့်ပတ်သက်၍၊ ရန်ကုန်ရှိ ကလေးငယ် ၇၀ ရာခိုင်နှုန်းမှာ ကျန်းမာရေး အဆောက်အအုံများအတွင်း မွေးဖွားခဲ့ ကြခြင်း ဖြစ်ပါသည်။

၁.၅.၃.၅ ပညာရေး

ရန်ကုန်တိုင်းဒေသကြီးရှိ ၂၀၁၄ အချက်အလက်များအရ၊ အသက် ၁၅ နှစ် နှင့် အထက်ရှိ နိုင်ငံသားများ၏ စာတတ် မြောက်မှုနှုန်း မှာ ၉၆% ရှိပြီး၊ ၎င်းမှာ အမျိုးသား စာတတ်မြောက်မှုနှုန်း (၉၈%) နှင့် အမျိုးသမီး စာတတ်မြောက်မှုနှုန်း (၉၅%) တို့မှ တွက်ချက်ထားခြင်း ဖြစ်ပါသည်။ ကျောင်းအရေအတွက် စုစုပေါင်းမှာ ၂၇၁၇ ကျောင်းရှိပြီး၊ အထက်တန်း ၁၉၈ ကျောင်း၊ အလယ်တန်း ၂၂၅ ကျောင်း နှင့် မူလတန်း ၂၂၆၄ ကျောင်းတို့ ဖြစ်ကြပါသည်။ ၂၀၁၄ တွင် MIMU အချက်အလက်များအရ နိုင်ငံသားအများစုသည် မူလတန်းအဆင့်ကို ပြီးမြောက်ခဲ့သူများ ဖြစ်ကြသည်။

၁.၅.၃.၆ ယဉ်ကျေးမှုအမွေအနှစ်

ရန်ကုန်တိုင်းဒေသကြီးတွင် ယဉ်ကျေးမှုအရ အထင်ကရဧရိယာများရှိပါသည်။ အထူးသဖြင့် ဗုဒ္ဓဘာသာနေရာ အ ဆောက်အအုံများဖြစ်ကြပါသည်။ ဤဧရိယာများတွင် ဘုရားပုထိုးများ နှင့် ဘုန်းကြီးကျောင်းများကို တွေ့ရှိရပြီး၊ ၎င်းတို့မှာ ဒေသခံရပ်ရွာများအတွက် အရေးပါသောယဉ်ကျေးမှုနေရာများအဖြစ် စဉ်းစားပါသည်။ စီမံကိန်းလုပ်ငန်းခွင် နေရာ၏ ၅ ကီလိုမီတာအတွင်း ရွှေတိဂုံ သို့မဟုတ် ဆူးလေဘုရားတို့တို့ကဲ့သို့သော အရေးပါသော ယဉ်ကျေးမှုအမွေ အနှစ်နေရာအဆောက်အအုံအတော်အတန်ရှိပါသည်။ စီမံကိန်းလုပ်ငန်းခွင်နေရာများတွင် ယဉ်ကျေးမှုအမွေအနှစ် နေရာ များ မရှိပါ။

၁.၆ ထိခိုက်နိုင်မှုများ နှင့် ၎င်းနှင့်ဆက်နွယ်သော လျှော့ချရေး အစီအမံများ

တည်ဆောက်ရေး နှင့် လည်ပတ်ရေးအဆင့် နှစ်ရပ်လုံးအတွက် ထိခိုက်မှုဆန်းစစ်ခြင်း ရလဒ်များ နှင့် လျှော့ချရေး အစီအမံများ ၏ အနှစ်ချုပ်ကို ***ဇယား (၁.၄)*** တွင် တင်ပြထားပါသည်။

ဇယား (၁.၄) - သွယ်ယူရေးလိုင်းအတွက် ထိခိုက်နိုင်မှု နှင့် လျှော့ချရေးအစီအမံများ အနှစ်ချုပ်

စဉ်	ရင်းမြစ်/နေရာ	ဖြစ်ပေါ်လာနိုင်သော ထိခိုက်မှု	ဖြစ်ပေါ်လာနိုင်သော ထိခိုက်မှုများ၏ အရေးပါမှု	(သက်ဆိုင်ရာ) အဆိုပြုလျှော့ချရေး အစီအမံများ	ကြွင်းကျန် ထိခိုက်မှု၏ အရေးပါမှု
က	**လုပ်ငန်းခွင်ပြင်ဆင်ခြင်း နှင့် တည်ဆောက်ရေးအဆင့်**				
၁.၁	လေထုအရည်အသွေး	စီမံကိန်းလုပ်ငန်းများမှ ဖုန်မှုန့်ထုတ်လွှတ်မှုများသည် လေထုအရည်အသွေး၊ လူထုကျန်းမာရေး နှင့် ဂေဟစနစ်အပေါ် သက်ရောက်မှုရှိစေနိုင်သည်။	အတော်အတန်	■ ဖုန်များ နှင့် လေထုအရည်အသွေးတို့အား လုံးကို မှတ်တမ်းယူခြင်း၊ ဖော်ထုတ်ထားသော အကြောင်းအရင်း နှင့် ဤဇယားခွဲတင်ပြထားသည့် သင့်လျော်သော အစီအမံများကို ဖုန်မှုန့်ထွက်အချိန်မီ လျှော့ချရန် အကောင်အထည်ဖော် ဆောင်ရွက်ခြင်း။ ■ လေ နှင့် မျက်နှာပြင်ဖုန်မှုန့်ထွက်ရှိမှုကို ဖိသိပ်ရန် ရေလောင်းချမှုကို အသုံးပြုခြင်း၊ ■ ဖုန်မှုန့်ဖိသိပ်မှု နှင့် လျှော့ချမှုကို ထိရောက်စွာဆောင်ရွက်ရေးအတွက် လုပ်ငန်းခွင်တွင် လုံလောက်သော ရေကို ထားရှိခြင်း၊ ■ ဟာလာဟင်းလင်းဖြစ်နေသောနေရာများကို တတ်နိုင်သမျှ အမြန်ဆုံး ပြန်လည်၍ အပင်စိုက်ပျိုးခြင်း၊ ■ ပြန်လည်မစိုက်ပျိုးနိုင်သော နေရာများတွင် ဂုန်လျှော်၊ မြေငွေ့ထိန်းကောက်ရိုးများ သို့မဟုတ် တက်ကီဖိုင်းယား (tackifiers) များကို တတ်နိုင်သမျှ အသုံးပြုခြင်း၊ ■ တာဆည်ထားသောနေရာများတွင် သဲ နှင့် အခြားရောစာများကို သိုလှောင်သွားမည်ဖြစ်ပြီး၊ လိုအပ်ချက်မရှိလျှင် ၎င်းတို့ကို ခြောက်သွေ့သွားစေမည် မဟုတ်ပါ။ ‘အထွေထွေဆောက်လုပ်ရေး’ တွင် ဆွေးနွေးထားသည်များကဲ့သို့သော အခြားဖြစ်စဉ်အလိုက် ထိန်းချုပ်ရေးအစီအမံများကို အသုံးပြုသွားမည် ဖြစ်ပါသည်။ ■ ယာဉ်များအား လုံးသည် ရပ်နားနေသောအခါ စက်ကို သတ်ထားမည်။ ■ ပုံမှန် ယာဉ် နှင့် စက်ထိန်းသိမ်းမှု နှင့် ပြုပြင်မှုတို့ကို အကောင်အထည်ဖော်ဆောင်ရွက်သွားမည် ဖြစ်ပါသည်။ ■ သယ်ယူရေးကာလအတွင်း ဖိအားသုံးကိရိယာများမှ ယိုစိမ့်မှုကြောင့် ထုတ်လွှတ်မှုများ (fugitive emissions) ကို ရှောင်ကြဉ်ရန် ယာဉ်များအား လုံးကို လုပ်ငန်းခွင်သို့အဝင် နှင့် အထွက်တို့တွင် ပုံးထားစေခြင်း။ ■ လုပ်ငန်းခွင်မှ အပြင်ရောက်သွားသည့် ပစ္စည်းများကို ဖယ်ရှားရန် လုပ်ငန်းခွင်သို့သွားသည့် လမ်းနှင့် ဒေသခံသုံးလမ်းများကို ပုံမှန် စိုထိုင်းအောင် ဆွတ်ခြင်း/သန့်ရှင်းခြင်း။	သာမည
၁.၂	ဖန်လုံအိမ် ဓာတ်ငွေ့	တည်ဆောက်ရေးအတွက် လုပ်ငန်းခွင်သုံး ယာဉ်များ နှင့် စက်ကြီးများအသုံးပြုမှုသည် ဖန်လုံအိမ်ဓာတ်ငွေ့ ထုတ်လွှတ်မှုများကို ဖြစ်ပေါ်စေနိုင်သည်။	မပြောပလောက်	■ လေထုအရည်အသွေးအပေါ် ထိခိုက်မှုများကို လျှော့ချရန် တူညီသော လျှော့ချရေးအစီအမံများကို အကောင်အထည်ဖော်ဆောင်ရွက်ခြင်း (***စဉ် - ၁၁***)၊ ■ လောင်ကျွမ်းမှုစွမ်းရည်ပြည့်စေရန် စက်များ၊ နှင့် အင်ဂျင်များအတွက် ကြိုတင်ကာကွယ်သော ထိန်းသိမ်းပြုပြင်ရေးအစီအစဉ်ကို ရေးဆွဲအကောင်အထည်ဖော်ခြင်း၊ ■ ယာဉ် နှင့် စက် ထိန်းသိမ်းပြုပြင်မှုအစီအစဉ်ကို ရေးဆွဲခြင်း။	မပြောပလောက်
၁.၃	ဆူညံသံအဆင့်	လုပ်သားများ၊ ကိရိယာများ နှင့် ပစ္စည်းများကို သယ်ယူခြင်း နှင့် ဆောင်ရွက်ခြင်းတို့သည် ဇရိယာ၌ ဆူညံသံအဆင့်များ တိုးလာစေနိုင်သည်။	အတော်အတန်	■ ကန်ထရိုက်တာ၏ ပုံမှန်အလုပ်လုပ်ချိန်များမှာ 07:00 နှင့် 22:00 နာရီ၊ တနင်္လာမှ စနေ (အားလပ်ရက်များမှအပ) တိုအကြားဖြစ်သင့်ပါသည်။ အကယ်၍ ဤအချိန်များအပြင်ဘက်တွင် အလုပ်ဆောင်ရွက်ရန် လိုအပ်ပါက၊ အနီး NSRs တွင် ဆူညံသံသတ်မှတ်ချက်များကျော်လွန်မှုကို မဖြစ်ပေါ်စေရန် လုပ်ငန်းများကို ကန့်သတ်သင့်ပြီး၊ မနက်အစောပိုင်း နှင့် ညနေမိုးချုပ်ချိန် တည်ဆောက်ရေးတို့ကို ရှောင်ကြဉ်သင့်ပါသည်။ ■ ကောင်းမွန်စွာထိန်းသိမ်းထားသည့် ကိရိယာများဖြင့်သာ လုပ်ငန်းခွင်တွင် လည်ပတ်ဆောင်ရွက်သင့်ပါသည်။ ■ ချောဆီနှင့်ရွေ့လျားရသော အစိတ်အပိုင်းများ၊ လျှော့ကျနေမှုကို တင်းအောင်လုပ်ရသည့် အစိတ်အပိုင်းများ နှင့် အဟောင်းများကို အစားထိုးသည့် အစိတ်အပိုင်းများကဲ့သို့သော ကိရိယာများကို ပုံမှန်ထိန်းသိမ်းပြုပြင်မှု ဆောင်ရွက်သင့်ပါသည်။ ■ ကြိုးကြားကြိုးကြားအသုံးပြုသည့် စက်များ နှင့် တည်ဆောက်ရေးယာဉ်များ (ဥပမာ - ထရပ်ကားများ) ကို အလုပ်ချိန်စပ်ကြားများတွင် စက်သတ်ထားသို့မဟုတ် စက်ထိန်းချုပ်ထား သင့်ပါသည်။ ■ ဆက်တိုက် လည်ပတ်အသုံးပြုနေသော ကိရိယာအရေအတွက်ကို တတ်နိုင်သမျှလျှော့ချခြင်း။ ■ ဦးတည်ရာတစ်ဘက်သို့ ဆူညံသံများပြင်းထန်စွာထွက်ရှိသည့် ကိရိယာကို လူများနေထိုင်ရာဘက်မှ တတ်နိုင်သမျှဝေးသည့်ဘက်သို့ ဦးတည်စေခြင်း။ ■ လုပ်ငန်းများ (တိုင်ရိုက်ခြင်း နှင့် ပေါက်ကွဲစေသောလုပ်ငန်းများကဲ့သို့သော) မှ ဆူညံသံသက်ရောက်မှုများကို သင့်လျော်သလို ထိန်းချုပ်ရေးအစီအမံများ (ဥပမာ - ယာယီ ဆူညံသံအတားအဆီးများ နှင့် အကာအကွယ်များ ထားခြင်း) ကို အကောင်အထည်ဖော်လျက် အကာအတားများဖြင့် စနစ်တကျ လျှော့ချသင့်ပါသည်။ ■ ဆူညံသည့်စက်များ (မြေတူးစက်များ၊ ဘက်ဟိုးစက်များ၊ ရိုလာများ၊ ရေဖိအားသုံးတူများ နှင့် ကွန်ကရစ်ဖျော်စက် လော်ရီများကဲ့သို့သော) ကို လူနေရာများမှ တတ်နိုင်သမျှဝေးသည့် နေရာတွင် နေရာချခြင်း။ ■ ရှိနေသော ရပ်ရွာနေရာများကို ဖြတ်လျက် လုပ်ငန်းခွင်အတွင်း အပြင် ပစ္စည်းများ သယ်ယူပို့ဆောင်မှုကို ရှောင်ကြဉ်ခြင်း။	သာမည
၁.၄	မြေပေါ်ရေ	တည်ဆောက်ရေးအသုံးပြုခြင်းသည် မြေပေါ်ရေ နှင့် အရည်အသွေး အပေါ် ထိခိုက်စေနိုင်သည်။	အတော်အတန်	■ ဖြစ်ပေါ်လာနိုင်သော မြေတိုက်စားမှုကို လျှော့ချရန် ဟင်းလင်းဖြစ်နေသော မြေမျက်နှာပြင်များကို အခင်းကျောက်ပြားဖြင့် သို့မဟုတ် ဖို့သည့်ပစ္စည်းဝတ္ထုများဖြင့် အလျှင်အမြန်ဆုံး ကာကွယ်ဆောင်ရွက်သင့်ပါသည်။ ■ မိုးရွာသွန်းစဉ်၌ လုပ်ငန်းခွင်ရှိ တည်ဆောက်ရေးပစ္စည်းများ သို့မဟုတ် တည်ဆောက်ရေး စွန့်ပစ်ပစ္စည်းများကို ဟင်းလင်းဖွင့်စုပုံထားမှုကို တာပေါ်လင်စသို့မဟုတ် အလားတူဖျင်ဖုံးအုပ်ထားသင့်ပါသည်။ ■ ဘီးများသန့်ရှင်းရေးနေရာအဆောက်အအုံများအပါအဝင် လုပ်ငန်းခွင်တွင် လိုအပ်သလို နုန်းစီးကျမှုကို လျှော့ချရေးအတွက် နည်းလမ်းများကို အသုံးပြုခြင်း၊	မပြောပလောက်

စဉ်	ရင်းမြစ်/နေရာ	ဖြစ်ပေါ်လာနိုင်သော ထိခိုက်မှု	ဖြစ်ပေါ်လာနိုင်သော ထိခိုက်မှုများ၏ အရေးပါမှု	(သက်ဆိုင်ရာ) အဆိုပြုလျှော့ချရေး အစီအမံများ	ကြွင်းကျန် ထိခိုက်မှု၏ အရေးပါမှု
				■ ရေဆိုးများစီးဆင်းမှုကို ထိန်းချုပ်ရန်အတွက် ရေနုတ်မြောင်းစနစ်ကို ဒီဇိုင်းရေးခြင်း၊ ■ ကြမ်းနေသောအောက်ခံကျောက် သို့မဟုတ် အလားတူအရာတို့ဖြင့် လုပ်ငန်းခွင်တွင် ယာယီ ယာဉ်အသွားအလာနေရာများကို ကာကွယ်ထာခြင်း၊ ■ ပုံမှန်အားဖြင့်၊ မိုးရွာသွန်းပြီးနောက်၊ ရေနုတ်မြောင်းစနစ်များ နှင့် တိုက်စားမှုထိန်းချုပ်မ၍ နှင့် နုန်းဖယ်ရှားသည့် နေရာအဆောက်အအုံများကို စစ်ဆေးထိန်းသိမ်းပြုပြင်မှုဖြင့် စနစ်ကျပြီးစွမ်းရည်ပြည့်ဝသော လည်ပတ်မှုတို့ကို အချိန်တိုင်း ဖြစ်စေခြင်း၊ ■ လုပ်ငန်းခွင်ရေနုတ်မြောင်း တူဖော်ထားသောနေရာသို့ ဝင်လမ်းကို လျှော့ချရန် အစီအမံများ ထောက်ပံ့ပေးခြင်း၊ မိုးရာတွင်၌ မြောင်းများတူးဖော်ရမည်ဆိုပါက၊ အပိုင်းအတိုများဖြင့် တူးလျက် ပြန်ဖြည့်ခြင်းတို့ကို တတ်နိုင်သမျှဆောင်ရွက်ရမည်။ နုန်းဖယ်ရှားသည့် နေရာအဆောက်အအုံများမှတစ်ဆင့် မြောင်းများသို့မဟုတ် အုတ်မြစ်များတူးဖော်ထားသောနေရာများမှ ရေဆိုးနုတ်မြောင်းများသို့ စုပ်ထုတ်ထားသည့်ရေများကို စွန့်ထုတ်ခြင်း၊ ■ သင်လျော်ပြီးဆောင်ရွက်နိုင်သည့်နေရာများတွင် ဟင်းလင်းပွင့်နေရာများကို ထိန်းသိမ်းပေးခြင်း၊ ■ သင်လျော်ပြီးဆောင်ရွက်နိုင်သည့်နေရာများတွင် ချက်ချင်းပြန်၍ အပင်စိုက်ပျိုးခြင်း၊ ■ တည်ဆောက်ရေးပစ္စည်းများ၊ မြေဆီလွှာ၊ နုန်း သို့မဟုတ် အစအနများသည် တည်ဆောက်ရေးပစ္စည်းများ၏ ဟင်းလင်းပွင့် ပုံထားမှုနှင့်ပတ်သက်သော တူးမြောင်းစနစ်သို့ မျောပါမှုမှ ကာကွယ်ရန် အစီအမံများကို ဆောင်ရွက်ပေးခြင်း။ ■ လုပ်ငန်းခွင်တွင် ထွက်ရှိသော အစအနများ နှင့် အမှိုက်များကို ရေရှိနေရာများသို့ ဝင်ရောက်မှုကို ရှောင်ကြဉ်ရန် စနစ်တကျ ကောက်ယူ၊ ကိုင်တွယ်၍ စွန့်ထုတ်သင့်ပါသည်။ ဘိလပ်မြေ နှင့် အခြားတည်ဆောက်ရေး ပစ္စည်းပုံများကို အသုံးမပြုသောအခါ ဖုံးအုပ်ထားသင့်ပါသည်။ ■ ဆီများ၊ လောင်စာများ နှင့် ဓာတုပစ္စည်းများကို ညစ်ညမ်းမှုကိုကာကွယ်သည့်နေရာအဆောက်အအုံများရှိသည့် ဒီဇိုင်းလုပ်ထားသောနေရာများတွင်သာ အသုံးပြုသိုလှောင်သင့်ပါသည်။ မိုးရွာသွန်းပြီးနောက် ဆည်ထားသောနေရာမှာ မိုးရေများကို ထုတ်နုတ်သင့်ပါသည်။ ■ ဆီဖြင့်ညစ်ညမ်းနေသောရေကို ဒေသခံလိုင်စင်ရ စွန့်ပစ်ပစ္စည်း တစ်ဆင့်ခံကန်ထရိုက်တာများ (အဆင်ပြေလျှင်၊ နောက်ပိုင်းအဆင့်တွင် ဆုံးဖြတ်သွားမည်) က ကောက်ယူကိုင်တွယ်သွားမည် ဖြစ်ပါသည်။ ■ လုပ်ငန်းခွင်၌ ဆီ-ရေခွဲသည့် ကိရိယာများ နှင့် ထိန်းသိမ်းသည့်နေရာအဆောက်အအုံများကို မမျှော်လင့်သည့် ဆီပါသောရေထုတ်လွှတ်မှုများကို ကူညီဆောင်ကြဉ်းပေးရန် တပ်ဆင်သင့်ပါသည်။ ■ ရေဆိုးစနစ်သို့မစွန့်ထုတ်မီ ဆည်ထားသောနေရာများမှ မျက်နှာပြင်စီးဆင်မှုများသည် ဆီ/ရေ ခွဲသည့်ကိရိယာများကို ဖြတ်သွားသင့်ပါသည်။ အောက်ပါ အစီအမံများမှာ လုပ်သားများထံမှ လုပ်ငန်းခွင်၌ထွက်ရှိသည့် မိလ္လာရေနုတ်မြောင်းကို စီမံခန့်ခွဲရန် အထူးဒီဇိုင်းလုပ်ထားပါသည် - ■ အများပြည်သူသုံး မိလ္လာသန့်စင်ရေးစနစ်မရှိလျှင်၊ မိလ္လာအညစ်အကြေးများကို အိမ်တွင်းသုံး စွန့်ပစ်ပစ္စည်းယူနစ်ဖြင့် သန့်စင်သွားမည် ဖြစ်ပါသည်။ EPC ကန်ထရိုက်တာသည် တည်ဆောက်ရေးကာလတွင် အိမ်သုံးရေဆိုး နှင့် စွန့်ပစ်ရေ နှင့် မိလ္လာရေဆိုးများကို သန့်စင်ရန် ဒီဇိုင်းလုပ်တပ်ဆင်ထားသည့် အိမ်သုံးစွန့်ပစ်ပစ္စည်းယူနစ်ကို ဆောင်ရွက်ပေးသွားမည် ဖြစ်ပါသည်။ စွန့်ပစ်ရေများအားလုံးကို မြန်မာနိုင်ငံ၏ ထုတ်လွှတ်မှုများအတွက် NEQ လမ်းညွှန်များနှင့်အညီ ပတ်ဝန်းကျင်သို့ စွန့်ထုတ်မည် ဖြစ်ပါသည်။ ■ လုပ်ငန်းခွင်မှ အခြားဓာတုစွန့်ပစ်ပစ္စည်း သို့မဟုတ် ဆီဖြင့်ညစ်ညမ်းနေသောရေတို့ကို စုဆောင်းပြီး ဖော်ထုတ်သတ်မှတ်မည့် သင့်လျော်သော သင့်စင်မှု၊ ဒေသခံသန့်စင်ရေးနေရာအဆောက်အအုံများသို့ ပို့ဆောင်သွားမည် ဖြစ်ပါသည်။ ■ ယာယီ မိလ္လာရေဆိုးသန့်စင်မှု နေရာအဆောက်အအုံများကို ထောက်ပံ့ပေးခြင်း၊ ■ အိမ်သာများ၊ မီးဖိုချောင်များ နှင့် အလားတူနေရာများက ရေဆိုးများကို မိလ္လာရေဆိုးပိုက်နေရာများသို့ စွန့်ထုတ်သင့်ပါသည်။ လက်ဆေးခွက်များ၊ ပန်းကန်ဆေးကန်များ နှင့် ကြမ်းပြင်စီးဆင်မှုများအပါအဝင် မီးဖိုချောင်များမှ စုဆောင်းသည့် စွန့်ပစ်ရေများကို ဆီများစစ်ထုတ်သည့်ကိရိယာများမှတစ်ဆင့် မိလ္လာရေဆိုးပိုက်နေရာများသို့ စွန့်ထုတ်သင့်ပါသည်။ မစွန့်ထုတ်မီ မိလ္လာရေဆိုးပိုက်နေရာများသည် ယာယီရေဆိုးသန့်စင်သည့်စက်ရုံသို့ ဦးတည်သင့်ပါသည်။	
၁.၅	မြေဆီလွှာ	လုပ်ငန်းခွင်ရှင်းလင်းမှုကာအတွင်း စနစ်မကျသော စီမံခန့်ခွဲမှု နှင့် တူးဖော်မှုလုပ်ငန်းများသည် မြေဆီလွှာဆုံးရှုံးမှုကို ဖြစ်ပေါ်စေနိုင်သည်။	အတော်အတန်	■ ဖြစ်ပေါ်လာနိုင်သော မြေတိုက်စားမှုကို လျှော့ချရန် ဟင်လင်းဖြစ်နေသော မြေမျက်နှာပြင်များကို အခင်းကျောက်ပြားဖြင့် သို့မဟုတ် ဖို့သည့်ပစ္စည်းဝတ္ထုများဖြင့် အလျှင်အမြန်ဆုံး ကာကွယ်ဆောင်ရွက်သင့်ပါသည်။ ■ မိုးရွာသွန်းစဉ်၌ လုပ်ငန်းခွင်ရှိ တည်ဆောက်ရေးပစ္စည်းများ သို့မဟုတ် တည်ဆောက်ရေး စွန့်ပစ်ပစ္စည်းများကို ဟင်းလင်းဖွင့်စုပုံထားမှုကို တာပေါ်လင်စ သို့မဟုတ် အလားတူဖျင်ဖုံးအုပ်ထားသင့်ပါသည်။	သာမည
၁.၅	မြေအောက်ရေ	မြေဆီလွှာပေါ် ထိခိုက်မှုသည် မြေအောက်ရေအပေါ် ထိခိုက်စေနိုင်သည်။	အတော်အတန်	■ ရှင်းလင်းမည့်ဧရိယာများကို ကန့်သတ်ရန် လုပ်ငန်းခွင်နယ်နိမိတ်များကို အသေးစိတ်လုပ်ခြင်း၊ ■ (ဖြစ်နိုင်ပါက) မိုးသဲကြီးမဲကြီးရွာသွန်းမှု၊ အလန်အကျွံခြောက်သွေ့မှု နှင့် ပြင်းထန်စွာ လေတိုက်ခတ်မှုတို့ကို ရှောင်ကြဉ်ရန် ရှင်းလင်းရေးလုပ်ငန်းများကို အချိန်ဇယားရေးဆွဲခြင်း၊ ■ ဘီးများသန့်ရှင်းရေးနေရာအဆောက်အအုံများအပါအဝင် လုပ်ငန်းခွင်တွင် လိုအပ်သလို နုန်းစီးကျမှုကို လျှော့ချရေးအတွက် နည်းလမ်းများကို အသုံးပြုခြင်း၊ ■ ရေဆိုးများစီးဆင်းမှုကို ထိန်းချုပ်ရန်အတွက် ရေနုတ်မြောင်းစနစ်ကို ဒီဇိုင်းရေးခြင်း၊ ■ ကြမ်းနေသောအောက်ခံကျောက် သို့မဟုတ် အလားတူအရာတို့ဖြင့် လုပ်ငန်းခွင်တွင် ယာယီ ယာဉ်အသွားအလာနေရာများကို ကာကွယ်ထာခြင်း၊	သာမည

စဉ်	ရင်းမြစ်/နေရာ	ဖြစ်ပေါ်လာနိုင်သော ထိခိုက်မှု	ဖြစ်ပေါ်လာနိုင်သော ထိခိုက်မှုများ၏ အရေးပါမှု	(သက်ဆိုင်ရာ) အဆိုပြုလျှော့ချရေး အစီအမံများ	ကြွင်းကျန် ထိခိုက်မှု၏ အရေးပါမှု
				■ ပုံမှန်အားဖြင့်၊ မိုးရွာသွန်းပြီးနောက်၊ ရေနုတ်မြောင်းစနစ်များ နှင့် တိုက်စားမှုထိန်းချုပ်မှု နှင့် နုန်းဖယ်ရှားသည့် နေရာအဆောက်အအုံများကို စစ်ဆေးထိန်းသိမ်းပြုပြင်မှုဖြင့် စနစ်ကျပြီးစွမ်းရည်ပြည့်ဝသော လည်ပတ်မှုတို့ကို အချိန်တိုင်း ဖြစ်စေခြင်း၊ ■ လုပ်ငန်းခွင်ရေနုတ်မြောင်း တူဖော်ထားသောနေရာသို့ ဝင်လမ်းကို လျှော့ချရန် အစီအမံများ ထောက်ပံ့ပေးခြင်း၊ မိုးရာတွင်၌ မြောင်းများတူးဖော်ရမည်ဆိုပါက၊ အပိုင်းအတိုများဖြင့် တူးလျက် ပြန်ဖြည့်ခြင်းတို့ကို တတ်နိုင်သမျှဆောင်ရွက်ရမည်။ နုန်းဖယ်ရှားသည့် နေရာအဆောက်အအုံများမှတစ်ဆင့် မြောင်းများ သို့မဟုတ် အုတ်မြစ်များတူးဖော်ထားသောနေရာများမှ ရေဆိုးနုတ်မြောင်းများသို့ စုပ်ထုတ်ထားသည့်ရေများကို စွန့်ထုတ်ခြင်း၊ ■ သင်လျော်ပြီးဆောင်ရွက်နိုင်သည့်နေရာများတွင် ဟင်းလင်းပွင့်နေရာများကို ထိန်းသိမ်းပေးခြင်း (ဥပမာ - မြေငွေ့ထိန်းအုပ်ပေးခြင်း)၊ ■ သင်လျော်ပြီးဆောင်ရွက်နိုင်သည့်နေရာများတွင် ချက်ချင်းပြန်၍ အပင်စိုက်ပျိုးခြင်း၊ ■ မြေဆီလွှာကိုင်တွယ်မှုဆိုင်ရာ ပမာဏာကို လျှော့ချခြင်း၊ ■ ထူးဖော်ထားသည့် ပစ္စည်း သို့မဟုတ် ဖို့ထားမှုနှင့်ပတ်သက်သော စုပုံမှုများအပေါ် ရေဖြန်းပက်ခြင်း၊ ■ ဟင်းလင်းပွင့်နေသော မြေဆီလွှာများအနှောင့်အယှက်ဖြစ်မှုကို လျှော့ချရန် ယာဉ်ကြီးများရွှေ့လျားမှု နှင့် အောက်ခံမြေအလွှာများကျစ်လစ်မှုတို့အတွက် လမ်းကြောင်းများကို ဘောင်ခတ်ခြင်း၊ ■ ပြန်လည်ထိန်းသိမ်းရေးလုပ်ငန်းများအတွင်း အပေါ်မြေဆီလွှာများကို တတ်နိုင်သမျှ ပြန်လည်အသုံးပြုခြင်း၊ ■ စိုစွပ်နေချိန်မဟုတ်သည့် ခြောက်သွေ့နေချိန်တွင် မြေဆီလွှာများကို ခွာခြင်း နှင့် နေရာချထားခြင်း၊ ■ လွှဲပြောင်းရေး တူးမြောင်းများ၊ နုန်းအကာအရံများ၊ နှင့် နုန်းထိန်းသည့် ဘေဇင်များမှတစ်ဆင့် တိုက်စားမှုကို ထိန်းသိမ်းခြင်း၊ ■ ပြန်လည်ပြုပြင်သည့် လုပ်ငန်းများတွင် နောင်တွင်အသုံးပြုရန်အတွက် သိုလှောင်ထားသည့် အပေါ်မြေဆီလွှာနေရာတွင် အောက်ပါအခြေခံမူများကို ကျင့်သုံးမည် ဖြစ်ပါသည် - - စုပုံထားမှုများကို အပေါ်မြေဆီလွှာ နှင့် အောက်ခံမြေဆီလွှာတို့အဖြစ် သီးခြားခွဲထား၍ မြေပေါ်ရေရင်းမြစ် သို့မဟုတ် မြေအောက်ရင်းမြစ်ရေတွင်းတို့မှ အနည်းဆုံး ၅၀ မီတာအကွာတွင် တည်ရှိရပါမည်၊ - လေတိုက်စားမှုအတွက် ဖြစ်နိုင်ခြေကို လျှော့ချရန် စုပုံထားမှုများကို သဘာဝလေအရံအတားများပတ်ပတ်လည်ရှိနေသော နေရာများတွင် တတ်နိုင်သလောက် ထားသင့်ပါသည်၊ - စုပုံထားရန် သိုလှောင်ရေးဧရိယာများကို အပေါ်မြေဆီလွှာကို ကြိုတင်ဖယ်ရှား၍ ပြင်ဆင်သင့်ပါသည်၊ - လေတိုက်စားမှုကို လျှော့ချရန် အပေါ်မြေဆီလွှာအမြင့်ကို ကြမ်းပြင်ထက် အမြင့် ၂ မီတာတွင် ကန့်သတ်ရမည် ဖြစ်ပြီး၊ ၎င်းတို့သည် လေသလပ်ပေးမှုကို မြှင့်ရန်၊ မြေဆီလွှာထောင်လိုက်ဖွဲ့စည်းမှုကို ထိန်းသိမ်းရန်၊ စီးကျမှုကို လျှော့ချရန် နှင့် စိုဝင်မှုကို အားပေးရန် အပေါ်လွှာအပေါ် တစ်စိတ်တစ်ဒေသကိုသာ ကျစ်လစ်အောင်ထားရမည်။ အောက်ပါ လျှော့ချရေးအစီအမံများကို မစီစဉ်ထားသည့် ဖြစ်ရပ်များအတွက် အထူးစီစဉ်ထားဒီဇိုင်းလုပ်ထားပြီး၊ မစီစဉ်ထားသည့် အခြေအနေများအရ လိုက်လျောညီထွေဆောင်ရွက်သင့်ပါသည် - ■ ပြာမှုန်စွန့်ထုတ်သည့်ကန်ငယ်တည်ဆောက်ရေးကာလအတွင်း လုံလောက်သော အရည်အသွေးထိန်းချုပ်မှု နှင့် အရည်အသွေးသေချာစေခြင်းစစ်ဆေးမှုများ ဆောင်ရွက်စေခြင်း၊ ■ မတော်တဆယိုစိမ့်ဖိတ်မှုများ နှင့် ယိုစိမ့်မှုများကို ထည့်ရန် ယိုဖိတ်မှု သို့မဟုတ် အစက်ကျမှုအတွက် သုံးသည့်ဗန်းများကို အသုံးပြုခြင်း၊ ■ ယိုဖိတ်မှုများ နှင့် ယိုစိမ့်မှုများကို ထည့်ရန် နှင့် သန့်ရှင်းရန် ယိုဖိတ်မှုသုံးကိရိယာများကို အသုံးပြုခြင်း၊ ■ အပြည်ပြည်ဆိုင်ရာ ဆည်လုပ်ထားခြင်း နှင့် သိုလှောင်ခြင်း ဆိုင်ရာ သတ်မှတ်ချက်များနှင့်အညီ၊ ဆည်ထားသည့်စိမ့်မဝင်နိုင်သောဧရိယာများတွင် ဓာတုပစ္စည်း များ၊ လောင်စာများ နှင့် ဆီများကို သိုလှောင်ခြင်း၊ ■ အိမ်တွင်းသုံး စွန့်ပစ်ရေနှင့်ပတ်သက်၍ သင့်လျော်သလို စီမံခန့်ခွဲမှု၊ ■ စွန့်ပစ်ပစ္စည်းများကို သင့်လျော်သလို စီမံခန့်ခွဲမှု၊ သိုလှောင်မှု နှင့် စွန့်ထုတ်မှု၊	

စဉ်	ရင်းမြစ်/နေရာ	ဖြစ်ပေါ်လာနိုင်သော ထိခိုက်မှု	ဖြစ်ပေါ်လာနိုင်သော ထိခိုက်မှုများ၏ အရေးပါမှု	(သက်ဆိုင်ရာ) အဆိုပြုလျှော့ချရေး အစီအမံများ	ကြွင်းကျန် ထိခိုက်မှု၏ အရေးပါမှု
				■ ဝန်ထမ်းများကို အရေးပေါ်လုပ်ထုံးလုပ်နည်းများ နှင့် အလေ့အကျင့်များတို့ဖြင့် ရင်းနှီးမှုရှိစေရန် လေ့ကျင့်သင်ကြားမှုအစီအစဉ်ကို အကောင်အထည်ဖော်ဆောင်ရွက်ခြင်း။	
၁.၆	စွန့်ပစ်ပစ္စည်း	စနစ်မကျသော စွန့်ပစ်ပစ္စည်းသိုလှောင်မှုသည် ရှု၊ ဇီဝ နှင့် လူမှုအခြေခံအနေအထားများအပေါ် ထိခိုက်စေနိုင်သည်။	သာမည	■ မြေဆီလွှာ၊ မြေအောက်ရေ နှင့် မြေပေါ်ရေတို့အပေါ် ထိခိုက်မှုများကို လျှော့ချရန် တူညီသော လျှော့ချရေးအစီအမံများကို အကောင်အထည်ဖော် ဆောင်ရွက်ခြင်း (စဉ် ၁.၄ နှင့် စဉ် ၁.၅)၊ ■ စွန့်ပစ်ရေများ ယိုစိမ့်မှု နှင့် အနီးပတ်ဝန်းကျင်နေရာများသို့အန္တရာယ်ရောက်ရှိမှုတို့ကို ရှောင်ကြဉ်ရန် စွန့်ပစ်ရေသိုလှောင်မှုယူနစ်၏ အရည်အသွေးကောင်းစေခြင်း၊ ■ ဖြစ်ပေါ်လာနိုင်သော ပတ်ဝန်းကျင်၊ ကျန်းမာရေး နှင့် ဘေးကင်းရေး အန္တရာယ်များ နှင့် ထိခိုက်မှုများနှင့် ပတ်သက်၍ နားလည်သဘောပေါက်မှုအပေါ် အခြေခံ၍ လုပ်ငန်းအစဉ် စွန့်ပစ်ပစ္စည်းစီမံခန့်ခွဲမှု ဦးစားပေးမှုများ နှင့် ဝါစဉ်များကို တည်ဆောက်ခြင်း၊ ■ လုပ်ငန်းခွင်တွင် စွန့်ပစ်ပစ္စည်းသိုလှောင်မှုကာလအတွင်း စွန့်ပစ်ပစ္စည်း ယိုစိမ့်မှု နှင့် ရေယိုစိမ့်မှုတို့ကို ရှောင်ကြဉ်ရန် သင့်လျော်သော စွန့်ပစ်ပစ္စည်း ထည့်စရာများအသုံးပြုခြင်း နှင့် လုပ်ငန်းခွင်တွင် ဓာတ်တုပစ္စည်းများ သို့မဟုတ် စွန့်ပစ်ပစ္စည်းများပတ်ပတ်လည်တွင် တစ်ဆင့်ခံ ကန့်သတ်ထိန်းချုပ်ခြင်း၊ ■ ဖော်ထုတ်နိုင်ပါက၊ သင့်လျော်သော စွန့်ပစ်ပစ္စည်းကောက်ယူသူများကိုသာ အသုံးပြုခြင်း၊ ■ ထရပ်ကားများဖြင့် ကုန်များကိုဖုံးလျက် သို့မဟုတ် အဖွင့်အပိတ်ပါထရပ်ကားများဖြင့် စွန့်ပစ်ပစ္စည်းများကို သယ်ယူလျက် စွန့်ပစ်ပစ္စည်းများသယ်ယူပို့ ဆောင်စဉ်ကာလအတွင်း လေတိုက်ခတ်မှုကြောင့် အမှိုက် နှင့် ဖုန်မှုန့်များ လွင့်ပါမှုကို လျှော့ချခြင်း၊ ■ ဓာတ်တုပစ္စည်းများ နှင့် စွန့်ပစ်ပစ္စည်းသိုလှောင်မှုတို့ ထားရှိရာတွင် အနီးနေရာများကို ထည့်သွင်းစဉ်းစားသင့်ပါသည်။ ဆိုလိုသည်မှာ ရေသွားလမ်း ကြောင်းများ သို့မဟုတ် သောက်သုံးနိုင်သောရေရင်းမြစ်များမှ အဝေးတွင် ထားရမည် ဖြစ်ပါသည်။ ■ ပစ္စည်းများပြန်လည်အသုံးပြုမှု သို့မဟုတ် ပြန်လည်ပြုပြင်အသုံးပြုမှု နှင့် ၎င်းတို့ကို စနစ်တကျ စွန့်ထုတ်မှုတို့ကို တိုးမြှင့်စေရန် ကွဲပြားသော ထည့်စရာများ၊ သတ္တုပုံးကြီးများ သို့မဟုတ် စုပုံမှုများတွင် မတူကွဲပြားသော စွန့်ပစ်ပစ္စည်းအမျိုးအစားများကို ခွဲခြား၍ သိုလှောင်ခြင်း၊ ■ ဖြစ်ပေါ်လာနိုင်သော အပျက်အစီးများ သို့မဟုတ် ပစ္စည်းညစ်ညမ်းမှုများကို လျှော့ချရန် တည်ဆောက်ရေးပစ္စည်းများကို စနစ်တကျ သိုလှောင်ခြင်း၊ ■ မိလ္လာရေဆိုးနှတ်ပယ်ရေးလမ်းကြောင်းသို့ မသင့်လျော်သော ပစ္စည်းများကို ကာကွယ်မည့် စည်းမျဉ်းများကို အားဖြည့်ခြင်း၊ ■ ထိခိုက်လွယ်နေရာများမှ ပို၍ဝေးမည့် စွန့်ထုတ်ရေးနေရာအမှတ်ကို ဒီဇိုင်းလုပ်ခြင်း၊ ■ ဇီဝလောင်စာစွန့်ပစ်ပစ္စည်းကို သယ်ယူသောအခါ၊ ထရပ်ကားများဖြင့် ကုန်များကိုဖုံးလျက် သို့မဟုတ် အဖွင့်အပိတ်ပါထရပ်ကားများဖြင့် စွန့်ပစ်ပစ္စည်းများကို သယ်ယူလျက် စွန့်ပစ်ပစ္စည်းများသယ်ယူပို့ ဆောင်စဉ်ကာလအတွင်း လေတိုက်ခတ်မှုကြောင့် အမှိုက် နှင့် ဖုန်မှုန့်များ လွင့်ပါမှုကို လျှော့ချခြင်း၊ ■ ပစ္စည်းအမျိုးမျိုးကို ခွဲထားရန် နှင့် သိုလှောင်ရန် အလုပ်ခွင်၏ သင့်လျော်သောနေရာများတွင် ဒီဇိုင်းပြုလုပ်ခြင်း၊ ■ ဒေသခံရပ်ရွာလူထုက မယူသည့် ဇီဝလောင်စာစွန့်ပစ်ပစ္စည်းများကို လုပ်ငန်းခွင်ထိန်းသိမ်းခြင်း နှင့် ပြန်လည်ပြုပြင်ရေးလုပ်ငန်းများတွင် နောက်ပိုင်းအသုံးပြုရန်အတွက် သင့်လျော်သလို သိုလှောင် (သို့မဟုတ် ချက်ချင်းမြေငွေ့ထိန်းအုပ်) ရမည် ဖြစ်ပါသည်။ ■ လုပ်ငန်းခွင် ရှင်းလင်းခြင်း နှင့် ပြင်ဆင်ခြင်းတို့ကို အပင်များအား အနည်းဆုံးဖယ်ရှားနိုင်မည့်ပုံစံဖြင့် ဒီဇိုင်းပြုလုပ်၍ဆောင်ရွက်ရမည် ဖြစ်ပါသည်။ ■ အမှိုက်မီးရှို့စက်၏ စွမ်းရည်ပြည့်ဝမှုကိုထိန်းသိမ်းရန် နှင့် ထုတ်လွှတ်မှုများကို လျှော့ချရန် ပုံမှန်ပြုပြင်ထိန်းသိမ်းမှုများကိုဆောင်ရွက်ခြင်း၊ ■ ဇီဝလောင်စာစွန့်ပစ်ပစ္စည်းကို မီးမရှို့မီ အစိုဓာတ်ပါဝင်မှုကို ထိန်းချုပ်ခြင်းဖြင့် မီးရှို့ရာတွင် မီးခိုးများထုတ်လွှတ်မှုကို လျှော့ချခြင်း၊ ■ စီမံကိန်းမှ အန္တရာယ်ရှိသောစွန့်ပစ်ပစ္စည်းများကို သင့်လျော်သော နေရာအဆောက်အအုံများတွင် စွန့်ထုတ်ရမည် ဖြစ်ပါသည်။ EPC ကန်ထရိုက်တာသည် အန္တရာယ်ရှိသော စွန့်ပစ်ပစ္စည်းများကို သက်ဆိုင်ရာလမ်ညွှန်ချက်များနှင့်အညီ သိုလှောင်စွန့်ထုတ်သင့်ပါသည်။ (လိုအပ်လျှင်) EPC ကန်ထရိုက်တာသည် ဒေသခံအာဏာပိုင်များထံသို့ အန္တရာယ်ရှိသော စွန့်ပစ်ပစ္စည်းများသန့်စင်မှုနှင့်ပတ်သက်၍ အစီရင်ခံသင့်ပါသည်။ ■ အန္တရာယ်ရှိသော စွန့်ပစ်ပစ္စည်းများကို အန္တရာယ်မရှိသော စွန့်ပစ်ပစ္စည်းများနှင့် ခွဲခြားထားခြင်း၊ ■ အန္တရာယ်ရှိသောစွန့်ပစ်ပစ္စည်းများကို လေထု၊ မြေဆီလွှာ နှင့် ရေရင်းမြစ်များထံသို့ မတော်တဆ မထုတ်လွှတ်မိစေရန် ကာကွယ် သို့မဟုတ် ထိန်းချုပ်ရန် သိုလှောင်သင့်ပါသည်။ ■ သိုလှောင်ထားမှုကို ရှင်းလင်းစွာ အမှတ်တံဆိပ်များကပ်၍ ဘောင်ခတ်ထားသင့်ပါသည် -	

စဉ်	ရင်းမြစ်/နေရာ	ဖြစ်ပေါ်လာနိုင်သော ထိခိုက်မှု	ဖြစ်ပေါ်လာနိုင်သော ထိခိုက်မှုများ၏ အရေးပါမှု	(သက်ဆိုင်ရာ) အဆိုပြုလျှော့ချရေး အစီအမံများ	ကြွင်းကျန် ထိခိုက်မှု၏ အရေးပါမှု
				- ထည့်စရာတစ်ခုချင်း၌ ပါဝင်သည့်အရာများကို ဖော်ပြသည့် တံဆိပ်များတပ်ခြင်းအပါအဝင်၊ အလုပ်သမားများနေဖြင့် ဓာတုပစ္စည်းများနှင့်သင့်လျော်မှုနှင့် ပတ်သက်သော သတင်းအချက်အလက်များကို အသင့်ရရှိနိုင်အောင် ဆောင်ရွက်ပေးသင့်ပါသည်။ - ယိုဖိတ်မှုများ နှင့် ယိုစိမ့်မှုများကို စောင့်ကြပ်ကြည့်ရှုစစ်ဆေးနိုင်ရန် ထည့်စရာပုံးများအကြား စစ်ဆေးနိုင်ပြီး အတူမထားသင့်သော စွန့်ပစ်ပစ္စည်းများကိုအကြား ရောနှောမှု သို့မဟုတ် ထိတွေ့မှုကို ကာကွယ်သည့်ပုံစံဖြင့် အန္တရာယ်ရှိသော စွန့်ပစ်ပစ္စည်းများကို သိုလှောင်သင့်ပါသည်။ - အန္တရာယ်ရှိသောစွန့်ပစ်ပစ္စည်းများကို နေရောင်၊ လေ နှင့် မိုးရေတို့ဖြင့် တိုက်ရိုက်ထိတွေ့မှုမှ ရှောင်ကြဉ်ရန် ထည့်စရာပုံများကို ပိတ်၍ သိုလှောင်သင့်ပါသည်။ - အန္တရာယ်ရှိသောစွန့်ပစ်ပစ္စည်းများကို အကြီးဆုံးစွန့်ပစ်ပစ္စည်းထည့်စရာ၏ ပမာဏသည် ၁၁၀% ကို ခံနိုင်စွမ်းရှိသည့် ကြမ်းပြင်ကို မဖောက်ထွက်နိုင်ပြီး မည်စည်မိုးစေသည့် နေရာတွင် သိုလှောင်သင့်ပါသည်။ - (လိုအပ်လျှင်) အန္တရာယ်ရှိသောစွန့်ပစ်ပစ္စည်းများသိုလှောင်မှုနေရာများသည် လုံလောက်သော လေဝင်လေထွက်ရှိပြီး၊ မီးကာကွယ်ရေးစနစ်တို့ ရှိသင့်သည်။ ■ အန္တရာယ်ရှိသောစွန့်ပစ်ပစ္စည်းများ မတော်တဆ ထုတ်လွှတ်မှုများကို ကိုင်တွယ်နိုင်ရန် ယိုဖိတ်မှုတုံ့ပြန်ရေး နှင့် အရေးပေါ်အစီအစဉ်များကို ပြင်ဆင်ရေးသား၍ အကောင်အထည်ဖော်ဆောင်ရွက်သင့်ပါသည်။ ■ ယိုဖိတ်မှုများ၊ ထုတ်လွှတ်မှု နှင့် လုပ်သားများ နှင့် အများပြည်သူထံသို့ ထိတွေ့မှုကို ကာကွယ်ရန် သို့မဟုတ် လျှော့ချရန် အလုပ်ခွင် အဝင်၊ အထွက် စွန့်ပစ်ပစ္စည်းသယ်ယူပို့ဆောင်မှုကို ဆောင်ရွက်ခြင်း၊ ■ အန္တရာယ်ရှိသော စွန့်ပစ်ပစ္စည်းများကို သင့်လျော်သည့် အန္တရာယ်ရှိသော စွန့်ပစ်ပစ္စည်းကောက်ယူသူမှတစ်ဆင့် စွန့်ထုတ်သင့်ပါသည်။ ■ ပြုပြင်ထိန်းသိမ်းရေးနေရာအဆောက်အအုံများသည် ဆည်ထားသောနေရာအတွင်း ခိုင်မာသည့်နေရာမျက်နှာပြင်များပေါ်တွင် တည်ထားသင့်ပါသည်။ ဆီခံခွက်များ နှင့် ဆီစုပ်ကိရိယာများကို ထားရှိသင့်ပါသည်။ ဖြစ်ပေါ်လာနိုင်သည့် ယိုဖိတ်မှု နှင့် ယိုစိမ့်မှုတို့အတွက် လုပ်ငန်းများအပါအဝင် ယာဉ်များ နှင့် ကိရိယာများ ထိန်းသိမ်းပြုပြင်မှုကို ဤစွန့်ထုတ်မှုများကို ထိန်းချုပ်ရန် စနစ်တကျ တပ်ဆင်ထားသည့် ဧရိယာများအတွင်းသာ ဆောင်ရွက်သင့်ပါသည်။ ■ စွန့်ပစ်ပစ္စည်းသန့်စင်ရေးစက်ရုံမှ အနည်အနှစ်များကို အန့်မထွက်စေရန် စီမံသင့်ပြီး၊ စနစ်တကျ စွန့်ထုတ်သင့်ပါသည်။ ■ စွန့်ပစ်ပစ္စည်းများကို လုပ်ငန်းခွင်အတွင်း သန့်စင်မှုဆောင်ရွက်သောအခါ၊ စွန့်ပစ်ပစ္စည်းကို ပတ်ဝန်းကျင် နှင့် မြစ်များသို့ ပစ္စည်းများ မကျရောက်စေမည့် ပုံစံဖြင့် သိုလှောင်ဆောင်ရွက်ရမည်ဖြစ်ပြီး၊ နှင့် စွန့်ပစ်ပစ္စည်းလမ်းကို ခွဲခြားထားရမည် ဖြစ်ပါသည်။ ■ ဇီဝလောင်စာစွန့်ပစ်ပစ္စည်းအမျိုးအစားများကို အမျိုးအစားတစ်ခုချင်း သက်ဆိုင်ရာနည်းလမ်းဖြင့် စီမံစွန့်ထုတ်ရန် သီးသန့်ခွဲခြားထားခြင်း။ ထို့ပြင်၊ မီးရှို့သည့် ကာအတွင်း အန္တရာယ်ရှိသော စွန့်ပစ်ပစ္စည်းများ နှင့် ဓာတုပစ္စည်းများသည် ဇီဝလောင်စာစွန့်ပစ်ပစ္စည်းတွင် ရှိမနေစေရန် အသေအချာ ဆောင်ရွက်ခြင်း။ အမှိုက်မီးရှို့သည့်စက်များတည်နေရာ နှင့် မီးရှို့နေရာများကို ထိခိုက်လွယ်နေရာများမှ အဝေးဆုံး၌ ရှိစေပြီး၊ ညစ်ညမ်းမှုလွှင့်စဉ်မှုဖြစ်ပေါ်လျှင်လည်း လွယ်ကူစွာ ထိန်းချုပ်နိုင်သည့် နေရာတွင် ဖြစ်ရမည်။	
	စွန့်ပစ်ပစ္စည်း	စွန့်ပစ်ပစ္စည်းထွက်ရှိမှုသည် ရှု၊ ဇီဝ နှင့် လူမှု အခြေခံအနေအထားများ အပေါ် ထိခိုက်စေနိုင်သည်။	အတော်အတန်	■ စွန့်ပစ်ပစ္စည်းများကို စနစ်တကျ သိုလှောင်စွန့်ထုတ်ရန် သက်ဆိုင်ရာစွန့်ပစ်ပစ္စည်းစီမံခန့်ခွဲမှုအစီအစဉ်ကို ပြင်ဆင်၍ အကောင်အထည်ဖော်ခြင်း။ စွန့်ပစ်ပစ္စည်းစီမံခန့်ခွဲမှုအစီအစဉ်တွင် ဖော်ထုတ်ထားသည့် စွန့်ပစ်ပစ္စည်းလမ်းကြောင်းများအားလုံးအတွက် သွယ်ယူရေးလိုင်း၏ တည်ဆောက်ရေးကာလအတွင်း စွန့်ပစ်ပစ္စည်းများကို စီမံရန်၊ ရှောင်ကြဉ်ရန် နှင့် ပြန်လည်အသုံးပြုရန် အသေးစိတ်သတ်မှတ်ချက်များကို ထည့်သွင်းမည်ဟုတ် တွက်ချက်ထားပါသည်။ ■ တည်ဆောက်ရေးမစတင်မီ၊ TPMC သည် တည်ဆောက်ရေးကာလအတါင်း စွန့်ပစ်ပစ္စည်းလမ်းကြောင်းသစ်များကို စုပ်ယူရန် ဒေသခံစွန့်ပစ်ပစ္စည်းစီမံခန့်ခွဲမှု ကွန်ရက်၏ စွမ်းရည်ကို ဆုံးဖြတ်ရန် ဒေသခံအာဏာပိုင်များ နှင့် အခြားသက်ဆိုင်သူများဖြင့် ထိတွေ့တိုင်ပင်ဆောင်ရွက်မည် ဖြစ်ပါသည်။ ■ စွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲမှုအစီအစဉ်တွင် ဖော်ထုတ်ထားသည့် စွန့်ပစ်ပစ္စည်းလမ်းကြောင်းများအားလုံးအတွက် သွယ်ယူရေးလိုင်း၏ တည်ဆောက်ရေးကာလ အတွင်း စွန့်ပစ်ပစ္စည်းများကို စီမံရန်၊ ရှောင်ကြဉ်ရန် နှင့် ပြန်လည်အသုံးပြုရန် အသေးစိတ်သတ်မှတ်ချက်များကိုထည့်သွင်း ရေးဆွဲသွားမည် ဖြစ်ပါသည်။ ■ ဖြစ်နိုင်လျှင် လုပ်ငန်းခွင်ရှိ လုပ်သားများအားလုံးအား စွန့်ပစ်ပစ္စည်းကို ရှောင်ကြဉ်ရန်၊ လျှော့ချရန် နှင့် ပြန်လည်အသုံးပြုရန် ပညာပေးဆောင်ရွက်ခြင်း၊ ■ တည်ဆောက်ရေးလုပ်ငန်းခွင်မှ စွန့်ပစ်ပစ္စည်းများ သို့မဟုတ် အသုံးမပြုသည့်ပစ္စည်းများ ကောက်ယူရန် အနည်းဆုံး နှစ်ပတ်တစ်ကြိမ်ဖြင့် စွန့်ပစ်ပစ္စည်း သန့်ရှင်းရေး အစီအမံများကို ဆောင်ရွက်မည် ဖြစ်ပါသည်။ တည်ဆောက်ရေးအဆင့်ကာလတွင် စွန့်ပစ်ပစ္စည်းစီမံခန့်ခွဲမှုအစီအစဉ်ကို ပြင်ဆင်၍ လိုက်နာဆောင်ရွက်ခြင်း။ ■ သက်ဆိုင်ရာကြီးကြပ်မှုများအားလုံးနှင့် အညီဖြစ်စေရန် ပတ်ဝန်းကျင်ဆိုင်ရာ တာဝန်သိအနေအထားဖြင့် စွန့်ထုတ်စေရန် စွန့်ပစ်ပစ္စည်းများစွန့်ထုတ်ရေးအတွက် ကွင်းဆက်စစ်ဆေးရေးမှတ်တမ်းများသုံးလျက် ခန့်အပ်ထားသော စွန့်ပစ်ပစ္စည်းကောက်ယူသူများကို စောင့်ကြပ်ကြည့်ရှုစစ်ဆေးခြင်း၊ ■ ခန့်အပ်ထားသောစွန့်ပစ်ပစ္စည်းကောက်ယူသူသည် နယ်နိမိတ်ကျော်သည့် စွန့်ပစ်ပစ္စည်းသယ်ယူပို့ဆောင်မှု နှစ်စဉ်အခြေအနေများကို အစီရင်ခံရမည်။ ■ ထွက်ရှိသော စွန့်ပစ်ပစ္စည်းများအရေအတွက် နှင့် ထွက်ရှိသော စွန့်ပစ်ပစ္စည်းများနှင့် ဆက်နွယ်သော အန္တရာယ်များကို ကာကွယ်ရန် သို့မဟုတ် လျှော့ချရန် လုပ်ငန်းစဉ်ကို ဒီဇိုင်းဆင်လည်ပတ်စေသင့်ပါသည်။	မပြောပလောက်

စဉ်	ရင်းမြစ်/နေရာ	ဖြစ်ပေါ်လာနိုင်သော ထိခိုက်မှု	ဖြစ်ပေါ်လာနိုင်သော ထိခိုက်မှုများ၏ အရေးပါမှု	(သက်ဆိုင်ရာ) အဆိုပြုလျှော့ချရေး အစီအမံများ	ကြွင်းကျန် ထိခိုက်မှု၏ အရေးပါမှု
				■ စွန့်ပစ်ပစ္စည်းထုတ်လုပ်မှုဖြစ်စဉ်များကို စဉ်းစားလျက် ပြန်လည်ပြုပြင်အသုံးပြုမှုကို အကောင်အထည်ဖော်ခြင်းနှင့် ပြန်လည်ပြုပြင်အသုံးပြုနုိင်သော ပစ္စည်းများကို ဖော်ထုတ်ခြင်း။ ထို့ပြင်၊ ထုတ်လုပ်သည်ဖြစ်စဉ် သို့မဟုတ် အခြားစက်မှုဖြစ်စဉ်လည်ပတ်မှုမှ အပြင်ဘေးကွက်များသို့ ပြန်လည်မိတ်ဆက် ပေးနိုင်သည့် ထုတ်ကုန်များကို ဖော်ထုတ်ခြင်း၊ ■ စီမံကိန်းလုပ်ငန်းခွင် သို့မဟုတ် အခြားတည်ဆောက်ရေးစီမံကိန်းများအတွင်း ဓာတ်မပြုသော တည်ဆောက်ရေးစွန့်ပစ်ပစ္စည်းများ (တူးယူထားသည့် မြေ နှင့် ကျောက်) ကို ပြန်လည်အသုံးပြုနိုင်ရန်အတွက် အခွင့်အလမ်းများကို ရှာဖွေခြင်း။ လုပ်ငန်းခွင်ပြင်ဆင်သည့်ကာလအတွင်း ဖယ်ထုတ်လိုက်သော မြေများကို ပြန်ဖြည့်ရန်လိုအပ်သော လုပ်ငန်းခွင်နေရာများ ပြန်ဖြည့်ခြင်း နှင့် မျက်နှာပြင်များအတွက် တတ်နိုင်သမျှ ပြန်လည်အသုံးပြုသွားမည် ဖြစ်ပြီး၊ ကျန်သည့်အမှိုက် (အပင်မှထွက်သည့် အမှိုက်များအပါအဝင်) များကို စွန့်ထုတ်ရန် ကန်ထရိုက်ချုပ်မည်။ ■ အမှိုက်စွန့်သည်နေရာသို့ စွန့်ထုတ်သည့် စွန့်ပစ်ပစ္စည်းများကို လျှော့ချရန် ပြန်လည်အသုံးပြုခြင်း နှင့် ပြန်လည်ပြုပြင်အသုံးပြုခြင်းတို့ကိုအတွက် မစွန့်ထုတ်မီ၊ တည်ဆောက်ရေးစွန့်ပစ်ပစ္စည်းများ၊ သံမဏိ နှင့် အခြားသတ္တုပစ္စည်းများကို တတ်နိုင်သမျှ သီးခြားခွဲထားခြင်း၊ ■ တည်ဆောက်ရေးကာလပြီးမြောက်သောအခါ အပိုပစ္စည်းများစွန့်ထုတ်ခြင်း ဖြစ်စေနိုင်သည့် တည်ဆောက်ရေသုံးပစ္စည်းများအလွန်အကျွံဝယ်ယူခြင်းကို လျှော့ချရန် တည်ဆောက်ရေးပစ္စည်းစာရင်း စီမံခန့်ခွဲရေးစနစ်ကို အကောင်အထည်ဖော်ဆောင်ရွက်ခြင်း၊ ■ အသင့်ရောနှောထားသော ကန်ကရစ် နှင့် ဘိလပ်မြေသရွတ်များကဲ့သို့သော ပစ္စည်းများ အော်ဒါအလွန်အကျွံမှာယူခြင်း နှင့် စွန့်ပစ်ခြင်းများကို လျှော့ချခြင်း၊ ■ ဖြစ်နိုင်သောနေရာများတွင်၊ အန္တရာယ်ရှိသောစွန့်ပစ်ပစ္စည်းအရေအတွက်များလျော့ကျစေခြင်း သို့မဟုတ် မထွက်ရှိခြင်း၊ သို့မဟုတ် အန္တရာယ်နည်းသော စွန့်ပစ်ပစ္စည်း အမျိုးအစားများ ထွက်ရှိသော လုပ်ငန်းစဉ်ကို ကျင့်သုံးခြင်း၊ ■ မီးရှို့ရမည့် ဇီဝလောင်စာစွန့်ပစ်ပစ္စည်းပမာဏကို လျှော့ချရန် ဇီဝလောင်စာစွန့်ပစ်ပစ္စည်းအတွက် ပြန်လည်ပြုပြင်အသုံးပြုနိုင်သော အစီအစဉ်ကို မိတ်ဆက် အကောင်အထည်ဖော်ဆောင်ရွက်ခြင်း။ ၎င်းတွင် ရင်းမြစ်အသုံးပြုခြင်း၏အစိတ်အပိုင်းအဖြစ် ဇီဝလောင်စာကို ပြန်လည်မိတ်ဆက်ပေးရန် ဖြစ်ပေါ်လာနိုင်သော ဘေးကွက် သို့မဟုတ် သက်ဆိုင်ရာစက်မှုလုပ်ငန်းတို့ကို ဖော်ထုတ်ခြင်းတို့ ပါဝင်နိုင်ပါသည်။	
၁.၇	မြင်ကွင်း	တည်ဆောက်ရေးအဆင့်ကာလတွင် ပစ္စည်းရောက်ရှိနေခြင်းသည် ဧရိယာကို ကာထားမှုသို့ ဦးတည်စေနိုင်သည်။	အတော်အတန်	■ သွယ်ယူရေးတာဝါရှိနေမှုကို ထေကာရန် ပို၍စိမ်းလန်းမှုများ ဖြစ်နေစေရန် မြင်ကွင်းရှုခင်းရှုကွက်နေရာများကို ရှိနေရန် စီမံကိန်းလုပ်ငန်းခွင်အတွင်း ရရှိသော နေရာကွက်လပ်၌ ရှုခင်းရှုကွက်များ (ဆိုလိုသည်မှာ သစ်ပင်၊ ချုံပုတ် နှင့် အပင်များဖုံးလွှမ်းနေသော မြေပြင်) ပြုလုပ်ပေးခြင်း။ တည်ဆောက်ရေးအဆင့်တွင် တတ်နိုင်သမျှ မြန်မြန် သစ်ပင်စိုက်ခြင်း၊ ■ ယာယီထိခိုက်ခံရသော ဧရိယာများအပါအဝင် တည်ဆောက်ရေးဧရိယာများပမာဏကို လျှော့ချခြင်း၊ ■ အပင်များရှင်းလင်းမှုကို တတ်နိုင်သမျှ လျှော့ချခြင်း။ သစ်ပင်ကြီးများရှိနေလျှင် တတ်နိုင်သမျှ ချန်ထားခြင်း။ မြေထိန်းသိမ်းပြုပင်မှုအပြင်ဘက် ကျရောက်သော အပင်များကို ထိန်းသိမ်းထားခြင်း။ ဖြစ်နိုင်လျှင်၊ ရှင်းလင်းခံရသော အပင်များကို လျော်ကြေးပေးခြင်း။ ■ လည်ပတ်ရေးအဆင့် (ဥပမာ - ကန်ထရိုက်တာစခန်း၊ ခင်းထားသောနေရာများ၊ စသည်ဖြင့်) အတွက် မလိုအပ်တော့သည့် ယာယီထိခိုက်ခံရသည့်ဧရိယာများကို အသုံးပြုပြီးနောက် (ဥပမာ - သင့်လျော်သောအပင်များနှင့် မြင်ကွင်းရှုကွက်များသုံးလျက်) တတ်နိုင်သမျှ ယခင်အနေအထားဖြစ်အောင် ပြန်လည်ပြုပြင်ပေးခြင်း။	မပြောပလောက်
၁.၈	ဇီဝမျိုးစုံမျိုးကွဲ	စီမံကိန်းခြေရာ နှင့် လုပ်ငန်းများသည် ထာဝရ သို့မဟုတ် ယာယီ နေရင်းဒေသရှုံးဆုံးမှု နှင့် ဇီဝမျိုးစုံမျိုးကွဲတန်ဖိုးများ (နေရင်းဒေသများ နှင့် မျိုးစိတ်) အပေါ် ထိခိုက်စေနိုင်သည်။	အတော်အတန်	■ ရပ်ရွာလူထုအစီအစဉ်မှာ ကမ်းခြေဦးဧရိယာများတစ်လျှောက် ဒီရေတောများ ပြန်လည်စိုက်ပျိုးရန် နှင့် အများပြည်သူများအသုံးမပြုသော မြေ နှင့် ပုဂ္ဂလိကပိုင် မြေ (မြေပိုင်ရှင်၏ သဘောတူချက်ရယူ၍) ပေါ်တို့တွင် ကမ်းရိုးကမ်းသစ်ပင်များ ပြန်လည် တည်ဆောက်ရန် ကပ်လျက်ရှိသော မြေပိုင်ရှင်များနှင့် တည်ဆောက်သွားမည် ဖြစ်ပါသည်။ ဤအစီအစဉ်မှာ ဒေသရင်း ငှက်မျိုးစိတ်များအတွက် EBA သင့်လျော်မှုအတွင်း နေရင်းဒေသ ပြန်လည်တည်ဆောက်သွား မည် ဖြစ်ပါသည်။ ■ အပင်များရှင်းလင်းခြင်းနှင့်စပ်လျဉ်း၍ တင်းကျပ်သောစည်းကမ်းများသည် စီမံကိန်းနှင့် ဆက်နွယ်သော စီမံကိန်းဝန်ထမ်းများ၊ လုပ်သားများ နှင့် ကန်ထရိုက်တာများအားလုံး နှင့် အမှုထမ်းများအားလုံးအား သက်ဆိုင်ရာဥပဒေများအရ ပြစ်ဒဏ်များစည်းကြပ်ခြင်း၊ ငွေဒဏ် နှင့် အလုပ်ဖြုတ်ခြင်း၊ နှင့် တရားစွဲခြင်း တို့ကို ဆောင်ရွက်သွားမည်။ ■ စီမံကိန်းနှင့်သက်ဆက်နွယ်သည့် ဝန်ထမ်း သို့မဟုတ် လုပ်သား သို့မဟုတ် အခြားပုဂ္ဂိုလ်တစ်ဦးဦးသည် စည်းမျဉ်းများ နှင့် ကြီးကြပ်ရေးစည်းကမ်းများကို ဖောက်ဖျက်လျှင် ပြစ်ဒဏ်ပေးရခံနိုင်မှု နှင့် ခွင့်မပြုထားသည့် အပင်များရှင်းလင်းမှုတို့နှင့်စပ်လျဉ်း၍ တင်းကျပ်မှုများနှင့် ပတ်သက်သော စည်းမျဉ်းများ၊ ကြီးကြပ်ရေးစည်းကမ်းများ နှင့် သတင်းအချက်အလက်များအားလုံးကို ၎င်း၏ ဝန်ထမ်း နှင့် လုပ်သားများထံသို့ ထုတ်ပြန်ပေးမှုအတွက် စီမံကိန်းအဆိုပြုသည် တိုက်ရိုက်တာဝန်ရှိပါသည်။ ■ မတော်တဆရှင်းလင်းမှုကို ရှောင်ကြဉ်ရန် တည်ဆောက်ရေး နှင့် လည်ပတ်ရေးလုပ်ငန်းများအတွက် စီစဉ်ထားသည့် ရှင်းလင်းရေးဧရိယာကို ရှင်းလင်းစွာ ဖော်ထုတ်၍ အမှတ်အသားပြုလုပ်ထားရမည် ဖြစ်ပါသည်။ ■ လမ်းအသုံးပြုမှုကို တည်ဆောက်ရေး နှင့် လည်ပတ်ရေးသုံး ယာဉ်များကိုသာ အသုံးပြုရန် ကန့်သတ်ခြင်း။ စစ်ဆေးရေးဂိတ်များကို စီမံကိန်းဧရိယာမှ ထုတ်ယူသည့် သစ်များ နှင့် သစ်တောထွက်ပစ္စည်းများအတွက် ယာဉ်များကို စစ်ဆေးစီမံရန် အသုံးပြုသင့်ပါသည်။	သာမည
	ဇီဝမျိုးစုံမျိုးကွဲ	စီမံကိန်းခြေရာ နှင့် လုပ်ငန်းများသည် ဒေသရင်း သက်ရှိသတ္တဝါများ နှင့် ဒေသရင်းအပင်များကို ယာယီ အနှောင့်အယှက် သို့မဟုတ်	သာမည	■ မလိုအပ်သော ဆူညံသံထွက်ရှိမှုကို လျှော့ချရန် လည်ပတ်ရေးသုံး ယာဉ်များကို စက်မှုလုပ်ငန်းစုံနှုန်းများနှင့်အညီ ထိန်းသိမ်းပြုပြင်သွားရမည် ဖြစ်ပါသည်။ ■ ယာဉ်အသွားအလာ အမှတ်အသားများကို မြန်နှုန်းကန့်သတ်မှုများဖော်ပြလျက် လမ်းများအားလုံးတွင် ထိန်းသိမ်းထားရှိမည် ဖြစ်ပါသည်။ ■ လမ်းအသုံးပြုမှုအပါအဝင် နေရာအဆောက်အအုံများဝင်ရောက်မှုကို လည်ပတ်ရေးသုံးယာဉ်များသာကို ခွင့်ပြုခြင်း။	မပြောပလောက်

စဉ်	ရင်းမြစ်/နေရာ	ဖြစ်ပေါ်လာနိုင်သော ထိခိုက်မှု	ဖြစ်ပေါ်လာနိုင်သော ထိခိုက်မှုများ၏ အရေးပါမှု	(သက်ဆိုင်ရာ) အဆိုပြုလျှော့ချရေး အစီအမံများ	ကြွင်းကျန် ထိခိုက်မှု၏ အရေးပါမှု
		နေရာ‌ဒွေ့ပြောင်းရမှုကို ဖြစ်ပေါ်စေနိုင်သည်။		■ ညမီးအလင်းရောင်များလိုအပ်သည့် လည်ပတ်ရေးနေရာများနှင့်ပတ်သက်၍ အလင်းများကို လိုအပ်သည့်နေရာကိုသာ ထိုးထားပြီး နေရင်းဒေသများမှ တတ်နိုင်သမျှ ဝေးရာသို့ မီးထိုးရမည်။ ■ ဒေသရင်းအပင်များ နှင့် သက်ရှိသတ္တဝါ တန်ဖိုးများနှင့်ပတ်သက်၍ လည်ပတ်ရေးလုပ်သားများအား အသိအမြင်များတိုးမြှင့်ရန် ကတိကဝတ်များပြုလုပ်သွားမည် ဖြစ်ပြီး၊ အမဲလိုက်ခြင်း နှင့် ခိုးဖမ်းခြင်းတို့ကို တားမြစ်မှုအတွက် အစီအစဉ်များကို ပြုလုပ်ခြင်း၊ ■ ထိန်းသိမ်းရေးအတွက်အရေးပါသော ၄က်မျိုးစိတ်များနှင့် သွယ်ယူရေးလိုင်းများနှင့် ဖြစ်ပေါ်လာနိုင်သော တိုက်မိမှုဆိုင်ရာ ထိခိုက်မှုများနှင့်စပ်လျဉ်း၍ နောက်ဆန့်စစ်ခြင်းအပိုင်းတွင် နောက်ထပ်လျှော့ချရေးအစီအမံများကို ဖော်ပြထားပါသည်။	
	ဇီဝမျိုးစုံမျိုးကွဲ	စီမံကိန်းခြေရာ နှင့် လုပ်ငန်းများသည် အတားအဆီးဖြစ်ပေါ်မှု၊ အနှောင့်အနွှန်းသက်ရောက်မှုများ နှင့် အစိတ်စိတ်အမွှာမွှာဖြစ်မှုတို့ကို ဖြစ်စေနိုင်သည်။	မပြောပလောက်	■ တည်ဆောက်ရေးကာလအတွင်း အကာအရံများ နှင့် သိမ်းဆည်သိုလှောင်မှုတို့ကိုအသုံးပြုမှုကို စီမံကိန်းတည်ဆောက်ရေးလုပ်ငန်းခွင်များအနီးတွင် အနည်းဆုံး ဖြစ်စေမည် ဖြစ်ပါသည်။ ■ တည်ဆောက်ရေးဇရိယာများပတ်ပတ်လည်ရှိ ဖုန်မှုန့်များထွက်ရှိမှုကို ကန့်သတ်ရန် နှင့် အပင်များဖယ်ရှားမှုကို ကန့်သတ်ရန် ဖုန်မှုန့်များထိန်းချုပ်ရန် အစီအမံများကို အသုံးပြုသွားမည် ဖြစ်ပါသည်။ ■ လမ်း နှင့် တည်ဆောက်ရေးလုပ်ငန်းခွင်များနှင့်ကပ်လျက်ရှိသော ကမ်းရိုးတန်းတစ်လျှောက် ဒီရေတောများအပါအဝင် ဒေသရင်းအပင်များစိုက်ပျိုးမှုသည် ကမ်းရိုးတစ်လျှောက် ချိတ်ဆက်မှုအပေါ် ထိခိုက်မှုများကို လျှော့ချရန် ဖြစ်ပါသည်။ ■ ဒေသရင်းအပင်များအသုံးပြုလျက် ထိခိုက်ခံရသောဇရိယာများကို သင့်လျော်သည့် ပြန်လည်ထူထောင်မှုသည် ဒေသရင်းသက်ရှိသတ္တဝါမျိုးစိတ်များသွားလာမှုကို အထောက်အကူပြုစေရန် ဖြစ်ပါသည်။	မပြောပလောက်
	ဇီဝမျိုးစုံမျိုးကွဲ	စီမံကိန်းခြေရာ နှင့် လုပ်ငန်းများသည် နေရင်းဒေသ၏ အရည်အသွေးလျော့ကျမှုကို ဖြစ်စေနိုင်သည်။	သာမည	■ တည်ဆောက်ရေး နှင့် လုပ်သားစခန်းဇရိယာများသို့ ဒေသရင်း နှင့် ထိုးဖောက်ဝင်ရောက်လာသောမျိုးစိတ်များအတွက် ဆွဲဆောင်မှုကို ရှောင်ကြဉ်ရန် တည်ဆောက်ရေး နှင့် လည်ပတ်ရေး (နှင့် ထိန်းသိမ်းပြုပြင်မှု) နှင့် အိမ်သုံးစွန့်ပစ်ပစ္စည်းများကို စနစ်တကျ သိုလှောင်၍ စွန့်ထုတ်သွားမည် ဖြစ်ပါသည်။ ■ ရေလမ်းကြောင်းများသို့ တိုက်ရိုက်စီးကျသည့်လမ်းကြောင်းရှိသည့် ဇရိယာများနှင့်ပတ်သက်၍၊ မြေမျက်ပြင်များကို အနောင့်အယှက်ဖြစ်မှုကို ထိန်းချုပ်ရန် အပင်များပြန်လည်စိုက်ပျိုးသည်အထိ နုန်း နှင့် တိုက်စားမှုထိန်းချုပ်ရေးကိရိယာများကို တပ်ဆင်၍ ထိန်းသိမ်းပြုသွားမည် ဖြစ်ပါသည်။ ■ ဆီ၊ ဓာတုပစ္စည်း နှင့် အစိုင်အခဲ စွန့်ပစ်ပစ္စည်များကို သက်ဆိုင်ရာ လိုင်စင်ရ စွန့်ပစ်ပစ္စည်းစီမံခန့်ခွဲသော ကန်ထရိုက်တာများက သိုလှောင် ကိုင်တွယ် စွန့်ထုတ်သွားမည် ဖြစ်ပါသည်။ ■ ရေလမ်းကြောင်းများသို့ ဝင်ရောက်နေသော မြေဆီလွှာညစ်ညမ်းစီးကျမှုကို လျှော့ချရန် တည်ဆောက်ရေးဇရိယာများအားလုံးတွင် နုန်း နှင့် တိုက်စားမှု ထိန်းချုပ်ရေးအစီအမံများကို အသုံးပြုမည် ဖြစ်ပါသည်။ ■ ဖြစ်နိုင်လျှင်၊ မီးအလင်းရင်းမြစ်များအားလုံးကို သဘာဝနေရင်းဒေသဇရိယာများမှ အဝေးသို့ ဦးတည်ထားမည် ဖြစ်ပါသည်။ ■ သဘာဝ နှင့် ပြုပြင်ထားသည့် နေရင်းဒေသဇရိယာများသို့ ပေါင်းပင်များရောက်ရှိလာမှုကို ရှောင်ကြဉ်ရန် ထိုးဖောဝင်ရောက်လာသည့် မျိုးစိတ်များ စီမံခန့်ခွဲရေး အစီအမံများကို အကောင်အထည်ဖော် ဆောင်ရွက်သင့်ပါသည်။ ■ ဆူညံသံ နှင့် ဖုန်မှုန့်ထွက်ရှိမှုကို ကန့်သတ်ရန် တည်ဆောက်ရေး နှင့် လည်ပတ်ရေးယာဉ်များအတွက် အမြင့်ဆုံးမြန်နှုန်း တစ်နာရီလျှင် ကီလိုမီတာ ၄၀ အထိ ကန့်သတ်ခြင်း၊ ■ သဘာဝပတ်ဝန်းကျင် (လေ နှင့် ရေတိုက်စားမှု) သို့ မတော်တဆထုတ်လွှတ်မှုကို ရှောင်ကြဉ်ရန် တည်ဆောက်ရေး နှင့် လည်ပတ်ရေး (နှင့် ထိန်းသိမ်းပြုပြင်မှု) ပစ္စည်းများ နှင့် ဓာတုပစ္စည်းများကို စနစ်တကျ လုံခြုံအောင် ဆောင်ရွက်သွားမည် ဖြစ်ပါသည်။	မပြောပလောက်
	ဇီဝမျိုးစုံမျိုးကွဲ	စီမံကိန်းခြေရာ နှင့် လုပ်ငန်းများသည် အထူးသဖြင့် ယာဉ်အသွားအလာ နှင့် ဖမ်းဆီးသတ်ဖြတ်မှု တို့သည် နေထိုင်ကြသည့် မျိုးစိတ်များကို သေဆုံးစေနိုင်သည်။	သာမည	■ ဒေသရင်းသက်ရှိသတ္တဝါများနှင့် တိုက်မိနိုင်မှုကို လျှော့ချ၇ေန် တည်ဆောက်ရေး နှင့် လည်ပတ်ရေးယာဉ်များအတွက် အမြင့်ဆုံးမြန်နှုန်း တစ်နာရီလျှင် ကီလိုမီတာ ၄၀ အထိ ကန့်သတ်ခြင်း၊ ■ အရေးကြီးသော မျိုးစိတ်များ နှင့် ဒေသရင်းအပင်များ ၏ တန်ဖိုးများနှင့်ပတ်သက်၍ တည်ဆောက်ရေး နှင့် လည်ပတ်ရေးလုပ်သားများအား အသိအမြင်များ တိုးမြှင့်ရန် ကတိကဝတ်များပြုလုပ်သွားမည် ဖြစ်ပြီး၊ ဝန်ထမ်းများက အမဲလိုက်ခြင်း နှင့် သစ်တောထွက်ပစ္စည်းတို့ကို တားမြစ်ရန်အတွက် အစီအစဉ်များကို ပြုလုပ်ခြင်း၊ ■ တည်ဆောက်ရေး နှင့် လည်ပတ်ရေးသုံး မဟုတ်သည့် ယာဉ်များနှင့်ပတ်သက်၍ စီမံကိန်းနေရာအဆောက်အအုံများသို့ ဝင်ရောက်မှုများအတွက် ကန့်သတ်မှုများ ချမှတ်ခြင်း၊ ■ တောရိုင်းသက်ရှိသတ္တဝါများ အမဲလိုက်ခြင်းနှင့်စပ်လျဉ်း၍ တင်းကျပ်စွာစည်းကြပ်သွားမည်ဖြစ်ပြီး၊ အပင်များရှင်းလင်းမှုနှင့်စပ်လျဉ်း၍ စီမံကိန်းနှင့် ဆက်နွယ်သော စီမံကိန်းဝန်ထမ်းများ၊ လုပ်သားများ နှင့် ကန်ထရိုက်တာ များအားလုံး နှင့် အမှုထမ်းများအားလုံးအား သက်ဆိုင်ရာဥပဒေများအရ ပြစ်ဒဏ်များစည်းကြပ်ခြင်း၊ ငွေဒဏ် နှင့် အလုပ်ဖြုတ်ခြင်း၊ နှင့် တရားစွဲခြင်း တို့ကို ဆောင်ရွက်သွားမည်။ ■ စမ်းချောင်းများတစ်လျှောက် မည်သည့်နေရာတွင်မဆို ငါးဖမ်းခြင်း နှင့် တရားမဝင်ငါးဖမ်းကိရိယာများအသုံးပြုခြင်းကို တားမြစ်သွားမည် ဖြစ်ပါသည်။	မပြောပလောက်
	ဇီဝမျိုးစုံမျိုးကွဲ	စီမံကိန်းခြေရာ နှင့် လုပ်ငန်းများသည် အထူးသဖြင့် ယာဉ်အသွားအလာ နှင့် တာဝါများထွက်ပေါ်	မပြောပလောက်	■ ပါဝါလိုင်းအရှည်အပေါ်တွင် ၄က်များလမ်းလွဲများအသုံးပြုခြင်း။ လမ်းလွဲကိရိယာများသည် ၄က်မျိုးစိတ်များက လွယ်ကူစွာမြင်တွေ့နိုင်သည့် လိုင်းပုံပန်းသဏ္ဌာန်ကို ထူစေလျက် လိုင်းအားမြင်နိုင်စွမ်းကို တိုးစေမည် ဖြစ်ပါသည်။ ■ လိုင်းအပေါ်နှင့်အောက်တွင် ငါထွက်နေပြီး၊ ၅-၁၀ မီတာအကွာထားသည့် သိသိသာသာကွဲပြားသောအရောင်များ (ဥပမာ - အနက် နှင့် အဖြူ) နှင့်ပတ်သက်၍ ရွှေ့ပြောင်းလွယ်အမှတ်အသားများ၊	မပြောပလောက်

စဉ်	ရင်းမြစ်/နေရာ	ဖြစ်ပေါ်လာနိုင်သော ထိခိုက်မှု	ဖြစ်ပေါ်လာနိုင်သော ထိခိုက်မှုများ၏ အရေးပါမှု	(သက်ဆိုင်ရာ) အဆိုပြုလျှော့ချရေး အစီအမံများ	ကြွင်းကျန် ထိခိုက်မှု၏ အရေးပါမှု
		လာမှု တို့သည် ၄က်မျိုးစိတ်များ သေဆုံးမှုကို ဖြစ်စေနိုင်သည်။		■ ဖြစ်နိုင်လျှင်၊ ဗို့အားမြင့်သွယ်ယူရေးလိုင်းအပေါ်တွင် သေးမျှင်သောအကာ သို့မဟုတ် ဝါယာကို ဖယ်ရှားခြင်း နှင့် မဖြစ်နိုင်လျှင်၊ ပို၍မြင်နိုင်စေရန် လိုင်များကို အမှတ်အသားများပြုလုပ်ခြင်း၊ ■ ပါဝါလိုင်းများ ဒေါင်လိုက်ဖြန့်မှုကို လျှော့ချခြင်း။ တိုက်မိမှုအန္တရာယ်များကို လျှော့ချရန် ရေပြင်ညီပုံစံဖြင့် လိုင်းများကို ထားရှိခြင်း၊ ■ ပျံသန်းမှုလုပ်ငန်း နှင့် ၄က်၏အပြုအမူကို လွှမ်းမိုးရန် နေရင်းဒေသကိုင်တွယ်ခြင်း၊ ဥပမာ - မြင်နိုင်စွမ်းကို တိုးစေရန် ဗို့အားမြင့်လိုင်းများအောက်တွင် သစ်ပင်လိုင်းများပြုလုပ်ခြင်း။ ■ တိုင်များအနီး လျှပ်ကာကေဘယ်ကြိုးများတပ်ခြင်း၊ ၄က်အိပ်တန်းဧရိယာများအနီးတွင် နှစ်ဖက်စလုံး၌ အနည်းဆုံး စင်တီမီတာ ၇၀ ရှိပြီ စင်တီမီတာ ၁၄၀ အထိရှိ လျှပ်ကာကြိုးများတပ်ဆင်ခြင်း၊ ■ အိပ်တန်းနေရာ (အထူးသဖြင့် တာဝါလက်တံများ) နှင့် ဓာတ်ကူးနေရာများ (လျှပ်ကူးများ) တို့အကြား အနည်းဆုံး စင်တီမီတာ ၇၀ အကွာထားလျက် လက်တံများ နှင့် တိုင်များဖြတ်လျက် အောက်တွင် လျှပ်ကာပစ္စည်းများထားခြင်း၊	
၁.၉	လူမှု - အလုပ်အကိုင်	စီမံကိန်းလိုအပ်ချက်များသည် အလုပ်အကိုင်များတိုးပွား စေနိုင်သည်။	အပြုသဘောဖြစ်	■ လေ့ကျင့်သင်ကြားမှု နှင့် ရွေးချယ်မှုလုပ်ငန်းစဉ်များပြီးနောက်၊ လုပ်သားများအား စီမံကိန်းနှင့်နီးစပ်သော နေရာများမှ ရှာဖွေသွားမည် ဖြစ်ပါသည်။ ထို့နောက်မှ တိုင်းဒေသကြီးအဆင့် သို့မဟုတ် အမျိုးသားအဆင့်မှ ရှာဖွေသွားမည် ဖြစ်ပါသည်။ ■ စီမံကိန်းအတွက် (သတင်းအချက်အလက်များ၊ လေ့ကျင့်သင်ကြားမှု နှင့် ထိတွေ့တိုင်ပင်မှုတို့အပါအဝင်) လူသစ်များစုစည်းမှု နှင့် ဝယ်ယူမှုလုပ်ငန်းများမှ ဒေသခံများအတွက် အကျိုးအမြတ်များကို မြှင့်တင်ရန်ရည်ရွယ်ချက်ဖြင့် ဤစီမံကိန်းအတွက် ရေးဆွဲသွားမည့် ရင်းမြစ်ရှာခြင်း၊ ဝယ်ယူခြင်း နှင့် လူသစ်စုခြင်း စီမံခန့်ခွဲမှုအစီအစဉ်ကို စီမံကိန်းအနေဖြင့် ရေးဆွဲသွားမည် ဖြစ်ပါသည်။	
	လူမှု - စီးပွားရေးပြောင်းရွှေ့ရခြင်း	စီမံကိန်း ခြေရာသည် စီးပွားရေး အပေါ် ထိခိုက်စေနိုင်သည်။	အတော်အတန်	■ မြေရယူမှုကို ပထဝီအရွယ်အစား နှင့် ကာလအရ အတတ်နိုင်ဆုံး လျှော့ချသင့်ပါသည်။ ထို့ကြောင့် လုပ်ငန်းများမရှိသောအခါ ချပ်လှန်ထားသည့်စိုက်ပျိုးရေး လုပ်ငန်းများကို နုတ်ထားသင့်ပါသည်။ ■ ဖြစ်နိုင်လျှင်၊ TPMC သည် တည်ဆောက်ရေးကာလတွင်း ထိခိုက်ခံရသည့်မြေပိုင်ရှင် သက်ဆိုင်သူများကို ကျွမ်းကျင်မှုမလိုသည့်အလုပ်အကိုင်များခေါ်ရာတွင် ဦးစားပေးသွားရန် အဆိုပြုသွားမည် ဖြစ်ပါသည်။ ■ TPMC သည် ထိခိုက်ခံရသော အရာများကို ဖော်ထုတ်ခြင်း နှင့် လျော်ကြေးပေးခြင်းတို့အတွက် ပြန်လည်သုံးသပ်ခြင်းအစီအစဉ်ကို ရေးဆွဲသွားမည် ဖြစ်ပါသည်။ ၎င်းအစီအစဉ်တွင် သက်ရောက်ခံရသည့် မြေပေါ်ရှိ မြေ၊ သီးနှံများ နှင့် အလုပ်အကိုင် တို့ပါဝင်မည် ဖြစ်ပါသည်။ ■ TPMC သည် တည်ဆောက်ရေး နှင့် လည်ပတ်ရေးကာလတို့အတွင်း ယာယီ သို့မဟုတ် ထာဝရ ထိခိုက်ခံရသည့် မြေပိုင်ရှင် သက်ဆိုင်သူများကို ဈေးကွက်ပေါက်ဈေး (ပြောင်းလဲမှုအတွက် လျော်ကြေး) ဖြင့် လျော်ကြေးပေးသွားမည် ဖြစ်ပါသည်။ ■ TPMC သည် တည်ဆောက်ရေးကာလအတွင်း သက်ရောက်ခံရသည့် သီးနှံပိုင်ရှင်သက်ဆိုင်သူများကို ဈေးကွက်ပေါက်ဈေးဖြင့် လျော်ကြေးပေးသွားမည် ဖြစ်ပါသည်။ ■ TPMC သည် တည်ဆောက်ရေးအဆင့်ပြီးနောက် စီစဉ်မထားသည့်ဖြစ်ရပ် (ယိုစိမ့်မှု)အကြောင့် ညစ်ညမ်းနေသောမြေနှင့်ပတ်သက်၍ ၎င်း၏ကနဦးအခြေအနေ အထိ ဖယ်ရှားမှု နှင့်/သို့မဟုတ် သင့်လျော်စွာ သင့်စင်မှုတို့အပါအဝင် ယာယီသက်ရောက်ခံရသောမြေများကို ပြန်လည်အပ်နှံသွားမည် ဖြစ်ပါသည်။ ■ TPMC သည် စီမံကိန်းလုပ်ငန်းများကြောင့် သက်ရောက်ခြင်းခံရသည့် မြေအမျိုးအစား နှင့် သီးနှံများအတွက် ဈေးကွက်ပေါက်ဈေးသတ်မှတ်၍ အပြင်မှ အထူးပြုကျွမ်းကျင်သူကို အသုံးပြုသွားမည် ဖြစ်ပါသည်။ ■ TPMC သည် စီမံကိန်း၏ အစိတ်အပိုင်းအနေဖြင့် သက်ဆိုင်သူများနှင့်ထိတွေ့တိုင်ပင်မှုအစီအစဉ်ကို ရေးဆွဲအကောင်အထည်ဖော်ရန် လိုအပ်မည် ဖြစ်ပါသည်။ အစီအစဉ်တွင် စိုက်ပျိုးရေးနေရာများပေါ်တွင် လုပ်ငန်းများအကြောင်းကို ကြိုတင်၍ ဒေသခံသက်ဆိုင်သူများကို အသိပေးရန် အစီအမံများကို ထည့်သွင်းသင့်ပါသည်။ ■ စီမံကိန်းသည် ဒေသခံသက်ဆိုင်သူများ၏ သယ်ယူပို့ဆောင်မှုအပေါ် စီမံကိန်းလုပ်ငန်းများက သက်ရောက်မှုမှ အကြံပြုတိုင်ကြားမှုများကို ကောက်ယူရန် LNG ဓာတ်အားစက်ရုံစီမံကိန်းအတွက် ရေးဆွဲထားသည့် အကြံပြုတိုင်ကြားရေးယန္တရားကိုလည်း ရေးဆွဲသွားသင့်ပါသည်။	သာမည
	လူမှု - ယာဉ်အသွားအလာ & သယ်ယူပို့ဆောင်မှု	■ စီမံကိန်းနှင့်စပ်လျဉ်းသည့် ယာဉ်အသွားအလာသည် ယာဉ်အသွားအလာ နှင့် သယ်ယူပို့ဆောင်မှုတို့အပေါ် ထိခိုက်စေနိုင်သည်။	မပြောပလောက်	■ ထိခိုက်နစ်မြုပ်မှာ မပြောပလောက်သာဖြစ်သဖြင့်၊ ယာဉ်အသွားအလာ နှင့် သယ်ယူပို့ဆောင်မှုအပေါ် သက်ရောက်မှုအတွက် စီမံကိန်းက အသေးစိတ်တိကျသော အစီအမံများကို အကောင်အထည်ဖော်သွားမည် မဟုတ်ပါ။ သို့ရာတွင် စီမံကိန်းသည် အလုံ၊ ဆိပ်ကြီးခနောင်တို့ရှိ LNG ဓာတ်အားစက်ရုံ စီမံကိန်းအတွက် ရေးဆွဲထားသော သက်ဆိုင်သူများနှင့်ထိတွေ့တိုင်ပင်မှုအစီအစဉ်ကို အကောင်အထည်ဖော်ဆောင်ရွက်သွားမည် ဖြစ်ပါသည်။ အစီအစဉ်တွင် ဒေသခံလမ်းများ သို့မဟုတ် ဒေသံခံလမ်းများအနီး တွင် လုပ်ငန်းများများနှင့်ပတ်သက်၍ ကြိုတင်၍ ဒေသခံသက်ဆိုင်သူများကို အသိပေးရန် အစီအမံများကို ထည့်သွင်းသွားမည် ဖြစ်ပါသည်။ ■ စီမံကိန်းသည် ဒေသခံသက်ဆိုင်သူများ၏ သယ်ယူပို့ဆောင်မှုအပေါ် စီမံကိန်းလုပ်ငန်းများက သက်ရောက်မှုမှ အကြံပြုတိုင်ကြားမှုများကို ကောက်ယူရန် LNG ဓာတ်အားစက်ရုံစီမံကိန်းအတွက် ရေးဆွဲထားသည့် အကြံပြုတိုင်ကြားရေးယန္တရားကိုလည်း အသုံးပြုသွားမည် ဖြစ်ပါသည်။	မပြောပလောက်
	လူမှု - ပတ်ဝန်းကျင် ထုတ်လွှတ်မှုများ	■ စီမံကိန်းတည်ဆောက်မှုမှ ပတ်ဝန်းကျင် ထုတ်လွှတ်မှုများသည် လူနေထိုင်ရာနေရာ	သာမည	■ လျှော့ချရေးအစီအမံများကို လေထုအရည်အသွေး နှင့် ဆူညံသံထိခိုက်မှုဆန်းစစ်ခြင်းအပိုင်းများတွင် အဆိုပြုထားပြီး ဖြစ်ပါသည်။ သို့ရာတွင် TPMC သည် စီမံကိန်း၏ အစိတ်အပိုင်းအနေဖြင့် သက်ဆိုင်သူများနှင့်ထိတွေ့တိုင်ပင်မှုအစီအစဉ်ကို ပြင်ဆင်ရေးဆွဲအကောင်အထည်ဖော်သွားရန်လည်း လိုအပ်မည် ဖြစ်ပါသည်။ အစီအစဉ်တွင် အထူးသဖြင့် ဆူညံမှုလုပ်ငန်းများ (ဥပမာ - တိုင်ရိုက်ခြင်း) ကို ကြိုတင်၍ ဒေသခံသက်ဆိုင်သူများကို သတိပေးရန် အစီအမံများကို ထည့်သွင်းသင့်ပါသည်။	မပြောပလောက်

စဉ်	ရင်းမြစ်/နေရာ	ဖြစ်ပေါ်လာနိုင်သော ထိခိုက်မှု	ဖြစ်ပေါ်လာနိုင်သော ထိခိုက်မှုများ၏ အရေးပါမှု	(သက်ဆိုင်ရာ) အဆိုပြုလျှော့ချရေး အစီအမံများ	ကြွင်းကျန် ထိခိုက်မှု၏ အရေးပါမှု
		များသို့ အနှောင့်အယှက် ဖြစ်ပေါ်စေနိုင်သည်။		■ စီမံကိန်းသည် ဆူညံသံ၊ ဖုန်မှုန် နှင့် တုန်ခါမှုတို့မှ သက်ရောက်နိုင်သည့် ဒေသခံသက်ဆိုင်သူများထံမှ အကြံပြုချက်များကို ကောက်ယူရန် အကြံပြုတိုင်ကြားရေး ယန္တရားကိုလည်း ပြင်ဆင်ရေးဆွဲသင့်ပါသည်။	
	လူမှု - ရပ်ရွာလူထု ကျန်းမာရေး နှင့် ဘေးကင်းရေး	■ စီမံကိန်းလုပ်ငန်းများသည် ရပ်ရွာလူထု ကျန်းမာရေး နှင့် ဘေးကင်းရေးတို့အပေါ် ထိခိုက်စေနိုင်သည်။	သာမည	■ TPMC သည် သွယ်ယူရေးလိုင်း၏ တည်ဆောက်ရေးလုပ်ငန်းများများ နှင့် လူနေဆောင်စခန်းတည်နေရာအကြောင်းကို ဒေသခံများကို အသိပေးမည် ဖြစ်ပါသည်။ ■ TPMC သည် လျှပ်စစ်ဝါယာ၊ သွယ်ယူရေးထောက်တိုင်များ နှင့် သွယ်ယူရေးတာဝါများ၏ အရည်အသွေး နှင့် အခြေအနေကို နှစ်စဉ် စစ်ဆေးသွားမည် ဖြစ်ပါသည်။ ■ TPMC သည် တည်ဆောက်ရေးလုပ်ငန်းများ၏ နေ့စဉ် နှင့် ကာလအကြောင်းကို ရက်သတ္တပတ် ၂ ပတ် ကြိုတင်၍ အသိပေးသွားမည် ဖြစ်ပါသည်။ ■ TPMC သည် အန္တရာယ်များအကြောင်းကို ဒေသခံများ ပို၍သိလာရန် နှင့် သူတို့အား သတိပေးရန် သွယ်ယူရေးတာဝါတိုင်တွင် သတိပေးအမှတ်အသားများကို ဆောင်ရွက်သွားမည် ဖြစ်ပါသည်။ ■ TPMC သည် ယာဉ်များအတွက် ဘေးကင်းရေးဇုန်ကို ညွှန်ပြရန် တည်ဆောက်ရေးလုပ်ငန်းများကာလအတွင်း အသုံးပြုသည့် စီမံကိန်းယာဉ်များ သို့မဟုတ် စက်များပတ်ပတ်လည်တွင် ယာဉ်အသွားအလာကတော့ချွန်များကို ထားပေးသွားမည် ဖြစ်ပါသည်။ ■ TMPC သည် သူတို့ရှိနေမှုကို ဖော်ပြရန် တည်ဆောက်ရေယာဉ်များ/စက်များပေါ်တွင် သက်ဆိုင်ရာမီးအလင်းများကို ပြင်ပေးထားမည် ဖြစ်ပါသည်။	မပြောပလောက်
	လူမှု - လုပ်ငန်းခွင် ကျန်းမာရေး နှင့် ဘေးကင်းရေး	■ စီမံကိန်းတည်ဆောက်မှုသည် အလုပ်သမားများ၏ ကျန်းမာရေး နှင့် ဘေးကင်းရေးတို့ အပေါ် ထိခိုက်မှုရှိစေ နိုင်သည်။	အတော်အတန်	■ ကန်ထရိုက်တာသည် လုပ်ငန်းမစတင်မီ ကျန်းမာရေး နှင့် ဘေးကင်းရေး အစီအစဉ်ကို ပြင်ဆင်ရေးသားအကောင်အထည်ဖော်သွားမည် ဖြစ်ပါသည်။ ဤအစီအစဉ်တွင် လုပ်ငန်းများ၊ စက်ရုံအသုံးပြုမှုများ၊ တည်ဆောက်ရေးဖြစ်စဉ်များ နှင့် ဘေးကင်းရေးအစီအစဉ်ချမှုများကို ထည့်သွင်းသွားမည် ဖြစ်ပါသည်။ ■ အစီအမံများကို ဖြစ်ပေါ်လာနိုင်သော အန္တရာယ်များ၏ ဖြစ်ပေါ်လာနိုင်မှု နှင့် အကျိုးဆက်တို့ကို လျှော့ချရန် အကောင်အထည်ဖော်သွားမည် ဖြစ်ပါသည်။ ၎င်းတို့တွင်အောက်ပါ အန္တရာယ်တို့ ပါဝင်မည် ဖြစ်ပါသည် - - အမြင့်မှအောက်ပြုတ်ကျခြင်း၊ - ရေထဲပြုတ်ကျခြင်း၊ - စက်ပစ္စည်းများနှင့် ငြိခြင်း၊ - ရှိနေသောအတားအဆီးများ သို့မဟုတ် ကန့်လန့်ခံနေမှုတို့အပေါ် ခလုတ်တိုက်ခြင်း၊ - ချော်နေသော နေရာများတွင် ချော်ကျခြင်း။ - ပြုတ်ကျလာသော ပစ္စည်းများ၊ - အသက်ရှူမွန်းခြင်း၊ - ပေါက်ကွဲခြင်း၊ - အန္တရာယ်ရှိသောအရာများနှင့် ထိမိခြင်း၊ - လျှပ်စစ်ဓာတ်လိုက်ခြင်း၊ - ပြောင်းလဲနိုင်သော မိုးလေဝသအခြေအနေများ၊ - အလွန်လေးပင်သောပစ္စည်းများ မတင်ခြင်း၊ - ယာဉ်အသွားအလာ လည်ပတ်ဆောင်ရွက်ခြင်း။ ■ တည်ဆောက်ရေးလုပ်ငန်းများကို တစ်ဆင့်ခံကန်ထရိုက်တာလုပ်ရသောအခါ ကျွမ်းကျင်၍ ပြည့်စုံသောရင်းမြစ်များရှိသည့် တစ်ဆင့်ခံ ကန်ထရိုက်တာများကို အသုံးပြုသွားမည် ဖြစ်ပါသည်။ ■ တည်ဆောက်ရေးလုပ်ငန်းခွင်တွင် အလုပ်လုပ်နေသော လူများအားလုံးကို လုပ်ငန်းခွင်ရှိ အန္တရာယ်များဆိုင်ရာ သတင်းအချက်အလက်များကို ပြောပြပေးပြီး၊ လုပ်သားများကို ကန်ထရိုက်တာနှင့် ကျန်းမာရေး နှင့် ဘေးကင်းရေးဆိုင်ရာတို့ကို ဆွေးနွေးရန် စီစဉ်ပေးမည် ဖြစ်ပါသည်။ ■ ကန်ထရိုက်တာသည် အလုပ်မစတင်မီ ကျန်းမာရေး နှင့် ဘေးကင်းရေး အစီအစဉ်ကို ပြင်ဆင်၍အကောင်အထည်ဖော်သွားမည် ဖြစ်ပါသည်။ ဤအစီအစဉ်တွင် လုပ်ငန်းများ၊ တည်ဆောက်ရေးအစီအစဉ် နှင့် ဘေးကင်းရေး အစီအစဉ်ချထားမှုတို့အတွက် နည်းလမ်းဖော်ပြချက်များကို ထည့်သွင်းမည် ဖြစ်ပါသည်။ ■ အလုပ်သမားများအားလုံးကို ကျန်းမာရေး နှင့် ဘေးကင်းရေးဆိုင်ရာ ကိစ္စရပ်များနှင့်ပတ်သက်၍ အသေအချာ အသိပေးခြင်း၊ တိုင်ပင်ခြင်း နှင့် လေ့ကျင့်သင်ကြား ခြင်းတို့ကို ဆောင်ရွက်ပေးသွားမည် ဖြစ်ပါသည်။ ■ တစ်ကိုယ်ရေသုံးကွာကွယ်မှုကိရိယာ (PPE) ကို တည်ဆောက်ရေးလုပ်ငန်းခွင်၌ အမြဲတမ်းဝတ်ဆင်ထားရမည် ဖြစ်ပါသည်။ ၎င်းတွင် သင့်လျော်သော ဘေးကင်းရေးရှူးဖိနပ်များ၊ ဘေးကင်းရေးမျက်မှန်များ နှင့် ဦးထုပ်အမာများပါဝင်ရမည် ဖြစ်ပါသည်။ ချော်ကျမှုအန္တရာယ်များကို လျှော့ချရန် မချော်ကျစေသော သို့မဟုတ် ဖိနပ်သံမှိများပါသော ဘွတ်ဖိနပ်များကို ဝတ်ဆင်သွားရမည် ဖြစ်ပါသည်။ ■ အလုပ်မလုပ်မီ၊ သင့်လျော်သော ဘေးကင်းရေးကိရိယာများ နှင့် ရှေ့ဦးသူနာပြုပစ္စည်းများသည် နေရာတကျ ရှိမရှိကို စစ်ဆေးသွားမည် ဖြစ်ပါသည်။ ထုတ်လုပ်သူများက ဖော်ပြထားသည့်အတိုင်း ပုံမှန်အချိန်များတွင် လေရူးထောက်ကူမှုကိရိယာများကို စစ်ဆေးသွားမည် ဖြစ်ပါသည်။ ■ ချီမရေး ကိရိယာများ နှင့် ကရိန်းများအားလုံးကို ပုံမှန် စစ်ဆေးသွားမည်။ ဝန်ချီသည့်လမ်းကြောင်းများအားလုံးကို စောင့်ကြပ်သွားမည် ဖြစ်ပါသည်။ ■ ငြမ်းများအားလုံးကို အလုပ်ရုံများအက်ဥပဒေ (၁၉၅၁) နှင့် ကန်ထရိုက်တာမှ ထိန်းသိမ်းထားသည့် သက်ဆိုင်ရာ မှတ်တမ်းများနှင့်အညီ တပ်ဆင်၍ စစ်ဆေးသွားမည် ဖြစ်ပါသည်။	သာမည

စဉ်	ရင်းမြစ်/နေရာ	ဖြစ်ပေါ်လာနိုင်သော ထိခိုက်မှု	ဖြစ်ပေါ်လာနိုင်သော ထိခိုက်မှုများ၏ အရေးပါမှု	(သက်ဆိုင်ရာ) အဆိုပြုလျှော့ချရေး အစီအမံများ	ကြွင်းကျန် ထိခိုက်မှု၏ အရေးပါမှု
				■ ရေမြုပ်မည့်အန္တရာယ်ရှိသောအခါ၊ အသက်ကယ်အင်္ကျီများကို ပေးထားရမည်။ အလုပ်များဆောင်ရွက်သောအခါ (ရေအနီးတူးဖော်မှုကိုဆောင်ရွက်သောအခါ) တစ်ကိုယ်ရေ ပေါ်လေပေါ်စေနိုင်သောပစ္စည်းများ သို့မဟုတ် ကြိုးများ နှင့် ဘေးကင်းရေးလိုင်းများ၊ နှင့် တစ်ကိုယ်ရေကယ်ဆယ်ရေးပစ္စည်းများ အသင့်ရှိနေစေရမည် ဖြစ်ပါသည်။ ■ ကန်ထရိုက်တာသည် ဟင်းလင်းဖြစ်နေသော တွင်းများနှင့် တူးဖော်မှုများတွင် အန္တရာယ်သတိပေးအမှတ်အသားများဖြင့် သက်ဆိုင်ရာ ဘေးကင်းရေးအတားအဆီးများကို ဆောင်ရွက်ပေးထားမည် ဖြစ်ပါသည်။ ■ EPC ကန်ထရိုက်တာသည် မြန်မာနိုင်ငံက လက်မှတ်ရေးထိုးထားသည့် IFC လုပ်ဆောင်မှု စံသတ်မှတ်ချက် -၂၊ ဒေသတွင်း ဥပဒေ နှင့် ILO ကွန်ဗင်းရှင်းများနှင့် အညီ ဆောင်ရွက်သွားမည် ဖြစ်ပါသည်။ ■ TPMC အနေဖြင့် EPC ကန်ထရိုက်တာ နှင့် ၎င်း၏ တစ်ဆင့်ခံ ကန်ထရိုက်တာများက ကလေးသူငယ် နှင့်/သို့မဟုတ် အတင်းစေခိုင်းမှုများမရှိစေရန် ကွင်းဆက်များကိုထောက်ပံ့ရန် လုပ်အားအလေ့အကျင့်ကို လမ်းညွှန်ရန် နှင့် ၎င်းကို အသုံးပြုရန် ရုံးတွင်းစံနှုန်းကို ရေးဆွဲ၍ စောင့်ကြပ်ကြည့်ရှုစစ်ဆေးသွားမည် ဖြစ်ပါသည်။	
	လူမှု - ယဉ်ကျေးမှု အမွေအနှစ်	■ စီမံကိန်း ခြေရာ နှင့် တည်ဆောက်ရေး လုပ်ငန်းများသည် ယဉ်ကျေးမှုနေရာများအပေါ် သက်ရောက်စေ နိုင်သည်။	မပြောပလောက်	■ တည်ဆောက်ရေးကာလအတွင်း EPC ကန်ထရိုက်တာသည် စီမံကိန်းနှင့်အနီးဆုံး၌ ရှိနေသော ယဉ်ကျေးမှုဆိုင်ရာ အမွေအနှစ်တို့ကို စောင့်ကြပ်ကြည့်ရှုသွားမည် ဖြစ်ပါသည်။ အကယ်၍ စီမံကိန်း၏ ယာဉ်မှ အဆောက်အအုံများကို ပျက်စီးစေလျှင်၊ ပျက်စီးမှုဖြစ်ပေါ်မီ ၎င်း၏အနေမထားသို့ ရောက်ရှိအောင် ပြန်လည်ဆောင် ရွက်ရန် လျော်ကြေး (ငွေဖြင့် သို့မဟုတ် အမျိုးအစားဖြင့်) ကို ပေးရန် စီစဉ်သင့်ပါသည်။ ■ ဘုန်းကြီးကျောင်း အနီး စီမံကိန်းလုပ်ငန်းများသည် (ဥပမာ - ကြီးမားသောကိရိယာများ သယ်ယူခြင်း) အထူးဘာသာရေးလုပ်ငန်းများဆောင်ရွက်နေစဉ် ကာလအတွင်း မဆောင်ရွက်စေရန်အတွက် အနီးဆုံးစေတီ/ဘုန်းကြီးကျောင်းတို့နှင့် ဆွေးနွေးတိုင်ပင်၍ EPC ကန်ထရိုက်တာက အစီအစဉ်များ ရေးဆွဲသွားမည် ဖြစ်ပါသည်။ ■ TPMC သည် စီမံကိန်း၏ အစိတ်အပိုင်းအနေဖြင့် သက်ဆိုင်သူများနှင့်တိုင်ပင်ဆွေးနွေးခြင်းအစီအစဉ်ကို ရေးဆွဲအကောင်အထည်ဖော်သွားမည် ဖြစ်ပါသည်။ စီမံကိန်းတွင် စီမံကိန်းလုပ်ငန်းများကြောင့် ထိခိုက်ခံရသည့် ဒေသခံသက်ဆိုင်သူများထံမှ အကြံပြုချက်များကို ရယူရန် အကြံပြုတိုင်ကြားရေးယန္တရားကိုလည်း ထည့်သွင်းသွားမည် ဖြစ်ပါသည်။	မပြောပလောက်
ခ	**လည်ပတ်ရေးအဆင့်**				
၁.၇	မြင်ကွင်း	သွယ်ယူရေးလိုင်းရှိနေမှုသည် နယ်မြေအတွင်း မြင်ကွင်းကို ကာထားမှုသို့ ဦးတည်စေနိုင်သည်။	အတော်အတန်	■ မြင်ကွင်းများ စိစစ်ခြင်း၊ ဥပမာ - ဒေသရင်းအပင်များဖြင့် လုပ်ငန်းခွင်အဝန်းတစ်လျှောက်ရှိနေခြင်း (တည်ဆောက်ရေးကာလအတွင်း ခုတ်လိုက်ရသည့်အတွက် မဖြစ်မနေအစားထိုးသည့် သစ်ပင်များဖြစ်နိုင်သည်)၊ ■ စီမံကိန်းလုပ်ငန်းခွင်၌ ရရှိနိုင်သောနေရာအတွင်းတွင် မြေယာရှူခင်းရှုကွက်ကို ထိန်းသိမ်းပြုပြင်ခြင်း (ဆိုလိုသည်မှာ၊ အပင်၊ ချို နှင့် မြေကြီးကို အပင်စိုက်ပျိုးခြင်း)၊ နှင့် ■ ဖွဲ့စည်းထားမှုများအားလုံးကို ကောင်းမွန်စွာ ထိန်းသိမ်းခြင်း။	မပြောပလောက်

၁.၇ အများပြည်သူနှင့်တိုင်ပင်ဆွေးနွေးခြင်း နှင့် ထုတ်ဖော်တင်ပြခြင်း

သက်ဆိုင်သူများနှင့်ထိတွေ့တိုင်ပင်ဆွေးနွေးမှုကို စီမံကိန်းကြောင့် ထိခိုက်ခံစားရနိုင်သူများ သို့မဟုတ် စီမံကိန်းကို စိတ်ဝင်စားသူများနှင့် IEE လုပ်ငန်းစဉ်တစ်လျှောက် ဆောင်ရွက်ခဲ့ပါသည်။ သက်ဆိုင်သူများ၏ အမြင်များကို အဆိုပြု စီမံကိန်းကို တိုးတက်ကောင်းမွန်စေရန် နှင့် သင့်လျော်သကဲ့သို့ လျှော့ချရေးအစီအမံများတွင် ထည့်သွင်းထား ပါသည်။ သက်ဆိုင်သူများနှင့် တိုင်ပင်ဆွေးနွေးမှုကို ERM ၏ ဝိုင်းဝန်းကူညီမှုဖြင့် စီမံကိန်းအဆိုပြုသူက လူအားလုံး အထူးသဖြင့် အဆိုပြုစီမံကိန်းကြောင့် ထိခိုက်ခံစားရနိုင်သူများ အတွက် ဖွင့်ထားလျက် ယဉ်ကျေးမှုအရသင့်လျော် သော ပုံစံ နှင့် ဆောင်ရွက်ခဲ့ပါသည်။

တိုင်ပင်ဆွေးနွေးမှုလုပ်ငန်းစဉ်ကို ပူးပေါင်းပါဝင်မှုအတွက် မြန်မာနိုင်ငံဥပဒေ သတ်မှတ်ချက်များ (ပတ်ဝန်းကျင်ထိ ခိုက်မှု ဆန်းစစ်ခြင်းဆိုင်ရာလုပ်ထုံးလုပ်နည်း အမှတ် ၆၁၆/၂၀၁၅ အရ) နှင့် IFC လုပ်ဆောင်မှုစံသတ်မှတ်ချက်များတွင် ဖော်ပြ ထားသည့် တိုင်ပင်ဆွေးနွေးမှုဆိုင်ရာ နိုင်ငံတကာသတ်မှတ်ချက်တို့ကို ပြည့်မီရန် ဒီဇိုင်းရေးဆွဲခဲ့ပါသည်။

ဒိုင်ယာလော့တည်ဆောက်မှုတွင် ပထမအဆင့်သည် စီမံကိန်နှင့် သက်ဆိုင်သူများကို ဖော်ထုတ်သတ်မှတ်ခြင်း ဖြစ်ပါ သည်။ သက်ဆိုင်သူများမှာ စီမံကိန်းတစ်ခုကြောင့် တိုက်ရိုက် သို့မဟုတ် သွယ်ဝိုက်၍ ထိခိုက်ခံရနိုင်သူများ သို့မဟုတ် အုပ်စုများ နှင့် စီမံကိန်း အပေါ် စိတ်ဝင်စား သူများ နှင့်/သို့မဟုတ် စီမံကိန်း၏ ရလဒ်များကို (အပြုသ ဘောဖြင့် သို့မ ဟုတ် အနုတ်သဘောဖြင့်) လွှမ်းမိုးနိုင်စွမ်းရှိသူများ ဖြစ်ကြပါသည်။

စီမံကိန်းအဖွဲ့သည် IEE ကာလအတွင်း စီမံကိန်း သက်ဆိုင်သူများနှင့် ပူးပေါင်းပါဝင်ပြီး ဆက်တိုက်ဖြစ်သော ဒိုင်ယာလော့ တစ်ရပ်ဖြစ်ထွန်းသည် လုပ်ငန်းစဉ်တစ်ရပ်ကို ဆောင်ရွက်ရန် ကတိကဝတ်ထားရှိခဲ့ပါသည်။ တိုင်ပင် ဆွေးနွေးမှု၏ ရည်ရွယ်ချက်များမှာ အောက်ပါအတိုင်း ဖြစ်သည် -

- တိုင်ပင်ဆွေးနွေးသည့်လုပ်ငန်းစဉ်တွင် စီမံကိန်းကြောင့် ထိခိုက်ခံစားရနိုင်သူများ နှင့် စီမံကိန်းအပေါ် စိတ်ဝင် စားသူများ အသေအချာ ပါဝင်စေရန် သူတို့အားလုံးအား ဖော်ထုတ်သတ်မှတ်ရန်၊
- ပွင့်လင်း၍ ယဉ်ကျေးမှုနှင့်သင့်လျော်သည့် ပူးပေါင်းပါဝင်ကာ ပွင့်လင်းမြင်သာမှုရှိသည့် တိုင်ပင်ဆွေးနွေးမှု လုပ်ငန်းစဉ်ဖြင့် နားလည်သဘောပေါက်စေရန်။ သတင်းအချက်အလက်များကို စောနိုင်သမျှစော၍ ထုတ်ပြန်ပြီး ဖြစ်နိုင်သမျှ ပြည့်စုံအောင် တင်ပြခြင်း၊
- သက်ရောက်မှုများဆန်းစစ်ရာတွင်လည်းကောင်း၊ လျှော့ချရေး နှင့် စီမံခန့်ခဲရေး အစီအမံများ ထွက်ရှိစေရာတွင် လည်းကောင်း၊ IEE အစီရင်ခံစာ အပြီးသတ်ရာတွင် လည်းကောင်း သက်ဆိုင်သူများ ပါဝင်စေရန်။ သက်ဆိုင်သူ များသည် ထိခိုက်မှုဆန်းစစ်ခြင်းကို အသိပေးစေမည့် အခြေခံအချက်အလက်များအတွက် ဒေသအသိပညာများ နှင့် သတင်းအချက်အလက်များထောက်ပံ့ရာတွင် အရေးပါသောအခန်းကဏ္ဍတွင်လည်း ပါဝင်ကြပါသည်၊
- ပွင့်လင်းသော ဒိုင်ယာလော့ နှင့် တိုင်ပင်ဆွေးနွေးမှုမှတစ်ဆင့် ဆက်ဆံရေး နှင့် ယုံကြည်မှုတို့ကို တည် ဆောက် ရန်။ သက်ဆိုင်သူများနှင့် ယုံကြည်မှုတည်ဆောက်ရန် TPMC လုပ်ငန်းများနှင့်ပတ်သက်၍ ပွင့်လင်းမြင်သာမှု တည်ဆောက်ရန်၊
- တိုင်ပင်ဆွေးနွေးမှုအတွက် အားလုံးပါဝင်သောချဉ်းကပ်မှုနည်းလမ်းရှိစေရန် အားနည်းချက် (vulnerable) ရှိသူများ နှင့် အုပ်စုများနှင့် ချိတ်ဆက်ရန်။ အချို့ သက်ဆိုင်သူများသည် သူတို့၏ အားနည်းချက်ကြောင့် ဤကဲ့သို့ လုပ်ငန်း စဉ်တွင် အထူးအလေးပေးမှုရှိရန် လိုအပ်သည်၊
- အဆိုပြုစီမံကိန်းအကျိုးရလဒ်များနှင့်စပ်လျဉ်း၍ မျှော်လင့်ချက်များကို စီမံခန့်ခွဲရန်။ တိုင်ပင်ဆွေးနွေးမှုလုပ်ငန်းစဉ် သည် သက်ဆိုင်သူများ နှင့် ရပ်ရွာလူထုမျှော်လင့်ချက်များကို နားလည်မှု နှင့် စီမံမှုတို့အတွက် ယန္တရားတစ်ရပ် ဖြစ်ပြီး၊ မျှော်လင့်ချက်များကိုလည်း လက်လှမ်းမီနိုင်သောနည်းလမ်းဖြင့် တိကျမှန်ကန်သော သတင်းအချက် အလက်များကို ဖြန့်ဝေရာတွင် အောင်မြင်သွားမည် ဖြစ်ပါသည်၊ ထို့ပြင်၊
- လေးစားလိုက်နာစေရန်။ လုပ်ငန်းစဉ်သည် မြန်မာနိုင်ငံ ကြီးကြပ်ရေး ဆိုင်ရာ သတ်မှတ်ချက်များ နှင့် အပြည်ပြည် ဆိုင်ရာ နည်းလမ်းကောင်းများကို လေးစားလိုက်နာစေရန် ဒီဇိုင်းရေးဆွဲခဲ့ပါသည်။

၁.၅.၃ လူမှုအခြေခံအချက်အလက်များ - အဓိကအရေးကြီးသောတွေ့ရှိချက်များ အနှစ်ချုပ်

၁.၇.၁ အများပြည်သူနှင့် တိုင်ပင်ဆွေးနွေးခြင်းလုပ်ငန်းများအနှစ်ချုပ်

အစည်းအဝေးများကို ၂၀၁၉ အောက်တိုဘာလ ၂၉ ရက်နှင့် ၃၀ ရက်နေ့တို့တွင် ဆောင်ရွက်ခဲ့ပါသည်။ ဖိတ်ကြားခဲ့သော သက်ဆိုင်သူများမှာ လှိုင်သာယာ နှင့် တွံတေးမြို့နယ်တို့မှ ကျေးရွာများ၊ MOEE နှင့် ပညာရေးဝန်ကြီးဌာန (MOE) တို့ပါသည်။ အများပြည်သူနှင့်တိုင်ပင်ဆွေးနွေးသည်လုပ်ငန်းများကို စုစုပေါင်း တက်ရောက်သူ ၂၅၀ ဦးရှိခဲ့ပါသည်။ အသေးစိတ်ကို **ဇယား ၁.၅** တွင် တင်ပြထားပါသည်။

ဇယား (၁.၅) - ကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်းကာလအတွင်း ဆောင်ရွက်ခဲ့သည့် တိုင်ပင်ဆွေးနွေးမှုလုပ်ငန်းများ

နေ့စွဲ၊ အချိန်	နေရာ	သက်ဆိုင်သူများ	တက်ရောက်သူ အရေအတွက်
၂၀၁၉ အောက်တိုဘာ ၂၉ ရက်	လှိုင်သာယာမြို့နယ်၊ ကန်ဖျားဘုန်းကြီးကျောင်း၊ အပြင် ပတန်းကျေးရွာအုပ်စု	■ အတွင်း ပတန်းကျေးရွာ ■ အနောက်ပိုင်း ရန်ကုန်နည်းပညာ တက္ကသိုလ် ■ ကန်ပြိုကျေးရွာ ■ MOEE ■ ကန်းပြိုကျေးရွာ ■ သဲကွင်းကျေးရွာ ■ အပြင် ပတန်းကျေးရွာ ■ အတွင်းပတန်းကျေးရွာ ■ မြစ်ကျိုကန်ကွက်သစ်	၁၆၀
၂၀၁၉ အောက်တိုဘာ ၃၀ ရက်	တွံတေးမြို့နယ်၊ GAD ရုံး၊ တော်ဝင် စန္ဒကူးခန်းမ	■ တမံကြီးကျေးရွာ ■ ပညာရေးဝန်ကြီးဌာန ■ ရောင်ပိုင်းကျေးရွာ	၉၀

အများပြည်သူနှင့်တိုင်ပင်ဆွေးသည့် အစည်းအဝေးများအတွင်း မေးမြန်းခဲ့သည့် အဓိက စိုးရိမ်မှုများ နှင့် မေးခွန်းများမှာ မြေရယူမှု နှင့် သီးနှံများအတွက် လျော်ကြေးတို့ ဖြစ်ကြပါသည်။ မေးခွန်းများနှင့် သက်ဆိုင်ရာ အဖြေများကို ***ဇယား (၁.၆)*** တွင် ဖော်ပြထားပါသည်။ အဓိကရေးကြီးသော စိုးရိမ်မှုများ နှင့် မေးခွန်းများအပြည့်အစုံကို ***အခန်း (၁၁.၃)*** တွင် တွေ့ရမည် ဖြစ်ပါသည်။

ဇယား (၁.၆) - အများပြည်သူနှင့်တိုင်ပင်ဆွေးနွေးမှုကာလအတွင်း မေးမြန်းခဲ့ကြသည့် အဓိကရေးပါသည့် စိုးရိမ်မှုများ နှင့် မေးခွန်းများ

မေးခွန်းများ	အဖြေများ
EMP ကို မည်သူ စောင့်ကြပ်ကြည့်ရှုစစ်ဆေးမည်နည်း၊ PowerPoint တွင် တင်ပြထားသည့် ကတိကဝတ်များကို TTCL က မည်သို့ လိုက်နာမည်နည်း။	TTCL - MOEE က စောင့်ကြပ်ကြည့်ရှု စစ်ဆေးမည်၊ TTCL သည် စီမံကိန်းလုပ်ငန်းများ ကာလ အတွင်း အကောင်အထည်ဖော်ဆောင်ရွက်နိုင်ရန် ERM က လျှော့ချရေးအစီအမံများကို ထောက်ပံ့ဆောင်ရွက်ပေးသွားမည်။ ၏ ERM - ECD ကလည်း စောင့်ကြပ်ကြည့်ရှုစစ်ဆေးမည်။
တာဝါ၏ အကျယ်မှာ ဘာလဲ။ ဆလိုက်များတွင် တင်ပြထားသည့်အတိုင်း TTCL က မတည်ဆောက်မှာကို စိုးရိမ်။	TTCL နှင့် MOEE သည် ဆလိုက်များတွင် တင်ပြထားသည့်အချက်အလက်များကို အတည်ပြောကြားခဲ့ကြသည်။
စီမံကိန်းက ဘယ်တော့စတင်မည်နည်း။	TTCL – TTCL သည် ဓာတ်အားဝယ်ယူရေးသဘောတူညီမှုရရှိသောအခါမှသာ စတင်သွားမည်။

မေးခွန်းများ	အဖြေများ
ရိတ်သိမ်းမှုကို စိုးရိမ် အကြောင်းမှာ ၎င်းသည် စပါးပေါ်ရာသီဖြစ်သည်။	MOEE နှင့် TTCL - သူ၏ စိုးရိမ်မှုကို ထည့်သွင်းစဉ်းစားမည်။
လယ်မြေ နှင့် သီးနှံများအပေါ် ထိခိုက်မှုများအတွက် လျော်ကြေးပေးမည်လား။	MOEE - မြေယာလျော်ကြေးပေးမှုကော်မတီတွင် သီးနှံများအပေါ် ထိခိုက်မှုများအတွက် ပေးမည့် ပမာဏနှင့်စပ်လျဉ်း၍ လျော်ကြေးပေးမှု ဆိုင်ရာမူဘောင်ရှိပါသည်။ နောက်ဆုံးပမာဏကို သုံးနှင့် မြှောက်သွားမည်။ စီမံကိန်းဧရိယာအတွင်း ကျရောက်သည့် မြေပိုင်ရှင်များအား ၎င်းမြေတွင် လောလောဆယ်တွင် သီးနှံရှိမနေ လျင်လည်း သီးနှံလျော်ကြေးပေးသွားမည်။ လမ်းဖောက်လုပ်မှုနှင့်စပ်လျဉ်း၍ လျော်ကြေးအခြားအမျိုးအစားတစ်ခုရှိပါသည်။ ထုတ်လုပ်မှုများရှိနေသောနေရာကို လမ်းဖြတ်သွားမှုနှင့်ပတ်သက်၍ သီးနှံများအတွက် သာ လျော်ကြေးပေးသွားမည်။
သွယ်ယူရေးလိုင်းတာဝါ နှင့် လူနေထိုင်ရာ နေရာ များ အကြား ဘေးကင်းသော အကွာအဝေး (ROW) မှာ ဘာလဲ။	MOEE – MOEE ၏ စည်းမျဉ်းစည်းကမ်းများအရ၊ ROW သည် တာဝါစင်တာမှ ဂ၅ ပေး ဖြစ်သည်။ သွယ်ယူရေးလိုင်းသည် မည်သည့် လူနေထိုင်သည့်နေရာကိုမှ ဖောက်ဖြတ်သွားမည် မဟုတ်ဘဲ၊ လယ်မြေများ နှင့် NYDC ဧရိယာရှိ မိန်းလမ်းမတို့ကို ဖြတ်သွားမည်။ လူနေထိုင်ရာနေရာများနှင့်ပတ်သက်၍ စိုးရိမ်စရာမလိုပါ။
လယ်မြေ နှင့် အိမ်များအပေါ် TL က ဖြစ်စေမည့် ထိခိုက်မှုများကို စိုးရိမ်။ ပေ ၁၅၀ (အချင်း) ဧရိယာကို စဉ်းစားသည့် ယခင်လျော်ကြေးပေးမှုရှိသည် - ဤစီမံကိန်းသည် ၎င်းစီမံချက်အတိုင်း စဉ်းစားပါသလား။	MOEE - ဟုတ်ပါသည်။ ၎င်းမှာအတူတူ ဖြစ်မည်။
ပျက်စီးမှုများအတွက် လျော်ကြေးပမာဏမှာ ဘာလဲ။	MOEE - အကယ်၍ လယ်မြေအပေါ် ပျက်စီးမှုများ (ထိခိုက်မှုများ) ရှိလျှင်၊ လျော်ကြေးပေးမည် ဖြစ်ပါသည်။ ပမာဏမှာ ထုတ်လုပ်မှု (သီးနှံများ) အပေါ် မူတည်သည်။ ပျက်စီးမှုအတွက် လျော်ကြေးမှာ အများဆုံး သုံးဆဖြစ်ပါသည်။
အတိတ်မှာ ဖြစ်ပွားခဲ့သည့်အတိုင်း တည်ဆောက်ရေးလုပ်ငန်းများ (ဆိုလိုသည်မှာ စုပုံခြင်းများ၊ အပေါက်များ၊ မြေကို ပြန်မည်ခြင်း) ကြောင့် မြေယာသည် မူလအနေ အထားသို့ ပြန်မရမှုကို စိုးရိမ်သည်။	MOEE - ကြားရတာစိတ်မကောင်းကြောင်း နှင့် နောက်တစ်ခါ ထပ်မဖြစ်စေရန် အာမခံကြောင်း။ MOEE သည် ယင်းကဲ့သို့ ထပ်မဖြစ်စေရန် TTCL ကို တင်းကျပ်စွာ ညွှန်ကြားမည် ဖြစ်ပါသည်။ TTCL – TTCL အနေဖြင့် ကန်ထရိုက်တာအား စီမံကိန်းလုပ်ငန်းများသည် မြေယာကို မြေညှိခြင်းအပါအဝင် ယခင်အနေအထားထိ ရောက်ရှိအောင် ညွှန်ကြားမှုအား အသေအချာလိုက်နာစေမည် ဖြစ်ပါသည်။

၁.၈ နိဂုံး

မြန်မာနိုင်ငံ၊ ရန်ကုန်တိုင်းတဒေသကြီးရှိ အဆိုပြု ဓာတ်အားသွယ်ယူရေးလိုင်းနှင့် ဆက်နွယ်သော ရှုပမျက်နှာသွင်ပြင်၊ ဇီဝ နှင့် လူမှု-စီးပွားထိခိုက်နိုင်မှု အပိုင်းအခြားတို့ကို ဆန်းစစ်ရန် ကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်းကို ဆောင်ရွက် ခဲ့ပါသည်။ သို့ရာတွင်၊ ယခု ESIA ၌ တင်ပြထားသည့် လျှော့ချရေး/စီမံခန့်ခွဲရေး အစီအမံများကို အကောင် အထည်ဖော်ခြင်းဖြင့်၊ *၎င်းသက်ရောက်မှုအများစုသည် အရေးပါမှုနှင့်ပတ်သက်၍ သာမည မှ မပြောပ လောက်သော အဆင့်အထိ (အမြင့်ဆုံး) လျော့ချသွားနိုင်မည်* ဖြစ်ပြီး၊ ယခုအဆိုပြု သွယ်ယူရေးလိုင်း တည်ဆောက်ဆောင်ရွက်မှုကို တားဆီးမည့် ပတ်ဝန်းကျင် သို့မဟုတ် လူမှုဆိုင်ရာ ဆိုးရွားသောအပြစ်အနာအဆာများ မရှိပါ။

ယခု IEE သည် စက်မှုပညာဒီဇိုင်း နှင့် အစီအစဉ်ချရေးအဆင့်အပေါ်အခြေပြု ပြီးမြောက်ခဲ့သောကြောင့်၊ စီမံကိန်း တည်နေရာ၊ တည်ဆောက်ရေးနည်းလမ်းများ နှင့် လည်ပတ်မှုများနှင့်ပတ်သက်သော အပြောင်းအလဲများသည် ဒီဇိုင်း နှင့် အစီအစဉ်ချရေး နောက်ပိုင်းအဆင့်များတွင် ပေါ်လာနိုင်ပါသည်။ ထို့ပြင်၊ တည်ဆောက်ရေးအတွက် EPC ကို မခန့်အပ်

ရသေးသောကြောင့်၊ အပြီးသတ် စီမံကိန်းတည်နေရာများတွင် ပကတိအခြေအနေများ နှင့် ပတ်သက်သော နောက်ထပ် လေ့လာမှုများ၊ ကျယ်ပြန့်သော သက်ဆိုင်သူများနှင့်ချိတ်ဆက်ထိတွေ့မှု နှင့် ခန့်အပ် သည့် EPC၏ လေ့ကျင့်သင်ကြားမှု တို့ကို နောက်ပိုင်း အစီအစဉ်ချသည့်အဆင့်ကာလ နှင့် တည်ဆောက်ရေး နှင့် လည်ပတ်ရေးအဆင့်များတစ်လျှောက် လိုအပ်နိုင်မည်ဖြစ်ပြီး၊ စီမံကိန်းနှင့်ပတ်သက်၍ သိသာသောအပြောင်းအလဲများရှိနိုင်ပါသည်။ TPMC သည် နောက်ထပ် စစ်တမ်းများ နှင့် လေ့လာမှု များဆောင်ရွက်ခြင်းအပါအဝင် အကြံပြုထားသည့် လျှော့ချရေး နှင့် စီမံခန့်ခွဲမှုနည်းလမ်းများ အားလုံး အကောင် အထည်ဖော်ရေး အတွက် နှင့် သက်ဆိုင်ရာ သက်ဆိုင်သူများ နှင့် အာဏာပိုင်အဖွဲ့အစည်းများထံသို့ လုပ်ဆောင်မှုနှင့် ပတ်သက်သော အစီရင်ခံစာများအတွက် တာဝန်ရှိပါသည်။

1. EXECUTIVE SUMMARY

1.1 Introduction

TTCL Power Myanmar Company Limited ('TPMC' and/or 'the Project Proponent') is planning to develop a 25 km long, 230 kV Transmission Line ('the Project') connecting its 388 MW Combined Cycle Power Plant (CCPP) in Ahlone Township to the sub-station located in Hlaingthayar Township, both in Yangon Region.

In January 2018, the Ministry of Electricity and Energy (MOEE) issued the Notice to Proceed (NTP) to TPMC to develop the LNG (Liquefied Natural Gas) Power Plant (Ahlone) Project. The purpose of the Transmission Line is to transfer electricity generated by the new LNG Power Plant (Ahlone) to the nearby sub-station as the electricity will be sold to the Myanmar Power Grid. This Initial Environmental Examination (IEE) will only cover the Transmission Line; while the Project Proposal Report (PPR), Scoping Study, and Environmental and Social Impact Assessment (ESIA) for the LNG Power Plant (Ahlone) is being prepared as separate documents.

The electricity generated from the LNG Power Plant (Ahlone) facility shall be sold to the Myanmar national grid, using a 230 kV transmission line with approximately 25 km long from the power plant substation to the Ministry of Electricity and Energy (MOEE's) proposed substation in Hlaingthayar Township, Yangon Region, Myanmar.

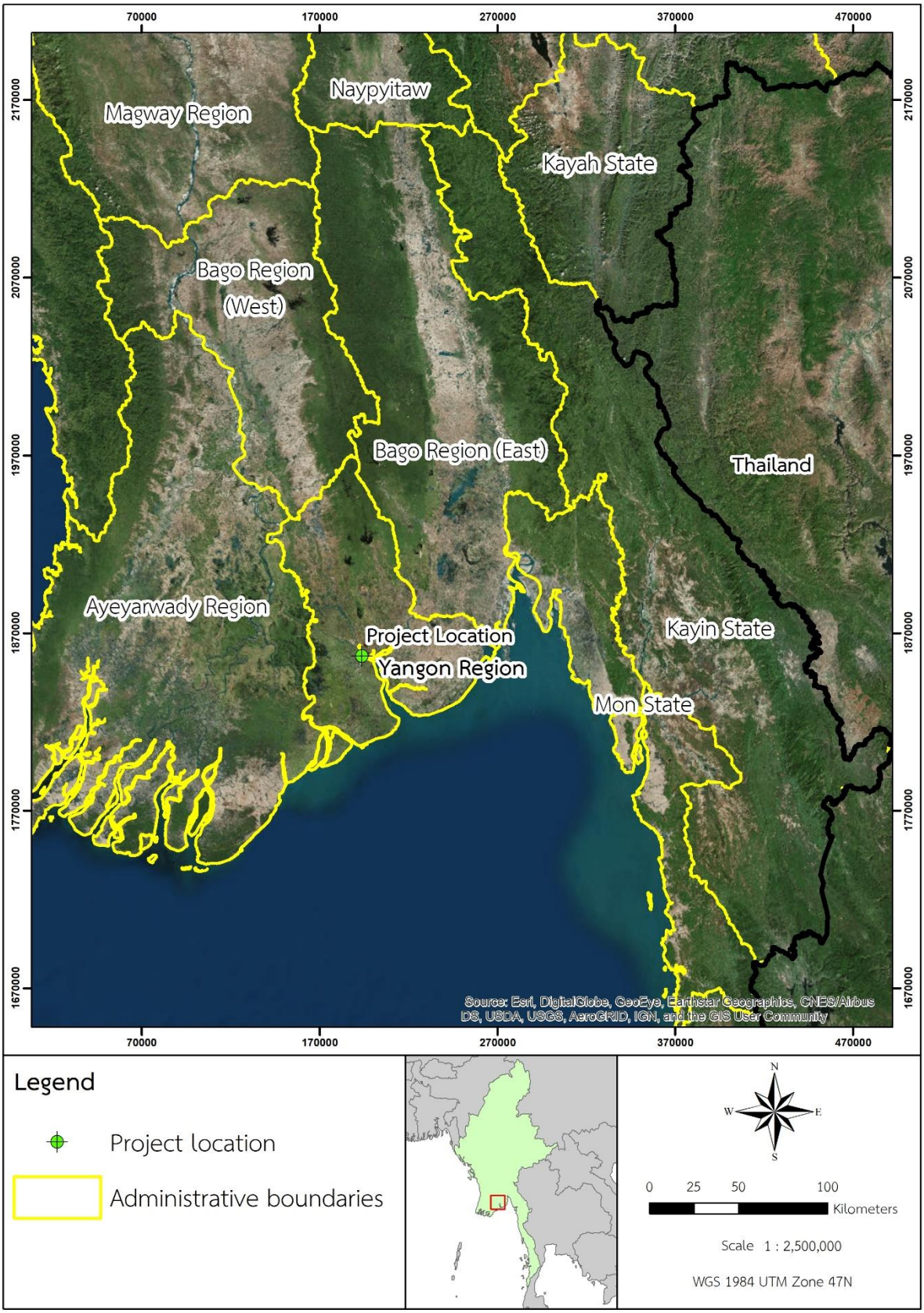
The necessary level of environmental assessment (i.e. IEE OR EIA) for the proposed Project is subject to approval by the Ministry of Natural Resources and Environmental Conservation (MONREC). According to the *Annex 1* of the *EIA Procedure, dated 29th December 2015*, the scope of the proposed Project falls under *Item 24: Electrical Power Transmission Lines ≥ 230 kV (other than the types in item 23)* and will only require an IEE Study.

The Project Proponent has prepared and submitted the Project Proposal Report (PPR) to MOEE and MONREC on 24th December 2018. The PPR recommended that TPMC shall proceed with an Initial Environmental Examination (IEE) Study of the Project and prepare an Environmental Management Plan (EMP) to put forward its commitments for environmental and social mitigation and management measures.

The IEE study, this Report, is prepared in compliance with Myanmar IEE requirements (as per Myanmar *EIA Procedure 2015*) and in line with International Standards, namely IFC PS (International Finance Corporation Performance Standards) and Associated EHS Guidelines.

ERM-Siam Company Limited ('ERM' and/or 'the Consultant') has been appointed by TPMC as third party consultant to undertake the IEE study as proposed in the PPR report.

Figure 1.1: Project Location in Myanmar



Source: TPMC, 2019 (Modified by ERM)

1.2 Context of the Project

TTCL Power Myanmar Company Limited ('TPMC' and/or 'the Project Proponent') is planning to develop a 25 km long, 230 kV Transmission Line ('the Project') connecting its 388 MW Combined Cycle Power Plant (CCPP) in Ahlone Township to the sub-station located in Hlaingthayar Township, both in Yangon Region.

In January 2018, the Ministry of Electricity and Energy (MOEE) issued the Notice to Proceed (NTP) to TPMC to develop the LNG (Liquefied Natural Gas) Power Plant (Ahlone) Project. The purpose of the Transmission Line is to transfer electricity generated by the new LNG Power Plant (Ahlone) to the nearby sub-station as the electricity will be sold to the Myanmar Power Grid. This Initial Environmental Examination (IEE) will only cover the Transmission Line; while a Project Proposal Report (PPR), Scoping Study, and Environmental Impact Assessment (EIA) for the LNG Power Plant have been prepared as separate documents.

Details of the Project Proponent are as follows:

Company Name:	**TTCL Power Myanmar Company Limited (TPMC)**
Address:	16B, 16th Floor, Centre Point Tower, NO. 65, Corner of Sule Pagoda Road and Merchant Street. Kyauktada Township, Yangon, Myanmar
Contact Person:	Ms. Nini San
Telephone:	+95 [0] 9 254 311058 +95 [0] 1 371 962
Fax:	+95 [0] 1 371 963
Email:	nini.s@ttcl.com

The proposed Project is located in Ahlone, Seikgykanaungto, Twantay and Hlaingthayar Townships Yangon Region in the Republic of the Union of Myanmar.

The Transmission Line originates from the existing substation located in the existing Ahlone Power Plant. The proposed Transmission Line will be connected to three (3) new Ahlone bay (not within the scope of this Project) where one of the new bay is coupled with a single 230 kV Transmission Line named, the Hlaingthayar-Ahlone Transmission Line. Moreover, the other 230 kV Transmission Line will be a double circuit type to support sufficient transfer of power.

This transmission line is planned to run parallel to the existing Hlaingthayar-Kyaiklat Transmission Line for the first half of the route then continue to follow the existing Hlaingthayar-Ahlone Transmission Line, while maintaining a set-back distance (spacing between each transmission line/towers) of 23 m from each side. Prior to connecting to the Ahlone sub-station, the Transmission Line will be required to cross the Yangon River. Majority portion of the route coverage are agricultural and shrubs area with small settlements.

1.3 Policy and Regulatory Framework

Under Section 7 of the Environmental Conservation Law and Articles 52 and 53 of the Environmental Conservation Rules of the Republic of the Union of Myanmar, TPMC is required to undertake an IEE to obtain an Environmental Compliance Certificate (ECC) for the proposed Project.

The Project will be undertaken in line with national regulation and international standards. Local laws relating to IEE include: Environmental Conservation Law (2012); Environmental Conservation Rules (2014); National Environmental Quality (Emission) Guidelines (2015); and the Environmental Impact Assessment (EIA) Procedure (2015).

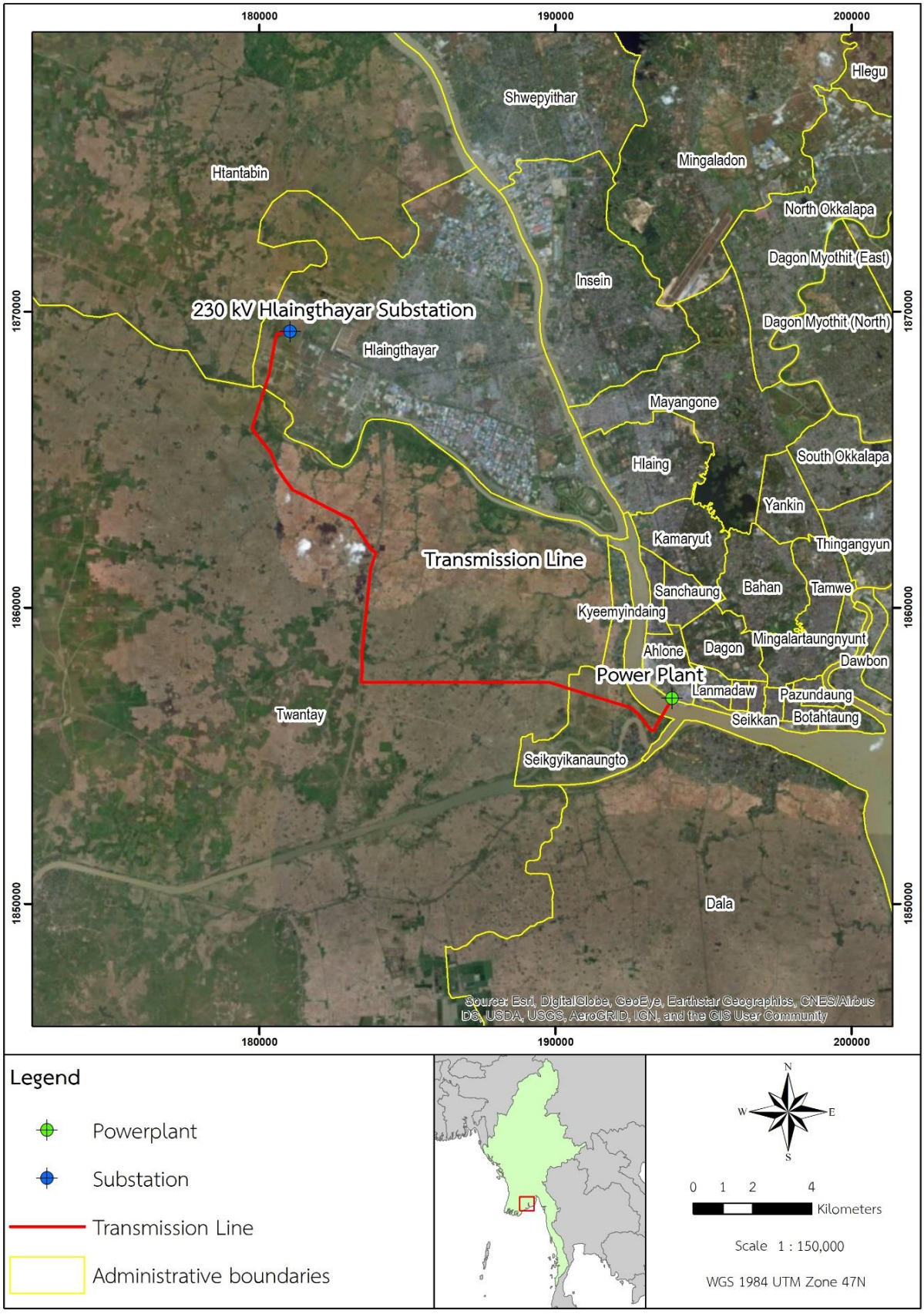
With the release of the final Myanmar EIA Procedure in December 2015, the National Environmental Quality (Emissions) Guidelines were also released. These Guidelines provide the basis for regulation and control of noise and air emissions and effluent discharges from projects in order to prevent pollution and protect the environment and public health.

1.4 Project Description

1.4.1 Project Location

The Project Site is located in four (4) Townships namely: Ahlone, Seikgyikanaungto, Twantay, and Hlaingthayar, Yangon Region in the Republic of the Union of Myanmar. The proposed Project Location is presented in ***Figure 1.1*** and Transmission Line alignment is presented in ***Figure 1.2.***

Figure 1.2 Proposed Transmission Line Alignment



1.4.2 Project Key Components

The Transmission Line components include:

- Transmission Line (conductors);
- Transmission Tower;
- Switchyard and Substations;
- Connectivity;
- Right of Way (ROW) and Crossings; and
- Access Roads

1.4.3 Construction Phase

Construction of the Transmission Line will include the followings activities.

1.4.3.1 Earthwork

Earthworks will include clearing of vegetation and grading of the Project site. It is expected that the subsoil, which will be stripped and removed from the Project site, shall be utilised for levelling and/or backfilling. The construction site will be required to cross over a large river, therefore careful consideration is required for erection of the Transmission Tower and connecting of Transmission Line over the water body.

1.4.3.2 Access Roads

The existing roads are not capable of supporting the types of vehicles required for construction of the Transmission Line; therefore sections of new road construction and upgrading of roads will be required prior construction materials, equipment (machineries) and workforce can be mobilized.

1.4.3.3 Construction (Temporary) Camp

To minimize travel, temporary worker's construction camp will be set up within reasonable travelling distance to the construction area. Various teams will be travelling in parallel to the construction-site which will move continuously with the progression of the Transmission Line.

1.4.4 Operation Phase

In general, operation and maintenance activities of Transmission Line system involve periodic inspections, and management of system and structural components as well as clearing of ROW at the towers location. It is anticipated that minimal physical operation or workforce is require during this phase.

1.4.5 Construction Schedule

The Transmission Line is estimated to be constructed within 25 months. The construction tentative schedule is presented in ***Table 1.1***.

Table 1.1: Tentative Project Schedule

Project Schedule	Tentative Date
Completion of Feasibility Study	-3rd Month to -1st Month (Lead time before site work)
Stakeholder Engagement	1st Month – 3rd Month
Final IEE Study	1st Month – 3rd Month
Site Preparation	7th Month – 10th Month

Project Schedule	Tentative Date
Detailed Engineering	1st Month – 10th Month
Procurement	10th Month – 18th Month
Construction	7th Month – 24th Month

Source: TPMC, 2018

It is noted the above Project Schedule is tentative and subject to be changed and updated

1.4.6 Workforce

The indicative number of workers estimated to be working on-site during the construction phase of each task for the Project is shown in ***Table 1.2***.

Table 1.2: Estimated Number of Workers Expected On-site

Item no.	Type of work	No. of workers	Locals workers	Expats workers (specialists/ skilled workers)
1	Tower Erection	40	24	16
2	Cable Pulling and Installation	75	40	35
3	Foundation Construction	60	36	24
	Construction (Total)	175	100	75

Source: TPMC, 2019

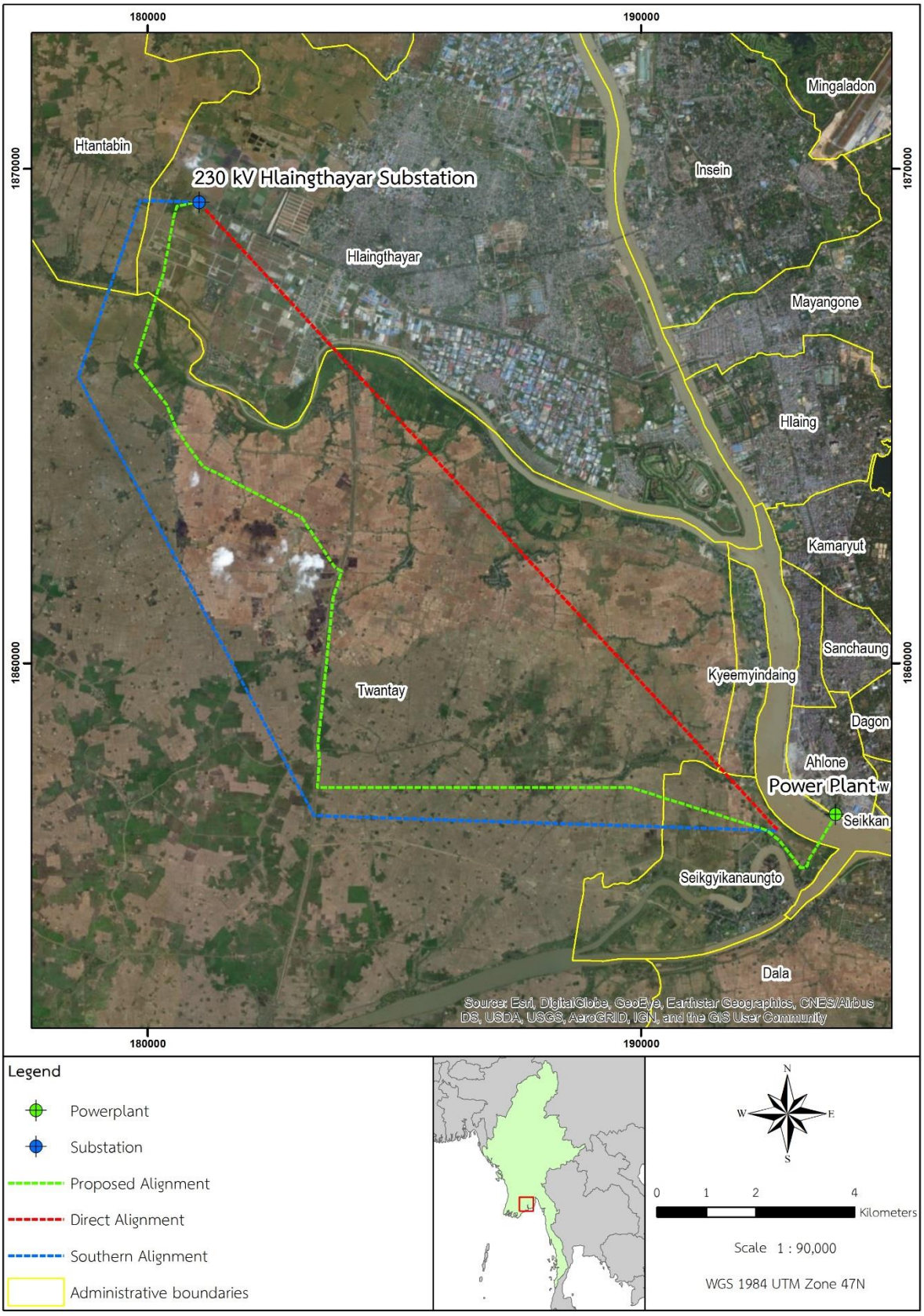
1.4.7 Alternative Considered

There were three (3) Transmission Line route options which form part of the route selection study, these were (as shown in ***Figure 1.3***):

- A direct alignment to the sub-station, 17.4 km long;
- The proposed alignment, 25 km long; and
- A Southern alignment, 24.47 km long.

The proposed and chosen route and layout is assessed as the most feasible with consideration to the safety, environmental, biological and socio-economic impacts aspects.

Figure 1.3: Alternative and Proposed Transmission Route



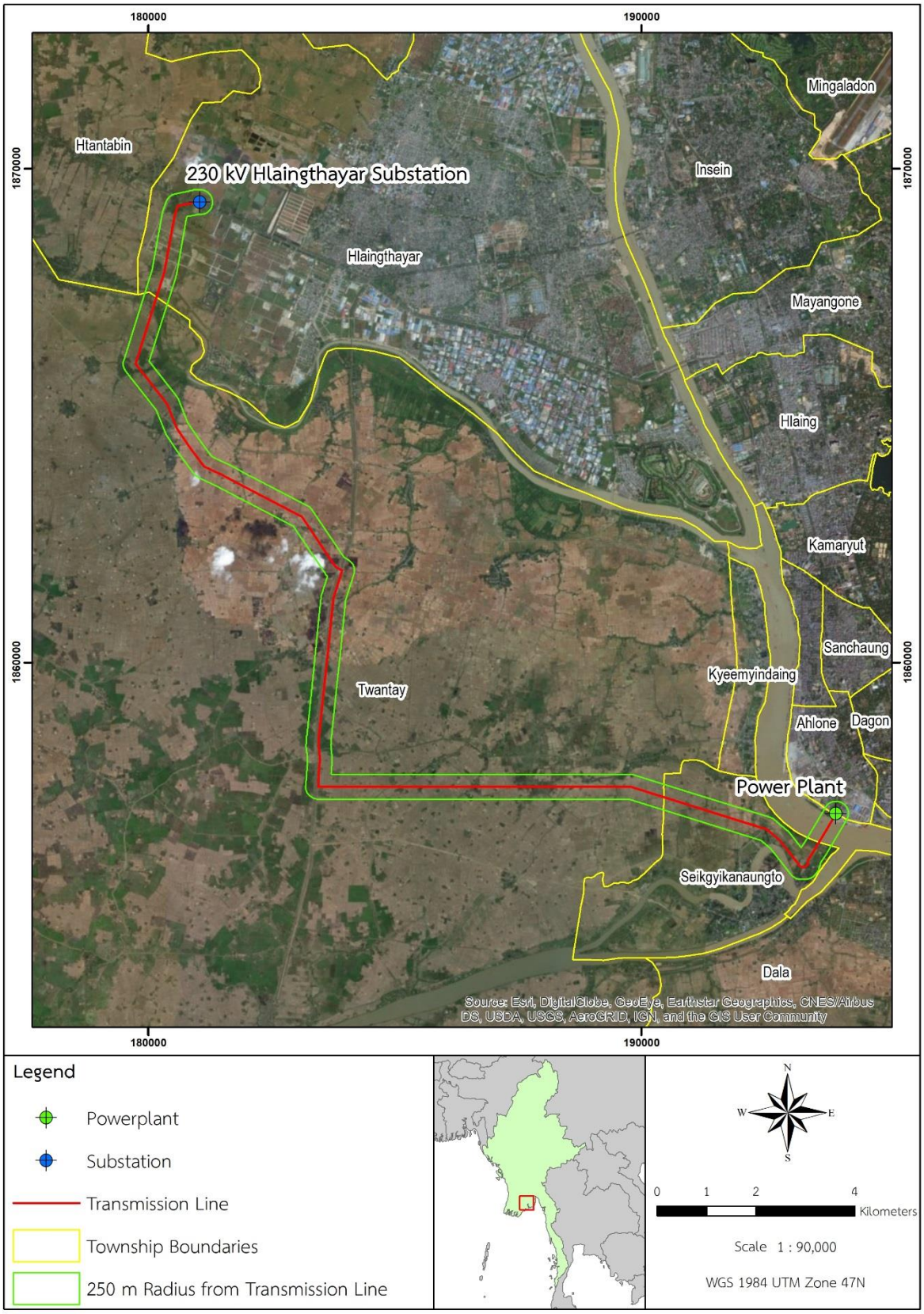
Source: TPMC, 2019

1.5 Project Environmental, Biological and Social Context

The Study Area of this Project will cover 250 m (0.25 km) each side of the Transmission Line. This is based on initial review of sensitive receptors, and ERM's past experience. The Study Area cover the entire Area of Influence (AoI) of the Project (i.e area potentially impacted by the Project) for environmental and biodiversity component of the environment. It also cover all the social receptors that might be directly impacted by the Project, although the social baseline also covered a larger area in order to ensure inclusiveness of all potential socio-economic, health and cultural heritage components present in the AoI of the Project. The study area is shown in ***Figure 1.4***.

The Transmission Line is developed in order to deliver the electricity generated by the LNG (Ahlone) Power Plant to the proposed sub-staation. An Environmental and Social Impact Assessment (ESIA) has been prepared for the LNG (Ahlone) Power Plant Project and the study area for this ESIA partially overlapped with the study area for this IEE study. When possible and relevant, primary and secondary data collected for the ESIA study have also been included in this report to supplement secondary data collected specifically for this IEE study. This apply to physical, biological and social environment data. ERM in-house data base, based on previous studies realised in the area, has also been used when possible to complement the baseline information included in this report.

Figure 1.4 Project Study Area



1.5.1 Physical Environment Baseline: Summary of Main Findings

The main findings of each physical environmental parameters are as follows.

1.5.1.1 Ambient Air Quality

Air quality data that was collected for the LNG (Ahlone) Power Plant ESIA (refered above) determined that air quality monitoring for both dry and wet seasons indicate at least three different parameters ($PM_{2.5}$, PM_{10}, and SO_2) exceed at some location the Myanmar emission guideline values (National Emission Quality Guideline). This is consistent with other air quality monitoring realised previously in the region.

1.5.1.2 Climate and Meteorology

Most of Myanmar belongs to the tropical region characterised by a tropical monsoon climate with three well-defined seasons: summer, rainy and cold seasons. The summer months are from March to Mid-May. The rainy season typically lasts from mid-May to the end of October and the cold season starts in November and lasts up to the end of February. These data are relevant for the study area.

1.5.1.3 Noise

Noise level data that was collected for the LNG (Ahlone) Power Plant ESIA (refered above) determined the noise condition as follows:

- According to the noise baseline results, nine out of ten noise monitoring stations that exceeded the Myanmar standard for at least one time period; and
- Possible sources of high noise levels include the existing Power Plant, traffic activities, human activities, and rain/weather events.
- Given the similar environment and proximity between the noise monitoring stations location used for the ESIA and the Study area of the IEE, these result are considered relevant for this study.

1.5.1.4 Surface Water

Surface water quality data that was collected for the LNG (Ahlone) Power Plant ESIA (refered above) determined the water quality as follows:

- Total Dissolved Solid (TDS) concentrations at all sampling locations (4,052 – 12,760 mg/L) exceeded the United States Environmental Protection Agency (EPA) Standard (250 mg/L). Manganese concentrations at most sampling locations (0.22 – 1.40 mg/L), exceeded the EPA (Environmental Protection Authority) Standard (0.05 mg/L); and
- All other parameters are found to be within the Myanmar Standard, IFC Standards, and EPA Standards.
- Given the similar environment and proximity between the surface water sampling stations location used for the ESIA and the Study area of the IEE, these result are considered relevant for this study.

1.5.1.5 Soil

Soil quality data that was collected for the LNG (Ahlone) Power Plant ESIA (refered above) determined the soil quality as follows:

- One of the sampling site (SO_2) exceeded the target value for copper in top soil, and at another sampling location (SO_4) exceeded the Dutch Standard for copper in subsoil (between 37.44 and 38.29 mg/kg). Sub-soil at site (SO_2) also exceeded the target value for mercury (1.04 mg/kg).
- Other remaining sampling sites and parameters were found to be within the Dutch Standard.

1.5.1.6 Groundwater

Groundwater quality data that was collected for the LNG (Ahlone) Power Plant ESIA (refered above) determined the water quality as follows:

- The productivity of aquifers near the Study Area can be classified as “Strong Pore Water”, or “Weak Fissure Water”, and groundwater quality is considered “Fresh Groundwater”. The groundwater type ranges from “Pore Water” to “Fractured Water”. Groundwater resources classifications consist of "Discontinuous Aquifer in Hilly Area" and "Continuous Aquifer in Plain and Intermontaine Basin", with Natural Recharge Modulus ranging from 200,000-500,000 m3/km2-yr.
- Parameters than exceeded the relevant standards/guidelines include Total Dissolved Solids (TDS), Nitrate (NO_3), Iron (Fe), Manganese (Mn), and Chloride (Cl).
- All other parameters were found to be within the Myanmar standards, EPA, and WHO guidelines.

1.5.2 Biological Baseline: Summary of Main Findings

The main findings of each biological aspects are as follows.

1.5.2.1 EcoRegion

- The Project Study Area resides within the Myanmar Coastal Mangrove [IM1404] EcoRegion. This ecoregion, specifically the Irrawaddy (Ayeyarwady) mangrove region, would naturally be dominated by mangrove flora but has been seriously degraded in recent history; and
- The EcoRegion is currently classified as Critical/Endangered; however, this is a generalization of a large area (21,238 km^2) and may not represent specific differences in habitat types and conditions within the area. The proposed Project is located in areas that do not contain any important natural habitat that defines the characteristics of this EcoRegion, considering the area has been considerably degraded by human activities.

1.5.2.2 Key Biodiversity Areas (KBA)

- Three (3) Key Biodiversity Areas are located within 30km from the Project Site. These sites are the Hlawga Reservoir, Maletto Inn and Payagyi KBAs which contain critically endangered, endangered and vunerable species of conservation concern. These are far out of the Area of Influence of the Project.

1.5.2.3 Protected Areas (PA)

- One (1) protected area lies within 50km of the Study Area, The Hlawga Park, which is located18 km to the northeast of the Project.

1.5.2.4 Species of Conservation Significance

Species of conservation significance found within the species grid location from the Integrated Biodiversity Assessment Tool (IBAT) include 19 bird species, 1 fish species, 7 mammal species, 3 plant species, and 3 reptile species. These species are evaluated as either Vulnerable (VU), Endangered (EN), or Critically Endangered (CR), according to the IUCN Red List.

Flora

Biodiversity data that was collected for the LNG (Ahlone) Power Plant ESIA refered above determined the flora baseline as follows:

- Twenty-three (23) flora species were identified during the surveys; and

- The majority of other flora identified was identified as Least Concern (LC); Data Deficient (DD) or Not Evaluated (NE). No species of conservation significance were detected that would trigger a Critical Habitat assessment.

Fauna

Biodiversity data that was collected for the LNG (Ahlone) Power Plant ESIA refered above determined determined the fauna baseline as follows:

- A total of fourteen (14) bird species were detected during the survey. All species were identified as Least Concern on the IUCN Red list.
- One mammal species was recorded during the survey, the delta pigmy rice rat *Oligoryzomys nigripes.* The common grey mongoose (*Herpestes edwardsii*) is known to be in the vicinity of the site but was not recorded during the survey. No species were determined to be conservation significant and would hence trigger a Critical Habitat assessment.
- A total of two (2) species of reptile and no amphibian species detected during the surveys. All species were classed as Least Concern or Not Evaluated under the IUCN Red List.
- From ERM in-house database, numerous black-headed gulls (*Chroicocephalus ridibundus*) were observed at waters neighbouring the Project Site. Aquatic habitat in the vicinity of the Project Site appears to have negligible ecological value.

Invasive Species

- Invasive species have the capacity to exacerbate their role in ecosystem degradation through combination threats by habitat change, climate change over-exploitation of ecosystem resources and pollution, which further enhances their threat to biodiversity and the human condition (Emerton and Howard, 2008).
- According to the Global Invasive Species Database (GISD) (2015), 97 species have been identified as invasive species in Myanmar.

1.5.2.5 Land Class Mapping

Satellite imagery was used to map the land classes identified within the Study Area and Area of Influence. The major land classes identified include agriculture, mangrove, scrub land and grassland, Urban and residential, standing water/waterlogged and riverine.

1.5.2.6 Natural Habitat and Modified Habitat

IFC PS6 requires the assessment of the distribution of Natural Habitat and Modified Habitat in order to identify risks and mitigations to biodiversity values during the impact assessment phase.

The total area of natural habitat and modified habitat within the Study Area and Area of Influence is shown in ***Table 1.3***.

Table 1.3: Areas of Natural Habitat and Modified Habitat within the AoI

Habitat Type	Project Area (ha)	Area of Influence (ha)
Natural Habitat	0	49.86
Modified Habitat	1.705	1261.69

Source: ERM, 2019.

1.5.3 Social Baseline: Summary of Main Findings

The main findings of each social aspects are as follows.

1.5.3.1 Demographics

- The region covers an area of approximate 10,171.30 km^3, which is divided into 4 districts (Yangon North, Yangon East, Yangon West and Yangon South), 33 townships, 742 wards and 2,170 villages[4] Total population is around 7 million peoples, with 52.2% female;
- Citizens are mostly aged between 15 – 64 years old; and
- The majority of the population in the Study Area are Bamar people; Bamar people are the dominant ethnic group in Myanmar, with a population of more than 30,110,000 people. There are, however, small numbers of Kayin, Mon, and Rakhine living in the Study Area.

1.5.3.2 Livelihood and Economy

In the agricultural field, rice, beans and pulses are the main crops, produced. Other agricultural activities consist of jute, rubbers, groundnut and sugarcane. Along the Yangon River, rice mills and sawmills can be found.

Small scale artisanal fishing takes place in the Yangon River, including around the Project sites. It is reported that fishermen make around 20,000 kyats (~17 USD) daily from fishing which is conducted using traditional cast-nets. Yangon is a main landing site for fish in Myanmar with a fish market at San Pya in Ahlone Township near the Project Site.

In the Yangon region, unemployment rate between men (4.3%) and women (3.9%) in Yangon is almost similar, percentage of men in labour force (81.8%) is significantly larger than percentage of women (46.4%). This is because Yangon is the main centre for trading and handling for many foreign commerce in Myanmar

1.5.3.3 Social Infrastructure

Yangon has various transport infrastructures, including port, Thilawa deep-water port, airport, roads, bridges, flyovers, highway and Twantay Canal, which connects Yangon River with Irrawaddy River. Importantly, Yangon is the terminus of five railway lines. There are number of roads, connecting Yangon region with other regions in Myanmar as well. In addition, it is reported that rural access index of Yangon is 60%. According to Asian Development Bank, the rural access Index (RAI) is “an internationally used indicator that shows the portion of the rural population that lives less than 2 km away from an all-season road”.

1.5.3.4 Health Infrastructures

In 2016, in Yangon region, there were 85 hospitals, 11,610 sanctioned beds, 12,260 available beds, 527,308 admissions, 525,851 discharges and deaths, 3,537,276 patient days, 16,656 numbers of death, hospital death rate at 3.2%, and 2,516,767 out-patient attendance. Sanctioned bed is the official bed capacity of the hospital. Regarding to health facilities and hospitals, almost 70 percent of children in Yangon are born in health facilities.

1.5.3.5 Education

The 2014 data shows that in Yangon region, literacy rate of citizens aged of 15 years old and above is 96.6%, which is calculated from literacy rate in men (98%) and women (95.5%). The total numbers of schools are 2,717 schools, which include of 198 high schools, 255 middle schools and 2,264 primary schools. MIMU data show in 2014 that majority of citizens accomplished primary schools.

[3] Yangon Region, A Snapshot of Child Wellbeing. Accessed on 24 October 2018 at https://www.unicef.org/myanmar/Yangon_Region_Profile_30-07-15.pdf

[4] The 2014 Myanmar Population and Housing Census (Yangon Region). Accessed at 24 October 2018 at http://www.dop.gov.mm/sites/dop.gov.mm/files/publication_docs/yangon_region_census_report_-_english.pdf

1.5.3.6 Cultural Heritage

Yangon Region has a number of culturally significant areas, particularly Buddhists sites. Pagodas and monasteries found in these areas are considered as important cultural centres for the local communities. There are a number of important designated heritage buildings within 5 km of the Project Site such as the Shwedagon or Sule Pagoda. There is no cultural heritage in the footprint of the Project sites.

1.6 Impacts and Associated Mitigation Measures

A summary of the impact assessment outcomes and mitigation measures for both the construction and operation phases for the Transmission Line are provided in ***Table 1.4***.

The environmental and social monitoring programme for the Transmission Line is provided in ***Table 1.5***.

Table 1.4: Summary of Impacts and Mitigation Measures for the Transmission Line

S. No.	Resource/Receptor	Potential Impact	Significance of Potential Impacts	Proposed Mitigation Measures (if applicable)	Residual Impact Significance
A	**Site Preparation and Construction Phase**				
1.1	Air Quality	Dust emissions from Project activities have the potential to impact to air quality, human health, and ecology.	Moderate	■ All dust and air quality complaints will be recorded, the cause identified and appropriate measures such as those presented in this table will be implemented or intensified to reduce dust emissions in a timely manner; ■ Watering will be used to suppress wind and physical disturbance dust generation; ■ Ensure an adequate water supply on-site for effective dust suppression and mitigation; ■ Re-vegetate earthwork and exposed areas as soon as is practicable; ■ Use hessian, mulches or tackifier where it is not possible to revegetate, or cover with top soil as soon as is practicable; ■ Sand and other aggregates will be stored in bunded areas and will not be allowed to dry out unless this is required for a particular process, in which case additional control measures such as those discussed in 'General Construction' will be applied; ■ All vehicles will switch off engines when stationary; ■ A regular vehicle and machinery maintenance and repair programme will be implemented; ■ Ensure that all vehicles entering and leaving the site are covered to avoid fugitive emissions during transport; and ■ Regularly dampen/clean the site access and local roads to remove any materials tracked out of the site.	Minor
1.2	Greenhouse gas	Use of onsite vehicles and heavy machineries for construction have the potential to increase greenhouse gas emissions	Negligible	■ Implement the same mitigation measures to minimize impacts to Air Quality (***No 1.1***); ■ Develop and implement preventive maintenance plan for machines, and engines to ensure combustion efficiency; and ■ Develop vehicle and machine maintenance plan.	Negligible
1.3	Noise level	Transportation and operation of workers, equipment and materials have the potential to increase noise levels in the area.	Moderate	■ Normal working hours of the contractor should be between 07:00 and 22:00 hours from Monday to Saturday (except holiday). If work needs to be undertaken outside these hours, it should be limited to activities that do not lead to exceedance of noise criteria at nearby NSRs and avoid early morning and night time construction; ■ Only well-maintained equipment should be operated on-site; ■ Regular maintenance of equipment such as lubricating moving parts, tightening loose parts and replacing worn out components should be conducted; ■ Machines and construction items (e.g. trucks) that may be in intermittent use should be shut down or throttled down between work periods; ■ Reduce the number of equipment operating simultaneously as far as practicable; ■ Orientate equipment known to emit noise strongly in one direction so that the noise is directed away from receptors far as practicable; ■ Noise impacts from activities (such as piling and blasting activities) should be properly reduced by shielded by implementing control measures (e.g. erecting temporary noise barriers and deflectors) whenever applicable; ■ Locate noisy plant (such as bulldozers, backhoes, rollers, hydraulic hammer and lorry mounted concrete pump) as far away from receptors as practicable; and ■ Avoid transportation of materials on- and off-site through existing community areas.	Minor
1.4	Surface Water	Construction consumption has the potential to impact surface water quality and quantity.	Moderate	■ Exposed soil surfaces should be protected by paving or fill material as soon as possible to reduce the potential of soil erosion; ■ Open stockpiles of construction materials or construction wastes on-site should be covered with tarpaulin or similar fabric during rainstorms; ■ Use methods for minimising sediment runoff, as appropriate to the conditions on-site, including wheel cleaning facilities; ■ Design drainage system for the controlled release of storm flows; ■ Protect temporary trafficked areas on-site with coarse stone ballast or equivalent; ■ Regularly, and particularly following rainstorms, inspect and maintain drainage systems and erosion control and silt removal facilities to ensure proper and efficient operation at all times; ■ Provide measures to reduce the ingress of site drainage into excavations. If trenches have to be excavated during the wet season, excavate and backfill them in short sections wherever practicable. Discharge any water pumped out from trenches or foundation excavations into storm drains via silt removal facilities; ■ Stabilise exposed areas, where practicable and appropriate; ■ Re-vegetate areas promptly, where practicable and appropriate; and ■ Provide measures to prevent the washing away of construction materials, soil, silt or debris into any drainage system of open stockpiles of construction materials. ■ Debris and refuse generated on-site should be collected, handled and disposed of properly to avoid entering the receiving waters. Stockpiles of cement and other construction materials should be kept covered when not being used; ■ Oils, fuels and chemicals should only be used and stored in designated areas which have pollution prevention facilities. The bund should be drained of rainwater after a rain event;	Negligible

S. No.	Resource/Receptor	Potential Impact	Significance of Potential Impacts	Proposed Mitigation Measures (if applicable)	Residual Impact Significance
				■ The oil contaminated water will be collected and handled by local licensed waste water sub-contractors (if available, to be determined at the later stage); ■ On-site oil-water separators and holding facilities should be installed to accommodate and unanticipated releases of oily water; and ■ Surface run-off from bunded areas should pass through oil/water separators prior to discharge to the storm water system. The following mitigation measures are specifically designed to manage sewage generated on-site from the workforce: ■ Where no public sewage treatment system is available sanitary waste water will be treated by domestic waste water unit. The EPC contractor will provide the domestic waste water unit which is designed and installed to treat all domestic wash and wastewater and sewage during construction. All effluents shall comply with Myanmar NEQ guidelines for emissions into the environment, as appropriate; ■ All other chemical waste or oil contaminated water will be collected and sent off-site for appropriate treatment, local treatment facilities to be identified. ■ Provision of temporary sewage treatment facilities; and ■ Sewage from toilets, kitchens and similar facilities should be discharged into a foul sewer or appropriate receiving facility. Wastewater collected from canteen kitchens, including that from basins, sinks and floor drains, should be discharged into foul sewers via grease traps. The foul sewer should then lead to the temporary sewage treatment plant prior to discharge.	
1.5	Soil	Improper management during site clearance and excavation activities can lead to loss of soil.	Moderate	■ Exposed soil surfaces should be protected by paving or fill material as soon as possible to reduce the potential of soil erosion; ■ Open stockpiles of construction materials or construction wastes on-site should be covered with tarpaulin or similar fabric during rainstorms; ■ Delineation of site boundaries to limit the areas to be cleared; ■ Scheduling clearance activities (if possible) to avoid extreme weather events such as heavy rainfall, extreme dry and high winds; ■ Use methods for minimising sediment runoff, as appropriate to the conditions on-site, including wheel cleaning facilities; ■ Design drainage system for the controlled release of storm flows; ■ Protect temporary trafficked areas on-site with coarse stone ballast or equivalent; ■ Regularly, and particularly following rainstorms, inspect and maintain drainage systems and erosion control and silt removal facilities to ensure proper and efficient operation at all times; ■ Provide measures to reduce the ingress of site drainage into excavations. If trenches have to be excavated during the wet season, excavate and backfill them in short sections wherever practicable. Discharge any water pumped out from trenches or foundation excavations into storm drains via silt removal facilities; ■ Stabilise exposed areas (for example via mulching), where practicable and appropriate; ■ Revegetate areas with temporary land use, conducting progressive rehabilitation; ■ Minimize the amount of soil handling; ■ Spray water on stockpiles of excavated material or backfill; ■ Demarcate routes for movement of heavy vehicles to minimise disturbance of exposed soils and compaction of sub-surface layers; ■ Reuse topsoil as much as possible within rehabilitation activities; ■ Stripping and placing soils when dry, and not when wet; ■ Control erosion through diversion drains, sediment fences, and sediment retention basins; and ■ Where topsoil is to be stored for later use in rehabilitation activities, the following basic principles are to be applied: - Stockpiles to be separated into topsoil and sub-soil and be located at least 50m from any surface water source or groundwater well; - To the extent possible, stockpiles are to be located in areas surrounded by natural wind barriers to minimise the potential for wind erosion; - Stockpile storage areas are to be prepared in advance of the removal of topsoil as much as possible; and - Topsoil heights are to be restricted in height to 2 m above ground level to minimise wind erosion, and they are only to be partially compacted on the upper layer in order to promote aeration, maintain soil vertical structures, reduce runoff and encourage infiltration.	Minor
1.5	Groundwater	Impact on soil can lead to groundwater impacts.	Moderate		Minor

S. No.	Resource/Receptor	Potential Impact	Significance of Potential Impacts	Proposed Mitigation Measures (if applicable)	Residual Impact Significance
				The following mitigation measures are designed specifically for unplanned events and should be adapted accordingly to the unplanned situtaions: ■ Ensuring adequate quality control and quality assurance checks during construction of the ash disposal pond; ■ Use of spill or drip trays to contain accidental spills and leaks; ■ Use of spill control kits to contain and clean small spills and leaks; ■ Storage of chemicals, fuel, and oil in adequately bunded impervious areas, as per international bunding and storage requirements; ■ Appropriate management of domestic wastewater; ■ Appropriate management, storage and disposal of waste; and ■ Implement a training program to familiarise staff with emergency procedures and practices.	
1.6	Waste	Inappropriate storage of waste can lead to impact on physical, biological and social baseline.	Minor	■ Implement the same mitigation measures to minimize impacts to soil, groundwater and surface water (No 1.4 and No 1.5); ■ Ensure the integrity of wastewater storage unit to avoid leaking of wastewater and odor to the surrounding receptors; ■ Establish waste management priorities and hierarchy at the outset of activities based on an understanding of potential environmental, health and safety risks and impacts; ■ Use appropriate waste containers and build secondary containment around chemical or waste storage on-site to avoid spillage of waste and leakage of leachate during waste storage on-site; ■ Use only appropriate waste collectors if can be identified; ■ Minimise windblown litter and dust during the transportation of waste by either covering the load on the trucks or by transporting the waste in enclosed trucks; ■ Siting of chemical and waste storage should consider nearby receptors, i.e. site away from watercourses or portable water sources; ■ Segregate and store different types of waste in different containers, skips or stockpiles to enhance reuse or recycling of material and their proper disposal; ■ Properly store the construction materials to minimise the potential damage or contamination of the materials; ■ Enforce rules that prevent inappropriate materials going into the sanitary wastewater stream; ■ Design discharge point to be furthest away from sensitive receptors; ■ When transporting biomass waste, ensure to minimise windblown litter and dust during transportation of waste by either covering the load on the trucks or by transporting the waste is enclosed trucks; ■ Designate suitable areas of the worksites for segregation and storage of the various materials; ■ Any biomass not taken by the local community is to be appropriately stored (or immediately mulched) for later use within site stabilisation and rehabilitation activities; ■ Site clearance and preparation is to be designed and conducted in a manner that requires minimum removal of vegetation; ■ Conduct regular maintenance and upkeep of the incinerator to maintain its efficiency and consequently minimise emission; ■ Minimising smoke emission from burning by controlling moisture content of the biomass waste prior to burning; ■ Hazardous waste from the Project shall be disposed at appropriate facilities. The EPC Contractor should store and dispose of the hazardous waste in accordance with the applicable guidelines. The EPC Contractor should report the hazardous waste treatment arrangements to the local authorities (if required); ■ Segregate hazardous waste from non-hazardous waste; ■ Hazardous waste should be stored so as to prevent or control accidental releases to air, soil and water resources. Where practicable:	Negligible

S. No.	Resource/Receptor	Potential Impact	Significance of Potential Impacts	Proposed Mitigation Measures (if applicable)	Residual Impact Significance
				■ the storage area should be clearly labelled and demarcated; - readily available information on chemical compatibility should be provided to employees, including labelling each container to identify its contents; - hazardous waste should be stored in a manner that prevents the commingling or contact between incompatible wastes and allows for inspection between containers to monitor leaks or spills; - hazardous waste should be stored in closed containers away from direct sunlight, wind and rain; - hazardous waste storage area should be have an impermeable floor and containment, of capacity to accommodate 110% of the volume of the largest waste container; - hazardous waste storage areas have adequate ventilation, fire prevention system (if needed); ■ Spill response and emergency plans should be prepared and implemented to address the potential accidental release of hazardous waste; ■ On-site and off-site transportation of waste should be conducted so as to prevent or minimise spills, release and exposures to employees and public; ■ Disposal of hazardous waste should be via an appropriated hazardous waste collector; ■ Maintenance facilities should be located on hard standing surfaces within a bunded area. Sumps and oil interceptors should be provided. Maintenance of vehicles and equipment involving activities with potential for leakage and spillage should only be undertaken within areas appropriately equipped to control these discharges; ■ Sludge from the wastewater treatment plant should be managed to prevent odour and appropriately disposed; ■ Where onsite treatment of waste is conducted, the waste shall be stored and contained so as to ensure no material is released to the environment and river, and waste streams are segregated; and ■ Segregate different type of biomass waste to manage and dispose each waste type with an appropriate method. Additionally, ensure no hazardous materials and chemicals are in the biomass waste during the incineration. Location of incinerators and burning area are to be designated furthest away from sensitive receptors and where burning can be controlled easier in case of loss of containment.	
	Waste	Waste generation can lead to impact on physical, biological and social baseline.	Moderate	■ Devise and implement appropriate waste management plan to store and dispose waste appropriately. The waste management plan is expected to include specific requirements to manage, avoid, reduce and reuse waste during the construction phase of the Transmission Line for all of the waste streams identified; ■ Prior to construction commencing, TPMC is to engage with local authorities and other stakeholders to determine the capacity of the local waste management network to absorb the new waste streams during construction; ■ A waste management plan is to be developed which includes specific requirements to manage, avoid, reduce and reuse waste during the construction phase for all of the waste streams identified; ■ Education of all workers on site shall be undertaken to avoid, reduce, and reuse waste where possible; ■ Waste clean-up measures are to be undertaken on at least a fortnightly basis to collect any waste or unused materials from the construction site. A waste management plan will be prepared and followed during the construction phase; ■ Monitoring of appointed waste contractors using chain-of custody documentation for the disposal of waste to ensure that it is able to be disposed of in an environmental responsible manner and in accordance with all prevailing regulations; ■ The appointed waste contractor shall report on an annual basis on any cross-boundary transport of waste; ■ Processes should be designed and operated to prevent or minimize the quantities of wastes generated and hazards associated with the waste generated; ■ Implement recycling plans by considering waste production processes and identify potential recyclable material and identify of products that can be reintroduce into the manufactory process or external markets by other industrial process operation; ■ Explore opportunities for reuse of inert construction waste (excavated soil and rock) within the Project site or other construction projects. The removed soil during site preparation will be utilised as far as possible for surface cover at places on the Site where backfilling takes place, with the rest (together with vegetation wastes) being contracted for disposal; ■ Segregate, prior to disposal, construction waste, steel and other metals, to the extent practicable, for re-use and recycling to minimise the quantity of waste to be disposed of to the dump site; ■ Implement a construction materials inventory management system to minimise over-supply of the construction materials, which lead to disposal of the surplus materials at the end of the construction period; ■ Minimise over ordering and waste of materials such as ready mixed concrete and cement grouts; ■ Where practicable, adopt processes which generate reduced quantities or even no hazardous waste, or less dangerous types of hazardous waste; and	Negligible

S. No.	Resource/Receptor	Potential Impact	Significance of Potential Impacts	Proposed Mitigation Measures (if applicable)	Residual Impact Significance
				■ Introduce and implement, where practicable, a recycling plan for biomass waste to reduce the amount of biomass required to be burnt. This may include identifying potential market or appropriate industry to reintroduce the biomass as part of their resource consumption.	
1.7	Visual	Physical presence during construction phase can lead to impact to the visual envelope of the area.	Moderate	■ Provide soft landscaping (i.e. tree, low shrub and ground cover planting) within available space within the Project Site to accommodate visual landscape of the receptors to consist of more greeneries to offset the presence of the Transmission Tower. Plant as soon as practical during construction phase; ■ Minimize the extent of construction areas and including temporarily affected areas; ■ Minimize clearing of vegetation as far as practical. Existing large trees (if any) should be retained as far as practical. Those that fall outside the earthworks area must be retained. Felled trees should be compensated for where possible; and ■ Reinstatement of temporarily affected areas which will no longer be required for the operational stage (e.g. contractor camp, laydown areas, etc.), to suitable pre-construction condition as soon as practical after use (e.g. using landscaping with suitable vegetation).	Negligible
1.8	Biodiversity	Project footprint and activities can lead to permanent and temporary habitat loss and impact to biodiversity values (habitats and species).	Moderate	■ A community program is to be established with adjacent landowners to replant mangrove forest along foreshore areas and re-establish coastal vegetation on non-utilised public land and private land (with consent of the land-owner). This program will re-establish habitat within the EBA suitable for the endemic bird trigger species; ■ Strict rules against clearing vegetation will be imposed on all Project staff, workers, and all contractors and personnel engaged in or associated with the Project, with penalties levied, including fines and dismissal, and prosecution under the relevant laws; ■ The Project Proponent shall be directly responsible for dissemination to its staff and workers of all rules, regulations and information concerning restrictions related to unauthorised clearing of vegetation, as well as the punishment that can expected if any staff or worker or other person associated with the Project violate rules and regulations; ■ The planned clearance area for the construction and operation works shall be clearly identified and marked to avoid accidental clearing; and ■ Use of the access road should be restricted to construction and operation vehicles only. Checkpoints should be used to manage access and inspect vehicles for timber and forest products taken from the Project Area.	Minor
	Biodiversity	Project footprint and activities can lead to temporary disturbance or displacement of fauna and flora	Minor	■ Operational vehicles will be maintained in accordance with industry standard to minimise unnecessary noise generation; ■ Traffic signs will be maintained on all roads depicting speed limits; ■ Access to facilities, including the access road should be restricted to operational vehicles only; ■ For operational areas requiring night-time lighting, lights will be used only where necessary and will be directed toward the subject area and away from habitat areas where possible; ■ Commitment will be made to raise awareness of the operator work force regarding flora and fauna values and make arrangements for restriction of hunting and poaching; and ■ Additional mitigation measures are outlined in the next assessment section in relation to impacts from potential collision with the Transmission Line to conservation significant bird species.	Negligible
	Biodiversity	Project footprint and activities can lead to temporary and permanent barrier creation, edge effects and fragmentation	Negligible	■ The use of fencing and hoarding during construction is to be kept to a minimal around the Project construction sites; ■ Measures to control dust are to be utilised to limit generation of dust and hence deposition onto vegetation surrounding the construction areas; ■ Planting of native indigenous flora, including mangroves along the shoreline adjacent to the road and construction sites is to occur to reduce impacts to connectivity along the shoreline; and ■ Appropriate rehabilitation of disturbed areas using native vegetation is to occur to facilitate movement of fauna species.	Negligible
	Biodiversity	Project footprint and activities can lead to degradation of Habitat	Minor	■ Construction and operation (and maintenance) and domestic waste will be appropriately stored and disposed of to avoid attracting native and alien species to the construction and worker camp areas; ■ For areas in direct runoff path to a watercourse, sediment and erosion control devices will be installed and maintained until vegetation replanting can occur to stabilise disturbed soil surfaces; ■ Oil, chemical and solid waste will be stored, and handled and disposed of by appropriately licenced waste management contractors; ■ Sediment and erosion control measures are to be used in all areas of construction to minimise soil contaminated runoff entering waterways; ■ All light sources are to be directed away from areas of Natural Habitat where feasible; ■ Invasive species management measures should be implemented in accordance to avoid introduction of weeds to natural and modified habitat areas; ■ Speed limits to maximum of 40 km/hr for construction and operation vehicles will be enforced to limit noise and dust generation; and ■ Construction and operation (and maintenance) materials and chemicals will be appropriately secured to avoid accidental release to the natural environment (wind and water erosion).	Negligible
	Biodiversity	Project footprint and activities, in particular traffic and poaching, can lead to mortality of Resident Species	Minor	■ Speed limits to maximum of 40 km/hr for construction and operation vehicles will be enforced to minimise potential for fauna strike; ■ Commitment will be made to raise awareness of values of important species and habitat areas to construction and operation work force and arrangements will be made for restriction of poaching and forest product collection by staff; ■ Access restriction should be applied to Project facilities for non-construction and operation vehicles; ■ Hunting wild animals will be strictly prohibited for Project staff, workers, all contractors and personnel engaged in or associated with the Project, with penalties levied, including fines and dismissal, and prosecution under relevant laws for clearing vegetation; and ■ Fishing and using of illegal fishing gear anywhere along the stream will be prohibited.	Negligible

S. No.	Resource/Receptor	Potential Impact	Significance of Potential Impacts	Proposed Mitigation Measures (if applicable)	Residual Impact Significance
	Biodiversity	Project footprint and activities, in particular traffic and erection of towers can lead to mortality of Avifauna	Negligible	■ Use of bird deflectors on the length of the power line. The deflectors will increase line visibility by thickening the appearance of the line for easier detection by avifauna; ■ Moveable markers of contrasting colours (e.g. black and white) that protrude above and below the line, and be placed 5-10 m apart; ■ Removing the thin neutral or earth (shield) wire above the high voltage transmission line where feasible, and where this is not possible, marking the line to make it more visible; ■ Minimising the vertical spread of power lines. Having lines in a horizontal plane reduces collusion risk; ■ Habitat manipulation to influence flight activity and bird behaviour, e.g. tree lines under the high voltage lines to increase visibility; ■ Insulating cables close to poles, at least 70 cm on both sides and around perching areas, and up to at least 140 cm; and ■ Hanging insulators under cross arms and poles, provided the distance between a likely perch (mainly the transmission tower crossarm) and the energised parts (conductors) is at least 70 cm.	Negligible
1.9	Social - Employment	Project needs can lead to increased employment rates	Positive	■ The workforce will be sourced from areas close to the Project after a training and selection process; and thereafter at a regional or national level; and ■ The Project will develop a Sourcing, Procurement and Recruitment Management Plan which will be developed for this Project with the aim to promote benefits to locals from recruitment and procurement activities for the Project (including information, training and engagement).	
	Social - Economic Displacement	Project footprint can lead to impact to the economy	Moderate	■ Land take should be minimised to the extent possible both in terms of geographical size and duration; and as such, when no activities are being undertaken, exclusions of agricultural activities should be lifted; ■ When possible, TPMC will propose to recruit for unskilled jobs in priority stakeholders whose land is being impacted during construction phase; ■ TPMC will develop a Land Acquisition Plan separately for the identification and compensation of assets being impacted. This document will cover all potential assets and livelihood activities impact from Project activities, compensation plan and management committee; ■ TPMC will compensate stakeholders whose land is temporarily or permanently impacted during construction and operation using market price with a premium (to compensate for the change); ■ TPMC will compensate stakeholders whose crops is being impacted during construction using market price; ■ TPMC will return land temporarily impacted to its initial state after construction phase, including ensuring contaminated land due to unplanned event (leak) is removed and/or treated appropriately; ■ TPMC will use an external specialist to identify market price for the type of land and crops being impacted by project activities; ■ TPMC will need to develop and implement a Stakeholder Engagement Plan as part of the Project. The plan should include measures to notify local stakeholders in advance of any particularly activities on agricultural areas; and ■ The Project should also develop a Grievance Mechanism to collect grievances from local stakeholder whose agricultural activities are affected by the Project activities.	Minor
	Social - Traffic & Transport	■ Traffic related to the Project can lead to impact to traffic and transportation	Negligible	■ As the impact is negligible, no specific mitigation measures will be implemented by the Project for impact on Traffic and Transport. But the Project will implement a Stakeholder Engagement Plan developed for the LNG Power Plant Project in Ahlone, Seikgyikanaungto and Dala Townships. The plan will include measures to notify local stakeholders in advance of any particularly activities on local roads or near to local roads; and ■ The Project will also use the Grievance Mechanism developed for the LNG Power Plant Project to collect grievances from local stakeholder whose regular transport is affected by the Project activities.	Negligible
	Social - Environmental Emissions	■ Environmental emissions from the Project construction can lead to nuisance to human receptors	Minor	■ Mitigation measures have already been proposed in the Air Quality and Noise Impact Assessment sections but TPMC will also need to develop and implement a Stakeholder Engagement Plan as part of the Project. The plan should include measures to notify local stakeholders in advance of any particularly noisy activities (e.g. pile driving); and ■ The Project should also develop a Grievance Mechanism to collect grievances from local stakeholder impacted by noise, dust and vibration.	Negligible
	Social - Community health and safety	■ Project activities can lead to impacts to health and safety of the community	Minor	■ TPMC will notify local people about location of accommodation camp and construction activities of the Transmission Line; ■ TPMC will annually check quality and condition of both electric wire, transmission legs and transmission tower; ■ TPMC will notify local people 2 weeks in advance about date and duration of construction activities; ■ TPMC will provide warning sign around the Transmission Tower in order to increase awareness and warn local people about risks; ■ TPMC will put traffic cone around the Project vehicles or machines used during construction activities to indicate as safe zone for vehicles; ■ TMPC will provide appropriate lights on construction vehicles/ machines to indicate their presences; ■	Negligible
	Social - Occupational health and safety	■ Project construction can lead to impacts to	Moderate	■ The Contractor will prepare and implement a Health and Safety Plan prior to commencing work. This plan will include method statements for work activities, plant utilisation, construction sequence and safety arrangements; ■ Measures will be implemented to reduce the likelihood and consequence of the potential hazards. This shall include (but not limited to) the following hazards: - Falling from height;	Minor

S. No.	Resource/Receptor	Potential Impact	Significance of Potential Impacts	Proposed Mitigation Measures (if applicable)	Residual Impact Significance
		health and safety of the workers		- Falling into water; - Entanglement with machinery; - Tripping over permanent obstacles or temporary obstructions; - Slipping on greasy walkways; - Falling objects; - Asphyxiation; - Explosion; - Contact with dangerous substances; - Electric shock; - Variable weather conditions; - Lifting excessive weights; and - Traffic operations. ■ Competent and adequately resourced sub-contractors will be used where construction activities are to be sub-contracted; ■ All persons working on the construction site will be provided information about risks on Site and arrangements will be made for workers to discuss health and safety with the Contractor; ■ The Contractor will prepare and implement a Health and Safety Plan prior to commencing work. This plan will include method statements for work activities, construction sequence and safety arrangements; ■ All workers will be properly informed, consulted and trained on health and safety issues; ■ Personal Protective Equipment (PPE) shall be worn at all times on the construction Site. This shall include appropriate safety shoes, safety eyewear, and hard hats. Non-slip or studded boots will be worn to minimize the risk of slips; ■ Before starting work all the appropriate safety equipment and the first-aid kits will be assembled and checked as being in working order. Breathing apparatus if necessary will be tested at regular intervals in the manner specified by the manufacturer; ■ All lifting equipment and cranes will be tested and inspected regularly. All hoist ways will be guarded; ■ All scaffolding will be erected and inspected in conformity with the Factories Act (1951) and the appropriate records maintained by the Contractor; ■ When there is a risk of drowning lifebelts shall be provided and it shall be ensured that personnel wear adequate buoyancy equipment or harness and safety lines, and that rescue personnel are present when work is proceeding (near the water extraction point); ■ The Contractor shall provide appropriate safety barriers with hazard warning signs attached around all exposed openings and excavations; ■ The EPC contractor will comply with the IFC Performance Standard 2, local regulation and ILO conventions signed by Myanmar; and ■ TPMC will develop and monitor an internal standard to guide labour practices and apply this to supply chain to ensure that no child and/or forced labour will be employed by the EPC contractor and its sub-contractors.	
	Social - Cultural Heritage	■ Project footprint and construction activities can lead to impact to cultural sites	Negligible	■ The EPC contractor during construction will monitor the state of any cultural heritage closest to the project site. If damage is done to the buildings by vehicle of the Project, compensation (in kind or in cash) should be organised to restore the building to its state before the damage occur; ■ The EPC contractor will develop the construction planning in discussion with the nearest temple/monastery in order to make sure that any Project activity near the monastery (e.g transport of large equipment) do not take place during special religious activities; and ■ TPMC will develop and implement a Stakeholder Engagement Plan as part of the Project. The Project will also include a Grievance Mechanism to collect grievances from local stakeholder affected by the Project activities.	Negligible
B	**Operation Phase**				
1.7	Visual	Physical presence of the Transmission Line can lead to impact to the visual envelop of the area.	Moderate	■ Visual screening e.g. surround perimeter of site with native trees (can be compensatory trees for any felled during construction); ■ Maintain soft landscaping (i.e. tree, low shrub and ground cover planting) within available space in the Project Site; and ■ Maintain all structural facilities in good repair.	Negligible

Table 1.5: Environmental and Social Monitoring Programme for the Transmission Line

Project Stage/ Affected Component	Potential Impact	Parameters to be Monitored	Location	Measurements	Frequency	Responsibility	Cost
Site Preparation and Construction Phase							
	General	General compliance with mitigation measures presented in the ESMP and as specified in EPC Contractor Manual	Project activity areas and construction workers camp	Visual inspection of all active work areas	Daily	EHS Team of EPC Contractor	EPC Contractor Cost (included in Capex cost)
7.1	Air Quality	PM2.5, PM10	Nearest Sensitive Receptors to active construction area	As per DMP requirements (PM2.5 and PM10)	Bi-monthly	EPC Contractor	EPC Contractor Cost (included in Capex cost)
7.3	Noise	Noise levels in Leq, Leq day, Leq night and hourly Leq	Identified NSRs within 250 m from the Project boundary	24-hour	Once during peak noisy construction activities where NSR are located within 250m	3rd Party Environmental Consultant	EPC Contractor Cost (approx. ~2,000 USD / time)
7.4	Soil	pH, salinity, NH_4^+, total P, heavy metals	Construction site or laydown area or spill area	Standard analytical methods	In the event of any leakage or spillage of hazardous substances, oil, or toxic chemicals	3rd Party Environmental Consultant	EPC Contractor Cost (approx. ~2500 USD / time)
	Groundwater	pH, Electrical Conductivity, Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Total Nitrogen, Total Phosphorus, Oil & Grease, Total Suspended Solids(TSS), Total Coliform Bacteria (TCB), Total Chromium (Cr), Copper (Cu), Iron (Fe), Zinc (Zn), Lead (Pb), Cadmium (Cd), Mercury (Hg); Arsenic (As).	At nearest ground water extraction pump from Transmission Line construction area	Standard analytical methods	Every 6 month or upon complaint from local stakeholders	3rd Party Environmental Consultant	EPC Contractor Cost (approx. ~2500 USD / time)
7.5	Surface Water	pH, Electrical Conductivity, Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Total Nitrogen, Total Phosphorus, Oil & Grease, Total Suspended Solids(TSS), Total Coliform Bacteria (TCB), Total Chromium (Cr), Copper (Cu), Iron (Fe), Zinc (Zn), Lead (Pb), Cadmium (Cd), Mercury (Hg); Arsenic (As).	Water bodies/channel (upstream and downstream of the Transmission Line alignment)	Standard analytical methods	Before and After construction activities have crossed the water body/channel	3rd Party Environmental Consultant	EPC Contractor Cost (approx. ~2500 USD / time)
7.6	Waste	Implementation of Waste Management Plan (WMP)	Project activity areas and construction workers camp, transport assets and disposal areas	Compliance to the WMP	Unplanned audit of contractors against WMP twice a year	EHS Team of EPC Contractor	EPC Contractor Cost (included in Capex cost)

Project Stage/ Affected Component	Potential Impact	Parameters to be Monitored	Location	Measurements	Frequency	Responsibility	Cost
					Weekly monitoring of on-site segregation, storage, management and disposal procedure		
7.7	Visual and Landscape	Complaint from Stakeholders	NA	Number of Complaint	Weekly during construction and yearly during operations	EHS Team of EPC Contractor or TPMC during operation	EPC Contractor Cost (included in Capex cost) and TPMC Opex Cost
7.8	Biodiversity	Vegetation clearing extent	Within and around the Project Study Area	Extent of vegetation clearing in area unit.	Weekly during construction and yearly during operations	EHS Team of EPC Contractor or TPMC during operation	EPC Contractor Cost (included in Capex cost) and TPMC Opex Cost
	Biodiversity	Efficiency of mitigation measures	Within and around the Project Study Area	Review of records on the application of the fencing and hoarding implementation; Level of dust deposition on vegetation surrounding the Project Area. Review of records on the planting of indigenous flora and fauna on disturbed areas; Rehabilitation success/failure on all replanting sites.	Weekly during construction for dust deposit and Every 3 month during construction for femcing and hoarding, planting of indigenous species and rehabilitation status.	EHS Team of EPC Contractor or TPMC during operation	EPC Contractor Cost (included in Capex cost) and TPMC Opex Cost
7.9	Social	Local Content	NA	Number of local employees	Once at the beginning of construction.	EHS Team of EPC Contractor	EPC Contractor Cost (included in Capex cost)
7.1		Number and resolution of grievances	NA	Compliance of resolution duration of grievance with Grievance Mechanism	Weekly	EHS Team of EPC Contractor	EPC Contractor Cost (included in Capex cost)
7.2		Livelihood of PAP	NA	Employment of PAP or livelihood of PAP	Monthly for employment of PAP Yearly for livelihood level	EHS Team of EPC Contractor 3rd Party social consultant	EPC Contractor Cost (included in Capex cost) approx. 5,000 USD/ year
7.3	Community Health and Safety	Construction site and tower signs H&S Trainings Accident log Worker code of conduct implementation Waste management facilities Grievances	Project activity areas and construction workers camp, transport assets and disposal areas	Visual confirmation	Daily for signs Yearly for tower signs Bi-monthly for training log Monthly for accident log Monthly unplanned audit for worker code of conduct Bi-yearly for waste management facilities Weekly for Grievance log	EHS Team of EPC Contractor or TPMC during operation	EPC Contractor Cost (included in Capex cost) and TPMC Opex Cost
7.4	Occupational Health and Safety	H&S Training Accident log Worker grievance log	Project activity areas and construction workers camp.	Visual Confirmation	Bi-monthly for training log Monthly for accident log Weekly for Grievance log	EHS Team of EPC Contractor or TPMC during operation	EPC Contractor Cost (included in Capex cost) and TPMC Opex Cost
7.5	Cultural heritage	Accident log Training Grievance	Project activity areas and construction workers camp.	Visual Confirmation	Bi-monthly for training log Monthly for accident log Weekly for Grievance log	EHS Team of EPC Contractor or TPMC during operation	EPC Contractor Cost (included in Capex cost) and TPMC Opex Cost

1.7 Public Consultation and Disclosure

Stakeholder Engagement, the process of engaging with people who may be affected by or interested in the Project, has been undertaken throughout the IEE process. Stakeholder views have been considered to improve the proposed Project and mitigation measures where possible. Stakeholder Engagement was conducted in a culturally appropriate maner by the Project proponent with the support from ERM, open to all people, especially people who will be affected by the proposed Project.

The engagement process has been designed to meet both Myanmar legal requirements (per the Environmental Impact Assessment Procedure No. 616/2015) for public participation, and international requirements for engagement as outlined by the IFC Performance Standards.

The first step in establishing a dialogue was identifying the Project stakeholders. Stakeholders are persons or groups who are directly or indirectly affect by a project, and those who may have interest in and/or the ability to influence a project's outcomes (either positively or negatively).

The Project team committed to undertake a process that delivers an inclusive and continuous dialogue with the Project stakeholders during the IEE. The objectives of the engagement were to:

- Identify all those affected or interested in the Project to ensure they were included in the engagement process;
- Ensure understanding through an open, inclusive culturally appropriate and transparent engagement process. Information has been disclosed as early and as comprehensively as possible;
- Involve stakeholders in the assessment of impacts, the generation of mitigation and management measures and the finalization of IEE Report. Stakeholders also played an important role in providing local knowledge and information for the baseline to inform the impact assessment;
- Build relationships and trust through open dialogue and engagement. Establish transparency of TPMC activities to build trust with stakeholders;
- Engage vulnerable peoples and groups by having an inclusive approach to consultation. Some stakeholders need special attention in such a process due to their vulnerability;
- Manage expectations with respect to proposed Project benefits. The engagement process served as a mechanism for understanding and managing stakeholder and community expectations, where the latter will be achieved disseminating accurate information in an accessible way; and
- Ensure compliance. The process was designed to ensure compliance with both Myanmar regulatory requirements and international best practice.

1.7.1 Summary of Public Consultation Activities

The meeting was conducted on 29 and 30 October 2019. Stakeholders invited included villiges from Hlaignthayar and Twantay Township, MOEE and the Ministry of Education (MOE). A total of 250 participants attended the public consultation activities. The details are listed in ***Table 1.6***.

Table 1.6: Consultation Activities Undertaken during IEE

Date, time	Location	Stakeholder	Number of Participants
29 October 2019	Hlaing Thar Yar Township: Kanphyar Monestery, Apyin Padan Village Group	■ Atwin Padan Village ■ West Yangon Technology University ■ Kan Pyo Village ■ MOEE ■ Kann Pyo Village ■ Thae Kwin Village ■ Apyin Padan Village ■ Atwin Padan Village	160

Date, time	Location	Stakeholder	Number of Participants
		■ Myit Kyo Kan Kwat Thit	
30 October 2019	Twantay Township: GAD Office, Tawwin Sandakuu Hall	■ Tamangyi Village ■ Ministry of Education ■ Jaung Wine Village	90

The main concerns and questions raised during public consultation meetings refer to land acquisition and compensation for crops. Questions and respective responses are listed in ***Table 1.7***. The full list of key concerns and questions can be found in ***Section 11.3***.

Table 1.7: Key Concerns and Questions Raised during Public Consultation

Questions	Response
Who will monitor the EMP, and how will TTCL follow the commitments presented in the PowerPoint?	TTCL: MOEE will monitor, ERM will provide support and prepare mitigation measures so TTCL can implement during Project activities. ERM: ECD will also monitor.
What is the width of the tower? Worried TTCL will not build the towers as presented in the slides.	TTCL and MOEE confirmed the information as presented in the slides.
When will the project start?	TTCL: Will only start when TTCL gets the power purchase agreement.
Concerned about harvesting, because this is rice season.	MOEE and TTCL: will take his concern into consideration.
Is there any compensation to the damage caused to the farmland and crops?	MOEE: Land compensation committee has the compensation framework with the amount to be paid for impact to crops. The final amount will be multiplied by three. Will provide compensation for crops to landowners who have crop land in the Project area, even if there is no crop being grown at the moment. There's another type of compensation for access road. Will only provide compensation for crops, those who have production where access road will pass.
What is the safety distance [ROW] between the transmission line tower and settlements?	MOEE: According to MOEE rules and regulation, ROW is 75 ft from the tower centre. The Transmission Line will not cross any settlements, only farmland and main road in NYDC area. No need to worry about the settlements.
Concerned about damages caused by the TL on farmland and houses Previous compensation considered the area of 150 feet (diameter); will this project consider the same scheme?	MOEE: Yes, it will be the same.
What is the amount of compensation for damages?	MOEE: if there are any damages (impact) to the farmland there is compensation; the amount will be based on the production (crops). Maximum of three times the compensation for damages.
Worried that land will not be returned to original state due to construction activities (i.e. piling, holes, not leveling the land) as has happened in the past.	MOEE: Apologized and guarantee it will not happen again. MOEE will strictly instruct TTCL so that will not happen again. TTCL: TTCL will make sure that the contractor responsible for construction activities will follow the instruction to return the land to previous state, including leveling.

1.8 Conclusion

The IEE process has been undertaken to assess a range of potential physical, biological and socio-economic impacts associated with the proposed Transmission Line in Yangon Region, Myanmar;, provided that the mitigation/management measures provided in this IEE are implemented, *the majority of these impacts will be reduced to a minor to negligible level of significance (at maximum)* and there are no environmental or social fatal flaws which prevent the development of this proposed Transmission Line.

Since this IEE was completed based on the mid-stage of the design and planning phase, changes to the Project location, construction methods, and operation may occur in the later phases of the engineering design and planning. In addition, since the EPC Contractor for construction has not been appointed, further studies on actual conditions at final Project locations, extensive stakeholder engagement and hands-on training of the appointed EPC Contractor may be required during the later planning phase and throughout the construction and operation phases should there are singnificant changes of the Project location and description. TPMC will be responsible for the implementation of all recommended mitigations and management methods, including the conduct of additional surveys, monitoring and studies, and for reporting on performances to the relevant stakeholders and authorities.

1.9 Statement of Commitments

TPMC shall fully implement the ESMP, all Project commitments, and conditions, and is liable to ensure that all contractors and subcontractors of the project comply fully with all applicable Environmental Conservation Law, Rules and Procedures, and TOR for the IEE.

TPMC will at all times comply fully with the commitments, mitigation measures and monitoring plans that have been presented in this IEE Report.

The full statement of commitments can be found in ***Chapter 13***.

2. INTRODUCTION

2.1 Project Background and Overview

TTCL Power Myanmar Company Limited ('TPMC' and/or 'the Project Proponent') is planning to develop an approximately 25 km long, 230 kV Transmission Line ('the Project') connecting its 388 MW Combined Cycle Power Plant (CCPP) in Ahlone Township to the sub-station located in Hlaingthayar Township, both in Yangon Region.

In January 2018, the Ministry of Electricity and Energy (MOEE) issued the Notice to Proceed (NTP) to TPMC to develop the LNG (Liquefied Natural Gas) Power Plant (Ahlone) Project. The purpose of the Transmission Line is to transfer electricity generated by the new LNG Power Plant (Ahlone) to the nearby sub-station as the electricity will be sold to the Myanmar Power Grid. This Initial Environmental Examination (IEE) will only cover the Transmission Line; while the Project Proposal Report (PPR), Scoping Study, and Environmental Impact Assessment (EIA) for the LNG Power Plant is being prepared as separate documents.

The electricity generated from the LNG Power Plant (Ahlone) facility shall be sold to the Myanmar national grid, using a 230 kV transmission line with approximately 25 km long from the power plant substation to the Ministry of Electricity and Energy (MOEE's) proposed substation in Hlaingthayar Township, Yangon Region, Myanmar.

Under *Section 7* of the *Environmental Conservation Law* and *Articles 52* and *53* of the *Environmental Conservation Rules* of the Republic of the Union of Myanmar, TPMC is required to undertake an Initial Environmental Examination (IEE) Study OR an Environmental Impact Assessment (EIA) Study to obtain an Environmental Compliance Certificate (ECC) for the proposed Project.

The necessary level of environmental assessment (i.e. IEE OR EIA) for the proposed Project is subject to approval by the Ministry of Natural Resources and Environmental Conservation (MONREC). According to the *Annex 1* of the *EIA Procedure, dated 29th December 2015*, the scope of the proposed Project falls under *Item 24: Electrical Power Transmission Lines ≥ 230 kV (other than the types in item 23)* and will only require an IEE Study.

The Project Proponent has prepared and submitted the Project Proposal Report (PPR) to MOEE and MONREC on 24th December 2018. The PPR recommended that TPMC shall proceed with an Initial Environmental Examination (IEE) Study of the Project and prepare an Environmental Management Plan (EMP) to put forward its commitments for environmental and social mitigation and management measures. The submission letter of the PPR is attached in ***Appendix A*** for reference.

2.2 Presentation of the Project Proponent

2.2.1 Name of the Project

Transmission Line for the LNG Power Plant (Ahlone) Project in Yangon, Myanmar.

2.2.2 The Project Proponent

TPMC is a project company set up by TTCL Public Company Limited and the main Project Proponent for the proposed Project. TPMC was established in 2018 to carry out the development, operation and maintenance of the Project.TTCL Public Company Limited (TTCL), the first integrated Engineering, Procurement and Construction (Integrated EPC) company in Thailand, was incorporated on 24 April, 1985 with a start-up capital of 20 million Baht. TTCL was formed by a joint venture between two (2) leading international engineering and construction companies from Japan and Thailand. TTCL has experience and expertise in providing integrated design and engineering, procurement of machinery & equipment, and construction (Integrated EPC) of turnkey projects for industrial and process plants, mainly in energy, petrochemical, chemical and power industries.

TTCL has set up TTPMC in 2012 for the development of a 120 MW Gas-fired power plant in Ahlone Township, Yangon, the Republic of the union of Myanmar,

Details of the main Project Proponent are as follows:

Company Name:	**TTCL Power Myanmar Company Limited (TPMC)**
Address:	16B, 16th Floor, Centre Point Tower, NO. 65, Corner of Sule Pagoda Road and Merchant Street. Kyauktada Township, Yangon, Myanmar
Contact Person:	Ms. Nini San
Telephone:	+95 [0] 9 254 311058 +95 [0] 1 371 962
Fax:	+95 [0] 1 371 963
Email:	nini.s@ttcl.com

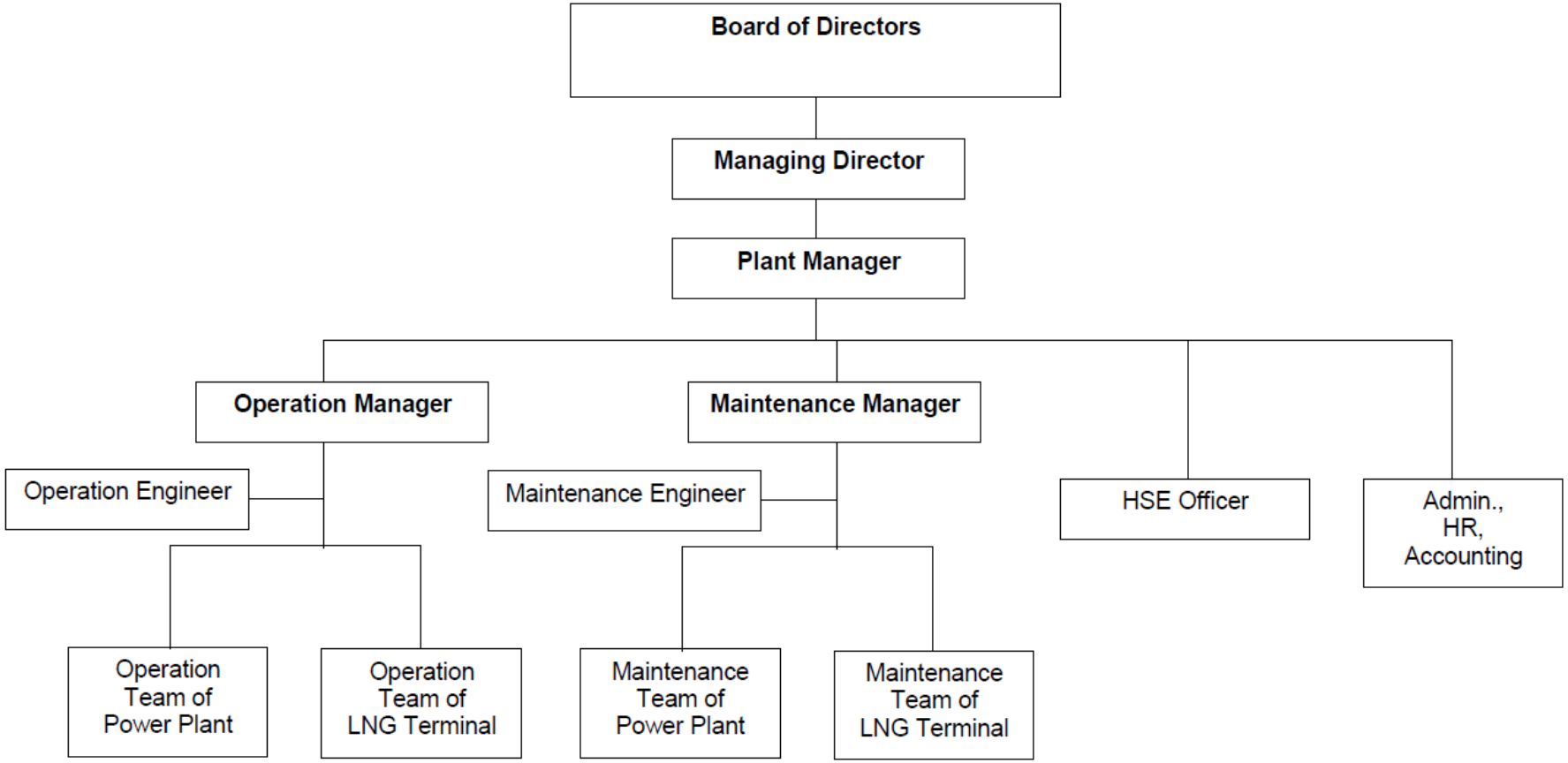
Figure 2.1 presents the Project organization chart. TTCL's key facts are highlighted in ***Table 2.1***.

Table 2.1: Key Facts of TTCL

Key Facts	Description
Year of Incorporation	Founded on 24th April, 1985, listed on SET in 2009
Listing	The Stock Exchange of Thailand
Market Capitalisation	896 million Baht in 2018
Major Shareholders	Sojitz Corporation; Global Business Management Co., Ltd.
Key Business	Engineering, Procurement, and Construction (EPC), and Power
Global Presence	Thailand, Myanmar, Singapore, Malaysia, Philippines, Vietnam, and Qatar

Source: TTCL, 2019

Figure 2.1: TPMC Project Organization Chart



Source: TTCL/TPMC, 2019 (modified by ERM)
Notes: The Transmission Line team will be shared with Power Plant team during both construction; therefore, will use the same Organisation Chart.
The Transmission Line will be Build and Transfer, in which MOEE will operate this Transmission Line.

2.3 Project Site and Location

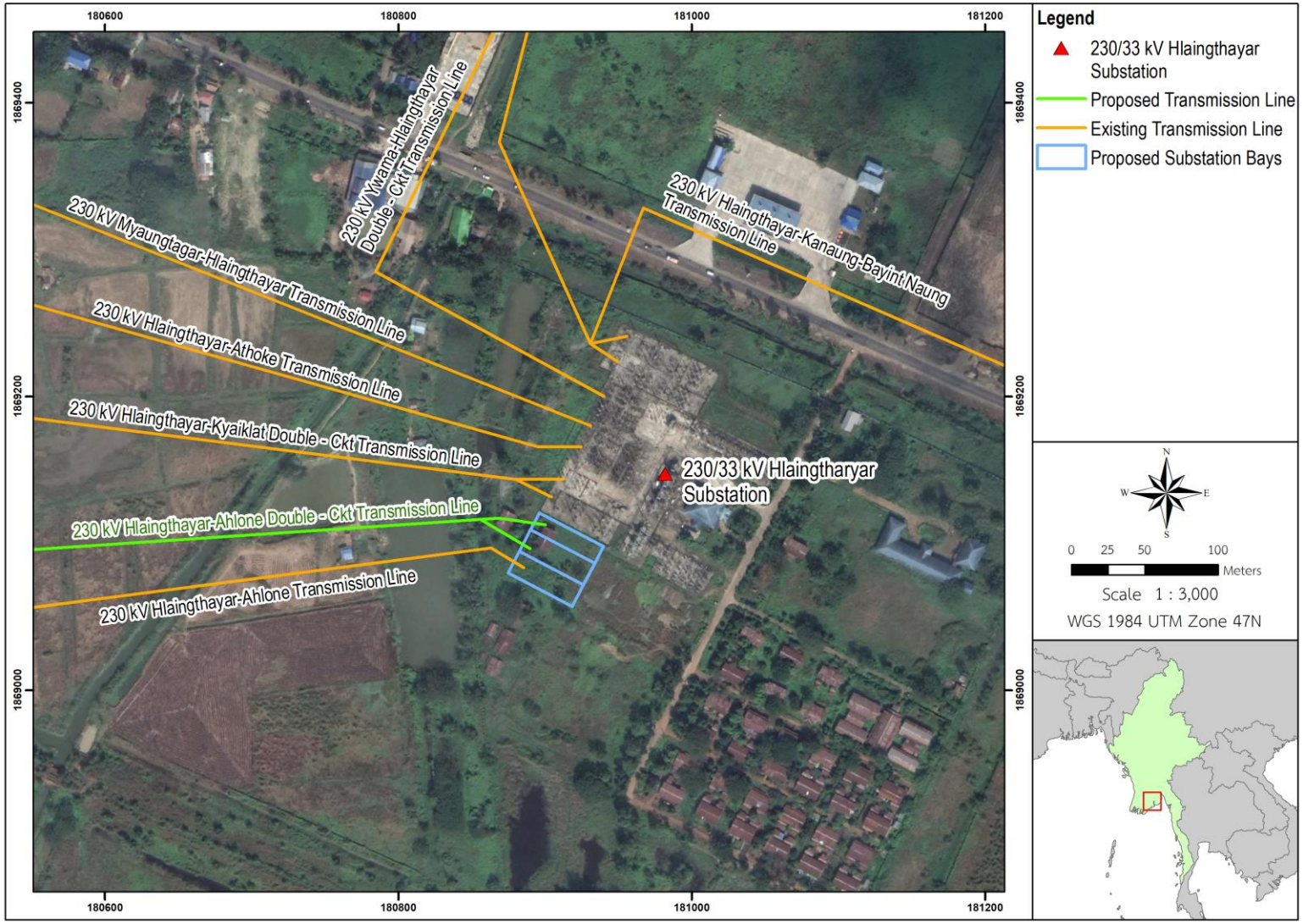
The proposed Project is located in Ahlone, Seikgykanaungto, Twantay and Hlaingthayar Townships Yangon Region in the Republic of the Union of Myanmar.

The Transmission Line originates from the existing substation located in the existing Ahlone Power Plant. The proposed Transmission Line will be connected to three (3) new Ahlone bay (not within the scope of this Project) where one of the new bay is coupled with a single 230 kV Transmission Line named, the Hlaingthayar-Ahlone Transmission Line. Moreover, the other 230 kV Transmission Line will be a double circuit type to support sufficient transfer of power (as shown in ***Figure 2.2***).

This transmission line is planned to run parallel to the existing Hlaingthayar-Kyaiklat Transmission Line for the first half of the route then continue to follow the existing Hlaingthayar-Ahlone Transmission Line, while maintaining a set-back distance (spacing between each transmission line/towers) of 23 m from each side. Prior to connecting to the Ahlone sub-station, the Transmission Line will be required to cross the Yangon River. Majority portion of the route coverage are agricultural and shrubs area with small settlements.

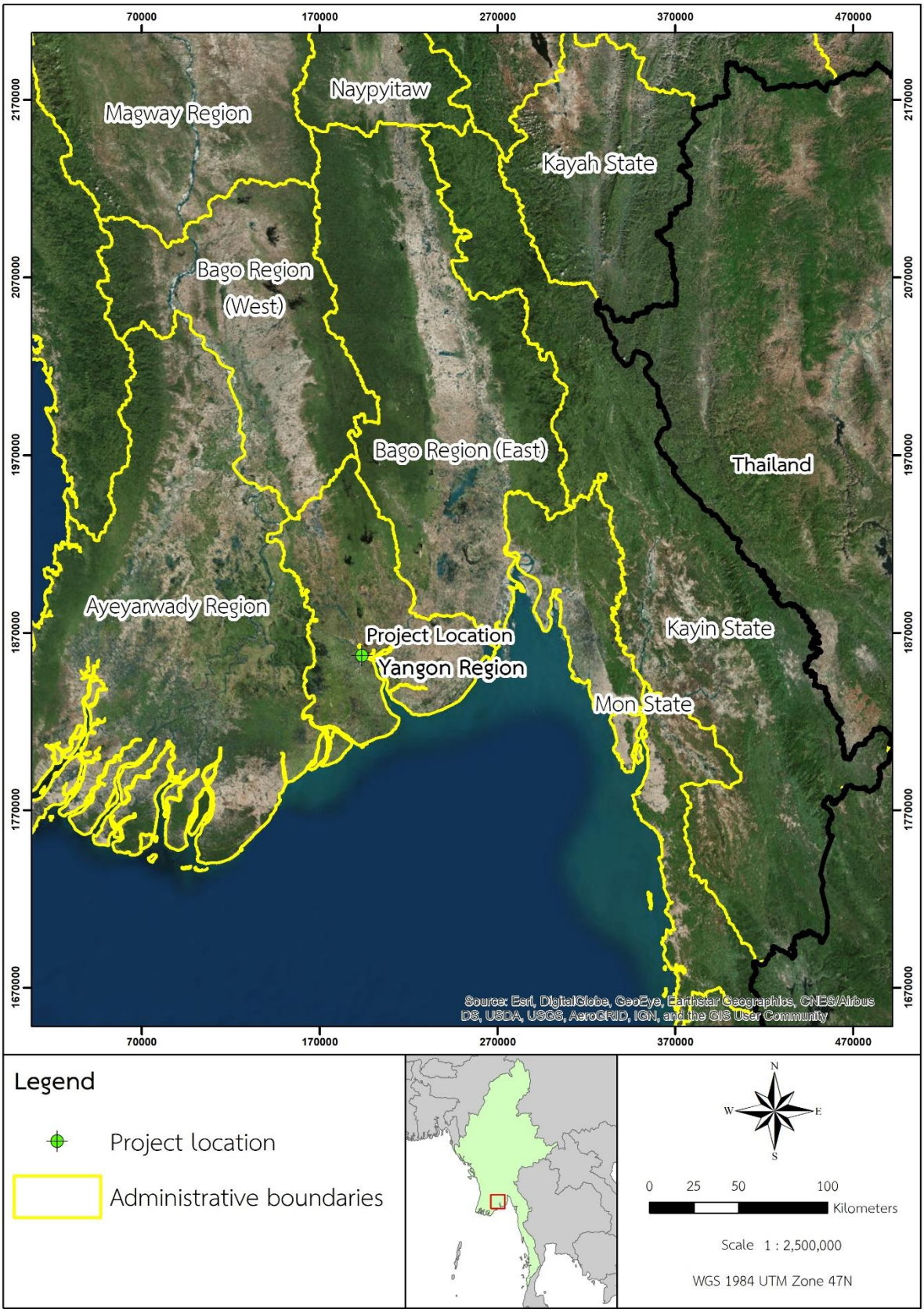
The proposed Project locations are shown in ***Figure 2.3*** and ***Figure 2.4***.

Figure 2.2: Hlaingthayar Substation Expansion and Connection to Transmission Line



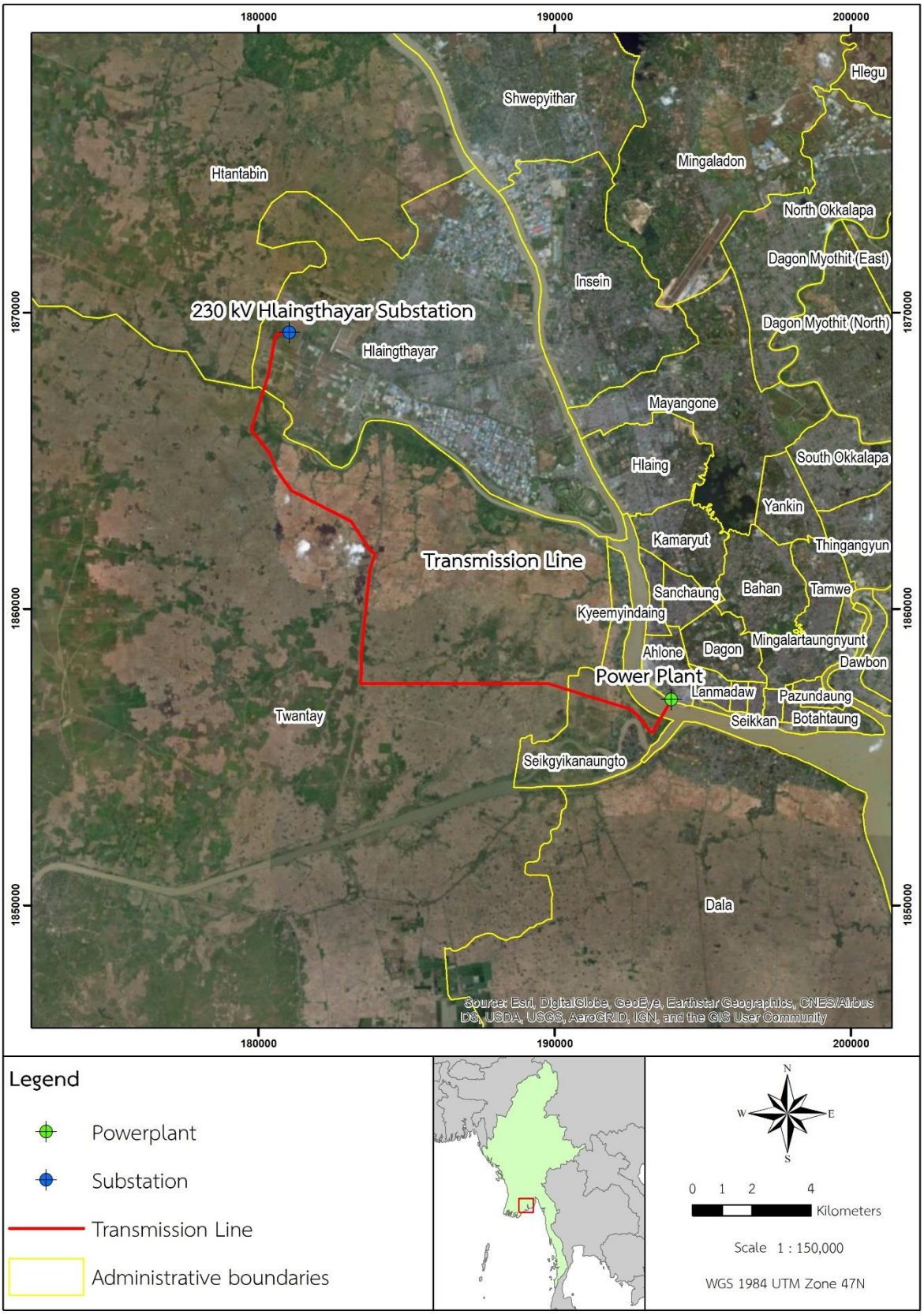
Source: TTCL/TPMC, 2019 (modified by ERM)

Figure 2.3: Proposed Project Location within Myanmar



Source: TTCL/TPMC, 2018 (modified by ERM)

Figure 2.4: Indicative Project Locations in Yangon Region



Source: TTCL/TPMC, 2018; (modified by ERM)

2.4 Purposes and Objective of this IEE Report

This **Initial Environmental Examination (IEE) Report** presents an assessment of the potential environmental, social and health impacts associated with the proposed Transmission Line connecting from the LNG Power Plant (Ahlone) Project to Hlaingthayar sub-station. The specific objectives of this IEE Report are as follows:

- Facilitate an understanding of the elements of the existing baseline conditions that are relevant to resources/receptors that could potentially be impacted by the Project;
- Identify the aspects of the Project that could potentially result in significant environmental, social and health impacts on resources/receptors;
- Document how stakeholders have been engaged during the impact assessment process, and how stakeholder feedback has been considered in the IEE study;
- Predict and evaluate the significance of the potential environmental and social impacts of the Project;
- Identify the aspects of the Project that need to be managed, and recommend appropriate and justified mitigation and enhancement measures;
- Determine the significance of residual impacts, taking into account the implementation of mitigation measures; and
- Generate plans for the management and monitoring of impacts, including plans for ongoing stakeholder engagement.

2.5 Presentation of Environmental, Social and Health Experts

ERM-Siam Company Limited, who has been certified under the Transitional Consultant Registration as an EIA Consulting Organization Type-A (Certificate No. 0016), has been commissioned by TPMC to undertake an Initial Environmental Examination (IEE) Study for the Project. The outcomes of the IEE Study will be submitted to relevant Myanmar authorities for assessment in order to inform the decision for the Project Proponent to obtain an ECC. ERM has been approved by the Environmental Conservation Department (ECD) of the Ministry of Natural Resources and Environmental Conservation (MONREC) as third party consultant on the 26th December, 2018 (***Appendix B***).

ERM is a leading global provider of environmental, health, safety, risk, social consulting and sustainability related services. ERM have more than 5,000 people in over 40 countries and territories working out of more than 150 offices.

ERM is committed to providing a service that is consistent, professional and of the highest quality. ERM was approved by the Ministry of Natural Resources, Environment and Conservation (MONREC), and have recently registered our Company as a separate ERM Myanmar entity and opened an office in Yangon.

ERM has high international standing, and an unrivalled track record in preparing successful ESIAs for high profile and often controversial development projects. ERM has over 20 years' experience undertaking ESIA Studies for the power sector worldwide, including many high profile power projects.

ERM has been working in Myanmar since 1994 and has already been involved in the development of several power plant in Myanmar.

The key personnel from ERM involved in the preparation of this IEE Study are presented in ***Table 2.2***.

Table 2.2: ERM Key Personnel involved in Preparation of the IEE Study

Name	Educational Background	Experience	Designation/Expertise
Kamonthip Ma-oon	■ Executive Study: General Management Programme, Judge Business School, University of Cambridge, UK ■ MSc. (DIC) in Environmental Engineering and Business Management, Imperial College, London ■ BEng. in Environmental Engineering, Chulalongkorn University, Thailand	13	Partner in Charge ■ Environmental and Social Impact Assessment ■ Environmental and Social Management Plan ■ Feasibility Studies ■ Waste Management
Maria Rita Borba	■ MA. International Affairs, Fletcher School, Tufts University, USA, 2015 ■ MSc. Human Geography, University of Sao Paulo, Brazil, 2012 ■ BSc. Geography, University of Sao Paulo, Brazil, 2006 ■ BA. International Relations, FMU, Brazil, 2005	15	Project Manager and Social Specialist ■ Social Impact Assessment ■ Stakeholder Engagement
Chris Brown	■ M.Sc. (Environmental Engineering) ■ B.Sc. (Manufacturing Engineering)	11	Soil / Water Specialist ■ Water Pollution Control ■ Groundwater and Hydrology
Edmund Taylor	■ Master of Science (M.Sc.) in Environmental Dynamics and Climate Change 2011: Swansea University, UK. ■ Bachelor of Science (B.Sc.) in Geography 2009: Swansea University, UK.	5	Air Quality Specialist ■ Noise and Vibration Impact Assessment
Mandy To	■ MSc Environmental Management, The University of Hong Kong, 2001 ■ BSc Environmental Science, The University of Hong Kong, 1996	17	Noise Specialist ■ Noise Impact Assessment
Christine Bryant	■ MSc Ecological Economics, University of Edinburgh, UK ■ BSc Economics (with specialization in Environmental Economics) George Mason University, USA	7	Cumulative Impact Specialist ■ Cumulative Impact Assessment
David Nicholson	■ Bachelor of Applied Science (Environmental Assessment and Management) 1992: University of Newcastle - Water Resource Management; Plant Systematics and Ecology ■ Executive Masters in Public Administration (With Merit) 2007: Australian and New Zealand School of Government - International Politics and Development; Government and Business Ethics; and Financial Management	20	Biodiversity Specialist ■ Ecology and Biodiversity baseline. Impact Assessment.

Name	Educational Background	Experience	Designation/Expertise
Sarinya Rangsipatcharayut	■ M.Sc. in Environmental and Natural Resources Economics (International Program), Chulalongkorn University ,2007 ■ B.Sc. in Environmental Science (2nd honour degree), Thammasat University, 2006	9	GHG Specialist ■ GHG Impact Assessment
Kanokphorn Chaivoraphorn	■ M.A. (Social Development – Social Organization and Development) ■ B.Sc. (Industrial Chemistry) ■ B.P.H. (Occupational Health and Safety)	19	Technical Advisor/Principal (ERM) ■ EIA and Health Consultant,

Source: ERM, 2019.

For this Project, baseline data collection was conducted as a combined activity with the ESIA study by **Sustainable Environment Myanmar Co., Ltd (SEM)**, who has experience in carrying out baseline data collection. Note that all the works provided by SEM are under ERM supervision.

SEM is a leading resource and environmental consultancy firm based in Myanmar, consisting of former and current university faculty members of various disciplines relating to environmental and social management.

They have worked extensively across Myanmar undertaking Environmental Impact Assessment related works including terrestrial biodiversity surveys, habitat and land use mapping, health and social impact surveys and development of post project monitoring surveys.

SEM has been involved in all the field activities related to environmental baseline data collection, in particular the biodiversity study, air quality and noise data collection, surface/ground water and soil sampling. SEM also supported ERM in the stakeholder engagement process leading the public participation meetings.

2.6 Structure of this IEE Report

Following the Executive Summary in Myanmar language and English presented as ***Chapter 0*** and ***Chapter 1*** respectively and this Chapter (***Chapter 2***), the remainder of this IEE Report is presented as follows:

- ***Chapter 3*** presents an overview of the environmental and social policy, legal and institutional framework related to the proposed Project;
- ***Chapter 4*** provides details on the Project description and alternatives considered;
- ***Chapter 5*** provides a description of the existing biophysical and socio-economic environment;
- ***Chapter 6*** presents the Impact Assessment Methodology used for this study;
- ***Chapter 7*** presents the key potential environmental and social impacts and potential mitigation measures;
- ***Chapter 8*** provides the summary of significance of the impact assessment;
- ***Chapter 9*** presents the potential cumulative impact assessment (CIA) and potential mitigation measures;
- ***Chapte 10*** Environmental and Social Management Plan (ESMP);
- ***Chapter 11*** highlights the stakeholder identification, stakeholder engagement activities, including Project disclosure and results from Public Consultation meetings;
- ***Chapter 12*** provides conclusions and recommendations; and
- ***Chapter 13*** present the Statement of Commitment.

The supported documents are form part of Appendixes, as follows:

- ***Appendix A***: Project Proposal Report Submission Letter;
- ***Appendix B***: Transitional Registration for ERM as Consultant;
- ***Appendix C***: TPMC's HSE Plan and Procedures;
- ***Appendix D***: Notice to Proceed;
- ***Appendix E***: List of Invasive Species;
- ***Appendix F***: Presentation Slides;
- ***Appendix G***: Signed Sheet from the Engagement Meetings;
- ***Appendix H***: Stakeholder Engagement Minutes of Meeting.

3. OVERVIEW OF POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

3.1 Introduction

This chapter summarises the relevant legal and policy context in Myanmar for a Transmission Line Project and documents the environmental and social standards with which the Project will achieve compliance. It also include the international standards that the Project will follow as well as applicable international treaties and conventions, and internal guidelines and standards voluntarily committed to by the Project Proponent. This section will be presented including the following:

- TPMC Health, Safety and Environment (HSE) Plan Procedure;
- Myanmar Regulatory Framework;
- National Administrative Requirements;
- International Agreements;
- International Standards and Associated Guidelines;
  - International Finance Corporation (IFC);
  - World Bank; and
- International Convention.

3.2 TPMC Health, Safety, and Environment (HSE) Plan Procedure

The purpose of the HSE plan is to provide the necessary rules, regulations, and guidelines to prevent incidents and injuries from occurring, and minimizing adverse environmental impacts.

It is stated by TPMC's HSE Plan procedure that the Project HSE objectives are as follows:

1. TPMC shall carry out project management and construction management activities in compliance with the applicable legal and other HSE requirements as specified in the contract.
2. TPMC shall perform and manage construction work in safe manner to achieve the safety target of "No Lost time Accident"
3. Project incidence rates should not exceed the following values;
   IFR (incidence frequency rates), 3.7
   ISR (incidence severity rates), 37
4. TPMC shall perform construction work by taking into account for the Environmental impact protection and complaint from the community shall be "Zero".

TPMC's HSE Plan Procedure is shown in ***Appendix C***.

3.3 Overview of Myanmar Regulatory Framework

3.3.1 Administrative Divisions of Myanmar

Myanmar is divided into twenty-one (21) main administrative sub-divisions, which include:

- Seven states;
- Seven regions (Note that regions were previously referred to as "divisions", prior to August 2010);
- Five self-administered zones;
- One self-administered division; and
- One union territory.

The administrative subdivisions are detailed in ***Table 3.1***, and an administrative map is presented in ***Figure 3.1***.

Table 3.1: Administrative Regions of Myanmar

Name	Capital	Population	Area (km^2)
Ayeyarwady Region	Pathein	6,184,829	35,032
Bago Region	Bago	4,867,373	39,402
Chin State	Hakha	478,801	36,019
Kachin State	Myitkyina	1,689,441	89,041
Kayah State	Loikaw	286,627	11,732
Kayin State	Pa-an	1,574,079	30,383
Magway Region	Magwe	3,917,055	44,821
Mandalay Region	Mandalay	6,165,723	37,946
Mon State	Mawlamyaing	2,054,393	12,297
Rakhine State	Sittwe	3,188,807	36,778
Sagaing Region	Sagaing	5,325,347	93,705
Shan State	Taunggyi	5,824,432	155,801
Tanintharyi Region	Dawei	1,408,401	43,345
Yangon Region	Yangon	7,360,703	10,277
Naypyidaw Union Territory	Naypyidaw	1,160,242	N/A
Danu Self-Administered Zone	Pindaya	N/A	N/A
Kokang Self-Administered Zone	Laukkai	N/A	N/A
Naga Self-Administered Zone	Lahe	N/A	N/A
Pa-O Self-Administered Zone	Hopong	N/A	N/A
Pa Laung Self-Administered Zone	Namhsan	N/A	N/A
Wa Self-Administered Division	Hopang	N/A	N/A

Source: The Union Report: Census Report Volume 2. The 2014 Myanmar Population and Housing Census. Nay Pyi Taw: Ministry of Immigration and Population. 2015. p. 12.

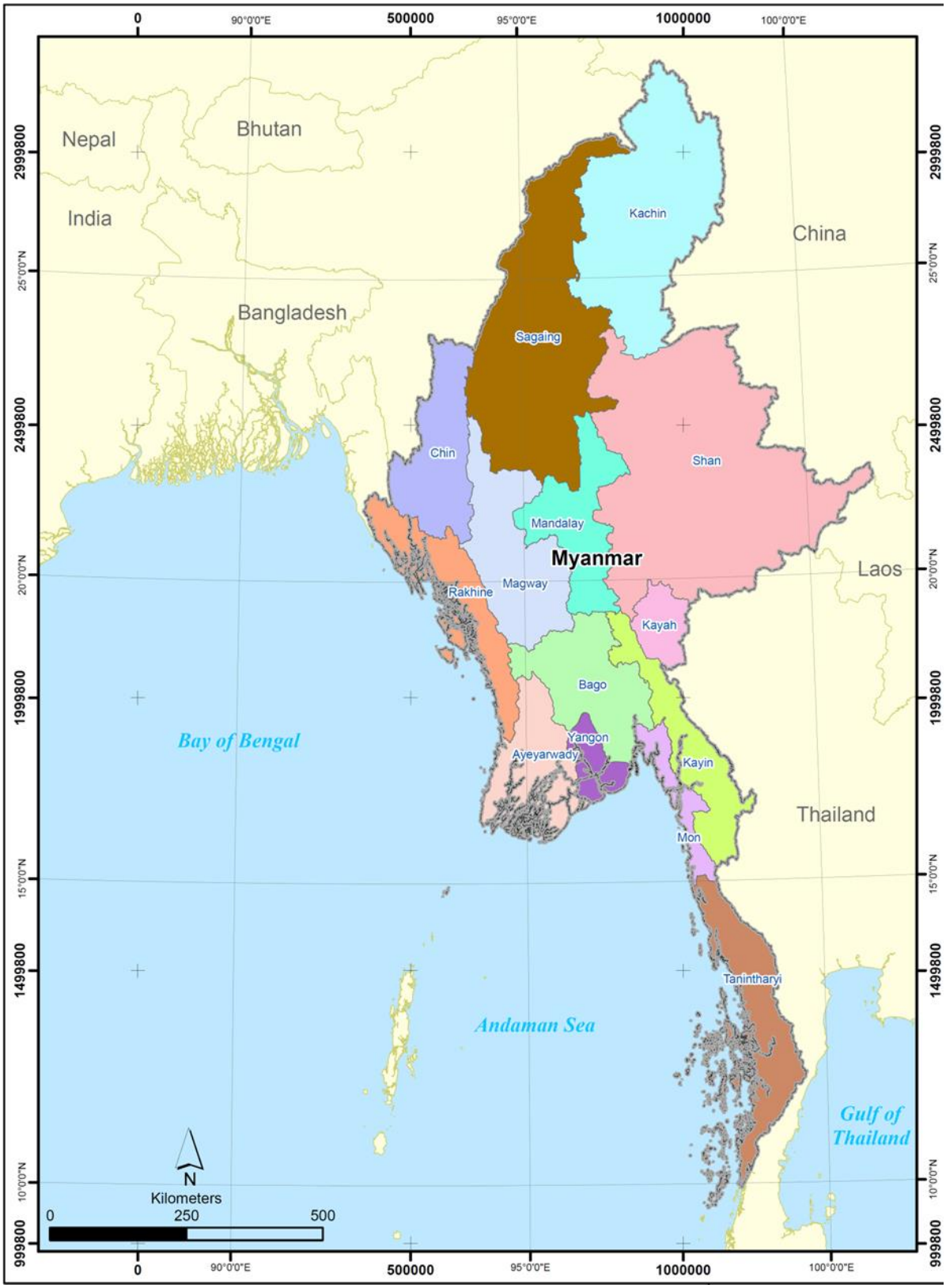
States and regions are divided into districts. Districts consist of townships, which are composed of towns, wards and village-tracts. Village-tracts are groups of adjacent villages. The administrative structure of the states, regions and self-administering bodies is defined in the Constitution.

Each region and state has a Regional/State Government, consisting of a Chief Minister, Ministers and an Advocate General. Legislative authority resides with the State/Regional “Hluttaw” (a parliament or legislative body), which are made up of elected civilian members and representatives of the military.

The Constitution states that Naypyidaw is a Union Territory under the direct administration of the President. The Naypyidaw Council, led by a Chairperson, carries out general functions on behalf of the President. The Chairpersons of the Naypyidaw Council are appointed by the President, and include civilians and representatives of the military.

Self-Administered Zones and Self-Administered Divisions are administered by a Leading Body, which is headed by a Chairperson, and has executive and legislative powers. The Leading Body consists of elected State/Regional Hlutttaw members and military personnel.

Figure 3.1: Myanmar States/Regions and Townships



Source: ERM, 2019

Articles in the Constitution relevant to environmental protection are Articles 37, 42 and 390. These three (3) Articles in the Constitution provide a basis for legalizing and institutionalizing environmental health impact assessment and social impact assessment. They are quoted below in ***Table 3.2.***

Table 3.2: Articles in the Constitution Relevant to Environmental Protection

Article	Content
Article 37	(a) The Union is the ultimate owner of all lands and all natural resources above and below the ground, above and beneath the water and in the atmosphere in the Union; The Union shall enact necessary law to supervise extraction and utilization of State owned natural resources by economics forces;
Article 42	The Union shall protect and conserve natural environment.
Article 390	Every citizen has the duty to assist the Union in carrying out the following matters: (a) preservation and safeguarding of cultural heritage; (b) environmental conservation; (c) striving for development of human resources; and (d) protection and preservation of public property.

Source: Constitution of the Republic of the Union of Myanmar, 2008

3.3.2 Myanmar Regulatory Authorities

Matters pertaining to Health, Safety and Environmental (HSE) requirements for this Project are under the jurisdiction of the ministries and state-owned enterprises in the electricity and energy sector and environment authorities. Key ministries, agencies and state-owned enterprises that have jurisdiction over environment, electricity and energy matters are included in ***Table 3.3***.

Table 3.3: Key Ministries, Agencies and State-Owned Enterprises Involved in HSE for this Project

Ministry/Agency	Responsibility
Ministry of Natural Resources and Environmental Conservation (MONREC)	The Environmental Conservation Department (ECD) of MONREC has ultimate responsibility in the review and approval, or otherwise, of submissions under the EIA process.
Ministry of Electricity and Energy (MOEE)	Primary responsible for electricity planning, generating and transmission. MOEE is also the sole supplier of natural gas for power generation and is responsible for issuing regulations on the generation, transmission and delivery of electric power in Myanmar.
Electric Power Generation Enterprise (EPGE)	Responsible for purchasing power from public and private power producers, including Build, Operate Transfer (BOT) project companies and reselling that power. In addition, the EPGE controls all transmission lines and substations.
Myanmar Investment Commission (MIC)	MIC is a government agency responsible for coordinating with ministries (such as the MOEE) and other state entities to facilitate foreign investment in Myanmar. The MIC is also responsible for granting MIC permits, which enable foreign investors to carry out business activities under the Myanmar Investment Law (18, October, 2016).
Department of Electrical Power Planning (DEPP)	Formed in 2012 from a combination of the Power Department, and the Ministry for Planning Policies Mission planning. Main responsibilities are implementing Power Projects on behalf of the Ministry.

Source: ERM, 2019

3.3.3 Myanmar Legislation Potentially Relevant

Laws related to environmental and social issues and hence potentially relevant to the IEE Study for the proposed Project are included in ***Table 3.4***.

Table 3.4: Myanmar Legislation Relevant to the Project

Sector	Relevant Laws in Myanmar
Administration	Myanmar Investment Law, October 2016 & Myanmar Investment Commission Notification No. 15 /2017, April 2017.
	The Private Industrial Enterprise Law - SLORC Law No. 22/90
	The Law on Standardisation (2014)
	National Sustainable Development Strategy (2009)
	Myanmar Insurance Law (1993) Myanmar Insurance Business Law (1996) Myanmar Insurance rule (1997)
	Myanmar Fire Services Law (2015)
	The Emergency Provisions Act, 1950
	The Essential Supplies and Services Act, 1947
	The Private Industrial Enterprise Law, 1990
	The Embankment Act, 1909
	Myanmar Fire Brigade Law, 2015
	The Emergency Provisions Act, 1950
	The Penal Code of Offences Affecting the Public Health, Safety, Convenience, Decency and Morals, 1861
	Electricity Law, 2014
	The Underground Water Act, 1930
	Anti-Corruption Law No.23/2013
Agriculture and Irrigation	Farmland Rules – Notification No 62/2012 (English)
	Vacant, Fallow and Virgin Lands Management Rules – Notification No. 1/2012
	Vacant, Fallow and Virgin Land Management Act – Pyidaungsu Hluttaw Law No. 10/2012
	The Protection and Preservation of Cultural Heritage Region law, 1998 (Revised in 2009 and Supplemented in 2011)
	Antiquities Act, 1957 (Revised 1962)
	The Protection and Preservation of Ancient Building Law, 2015
Culture	The Protection and Preservation of Ancient Monuments Law, 2015
	Law Protecting Ancient Objects Law No.43/2015
	The Protection of Wildlife and Conservation of Natural Areas Law, 1994 (No. 6/94) and Rules on Protection of Wildlife
	Protected Area Conservation Law (2003) and the Protection of Wildlife, and Wild Plant and Conservation of Natural Areas Rules (2002)
	The Conservation of Water Resources and Rivers Law, 2006

Sector	Relevant Laws in Myanmar
Forestry, Environment and Natural Resources	The Burma Wildlife Protection Act 1936 and Burma Wild Life Protection Rules, 1941
	Environmental Impact Assessment Procedures (notification no 616/2015)
	Environmental Conservation Law (March 2012) and associated Rules (notification no. 50/2014)
	National Environmental Quality (Emission) Standards Guideline (notification 615/2015)
	Myanmar Agenda 21 (1997)
	Myanmar Cliamte Change Policy (2019)
	National Environmental Policy (1994)
	Constitution of the Republic of the Union of Myanmar, 2008
	The Union of Myanmar Public Health Law, 1972
	Private Health Act, 2007
	Prevention from Danger of Chemical and Associated Material Law (2013)
	Private Health Act, 2007
	Prevention from Danger of Chemical and Associated Material Law (2013)
Public Health	The Prevention and Control of Communicable Disease Law (1995), 2011
	Control of Smoking and Consumption of Tobacco Product Law, 2006
	Ministry of Health Notification No. 5/2014, Order Stipulating the Caption, Sign and Marks Referring to the “No Smoking Area”
	Ministry of Health Notification No. 6/2014, Order Stipulating the Requirements to be Managed at the Specific Area where Smoking is Allowed.
	Employment and Training Act 1950, replaced by Employment and Skill Development Law, 2013
	Employment Restriction Act (1959)
	Protection of the citizen for the personal freedom and personal security Law No. 5/2017
Labour and Occupational Health and Safety	Workmen’s Compensation Act
	Leave and Holidays Act, 1951
	Minimum Wage Act 2013
	Occupational Safety and Health Law, 2012
	Payment of Wages Act 2016
	Standing Order 2_95 Occupational Health Plan, 1995
	Social Security Act 2012
	Settlement of Labour Dispute Law (2012)
	Employment and Skill Development Law (2013)
	Employment Statistics Act (1948)
	Electricity Law (44/2014)
	Import and Export Law (2015)

Sector	Relevant Laws in Myanmar
	The Factories Act (1951)
	The Petroleum Act (1934)
	The Freshwater Fisheries Law, 1991
	The Myanmar Marine Fisheries Law, 1990
	The Law Relating to Aquaculture, 1989
Transportation	Coastal and Marine Transportation Law, 2015
	Myanmar Port Authority Law, 2015
	The Yangon Port Act, 1905
	Inland Water Transportation Law No. 13/2017
	Land Acquisition Act, 1894
	The Towns Act, 1907
	The Village Act, 1907
Land Use	Farmland Law and Farmland Rules, 2012
	Vacant, Fallow and Virgin Land Management Law, 2012

Source: ERM, 2019

3.4 National Administrative Requirements

3.4.1 Overview of Myanmar Legislation

3.4.1.1 The Constitution

The latest enacted Constitution (May 2008) provides information on governing laws and regulations in Myanmar. The Constitution takes precedence over any other national legislation or international agreements. The general provisions of the Constitution that relate to the Project are the requirement for Myanmar citizens to assist in:

- Preservation and safeguarding of cultural heritage;
- Environmental conservation;
- Striving for development of human resources; and
- Protection and preservation of public property.

3.4.1.2 EIA Requirements in Myanmar

Laws in Myanmar related to EIA requirements are as follows:

Environmental Policy, 1994; Myanmar Agenda 21, 1997; and National Sustainable Development Strategy, 2009.

Myanmar issued an Environmental Policy in 1994, which was as follows:

"…. The wealth of the nation is its people, its cultural heritage, its environment and its natural resources. 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. Every nation has the sovereign right to utilize its natural resources in accordance with its environmental policies, but great care must be taken not to exceed its jurisdiction or infringe upon the interests of other nations. It is the responsibility of the State and every

citizen to preserve its natural resources in the interest of present and future generations. Environmental protection should always be the primary objective in seeking development".

With a view to implementing a National Environment Policy (NEP), the National Commission for Environmental Affairs (NCEA) formulated Myanmar Agenda 21 in 1997 under the guiding principles established at the United Nations Conference on Environment and Development (UNCED), held in Rio de Janeiro in 1992. The Agenda 21 provided the first framework for integrating environmental considerations into national development plans in Myanmar. The purpose of Agenda 21 is to mobilize and focus national efforts to achieve sustainable development, and is intended to have the following functions:

1. To define the choices, set the goals and targets, and establish the standards for sustainable development in Myanmar;
2. To illuminate the environmental and ethical dimensions underlying the choices to be made and goals to be achieved in sustainable development;
3. To analyze the ecological, economic and social issues in the country in a comprehensive and integrated fashion, clarifying the links between them, identifying the policy gaps, and showing how to reduce conflicts between environment and development;
4. To identify and evaluate options for addressing priority issues, problems and opportunities, including the identification of appropriate programmes for legal reform, development of economic instruments, institutional development, capacity-building and other measures;
5. To set out sectoral and cross-sectoral policies and plans which rationalize the responsibilities for sustainable development, reduce duplication, close gaps, prevent or reduce conflicts, and take advantage of compatibilities and synergies among sectors and interest groups;
6. To improve decision-making and policy formulation through better information and analytical techniques, and by enabling those most affected by decisions to participate in the decision-making process;
7. To develop understanding and build consensus so that decisions have strong support;
8. To identify, promote and support actions leading to sustainable development and to reduce, abate and put a stop to actions impeding sustainable development;
9. To identify and apply practices which sustain the resource base of the economy, achieve sustainable levels of resource use, restore degraded natural resources, make use of unused or under-used resource potential, improve the efficiency of existing resource use, and diversify the use or seek substitution of existing resources;
10. To determine priorities for action, evaluating costs and benefits and the trade-offs between the different concerns affecting all levels of society;
11. To provide a basis for the allocation and optimal use of limited resources;
12. To develop and strengthen institutions for sustainable development; and
13. To build up the capacity of institutions and the population of the country to handle complex and inter-related issues through frameworks which integrate environmental concerns with planning.

Subsequently in 2007, the NCEA developed the National Sustainable Development Strategy (NSDS) for Myanmar. It incorporated the aspirations of the Agenda 21 as well as Myanmar's Millennium Development Goals. The NSDS was approved in 2009 and served as the main guiding principal on environmental protection in the country.

Specific strategies are outlined under each goal. For example, the goal for Sustainable Management of Natural Resources suggests strategies for forest resource management, sustainable energy production and consumption, biodiversity conservation, sustainable freshwater resources management,

sustainable management of land resources, sustainable management for mineral resources utilization, etc.

The aim of NSDS is to achieve sustainable development through three sectors, focused on natural resource management, economic development, and social development. Relevant government ministries are expected to institutionalize NSDS principles into their sectoral development through short-term, medium-term and long-term actions.

Although much of the NSDS guidelines are for adoption and integration into the government legislation and regulation body, some are targeted at the private sector, such as the polluter pay principle, and reduction of energy consumption and greenhouse gas emission from industries.

The Environmental Conservation Law, 2012

The legal mechanism for EIA has been put in place with the 2012 Environmental Conservation Law. The Pyidaungsu Hluttaw enacted this law by Law No. 9 of 2012 on the date of 30th March, 2012. The legal mechanism for EIA has been described in this law. According to the text of The Environmental Conservation Law, the main objectives of the Law are as follows:

1. to enable to implement the Myanmar National Environmental Policy;
2. to enable to lay down the basic principles and give guidance for systematic integration of the matters of environmental conservation in the sustainable development process;
3. to enable to emerge a healthy and clean environment and to enable to conserve natural and cultural heritage for the benefit of present and future generations;
4. to reclaim ecosystems as may be possible which are starting to degenerate and disappear;
5. to enable to manage and implement for decrease and loss of natural resources and for enabling the sustainable use beneficially;
6. to enable to implement for promoting public awareness and cooperation in educational programmes for dissemination of environmental perception;
7. to enable to promote international, regional and bilateral cooperation in the matters of environmental conservation; and
8. to enable to cooperate with Government departments, Government organizations, international organizations, non-government organizations and individuals in matters of environmental conservation.

The following articles are particularly relevant to EIA requirements and this project:

“7. The duties and powers relating to the environmental conservation of the Ministry are as follows:

(m) causing to lay down and carry out a system of environmental impact assessment and social impact assessment as to whether or not a project or activity to be undertaken by any Government department, organization or person may cause a significant impact on the environment;”

Also in this law, Article 14 and Article 15 are related with waste disposal in accordance with environmental standards:

“14. A person causing a point source of pollution shall treat, emit, discharge and deposit the substances which cause pollution in the environment in accord with stipulated environmental quality standards.

15. The owner or occupier of any business, material or place which causes a point source of pollution shall install or use an on-site facility or controlling equipment in order to monitor, control, manage, reduce or eliminate environmental pollution. If it is impracticable, it shall be arranged to dispose the wastes in accord with environmentally sound methods.”

Article 19 is related to maintenance of cultural heritage:

"19. The Ministry shall cooperate with the relevant Government departments and Government organizations in the matters of environmental conservation for perpetual existence of cultural heritage sites and natural heritage sites, cultural monuments and natural areas stipulated under any existing law."

For violations of bylaws, regulations and directives issued under this law, punishment is not more than one year or fine (unspecified amount), or both, under Article 32.

Environmental Conservation Rules (2014)

The Ministry of Natural Resources and Environmental Conservation, in exercise of power conferred under sub-section (a) of section 42 of the Environmental Conservation Law, issues this rules by No. 50 of 2014 on the date of 5th June, 2014, as shown in ***Table 3.5***.

Table 3.5: Section 42 of the Environmental Conservation Law

Rule	Content
Rule 51	The Ministry shall assign duty to the Department for enabling to adopt and carry out the environmental impact assessment system.
Rule 52	The Ministry shall determine the categories of plan, business or activity which shall carry out environmental impact assessment
Rule 53	The Ministry shall to scrutinize whether or not it is necessary to conduct environmental impact assessment, determine the proposed plans, businesses or activities which do not include in stipulation under rule 52
Rule 56	The person who carries out any project, business or activity shall arrange and carry out for conducting the environmental impact assessment for any project, business or activity by a qualified third person or organization accepted by the Ministry.
Rule 58	The Ministry shall form the Environmental Impact Assessment Report Review Body with the experts from the relevant Government departments, Government organizations.
Rule 61	The Ministry may approve and reply on the EIA report or IEE or EMP with the guidance of the Committee
Rule 69	Any person shall not emit, cause to emit, dispose, cause to dispose, pile and cause to pile, by any means, the pollutants and the hazardous waste or hazardous material stipulated by notification under the Law and any of these rules at any place which may affect the public directly or indirectly. Any person shall not carry out to damage the ecosystem and the natural environment which is changing due to such system, except for carrying out with the permission of the Ministry for the interest of the people.

Source: The Republic of the Union – Ministry of Environmental Conservation and Forestry, 2014

Environmental Impact Assessment Procedures 2015

The Environmental Impact Assessment Procedure was promulgated on December 29th, 2015, and sets out the procedures for completing an IEE, EIA and/or EMP in Myanmar. This includes information on project categorization, responsibilities of project developers and ministries, IEE/EIA review, monitoring and auditing, among other issues, under the Environmental Conservation Law 2012 and Environmental Conservation Rules 2014 of the National Environmental Policy for Myanmar 1994. The Procedure states that:

"….all Projects and Project expansions undertaken by any ministry, government department, organization, corporation, board, development committee and organization, local government or authority, company, cooperative, institution, enterprise, firm, partnership or individual (and/or all Projects, field sites, factories and businesses including expansions of such Projects, field sites, factories and businesses identified by the Ministry, which may cause impact on environmental quality and are

required to obtain Prior Permission in accordance with Section 21 of the Law, and Article 62 of the Rules) having the potential to cause Adverse Impacts, are required to undertake IEE or EIA or to develop an EMP, and to obtain an ECC in accordance with this Procedure."

According to the EIA Procedure, based on the criteria indicated in Annex 1 'Categorization of Economic Activities for Assessment Purposes', electrical power transmission lines (of any size) with a capacity of equal to or greater than 230 kV requires an IEE.

The EIA Procedure also outlines requirements for all IEE Projects, which are required to be undertaken according to Article 35 and Article 36, as follows:

"35. The Project Proponent shall issue a letter of endorsement in a format prescribed by the Ministry. Such letter shall be submitted to the Department together with the IEE Report prepared either in the Myanmar language, or in the English language with an accompanying, accurate summary in the Myanmar language, and confirming:

a. the accuracy and completeness of the IEE,

b. that the IEE has been prepared in strict compliance with applicable laws including this Procedure, and

c. that the Project will at all times comply fully with the commitments, mitigation measures, and plans in the IEE Report.

36. The IEE Report shall contain the following:

a. Project description in reasonable detail with description of the project size, installations, technology, infrastructure, production processes, use of materials and resources, generation of waste, emissions and disturbances together with overview maps and site layout maps (using aerial photos and satellite images in proper scale) for each Project phase and, where relevant, project alternatives for each Project phase;

b. identification of the Project Proponent including (where the Project Proponent is not a natural person but a company or other juridical entity) the identification of the owners, directors (if any) and day to day management and officers of the Project Proponent;

c. identification of the IEE experts, including which expert is responsible for which part of the IEE Report;

d. description of applicable laws, decrees, regulations, standards, guidelines and corporate policies related to environmental and social matters of the Project together with the relevant government agencies involved and their roles and responsibilities vis-à-vis the Project.

e. description of the surrounding environmental and social conditions of the Project including maps of all relevant physical, biological, social, socioeconomic and cultural features;

f. identification and assessment of potential Environmental Impacts including assessment and description of Adverse Impacts and Residual Impacts with presentation of the spatial and temporal characteristics of the impacts using maps, images, aerial photos and satellite images;

g. results of the public consultation and public participation processes, recommendations received from the public, and the Project Proponent's written responses to comments received during that process;

h. the environmental protection measures of the Project which are intended to mitigate Adverse Impacts clearly presented together with applicable environmental and social requirements and any Residual Impacts;

i. the EMP; and

j. the persons, organizations and budgets needed for implementation of the EMP."

3.4.1.3 National Environmental Quality (Emission) Guidelines

Myanmar's National Environmental Quality (Emission) (NEQ) Guidelines were promulgated on December 29th, 2015. The Guidelines are largely based on International Finance Corporation (IFC) Environmental Health and Safety (EHS) Guidelines, and provide the basis for regulation and control of various environmental parameters, including noise and vibration, air emissions, and effluent discharges, from various sources. The Project is committed to comply with the emission standards presented in this section.

Relevant excerpts from the guidelines are as follows:

"6. Provisions of the general and applicable industry-specific Guidelines shall be reflected in project EMP and ECC and together constitute a project's commitment to take necessary measures to avoid, minimize and control adverse impacts to human health, safety, and the environment through reducing the total amount of emissions generation; adopting process modifications, including waste minimization to lower the load of pollutants requiring treatment; and as necessary, application of treatment techniques to further reduce the load of contaminants prior to release or discharge.

7. Further reference should be made by projects to applicable industry-specific IFC EHS guidelines for advice on means of achieving limit values specified in Annex 1.

8. These Guidelines supersede any existing national guideline or standard provision relating to regulation and control of noise, air, and water emissions from activities and projects subject to the EIA Procedure.

9. As specified in Article 56 of the EIA Procedure, all projects are obliged to use, comply with and refer to applicable national guidelines or standards or international standards adopted by the Ministry.

These Guidelines will henceforth be applied by the Ministry in satisfying this requirement until otherwise modified or succeeded by other guidelines or standards.

12. As specified in Article 95 of the EIA Procedure, projects shall engage in continuous, proactive and comprehensive self monitoring of the project and comply with applicable guidelines and standards. For purposes of these Guidelines, projects shall be responsible for the monitoring of their compliance with general and applicable industry-specific Guidelines. Projects shall be responsible for ensuring compliance at the point of compliance specified in the applicable Guidelines.

13. To demonstrate compliance with these monitoring requirements as specified in articles 97 and 98 of the EIA Procedure, projects shall submit monitoring reports to the Ministry at least every six months or more frequently as provided in the EMP and ECC. Monitoring reports shall inter alia document compliance, difficulties encountered in complying with EMP and ECC conditions, number and type of non-compliance with EMP and ECC, and monitoring data of prescribed environmental parameters as detailed in the EMP and ECC."

General

Air Emissions

"Projects with significant sources of air emissions, and potential for significant impacts to ambient air quality, should prevent or minimize impacts by ensuring that: (i) emissions do not result in pollutant concentrations that reach or exceed ambient quality guidelines and standards, or in their absence the current World Health Organization (WHO) Air Quality Guidelines; and emissions do not contribute a significant portion to the attainment of relevant ambient air quality guidelines or standards (i.e. not exceeding 25 percent of the applicable air quality standards to allow additional, future sustainable development in the same airshed."

The Government of Myanmar has established numerical standard for ambient air quality in the Myanmar National Environmental Quality (NEQ) (Emission) Guidelines (2015) based on the IFC's Environmental, Health and Safety Guidelines: Air Emissions and Ambient Air Quality (2007) which adopted the WHO

Ambient Air Quality Guidelines (2005). The Myanmar NEQ Guidance Values shown in ***Table 3.6*** have been adopted as the ambient air quality guidelines for this Project.

Table 3.6: Ambient Air Quality Guidelines

Parameter	Averaging Period (mean)	Myanmar NEQ Guidance Value (µg/m^3)[(a)]	WHO Guidance Value (µg/m^3)[(b)]
Nitrogen dioxide	1-year 1-hour	40 200	40 (guideline) 200 (guideline)
Ozone	8-hour daily maximum	100	160 (Interim target-1) 100 (guideline)
Particulate matter PM_{10}	1-year	20	70 (Interim target-1) 50 (Interim target-2) 30 (Interim target-3) 20 (guideline)
	24-hour	50	150 (Interim target-1) 100 (Interim target-2) 75 (Interim target-3) 50 (guideline)
Particulate matter $PM_{2.5}$	1-year	10	35 (Interim target-1) 25 (Interim target-2) 15 (Interim target-3) 10 (guideline)
	24-hour	25	75 (Interim target-1) 50 (Interim target-2) 37.5 (Interim target-3) 25 (guideline)
Sulphur dioxide	24-hour	20	125 (Interim target-1) 50 (Interim target-2) 20 (guideline)
	10-minute	500	500 (guideline)

Note: (a) Extracted from Myanmar's National Environmental Quality (Emission) (NEQ) Guidelines (2015)
(b) Extracted from WBG EHS General Guidelines, Environmental Chapter, Section 1.1, Table 1.1.1 based on World Health Organization (WHO). Air Quality Guidelines Global Update, 2005. PM 24-hour value is the 99th percentile.

Vegetation Protection

IFC makes reference to ecologically sensitive areas in its Performance Standards, requiring for air quality assessment to be conducted but doesn't specify criteria for the assessment. Myanmar does not have such criteria either and therefor the Project is using other internationally recognised sources as recommended by the IFC. ***Table 3.7*** shows the criteria that has been used in this study.

Table 3.7: Critical Levels for the Protection of Vegetation

Substance	Averaging Period	Critical Level (µg/m^3)
Sulfur Dioxide (SO_2)	Annual	20
Oxides of Nitrogen (NO_x)	Annual	30

Source: Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on Ambient Air Quality and Cleaner Air for Europe

Noise Levels

The Myanmar NEQ (Emission) Guidelines (2015) for noise, IFC General EHS Guidelines: Environmental – Noise Management (2007) and the IFC General EHS Guidelines: Construction and Decommissioning (2007) are relevant to the Project. ***Table 3.8*** below presents the prescribed standards on noise impacts in the surrounding industrial and residential areas of the Project.

Table 3.8: Myanmar NEQ and IFC General EHS Guidelines for Noise Levels at Receptors

Area	Maximum Allowable Noise Level (1 hour) [(a)] dB(A)	
	Daytime 0700 – 2200 hours	Night-time 2200 – 0700 hours
Residential, institutional, educational	55	45
Industrial/commercial areas	70	70

Source: National Environmental Quality (Emission) Guidelines, 2015

Note: Noise impacts should not exceed the levels presented in this table, or result in a maximum increase in background levels of 3dB(A) at the nearest receptor location off-site.

3.4.1.4 Myanmar Protected Areas

The first legal instrument related to protected areas, which designated a wildlife sanctuary in the environs of the Royal Mandalay City, was promulgated in 1859. The first piece of wildlife legislation to be enacted was the Wild Elephant Protection Act of 1879. The Forest Act of 1902 gave responsibility for wildlife management to the Forest Department. Legislation specific to wild animals followed in 1927, and broader legislation followed nine years later with The Burma Wildlife Protection Act 1936 and The Burma Wildlife Protection Rules 1941 (Burma Act No. Vii of 1936). This provided for designation of wildlife sanctuaries with species-specific conservation objectives. Legislation was revised in 1994 with issue of the Protection of Wildlife and Wild Plants and Conservation of Natural Areas Law. The 1994 Law, which was issued by the State Law and Order Restoration Council, provides for:

- A Committee for the Protection of Wildlife and Wild Plants and Conservation of Natural Areas, which is to serve as an advisory body to the Minister of Forestry; supervise implementation of the Law; give guidance in matters of research, conserving species in danger of extinction and international cooperation;
- Categories of ‘natural areas’ and zoological and botanical gardens, their declaration and uses;
- Categories of protected wild animals (almost the same as provided for under earlier law): completely protected, normally protected and seasonally protected;
- Hunting licences;
- Establishment of zoological and botanical gardens;
- Registration of ownership of completely protected animals or trophies thereof;
- Administrative actions;
- Appeals; and
- Offences and penalties.

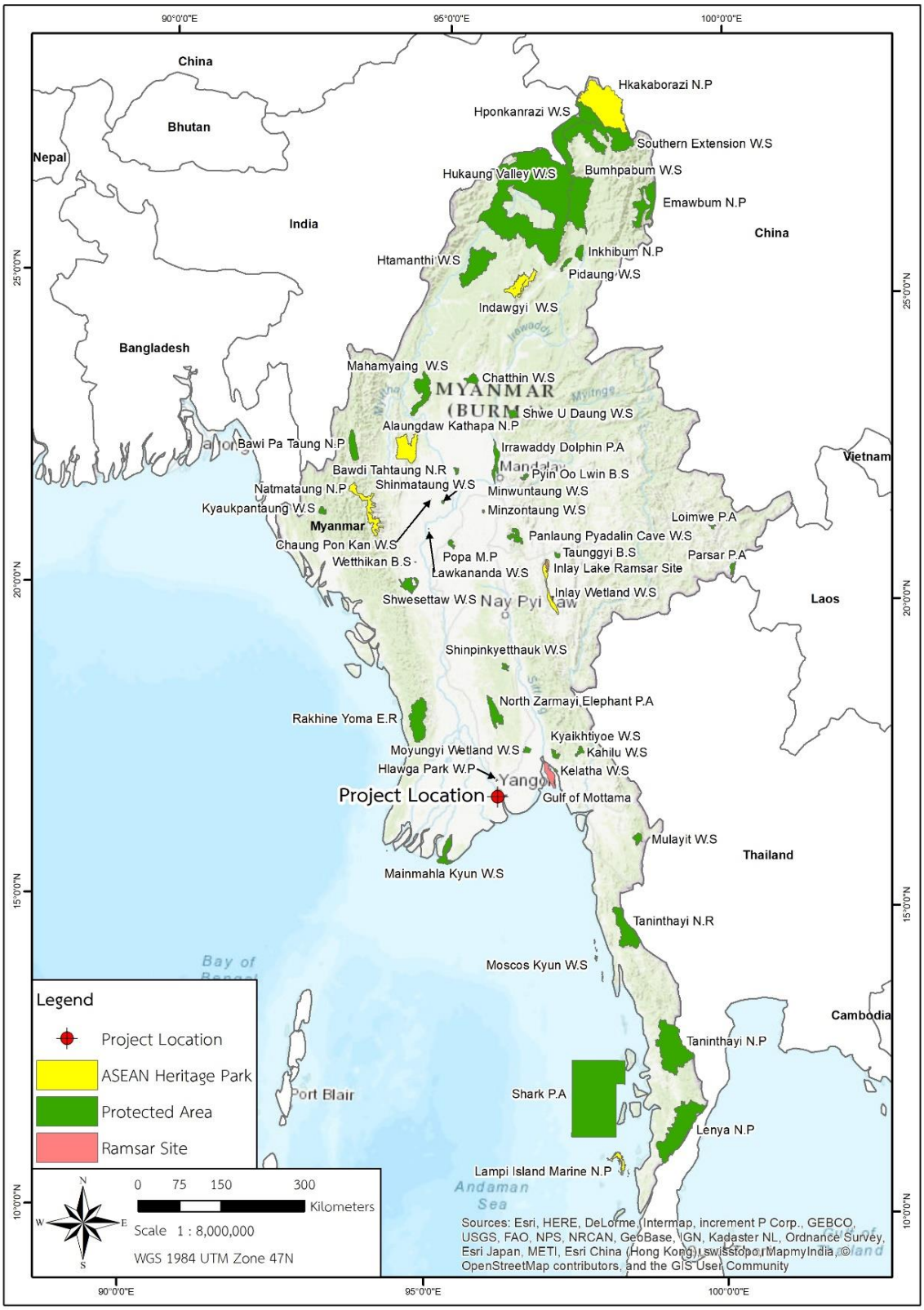
The categories of so-called ‘natural areas’ are defined in the Law described above as:

- Scientific Nature Reserve;
- National Park;
- Marine National Park;

- Nature Reserve;
- Wildlife Sanctuary;
- Geo-Physically Significant Reserve; and
- Other Nature Reserve Determined by the Minister.

A total of 50 protected areas have been established or proposed in Myanmar, and are shown in ***Figure 3.2.*** The nearest protected area to the Project is the Hlawga Park Wildlife Park, which is located approximately 18.5 km Northeast of the Project.

Figure 3.2: Protected Areas in Myanmar and Project Location



Source: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, 2019

Note: W.S – Wildlife Sanctuary, P.A – Protected Area, N.P – National Park, N.R. – Nature Reserve, W.P – Wildlife Park, E.R – Elephant Range, B.S – Bird Sanctuary, M.P – Mountain Park,

3.4.2 Rules on Protection of Wildlife, and Protected Area Conservation Law (2003) and the Protection of Wildlife, and Wild Plant and Conservation of Natural Areas Rules (2002)

The objectives of this Law are as follows:

1. to implement the Government policy for wildlife protection;
2. to implement the Government policy for natural areas conservation;
3. to carry out in accordance with the International Conventions acceded by the State in respect of the protection and conservation of wildlife, ecosystems and migratory birds;
4. to protect endangered species of wildlife and their natural habitats.

Article 15 states that:

The Director General shall, with the approval of the Minister:

a. determine and declare endangered species of wild animal which are to be protected according to the following categories:
    i. completely protected species of wild animals;
    ii. normally protected species of wild animals;
    iii. seasonally protected species of wild animals;
b. determine and declare the endangered species of wild plants and their nature habitats thereof;
c. lay down and carry out measures for the preservation of protected wildlife species;

And article 31 that a Forest Officer may pass an administrative order causing a fine that may extend to Kyat 10,000 to be paid, on a person who kills, hunts, wounds or raises a seasonally protected wild animal without permission during the closed season.

3.4.2.1 Foreign Investment Law, 2012, Foreign Investment Rules, 2013, and Notifications for Investment, 2013

Myanmar passed a new Foreign Investment Law on 2nd November, 2012, which replaced the Myanmar Foreign Investment Law of 1988. The recently enacted rules require EIA for large projects according to the rules of MONREC.

Although the law does not specifically define legislation for EIAs, Notification 1/2013 provides a categorization of the business activities in which foreigners will be allowed to engage. Under this, “Electrical power production” projects fall under “Category 3.3: activities allowed only following an Environmental Impact Assessment”. Specifically, electrical power production projects “must conduct Environmental Impact Assessment and obtain and follow MONREC’s terms and conditions”.

3.4.3 Government Administration of Myanmar Electricity and Energy

The electricity and energy sector in Myanmar is governed primarily by the Ministry of Electric and Energy (MOEE). MOEE supervises the sector and governs power generation, transmission and distribution. Various other ministries play a role, as follows:

- **Ministry of Electricity and Energy (MOEE)** – primary responsibility for electricity planning, generating and transportation. It is also the sole supplier of natural gas for power generation and is responsible for issuing regulations on the generation, transmission and delivery of electric power in Myanmar. It consists of three main departments, the Department of Electricity Planning (DEP), the Department of Hydropower Implementation (DHPI) and the Department of Hydropower Planning (DHPP).

- **Electric Power Generation Enterprise (EPGE)** – solely responsible for purchasing power from public and private power producers, including Build, Operate Transfer (BOT) project companies, and reselling that power on to the Electricity Supply Enterprise (ESE) and the Yangon Electricity Supply Board (YESB). In addition, the EPGE controls all transmission lines and substations.
- **Hydropower Generation Enterprise The Hydropower Generation Enterprise (HPGE)** – government partner for all hydro-generation BOT projects, and operates and maintains all large-scale public sector hydro-generation facilities. It is to be noted that HPGE is the only entity in this list not directly involved in this project.
- **Yangon City Electricity Supply Cooperation (YESC)** – plans, develops and maintains the Yangon electricity distribution system.
- **National Energy Management Committee (NEMC)** – recently implemented body that will, among other duties, coordinate with the Privatization Commission and the Myanmar Investment Commission in order to facilitate development of the energy and electricity sectors through private investments.
- **Ministry of Planning and Finance (the successor of Ministry of National Planning and Economic Development (MNPED))** – oversees the Directorate of Investment and Company Administration (DICA) and its sub-agency, the Myanmar Investment Commission (MIC). DICA oversees the process of company registration in Myanmar, and oversees the Foreign Investment Department (FID), who has a role in reviewing applications and is responsible for issuing the relevant licenses and permits after MIC and DICA approval. MIC is responsible for interfacing with foreign investors incorporated under the FIL.

3.4.3.1 Myanmar Legislation Specific to the Electricity and Energy Sector

The existing legislation governing electricity and energy in Myanmar is Electricity Law (2014) Pyidaungsu Hluttaw Law No. 44/2014 dated 27th October 2014.

The objectives of this Law are as follows:

1. To systematically manage, in accordance with the present policies of the Union government, electricity activities in order to better develop the electric power sector, to satisfy the country's need for electric power and to supervise and control electricity activities;
2. To encourage more large-scale electric power generation and distribution projects which the Union may manage, and mid-sized and small-scale electric power generation and distribution projects in the regions and states;
3. To enable the wider use of electric power without the occurrence of electrical hazards;
4. To perform electricity activities in conformity with the prescribed standards and norms;
5. To increase foreign and local investments in electricity activities;
6. To write and promulgate equitable, transparent and reasonable rules and regulations for fixing electric power rates depending on the area;
7. To enable power consumers to use electric power with a voltage and frequency conforming to the standards and norms, and to prevent damage and loss to their electrical appliances due to electric power which is not in conformity with the standards and norms;
8. To respect and comply with the international conventions on environmental conservation, approved and signed by Myanmar.

Chapter (5) Right to engage in electricity activities states that:

11. Any local or foreign person desirous to invest in any electricity activity must, in accordance with the stipulations, apply to the person authorized to issue the license in order to acquire it.

12. The relevant ministry which is authorized to issue the license may, with the consent of the Union government, issue the license to any local or foreign person or organization desirous to invest in large-scale power projects which may only be managed by the Union.
13. The region or state government which is authorized to issue the license may issue the license in accordance with the existing laws to any local or foreign person or organization desirous to invest in mid-size or small-scale electricity generation and distribution projects which may only be managed by the Union.
14. A license holder may apply to the ministry if he wants to sell electric power to the national grid. The ministry may allow or refuse the application after scrutinizing.
15. The head ("oozi") of the relevant self-administered division or zone may, after having negotiated with the relevant region or state government, issue licenses to any local or foreign person or organization desirous to invest in the electrification of the towns and villages situated in his area in accordance with the existing laws.

1. The license holder has the right to engage in electric power generation and distribution only after having received the electrical hazards safety certificate from the chief inspector.
2. (a) The license holder must apply to the relevant authorized ministry or organization if he desires to cooperate, with regard to the entire licensed project or some portion thereof, with other organizations, or transfer, sell, mortgage, lease or exchange licensed project or some portion thereof;
3. (b) The authorized ministry may, after having received the application under sub-section (a) and having scrutinized it, grant the application or refuse it.
4. The license holder abide by the rules, regulations, notifications, orders, directives and procedures issued by the relevant ministry relating to the licensed electricity activities.
5. (a) The license holder shall, if he fails to comply with the law, rules, regulations, procedures, orders and directions or the specified quality, standards and norm, be responsible in accordance with the law if any person or organization is affected of suffers a loss as a result.
6. (b) The relevant ministry must stipulate the rules and procedures for taking action relating to the matters under sub-section (a)
7. (a) The license holder shall be responsible in accordance with the law if any person or organization is affected or suffers a loss due to his negligence in performance;
8. (b) The relevant ministry must stipulate the rules and procedures for taking action relating to the matters under sub-section (a)
9. (a) The license holder shall not be responsible in accordance with the law if any person or any enterprise is affected or suffers a loss due to any force majeure event due to natural disaster including damages and losses to electricity activities;
10. (b) The relevant ministry must stipulate the rules and procedures relating to force majeure events with regard to electricity activities.
11. A power consumer must, if damage or loss occurs to other electric power consumers or any electricity activities due to his negligence, pay compensation calculated in accordance with the specified method of the ministry.
12. The license holder shall, upon expiry of the term of license, transfer the project to the concerned part in accordance with the agreement or the regulations in place at the time of receiving the license.
13. The license holder must comply with the following-

    (a) Electricity exploration must be done in accordance with the law;

(b) In electric power generation, transmission and distribution-

(1) Electrical power must be generated as specified in the license;

(2) Instruments for measuring electric power and protective equipment must be systematically used and maintained in accordance with the stipulations.

14. The license holder and the authorized person must inform the chief inspector and the relevant department in charge immediately if an electrical hazard has accidentally occurred when generating, transmitting, distributing or consuming electric power.

Chapter (10) Electrical power rates and service charges states that:

41. The relevant ministry shall, with the consent of the Union government, have the right to fix suitable electric power rates that are to be changed to the power consumers according to the region. The electric power rates may be changed from time to time.

42. The governments of the regions and states and the heads (“oozi”) of the self-administered divisions and self-administered zones shall have the right to fix, after consultation with the relevant ministry, suitable electric power rates that are to be charged for electric power under their own management in the electric power system of their area. The electric power rates may be changed from time to time.

Those who violate a specific section under Chapter (12) Prohibition can be punished with a fine ranging from 50,000 to 3,000,000 kyats, and/or imprisoned for 1 year at least up to 3 years at most.

3.4.4 Other Project-Relevant Legislation in Myanmar

Table 3.9 provides a list of major laws relevant to the Project, which forms part of the Project commitments.

Table 3.9: Project-Relevant Legislation in Myanmar

Laws and Regulations	Description
NEQ Guidelines (2015)	
The NEQ sets out emission standards for air, noise and effluent discharges for oil and gas operations. The project shall consider emissions standards in its environment impact assessment and environmental management plan.	
Myanmar Investment Law (2016)	
3. The objectives of this Law are as follows: a. To develop responsible investment businesses which do not cause harm to the natural; b. environment and the society for the benefit of the Union and its citizens; c. To protect the investors and their investments in accordance with the law; d. To create job opportunities for the people; e. To develop human resources; f. To develop high functioning production, service, and trading sectors. g. To develop technology and the agriculture, livestock and industrial sectors; h. To develop various professional fields including infrastructure across the Union; i. To enable the citizens to be able to work alongside with the international community; and j. To develop businesses and investments that meet international standards.	
Conservation of Water Resources and Rivers Law (2006)	
Section 6 outlines prohibitions for the following activities: ■ "No person shall anchor the vessels where vessels are prohibited from anchoring in the rivers and creeks. ■ No person shall dispose of 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. No one shall dispose of any substance into the rivercreek that may cause damage to waterway or change of watercourse from the bank or vessel." The aims of this Law are as follows: ■ to conserve and protect the water resources and river systems for beneficial utilization by the public; ■ to smooth and enhance safety of waterways navigation along rivers and creeks; ■ to contribute to the development of State economy through improving water resources and river systems; and ■ to protect environmental impact. The empowerment of this Law is provided to the Ministry of Transport for controlling navigation of vessels in the rivers and creeks as well as communicating with local and foreign government and organizations for conservation of water resources, rivers and creeks. Also, to carry out conservation works for water resources, rivers and creeks, in accordance with the relevant international conventions, regional agreements and bilateral agreements for environmental conservation.	
The Forest Law (1992)	
The State Law and Order Restoration Council had enacted the following Law in 3rd November, 1992 as Forest Law	

Laws and Regulations	Description
Chapter II: Basic Principles	3. This Law shall be implemented in accordance with the following basic principles: a. to implement the forestry policy of the Government; b. to implement the environmental conservation policy of the Government; c. to promote the sector of public co-operation in implementing the forestry policy and the environmental conservation policy of the Government.
Chapter IV: Management of Forest Land	9. The functions and responsibilities of the Forest Department are as follows:- a. implementation of the forestry policy of the Government; b. implementation of the plans relating to conservation of water, bio-diversity and environment, sustained yield of forest produce and protection of forest covered land; c. management of forest land in accordance with the provision of this Law; d. submitting proposals to the Minister for the determination, alteration or cancellation of reserved forest, protected public forest and species of reserved trees; Whoever, within a forest land and forest covered land at the disposal of the Government: is desirous of carrying out any development work or economic scheme shall obtain the prior approval of the MONRAEC.
Chapter XII: Offences and Penalties	40. Whoever commits any of the following acts shall, on conviction be punished with fine which may extend to Kyat 5,000 or with imprisonment for a term which may extend to 6 months or with both: a. trespassing and encroaching in a reserved forest; b. pasturing domestic animals or permitting domestic animals to trespass in a reserved forest; c. breaking up any land, clearing, digging or causing damage to the original condition of the land without a permit in a reserved forest; d. causing damage to a water-course, poisoning in the water, using chemicals or explosives in the water in a reserved forest; e. catching animals, hunting or fishing in a reserved forest; f. kindling, keeping, carrying any fire or leaving any fire burning which may set fire to the forests in a reserved forest; g. violating any provision of the rule, procedure, order, directive or notification issued under this Law.

Laws and Regulations	Description
The Burma Wildlife Protection Act 1936 and The Burma Wildlife Protection Rules 1941 (Burma Act No. Vii Of 1936)	
This legislation makes provision for the establishment of sanctuaries (game sanctuaries) on any land at the disposal of the government or, subject to the consent of the owner, any land which is private property. It also provides for the protection of a number of named species outside sanctuaries and reserved forests.	
The Protection and Preservation of Cultural Heritage Regions Law (1998)	
The State Peace and Development Council Law enacted this law by Law No. 9/ 98 on the date of 10 September, 1998. The Ministry of Culture may, with the approval of the Government issue notification for the protection of cultural heritage areas are categorized as following kinds of zones / region: a. Ancient monumental zone; b. Ancient site zone. **Objectives:** a. to implement the protection and preservation policy with respect to perpetuation of cultural heritage that has existed for many years; b. to protect and preserve the cultural heritage regions and the cultural heritage therein so as not to deteriorate due to natural disaster or man-made destruction; c. to uplift hereditary pride and to cause dynamism of patriotic spirit of citizens by protecting and preserving the cultural heritage regions; d. to promote public awareness and will as to the high value of the protection and preservation of the cultural heritage regions; e. to protect the cultural heritage regions from destruction; f. to carry out protection and preservation of the cultural heritage regions in conformity with the International Convention approved by the State.	
The Conservation of Antique Objects Law (2016)	
The objectives of this law are as follows: a. to implement the policy of protection and preservation for the perpetuation of antique objects; b. to protect and preserve antique objects so as not to deteriorate due to natural disaster or man-made destruction; c. to uplift hereditary pride and to cause dynamism of patriotic spirit by protection and preservation of antique objects; d. to have public awareness of the high value of antique objects; e. to carry out in respect of protection and preservation of antique objects in conformity with the International Convention and Regional Agreement ratified by the State.	
The Protection and Preservation of Ancient Monuments Law (2016)	
3. The objectives of this law are as follows: a. To implement the protection and preservation policy for the perpetuation of ancient monuments which have existed for many years; b. To protect and preserve cultural heritage regions and ancient monuments so that they are not destroyed by natural disaster or man;	

Laws and Regulations	Description

c. To uplift hereditary pride and to cause dynamism of patriotic spirit of citizens by protecting and preserving cultural heritage regions;

d. To promote public awareness and will as to the high value of the protection and preservation of cultural heritage regions;

e. To explore and preserve new ancient monuments;

f. To protect cultural heritage regions from destruction; and

g. To implement protection and preservation of ancient monuments in conformity with international conventions and regional agreements.

15. Every person desirous to engage in the following within the area of certain ancient monuments has to apply for the permission of the administration department:

(d) (e) digging a **well**, **pond** or fish-breeding pond;
(f) (f) **mining** for gold, producing sand, digging stones, brickworks and other works which can impact the soil density and ground structure;

The Private Industrial Enterprise Law (1990)

The State Law and Order Restoration Council enacted this law by Law No.22/90 on 26th November, 1990.According to this law; all private industrial enterprises shall avoid or reduce the use of polluting technology. The Supervisory Body supervises and inspects the enterprise to ensure the following:

- No health threats from the industrial enterprise to the nearby residence;
- No fire threats or hazards;
- No source of nuisance or pollution originating from the enterprise; and
- No occupational hazard to the workers and Compliance with the existing law.

Myanmar Fire Force Law (2015)

The objectives of Myanmar Fire Force Law are:

a. To take precautionary and preventive measure and loss of state own property, private property, cultural heritage and the lives and property of public due to fire and other natural disasters

b. To organize fire brigade systemically and to train the fire brigade

c. To prevent from fire and to conduct release work when fire disaster, natural disaster, epidemic disease or any kind of certain danger occurs

d. To educate, organize an inside extensively so as to achieve public corporation

e. To participate if in need for national security, peace for the citizens and law and order

The relevant Government Department or organization shall, for the purpose of precaution and prevention, obtain the approval of the Fire force Department before granting permission for the following cases:

a. Constructing three-storied and above buildings market and condominium buildings,

b. Operating hotel ,motel, guest house enterprise

c. Constructing factory, workshop ,storage facilities and warehouse

d. Operating business expose to fire hazard by using in inflammable materials or explosive materials

e. Producing and selling fire-extinguishing apparatuses

Doing transport business, public utility vehicles train, airplane, helicopter, vessel, ship, etc.

Laws and Regulations	Description
The relevant government department or organization shall obtain the opinion of the Fire Services Department for the purpose of fire precaution and prevention, when laying down plans for construction for town, village and downtown or village development plans.	
Underground Water Act (1930)	
The underground water act enacted on the date of 21st June in 1930 whereas it is expedient to conserve and protect underground sources of water supply in the Union of Myanmar. This act prohibits sinking of a tube for the purpose of obtaining underground water except under and in accordance with the terms of a license granted by the water officer. Township Officer or sub-divisional officer had power to close a license tube after exercising jurisdiction over the local area concerned and the expense of such closure shall be recoverable from the owner of the tube as if it were an arrear of land-revenue.	
Land Acquisition Act (1984)	
To determine how land is acquired for projects and how compensation is paid for the land. This includes compensation for things attached to the earth or permanently fastened.	
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. It is concerned with the protection of peoples' health by controlling the quality and cleanliness of food, drugs, environmental sanitation, epidemic diseases and regulation of private clinics. 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 owner will abide by any instruction or stipulation for public health. Section 5: The project owner will accept any inspection, anytime, anywhere if it is needed.	
The Protection and Prevention of Communicable Disease Law (1995)	
Chapter 5 of this law states that all persons are responsible for reporting an outbreak of a communicable disease to the nearest Health Officer.	
The Control of Smoking and Consumption of Tobacco Product Law (2006)	
3. The objectives of this Law are as follows; a. to convince the public that health can be adversely affected due to smoking and consumption of tobacco product and to cause refraining from the use of the same; b. to protect from the danger which affects public health adversely by creating tobacco smoke-free environment; c. to obtain a healthy living style of the public including child and youth by preventing the habit of smoking and consumption of tobacco product; d. to uplift the health, economy and social standard of the public through control of smoking and consumption of tobacco product; and e. to implement measures in conformity with the international convention ratified by Myanmar to control smoking and consumption of tobacco product.	
The Development of Employees and Expertise (Skill) (2013)	
5. (a) (1) If the employer has appointed the employee to work for an employment, the employment agreement shall be made within 30 days. But it shall not be related with government department and organization for a permanent employment. (2) If pre training period and probation period are stipulated before the appointment the said trainee shall not be related with the stipulation of sub- section (1). (b) The following particulars shall be included in the employment agreement: (1) the type of employment;	

Laws and Regulations	Description

(2) the probation period;
(3) wage, salary;
(4) location of the employment;
(5) the term of the agreement;
(6) working hour;
(7) day off, holiday and leave;
(8) overtime;
(9) meal arrangement during the work hour;
(10) accommodation;
(11) medical treatment;
(12) ferry arrangement to worksite and travelling;
(13) regulations to be followed by the employees;
(14) if the employee is sent to attend the training, the limited time agreed by the employee to continue to work after attending the training;
(15) resigning and termination of service;
(16) termination of agreement;
(17) the obligations in accord with the stipulation of the agreement;
(18) the cancellation of employment agreement mutually made between employer and employee;
(19) other matters;
(20) specifying the regulation of the agreement, amending and supplementing;
(21) miscellaneous.

(c) The worksite regulations contained in the employment agreement shall be in compliance with any existing law and the benefits of the employee shall not be less than those of the any existing law.
(d) According to the employment agreement, the Ministry shall issue the notification for paying the stipulated compensation to the employee by the employer, if the work is completed earlier than the stipulated period or the whole work or any part of it have to be terminated due to unexpected condition or the work has to be terminated due to various conditions.
(e) The employment agreement made under sub- section (a) shall be related with daily wage workers, piece rate workers who are appointed temporarily in the government department and organization.
(f) The worksite regulations and benefits contained in the employment agreement mutually made between the employer and employee or among the employees shall be amended as necessary, in accord with the existing law.
(g) The employer shall send a copy of the employment agreement made between the employer and employee, to the relevant employment and labour exchange office within the stipulated period and shall get the approval of it.
(h) The employment agreement made before the enforcement of this law shall be confirmed up to the end of the term of the original agreement.

14. The employer shall carry out the training program in accord with the work requirement in line with the policy of the skill development team to develop the skill relating to the employment for the workers who are proposed to appoint and working at present.

15. The Employer:

(a) shall carry out the training for each work or compounding the work individually or group- wise by opening on- job training, training systematically at worksite, sending outside training and training by using information technology system, for arranging the training program to enhance the employment skill of the workers;
(b) appointing the youths of 16 years as apprentice, shall arrange the training for technology relating to the employment systematically in accord with the regulations prescribed by the skill development team.

Laws and Regulations	Description
	30. (a) The employer of the industry and service business shall put in to the fund monthly as put in fees without fail for the total wages of the subordinates and the supervisors' salary for not less than 0.5%; (b) Put in money paid under sub- section (a) shall not be deducted from the wage and salary of the employees.
The Settlement of Labour Dispute Law (2012)	
The Pyidaungsu Hluttaw hereby had enacted this Law for safeguarding the right of workers or having good relationship between employer and workers and making peaceful workplace or obtaining the rights fairly, rightfully and quickly by settling the dispute of employer and worker justly.	
The Workmen Compensation Act (1923), (amended 2005)	
In the Workmen's compensation Act, 1923, the expression" Kyats 2,160 and Kyats 7,200" contained in clause A (i) of sub-section (1) of section 4, the expression "two hundred Kyats" contained in clause A (ii) of sub-section (1) of section 4, the expression "Kyats 3,024and Kyats 10,080" contained in clause B (i) of sub-section (1) of section 4, the expression "twelve hundred Kyats" contained in clause B (ii) of sub-section (1) of section 4, the expression "one hundred Kyats" contained in the proviso of sub-section (1) of section 8 shall be substituted respectively by the expression "the amount of compensation prescribed by notification by the Ministry of Labour, with the approval of the Government." The expression “subject to a maximum of thirty Kyats" contained in clause D (ii) of sub-section (1) of section 4 of the Workmen's Compensation Act, 1923 shall be deleted. The expression "ten Kyats" contained in sub-section (2) of section 8, the expression "twenty five Kyats" contained in sub-section (4) of section 8, the expression "three hundred Kyats" contained in the first proviso of sub-section (1) of section 30 of the Workmen's Compensation Act, 1923 shall be substituted respectively by the expression "the amount of money prescribed by notification by the Ministry of Labour, with the approval of the Government. The expression "shall be punishable with fine which may extend to one hundred Kyats" contained in sub-section (1) of section 18 A of the Workmen's Compensation Act, 1923 shall be substituted by the expression "shall be punishable with fine which may extend to Kyats 10,000."	
Labour Organization Law (2012)	
This Law was enacted, to protect the rights of the workers, to have good relations among the workers or between the employer and the worker, and to enable to form and carry out the labour organizations systematically and independently.	
Minimum Wages Law (2013)	
This Law was enacted to meet with the essential needs of the workers, and their families, who are working at the commercial, production and service, agricultural and livestock breeding businesses and with the purpose of increasing the capacity of the workers and for the development of competitiveness.	
Payment of Wages Law (2016)	
Salaries are to be paid at the end of the month or, depending on the size of the employing enterprise, between 5-10 days before the end of the month. The employer is permitted and required to withhold income tax and social security payments. Other deductions, e.g. for absence, may only be withheld in accordance with the law. Section 3 The employer (a) will pay for salary either Myanmar Kyats or Foreign Cash permitted by National Bank of Myanmar. When delivery the salary (b) If the employer needs to pay the other opportunities or advantages, he can pay cash together with other materials according employee’s attitude. Section 4 When the contract finish, employer need to pay the salary (not more than one month) to employees. For the permanent worker, need to pay per monthly. If more than 100 employees, need to pay within the 5 days from the end of month. If fire the employees, need to pay salary within two days after fire. When employee dies due to the accident, need to pay money as an insurance to employee’s family within two days. Section 9 When cut the salary due to the employees’ absence, total cut salary not more than 50 % of his salary.	

Laws and Regulations	Description
Section 10 Employer need to approval form the department as a penalty and cannot more than actual ravage rate when cut salary. No cut salary from the employees under 16 age.	
Social Security Law (2012)	
The Establishments Applied Section 11. (a) The following establishments shall be applied with the provisions for compulsory registration for social security system and benefits contained in this Law if they employ minimum number of workers and above determined by the Ministry of Labour in co-ordination with the Social Security Board: i. production industries doing business whether or not they utilize mechanical power or a certain kind of power, works of production, repairing or services, or engineering works, mills, warehouses, establishments; ii. Government departments, Government organizations and regional administrative organizations doing business; iii. development organizations; iv. financial organizations, v. companies, associations, organizations and their subordinate departments and branch offices doing business; vi. shops, commercial establishments, public entertaining establishments; vii. Government departments and Government organizations doing business or transport businesses owned by regional administrative body, and transport businesses carried out with the permission of such department, body or in joint venture with such department or body; viii. construction works carried out for a period of one year and above under employment agreement; ix. works carried out with foreign investment or citizen investment or joint ventured businesses; x. works relating to mining and gemstone contained in any existing law; xi. works relating to petroleum and natural gas contained in any existing law; xii. ports and out-ports contained in any existing law; xiii. works and organizations carried out with freight handling workers; xiv. Ministry of Labour and its subordinate departments and organizations; xv. establishments determined by the Ministry of Labour from time to time, in co-ordination with the Social Security Board and with the approval of the Union Government; that they shall be applied with the provisions of compulsory registration for Social Security System and benefits contained in this Law. (b) Any establishment which is applied with the provisions of compulsory registration under sub-section (a) shall continue to be applied by this Law even though any of the following situations occurs if it continues to carry out such work: xvi. carrying out work by employing under stipulated minimum number of workers but more than one worker; xvii. changing the employer or changing the type of business. Section 48 (a) The employer shall effect insurance by registering for employment injury benefit insurance system contained in section 45 at the relevant township social security office and pay contribution to employment injury benefit	

Laws and Regulations	Description
	fund in accord with stipulations in order that workers applied to provisions of compulsory registration may obtain the employment injury benefits. Section 51 The employer (a) shall pay contribution monthly to Employment Injury Benefit Fund at the rates stipulated under section 50. Moreover he shall also bear the expenses for paying as such; (b) shall pay defaulting fee stipulated under section 88, in addition to the contribution if fails to contribute after effecting insurance for employment injury benefit. Section 53 (a) The employers and workers shall co-ordinate with the Social Security Board or insurance agency in respect of keeping plans for 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; Section 54 (a) The employer shall report to the relevant township social security office immediately if a serious employment accident occurs to his insured worker. There shall not be any delay without sufficient cause to report as such. (b) A team of officers and other staff who inspect the establishments, if it is found out the employment injury, death, and contracting disease, shall report to the relevant township social security office in accord with the stipulations.
Leaves and Holidays Act (1951)	
	Under the Leave and Holidays Act (1951), every employee shall be granted paid public holidays as announced by the Government in the Myanmar Gazette. On average, Myanmar has 26 public holidays per year, depending on the date of the variable holidays. Myanmar law recognizes various types of leave. Leave is governed by the Leave and Holidays Act (1951), but additional rules may apply in accordance with other laws, such as the Social Security Law (2012) for employees contributing to the Social Security Fund.
The Import and Export Law (2012)	
	7. A person who obtained any license shall not violate the conditions contained in the license.

Source: ERM, 2019

3.4.5 Institutional Framework

3.4.5.1 Central EIA/ IEE Authority

MONREC is the authority that is responsible for implementing EIA. In 2011, MONREC became the coordinating agency responsible for the country environmental management.

3.4.5.2 Other Governmental Parties Involved in EIA/ IEE Process

MONREC has assigned responsibilities with regards to IEE/EIA to the Environmental Conservation Department (ECD), which is one of the 6 departments of the MONREC. The ECD was set up in October 2012 and is mainly responsible for implementing the National Environmental Policy, strategy, framework, planning and action plan for the integration of environmental consideration into the national sustainable development process.

In addition, an IEE/EIA Report Review Body, consisting of individual experts and/or experts from relevant government departments and organizations, may support MONREC with the review process.

The Myanmar Investment Commission (MIC) has responsibility for making decisions regarding project approval. MIC is a government-appointed body under the Ministry of National Planning and Economic Development, formed in 1994, that appraises investment proposals in Myanmar.

3.4.5.3 IEE Review and Approval Process

Based on the EIA Procedure, articles relevant to the submission and approval of an IEE Report are presented below. In addition, an overview of the process (from the EIA Procedure) is shown in ***Figure 3.3***.

Submission of IEE Report

37. After completing all investigations and public consultation and participation processes required for IEE Type Projects, the Project Proponent shall submit the IEE Report for the Project to the Department in both digital form and complete paper copies, together with the required service fee as prescribed by the Department.

38. Not later than fifteen (15) days after submission of the IEE Report to the Department, the Project Proponent shall disclose the IEE Report to civil society, PAPs, local communities and other concerned stakeholders: (i) posting on the Project or Project Proponent's website(s), (ii) by means of local media (i.e. newspapers); (iii) at public meeting places (e.g. libraries, community halls); and (iv) at the offices of the Project Proponent.

Submission, Review and Approval Process for IEE Report

37. After completing all investigations and public consultation and participation processes required for IEE Type Projects, the Project Proponent shall submit the IEE Report for the Project to the Department in both digital form and complete paper copies, together with the required service fee as prescribed by the Department.

38. Not later than fifteen (15) days after submission of the IEE Report to the Department, the Project Proponent shall disclose the IEE Report to civil society, PAPs, local communities and other concerns stakeholders: (i) by means of local media (i.e. newspapers); (ii) at public meeting places (e.g. libraries, community halls); and (iii) at the offices of the Project Proponent.

39. Upon receipt of the IEE Report from the Project Proponent, the Department shall:

a. disclose the IEE Report to the public on the Ministry and/or Department website(s), and/or through other appropriate media;

b. invite comments and suggestions on the IEE Report from all relevant parties including relevant government organizations, institutions, civil society organizations, and PAPs, as appropriate;

c. arrange public consultation meetings at the local level, at which the Project Proponent shall present the IEE Report; and

d. collect and review all comments and recommendations received, and forward the same to the Ministry to enable it to make a final decision on approval of the IEE Report.

40. If it is determined by the Ministry that the IEE Report does not satisfy requirements, then the Project Proponent shall be called upon by the Department to undertake necessary amendments and/or to provide supplementary information as directed by the Ministry.

41. Upon completion of its review of the IEE Report, the Ministry shall;

a. approve the IEE Report, subject to any conditions it may prescribe, and issue an ECC; or

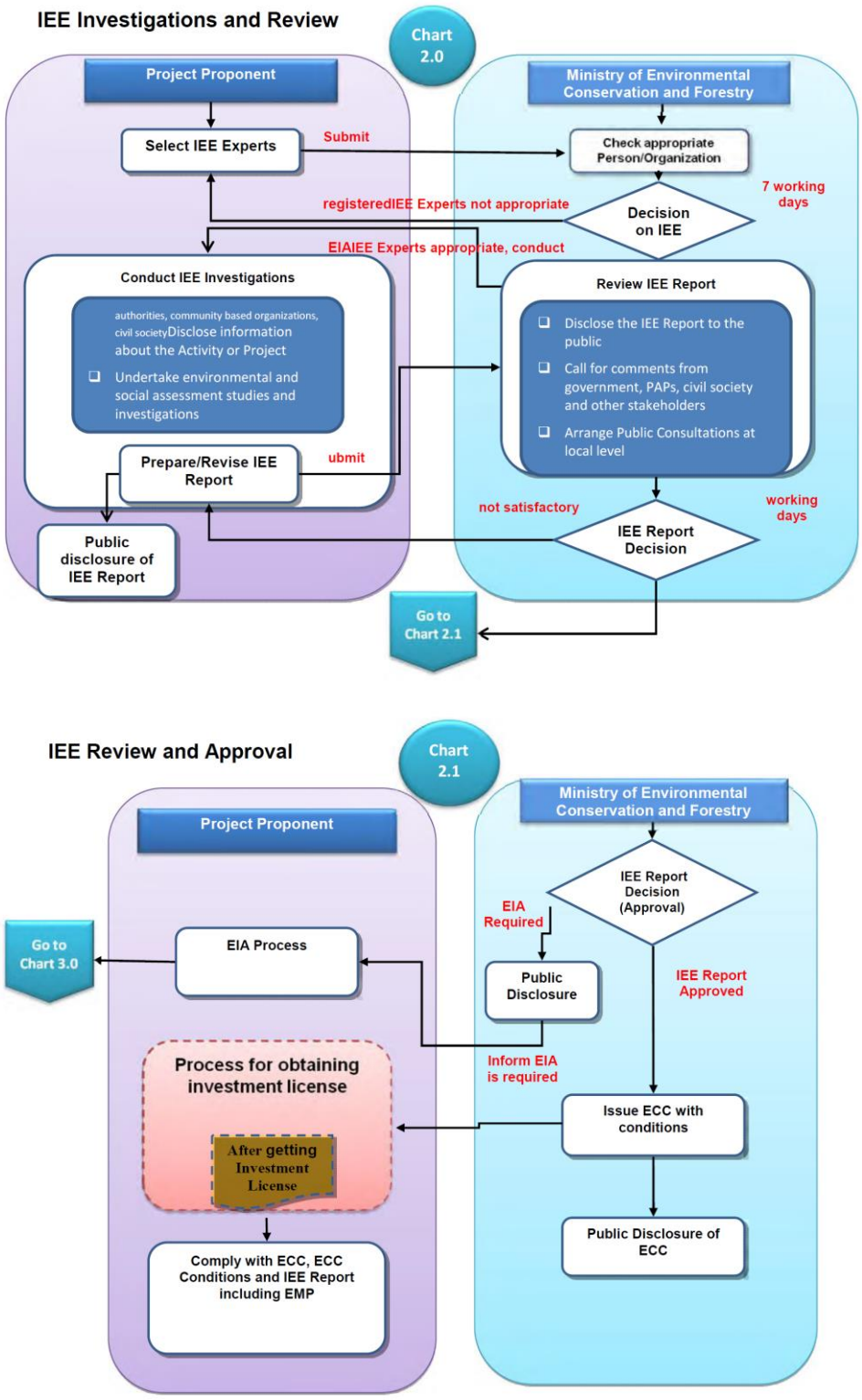
b. require that the Project carry out an EIA, citing the reasons for this decision and informing the Project Proponent of its decision; and, in either case

c. publicly disclose its decision.

42. The Department shall deliver the final decision of the Ministry within sixty (60) working days of receipt of an IEE Report. If the Ministry requires an IEE Report to be amended, then the due date for delivery of the Ministry's decision shall be extended accordingly.

43. All costs incurred in completing the IEE Report disclosure and review, including the public consultation process, shall be borne by the Project Proponent.

Figure 3.3: IEE Investigations, Review and Approval Process



Source: EIA Procedure, 2015.[5]

[5] MOECAF (2015) Environmental Impact Assessment Procedure. Ministry of Environmental Conservation and Forestry Notification No. 616 / 2015.

3.5 International Agreements and Conventions

In addition to the local regulations presented above, Myanmar is also a signatory to the following international conventions which may have relevance to the proposed Project:

- Asia Least Cost Greenhouse Gas Abatement Strategy (ALGAS) (1998);
- United Nations Framework Convention on Climate Change (1994);
- Montreal Protocol on Substances that Deplete the Ozone Layer (1989);
- Kyoto Protocol to the UNFCC on Climate Change (1997);
- Basel Convention (1989);
- Ramsar Convention on Wetland (1971);
- International Convention on Standards of Training Certification and Watch-keeping for Seafarers (1978);
- Vienna Convention for the protection of the Ozone layer (1988); and
- United Nation Convention on Biological Diversity (1992).

3.6 International Standards and Guidelines

TPMC will undertake the impact assessment study and Project activities in a manner guided by Good International Industry Practice (GIIP). These standards are set to complement and reinforce national legislation and ensure the Project is conducted under best practices in a way that minimizes risks, impacts and ensures compliance and fair practices. The international performance standards and guidelines provide guidance on how to identify risks and impacts, and are designed to help avoid, mitigate, and manage risks and impacts as a way of doing business in a sustainable way, including stakeholder engagement and disclosure obligations of the client in relation to project-level activities.

Applicable guidelines which TPMC will consider in preparing its approach include:

- International Finance Corporation (IFC) Performance Standards on Environmental and Social Sustainability (2012);
- IFC Environmental, Health and Safety (EHS) guidelines, including:
  - General EHS Guidelines (2007); and
  - EHS Guidelines for Electric Power Transmission and Distribution (2007).
- IFC's Stakeholder engagement handbook and other relevant Good Practice Notes;
- IFC's Handbook for Preparing a Resettlement Action Plan (if applicable); and
- International Union for Conservation of Nature and Natural Resources, Red List of Threatened Species (1964).

3.6.1 International Finance Corporation (IFC) and World Bank Performance Standards

The IFC updated its Sustainability Framework in January 2012. This included revising the Performance Standards; which replace the previous safeguard policies and will be used to evaluate any project seeking funding through the IFC.

The Performance Standards represent the 'policy framework' for the ESIA and sustainable social and environmental management for the Project, whereas the IFC EHS Guidelines provide guidance on general and industry best practice as well as recommended numerical limits for emissions to the atmosphere, noise, liquid and solid wastes, hazardous wastes, health and safety, and other aspects of

industrial facilities and other types of development projects. The relevant IFC Performance Standards are listed in ***Table 3.10*** and the EHS Guidelines are discussed further in the following sections.

Table 3.10: IFC Performance Standards (PS)

Performance Standards	Objectives
Performance Standard 1 - Assessment and Management of Environmental and Social Risks and Impacts underscores the importance of managing social and environmental performance throughout the life of a project (any business activity that is subject to assessment and management).	■ *Impact identification and assessment*. To identify and assess social and environmental impacts, both adverse and beneficial, in the project's area of influence ■ *Mitigation*. To avoid, or where avoidance is not possible, minimize, mitigate, or compensate for adverse impacts on workers, affected communities, and the environment ■ *Stakeholder engagement*. To ensure that affected communities are appropriately engaged on issues that could potentially affect them *Effective management*. To promote improved social and environment performance of companies through the effective use of management systems.
Performance Standard 2 - Labour and Working Conditions recognizes that the pursuit of economic growth through employment creation and income generation should be balanced with protection for basic rights of workers.	■ To promote fair treatment, non-discrimination and equal opportunity of workers, and compliance with national labour and employment laws ■ To establish, maintain and improve the worker management relationship. ■ To promote compliance with national employment and labour laws. ■ To protect the workforce by addressing child labour and forced labour. ■ To promote safe and healthy working conditions, and to protect and promote the health of workers.
Performance Standard 3 - Resource Efficiency and Pollution Prevention recognizes that increased industrial activity and urbanization often generate increased levels of pollution to air, water, and land that may threaten people and the environment at the local, regional, and global level.	■ To avoid or minimize adverse impacts on human health and the environment by avoiding or minimizing pollution from project activities ■ To promote more sustainable use of resources, including energy and water. ■ To reduce project –related GHG emissions.
Performance Standard 4 - Community Health, Safety and Security recognizes that project activities, equipment, and infrastructure often bring benefits to communities including employment, services, and opportunities for economic development.	■ To anticipate and avoid adverse impacts on the health and safety of the Affected Community during the project life from both routine and non routine circumstances ■ To ensure that the safeguarding of personnel and property is carried out in accordance with relevant human rights principles and in a manner that

Performance Standards	Objectives
	avoids or minimizes risks to the Affected Communities.
Performance Standard 5 - Land Acquisition and Involuntary Resettlement outlines that involuntary resettlement refers both to physical displacement (relocation or loss of shelter) and to economic displacement (loss of assets or access to assets that leads to loss of income sources or means of livelihood) as a result of project-related land acquisition	■ To avoid, and when avoidance is not possible, minimize displacement by exploring alternative project designs. ■ To avoid forced eviction ■ To anticipate and avoid, or where avoidance is not possible, minimize adverse social and economic impacts from land acquisition or restrictions on land use by (i) providing compensation for loss of assets at replacement cost and (ii) ensuring that resettlement activities are implemented with appropriate disclosure of information, consultation and the informed participation of those affected. ■ To improve, or restore, the livelihoods and standards of living of displaced persons. ■ To improve living conditions among physically displaced persons through the provision of adequate housing with security of tenure at resettlement sites.
Performance Standard 6 - Biodiversity Conservation and Sustainable Management of Living Natural Resources recognizes that protecting and conserving biodiversity—the variety of life in all its forms, including genetic, species and ecosystem diversity—and its ability to change and evolve, is fundamental to sustainable development	■ To protect and conserve biodiversity ■ To maintain the benefits from ecosystem services ■ To promote the sustainable management of living natural resources through the adoption of practices that integrate conservation needs and development priorities
Performance Standard 7 - Indigenous People recognizes that Indigenous Peoples, as social groups with identities that are distinct from dominant groups in national societies, are often among the most marginalized and vulnerable segments of the population.	■ To ensure that the development process fosters full respect for the dignity, human rights, aspirations, cultures and natural resource-based livelihoods of Indigenous Peoples ■ To anticipate and avoid adverse impacts of projects on communities of Indigenous Peoples, or when avoidance is not feasible, to minimize, mitigate, or compensate for such impacts, and to provide opportunities for development benefits, in a culturally appropriate manner ■ To promote sustainable development benefits and opportunities for Indigenous Peoples in a culturally appropriate manner. ■ To establish and maintain an ongoing relationship based on Informed Consultation and Participation (ICP) with the Indigenous Peoples affected by a project throughout the life of the project

Performance Standards	Objectives
	■ To ensure the Free, Prior and Informed Consent (FPIC) of the Affected Communities of the IPs when the circumstances described in this Performance Standard are present. ■ To respect and preserve the culture, knowledge and practices of Indigenous Peoples
Performance Standard 8 - Cultural Heritage recognizes the importance of cultural heritage for current and future generations. Consistent with the Convention Concerning the Protection of the World Cultural and Natural Heritage, this Performance Standard aims to ensure that clients protect cultural heritage in the course of their project activities.	■ PS 8 aims to protect the irreplaceable cultural heritage and to guide clients on protecting cultural heritage in the course of their business operations. In addition, the requirements of this PS on a project's use of cultural heritage are based in part on standards set by the Convention on Biological Diversity. PS 8 recognizes the importance of cultural heritage with an objective to: ■ Protect cultural heritage from the adverse impacts of project activities and support its preservation; and ■ Promote the equitable sharing of benefits from the use of cultural heritage in business activities. ■ The PS requires the project proponent to comply with relevant national law on the protection of cultural heritage, including national law implementing the host country's obligations under the Convention Concerning the Protection of the World Cultural and Natural Heritage and other relevant international law.

Source: IFC, 2012[6]

[6] IFC (2012) Performance Standards on Environmental and Social Sustainability. International Finance Corporation. https://www.ifc.org/wps/wcm/connect/115482804a0255db96fbffd1a5d13d27/PS_English_2012_Full-Document.pdf?MOD=AJPERES

3.6.2 International Finance Corporation (IFC)/World Bank Environmental, Health, and Safety (EHS) Guidelines

The EHS Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP). The EHS Guidelines contain the performance levels and measures that are generally considered to be achievable in new facilities by existing technology at reasonable costs. Application of the EHS Guidelines to existing facilities may involve the establishment of site-specific targets, with an appropriate timetable for achieving them. The applicability of the EHS Guidelines should be tailored to the hazards and risks established for each project on the basis of the results of an environmental assessment in which site-specific variables, such as host country context, assimilative capacity of the environment, and other project factors, are taken into account. The applicability of specific technical recommendations should be based on the professional opinion of qualified and experienced persons. When host country regulations differ from the levels and measures presented in the EHS Guidelines, projects are expected to achieve whichever is more stringent.

Due to the technical nature of the standards, the limits and levels are not included here in the regulatory review. However the standards, where applicable, will be assessed and complied with as per the technical requirements set out in the original document.

Applicable IFC General EHS Guidelines are shown in ***Table 3.11*** and IFC/World Bank EHS Guidelines for Electric Power Transmission and Distribution are shown in ***Table 3.12***.

Table 3.11: Applicable IFC General EHS Guidelines

Applicable IFC EHS Guidelines
General Environmental Guidelines
1.1 Air Emissions and Ambient Air Quality
1.2 Energy Conservation
1.3 Wastewater and Ambient Water Quality
1.4 Water Conservation
1.5 Hazardous Materials Management
1.6 Waste Management
1.7 Noise
1.8 Contaminated Land
General Occupational Health and Safety Guidelines
2.1 General Facility and Design and Operation
2.2 Communications and Training
2.3 Physical Hazards
2.4 Chemical Hazards
2.5 Biological Hazards
2.7 Personal Protective Equipment (PPE)
2.8 Special Hazards Environments
2.9 Monitoring

Applicable IFC EHS Guidelines
General Community Health and Safety
3.1 Water Quality and Availability
3.2 Structural Safety and Project Infrastructure
3.3 Life and Fire Safety (L&FS)
3.4 Traffic Safety
3.5 Transport of Hazardous Materials
3.6 Disease Prevention
General Construction and Demolition Guidelines
4.1 Environment
4.2 Occupational Health and Safety
4.3 Community Health and Safety
Sectors Specific EHS Guidelines
EHS Guidelines for Electric Power Transmission and Distribution

Source: IFC, 2007[7]

Where different standards are prescribed by the different agencies, the most stringent of the national and international standards will apply to the Project:

"When host country regulations differ from the levels and measures presented in the EHS Guidelines, projects are expected to achieve whichever is more stringent. If less stringent levels or measures than those provided in these EHS Guidelines are appropriate, in view of specific project circumstances, a full and detailed justification for any proposed alternatives is needed as part of the site-specific environmental assessment. This justification should demonstrate that the choice for any alternate performance levels is protective of human health and the environment." (IFC EHS General Guidelines, page 1).

In general, the IFC's EHS Guidelines are the more comprehensive and stringent. Compliance with national standards is always required.

[7] IFC, 2007. Environmental, Health, and Safety General Guidelines.

Table 3.12: IFC/World Bank EHS Guidelines for Electric Power Transmission and Distribution

EHS Guidelines for Electric Power Transmission and Distribution	
1.0	Industry-Specific Impacts and Management
1.1	Environment
	- Terrestrial habitat alteration - Aquatic habitat alteration - Electric and magnetic fields - Hazardous materials
1.2	Occupational Health and Safety (OH&S)
	- Live power lines - Working at height - Electric and magnetic fields - Exposure to chemicals
1.3	Community Health and Safety
	- Electrocution - Electromagnetic interference - Visual amenity - Noise and Ozone - Aircraft Navigation Safety
2.0	Performance Indicators and Monitoring
2.1	Environment
	- Emission and Effluent Guidelines - Environmental Monitoring
2.2	Occupational Health and Safety (OH&S)
	- OH&S Guidelines - Accident and Fatality Rates - OH&S Monitoring

Source: IFC, 2007 [8]

[8] IFC, 2007. Environmental, Health and Safety Guidelines for Electric Power Transmission and Distribution.

3.7 International Conventions

Myanmar has ratified several international conventions. Highlights of key conventions are provided below.

3.7.1 The Kyoto Protocol on Climate Change (UNFCC)

Myanmar achieved full accession to the UNFCC in 2003. This obligates Myanmar to assure that future development in the country meets the conditions of the Convention. Relevant to this Project are the requirements associated with the potential generation of greenhouse gas from the operation of the coal-fired power plant; further conditions of relevance include:

- Enhancement of energy efficiency in relevant sectors;
- Protection and enhancement of sinks and reservoirs of greenhouse gases;
- Promotion of sustainable forest management practices, afforestation and reforestation;
- Promotion of sustainable forms of agriculture;
- Implementation of measures to limit and/ or reduce emissions of greenhouse gases; and
- Limitation and/ or reduction in methane emissions.

3.7.2 United Nations Framework Convention on Climate Change 1994

The United Nations Framework Convention on Climate Change (UNFCCC or FCCC) is an international environmental treaty negotiated at the United Nations Conference on Environment and Development (UNCED). The objective of this framework is to “stabilize greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.”

3.7.3 Montreal Protocol on Substances that Deplete the Ozone Layer 1989

The Montreal Protocol was signed by 197 countries and agreed to eliminate the production and consumption of ozone depleting substances to limit their damage to the earth’s ozone layer. This has been contributed by a broad coalition that developed and implemented flexible, innovative, and effective approaches to protect the stratospheric ozone later[9].

3.7.4 Ramsar Convention on Wetland 1971

This convention is an intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources. The contract has been signed by 170 countries, gathering 2,339 wetland sites covering a total surface area of 252,054,231 ha.

3.7.5 International Convention on Standards of Training Certification and Watch-keeping for Seafarers 1978

The International Convention on Standards of Training, Certification and Watchkeeping for Seafarers which is also known as the 1978 STCW Convention was established with the objective to prescribe minimum standards relating to training, certification and watchkeeping for seafarers[10] which countries are obliged to meet or exceed. The STCW convention chapter were presented as follow:

- Chapter I: General provisions;
- Chapter II: Master and deck department;

[9] EPA, 2018.

[10] A person who regularly travels by sea

- Chapter III: Engine department;
- Chapter IV: Radiocommunication and radio personnel;
- Chapter V: Special training requirements for personnel on certain types of ships;
- Chapter VI: Emergency, occupational safety, medical care and survival functions;
- Chapter VII: Alternative certification; and
- Chapter VIII: Watchkeeping.

3.7.6 Vienna Convention for the protection of the Ozone layer 1988

The objective of this convention was to take appropriate measures in accordance with the provisions of this Convention and those protocols in force to which they are party to protect human health and the environment against adverse effects resulting or likely to result from human activities which modify or are likely to modify the ozone layer.

3.7.7 United Nations Convention on Biological Diversity 1992

This Convention seeks to conserve biodiversity and promote its sustainable use. It requires the identification and monitoring of the biodiversity in an area and adopting the necessary conservation measure. Myanmar became party to this Convention in 1994.

3.7.8 Basel Convention 1989

This was developed under the auspices of the United Nations Environmental Programme (UNEP) in response to the growing worldwide awareness of the problem of international traffic in hazardous waste. The Basel Convention 1989 is the first and foremost global environmental treaty that strictly regulates the trans-boundary movement of hazardous wastes. It obligates parties to ensure environmentally sound management, especially during the disposal process.

The objectives of the Convention are to:

- Ensure that waste is disposed of as near as possible to the place or source of its generation;
- Reduce trans-boundary waste and where it cannot be avoided, to be disposed of in an environmentally sound and efficient manner; and
- Provide assistance to developing countries in the management of hazardous waste and the generation.

The Convention places a ban on the export of hazardous waste from Organization for Economic Cooperation and Development (OECD) countries to non-OECD countries.

3.7.9 International Labour Organisation (ILO) 1919

Myanmar ratified several ILO Fundamental and Technical conventions relevant to the Project. This includes:

- C1 Hours of Work (Industry), relative to the maximum working hours for the industrial sector (private and public) and the exceptions that can be applied to the maximum of 8 hours per day and 48 hours per week stated in this convention and under what conditions.
- C14 Weekly Rest (Industry), relative to the minimum of 24 consecutive hours of rest every period of seven days and the exceptions that can be applied and under what conditions.
- C17 Workmen's Compensation (Accidents), relative to compensation to be provided to workmen who suffer personal injury due to an industrial accident, or their dependents.
- C19 Equality of Treatment (Accident Compensation), relative to the equality of treatment for compensation between citizen of every country that has ratified this Convention.

- C26 Minimum Wage Fixing Machinery, relative to the creation or maintenance of machinery whereby minimum rates of wages can be fixed for workers employed in certain of the trades or parts of trades in which no arrangements exist for the effective regulation of wages by collective agreement or otherwise and wages are exceptionally low.
- C29 Forced Labour Convention, relative to the suppression in the shortest possible delay of every kind of forced or compulsory labour.
- C42 Workmen's Compensation (Occupational Diseases) Revised 1934, relatives to the payment of compensation to workmen, or their relatives in case of death, incapacitated by occupational diseases. The convention also includes a list of diseases and toxic substances and corresponding trades.
- C52 Holidays with Pay, relative to the minimum of 6 working days of paid holiday due to employee having work a minimum of one year of continuous service. The convention includes a list of exceptions that can be applied and under what conditions.
- C87 Freedom of Association and Protection of the Right to Organize, relative to the right of workers and employees to establish and join organisations of their own choosing without previous authorisation and the rights of these organisations.

A list of Project-relevant international treaties of which Myanmar is a signatory are provided in ***Table 3.13***.

Table 3.13: International Conventions Ratified by Myanmar

No.	Conventions	Year (Ratified/Acceded/Accepted)
Environment		
1	Plant Protection Agreement for the Southeast Asia and Pacific Region, Rome 1956	1959 (Ratified)
2	MARPOL: International Convention for the Prevention of Pollution from Ships 1973 and MARPOL Protocol of 1978	1988 (Accession)
3	ICAO: ANNEX 16 to the Convention on International Civil Aviation Environmental Protection Vol. I and II, Aircraft Noise and Aircraft Engine Emission	Accession
4	Agreement on the Networks of Aquaculture Centres in Asia and the Pacific, Bangkok 1988	1990 (Accession)
5	Vienna Convention for the Protection of the Ozone Layer, Vienna 1985	1993 (Ratification)
6	Montreal Protocol on Substances that Deplete the Ozone Layer, Montreal 1987	1993 (Ratification)
7	London Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer, London 1990	1993 (Ratification)
8	United Nations Framework Convention on Climate Change (UNFCCC), New York 1992	1994 (Ratification)
9	Convention on Biological Diversity, Rio de Janeiro 1992	1994 (Ratification)
10	The Convention Concerning the Protection of the World Cultural and Natural Heritage, Paris 1972	1994 (Acceptance)
11	International Tropical Timber Agreement (ITTA), Geneva 1994	1996 (Ratification)
12	United Nations Convention to Combat Desertification in Those Countries Experiencing Serious Drought, Paris 1994	1997 (Accession)

No.	Conventions	Year (Ratified/Acceded/Accepted)
13	Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), Washington DC 1973; and as amended in Bonn, Germany 1979	1997 (Accession)
14	ASEAN Agreement on Conservation of Nature and Nature Resources, Kuala Lumpur, 1985	1997 (Signatory)
15	Kyoto Protocol to the Convention on Climate Change, Kyoto 1997	2003 (Accession)
16	ASEAN Agreement on Trans-boundary Haze Pollution	2003 (Ratification)
17	Stockholm Convention on Persistent Organic Pollutants (POPs), 2001	2004 (Accession)
18	Ramsar Convention on Wetlands of International Importance	2005 (Accession)
19	Establishment of ASEAN Regional Centre for Biodiversity	2005 (Signatory)
20	Declaration on ASEAN Heritage Parks	2003 (Signatory)
21	International Treaty on Plant Genetic Resources for Food and Agriculture, 2001	2004 (Ratification)
22	Catagena Protocol on Biosafety, Cartagena, 2000	2001 (Signatory)
23	Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas, Rome, 1973	1994 (Acceptance)
24	United Nations Convention on the Law of the Sea, Montego Bay, 1982	1996 (Ratified)
25	Agreement Relating to the Implementation of Part XI of the United Nations Convention on the Law of the Sea of 10 December 1982, New York, 1994	1996 (Accession)
26	Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and their Destruction, Paris, 1993	1993 (Signatory)
27	Treaty on the Prohibition of the Emplacement of Nuclear Weapons and other Weapons of Mass Destruction on the Sea Bed and Ocean Floor and in the Subsoil there of, London, Moscow, Washington, 1971	1971 (Signatory)
Social, Labour and Health		
28	Universal Declaration of Human Rights (UNDHR)	signed
29	Convention on the Rights of the Child	1991 (acceded)
30	Convention on Elimination of All Forms of Discrimination against Women (CEDAW)	1997 (acceded)
31	Relevant ILO Conventions in force in Myanmar ■ C1 Hours of Work (Industry) ■ C14 Weekly Rest (Industry) ■ C17 Workmen's Compensation (Accidents) ■ C19 Equality of Treatment (Accident Compensation) ■ C26 Minimum Wage Fixing Machinery	Ratified: ■ 1921 ■ 1923 ■ 1956 ■ 1927 ■ 1954

No.	Conventions	Year (Ratified/Acceded/Accepted)
	■ C29 Forced Labour Convention	■ 1955
	■ C42 Workmen's Compensation (Occupational Diseases) Revised 1934	■ 1957
	■ C52 Holidays with Pay	■ 1954
	■ C87 Freedom of Association and Protection of the Right to Organize	■ 1955

Source: ERM, 2019

4. DESCRIPTION OF THE PROJECT AND ALTERNATIVES

4.1 Project Background

TPMC is planning to develop an approximately 25 km long, 230 kV Transmission Line ('the Project') connecting its 388 MW Combined Cycle Power Plant (CCPP) in Ahlone Township, Yangon to the sub-station in Hlaingthayar.

In January 2018, the MOEE issued the Notice to Proceed (NTP) (***Appendix C***) to TPMC to develop the LNG Power Plant (Ahlone) Project. The purpose of the Transmission Line is to transfer electricity generated by the new LNG Power Plant to the nearby sub-station in Hlaingthayar as the electricity will be sold to the Myanmar Power Grid.

The electricity generated from the LNG Power Plant (Ahlone) facility shall be sold to the Myanmar Power Grid, using a 230 kV Transmission Line, approximately 25 km long from the LNG Power Plant (Ahlone) sub-station to the Ministry of Electricity and Energy (MOEE's) proposed sub-station in Hlaingthayar Township, Yangon Region, Myanmar. The Transmission Line is expected to mainly run parallel with the existing transmission line connecting the existing power plant to the Hlaingthayar sub-station.

It shall be noted that the Project Proponent has prepared and submitted the Project Proposal Report (PPR) to MOEE and Ministry of Natural Resources and Environmental Conservation (MONREC) on 24th December 2018. The PPR recommended that TPMC shall proceed with an Initial Environmental Examination (IEE) Study of the Project and prepare an Environmental Management Plan (EMP) to put forward its commitments for environmental and social mitigation and management measures.

This Chapter provides a description of the proposed 230 kV Transmission Line, including the facilities, equipment required and the associated activities to be undertaken throughout the Project cycle, including construction and operation (and maintenance) phase. This chapter also provides an analysis of alternatives to the Project in ***Section 4.5***.

4.2 Project Location

The Project Site is located in four (4) Townships namely: Ahlone, Seikgyikanaungto, Twantay, and Hlaingthayar, Yangon Region in the Republic of the Union of Myanmar. The proposed Project Location is presented in ***Figure 4.1***. It is noted that the Project Location may be subjected to change during the detailed design stage of the Project.

4.2.1 Study Area

The Study Area of this Project will cover 250 m[11] (0.25 km) each side of the Transmission Line; this is based on initial review of sensitive receptors, and ERM's past experience. The Transmission Line will have a total length of 22.34 km as shown in ***Figure 4.2***, thus the Study Area covers an approximate total area of 5,585,000 m^2 (5.585 km^2).

The Project is expected to run in parallel to existing transmission lines (shown in ***Figure 4.4*** and ***Figure 4.5***), which begins from Ahlone Township crossing over Yangon River into Seikgyikanaungto Township; following the existing 230 kV Hlaingthayar-Ahlone transmission line, and later follows a different transmission line (230 kV Hlaingthayar-Kyaiklat) approximately 1.4 km before crossing the Pun Hlaing River. It shall be noted that the offset distance between the existing transmission line and the Project is proposed to be 46 m from either side of the Transmission Line, however it will be determined and agreed with the relevant authorities at a later stage.

The estimated distance crossing over in each area is presented in ***Table 4.1***.

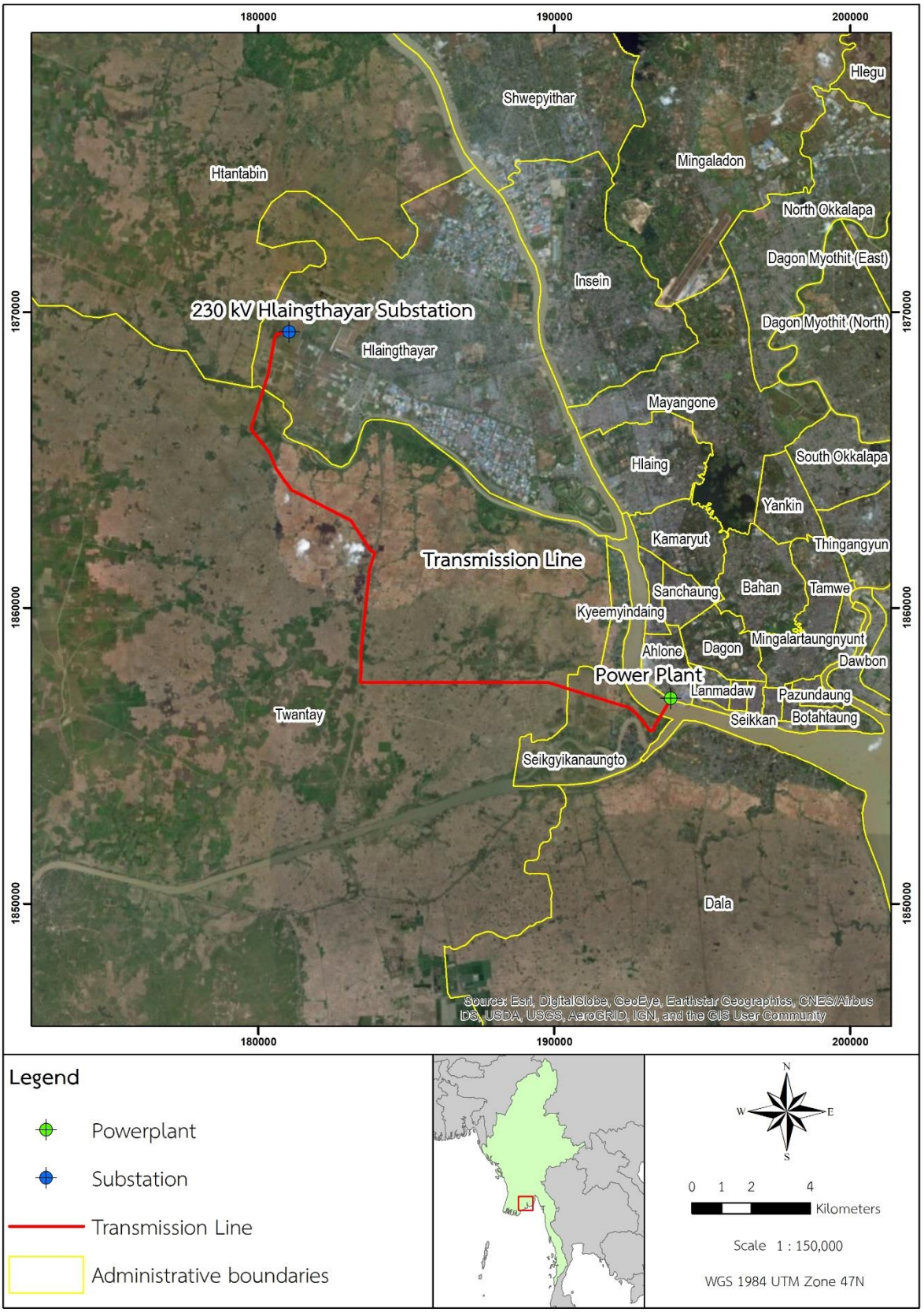
[11] Best practice to ensure inclusion of all potential receptor of impacts from the Project.

Table 4.1: Transmission Line Distance in Each Area

Area	Distance (km)
Ahlone Township	0.49
Yangon River	0.53
Seikgyikanaungto Township	3.83
Twantay Township	15.44
Pun Hlaing River	0.05
Hlaingthayar Township	2.00
Total	**22.34**

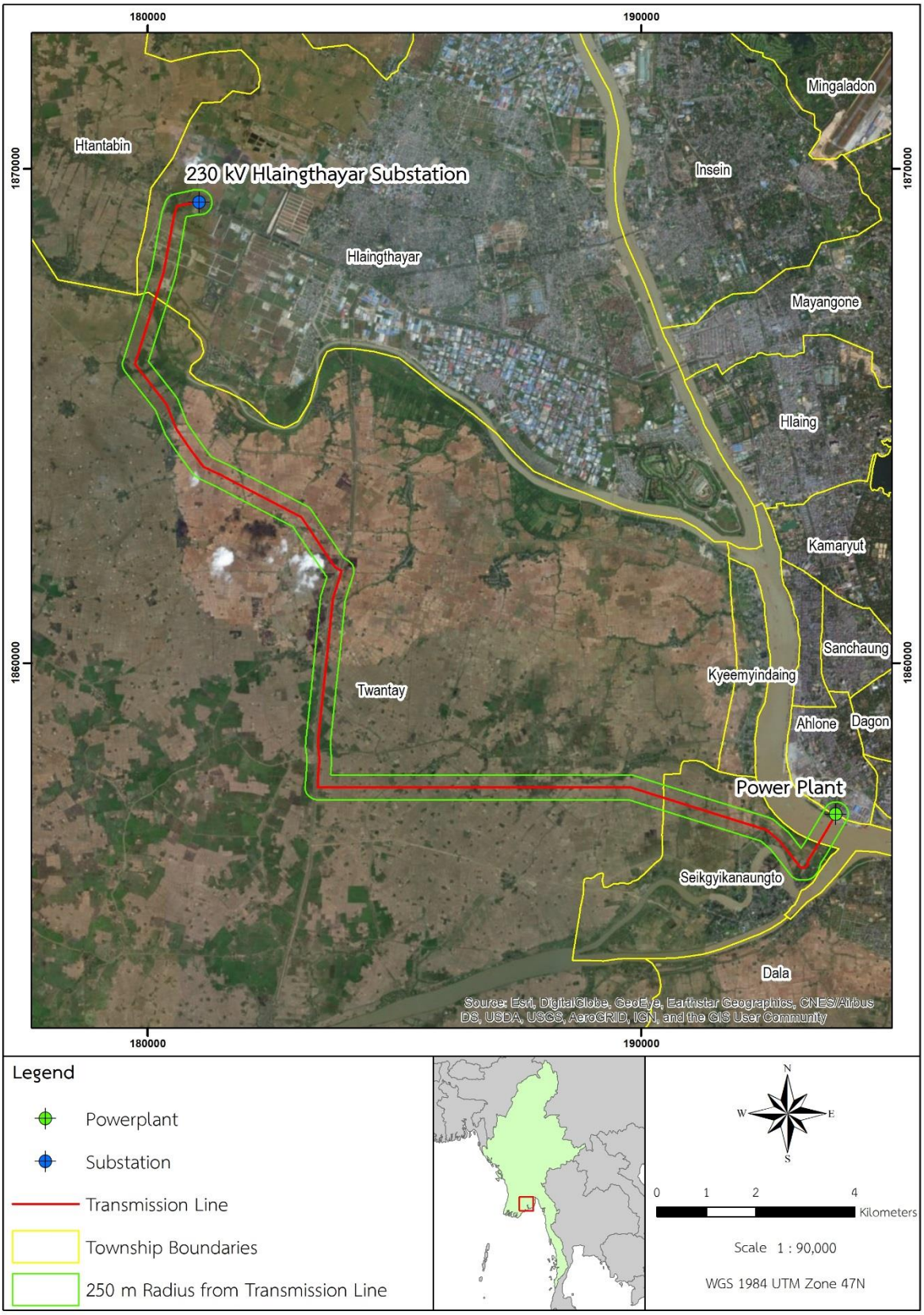
Source: ERM, 2019.

Figure 4.1: Proposed Transmission Line Route



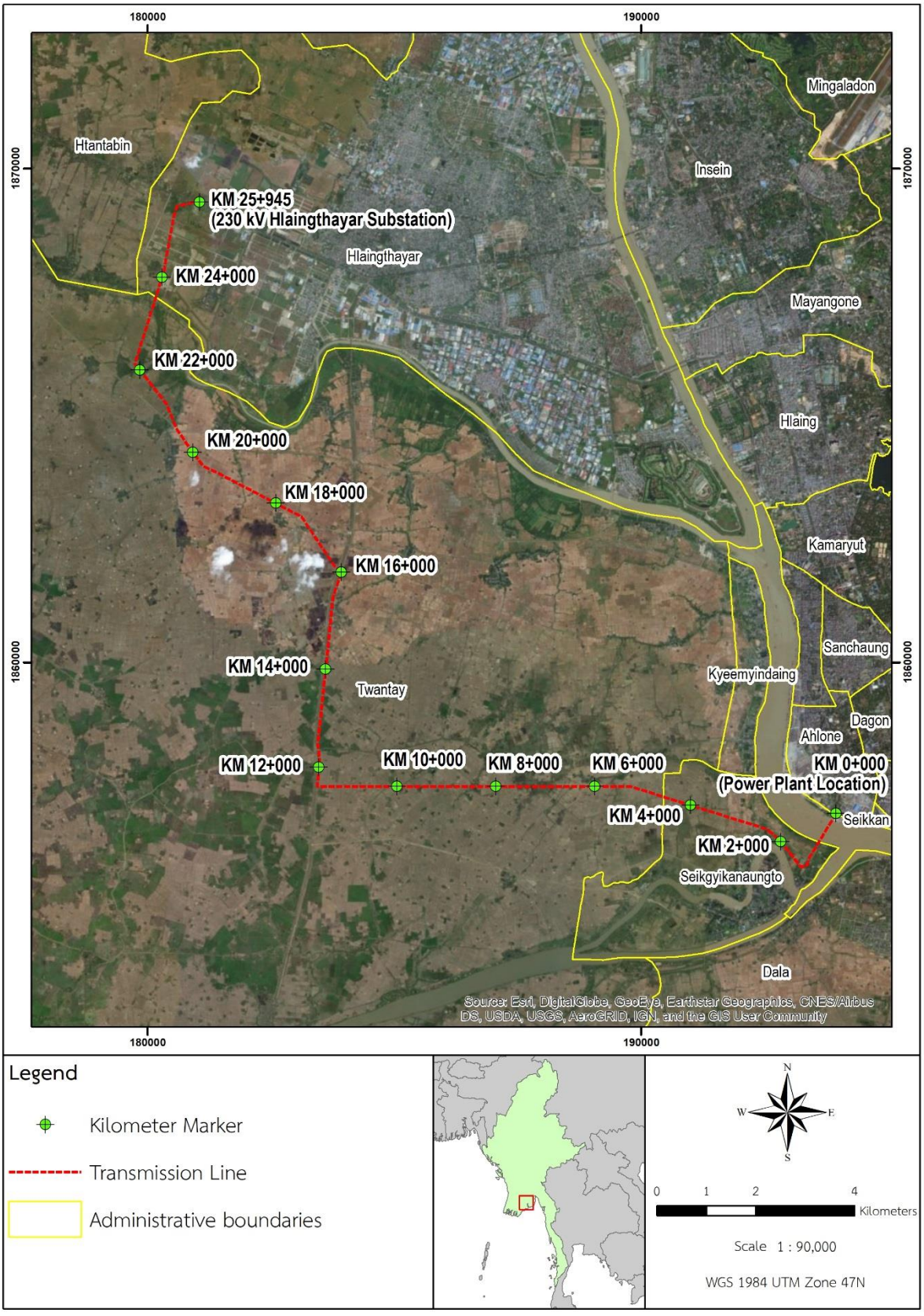
Source: TPMC, 2018 (modified by ERM)

Figure 4.2: Proposed Transmission Line Study Area



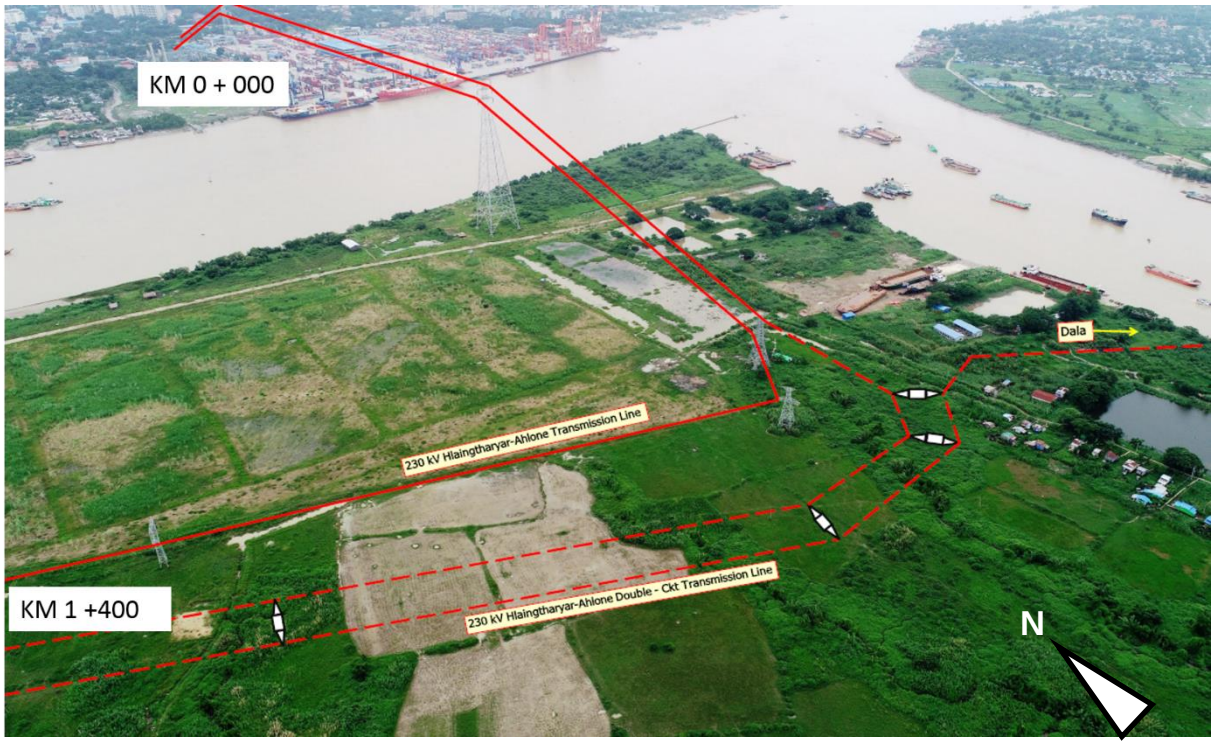
Source: TPMC, 2018 (modified by ERM)

Figure 4.3: Proposed Transmission Line with Milestone (Kilometers)



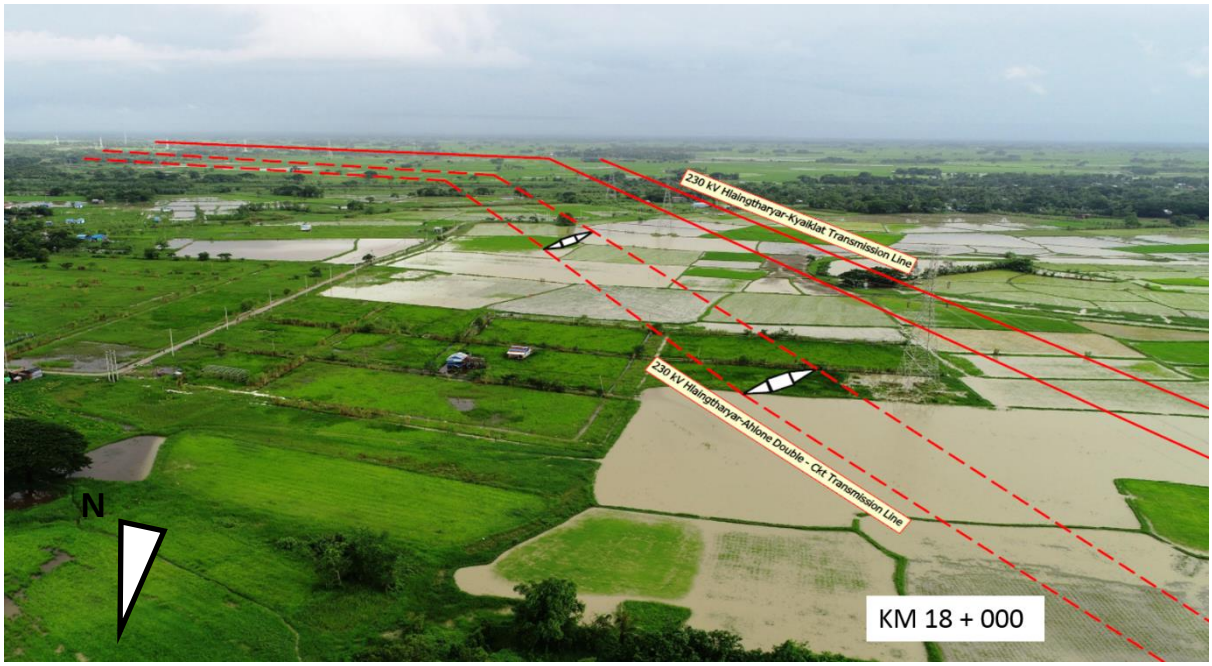
Source: TPMC, 2018 (modified by ERM)

Figure 4.4: Photos of Existing (solid line) and Proposed (dotted line) Transmission Line



Between KM 0+000 and KM 1+400

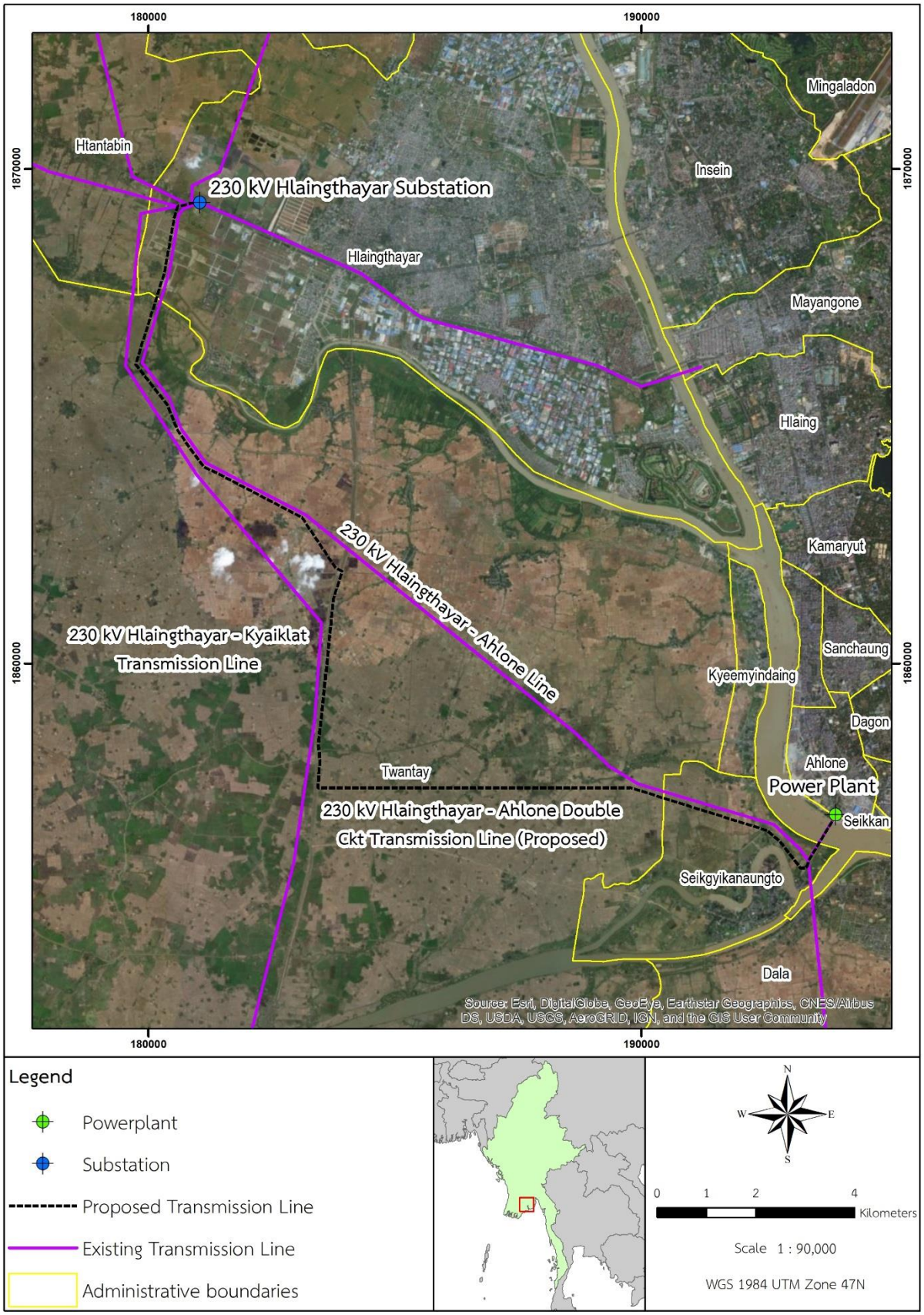
Between KM 0+800 and KM 2+000



After KM 18+000

Source: TPMC, 2018

Figure 4.5: Layout of Existing and Proposed Transmission Line



Source: TPMC, 2018

Figure 4.6: Photos of Existing Transmission Line nearby 230 kV Hlaingthayar Sub-Station (at KM 22+000)

Source: ERM, 2018

4.3 Project Key Components and Tentative Project Schedules

The construction of the Transmission Line Facility is estimated to be around 25 months.

4.3.1 Project Components

This section will presents the Transmission Line components and its details with the following sub-sections headings:

- Transmission Line (conductors);
- Transmission Tower;
- Switchyard and Substations;
- Connectivity;
- Right of Way (ROW) and Crossings; and
- Access Roads.

4.3.1.1 Transmission Line (Conductors)

The proposed designed of the Transmission Line should meet the current requirements in Myanmar for 230 kV circuit. The proposed specifications are summarised in ***Table 4.2***.

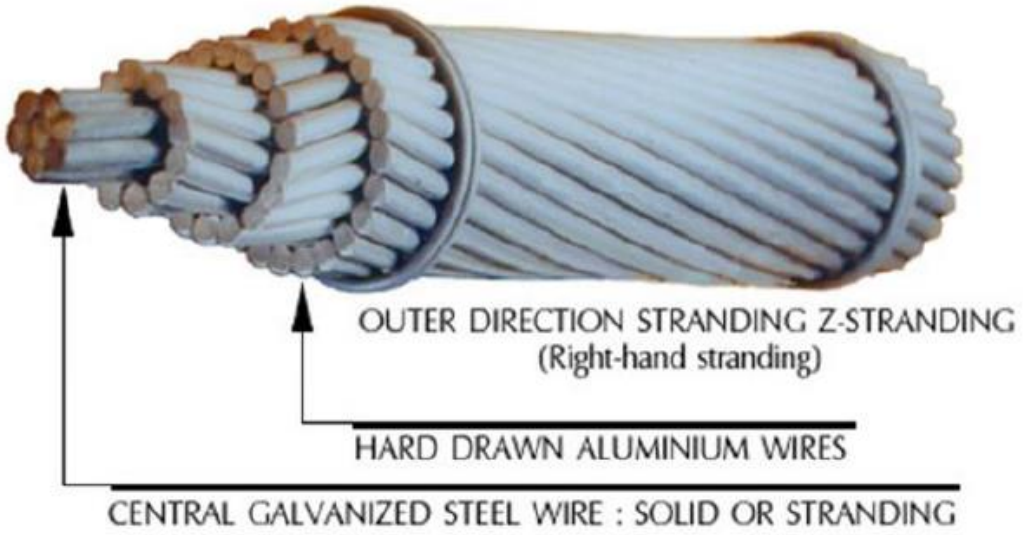
Table 4.2: Transmission Line Proposed Specifications

Specifications	Unit / Type
Voltage Level	230 kV
Highest System Voltage	245 kV
No. of circuits	One double circuit
No. of Conductors	Two bundle per phase
Type and Model of Conductor	ACSR 795 MCM (Drake)
Type and Model of Ground wire	One OHGW and One OPGW
Type of Insulation	Strain Insulator Fourteen (14) Ceramic Disks
Contamination Severity	0.24-0.48 mg/cm^2 (heavy)
Thermal Capacity	3200 MVA
Resistance at 20 °C	0.030 Ω/km
Reactance at 50Hz	0.26 Ω/km
Effective capacitance	14.4 nF/km
Capacitance to earth	6.5 nF/km
Charging Power	~ 650 KVA/km
Earth Fault Current	1.35 A/km
Surge Impedance	240 Ohm
Surge Impedance Load	~ 600 MVA

Source: TPMC, 2019

The design of the conductor is shown in ***Figure 4.7***.

Figure 4.7: Typical Conductor Design



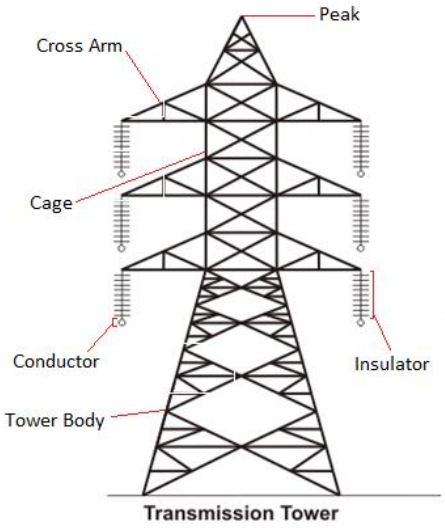
Description		Unit	DRAKE
Stranding & Wire diameter			
a) Aluminium	(Nom.)	No. / mm	26 / 4.44
b) Steel	(Nom.)	No. / mm	7 / 3.45
Calculated cross-sectional area			
a) Aluminium		mm^2	402.92
b) Steel		mm^2	65.59
c) Total		mm^2	468.51
Overall diameter	(Approx.)	mm	28.50
Total weight (without grease)	(Approx.)	kg/km	1630
Max. DC Resistance at 20°C		Ohm/km	0.0719
Calculated breaking load		kN	139.9

Source: TPMC, 2019.

4.3.1.2 Transmission Tower

The main component of a Transmission Tower are presented in ***Table 4.3***.

Table 4.3: Main components of a Typical Transmission Tower

Image	Part	Description
	Peak	The portion above the top cross arm; Generally, earth shield wire and OPGW connected to the tip of this peak.
	Cross Arm	Cross arms hold the transmission insulator.
	Cage	The portion between tower body and peak; Holds the cross arms.
	Tower Body	The portion from bottom cross arms up to the ground level. Maintains required ground clearance of the bottom conductor of the transmission line.
	Conductor	A material that allows for the flow of an electrical current. Used for delivering electricity from one point to another. Supported by multiple transmission towers.
	Insulator	Insulator holds the conductor. Made of materials that is not electrically conductive.

Source: TPMC, 2018

The Transmission Towers will be approximately 52m high and the average inter-tower distance (distance between each transmission tower) is approximately 319 m, depending on the route survey and sag-tension calculations as applicable for each tower location. A corridor distance of at least 23 m from each side of the Transmission Line will be left clear from other Transmission Line in order to avoid interference from overlapping of magnetic and electric field. It is currently estimated that approximately 70 transmission towers (53 suspension towers and 17 tension towers) will be built for this Project. This is equivalent to 0.5 km spacing between towers. The Transmission Line spatial characteristics is described in ***Table 4.4***.

Table 4.4: Transmission Tower Spatial Characteristics

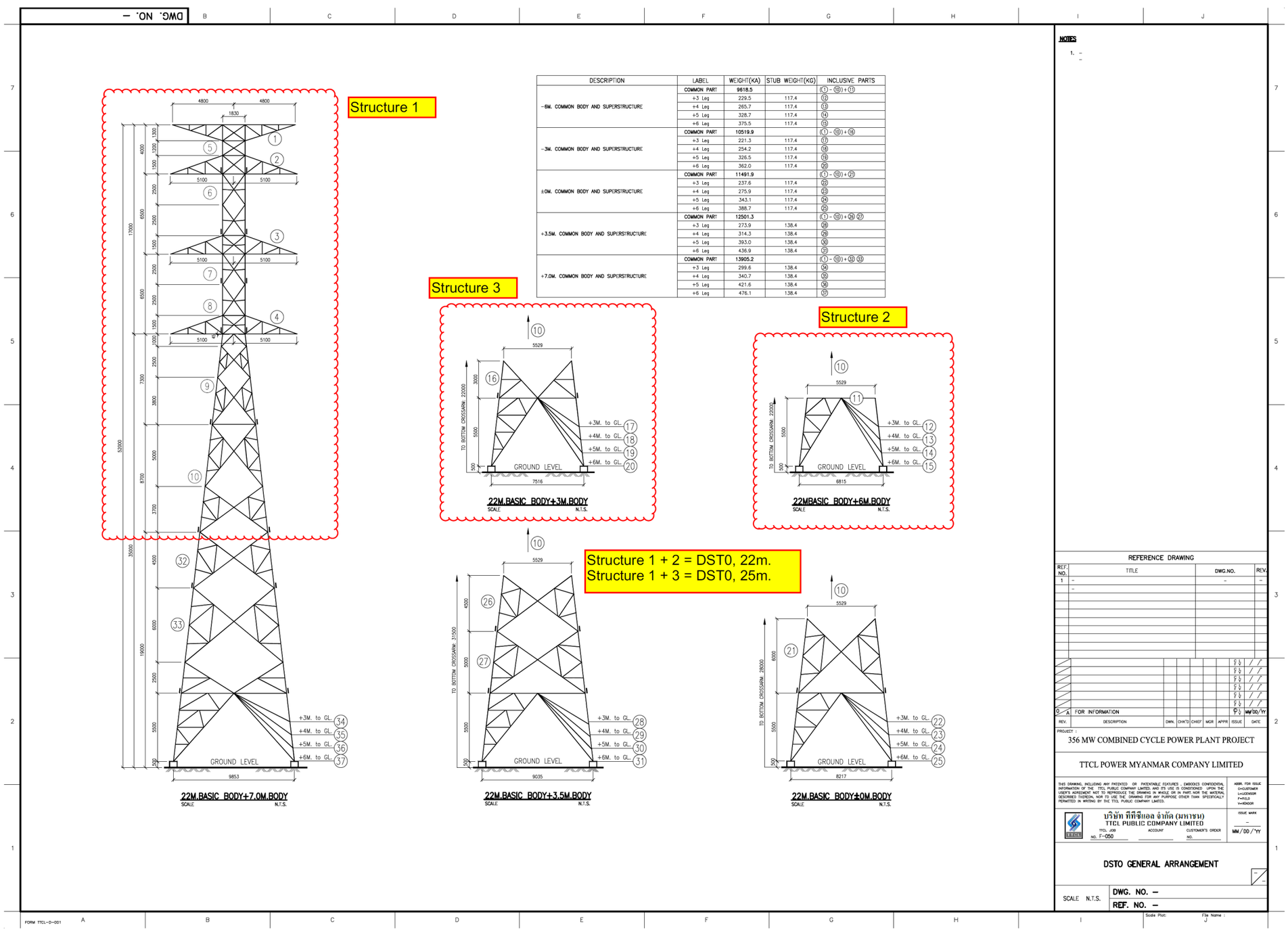
Spatial Components	Distance
Transmission Tower height	52 m
Diameter at ground	5 x 5 – 15.6 x 15.6 m
Distance from lowest conductor to ground	11.0 m
Width of cross arm	7.0 – 13.0 m
Distance from centre of tower to conductor	3.7 - 6.5 m

Source: TPMC, 2018

For the foundation design of the 230 kV towers, individual footing foundation is recommended for firm ground and the cast-in-situ pile foundation type is recommended for marshy areas, weak ground, river crossing and other crossings. However, this will be optimized based on soil investigation and geo-technical survey findings.

The design consideration for earth resistance of the tower footing is below 10Ω (ohms) in all cases in Myanmar. For safer ground design however, it is recommended that one ground rod for each tower leg should be installed. The technical drawing of the Transmission Line tower is shown in ***Figure 4.8***.

Figure 4.8: Transmission Line Tower Layout

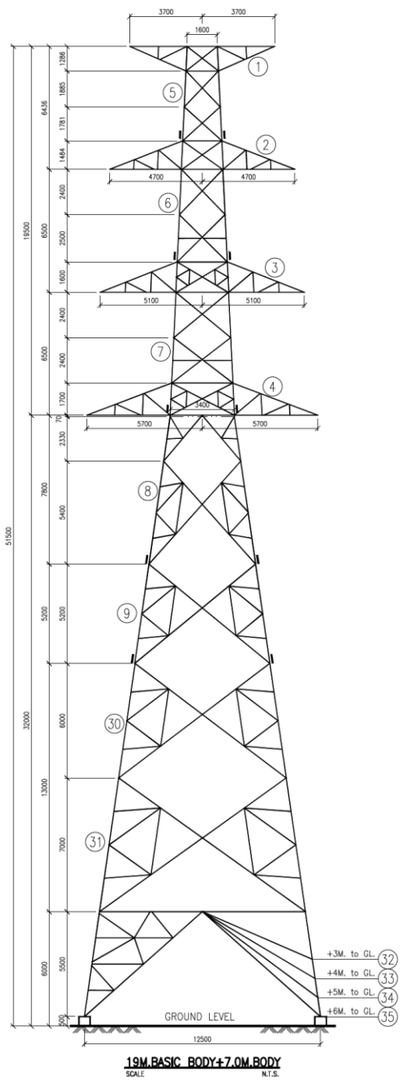


DESCRIPTION	LABEL	WEIGHT(KA)	STUB WEIGHT(KG)	INCLUSIVE PARTS
-6M. COMMON BODY AND SUPERSTRUCTURE	COMMON PART	9618.5		①-⑩)+⑪
	+3 Leg	229.5	117.4	⑫
	+4 Leg	265.7	117.4	⑬
	+5 Leg	328.7	117.4	⑭
	+6 Leg	375.5	117.4	⑮
-3M. COMMON BODY AND SUPERSTRUCTURE	COMMON PART	10519.9		①-⑩)+⑯
	+3 Leg	221.3	117.4	⑰
	+4 Leg	254.2	117.4	⑱
	+5 Leg	326.5	117.4	⑲
	+6 Leg	362.0	117.4	⑳
±0M. COMMON BODY AND SUPERSTRUCTURE	COMMON PART	11491.9		①-⑩)+㉑
	+3 Leg	237.6	117.4	㉒
	+4 Leg	275.9	117.4	㉓
	+5 Leg	343.1	117.4	㉔
	+6 Leg	388.7	117.4	㉕
+3.5M. COMMON BODY AND SUPERSTRUCTURE	COMMON PART	12501.3		①-⑩)+㉖㉗
	+3 Leg	273.9	138.4	㉘
	+4 Leg	314.3	138.4	㉙
	+5 Leg	393.0	138.4	㉚
	+6 Leg	436.9	138.4	㉛
+7.0M. COMMON BODY AND SUPERSTRUCTURE	COMMON PART	13905.2		①-⑩)+㉜㉝
	+3 Leg	299.6	138.4	㉞
	+4 Leg	340.7	138.4	㉟
	+5 Leg	421.6	138.4	㊱
	+6 Leg	476.1	138.4	㊲

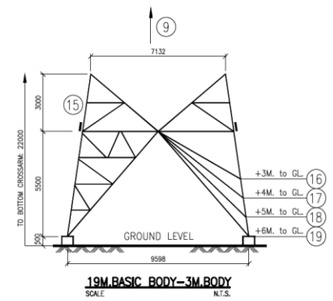
DWG. NO. –

Structure DTT1

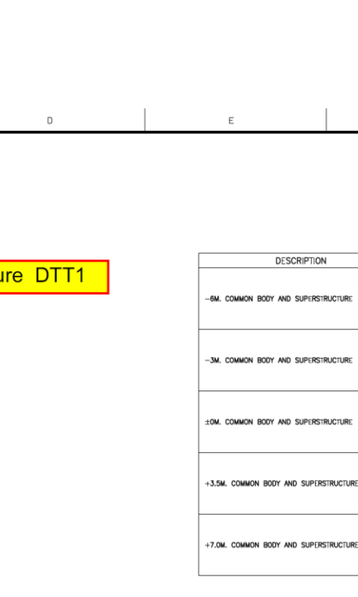
DESCRIPTION	LABEL	WEIGHT(KA)	STUB WEIGHT(KG)	INCLUSIVE PARTS
–6M. COMMON BODY AND SUPERSTRUCTURE	COMMON PART	15540.4		①–⑨+⑩
	+3 Leg	386.6		⑪
	+4 Leg	484.6		⑫
	+5 Leg	614.9		⑬
	+6 Leg	686.9		⑭
–3M. COMMON BODY AND SUPERSTRUCTURE	COMMON PART	17078.9		①–⑨+⑮
	+3 Leg	409.3		⑯
	+4 Leg	516.1		⑰
	+5 Leg	651.4		⑱
	+6 Leg	724.5		⑲
±0M. COMMON BODY AND SUPERSTRUCTURE	COMMON PART	18963.1		①–⑨+⑳
	+3 Leg	442.0		㉒
	+4 Leg	544.5		㉓
	+5 Leg	702.7		㉔
	+6 Leg	772.1		㉕
+3.5M. COMMON BODY AND SUPERSTRUCTURE	COMMON PART	20695.1		①–⑨+㉙
	+3 Leg	477.4		㉖
	+4 Leg	598.2		㉗
	+5 Leg	743.8		㉘
	+6 Leg	811.6		㉙
+7.0M. COMMON BODY AND SUPERSTRUCTURE	COMMON PART	23189.1		①–⑨+㉜㉛
	+3 Leg	526.5		㉜
	+4 Leg	656.6		㉝
	+5 Leg	804.4		㉞
	+6 Leg	863.0		㉟



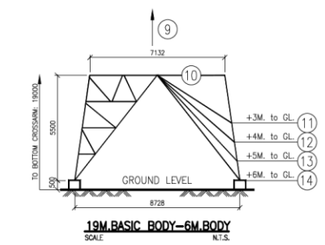
19M.BASIC BODY+7.0M.BODY
SCALE N.T.S.



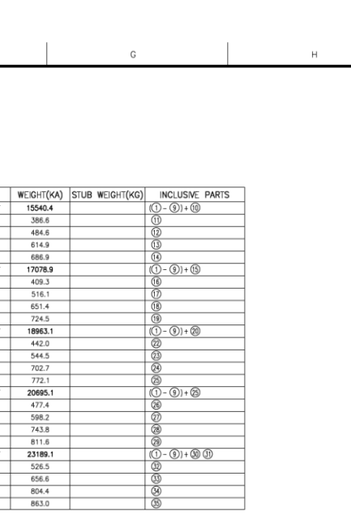
19M.BASIC BODY–3M.BODY
SCALE N.T.S.



19M.BASIC BODY+3.5M.BODY
SCALE N.T.S.



19M.BASIC BODY–6M.BODY
SCALE N.T.S.



19M.BASIC BODY±0M.BODY
SCALE N.T.S.

NOTES
1. –
–

REFERENCE DRAWING

REF. NO.	TITLE	DWG.NO.	REV.
1	–	–	–
	–		

REV.	DESCRIPTION	DWN.	CHK'D	CHIEF	MGR	APPR	ISSUE	DATE
0	A FOR INFORMATION						P	MM/DD/YY

PROJECT :
356 MW COMBINED CYCLE POWER PLANT PROJECT

TTCL POWER MYANMAR COMPANY LIMITED

ABBR. FOR ISSUE
C=CUSTOMER
L=LICENSOR
F=FIELD
V=VENDOR

บริษัท ทีทีซีแอล จำกัด (มหาชน)
TTCL PUBLIC COMPANY LIMITED
TTCL JOB NO. F-050 ACCOUNT CUSTOMER'S ORDER NO.

ISSUE MARK
–
MM/DD/YY

DTT1 GENERAL ARRANGEMENT

SCALE N.T.S.
DWG. NO. –
REF. NO. –

FORM TTCL-D-001

Source: TPMC, 2019

4.3.1.3 Connectivity

The proposed Transmission Line will connect the sub-station at the proposed power plant to the proposed sub-station in Hlaingthayar Township. The 230 kV switching facility (in Hlaingthayar) required to connect the double circuit line would form part of the development of the Project.

The alternative connections are not under the scope of the IEE Study as the alternative connection study and required information is not available during this IEE Study.

4.3.1.4 Right of Way (ROW) and Crossings

The Right of Way (ROW) clearance width required in Myanmar is 23m on each side for 230 kV transmission lines. The acquisition of the ROW shall be handled by the MOEE as per their guidelines for compensation.

The Transmission Line will cross over mostly lowland agricultural and plain areas. The proposed route will also cross some existing infrastructures and natural obstacles including rivers and canals, existing transmission and distribution lines. The interception and crossing issue should be solved with proper negotiation, appropriate compensation and due approval from Myanmar government and relevant authorities. The Transmission Line may also cross several streams and roads which are not considered as obstacles. A summary of potential route crossings are listed in ***Table 4.5***.

Table 4.5: Potential Route Crossings

Crossing with	Number of crossing
230 kV line	-
Main road	2
Village road	8
River	1
Stream	16
Pond/lake	13

Source: ERM, 2019

Clearance to surrounding objects and various surfaces are determined by several factors. The proposed Transmission Line should meet the following clearance requirements (presented in ***Table 4.6***). During construction and erection of the Transmission Tower, the construction footprint will be limited to a 46 m width of ROW with the exception for construction of temporary and permanent external access road as part of the construction requirement of Transmission Line.

Table 4.6: Clearance to Ground and Obstacles

No	Objects	Clearance
1.	Ground (Mountains or Forests Area)	11.0 m
2.	Ground (Paddy Field)	14.0 m
3.	River Crossing (Above Highest Water Level)	20.0 m
4.	Road	7.5 m
5.	Railway	16.0 m
6.	Trees (Rubber Plants etc.)	7.0 m
7.	Distribution Line (Including Pole)	8.0 m
8.	Transmission Line (Including Tower)	

No	Objects	Clearance
	- 66 kV Transmission Line	9.0 m
	- 132 kV Transmission Line	9.0 m
	- 230 kV Transmission Line	9.0 m
	- Other	7.0 m

Source: ERM, 2019

The Transmission Line route is expected to cross over mostly agricultural and plain areas. Particular attention and consideration shall be made during the final design phase in order to avoid the following areas:

- Natural Protected Areas (e.g. Natural Parks, Wildlife refuges/sanctuary, etc.);
- Other environmental sensitive areas (e.g. mangrove forests, natural forests);
- Human settlements; and
- Mining or other extractive activities areas.

Additional key aspects that will be considered as part of the ROW include, but not limited to:

- For maximum safety, minimum construction cost and effective material use;
- Transmission Line alignments were designed to be as straight as possible between start and end points of transmission lines and between each tower;
- Whenever and wherever possible, the Transmission Line alignment will be located relatively parallel to the existing transmission line, this will the difficulty of gaining access for construction, operation and maintenance thus reducing the need for clearing new patch of land and disrupting people;
- Maximizes distance from residential areas (houses and settlements) to minimize the requirement of relocation and resettlement;
- Maximizes distance to historical, cultural and religious significant lands such as cemeteries, pagodas and temples;
- Maximizes distance to environmentally sensitive areas such as natural reserves, wildlife sanctuaries and national parks; and
- Cost and ease of access during construction and maintenance.

4.3.1.5 Access Roads

Access roads will be established through recurring use. The temporary access road connecting main road to transmission line tower shall be built approximately at 2 km interval based on the location. Approximately 10 km of temporary access road will be needed for the construction phase of the Project. Mostly the Right of Way shall be used for machinery/equipment movement during the construction phase. However, the access road cannot be finalized until the completion of detailed design.

4.3.2 Project Schedule

The construction of the transmission line, switchyard and substation is estimated to be around 25 months. The tentative Project schedule is presented in ***Table 4.7***.

Table 4.7: Tentative Project Schedule

Project Schedule	Tentative Date
Completion of Feasibility Study	-3rd Month to -1st Month
Stakeholder Engagement	1st Month – 3rd Month
IEE Study Preparation	1st Month – 3rd Month
Approval Process	4th Month– 7th Month
Site Preparation	7th Month – 10th Month
Detail Engineering	1st Month – 10th Month
Procurement	10th Month – 18th Month
Construction	7th Month – 24th Month

Source: TPMC, 2018

It is noted the above Project Schedule is tentative and subject to be changed and updated

The sequence of construction activities for each tower site is listed in ***Table 4.8***. The approximate duration of each construction activity and the required team size and vehicle access for each activity, are also presented in the table. Different teams will be involved depending on the activity. Some or all of the teams may be working at different points along the Project Location. An estimate of 14 active construction days will be required for each tower site.

Table 4.8: Construction Activities and Requirements

Item no.	Construction Activities	Vehicle Load	Approx. team size	Approx. duration (days)
1	Access Negotiations	Light	-	5
2	Tower Pegging[a] each Tower	Light	5	1
3	Foundation Nominations[b] each Tower	Heavy	5	2
4	Foundation Excavation each Tower	Heavy	10	3
5	Foundation Steelwork (Reinforcing) each Tower	Heavy	10	2
6	Foundation Concrete Pouring each Tower	Heavy	20	4
7	Delivery of Steelwork each Tower	Heavy	5	1
8	Assembly, Punching and Painting each Tower	Light	10	4
9	Erection each Tower	Abnormal Load	60	15
10	Stringing Section of 1 Span of 8 Towers	Abnormal Load	40	10
11	Rehabilitation*	Heavy & Light	5-15	2-10
12	Testing and Commissioning	-	40	30
	*Approximate in working days. Dependent on-site conditions.			

Source: TPMC, 2018

Note: [a] *Tower Pegging is the process of setting out the footing of the pylons*
[b] *Foundation Nominations is the process of digging trail pits at main foundation points*

4.4 Project Phases

4.4.1 Construction Phase

4.4.1.1 Construction of Transmission Towers

Construction methods of the Transmission tower will be finalise after the input from the Engineering, Procurement, and Construction (EPC) vendor. A brief description of the general construction methods is provided in the following sections.

Foundation of Transmission Tower

Upon determination of main foundation points, trial pits will be dug using mechanical back-actor/auger method or manual labour. Foundations of up to 6 m by 6 m may be required. After finalization of soil investigation report, the type of footing of towers will be determined. The type of footings may include the following:

- Individual footing foundation (Shallow foundation); and
- Pile foundation (Deep foundation).

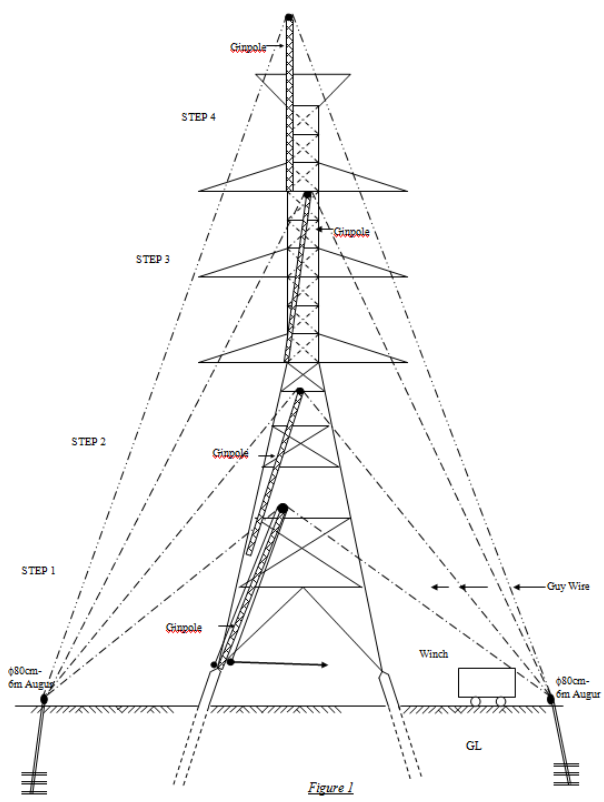
Erection of Transmission Tower

As per the general practice, the derrick[12] method is most suitable method for the erection of the lattice[13] type transmission line towers. However, erection methods can still vary depending on local situation, surrounding environment of construction sites and other aspects. High capacity mobile cranes are also used where access to the location is favourable. The method used for the erection of Transmission Towers is shown in ***Figure 4.9***.

[12] Derrick is a lifting device

[13] Lattice tower (also known as truss tower) is a freestanding framework tower

Figure 4.9: Transmission Tower Erection Method (Example Design and Photo)



Source: TPMC, 2019

Stringing of Ground Wire & Line Conductor

After tower erection, stringing work of ground wire and power conductors will then be carried out. Stringing of ground wire mainly consist of installing primary conductor onto the Transmission Line structures. The process involves the following operations:

- After completion of preparation works including checking of towers and cross arms, setting up of stringing equipment and construction of scaffolding wherever necessary, messenger wire (pulling wire rope) are pulled out through stringing blocks installed at each tower arm in the stringing section of transmission line. Pulling out of messenger wire is done at first on ground by truck/trailer or manpower and the messenger wire is then hung on stringing block at each tower. Paying out of conductors and ground wires are carried out with low tension as much as possible with the help of pulling wire rope. The line is then pulled is ensure there is sufficient clearance from the surrounding environment;
- Sagging and dead-ending – a tensioner is used to sag conductors with the proper tension. Appropriate amount of tension is required in order to account for the expansion and contraction during changes of temperature so that enough clearance achieved when the line fully expand and tension is not too great when it contracts;
- Splicing – Since more than one reel length is required to obtain total length of conductor to be strung at one time, the conductor lengths must be spliced together. Compression splices are used to obtain the strength and electrical conductivity needed to join together conductors in tension; and
- Clipping-in – the final process of stringing ground wire and line conductor is to ‘clip’ the line to the adjacent towers. This entails removing the conductor and ground wire from stringing blocks and placing them in their permanent suspension clamps attached to the insulator assemblies.

The method of stringing the ground wire and conductors are shown in ***Figure 4.11***. Detailed information of the Hydraulic Puller-Tensioner AFB616 is shown in ***Table 4.9***.

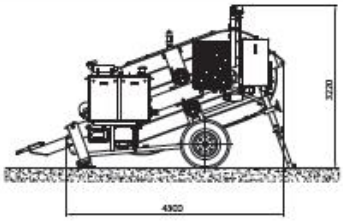
Figure 4.10: TESMEC Hydraulic Puller-Tensioner AFB616 Specifications

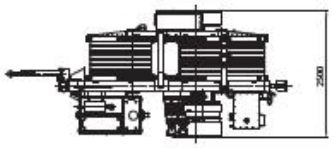
TESMEC

Hydraulic Puller-Tensioner AFB616

The machine is suitable to string one or two ropes or bundled conductors on bull-wheels with two pairs of bull-wheels with completely independent controls.
The bull-wheel grooves are made of wear-proof interchangeable nylon sectors.
The machine is completely electronically controlled.

AFB616 with ALL071





Puller Performance

Max pull	2 x 70 kN
or	1 x 140 kN
Speed at max pull	2 km/h
Max speed	4.5 km/h
Pull at max speed	2 x 30 kN
or	1 x 60 kN

Tensioner Performance

Max tension	2 x 70 kN
or	1 x 140 kN
Max speed	4.5 km/h

Note: the basic machine performance is calculated at 20°C and at sea level

Characteristics

Nominal bull-wheel diameter	1700 mm
Max conductor diameter	46 mm
Max rope diameter	24 mm
Mass	8000 kg

Engine

Diesel	129 kW (173 hp)
Cooling system	water
Electrical system	12 V

Hydraulic Transmission

2 closed hydraulic circuits for stepless speed variation in both rotating directions.
This machine is provided with 2 pull pre-setting systems that maintain the pre-set pulling value (also when the speed is reduced to "0") by automatically adjusting the operation speed according to the friction and unexpected loads which may occur.

Configuration

2 negative self-acting hydraulic brakes
2 hydraulic dynamometers with set-point and automatic control of maximum pull
Hydraulic oil cooling system
Digital meter counters
Control instruments for hydraulic system and Diesel engine
Rigid axle for towing at max speed of 30 km/h with mechanical parking brake
Hydraulic power pack to control up to 2 reel stands with hydraulic head or 2 reel winders with independent controls
Electronic pull and speed recorder kit (for one rope or conductor) (instrument not included)
Hydraulic front stabiliser
Grounding connection point

Available Devices

ALL005	Hydraulic power for an external compressor
ALL037	Preheating device for use up to -30°C
ALL051	Cable remote control kit (instrument not included)
ALL059	Radio remote control kit (instrument not included)
ALL071	2 hydraulic rope/conductor clamps for reel/drum change operations
ALL084	1 or 2 gearboxes with 3 operating positions: • neutral position (with free bull-wheels for conductor loading and unloading) • low tension position (5 ÷ 20 kN) • nominal tension position
ALL089	Electronic arrangement for connection of multiple machines and for stringing synchronization

Certified Quality System ISO 9001:2008

Keep you updated on: www.tesmec.com

Tesmec S.p.A.
Headquarters
Via Zanica, 17/0 - 24050 Grassobbio (BG) - Italy
Tel: +39.035.4232911 - Fax: +39.035.4522445

Manufacturing facilities
Via Pertegalli, 2 - 24060 Endine Gaiano (BG) - Italy
Tel: +39.035.825024 - Fax: +39.035.826375

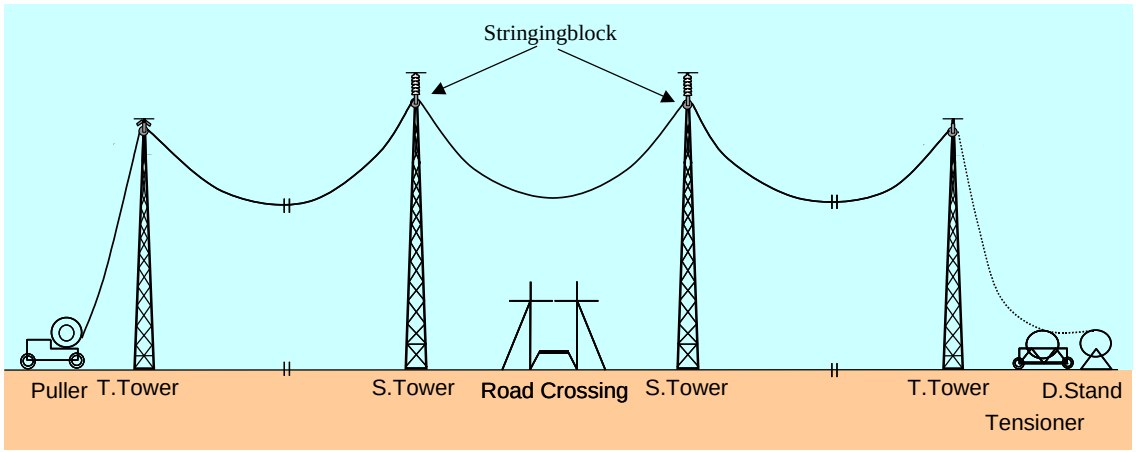
Manufacturing facilities
Via Don Brambilla, 26/28 - 23844 Sirone (LC) - Italy
Tel: +39.031.858311 - Fax: +39.031.853562

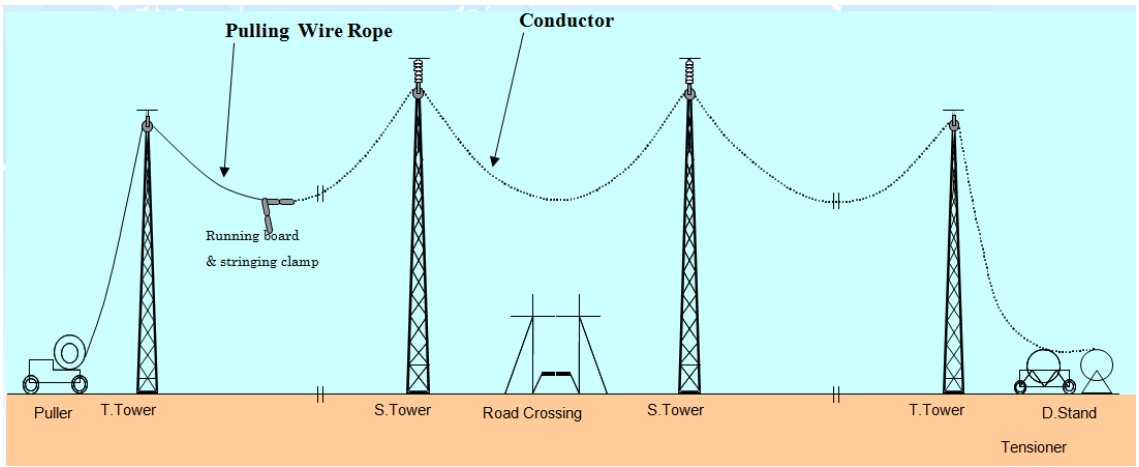
1360

Ed. 2015/2016

Source: TPMC, 2019

Figure 4.11: Conductor and Ground Wire Stringing Method (Example Photo and Design)





Source: TPMC, 2019

4.4.1.2 Communications System

Erection of Transmission Line and Towers create opportunities for communication service providers such as radio to operate on the same tower to share the expensive and common portion of the Transmission Tower. Most of these are communication system such as microwave radio tower, communication tower and antennae, light beacon, microwave dish, parabolic dish. This system often require a large clearance distance from ground and a relatively flat topography in order for the communication system to function effectively.

4.4.1.3 Possible Aggregates Sources

Sand required for the construction of the Transmission Line will be sourced from nearby quarries which are not owned or operated by the Project. Tower steel structures will be imported/local fabricate and other construction material such as cement aggregates will be procured from Myanmar local market.

4.4.1.4 Power and Water Supply

Power for construction will be from potable diesel generator where and when necessary. Power supply for Camp site office and labour camps will be taken temporarily from Yangon electricity supply company.

Water for construction will be supplied using the portable truck mounted water tanker. Water for campsite and labour camps will be supplied from a fixed water tank.

There is a 25 kV (3 phase diesel generator) on site in case power disruption or black-out occur.

4.4.1.5 Transportation of Materials

Construction materials will mainly be transported by trucks. The details of expected type of truck, duration and number of trucks used per day is presented in ***Table 4.9***.

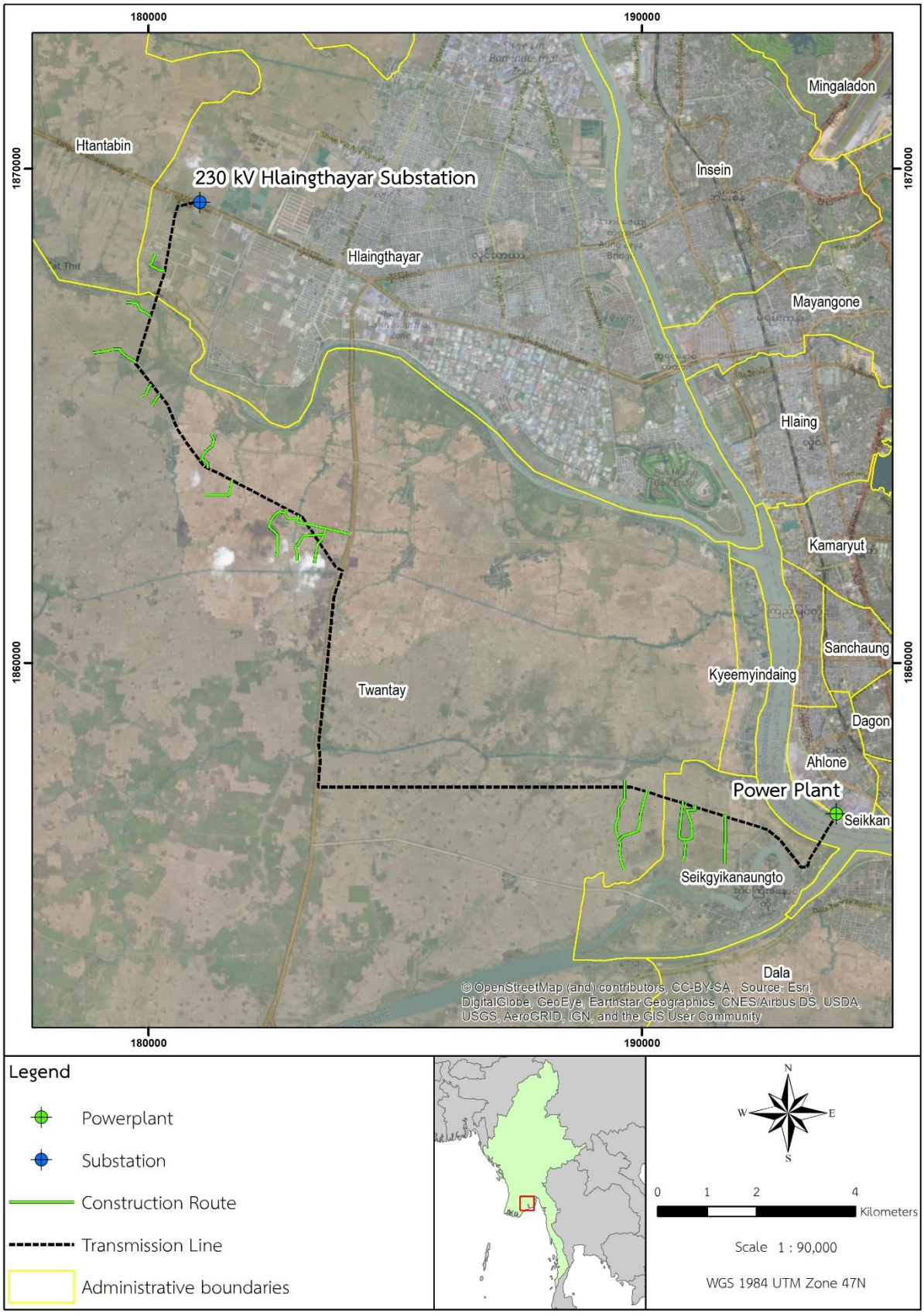
Table 4.9: Expected Vehicle Used During Construction

Item no.	Type of vehicle	No. of vehicles (Peak/ Average) per day	Duration of use (hours)	Total road length
1	Truck	5/4	5-8	100-200 km/unit/day
2	Pick-up Truck	6/4	5-8	100-200 km/unit/day
3	Concrete Transit Mixer	2/2	4-6	80-150 km/unit/day

Source: TPMC, 2019

The expected route for trucks mobilization is shown in ***Figure 4.12***.

Figure 4.12: Anticipated Trucks Mobilization Route Used for Construction



Source: TPMC, 2019

4.4.1.6 Construction Waste and Site Clearance

The Project is expected to produce waste throughout the construction phase; the total maximum amount of non-hazardous waste that is expected to be produced approximately 200 m^3. Hazardous waste is not expected to be produced during this phase.

Land cleareance is required for contruction activites and transmission line ROW; the total amount of land that is expected to be cleared is approximately 10,000 m^2. Excavation activities is also required, approximately 23,000 m^3

As a result of land clearance, the amount of biomass material that is expected to be generated is approximately 200 m^3.

4.4.1.7 Workforce

The indicative number of workers estimated to be working on-site during the construction phase of each task for the Project is shown in ***Table 4.10***.

Table 4.10: Estimated Number of Workers Expected On-site

Item no.	Type of work	No. of workers	Locals workers	Expats workers (specialists/ skilled workers)
1	Tower Erection	40	24	16
2	Cable Pulling and Installation	75	40	35
3	Foundation Construction	60	36	24
	Construction (Total)	175	100	75

Source: TPMC, 2019

Domestic Solid Waste from Work Force

From the estimated number of workers expected on-site, an approximation of domestic solid waste can be projected and is shown in ***Table 4.11***.

Table 4.11: Estimated Solid Waste Generated from Workers On-site

Phase	Anticipated Quantity	Number of Workers	Total Solid Waste
Construction	1.65 kg per employee per week	175	288.75 kg per week

Source: TPMC, 2019 (adapted by ERM).

Domestic Wastewater from Work Force

From the estimated number of workers expected on-site, an approximation of domestic wastewater can be projected and is shown in ***Table 4.12***.

Table 4.12: Estimated Wastewater Generated from Workers On-site

Phase	Anticipated Volume	Number of Workers	Total Liquid Waste
Construction	50 litres per employee per day	175	8,750 litres per day

Source: TPMC, 2019 (adapted by ERM).

4.4.1.8 Accommodation Camps

To minimize travel, worker camps will be set up during construction. The layout of the temporary construction camp is shown in ***Figure 4.14***.

Various teams will be travelling in parallel to the construction-site which will move continuously with the progression of the transmission line.

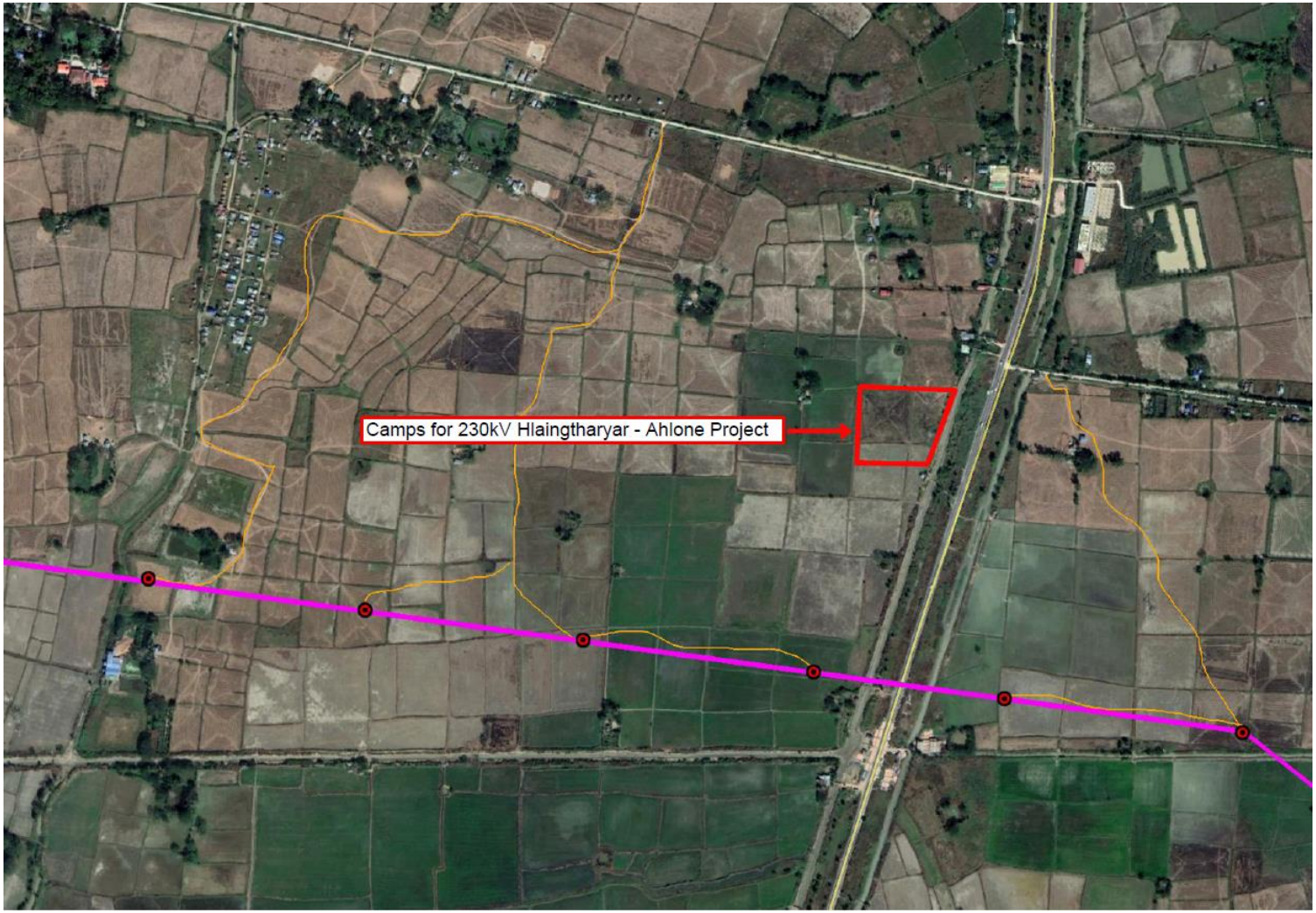
Accommodation camps and offices will draw water and power from local sources while dispose domestic waste to the public sewage management system.

Accommodation camp will take up approximately 12,011 m^2.

Temporary construction camp includes accommodation with toilet/bathroom facility for about 50 workers, warehouse, workshop, canteen/kitchen, office space, guard house and parking area. Potable water will be supplied to the camp. Proper drainage facility will be constructed to minimize soil erosion and waterways pollution. Solid waste will be collected, recycled and disposed to local municipal facility. Sanitary wastewater will be treated by septic tank before discharge. The construction camp will be provided with necessary medical facilities i.e. first aid kits for minor illness and construction injuries.

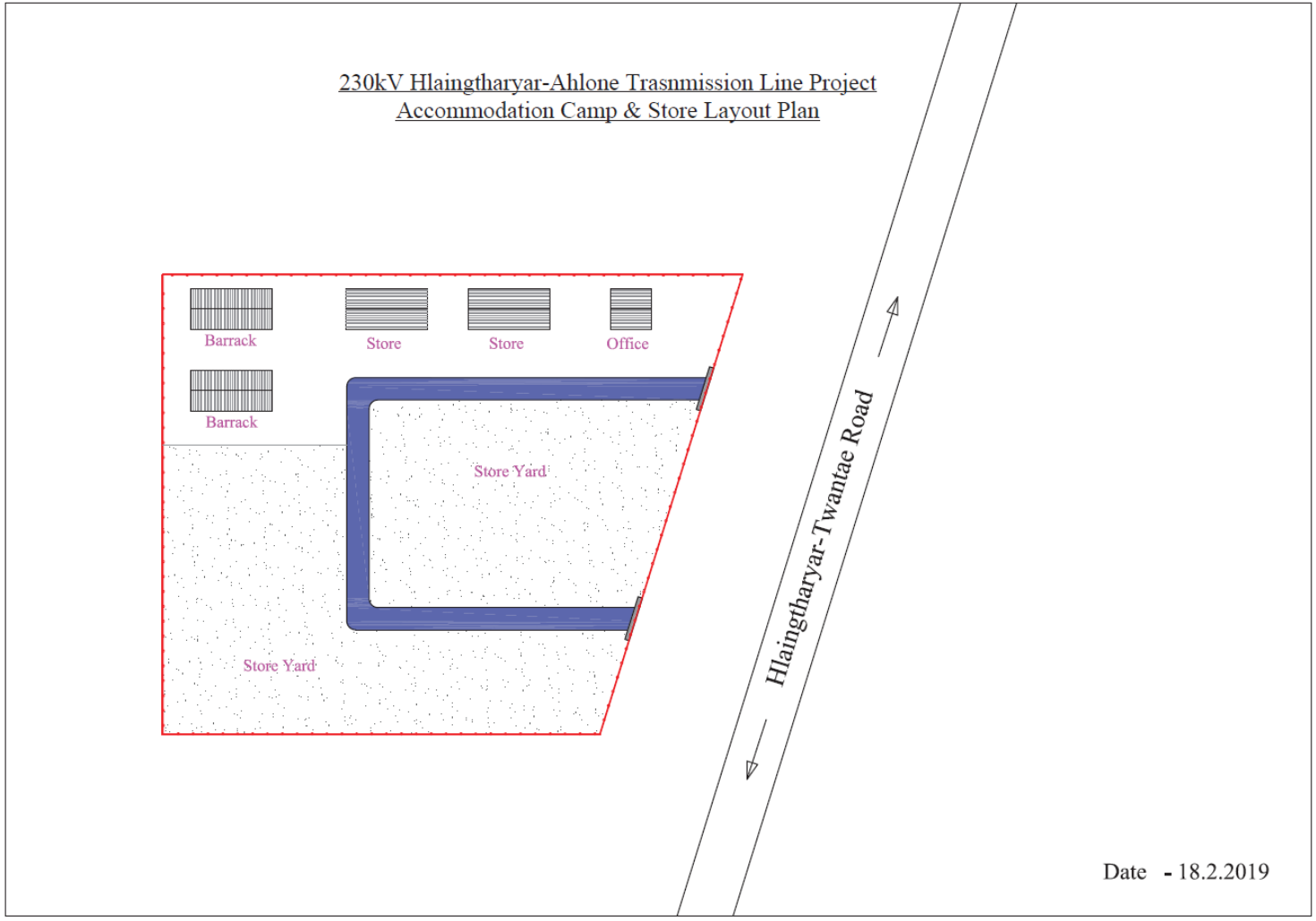
All of the facilities built in the construction camp will be removed and the environmental condition of the camp area will be returned to its original condition including removal of contaminated soils etc. after completion of the Project construction.

Figure 4.13: Temporary Construction Camp Location



Source: TPMC, 2019; modified by ERM, 2019.

Figure 4.14: Temporary Construction Camp Layout



Source: TPMC, 2019 (modified by ERM).

4.4.2 Operation and Maintenance Phase

4.4.2.1 Overview of Operating and Maintaining Transmission Line System

In general, operation and maintenance activities of transmission line systems involve periodic inspections and management of system and structural components as well as ROW. A summary of general operation and maintenance activities are listed in ***Table 4.13***.

During operation phase, all of the work force will be shared with the Power Plant facilities therefore, zero (0) work force will be present to work specifically on the Transmission Line.

These maintenance activities will be undertaken regularly, except in case of emergency, and will be of smaller scale than construction activities. Clearing of the ROW will be done biannually. Most of these activities will be undertaken within the Project Area and no new area will be disturbed.

Table 4.13: Operation and Maintenance Activities

Component	Specific Activities
Transmission Line	■ Ground and aerial patrols/inspection ■ Climbing inspection and tightening hardware on TL structures ■ Maintenance of ground wire, insulators, bird guards, cross arms, steel members, hardware, braces, dampener, ground spike, ground rod, armour rod, clipping-in structures, structure mile markers, ground anchors ■ Upgrade/maintenance of conductor, antennae ■ Maintenance and repair of existing culvert ■ Remove soil deposition around tower legs ■ Erosion control measures (e.g. fill in erosional features on access road) ■ Removal and/or pruning of danger trees/ vegetation ■ Stabilize small eroded areas ■ Remediation of small spills (oil/hazardous substances)
Communications System	■ Maintenance of microwave radio tower, communication tower and antennae, light beacon, microwave dish, parabolic dish
Facilities	■ Accommodation building maintenance (interior and exterior painting, roof, ceiling, floor, window and door) ■ Vegetation clearing within the property ■ Application of soil sterilants and herbicides ■ Maintenance of air conditioning system (if accommodation building is present)

The Transmission Line is expected to have annual or biannual routine inspection whereby if an issue or potential issue is identified, this may trigger maintenance activities. However, it is unlikely that maintenance activities will occur frequently since the design is intended to last a few decades with high structural integrity.

It shall be noted that the proposed Transmission Line is on Build and Transfer scheme. The Project Proponent will be responsible for “Build and Transfer” to MOEE, while MOEE will be operating the transmission line.

4.4.3 Electric and Magnetic Fields

Electric and Magnetic Fields (EMF) are emitted by any electrical device (e.g. power lines and electrical equipment). Conductive materials, trees and buildings shield electric fields. Magnetic fields pass through most materials and are difficult to shield. Both electric and magnetic fields decrease rapidly with distance, so they are of concerns for a limited distance from the source only. However, especially in dense urban areas where transmission and distribution facilities run very close to buildings, they might represent a potential health danger. Even if the scientific evidence of adverse health is weak, it is still sufficient to warrant concern.

The electric field generated by the Transmission Line exceeds 5,000 V m^{-1} (volt per meter) until the distance from center line of the Transmission Line is greater than 19.3 m for 2 m above ground level. 5,000 V m^{-1} of electric field strength is chosen with reference to the exposure limits for the general public (as shown in ***Table 4.14***) Accordingly to the Myanmar environmental standards related to electric field exposure, a corridor of about 20 m either side of the transmission line center line should be kept. However, for this Project, the Project Proponent has used a total corridor buffer distance of 46 m.

Table 4.14: Exposure Limits for General Public Exposure to Electric and Magnetic Fields

Frequency	Electric Field (V m^{-1})	Magnetic Field (μT)
50 Hz	5,000	100
60 Hz	4,150	83

Source: International Commission of Non-Ionizing Radiation Protection, cited in World Bank Group, 2017

4.4.4 Decommissioning Phase

Decommissioning is the final step in the Project lifecycle. This phase will need to take into account every project component, which will be decommissioned. Decommissioning is the term used to describe all the stages involved in the closure and rehabilitation of any project. The process can generally be categorized into three (3) key phases as follows:

- Pre-decommissioning activities: includes the detailed planning (development of the decommissioning plan) and approval procedures;
- Decommissioning activities: removal of concrete pad, steel structures, cables, wires and other related components; and
- Post-decommissioning activities: site survey, close-out report and field monitoring as necessary.

4.4.4.1 Decommissioning Plan

At present, there are no plans or schedule for decommissioning of the proposed Project. It is likely that the Project facilities will only be decommissioned/abandoned once it is no longer economical to continue operation, the Transmission Line is rendered redundant and/or no longer required for various reasons or is unsafe to operate. As the development process of the site is yet to fully begin, detailed decommissioning plans have not yet been formulated.

The Project facilities will be designed with decommissioning in mind. In general, facilities will be designed so that they can be isolated and decommissioned in steps which are in reverse of the installation procedure or which are most convenient to do so. The decommissioning phase activities will therefore be similar to those associated with excavation/foundation work, installation and civil construction phases. The decommissioning plant will also take into account environmental rehabilitation, which includes the removal of all surface facilities, as well as re-vegetation of localized natural flora.

Associated decommissioning activities in accordance with environmental measures and standards of good practice are as follows:

- Removal of site infrastructure and waste;
- All civil structures and associated infrastructure will be removed;
- All remaining materials and hydrocarbons and hazardous waste will be removed;
- All piling and trestles will be removed;
- All waste will be disposed of in an appropriate manner; and

- Reusable materials to be resold or recycled.

Hazardous Waste Clean-up and Transport:

- When decommissioned, all products within piping and storage infrastructure shall be removed from system along with all associated infrastructure and possible contaminated soils; and
- All hazardous wastes (if any) shall be transported to approve hazardous waste storage facilities or disposal sites.

Site Rehabilitation:

- All disturbed areas due to ROWs, transmission line, etc, shall be rehabilitated and revegetated;
- Native flora shall be used to revegetate the rehabilitated sites;
- Roadways will be scarified; and
- Natural drainage patterns will be reinstated where practical.

4.5 Project Alternatives

IFC Performance Standard 1 (Assessment and Management of Environmental and Social Risks and Impacts) ("PS1") requires an assessment process that identifies the risk and potential impacts associated with a project. Specifically, "the process may comprise a full scale environmental and social impact assessment, a limited or focused environmental assessment or straight forward application of environmental siting, pollution standards, design criteria or construction standards". PS1 states that for greenfield developments or large expansions with specifically identified physical elements, aspects and facilities that are likely to generate potential environmental or social impacts, the client will conduct a comprehensive ESIA, including an examination of alternatives, where appropriate.

This section presents an overview of the alternatives considered as part of the IEE study. The main design criteria, plant technology, Project type, and Project Location were determined by MOEE, and the Project Proponent will have to comply with MOEE requirements are therefore beyond the remit of this IEE study, and are not included in this review.

4.5.1 Alternative Layout and Route

A potential alternative foundation layout for the Transmission Tower will be instead of using a large foundation platform, the EPC can lay down small individual concrete foundation large enough to cover only the area where the Transmission Tower come into contact with the soil. This will reduce the amount of concrete required for the foundation but will increase the difficulty of the engineering work.

This Project is required for TPMC to sell their power generated from the new Ahlone Power Plant expansion, which will be built in parallel to this Project. Currently, there are existing transmission lines, but this is estimated that it will not have enough capacity for the new expansion to the Power Plant.

TPMC has chosen the proposed alignment based on environmental and social aspects, constructability and financial. The Transmission Line is crossing the Yangon River from the LNG Power Plant location using existing poles (one on the left bank and one on the right bank of the river), reducing impacts from additional pole installation. The alignment is then constrained to the limited land available between the Twantay canal and the Yangon River on the first kilometer.

Three options have been considered:

- A direct alignment to the sub-station, 17.4 km long;
- The proposed alignment, 20 km long; and
- A Southern alignment, 24.47 km long.

As seen on ***Figure 4.15***, the direct alignment, although shorter and therefore less costly, passes over 4 villages and benefit from less existing roads running parallel to it, increasing the need to open new

access roads during construction. It also crosses more water bodies or channels than the other options presenting more environmental risks.

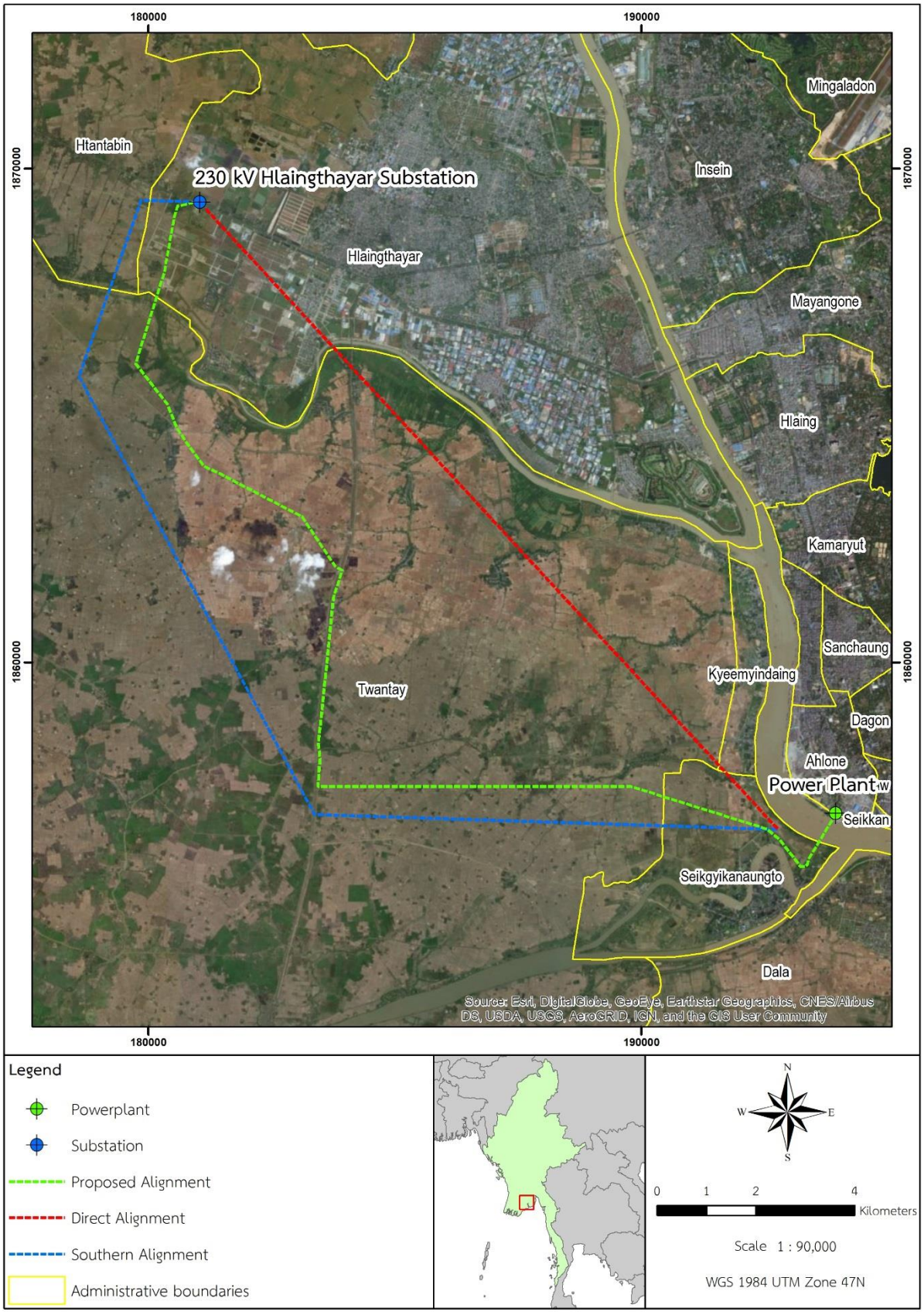
The southern alignment, longer than the proposed alignment and therefore more costly also has less existing road running parallel to it and do not passes near less villages than the proposed alignment. It has also more crossing of existing or planned transmission lines than the direct and proposed alignments.

The proposed alignment, although longer than the direct one, has more existing roads running parallel to it, avoid existing villages with the closest one more than 200 meters away and limit the number of crossing with existing and planned transmission lines in the area.

The proposed alignment therefore offer a financially and technically better option, also impacting less social receptors

In conclusion, the chosen route and layout is assessed as the most feasible with consideration to the safety, environmental, biological and socio-economic impacts aspects.

Figure 4.15: Alternative and Proposed Transmission Route



Source: TPMC, 2019 (modified by ERM).

5. DESCRIPTION OF THE SURROUNDING ENVIRONMENT

5.1 Introduction

The following section describes the physical, biological and social environment of the Project Site as well as the surrounding area, which defined as the “Study Area”.

The information provided is based on a review of published information, as well as through a review of available literature from the Project Proponent and from ERM’s in-house library.

Baseline data that has been collected for the purposes of the Ahlone CCPP ESIA report will also be used for this IEE Report, as the acquired data is also, to a certain level, representative of the Transmission Line’s Study Area.

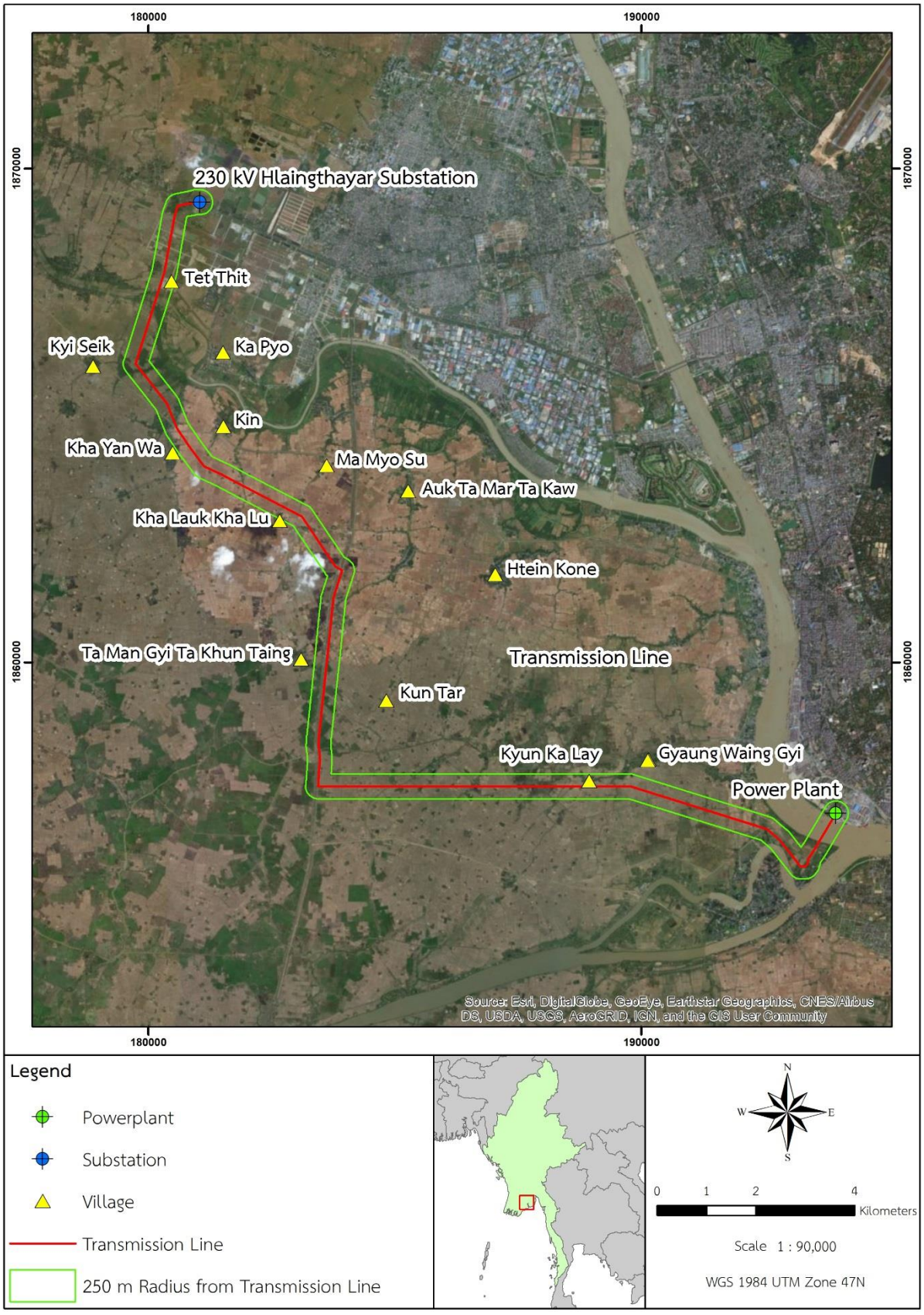
The purpose of reviewing the baseline conditions, albeit at a high level, is to present an understanding of the potential environmental and social sensitivities of the Study Area. Reviewing the baseline conditions allows the Project Proponent and its advisors to make an informed judgement on the appropriate level of impact assessment for the Project.

The ‘Study Area’ refers to the area that needs to be studied in order to adequately understand and describe the baseline conditions likely to be affected by the Project. The Study Area encompass the Project Footprint and the Area of Influence (AoI), whereby the AoI includes the following:

- The primary Project site(s) and related facilities that the Project Proponent develops or controls;
- Associated facilities that are not developed and funded as part of the Project but are essential for the Project and without which the Project cannot proceed;
- Areas potentially affected by cumulative impacts resulting from other developments known at the time of the Impact Assessment (IA), further planned phases of the Project or any other existing circumstances; and
- Areas potentially affected by impacts from predictable (but unplanned) developments as a result of the Project. The information provided is based on a review of published information, as well as through a review of available literature from the Project Proponent and from ERM’s in-house library.

For this IEE study, the Study Area has been defined 250 m area on each side of the Transmission Line (shown in ***Figure 5.1***).

Figure 5.1: Transmission Line Study Area



Source: TPMC, 2019 (Modified by ERM).

5.1.1 Project Site Setting

The Project Site is located in the semi-rural area stretching southeast to northwest of Hlaingthayar township, Yangon Region, Myanmar. The Project Site is situated primarily on agricultural land, near small residential settlements, and crosses various roads and water channels, with largest being the Yangon and Pun Hlaing River. The topography of the Project site suggests a generally flat terrain, and land-use is mainly free of any industrial sources and significant infrastructure developments.

Figure 5.2 Typical Existing Condition at the Project Area

Source: ERM, 2018.

At this stage, the baseline information presented in this report is based on satellite imagery and a site visit for ground truthing purposes.

Baseline information on physical environment at the Project Site and its vicinity is summarized below.

5.2 Physical Environment

5.2.1 Ambient Air Quality

A recent ambient air pollution global assessment undertaken by the World Health Organisation (WHO)[14] has ranked Myanmar as one of the worst in the world with ambient $PM_{2.5}$ concentrations well in excess of the annual average air quality standard set for the protection of human health. The figures presented in the assessment indicate that Myanmar's urban and rural areas combined had a median of 51µg/m^3

[14] World Health Organisation (WHO) (2016) Ambient Air Pollution: A Global Assessment of Exposure and Burden of Disease [Online] Available at: http://apps.who.int/iris/bitstream/10665/250141/1/9789241511353-eng.pdf?ua=1 [Accessed 11 April 2017].

and an estimated range between 32µg/m^3 and 80µg/m^3 and in excess of the Myanmar annual average air quality standard of 10µg/m^3 above which damage to human health is considered likely. The main sources of air pollution in Myanmar are reported as inefficient modes of transport, coal fired power plants, combustion of household fuels for cooking, lighting and heating, and industrial agriculture and waste burning[15].

The Environmental Performance Index[16] based on national-level environmental data, ranks Myanmar as the 138th (out of 180 countries) as of August 2018, with the overall score of 45.32 (out of 100). However, for air quality, Myanmar is ranked 171st, with a high rate of change with regard to exposure to $PM_{2.5}$ concentrations which is likely linked to the increase in the aforementioned sources of $PM_{2.5}$ emissions.

Quantitative information on the ambient air quality for the Project area is not publically available. The principal sources of emissions to the atmosphere in the vicinity of the Project site are likely to be from exhaust emissions from road and river transportation, industrial activity and other thermal power plants.

Air quality monitoring was conducted at selected sites in Yangon, henceforth, this air quality data is acceptable as the Project Area ambient air quality and condition. The monitoring was conducted at a commercial, residential and industrial zone and were measured for suspended particles, NO_2 and SO_2. The data is presented in ***Table 5.1***.

Table 5.1: Road Side Air Quality Monitoring in Yangon

Monitoring Location	PM_{10} (ug/m^3)	$PM_{2.5}$ (ug/m^3)	NO_2 (ug/m^3)	SO_2 (ug/m^3)
Commercial Area	342.58	177.69	-	-
Residential Area	168.61	68.59	1.14	23.22
Industrial Area	127.32	66.95	0.37	28.36

Source: http://www.mlit.go.jp/kokusai/MEET/documents/scripts/S1-Myanmar-Handout.pdf

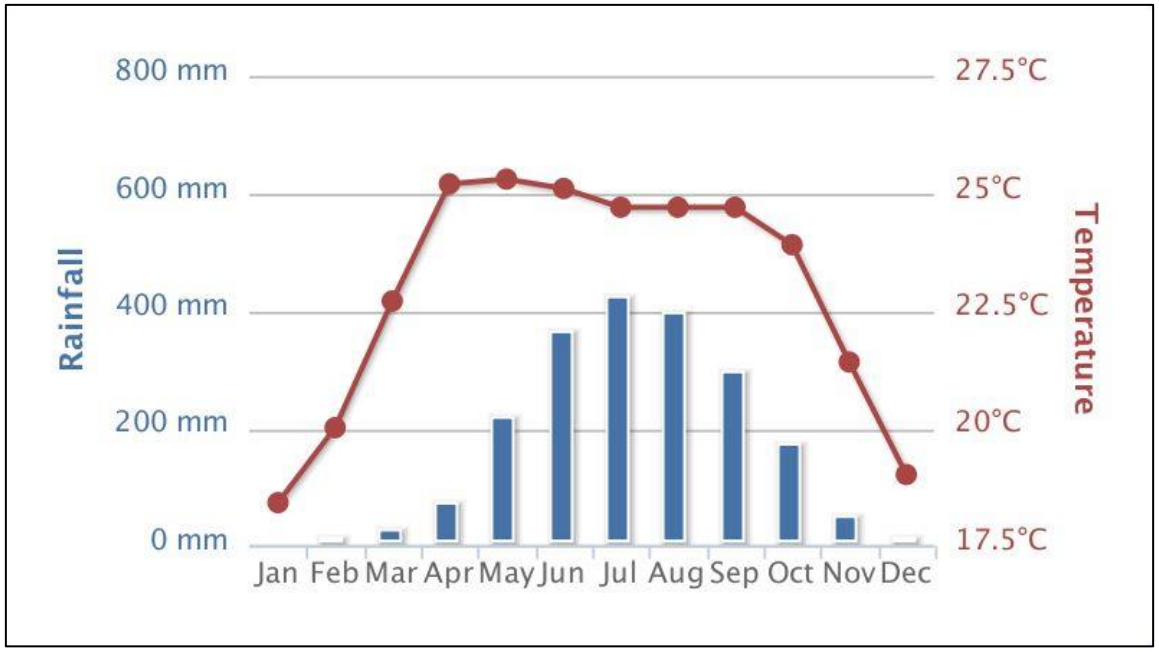
5.2.2 Climate and Meteorology

Most of Myanmar belongs to the tropical region characterised by a tropical monsoon climate (Köppen climate classification Am) with three well-defined seasons: summer, rainy and cold seasons. The summer months are from March to Mid-May. The rainy season typically lasts from mid-May to the end of October and the cold season starts in November and lasts up to the end of February (see ***Figure 5.3***).

[15] http://www.mmtimes.com/index.php/national-news/22840-myanmar-s-air-pollution-among-the-worst-in-the-world-who.html

[16] The Environmental Performance Index [Online] Available from: https://epi.envirocenter.yale.edu/epi-country-report/MMR [Accessed 21 August 2018]

Figure 5.3: Myanmar Climate 1900 – 2012



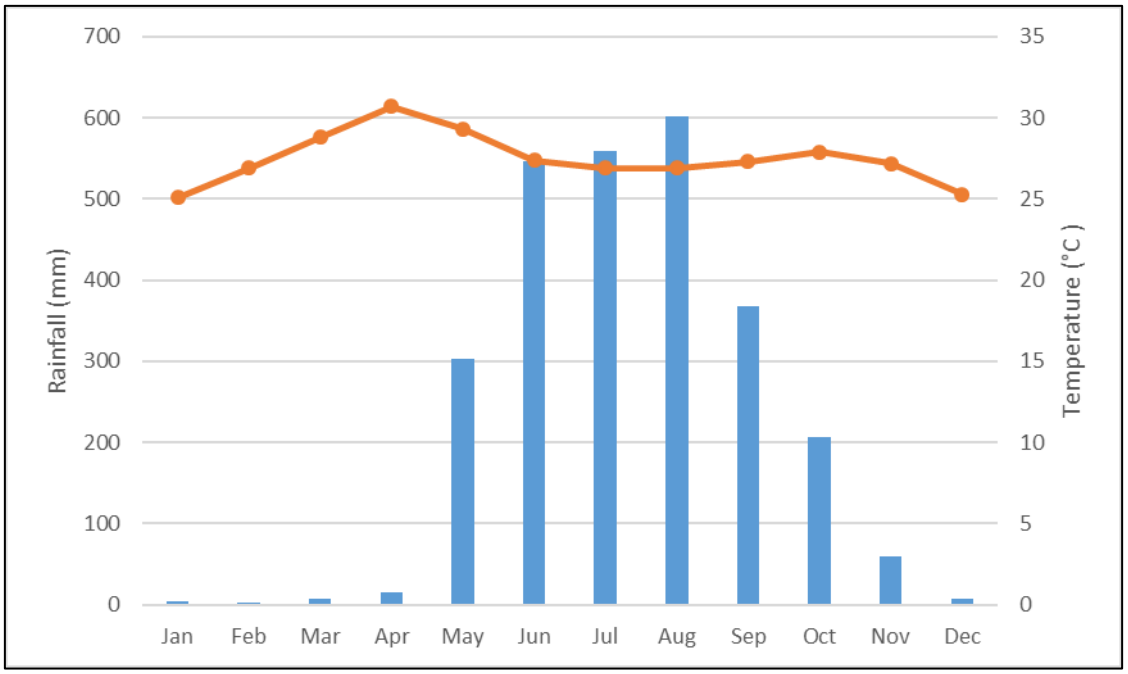
Source: The World Bank Group, Climate Change Knowledge Portal (http://sdwebx.worldbank.org/climateportal)

The southwest monsoon starts in late March or early April with local turbulence that includes tornados and cyclones, bringing winds that can reach up to 200 – 300 km/h. From October to mid-March the northeast monsoon brings a dry and cool climate. Due to widely differing topographical profiles throughout Myanmar and its range of latitudes, its climate conditions differ widely from one place to another[17].

In Yangon, the average annual temperature is 27.4 °C while the average annual rainfall is 2,681 mm. The warmest month of the year is April with an average temperature of 30.7 °C while the coolest month of the year is January with an average temperature of 25.1 °C. February is the driest month with an average of 2 mm of rainfall. The wettest month is August with an average of 602 mm (Climate Data Website). The predominant annual wind direction is south-westerly (Windfinder Website). Relative humidity ranges approximately from 52 to 89% (Climate Data Website). A graphical representation of this is shown in ***Figure 5.4***.

[17] The Union of Myanmar Ministry of Forestry (2005) National Action Programme of Myanmar to Combat Desertification in the Context of United Nations Convention to Combat Desertification (UNCCD) [Online] Available at: http://www.unccd.int/ActionProgrammes/myanmar-eng2005.pdf [Accessed 12 April 2017]

Figure 5.4: Yangon Climate



Source: http://www.yangon.climatemps.com/, adapted by ERM, 2019.

5.2.2.1 Climate Change Projections

Projected climate changes over Myanmar have been studied based on both General Circulation Model (GCMs) used in the Intergovernmental Panel on Climate Change (IPCC's) fourth assessment, and using dynamic downscaling with regional climate models forced by the GCMs[18].

Myanmar has been witnessing changing weather events in almost every year during the last three decades. These include the onset, withdrawal, duration and intensity of monsoon, and the frequency of the monsoon depressions[19]. The frequency of hot days and nights is expected to increase, while the frequency of cold days/nights will decrease.

Myanmar's total GHG emissions in 2013 were 201.5 million metric tons of carbon dioxide equivalent ($MtCO_2e$), totaling 0.42 percent of global GHG emissions[20].

According to the World Resources Institute Climate Analysis Indicators Tool (WRI CAIT), and Land Use Change and Forestry (LUCF) activities, were the leading sources of Myanmar's[21] GHG emissions in 2013, accounting for 51.0% of the country's total emissions[22]. Within the LUCF sector, changes in forest land contributed 73% of emissions[23]. Agriculture was the second most significant source (32.1%) with rice cultivation and enteric fermentation from livestock contributing 67% of agriculture emissions[24]. Energy was responsible for 10.9% of emissions, of which 50% were due to fugitive emissions and other

[18] Intergovernmental Panel on Climate Change. IPCC Fourth Assessment Report (AR4), (2007), Climate Change: Synthesis Report

[19] Tun Lwin, Khin and Cho Cho Shein., 2006. Hydrology and Meteorology report of Myanmar.

[20] https://www.climatelinks.org/resources/greenhouse-gas-emissions-factsheet-burma

[21] Burma ratified the UNFCCC as Myanmar. UNFCCC Status of Ratification, viewed on March 20, 2017.

[22] World Resources Institute Climate Analysis Indicators Tool (WRI CAIT 2.0, 2017). Global Warming Potentials (GWPs) are from the Intergovernmental Panel on Climate Change (IPCC) Second Assessment Report (SAR).

[23] Food and Agriculture Organization of the United Nations Statistics Division (FAOSTAT). Myanmar, Emissions – Land use total, viewed on March 18, 2017.

[24] FAOSTAT. Myanmar, Emissions – Agriculture total, viewed on March 18, 2017.

fuel combustion. Waste and Industrial Processes (IP) contributed 5.8% and 0.2% of total emissions respectively.

5.2.3 Noise

Information on the ambient noise conditions for the Study Area is not publicly available. The background noise levels are considered to be typical of a general rural environment. Sources of noise are likely to be limited to local traffic (e.g. motorbikes, scooters, minivan and private cars), humans (e.g. schools, village halls, local markets) and animals (e.g. dogs, cockerels).

Potential noise sensitive receivers in the area will include settlements and schools. These receivers will be sensitive to noise from the construction of the Project. Construction activities will include vehicle movement, site clearance, excavation, etc.

5.2.4 Surface Water

A study of source water and drinking water quality in Yangon in 2013 (Hiroshi Sakai, et al, 2013) sampled river waters within ~12 km upstream and ~3 km downstream of the proposed Power Plant.

The result of this study show the total coliform level of the river waters in Yangon was close to 50 cfu/ml. Amongst the sampling points on the Yangon River, the sampling point downstream of the Project Site, located at the riverbank close to a wastewater treatment plant discharge point, has significantly higher (21 fold higher) total coliform level than those sampling points in the centre of the river.

Analysis of chemical levels in the river water samples indicated that the dissolved organic carbon (DOC) was less than 3 mg/L. Levels of the Chlorine (Cl^-) ion tended to increase downstream. The levels of Bromine (Br) ion and Arsenic (As) displayed a similar trend, although the increase was not as marked. In contrast to the elemental measurements, DOC, dissolved total nitrogen (DTN), and nitrate were stable along the river flow. It was therefore assumed that the sources of Cl^-, Br^- and As were different from those of carbon and nitrogen. Overall, lake and river water quality were considered good in terms of concentrations of chemical parameters, but levels of bacterial contamination was considered as a concern.

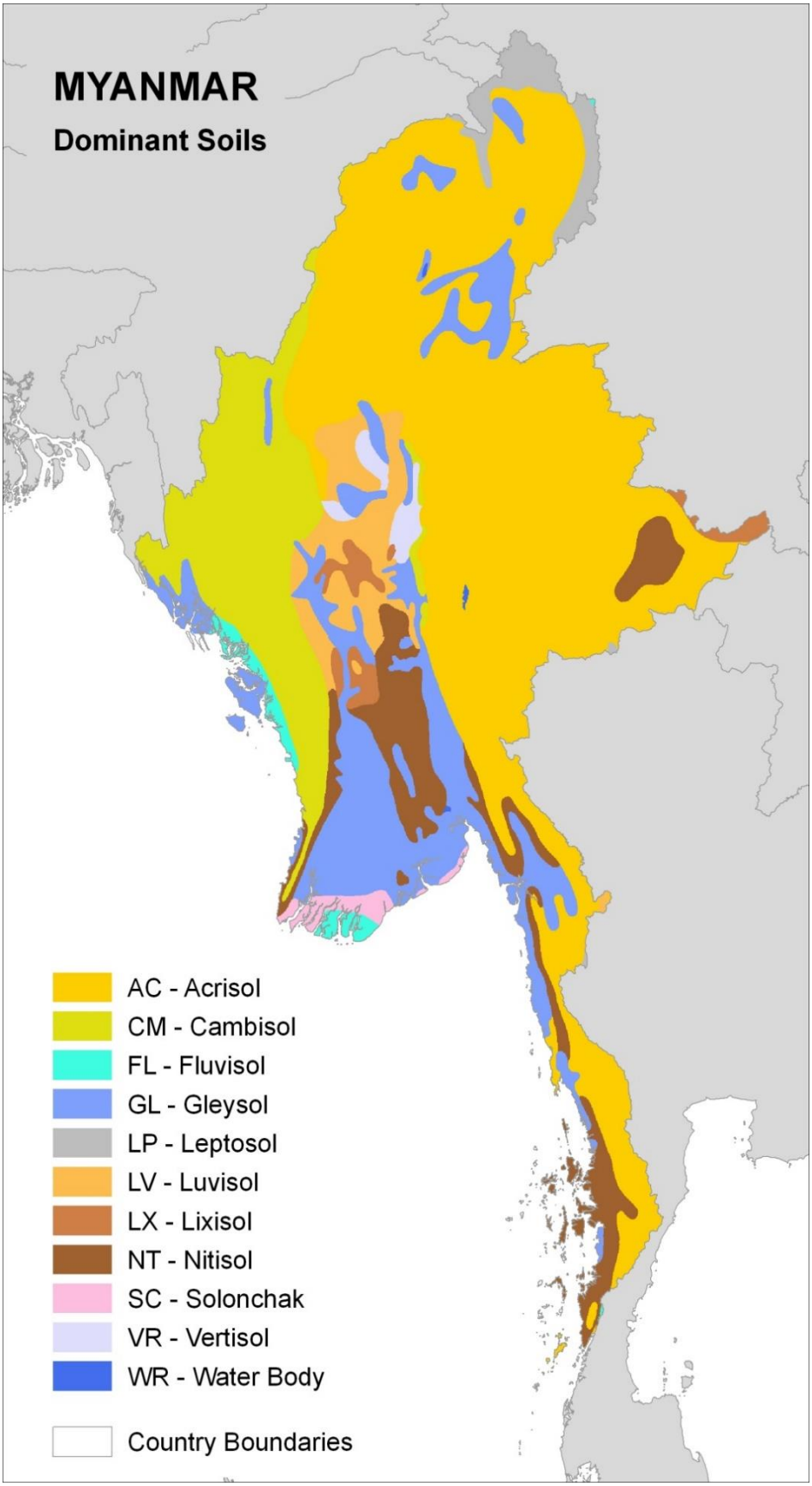
5.2.5 Soil

The soil types in Myanmar can generally be divided into ten (10) dominant subsoil types as presented in ***Figure 5.5***. At the Project site the soil type can be described as Dystric Nitosol. This soil type is described as follows:

- Argillic B horizon with a clay distribution where the percentage of clay does not decrease from its maximum amount by as much as 20 percent within 150cm of the surface;
- Lacking plinthite within 125cm of the surface;
- Lacking vertic and ferric properties; and
- Base saturation of less than 50 percent (by NH_4OAc) in at least a part of the B horizon within 125cm of the surface.

Soil characteristics in Yangon are classified as predominantly Gleysol. The Study Area is located on Meadow (Gleysol) and Meadow Alluvial soil (Fluvic Gleysols). The Meadow soil distributes near the river plains where occasional tidal floods occur and are typically non-carbonate, and they usually contain large amount of salts. Meadow Alluvial soil can be found in the flood plains. They have the texture of silty clay loam and are rich in plant nutrients (Union of Myanmar, 2009).

Figure 5.5: Myanmar Soil Profile



Source: http://www.fao.org/nr/myanmar/page4_en.htm

5.2.6 Groundwater

5.2.6.1 Hydrology

The Study Area starts 40 km upstream from the mouth of the Yangon River. The average tidal range of the Yangon River is about 5.85 m at spring tide and 2.55 m at neap tide. Modelling of the discharge of Yangon River indicates discharges ranging from <500 m^3/s in April to approximately 7,000 m^3/s in August, with tidal water level variations of ~1 m to ~6 m based on water level measurements at Monkey Point downstream of Project Site (De Koning & Janssen, 2015). In the Irrawaddy Delta which includes the Yangon River, drainage, salt intrusion and flood protection are major concerns (EO Earth Website, 2016). According to mapping of the August 2015 floods in Yangon (Yangon Delineation Overview), the riverbanks adjacent to the Project Site are impacted by the flooding (***Figure 5.1***).

5.2.6.2 Groundwater Quality

In general the groundwater in the Yangon region is dependent upon natural recharge from rivers and the upper watershed (JICA, 2003). Generally, declining ground water levels in the region are anticipated to have occurred due to associated environmental degradation of water sources as well as uncontrolled excessive pumping of wells. Siltation, accumulation of waste, and encroachment on the channel areas contribute to reduced drainage capacity.

Groundwater aquifers are typically prone to leaching during the monsoon periods, especially on impervious surfaces, e.g. clay seams, clay layers, bedrocks, etc. Rising groundwater can cause saturation of the soil and can cause very high pore-water pressure in slopes in sedimentary deposits.

Hlaingthayar and Seikgyikanaungto Township are located on a zone I (one) groundwater. Zone I (one) refers to good quality groundwater with high yield. Additionally, the high yield is sourced from Arzanigone sand rock (1000 – 1100 gph) and Valley fill deposits (6000 – 10000 gph) with total dissolved solids of 60 -200 ppm and 50 – 200 ppm, respectively (Khin Kay Khaing, 2011[25]). Therefore, we can expect that the groundwater quality in the Study Area is in reasonably good condition with high yield volume for communities and industrial use.

5.2.7 Landscape and Visual

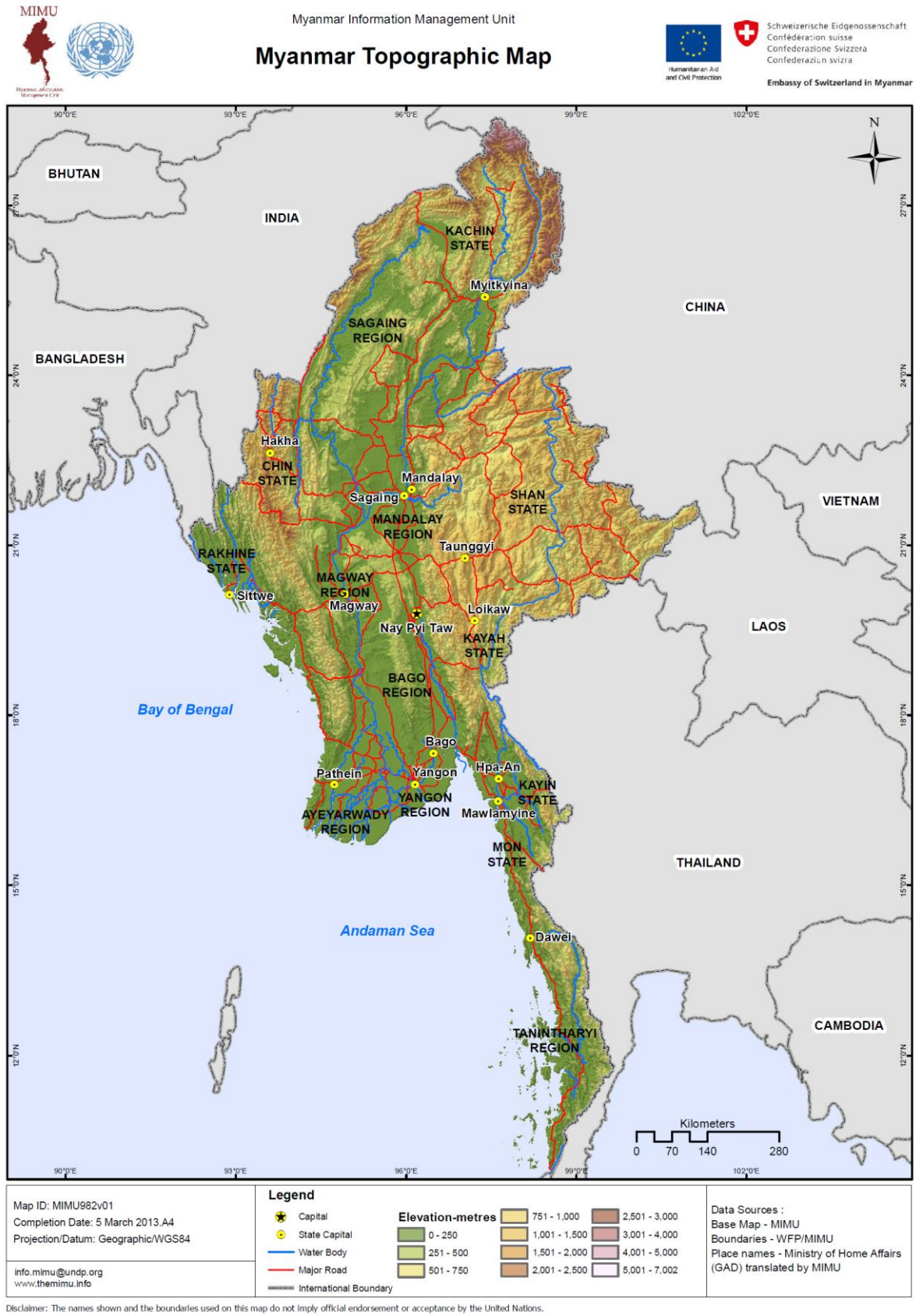
The central part of Myanmar, specifically within the Yangon Region and Ayeyarwady Region consists of mainly plains with little to no elevation. Although this characteristics is normal for land located near coastal areas, other northern regions of Myanmar have a large range of mountainous areas, and varying degrees of elevation, which are particularly pronounced in the Kayah State and Shan State.

With regards to the low land areas of Myanmar, it is possible to see that Yangon primarily consists of plains with low elevation; however, the Northern Region of Yangon contains mountainous areas with high elevation of approximately 500 – 1,000 meters as shown in ***Figure 5.6*** and ***Figure 5.7***. It is also possible to notice the slight elevation the stretches from the northern region down to Yangon City.

The Project area is characterise by urban/industrial settings in Ahlone township, then flat agricultural plains with only limited trees and one level constructions for most part of the Transmission Line alignment and finally semi-urban/industrial settings in the last two kilometres of the alignment. For the most part of the alignment, the Transmission Line will be installed next to an existing transmission line also going to the Hlaingthayar sub-station.

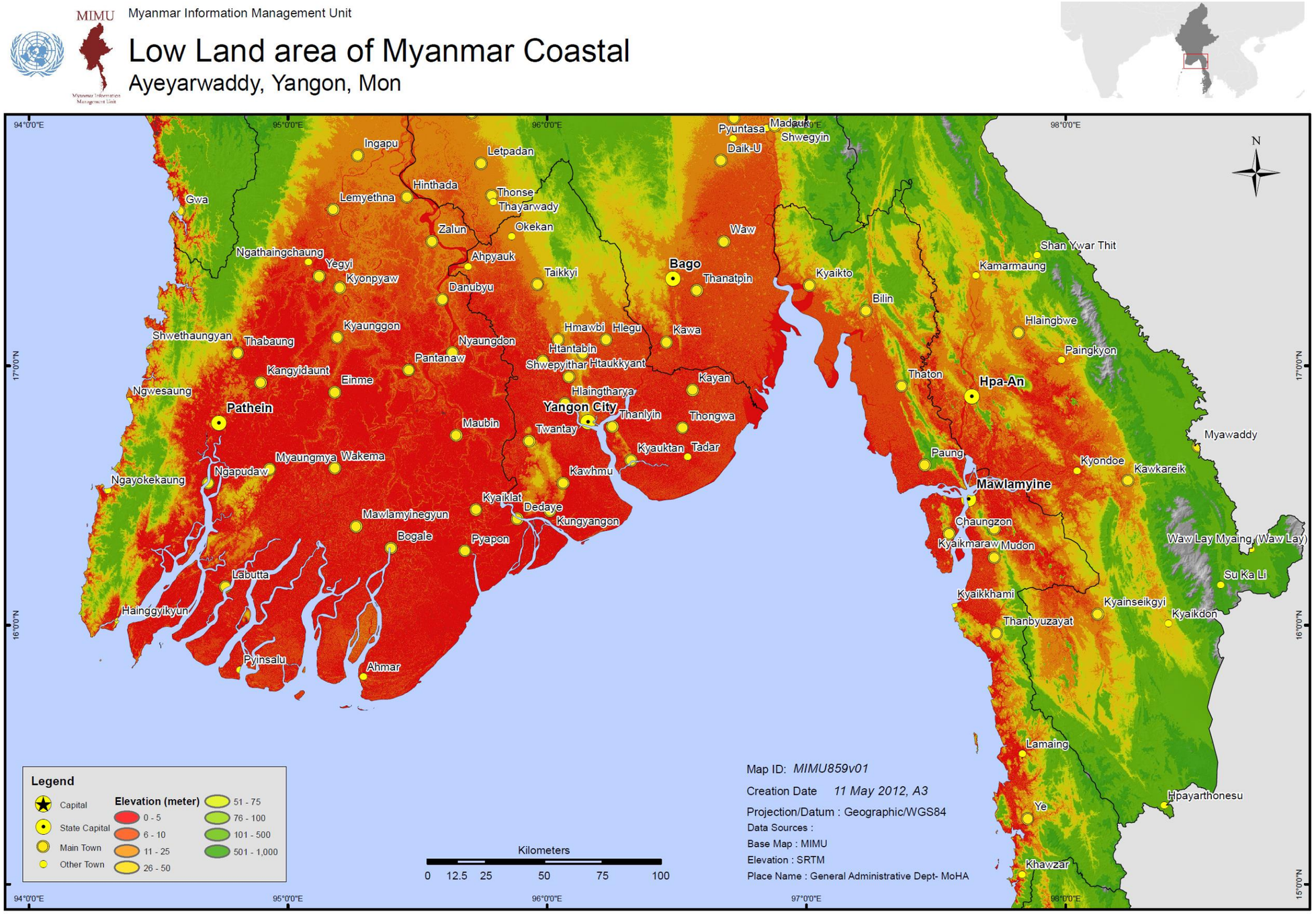
[25] http://www.myanmar-education.edu.mm/wp-content/uploads/2013/05/13_Khin_Kay_Khaing.pdf

Figure 5.6: Topographic Map of Myanmar



Source: MIMU, 2013

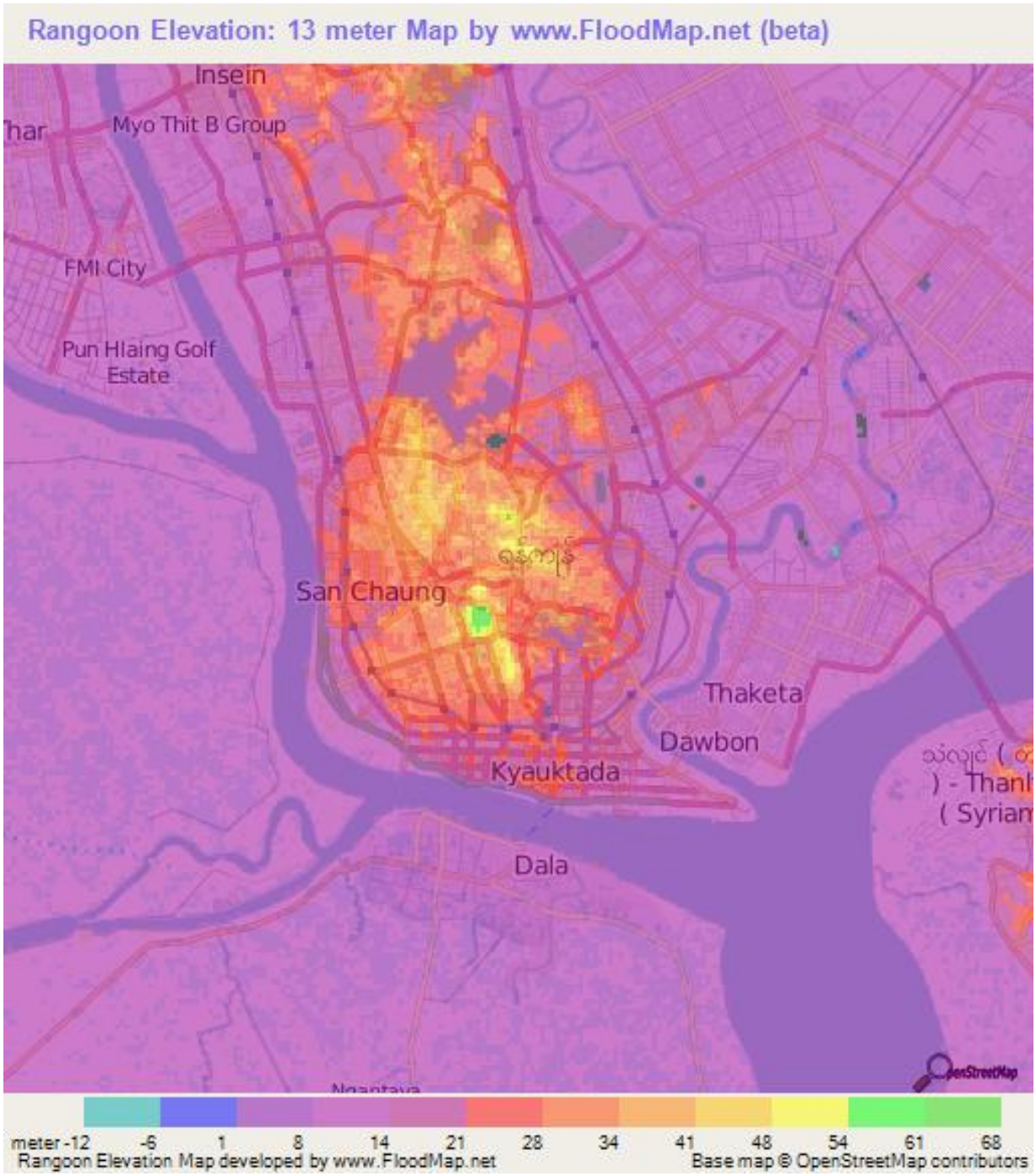
Figure 5.7: Topographic Map of Myanmar Coastal Low Land Area



Disclaimer: The names shown and the boundaries used on this map do not imply official endorsement or acceptance by the IASC membership.

Source: MIMU, 2012.

Figure 5.8: Elevation of Yangon City



Source: FloodMap.net, 2018.

5.2.8 Waste

There is currently no accurate and reliable data on the total waste production in Myanmar however according to the World Bank[26] the solid waste generation in Myanmar was 5,616 tonnes/day increasing

[26] The World Bank (2012) A Global Review of Solid Waste Management [Online] Available at: http://siteresources.worldbank.org/INTURBANDEVELOPMENT/Resources/336387-1334852610766/What_a_Waste2012_Final.pdf [Accessed 12 April 2017]

to 21,012 tonnes/day by 2025. Mandalay, Yangon and Nay Pyi Taw generate the majority of the waste (55%); Yangon produces the most of the waste (1,981 tonnes/day).

The countries municipal solid waste is generated from households (60%), markets (15%), commercial (10%), hotel (2%), garden (5%) and others (8%). In areas outside of Yangon, Mandalay and Nay Pyi Taw, where waste collection is the responsibility of local municipal authorities, the respective Township Development Committees under the local government typically manage municipal waste collection and disposal[27].

In 1995, the government made efforts to encourage the industrial sector to minimize impacts on the environment from industrial waste by issuing the Water and Air Pollution Control Plan (Standing Order No.3) which stated that actions to control, reduce and eliminate waste must be developed and carried out. However, Myanmar today faces substantial challenges with regard to managing their industrial waste with high volumes transported to landfill sites without prior treatment[17].

According to the Yangon City Development Committee (YCDC), the major landfill sites in Yangon that are currently in operation and their respective capacities are shown in ***Table 5.2***.

Table 5.2: Major Landfill Sites in Yangon

Location	Capacity (tonnes/day)
Hteinpin	1,080
Dawai Chang	843
Shwepyithar	61
Mingalardon	43
Dala	33
SeikyiKhanaungato	4

Source: YCDC, 2016

5.2.9 Seismicity

A review of publically available literature has been shown that Myanmar is seismologically unstable and vulnerable to earthquake[28]. Historical records show that at least 15 major earthquakes with magnitudes M≥7.0 have occurred in Myanmar in the last hundred years. Destructive earthquakes occurred in 1930 at Bago, in 1970 at Yangon and in 1975 at Pagan.

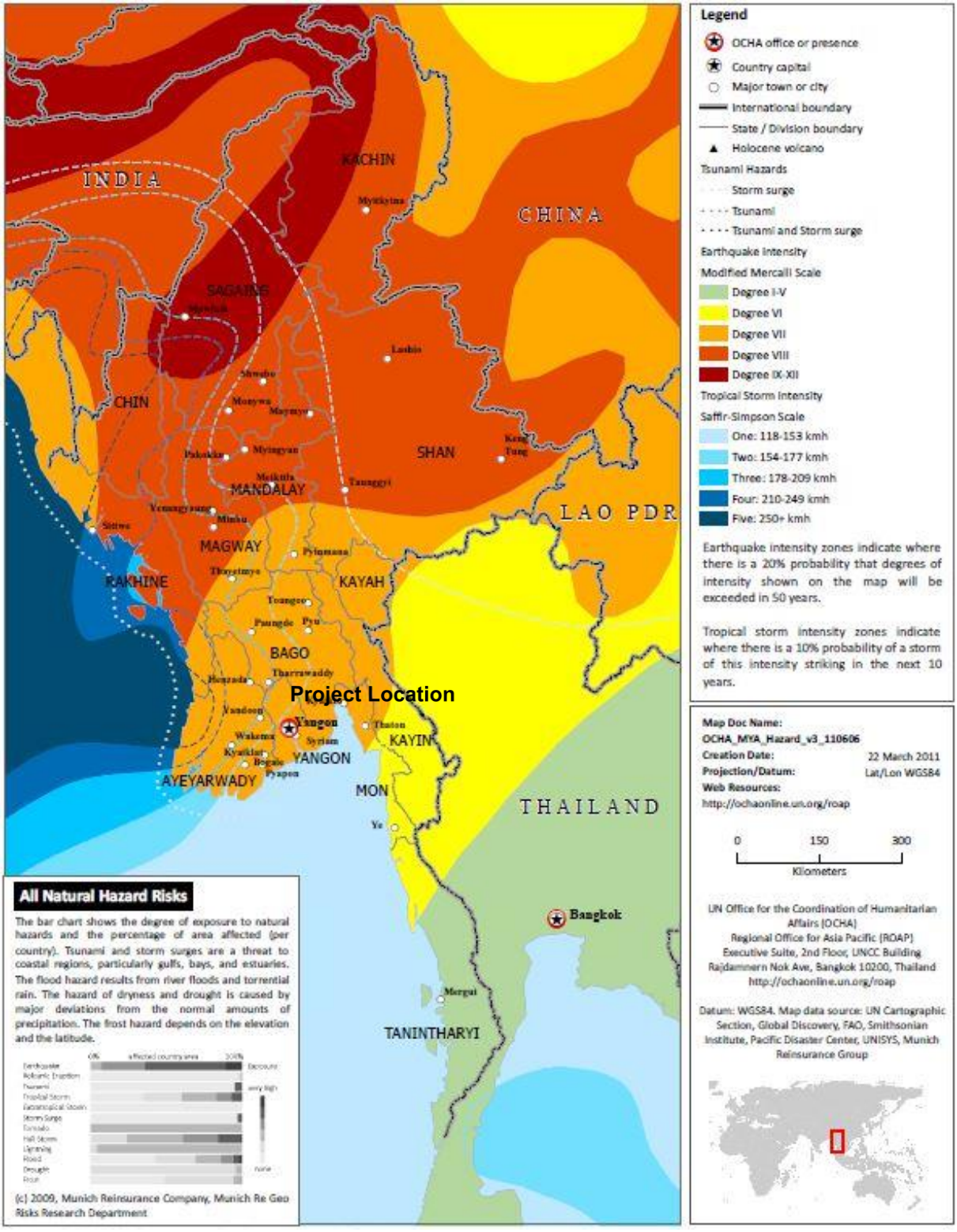
The Project site is located in an area classified as Degree IX to XII under the modified Mercalli Intensity Scale (see ***Figure 5.9***). The shacking associated with this classification is described as 'very strong' and damage is considered negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; and considerable in poorly built or badly designed structures[29]. Based on the data in ***Figure 5.10*** there appears to have been no seismic activity in the project area in the last 100 years.

[27] Institute for Global Environmental Strategies (IGES), Japan with the support of the Environmental Quality Management Co. Ltd. (2016) Quick Study on Waste Management in Myanmar [Online] Available at: http://www.iges.or.jp/files/research/scp/PDF/20160613/17_Quick_study_Web.pdf [Accesses 12 April 2017]

[28] Natural Hazard Assessment of SW Myanmar (2009) – A contribution of remote sensing and GIS methods to the detection of areas vulnerable to earthquakes and tsunami/ cyclone flooding [Online] Available at: http://tsunamisociety.org/282ThielenGPCa.pdf [Accessed 12 April 2017]

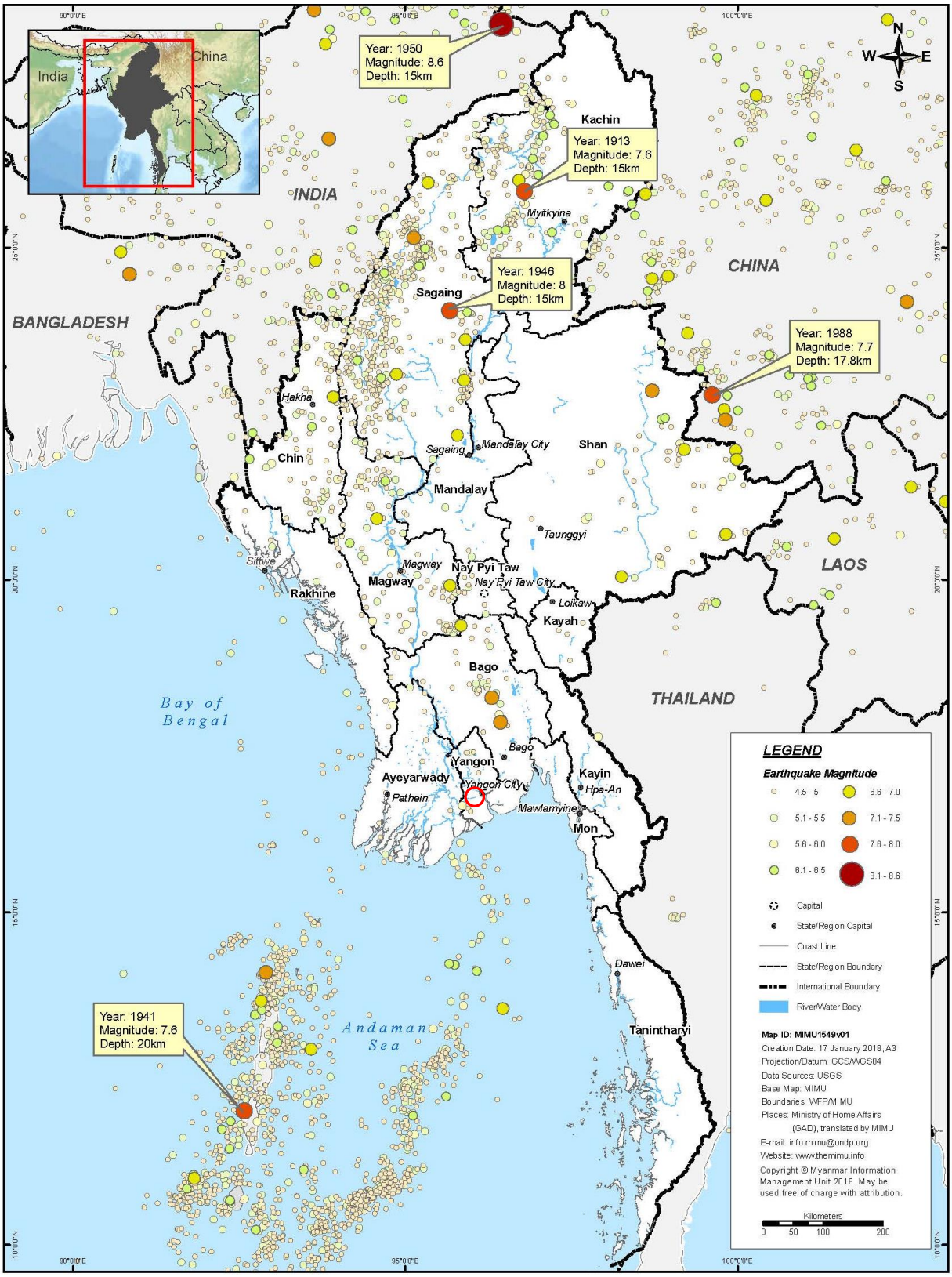
[29] United States Geological Survey (USGS) Earthquake Hazards Program [Online] Available at: https://earthquake.usgs.gov/learn/topics/mercalli.php [Accessed 12 April 2017].

Figure 5.9: Seismicity in Myanmar



Source: UN Office for the Coordination of Humanitarian Affairs (OCHA) (2011) http://www.preventionweb.net/files/4164_ochamyahazardv3110606.pdf

Figure 5.10: Epicentres of earthquakes in Myanmar over the last 100 years



Source: MIMU, 2018

5.2.10 Summary

The Project Site is located near several residential settlements (with three houses located 25 meters away from the Transmission Line) and these areas should be considered as Air Sensitive Receivers (ASRs) and Noise Sensitive Receivers (NSRs) and the potential air quality and noise impacts caused by the construction of the Project will be considered in this IEE Study while during the operation the potential impact will be access during maintenance will be considered. The Project may also affect surface water quality at the Pun Hlaing River and may produce industrial and municipal waste during its construction and possibly during maintenance activities which would also be examined in this IEE Study. There are no other surface water body that may be impacted from the Project. Moreover, the existing waste management facilities within Yangon Region is capable of managing 2,064 tonnes/day of landfill materials cumulative over eight (8) facilities. The surplus generation of waste will put pressure on these facilities and therefore raise these landfills as a receptor.

5.3 Biological Environment

The Myanmar *EIA Procedures (2015)* requires the assessment of biodiversity values however the Procedure does not include guidance on the approach to assess those values. ERM has used the International Finance Corporation (IFC) Performance Standard 6 Biodiversity Conservation and Sustainable Management of Living Natural Resources (PS6) to guide the approach of assessment. Reference is therefore made to certain requirements of IFC PS6.

5.3.1 EcoRegion Description

The Project Study Area resides within the Myanmar Coastal Mangrove [IM1404] EcoRegion. This ecoregion, specifically the Irrawaddy (Ayeyarwady) mangrove region, would naturally be dominated by mangrove flora but has been seriously degraded in recent history.

Mangrove forest are salt tolerant ecosystems that survive in brackish water around the intertidal zone, particularly in estuaries. They are some of the most exploited natural systems in the world, under pressure from land clearance for farming, aquaculture, land reclamation and development. The mangrove forests in this ecoregion are some of the most degraded or destroyed mangrove systems in the Indo-Pacific area. The Irrawaddy mangroves consists primarily of *Rhizophora mucronata, R. conjugata*, *Bruguiera parviflora*, *B. gymnorhiza*, *B. cylindrica*, *Heritiera formes*, *Sonneratia apetala*, *S. griffithii*, *S. caseolaris*, *Xylocarpus granatum*, *X. molluccensis*, *Ceiops roxburghiana*, *C. mimosoides*, *Avicennia officinalis*, *Kanddelia rheedii*, and *Excoecaria agallocha*.

The larger mammals historically found in this ecoregion have been extirpated including the Asian elephant *Elephas maximus* and tiger *Panthera tigris*. A few wild elephants survive in the neighbouring Rakhine mangrove region to the north. Other large mammals including leopard *Panthera pardus*, wild dog *Cuon apinus*, and otter *Lutra spp*. are largely absent. Sambar *Cervus unicolor*, hog deer *Cervus porcinus*, mouse deer *Tragulus javanicus*, barking deer *Muntiacus muntjak*, tapir *Tapirus malayanus*, and wild boar *Sus scrofa*, are abundant only in reserved forests.

Mangrove habitats are rich in migrants and resident waterbirds including the oriental darter *Anhinga melanogaster*, little cormorant *Phalacrocorax nigers*, reef heron *Egretta sacra*, dusky gray heron *Ardea sumatrana*, ruddy shelduck *Tadorna ferruginea*, bronze-winged jacana *Metopidius indicus*, lesser sand plover *Charadrius mongolus*, great stone plover *Esacus magnirostris*, black-winged stilt *Himantopus himantopus*, spotted greenshank *Tringa guttifer*, lesser black-back gull *Larus fuscus*, and common moorhen *Gallinula chloropus*.

Among reptiles, the southern part of the Ayeyarwady Delta contains the last population of crocodiles (*Crocodylus porosus*) in the ecoregion. The river terrapin (*Batagur baska*) now exists only in small isolated populations on offshore islands.

The EcoRegion is currently classified as Critical/Endangered.

5.3.2 Key Biodiversity Areas

In Myanmar, Key Biodiversity Areas (KBAs) fall in different land management categories including protected areas, public protected forests, community-conserved forests, community forests, reserve forests and other resource and land use areas. Therefore, they accommodate different management systems such as government, private, community-led and joint management. Within the last decade, KBAs were reviewed and updated in order to identify and prioritize investment opportunities for biodiversity conversation in Myanmar.

A total of 132 KBAs were identified for Myanmar and prioritized based on Species-based Vulnerability and Site-based Vulnerability. A total of three KBAs were identified under Alliance for Zero Extinction (AZE), one as a Ramsar site, 53 important bird areas, and six ASEAN Heritage Parks.

Key Biodiversity Areas (KBA) include Important Bird Areas (IBA), Alliance for Zero Extinction (AZE), Important Plant Areas (IPA) and Important Sites for Freshwater Biodiversity. There are no KBAs located within the Project's 250 m Study Area as seen in ***Figure 5.11***.

5.3.3 Protected Areas

Myanmar currently has a total of 58 Protected Areas (PAs), which account for only 6.37% of the country's total surface area (Protected Planet, 2018)[30].

One (1) protected area lies within 50 km of the Project Area, The Hlawga Park 18 km to the northeast.

5.3.4 Species of Conservation Significance

Species of conservation significance found within the species grid location from the Integrated Biodiversity Assessment Tool (IBAT) are outlined in ***Table 5.3***.

Table 5.3: Species of Conservation Significance (IBAT species grid)

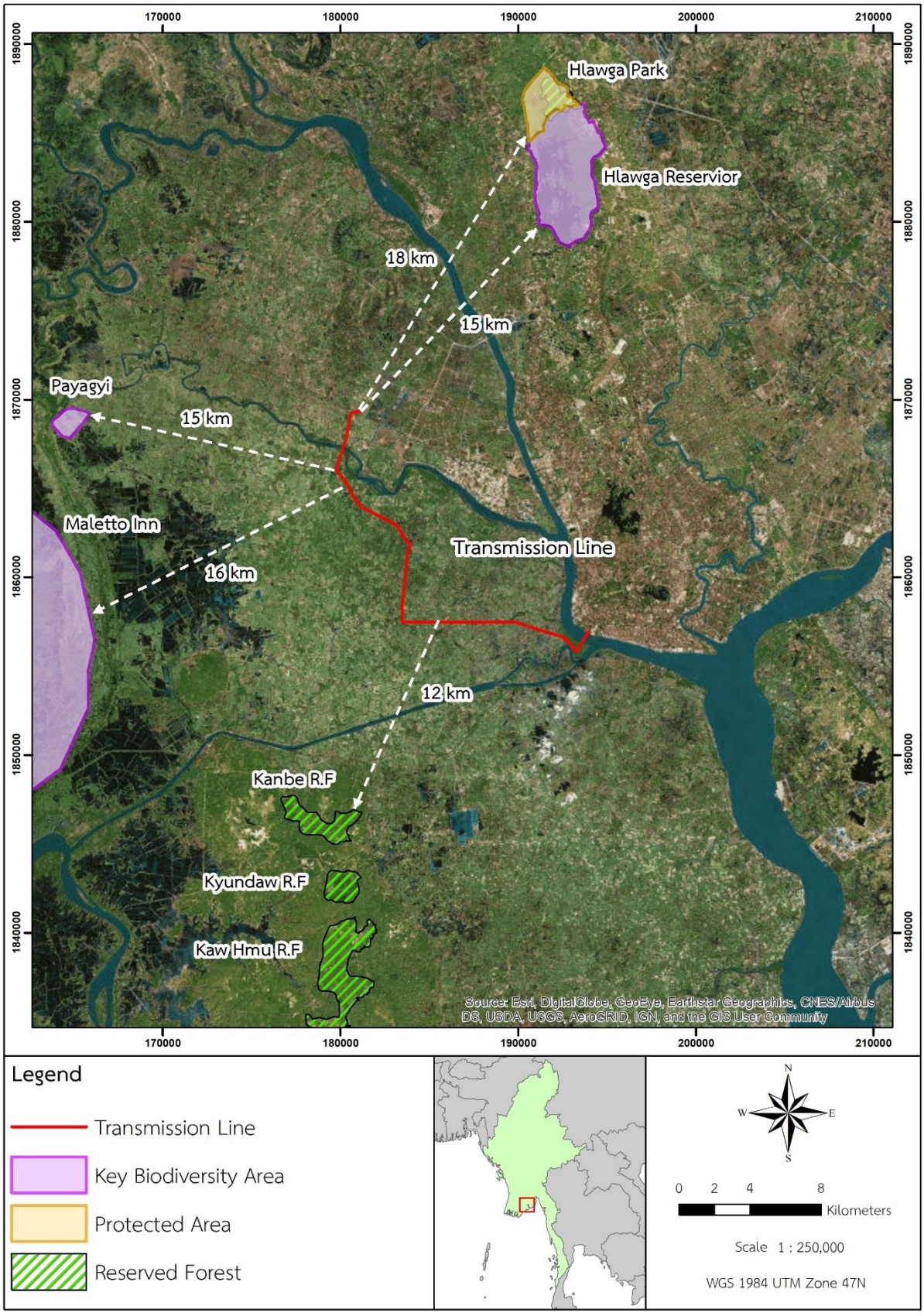
Taxonomic group	Species	Common name	IUCN Red List Category
Birds	*Aquila nipalensis*	Steppe Eagle	EN
Birds	*Asarcornis scutulata*	White-winged Duck	EN
Birds	*Calidris pygmaea*	Spoon-billed Sandpiper	CR
Birds	*Chrysomma altirostre*	Jerdon's Babbler	VU
Birds	*Ciconia episcopus*	Asian Woollyneck	VU
Birds	*Clanga clanga*	Greater Spotted Eagle	VU
Birds	*Emberiza aureola*	Yellow-breasted Bunting	CR
Birds	*Gallinago nemoricola*	Wood Snipe	VU
Birds	*Gracula robusta*	Nias Hill Myna	CR
Birds	*Gracula venerata*	Tenggara Hill Myna	EN
Birds	*Gyps bengalensis*	White-rumped Vulture	CR
Birds	*Gyps tenuirostris*	Slender-billed Vulture	CR
Birds	*Haliaeetus leucoryphus*	Pallas's Fish-eagle	EN
Birds	*Heliopais personatus*	Masked Finfoot	EN
Birds	*Leptoptilos dubius*	Greater Adjutant	EN

[30] Protected Planet Myanmar country profile: https://www.protectedplanet.net/country/MM. accessed 18/05/2018

Taxonomic group	Species	Common name	IUCN Red List Category
Birds	*Leptoptilos javanicus*	Lesser Adjutant	VU
Birds	*Pavo muticus*	Green Peafowl	EN
Birds	*Rynchops albicollis*	Indian Skimmer	VU
Birds	*Sarcogyps calvus*	Red-headed Vulture	CR
Fishes	*Glyphis siamensis*	Irrawaddy River Shark	CR
Mammals	*Arctonyx collaris*	Greater Hog Badger	VU
Mammals	*Balaenoptera musculus*	Blue Whale	EN
Mammals	*Cuon alpinus*	Dhole	EN
Mammals	*Lutrogale perspicillata*	Smooth-coated Otter	VU
Mammals	*Nycticebus bengalensis*	Bengal Slow Loris	VU
Mammals	*Rusa unicolor*	Sambar	VU
Mammals	*Trachypithecus phayrei*	Phayre's Leaf-monkey	EN
Plants	*Halophila beccarii*	Ocean Turf Grass	VU
Plants	*Heritiera fomes*	None	EN
Plants	*Sonneratia griffithii*	None	CR
Reptiles	*Enhydris vorisi*	None	EN
Reptiles	*Ophiophagus hannah*	King Cobra	VU
Reptiles	*Python bivittatus*	Burmese Python	VU

EN – Endangered
CR – Critical
VU – Vulnerable

Figure 5.11: Biodiversity Areas of Interest around the Project Location



Source: ERM, 2019

5.3.5 Biodiversity Survey

5.3.5.1 Flora

Survey Method

A Global Positioning System (GPS) was used to navigate and mark coordinates between sample plots around the AoI.

In order to obtain ecological data for predicting flora of shrubs and herbs a site reconnaissance was conducted in the locations detailed in ***Figure 5.12***. In each location, plant species were listed with particular attention to the identification of invasive species, threatened species, Critical Habitat triggers and the extent of Natural Habitat. Identification of any areas of habitats of concern that may contain species of conservation interest were noted.

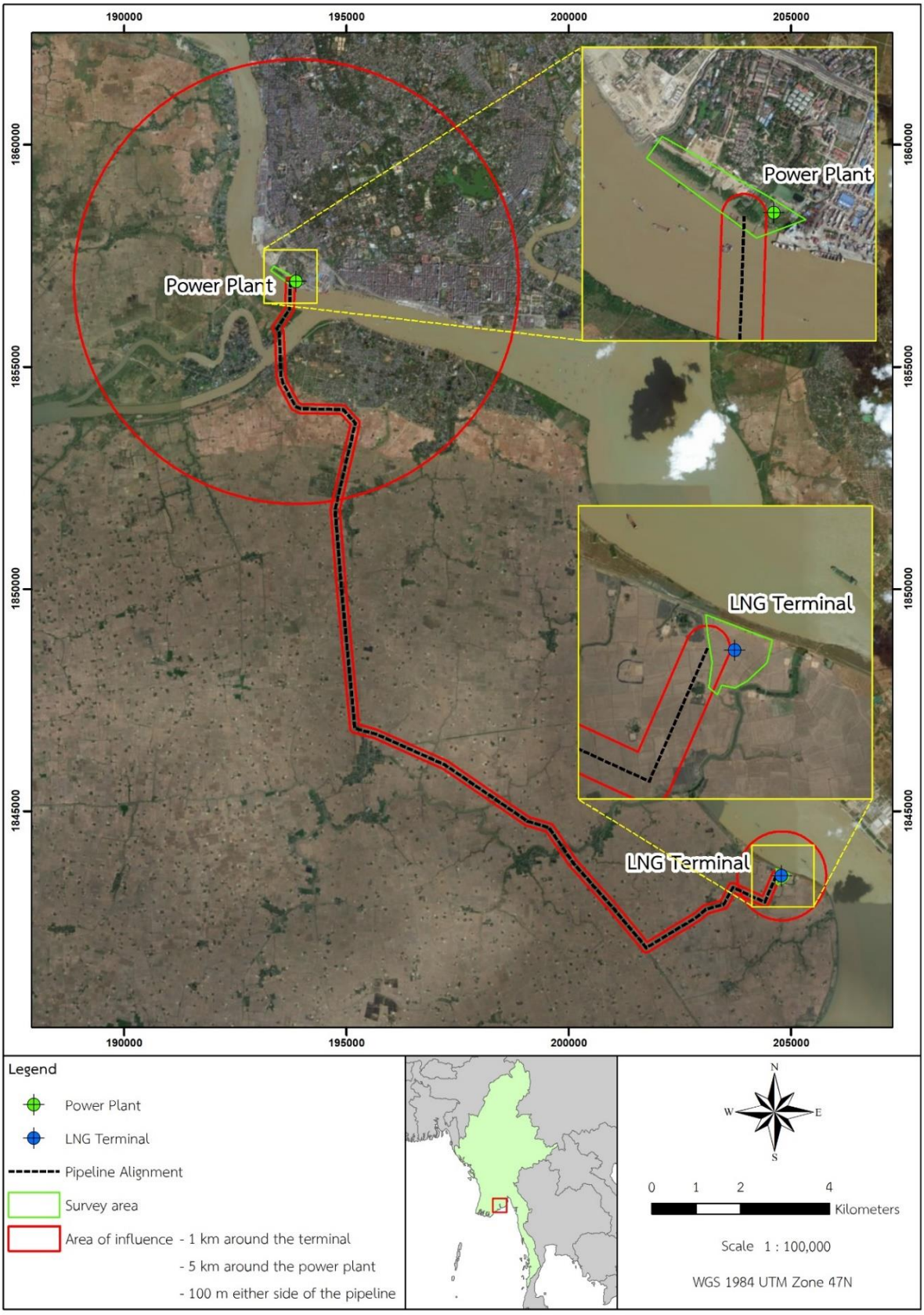
Survy Results

Based on the joint survey conducted between this IEE study and the ESIA study, 23 flora species were identified.

The majority of other flora identified was identified as Least Concern (LC); Data Deficient (DD) or Not Evaluated (NE). No species of conservation significance were detected that would trigger a Critical Habitat assessment.

Table 5.4 lists the flora species identified during field surveys in the AoI and Project area.

Figure 5.12: Biodiversity Survey Area



Source: ERM, 2019.

Table 5.4: Flora Species Recorded

No.	Family Name	Scientific Name	Common Name	IUCN Listing
1	Myrsinaceae	*Aegiceras corniculatum*	Black mangrove	LC
2	Amaranthaceae	*Alternanthera sessilis*	Sessile joyweed	LC
3	Poaceae	*Arundo donax*	Giant reed	LC
4	Poaceae	*Chloris barbata*	-	NE
5	Combretaceae	*Terminalia catappa*	Indian almond, Badan	NE
6	Verbenaceae	*Volkameria inermis (Clerodendrum inerme)*	Glory bower	NE
7	Tiliaceae	*Corchorus olitorius*	Jute, Jew's Mallow	NE
8	Cyperaceae	*Cyperus corymbosus*	-	LC
9	Moraceae	*Ficus benghalensis*	Banyan tree	NE
10	Heliotropiaceae	*Heliotropium ovalifolium*	-	LC
11	Verbenaceae	*Lantana trifolia*	Common lantana	NE
12	Arecaceae	*Nypa fruticans*	Nipa palm	LC
13	Fabaceae/ Mimosaceae	*Pithecellobium dulce*	Madras thorn, Jerusalem thorn	NE
14	Lythraceae	*Sonneratia apetala*	-	LC
15	Lythraceae	*Sonneratia caseolaris*	-	
16	Malvaceae	*Hibiscus tiliaceus*	Sea hibiscus	NE
17	Convolvulaceae	*Argyreia nervosa*	Elephant creeper	NE
18	Acanthaceae	*Acanthus ilicifolius*	Sea holly	LC
19	Fabaceae	*Albizia lebbeck*	Black siris, Kokko	NE
20	Musaceae	*Musa sanguinea*	Red banana, Nget-pyaw	NE
21	Fabaceae	*Albizia saman*	Rain tree	NE
22	Asteraceae	*Enhydra fluctuans*	-	NE
23	Mimosaceae	*Acacia auriculiformis*	Ear-leaf acacia	LC

Notes: *NE – Not Evaluated*
VU – Vulnerable
DD – Data Deficient
LC – Least Concern
NL – Not Listed

5.3.5.2 Birds

Survey Method

Observations of bird species were undertaken during the dry season survey and was conducted in the locations detailed in ***Figure 5.12***. Observations were made opportunistically using binoculars. Where possible, birds were identified from calls heard during the surveys.

Survey Results

Based on the joint survey conducted between this IEE study and the ESIA study, a total of fourteen (14) bird species were detected. All species were identified as Least Concern on the IUCN Red list. No species were determined to be conservation significant and hence would trigger a Critical Habitat assessment.

The results of the mammal survey are shown in ***Table 5.5***.

Table 5.5: Bird Species Identified within Sample Areas

No.	Scientific Name	Common Name	Family	IUCN Status
1	*Corvus splendens*	House Crow	Covidae	LC
2	*Aegithina tiphia*	Common Iora	Aegithinidae	LC
3	*Passer domesticus*	House Sparrow	Passeridae	LC
4	*Lonchua punctulata*	Scaly-Breasted Munia	Ploceidae	LC
	Streptopelia chinensis	Spotted Dove		
5	*Acridotheres tristis*	Common Myna	Sturnidae	LC
6	*Columba livia*	Rock Pigeon	Columbidae	LC
7	*Pycnonotus blanfordi*	Streak Eared Bulbul	Pycnonotidae	LC
8	*Lanius bucephalus*	Bull-Headed Shrike	Laniidae	LC
9	*Riparia paludicola*	Plain Martin	Hirundinidae	LC
10	*Cypsiurus balasiensis*	Asian Palm Swift	Apodidae	LC
11	*Haliastur indus*	Brahminy Kite	Accipitridae	LC
12	*Milvus migrans*	Black Kite	Accipitridae	LC
13	*Egretta garzetta*	Little Egret	Ardeidae	LC
14	*Ardeola grayii*	Indian Pond Heron	Ardeidae	LC

Notes: *NE – Not Evaluated*
VU – Vulnerable
DD – Data Deficient
LC – Least Concern
NL – Not Listed

5.3.5.3 Mammals

Survey Method

Records of mammals were taken opportunistically during the site survey using binoculars and observation of tracks and field signs. The survey was conducted in the locations detailed in ***Figure 5.12***.

Survey Results

Based on the joint survey conducted between this IEE study and the ESIA study, one mammal species was recorded during the survey, the delta pigmy rice rat *Oligoryzomys nigripes.* The common grey mongoose (*Herpestes edwardsii*) is known to be in the vicinity of the site but was not recorded during the survey. No species were determined to be conservation significant and would hence trigger a Critical Habitat assessment.

5.3.5.4 Herpetofauna

Survey Method

Records of herpetofauna were taken opportunistically during the site survey. The survey was conducted in the locations detailed in ***Figure 5.12***.

Survey Results

Based on the joint survey conducted between this IEE study and the ESIA study, a total of two (2) species of reptile and no amphibian species detected during the surveys. All species were classed as Least Concern or Not Evaluated under the IUCN Red List. No species were determined to be conservation significant and hence would trigger a Critical Habitat assessment.

The results of the survey are shown in ***Table 5.6***.

Table 5.6: Herpetofauna Species Recorded

No.	Family Name	Scientific Name	Common Name	Observation	IUCN status
1	Squamata	Gekkonidae	Hemidactylus frenatus	Asian house Gecko	LC
4	Squamata	Agamidae	Calotes versicolor	Garden fence lizard	NE

Notes: LC – Least Concern (IUCN)
NL – Not Listed

5.3.5.5 Fish

Survey Method

The ERM in-house database was consulted; Fish surveys involved interviews with local fishers and trapping of fish during February and March of 2019.[31]

Survey Results

From ERM in-house database, numerous black-headed gulls (*Chroicocephalus ridibundus*) were observed at waters neighbouring the proposed IEE study area. This fish species are considered common all over the world and are listed as of Least Concern (LC) on the IUCN Red List (IUCN, 2016). It is also noted that the commonly caught fish species by fishermen in Dala include;

- Soldier croaker (Nibea soldado): known as Nga Pote Thin in Myanmar;
- Truncated estuarine catfish (Cryptarius truncatus): known as Nga Zin Yaing in Myanmar; and
- Paradise threadfin (Polynemus paradiseus): known as Nga Pon Nar in Myanmar.

None of these species have been assessed on the IUCN Red List (2016). Aquatic habitat in the vicinity of the Project Site appears to have negligible ecological value.

5.3.5.6 Invasive Species

Invasive species are any species that are –non-native to a particular ecosystem and whose introduction and spread causes, or are likely to cause, socio-cultural, economic or environmental harm or harm to human health[32]. Invasive species are naturalized species that reproduce often in large numbers and are spread over a large area, damaging native species (FAO, 2005).

[31] ERM Myanmar Company Limited. (2020). Environmental Impact Assessment for the Development of New Yangon City Phase 1 Masterplan – Bridges.
[32] FAO, 2013

Invasive species have the capacity to exacerbate their role in ecosystem degradation through combination threats by habitat change, climate change over-exploitation of ecosystem resources and pollution, which further enhances their threat to biodiversity and the human condition (Emerton and Howard, 2008).

According to the Global Invasive Species Database (GISD) (2015), 97 species have been identified as invasive species in Myanmar. A checklist of invasive species is provided in ***Appendix E***. However, the database does not specifically mention on which part of Myanmar that the invasive species are being introduced.

Based on the joint survey conducted between this IEE study and the ESIA study, seven (7) invasive species were identified during the flora survey. These species are shown in ***Table 5.7*** below.

Table 5.7: Invasive Species Identified within the Area of Influence

No.	Scientific Name	Common Name	Origin	Threat Level
1	*Ficus religiosa* L.	Bo tree, Lagat, Pipal, Bawdi-nyaung	India/ Native	N
2	*Mimosa invisa* Martius ex Colla M.pigra M.pudica	Senstitive plant, Tigayon	South America. Mexico, Amazon. Tropical America	N
3	*Alternanthera philoxeroides*	Alligator weed	Temperate South America	N
4	*Leucaena leucocephala*	white leadtree, jumbay, river tamarind, subabul,white popinac, Bawza-gaing, Awai-yar	Mexico and northern Central America	N
5	*Eichhornia crassipes*	common water hyacinth	Amazon Basin	N
6	*Acacia auriculiformis*	Ear-leaf acacia	Papua New Guinea, Indonesia and Australia	N
7	*Albizia saman*	Rain tree	Central America, northern South America	N

Notes: R: Regional Significance
N: Nationally Significant

5.3.6 Area of Influence for Biodiversity Value

The Project Area of Influence (AoI) was defined based on a 250 m either side of the Transmission Line. The radius was determined based on the nature of the activities of the Project during construction and operation as well as identified natural areas within the vicinity of the Project Area and is consistent with the Project Study Area defined earlier in the report (***Figure 5.1***).

5.3.6.1 Land Class Mapping

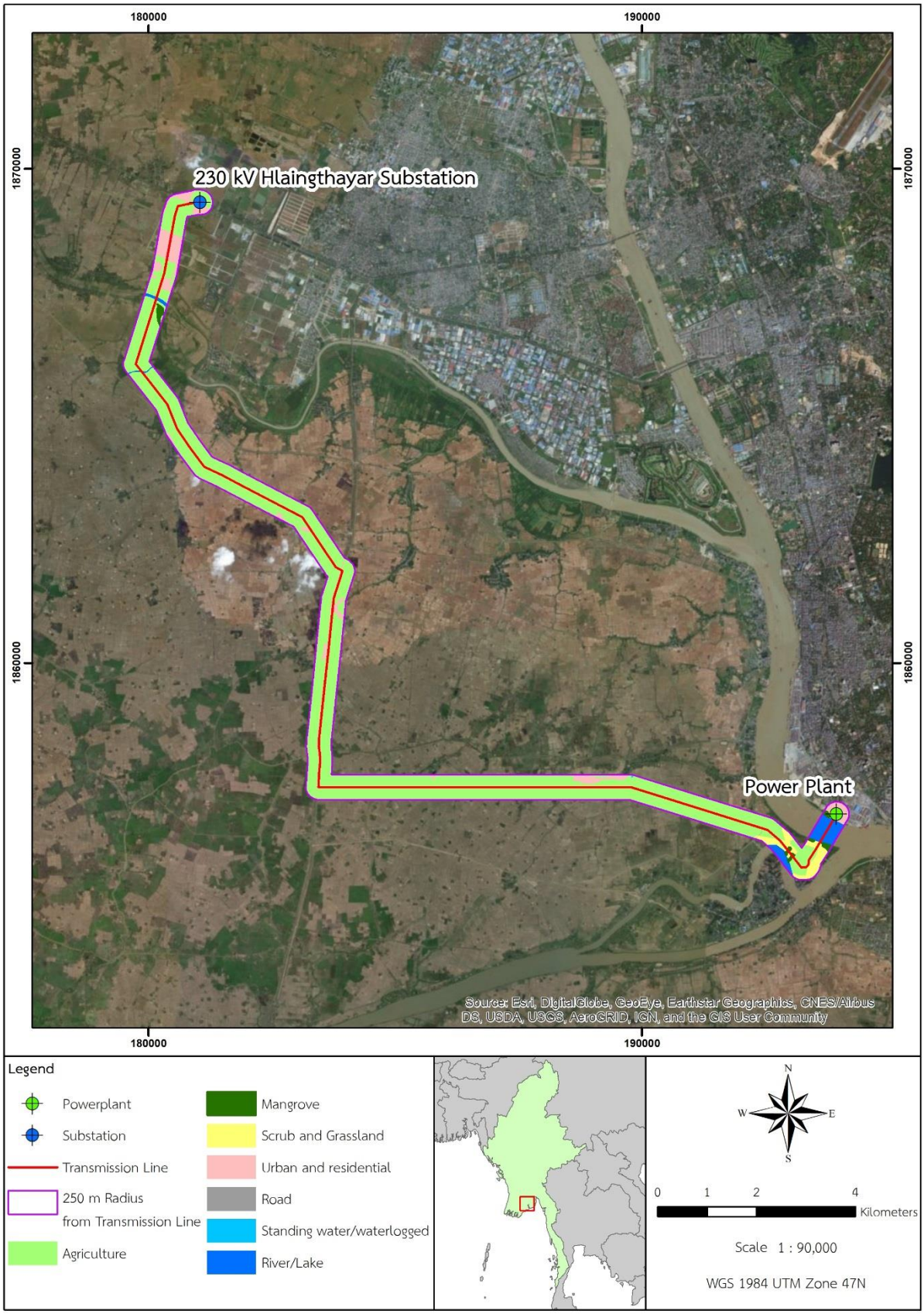
Satellite imagery was used to map the land classes identified within the Project Area and Area of Influence. The major land classes identified include agriculture, mangrove, scrub land and grassland, Urban and residential, standing water/waterlogged and riverine. Land class descriptions identified are described in ***Table 5.8***. ***Table 5.9*** outlines the areas of land classes within the AoI and Project area. ***Figure 5.13*** shows the distribution of the land classes within the AoI and Project area.

Table 5.8: Land Class Descriptions within the Project AoI

Land Class	Description	Photograph
Roads	Roads consist of bare areas that have been cleared of vegetation to facilitate the movement of vehicles between residential and agricultural areas. Small tracks have also been constructed for use by motorbikes within the project area.	
Agricultural land	Agricultural land is area that has been predominately cleared and is used for agricultural production. The agricultural land use identified with the project area is mainly rice farming with some grazing areas for livestock such as cattle and goats and lotus ponds.	
Mangrove	A riparian forest or riparian woodland is a forested or wooded area of land adjacent to a body of water such as a river, stream, pond, lake, marshland, estuary, canal, sink or reservoir. Plant habitats and communities along the river margins and banks are called riparian vegetation, characterized by hydrophilic plants. The Natural riparian habitat in the study area is mangrove with dominant salt water tolerant species including *Sonneratia caseolaris* and *Sonneratia apetala.*	
Scrub land, grassland and disturbed land	Scrub land habitats contain thickets of shrubs and young trees mixed with scattered grasses and wildflowers. A proportion of the site can be classed as disturbed habitat associated with derelict urban sites. Vegetation communities are varied, consisting of taller ruderal plants and lower (often grazed) grasses and herbs.	

Land Class	Description	Photograph
Urban and residential areas	Residential areas are used by local people and contain dwellings, gardens and small agricultural patches. Some natural vegetation including large trees may be exist for shade cover for houses. The area around the site consists of small villages and isolated rural dwellings.	
Standing water/ waterlogged areas	Ditches and depressions in and around the site contain standing water or are permanently waterlogged. Vegetation present is characterised by aquatic plants including the invasive *Eichhornia crassipes* and *Alternanthera philoxeroides.*	
The Yangon River (and its associated tributaries) and river bank	The Yangon River is an open water riverine aquatic environment located to the South of the Project Area. The river at the location of the Project Site is a tidal, estuarine system with mangrove (see above), mud banks and scrub (see above) along its banks. The photograph on the right shows the project site from the opposite river bank.	

Figure 5.13: Land Classes within the Area of Influence and Project Area



Source: ERM, 2019.

Table 5.9: Areas of Land Class within the Project Area of Influence

Land use	Project Area (ha)	Area of Influence (ha)
Agricultural land	1.52	1127.73
Urban and residential areas	0.073	93.89
Standing water/waterlogged areas	-	0.18
Scrub land and disturbed land	0.097	39.53
The Yangon River (and its associated tributaries)	-	40.51
Mangrove	-	9.35
Roads	0.015	0.34
Total	**1.705**	**1311.57**

Source: ERM, 2019.

5.3.6.2 Natural Habitat and Modified Habitat

IFC PS6 requires the assessment of the distribution of Natural Habitat and Modified Habitat in order to identify risks and mitigations to biodiversity values during the impact assessment phase. There is currently no methodology within IFC PS6 and the associated Guidance Note (GN) on the approach to assess the distribution of these habitat types.

Given the desktop information available on the land classes identified, a categorization of the land classes has been made based on the understanding of the history of land use, and species assemblages within each habitat. Each land class has been assigned habitat classifications according to the definitions of IFC PS6. The justification for the classification is shown in ***Table 5.10*** below. The results of the Natural Habitat and Modified Habitat assessment are detailed in ***Figure 5.14***. The areas of Natural Habitat and Modified Habitat within the AoI and Project area are shown in ***Table 5.11***.

Table 5.10: Natural and Modified Habitats within the Project Area of Influence

Land Class	IFC PS Habitat Classification	Justification
Roads	Modified Habitat	Roads are considered to be modified habitat. The ecological functions of the areas have been totally removed.
Agricultural land	Modified Habitat	Agricultural land is considered modified habitat. Little if any natural vegetation remains in these areas with predominately rice paddies or grazing land. Human use has substantially modified the condition of the habitat.
Mangrove	Natural Habitat	There are small areas of mangrove on the Yangon River and small waterways within the Project Area which are in a predominately natural state. The structure of vegetation remains, however human disturbance has modified the ground level vegetation in places and the faunal diversity is heavily impacted from its natural state.
Scrub land, grassland and disturbed land	Modified Habitat	Scrub land and grassland is considered to be modified habitat in the study area. Historic clearing of the mid storey and canopy has removed the forest structure. The habitat is in a substantially modified state. On recently disturbed land, pioneer vegetation

Land Class	IFC PS Habitat Classification	Justification
		communities (including invasive species) have recently colonised areas of human disturbance.
Urban and residential areas	Modified Habitat	Urban and residential areas are considered as modified habitat. Human use has substantially modified the condition of the habitat.
Standing water/waterlogged areas	Modified Habitat	Standing/waterlogged areas around the site remain wet for the majority of the year. Man-made ditches for drainage, heavily modified watercourses and waterlogged depressions within the disturbed site which are considered to be modified habitat.
The Yangon River (and its associated tributaries)	Natural Habitat	The Yangon River and its associated tributaries are considered to be natural habitat. Although containing sediment loads, the aquatic ecosystem contains naturally occurring species and is not in a substantially modified state.

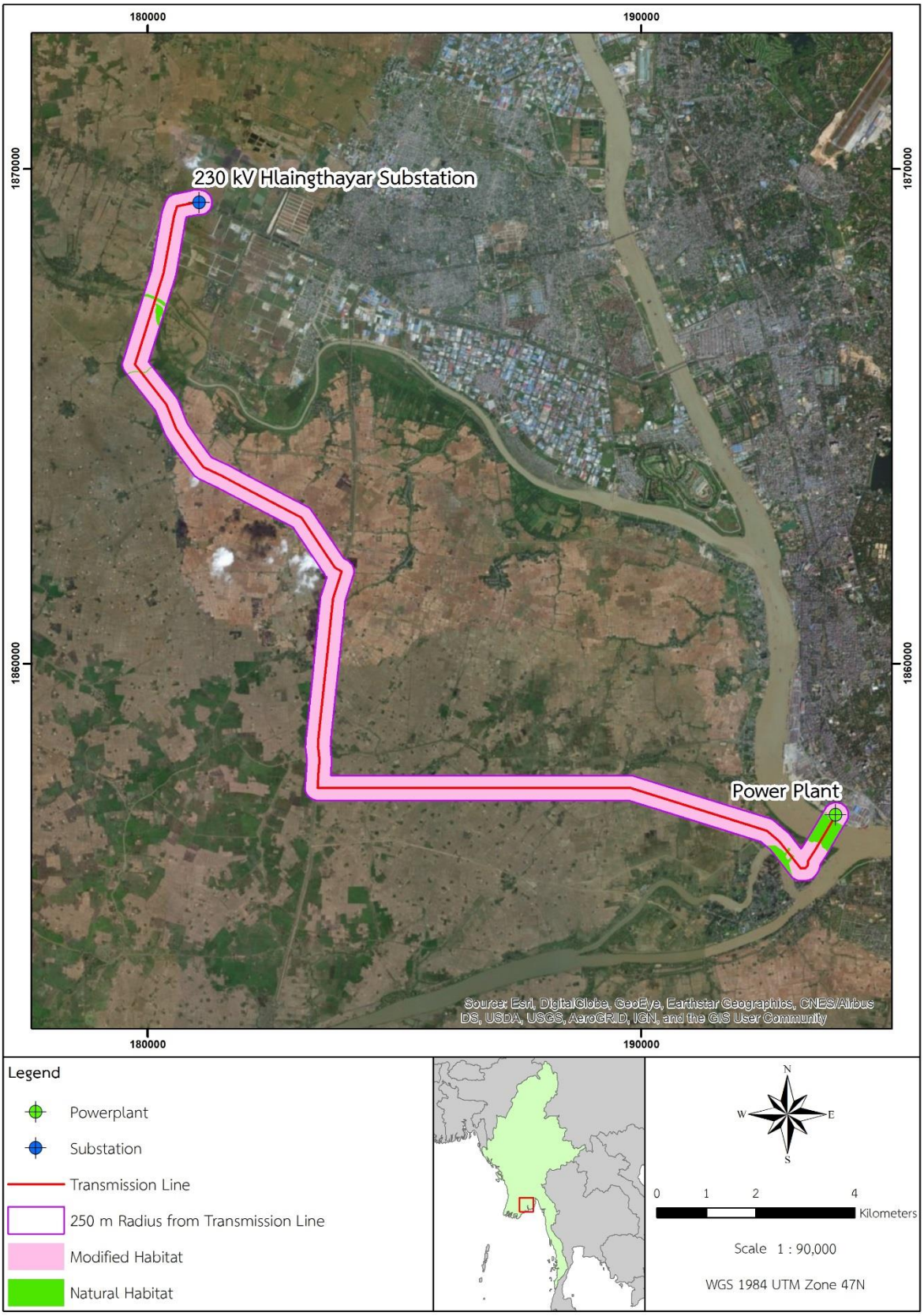
Source: ERM, 2019

Table 5.11: Areas of Natural Habitat and Modified Habitat within the AoI

Habitat Type	Project Area (ha)	Area of Influence (ha)
Natural Habitat	0	49.86
Modified Habitat	1.705	1261.69

Source: ERM, 2019.

Figure 5.14: Natural Habitat and Modified Habitat within the Project Area and Area of Influence



Source: ERM, 2019.

5.3.7 Summary

The Project Area for the biological study is 250 m around the Transmission Line where majority of this land is used for agricultural purposes and dominated by modified habitat. The terrestrial Project Area appears to be largely modified land with negligible ecological value. The majority of land has been converted mainly for agriculture. These terrestrial habitats has been verified during the IEE of the Project to inform the assessment of potential impacts to these areas. An ecological assessment of the aquatic biodiversity values will be undertaken to determine if any endemic or species of conservation significance exist within the Pun Hlaing River and associated Area of Influence of the project.

5.4 Socio-economic Baseline

The following Section provides an overview of the socio-economic, social, health, transport and cultural heritage conditions in the Project area.

5.4.1 Social Receptors

The baseline focuses on the receptors that may be impacted or influenced by the Project due to their proximity to the Project site and/ or Project associated infrastructure. This include people living in the four Township previously mentioned; Ahlone, Seikgyikanaungto, Twantay and Hlaingtharyar. As shown in (***Figure 5.15***), this includes people living in the following villages:

- Tet Thit;
- Kyi Seik;
- Ka Pyo;
- Kin;
- Kha Yan Wa;
- Kha Lauk Kha Lu;
- Ma Myo Su;
- Auk Ta Mar Ta Kaw;
- Ta Man Gyi Ta Khun Taing;
- Kun Tar;
- Htein Kone;
- Kyun Ka Lay; and
- Gyaung Waing Gyi.

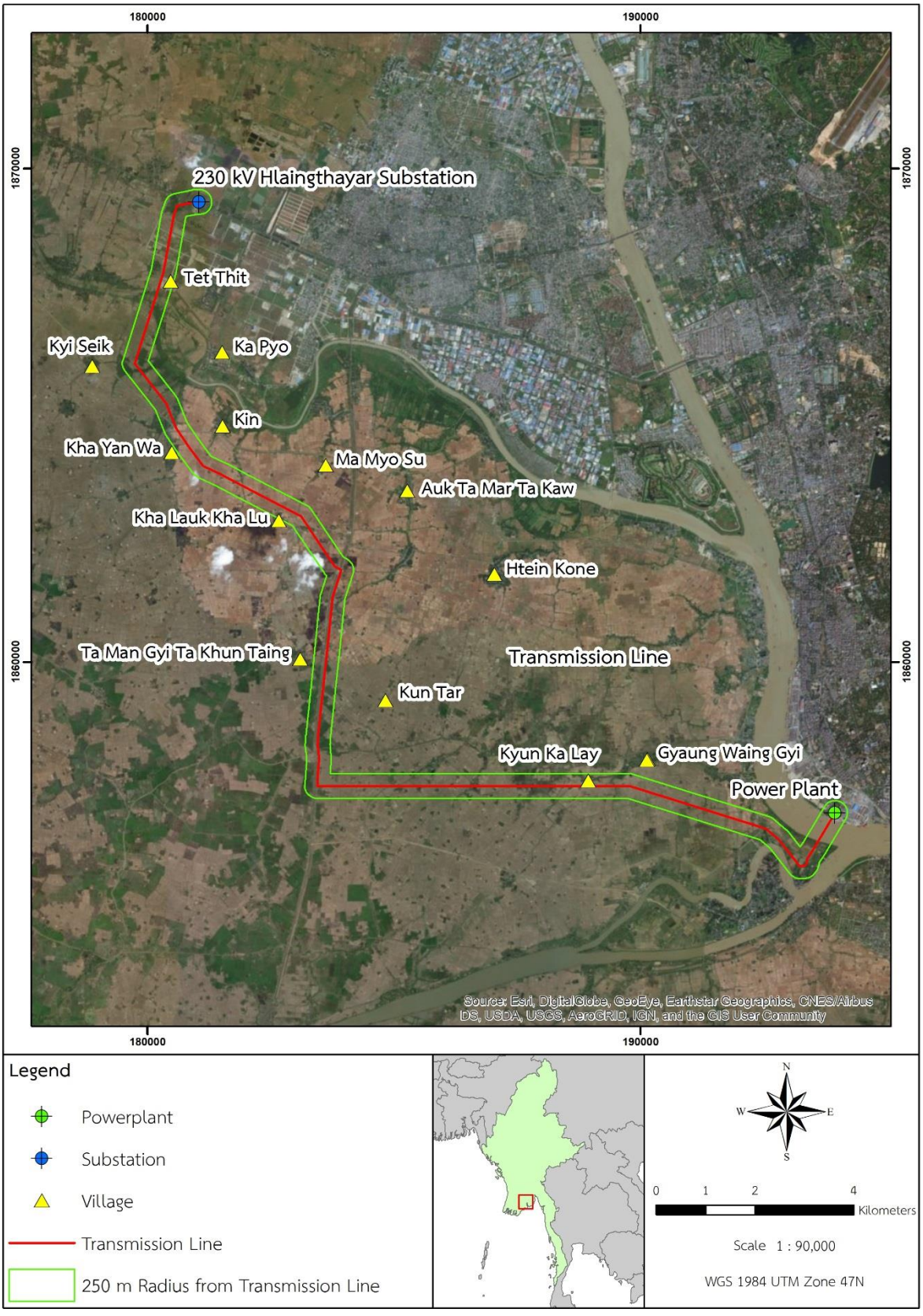
All the aforementioned villages are administrative by the village leaders with active participation from local committee in village activities e.g. woman community committee, farmer committee, and fisherman committee. These villages are covered within the area of New Yangon City Phase 1 and 2 project (***Section 9.4.1.1***).

Settlements located closest to the Project infrastructure are likely to experience negative and positive impacts as a result of the Project activities, including economic opportunities, social and environmental changes, lifestyle changes, and changes to community health and safety. Other social receptors located further from the Project may also benefit or experience negative impacts from the Project.

The Social Area of Influence (SAoI), for which data collection has been conducted to help establish the socio-economic baseline, is defined as the area inhabited or used by stakeholders and likely to be positively or negatively affected by the Project. This includes short, long term or permanent changes, as well as direct, induced or indirect impacts. The SAoI includes:

- The Project site(s) and related facilities that TPMC develops or controls and the additional areas in which aspects of the environment could conceivably experience significant impacts.
- Associated facilities that are not developed and funded as part of the proposed Project, but are essential for the Project and without which the Project cannot proceed, and the associated areas in which the environment could conceivably experience significant impacts.
- Areas potentially affected by cumulative impacts resulting from other developments known at the time of the IEE, further planned phases of the Project or any other existing circumstances.
- Areas potentially affected by impacts from predictable (but unplanned) developments as a result of the proposed Project (i.e., induced activities), occurring at a later stage or at a different location.

Figure 5.15: Social Receptors



Source: ERM, 2019

Table 5.12 Number of Townships and Villages in the Study Area

Category	Transmission Line
Total Townships	4
Total Villages	13

Source: ERM, 2019.

5.4.2 Data Collection

The Project Site and its surrounding area are referred to as the 'study area', which stretches 250 m each side of, and along the entire length of the Transmission Line.

The information presented in this Section was gathered through a desktop review of publicly available sources and provides a "snapshot" of the socio-economic, social, health, transport and cultural heritage conditions in the Project area at the time of writing this report. Given the limited secondary data available at the local level, primary data collected through household questionnaire, focus group discussion and Key informant interview in Ahlone and Seikgyikanaungto Townships for the Ahlone LNG Power Plant Project (as part of the ESIA process) were also used to provide additional context. Data for Twantay and Hlaingthayar are secondary data only.

During data collection for socio-economic baseline for the ESIA Study of Ahlone LNG Power Plant Project, primary data have been collected between November 15th and November 19th, 2018. The methods for gathering primary data are comprised of household questionnaire, face-to-face interview with key informants and focus group discussions with designated interviewees. Key stakeholder groups includes village leader, women, fisherman, nurse/medical/health officers and farmers within the local villages. A total of 150 household questionnaires as well as 11 Focus Group Discussions and Key Informant Interviews have been administered in Dala, Seikgyikanaungto and Ahlone townships.

Figure 5.16 Social Baseline Data Collection in Seikgyikanaungto Township

The data at local level indicated without specific footnote that refers to publicly available sources is extracted from ERM's interview processes.

5.5 Overview of Project Area and Study Area

Myanmar

Myanmar is located in Southeast Asia. The country is bordered to the east by Thailand and Laos, to the north by China and to the west by India and Bangladesh. Myanmar has a lengthy coastline that extends for approximately 2,400 km along the Andaman Sea and Bay of Bengal.

There are a number of mountain ranges and river systems, which run north to south through the country – creating natural divisions. There are four distinct seasons in Myanmar. The cold and dry season runs from November to February, while the hot season is March and April, and the rainy season extends from May to October. During the rainy season monsoons can occur, causing flooding and landslides.

Myanmar is split into number of States and Regions (sometimes also referred to as Divisions), which are further divided into Townships for administrative or governance purposes. Formerly, the capital of Myanmar was Yangon or Rangoon, divided into 33 townships. The boundaries for each district in the Yangon region is shown in ***Figure 5.17***. The Project Site is located in Seikgyikanaungto, Twantay, Hlaingthayar, and Ahlone townships of Yangon Region. Therefore, the information presented hereafter cover all four townships.

Yangon region

Yangon, formerly known as Rangoon, is the most urbanized region of Myanmar. The region is located in the southern central part of Myanmar on the west bank of Hlaing River. It was the administrative capital of Myanmar until 2006 when government proclaimed Nay Pyi Taw has the new administrative

capital of Myanmar[33]. In the city, structures of building are mixed between old colonial and modern structures. Although most buildings are constructed with bricks, wooden places can be commonly found in outskirt and distant areas.

Seikgyikanaungto Township

This township is located in the Southern district of Yangon[34], and isolated from the main Yangon area by the Yangon River, with less tourists and transport infrastructures[35]. In 2017, this township was awarded with the cleanest township award[36]. In this township, land is used for industrial area (2%), under development area (2%), open space (14%), water surface (15%), residential area (21%), and agricultural area (47%)[37].

Ahlone Township

Ahlone Township is located in the Western district of Yangon on the left bank of the Yangon River. This township is home to industrial activities (Yangon Port) and city like business as well as residential areas. The area of the proposed power plant is an unused area, subject to flooding. Ahlone can be reached by taking trains, buses and special buses from Yangon[38]. Land of Ahlone Township comprise of water surface (1%), public facilities area (3%), business area (5%), open space (9%), industrial area (20%), and residential area (62%)[37].

Twantay Township

Twantay Township is located in the southern district of Yangon Region. This township is famous for 21-mile-long canal that runs between the Ayeyawady Delta and the Yangon River. The township is also described as the delta region and centre of pottery and hand-woven cotton cloth. There are people living along the canal. People can reach this township, which is far from Yangon at 15 miles, by transportation on land or river from Yangon[(39)]. Land of this township is used for five areas, comprising of open space (2%), water surface (3%), residential area (3%), and agricultural area (92%)[37].

Hlaingthayar Township

Hlaingthayar Township is located in the north district of Yangon Region, on west side of the Yangon River. Land of this township is used for nine types of areas, comprising of green area (1%), public facilities area (1%), playground area (2%), open space (3%), water surface (8%), agricultural area (19%), industrial area (19%), residential area (22%), and under developing area (24%)[37].

[33] Yangon (Myanmar) - Encyclopaedia Britannica (Web)

[34] The 2014 Myanmar Population and Housing Census (Seikkyi Khanaungto Township) – The Union Report, October 2017 (Web)

[35] 7 day trip ideas for getting out of Yangon – Frontiermyanmar, October 2017 (Blog)

[36] Volunteers determined to clean up Yangon – The Myanmar Times, June 2017 (Web)

[37] The Project for the Strategic Urban Development Plan of the Greater Yangon (Final Report I)- Japan International Cooperation Agency (Web)

[38] Ahlone, Yangon, Myanmar (Burma) – Latlong (Web)

[39] http://myanmartravelinformation.com/around-yangon/twante.html

Figure 5.17: District Map of Yangon Region

Source: MIMU, 2016

5.5.1 Demographic Profile

Yangon Region

The region covers an area of approximate 10,171.30 sq. km[40], which is divided into 4 districts (Yangon North, Yangon East, Yangon West and Yangon South), 33 townships, 742 wards and 2,170 villages[41]. Total population is around 7 million peoples, with 52.2% female. (***Table 5.13***). Citizens are mostly aged between 15 – 64 years old (***Table 5.14***). More than 3 million of Yangon citizens are married (***Table 5.15***). Out of the total Yangon population, approximately 1,869,787 people (25%) are considered vulnerable populations[42].

The majority of the population in the Study Area are Bamar people; Bamar people are the dominant ethnic group in Myanmar, with a population of more than 30,110,000 people. There are, however, small numbers of Kayin, Mon, and Rakhine living in the Study Area. ***Figure 5.18*** shows that in Yangon, ethnic groups also comprise Indians, Chinese, Kayin, Rakhine and Mon. The Myanmar Government recognizes Mon. Kayin and Rakhine as national ethnic group[43]. The dominant religion is Buddhism, although Christianity, Islam and Hinduism are also present[34].

As shown in ***Table 5.16***, majority of Yangon populations are living in conventional households (a place where one or more persons share living quarter and meals, regardless of whether they are related or unrelated), which are mostly headed by men[40]. Many of them generally own conventional type of houses[40], which are mostly wooden houses (***Table 5.17***). The most popular materials for constructing houses in Yangon consist of brick/ tile/ concrete for wall, wood for floor, and corrugated sheet for roof (***Table 5.18***). The average size of households is four persons[40].

Table 5.13: Population in Yangon Region

Region	Total	Male	Female	Gender ratio
Yangon	7,360,703	3,516,403 (47.77%)	3,844,300 (52.23%)	92 males per 100 females

Source: The 2014 Myanmar Population and Housing Census (Yangon Region) – The Union Report, May 2015 (Web)

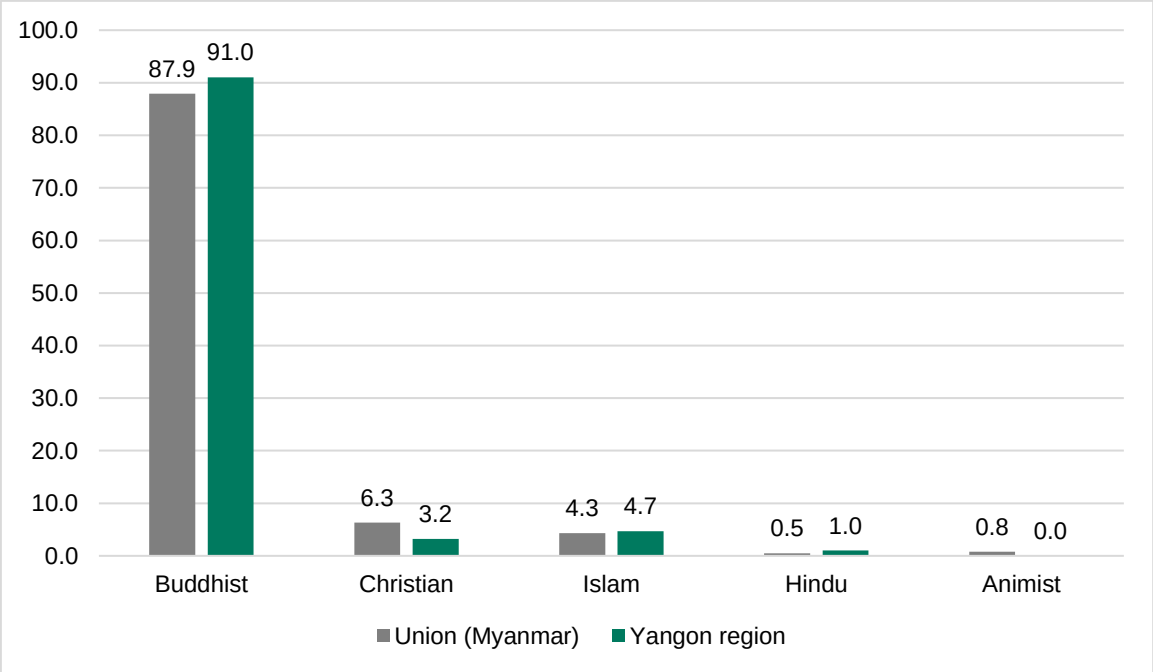
[40] https://www.unicef.org/myanmar/Yangon_Region_Profile_30-07-15.pdf

[41] http://www.dop.gov.mm/sites/dop.gov.mm/files/publication_docs/yangon_region_census_report_-_english.pdf

[42] Vulnerability in Myanmar - Humanitarian Assistance and Resilience Programme Facility and the Myanmar Information Management Unit. (Web) Note: the “approximate number of vulnerable population” is the number of persons in the area particularly affected by some of the aspect/aspects of vulnerability covered in the Vulnerability Index, namely low levels of literacy, sanitation, electricity, access to improved drinking water, housing quality, access to services/opportunities requiring identity documents, and high child dependency.

[43] https://themimu.info/sites/themimu.info/files/documents/Report_Local_Governance_Mapping_Yangon_UNDP_Feb2015.pdf

Figure 5.18: Religions in Myanmar and Yangon Region



Source: https://themimu.info/sites/themimu.info/files/documents/TspProfiles_Census_Hlinethaya_2014_ENG.pdf

Table 5.14: Population Sizes, Categorized by Age

Types of population	Yangon region
Children (0 – 14 years)	23.4%
Adults (15 – 64years)*	70.9%
Elders (65+ years)	5.7%

Source: The 2014 Myanmar Population and Housing Census (Yangon Region) – The Union Report, May 2015 (Web)

*Note: * Adults are referred to economically productive group of people in the source.*

Table 5.15: Marital Status in Yangon Region

Region/ districts	Region/ townships	Total (person)			
		Single	Married	Widowed	Divorced / separated
Region	Yangon	2,040,730	3,066,094	361,796	103,934

Source: The 2014 Myanmar Population and Housing Census (Yangon Region) – The Union Report, May 2015 (Web)

Table 5.16: Numbers of Citizens in Conventional Households and Institutional Households in Yangon Region

Types of dwellings	Total (person)
	Yangon region
Conventional households	6,949,440
Institutional households	411,263

Source: The 2014 Myanmar Population and Housing Census (Yangon Region) – The Union Report, May 2015 (Web)

Table 5.17: Housing Units of Conventional Households in Yangon Region

Housing Units	Total (household)
	Yangon region
Wooden houses	659,423
Bamboo	344,419
Apartment/condominium	266,864
Semi-pacca house	150,641
Bungalow/brick house	117,047
Hut 2 – 3 years	17,039

Source: The 2014 Myanmar Population and Housing Census (Yangon Region) – The Union Report, May 2015 (Web)

Table 5.18: Material for House Structures in Yangon Region

Materials	Percentage (%)		
	Yangon region		
	Wall	Floor	Roof
Brick/Tile/ Concrete	32	30.7	5.2
Wood	24	52	5.2
Bamboo	31.8	15.6	0.2
Dhani/Theke/ In leaf	9.2	-	17.8
Corrugated sheet	1.5	-	76.3
Earth	Less than 0.1	0.5	-
Other	1.5	1.2	0.3

Source: The 2014 Myanmar Population and Housing Census (Yangon Region) – The Union Report, May 2015 (Web)

Seikgyikanaungto Township

Seikgyikanaungto Township covers an area of approximate 7.9 sq. km, which is divided into 9 wards[34]. ***Table 5.19*** shows that there are 34,003 citizens (of which 17,068 are males, and of which 16,935 are females). Majority of them are aged between 15 – 64 years old[41] as for the rest of Yangon. Based on ***Table 5.20***, 14,461 persons are married (under 50%). The largest ethnic group in this township is also Bamar (***Table 5.21***). In this township, majority of citizens (33,251 persons) are living in conventional households (***Table 5.22***), which are largely male-headed[41] and a majority of people live in conventional, usually wooden houses. (***Table 5.23***) illustrates that the most popular materials for for construction are bamboo for wall, wood for floor, and corrugated sheet for roof. Primary data shows that five persons per household (above Yangon region) is the most common in Seikgyikanaungto Township.

A limited number of people present vulnerability in term of physical disability, chronic or critical diseases, or paralytic stroke (***Table 5.25***).

Ahlone Township

Ahlone Township covers area of approximate 2.7 sq. km, which is divided into 11 wards[44]. As provided in ***Table 5.19***, there are 55,482 people living in the Township (of which 29,931 are females, and 25,551 are males). Majority of them are aged between 15 – 64 years old[41]. ***Table 5.20*** shows that majority of Ahlone populations are married. Also, the majority of Ahlone citizens is Bamar (***Table 5.21***).

As shown in ***Table 5.22***, in Ahlone Township, majority of citizens (48,612 persons) are living in conventional households, which are mostly headed by males[41]. Majority of Ahlone citizens have ownerships over conventional houses[41], which are mostly apartment/ condominium (***Table 5.23***). ***Table 5.24*** shows that brick/ tile/ concrete are mostly used for wall and floor, but corrugated sheet is the most used for roof. Data from interviews shows that five persons per household is the average in Ahlone Township.

Twantay Township

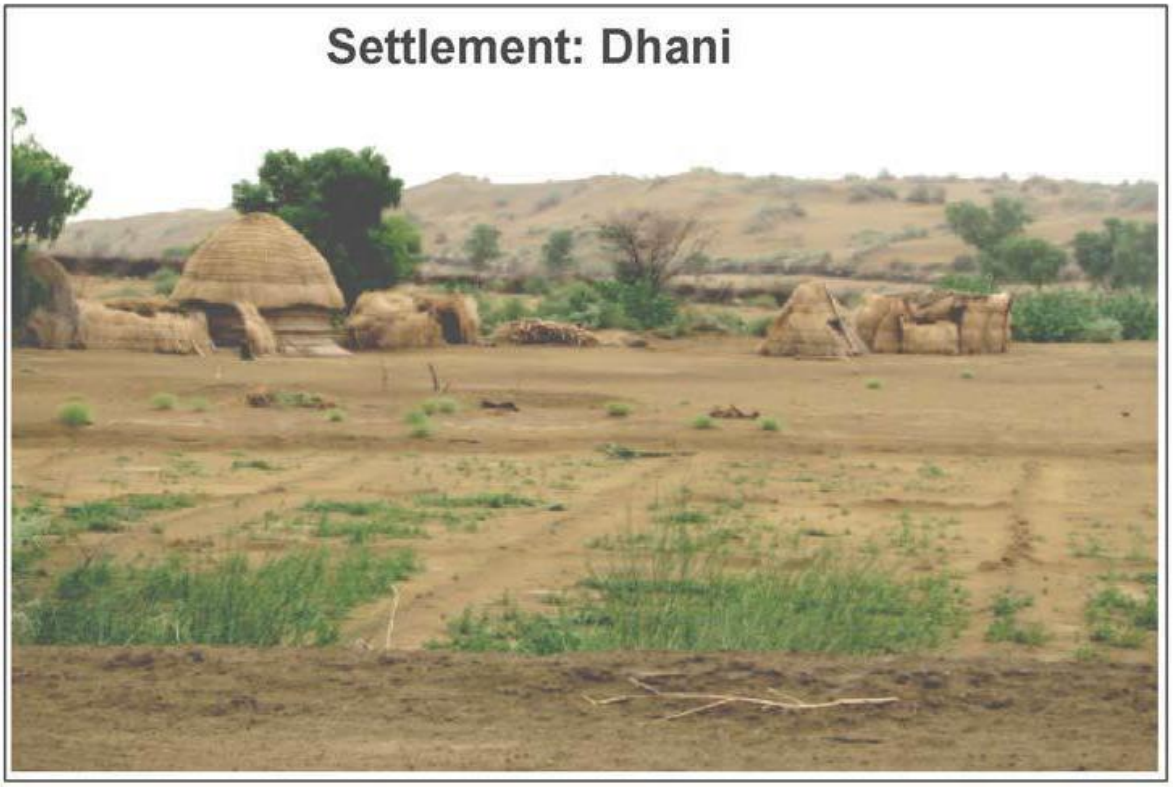
Twantay Township covers an area of approximate 724.9 sq. km, which is divided into 8 wards and 65 village tracts[45]. As shown in ***Table 5.19***, there is a total 226,836 people (of which 115,585 are females, and 111,251 male), who are mainly aged between 15 – 64 years old[41]. The majority of the population in this township is married (***Table 5.20***).

In Twantay, ***Table 5.22*** illustrates that the largest number of populations (221,372 persons) are living in conventional households, mainly headed by males[41]. Majority of them have ownerships over their house[40], which are mostly bamboo houses (***Table 5.23***). Regarding to material for house structures, ***Table 5.24*** shows that dhani/ theke/ in leaf is mostly used for constructing wall, while wood is used for constructing floor, and corrugated sheet is used for constructing roof. Example of dhani is provided in ***Figure 5.19***. MIMU data showed in 2014 that four persons per household are common in Twantay Township[41].

[44] The 2014 Myanmar Population and Housing Census (Ahlone Township) – The Union Report, October 2017 (Web)

[45] https://themimu.info/sites/themimu.info/files/documents/TspProfiles_Census_Twantay_2014_ENG.pdf

Figure 5.19: Housing Material (Dhani)



Source: https://www.researchgate.net/figure/Ground-photograph-showing-a-settlement-Dhani-near-Naryansar-village_fig6_265525629

Hlaingthayar Township

Hlaingthayar Township covers an area of approximately 67.4 sq. km[46], which is divided into 20 wards and 9 village tracts. In this township, there are a total 687,867 people (of which 365,005 are females, and 322,862 male), who are mostly aged between 15 – 64 years old[41]. ***Table 5.20*** provides that majority of them are married.

In this township, majority of citizens (663,463 persons) are living in conventional households, which are mainly headed by males[41]. Majority of Hlaingthayar citizens have no ownership over their house[41]. ***Table 5.23*** indicates that most of conventional houses are wooden houses. For materials of house structures, bamboo is mostly used for wall, wood is mostly used for floor and corrugated sheets are mostly used for roof (***Table 5.24***). In these households, MIMU data indicates in 2014 that three persons per household are common in Hlaingthayar Township[41].

[46] https://themimu.info/sites/themimu.info/files/documents/TspProfiles_Census_Hlinethaya_2014_ENG.pdf

Table 5.19: Population in Seikgyikanaungto, Ahlone, Twantay and Hlaingthayar

District	Township	Male	Female	Total	Gender ratio
Southern District	Seikgyikanaungto Township	17,068 (50.2%)	16,935 (49.8%)	34,003	101 males per 100 females
	Twantay Township	111,251 (49%)	115,585 (51%)	226,836	96 males per 100 females
Western District	Ahlone Township	25,551 (46.1%)	29,931 (53.9%)	55,482	85 males per 100 females
North District	Hlaingthayar Township	322,862 (46.9%)	365,005 (53.1%)	687,867	89 males per 100 females

Source: The 2014 Myanmar Population and Housing Census

Note: In MIMU, Hlaingthayar is described as Hlinethaya.

Table 5.20: Marital Status in Seikgyikanaungto, Ahlone, Twantay and Hlaingthayar

Region/ districts	Region/ townships	Total (person)			
		Single	Married	Widowed	Divorced / separated
Southern District	Twantay Township	50,686	93,502	10,072	2,547
Southern District	Seikgyikanaungto Township	6,761	14,461	1,775	652
Western District	Ahlone Township	20,995	21,868	2,578	554
North District	Hlaingthayar Township	193,181	289,891	27,545	10,063

Source: The 2014 Myanmar Population and Housing Census (Yangon Region) – The Union Report, May 2015 (Web)

Table 5.21: Ethnicity in Seikgyikanaungto and Ahlone Townships

Ethnicity	Percentage (%)	
	Seikgyikanaungto Township	Ahlone Township
Bamar	96.6	79.4
Rakhine	0.2	1.3
Kachin	-	1
Shan	-	0.8
Kayah	-	0.2
Kayin	0.3	5.7
Indian and Chinese	0.1	-
Chinese	0	-
Chin	-	0.7
Mon	0.6	1

Ethnicity	Percentage (%)	
	Seikgyikanaungto Township	Ahlone Township
Other	2.2	9.9

Source: ERM, November 2018.

Table 5.22: Numbers of Citizens in Conventional Households and Institutional Households

Types of dwellings	Seikgyikanaungto Township	Ahlone Township	Twantay Township	Hlaingthayar Township
Conventional households	33,251	48,612	221,372	663,463
Institutional households	752	6,870	5,464	24,404

Source: The 2014 Myanmar Population and Housing Census (Yangon Region) – The Union Report, May 2015 (Web)

Table 5.23: Housing Units of Conventional Households in Seikgyikanaungto, Ahlone, Twantay and Hlaingthayar

Housing Units	Seikgyikanaungto Township	Ahlone Township	Twantay Township	Hlaingthayar Township
Wooden houses	5,153	1,770	18,112	69,538
Bamboo	2,246	366	27,597	32,302
Apartment/ condominium	22	7,556	208	14,289
Semi-pacca house	186	652	2,181	17,161
Bungalow/ brickhouse	43	531	1,666	9,606
Hut 2 – 3 years	32	12	1,146	2,123
Hut 1 year	28	11	603	1,599

Source: The 2014 Myanmar Population and Housing Census (Yangon Region) – The Union Report, May 2015 (Web)

Table 5.24: Materials for House Structures in Seikgyikanaungto, Ahlone, Twantay and Hlaingthayar

Materials	Percentage (%)											
	Twantay Township			Hlaingthayar Township			Seikgyikanaungto Township			Ahlone Township		
	Wall	Floor	Roof	Wall	Floor	Roof	Wall	Floor	Roof	Wall	Floor	Roof
Brick/Tile/ Concrete	7.4	7.3	0.4	24.8	27	2.2	2.9	2.9	0.2	77.9	77.3	28.1
Wood	19.4	52.4	0.1	22.6	53.9	0.1	25.9	72.6	0.2	13.2	19.3	0.3

Materials	Percentage (%)											
	Twantay Township			Hlaingthayar Township			Seikgyikanaungto Township			Ahlone Township		
	Wall	Floor	Roof	Wall	Floor	Roof	Wall	Floor	Roof	Wall	Floor	Roof
Bamboo	35.7	39	0.1	39.1	17	0.3	43.3	23.5	0.1	4.5	2.5	Less than 0.1
Dhani/Theke/ In leaf	36.4	-	47.6	10.1	-	15.7	19.3	-	19	0.4	-	2
Corrugated sheet	0.3	-	51.6	1.7	-	81.2	6.2	-	80.3	1.7	-	28.1
Earth	Less than 0.1	0.6	-	0.1	0.5	-	0.1	0.2	-	Less than 0.1	0.2	Less than 0.1
Other	0.8	0.7	0.2	1.7	1.6	0.5	2.4	0.8	0.2	0.4	0.7	0.4

Sources: The 2014 Myanmar Population and Housing Census (Seikkyi Khanaungto Township) – The Union Report, October 2017 (Web), The 2014 Myanmar Population and Housing Census (Ahlone Township) – The Union Report, October 2017 (Web), https://themimu.info/sites/themimu.info/files/documents/TspProfiles_Census_Hlinethaya_2014_ENG.pdf, and https://themimu.info/sites/themimu.info/files/documents/TspProfiles_Census_Twantay_2014_ENG.pdf

Table 5.25: Vulnerabilities of Households in Seikgyikanaungto and Ahlone (2018)

Type of vulnerability	Seikgyikanaungto Township	Ahlone Township
No vulnerability	96.4%	100%
Physically disabled	0.7%	-
Paralytic stroke	1.4%	-
Chronic or critical disease	1.4%	-

Source: ERM, November 2018.

5.5.2 Livelihood and Economy

Yangon Region

In Yangon, many citizens are hired to work in industrial, commercial and trading sectors, but certain of them living in rural areas work in the livestock rearing, fisheries and agricultural fields. Principal exports of Yangon are rice, teak, and metal ores[47] coming from other part of Myanmar. Revenue and expenditure for 2017-2018 fiscal year in Yangon are 382,585.316 million Kyats and 424,280.667 million Kyats respectively[48].

Poverty incidence in Yangon region is 16%, estimated by UNICEF (United Nations International Children's Emergency Fund) [49] . In 2014, UN-HABITAT (United Nations Human Settlements

[47] Yangon (Myanmar) - Encyclopaedia Britannica (Web)

[48] Budget information for 2017-2018 Fiscal Year (Citizen's budget) – The Myanmar Information Management Unit (MIMU), 2017 (Web)

[49] Budget information for 2017-2018 Fiscal Year (Citizen's budget) – The Myanmar Information Management Unit (MIMU), 2017 (Web)

Programme) estimated that around 2.38 million of Yangon citizens were not only poor or extremely poor, but they also lived in substandard housing or illegal dwellings. Ten percent of them were also estimated to live in slum dwellings[50].

Seikgyikanaungto Township

Data shows that although Seikgyikanaungto Township is within the Yangon Region, the business development rate in this township is slow compared to the city across the river. Their businesses include agriculture, river transportation and casual workers who work in Yangon In addition, in the Study Area there is small scale fishing and dredging activities. Communities in those townships only have livestock for domestic consumption including chicken, pig and goat. Information on agriculture, sand dredging and fishing is presented in the next subsections.

In Seikgyikanaungto Township, the highest monthly income is at 1,300,000 Kyats, but the lowest monthly income is at zero (no income) Kyats. Based on ***Table 5.26***, average household's income per year is approximately 3,802,439 Kyats, which is mostly generated by businesses. However, as shown in ***Table 5.27***, average household's expenditure per year is approximately 809,864 Kyats. Regarding to negative net income, 58% of interviewees stated that housing expense creates negative income (***Figure 5.20***). In the last 12 month, 23.3% of interviewees borrow money mostly from microfinance (e.g BNK microfinance).

Ahlone Township

According to primary data, the highest monthly income is at 5,000,000 Kyats, but the lowest monthly income is at 200 Kyats. According to ***Table 5.26***, average household's income per year is approximately 4,617,461.5 Kyats, which is largely generated by businesses. Primary data shows that average household's expenditure per year is around 950,216 Kyats (***Table 5.27***). When interviewees were asked about underlying causes of negative net income, housing expense is referred by 72.7% of interviewees (***Figure 5.20***). In the last 12 month, 13% of Ahlone interviewees borrow money mostly from either friends or neighbours.

Twantay Township

Livelihood and economy in Twantay Township is mostly based on agriculture. Most of Twantay residents are farmers growing rice and vegetables[51] and production of freshwater fish fingerlings[52].

Hlaingthayar Township

The secondary data on livelihood in Hlaingthayar Township is limited. The Myanmar Times reported in 2017 that 2 interviewees (husband and wife) had monthly income over 310,000 Kyats in combination. They stated that while garment factory provided 180,000 Kyats per month, other activities generated 130,000 Kyats of revenue per month. Workers from Hlaingthayar industrial zones stated that monthly living cost was between 100,000 Kyats and 200,000 Kyats[53]. Later, Myanmar Times wrote in 2018 that most of 700,000 people living in this township were factory workers.

Save the Children wrote in 2017 that 40% of households in the Township were living on less than 1.25 USD per person per day[54].

[50] A snapshot of child wellbeing – UNICEF (Web)

[51] https://www.pressreader.com/myanmar/the-myanmar-times/20160329/281651074239680

[52] http://www.fao.org/3/a-bl827e.pdf

[53] https://www.mmtimes.com/news/workers-live-shadow-poverty.html

[54] https://www.heacod.org/en-gb/Published%20Reports/how_families_cope_with_poverty_in_asia-2017.pdf

Table 5.26: Average Household's Income per Year in Seikgyikanaungto, and Ahlone Townships

Source of household's income	Average households' income per year (Kyats)	
	Seikgyikanaungto Township	Ahlone Township
Business	2,066,341.5	3,117,307.7
Local wage employment	980,000	1,248,076.9
Part-time job	703,414.6	83,230.8
Government assistance	-	88,076.9
Other	52,682.9	80,769.2
Total	**3,802,439**	**4,617,461.5**

Source: ERM, November 2018

Note: government assistance is referred to pension or other government benefits

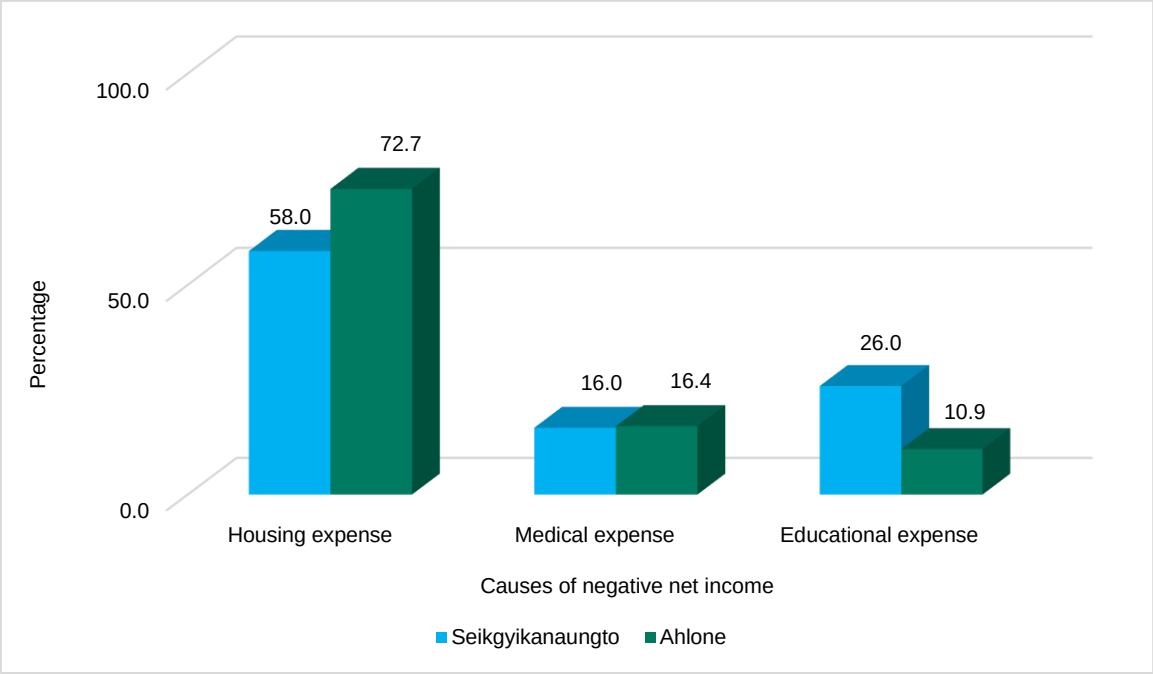
Table 5.27: Average Household's Expense per Year in Seikgyikanaungto, and Ahlone Townships

Source of household's expenditure	Average households' income per year (Kyats)	
	Seikgyikanaungto Township	Ahlone Township
Business costs	80,536.9	58,111.1
Housing	6,555.7	35,600
Medical care	43,892.6	42,311.1
Education	100,503.4	67,000
Family ceremonies	17,583.9	14,833.3
Transportation	80,389.3	31,722.2
Food	448,187.9	663,611.1
Donations	32,214.8	30,361.1
Others	-	6,666.7

Source: ERM, November 2018

Note: farming cost includes fertilizer, pesticides, feeds, seeds, irrigation etc.

Figure 5.20: Underlying Reasons of Negative Net Income



Source: ERM, November 2018

5.5.2.1 Agriculture

Yangon Region

In the agricultural field, rice, beans and pulses are the main crops being produced. Other agricultural activities consist of jute, rubbers, groundnut and sugarcane[55]. Along the Yangon River, rice mills and sawmills can be found[56].

Example of rice paddy in the Study Area is shown in ***Figure 5.21***.

[55] The state of local governance: trends in Yangon – UNDP Myanmar, February 2015 (Web)

[56] Yangon (Myanmar) - Encyclopaedia Britannica (Web)

Figure 5.21: Rice Paddy in the Project Area

Source: ERM, 2018

Seikgyikanaungto Township

In Seikgyikanaungto Township, none of interviewees owns land resource or participates in collection of forest products, but village leader from Seikgyikanaungto Township stated that small number of households engage in cultivation of monsoon paddy outside the village. Paddy was the main crop and was grown only during the rainy season.

Small number of interviewees also raise chickens. They are raised for both meat production and household consumption.

Ahlone Township

None of Ahlone interviewees owns land resource, raise livestock, participate in collection of forest products, or engage in agriculture.

Twantay Township

Agriculture is the main livelihood activity in Twantay Township[57], with rice being the main crop[58]. In remote areas of this township, undeveloped farmland exist[51]. At Aein Gyi village, there is subdivision of paddy fields along the main road[59].

Hlaingthayar Township

In this township, varieties of rice are grown and rice-rice cropping sequence is the most common rotation. Farmers use the same variety of rice for the monsoon and summer season[60]. In addition, there

[57] https://www.marcopolotoursmyanmar.com/tour-programs/yangon-twantay-yangon/

[58] https://www.jarts.info/index.php/jarts/article/download/66/60

[59] https://opendevelopmentmyanmar.net/topics/land/

[60] http://www.scielo.br/scielo.php?script=sci_arttext&pid=S1982-56762010000100001

is the Adipati Agricultural Produce Trading Limited rice reprocessing plant[61] with a capacity of 500 tonnes per day. There are also parboiled rice mills, in which workers are washing and processing rice (***Figure 5.22***). The production capacity of each mill is more than 350 tonnes of parboiled rice per day.

Myanmar Times reported in 2012 that there were farmers in Hlaingthayar Township, who lost 800 acres of farmland because of lobbying of long-dormant industrial zone[62].

Figure 5.22: Workers at Parboiled Rice Mill in Hlaingthayar Township

Source: https://www.mmtimes.com/business/4726-millers-target-eastern-europe-for-parboiled-rice.html

5.5.2.2 Fisheries

Yangon Region

Small scale artisanal fishing takes place in the Yangon River. It is reported that fishermen make around 20,000 kyats (~17 USD) daily from fishing which is conducted using traditional cast-nets. Yangon is a main landing site for fish in Myanmar with a fish market at San Pya in Ahlone Township.

Seikgyikanaungto Township

None of interviewees in Seikgyikanaungto Township engages in fishing activities.

Ahlone Township

None of interviewees in Ahlone Township engages in fishing activities.

[61] http://www.adipatiagri.com/500-ton-rice-reprocessing-plant-hlaingthaya

[62] https://www.mmtimes.com/national-news/yangon/773-farmers-take-land-fight-to-dhshd.html

Twantay Township

This township is not only where fisheries are perceived as one of the central businesses[57], but is also recognized as home to Yangon Region's top fish breeders[63]. In 2016, fish culture was concentrated with 2,005 fish farmers operating 3,692 ponds[64].

Hlaingthayar Township

There are shrimp and fish fishing company in the Township[65]. One in particular owns 47 fishing vessels and owns 3,800 acres for fresh water fish farming in Ma Eu Pin and Pantanaw (Delta Aea of Myanmar – Irrawaddy Division).

5.5.2.3 Market

Seikgyikanaungto Township

As shown in ***Figure 5.23***, majority of interviewees go to market in order to purchase groceries. All of interviewees stated that they normally go to Myoma Market. This market count more than one hundred shops[66]. For frequency of going to the market, 73.4% of interviewees go daily to the market, and the rest every few days (13.3%) or once a week (13.3%).

Ahlone Township

Figure 5.23 shows that majority of interviewees from this township go to market to purchase groceries. Based on primary data, 97.5% of interviewees normally go to Ahlone market, but 2.5% of them go to Sinmin market. For frequency of going to the market, 62.5% of interviewees go to the market on a daily basis, and 35% of them go there once a week.

Twantay Township

There is the Twantay market, in which merchants sell fruit, vegetables, meat, seafood and grains. Stalls and rickshaw taxis can be found in this market[67].

Hlaingthayar Township

In this township, there are Hlaing Thar Yar market[68], and Hlaing Tar Yar no. [1] market[69].

[63] http://www.thaibizmyanmar.com/th/news/detail.php?ID=631

[64] http://www.fao.org/3/a-bl827e.pdf

[65] https://fis.com/fis/companies/details.asp?l=e&filterby=companies&=&country_id=&page=1&company_id=98985&submenu=info

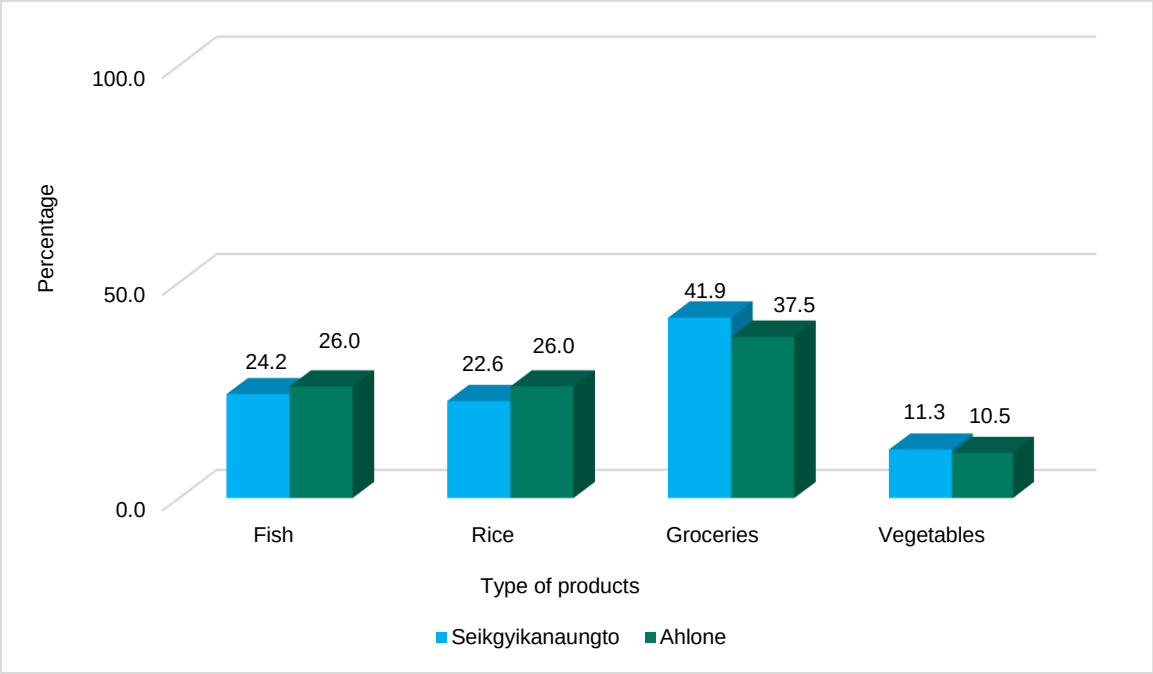
[66] http://travelnaypyitaw.org/index.php/ar/destinations/shopping/201-myoma-market

[67] https://2hungrywanderers.com/twantay-day-trip-yangon-and-what-are-these-snakes-doing-temple

[68] http://www.yangondirectory.com/en/categories-index/yangon-region/hlaing/586-markets-bazaars/L95609_000000000_hlaing-thar-yar-market_57501

[69] http://www.yangondirectory.com/en/categories-index/yangon-region/hlaing-thar-yar/586-markets-bazaars/L95652_000000000_hlaing-thar-yar-no-1-market_160792

Figure 5.23: Products Purchased at the Market



Source: ERM, November 2018.

5.5.2.4 Private Business

Yangon Region

In Yangon, there are three types of business ownerships, including state-owned, private-owned and cooperative-owned types. Whilst small industries in food processing, and clothing manufacturing are owned privately or cooperatively, major industries that manufacture soap, rubber, aluminium, iron, steel sheet and textiles are owned by the state[70].

Seikgyikanaungto Township

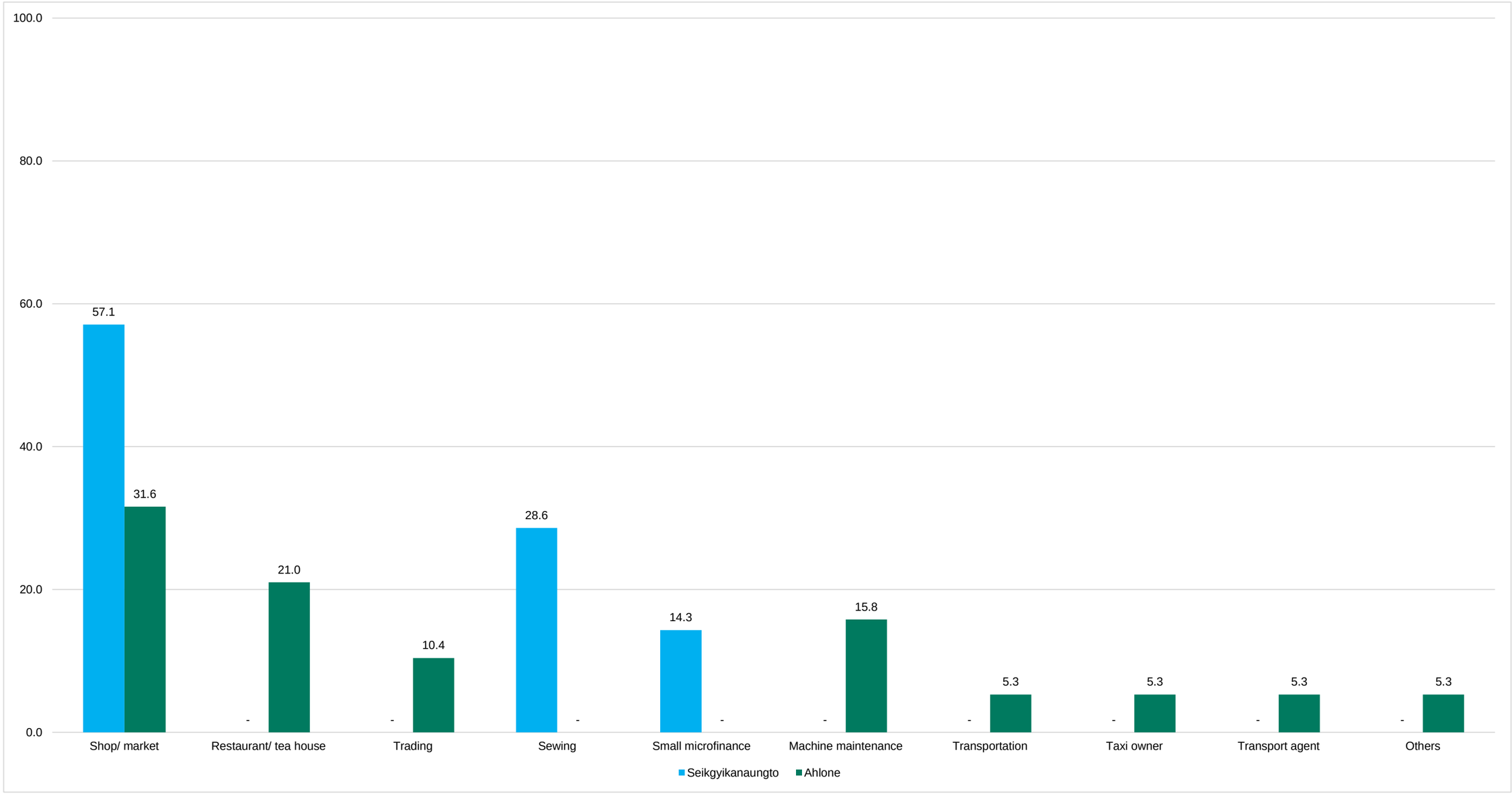
In Seikgyikanaungto Township, ***Figure 5.24*** shows that majority of interviewees are operating small-scale businesses shop/ market within the village/ ward. Average annual income from business operation is approximately 2,066,341.5 Kyats (***Table 5.26***).

Ahlone Township

Majority of Ahlone interviewees are operating shop/ market (***Figure 5.24***) within the township or within the village/ ward. As shown in ***Table 5.26***, average annual income from business operation is around 3,117,307.7 Kyats.

[70] Yangon (Myanmar) - Encyclopaedia Britannica (Web)

Figure 5.24: Private Businesses



Source: ERM, November 2018

5.5.2.5 Employment, Skill and Qualification

Yangon Region

Table 5.28 shows that although unemployment rate between men (4.3%) and women (3.9%) in Yangon is almost similar, percentage of men in labour force (81.8%) is significantly larger than percentage of women (46.4%). Because Yangon is the main center for trading and handling for many foreign commerce in Myanmar[71], the most popular job industry in Yangon is wholesale and retail trade (***Table 5.29***).

Table 5.28: Labour Force Participation and Unemployment

Region/Township	Percentage of Populations aged between 15 – 64 years old					
	Labour Force Participation (%)			Unemployment Rate (%)		
	Total	Men	Women	Total	Men	Women
Yangon Region	63.1	81.8	46.4	4.1	4.3	3.9
Seikgyikanaungto Township	62.3	87.4	37.1	4.6	4.8	4.2
Ahlone Township	63	79.2	49.4	4.8	4.8	4.8
Twantay Township	68.5	88.2	49.8	3.5	3.4	3.6
Hlaingthayar Township	68.9	86.8	53.6	2.4	2.7	1.9

Sources: The 2014 Myanmar Population and Housing Census (Yangon Region) – The Union Report, May 2015 (Web), The 2014 Myanmar Population and Housing Census (Seikkyi Khanaungto Township) – The Union Report, October 2017 (Web), The 2014 Myanmar Population and Housing Census (Ahlone Township) – The Union Report, October 2017 (Web), The 2014 Myanmar Population and Housing Census (Hlinethaya Township) – The Union Report, October 2017 (Web), and The 2014 Myanmar Population and Housing Census (Twantay Township) – The Union Report, October 2017 (Web)

Seikgyikanaungto Township

As shown in ***Table 5.28***, unemployment rate of men and women in this township is under 5%. Percentage of men in labour force (87.4%) is also larger than percentage of women (37.1%). Among participants in labour force, majority of Seikgyikanaungto workers are aged of 20 – 24 years old[34]. MIMU data show in 2014 that the largest number of citizens are services and sales worker (***Table 5.30*** Primary data reveals that 21.8% of interviewees are operating business or participating in dependent occupations (***Table 5.31***). They are working within the village/ ward (***Figure 5.25***) with average working months at approximately 10.7 months. The longest duration for working is 12 months and the shortest duration for working is 3 months.

As provided ***Table 5.31***, some of Seikgyikanaungto interviewees are vulnerable because they are day labor (16.8%), unemployed (13.9%) and lacking of capacities to work (3%).

Although majority of interviewees (25%) have computer certificate (***Table 5.32***), regarding to experience and skill, majority of them (19.7%) have skill/ experience in trading and shop keeping (***Table 5.33***).

Ahlone Township

Table 5.28 shows that unemployment rate of men and women in this township is under 5%, but percentage of men in labour force (79.2%) is significantly larger than percentage of women (49.4%). Among those in labour force, majority of them are aged of 25 – 29 years old[44]. In Ahlone Township, MIMU shows in 2014 that the largest number of citizens were services and sales worker (***Table 5.30***).

[71] Yangon (Myanmar) - Encyclopaedia Britannica (Web)

Table 5.31 relatively points out that majority of interviewees (23.9%) are wage employees. They are working within township (***Figure 5.25***) with average working months at approximately 12 months, which is also the longest duration of working in this township.

Table 5.31 illustrates that vulnerability in term of employment can be observed because 18.1% and 7.7% of interviewees are unemployed and working as day labor respectively. Based on ***Table 5.32***, majority of interviewees (31.3%) have driver license, but 20.2% of total interviewees have skill/ experience in trading and shop keeping (***Table 5.33***).

Twantay Township

As shown in ***Table 5.28***, unemployment rate of men and women in this township is under 4%, but percentage of men in labour force (88.2%) is significantly larger than percentage of women (49.8%). Among those in labour force, majority of them are aged of 25 – 29 years old[45]. ***Table 5.30*** shows that majority of citizens are skilled agricultural, forestry and fishery workers.

Hlaingthayar Township

Table 5.28 indicates that unemployment rate of men and women in this township is under 3%. Percentage of men in labour force (86.8%) is significantly larger than percentage of women (53.6%). Among those in labour force, majority of them are aged of 20 – 24 years old[72]. Based on ***Table 5.30***, majority of citizens are working as craft and related trades worker.

Table 5.29: Job Industries in Yangon Region

Industries	Number of populations (persons)
Wholesale and retail trade; repair and motorcycles of motor vehicles and motorcycles	476,047
Manufacturing	445,401
Agriculture, forestry and fishing	444,420
Accommodation and food service activities	282,883
Transportation and storage	274,751
Construction	263,880
Administrative and support service activities	150,777
Public administration and defence; compulsory social security	138,229
Other service activities	97,453
Education	64,680
Human health and social work activities	32,670
Activities of households as employers; undifferentiated goods- and services	32,399
Information and communication	26,799
Electricity gas steam and air conditioning supply	22,270
Arts entertainment and recreation	19,976
Financial and insurance activities	17,554
Professional scientific and technical activities	10,758
Water supply; sewerage waste management and remediation activities	8,234

[72] https://themimu.info/sites/themimu.info/files/documents/TspProfiles_Census_Hlinethaya_2014_ENG.pdf

Industries	Number of populations (persons)
Real estate activities	7,065
Mining and quarrying	3,955
Activities of extraterritorial organizations and bodies	1,598

Source: The 2014 Myanmar Population and Housing Census – The Union Report: Occupation and industry, March 2016 (Web)

Table 5.30: Types of Occupation in Seikgyikanaungto, Ahlone, Twantay and Hlaingthayar Townships

Occupations	Number of populations			
	Seikgyikanaungto Township	Ahlone Township	Twantay Township	Hlaingthayar Township
Services and Sales Workers	3,754	5,859	15,202	72,349
Craft and Related Trades Workers	3,533	2,145	14,247	129,660
Elementary Occupations	1,844	1,527	17,849	50,562
Skilled Agricultural, Forestry and Fishery Workers	306	286	34,576	4,114
Plant and Machine Operators and Assemblers	2,019	1,998	5,222	30,571
Clerical Support Workers	522	2,435	1,210	9,933
Technicians and Associate Professionals	297	1,747	1,027	6,024
Professionals	253	2,115	1,440	4,579
Managers	96	1,112	333	1,481

Sources: The 2014 Myanmar Population and Housing Census (Seikkyi Khanaungto Township) – The Union Report, October 2017 (Web), The 2014 Myanmar Population and Housing Census (Ahlone Township) – The Union Report, October 2017 (Web), The 2014 Myanmar Population and Housing Census (Hlinethaya Township) – The Union Report, October 2017 (Web), and The 2014 Myanmar Population and Housing Census (Twantay Township) – The Union Report, October 2017 (Web)

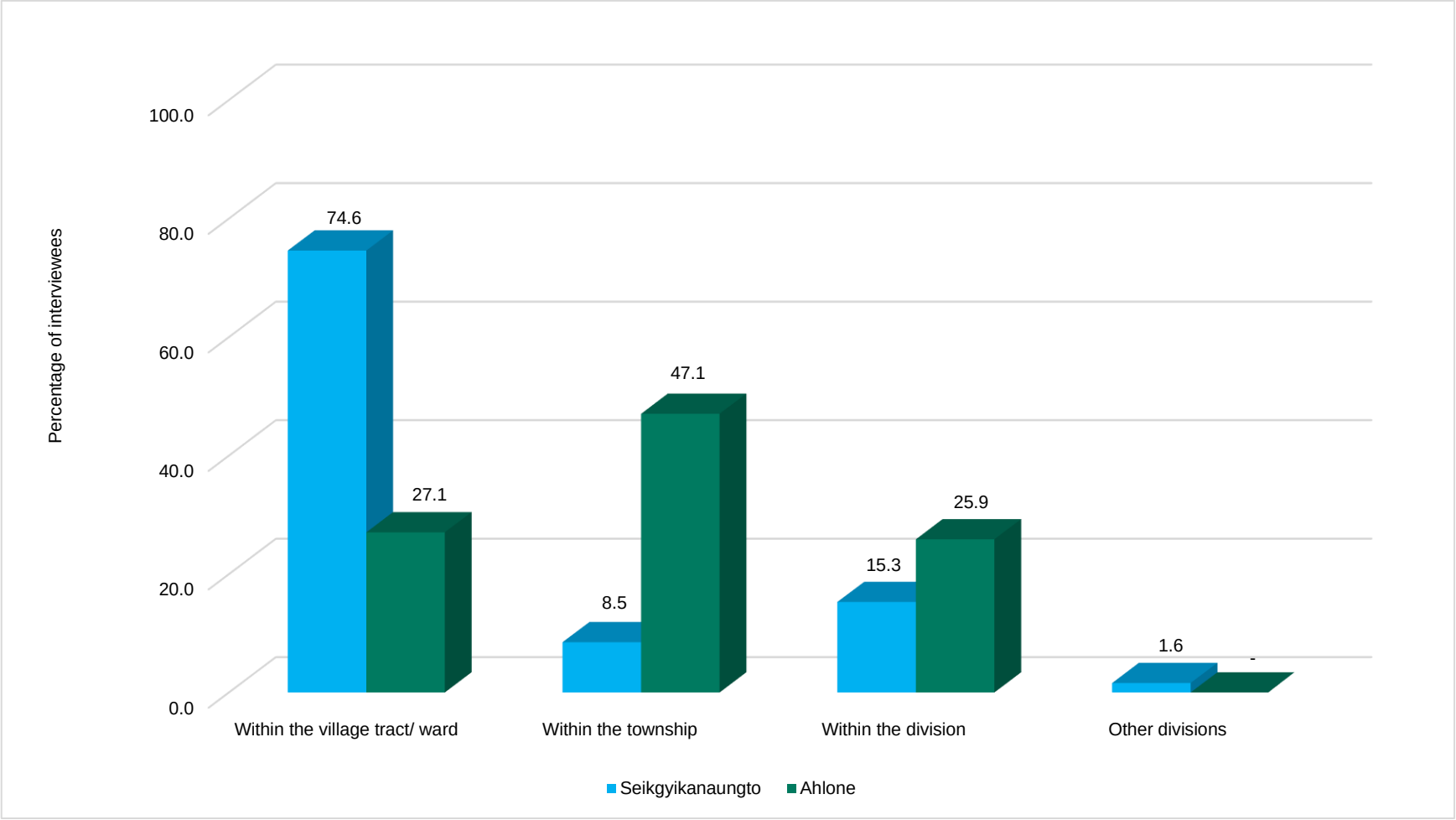
Table 5.31: Specific Occupations

Occupations	Percentage (%)	
	Seikgyikanaungto Township	Ahlone Township
Wage employee	18.8%	23.9%
Unemployed	13.9%	18.1%
Own business	21.8%	23.2%
Dependent	21.8%	23.2%
Day labour	16.8%	7.7%
Waiter	-	0.6%
Student	4%	2.6%
Retired	-	0.6%
N/A	3%	-

Source: ERM, November 2018

Note: N/A is referred to those, who are aged above 18 years old without capacity to work.

Figure 5.25: Location of Works of Citizens in Seikyikanaungto and Ahlone Townships



Source: ERM, November 2018.

Table 5.32: Formal Vocational Training and Qualification

Formal vocational training/ qualification	Percentage (%)	
	Seikgyikanaungto Township	Ahlone Township
Teacher certificate	25	6.2
Computer certificate	25	18.8
Accountant certificate	-	12.5
Diver license	-	18.8
Driver license	-	31.3
Shipping	-	6.2
Sewing certificate		6.2

Source: ERM, November 2018

Table 5.33: Skills and Experiences

Skill/experience	Percentage (%)	
	Seikgyikanaungto Township	Ahlone Township
Government staff	-	2
Driver	-	12.1
Shop keeping	19.7	20.2
Cooking	1.3	1
Teaching	-	1
Manual labour	6.6	10.1
Retired	-	1
Cleaning	1.3	3
Waiter/waitress in restaurant or supermarket	3.9	8.1
Taxi driver	-	2
Trading	19.7	16.2
Shipper	-	1
Government officer	3.9	9.1
Vehicle/ machinery maintenance	1.3	1
Hair dressing	-	1
Bank	1.3	1
Office staff	1.3	1
Teacher	-	1
Machinery maintenance	2.6	3
Private staff	1.3	3
Carpentry	3.9	2
Sewing	2.6	-

Skill/experience	Percentage (%)	
	Seikgyikanaungto Township	Ahlone Township
Welding	3.9	-
Others	6.6	-
Cycle carried/carry	2.6	-
General construction	1.3	-
Administrator	2.6	-
Accountant	1.3	-
Agent	1.3	-
Household leader	1.3	-
Tourist guide	1.3	-
Small microfinance	1.3	-
Beauty salon	1.3	-
Sell ticket	1.3	-
Trishaw driver	1.3	-
Fisherman	1.3	-

Source: ERM, November 2018

5.5.3 Utilities

5.5.3.1 Electricity

Yangon Region

It is reported that in 2017, 8% of households in Yangon region did not have access to public grid, while 13% had access to it without being connected, and 79% had access and were connected to it[43].

As shown in ***Table 5.34***, majority of Yangon conventional households use electricity as source of lighting. ***Table 5.35*** shows that there are nine sources of fuel for cooking. In Yangon, majority of households use electricity as main fuel for cooking.

Seikgyikanaungto Township

In this township, majority of conventional households use electricity as source of lighting (***Table 5.34***), and fuel for cooking (***Table 5.35***).

Village leader from Seikgyikanaungto Township stated that there are 10,941 households, utilizing government electricity/ national grid. In this township, all interviewees can access to grid generation during 24 hours (***Figure 5.26***).

Ahlone Township

In Ahlone Township, electricity is not only utmost used by conventional households as source of lighting (***Table 5.34***), but also as fuel for cooking (***Table 5.35***). All Ahlone interviewees can access to grid generation during 24 hours (***Figure 5.26***).

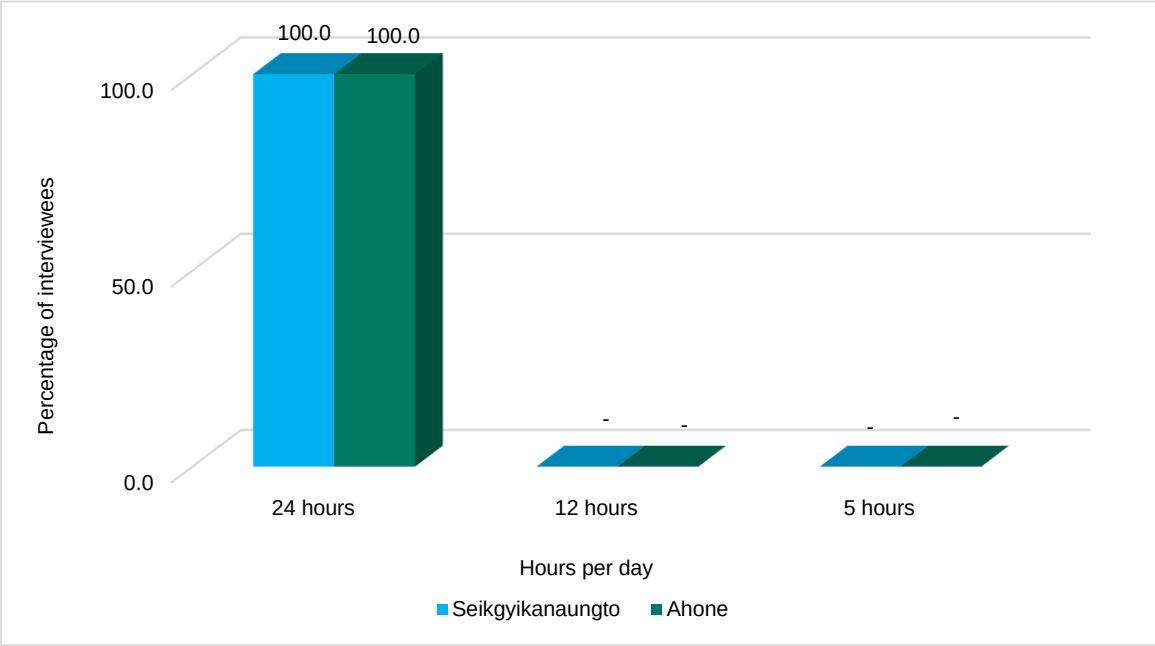
Twantay Township

As shown in ***Table 5.34***, in Twantay, majority of citizens use battery as source of energy for lighting. However, firewood is chosen by the largest number as source of fuel for cooking (***Table 5.35***).

Hlaingthayar Township

As provided in ***Table 5.34***, in this township, majority of conventional households use electricity as source of lighting. ***Table 5.35*** illustrates that Hlaingthayar populations use charcoal as source of fuel for cooking.

Figure 5.26: Duration of Accessibility to Grid Generation



Source: ERM, November 2018

Table 5.34: Sources of Energy for Lighting

Sources of energy for lighting	Yangon region	Seikgyikanaungto Township	Ahlone Township	Twantay Township	Hlaingthayar Township
Electricity	69.3%	76.4%	99%	16.4%	76.3%
Battery	11.8%	5.5%	0.6%	29.5%	8.5%
Candle	7.2%	17.4%	0.2%	16.9%	2.4%
Kerosene	5.7%	0.2%	0.1%	25.3%	0.1%
Generator (private)	4%	0.2%	-	6.6%	12.1%
Solar system/energy	1.6%	0.2%	Less than 0.1%	5.2%	0.2%
Other	0.4%	0.2%	Less than 0.1%	0.1%	0.3%
Water mill (private)	Less than 0.1%	-	-	0.1%	0.1%

Sources: The 2014 Myanmar Population and Housing Census (Yangon Region) – The Union Report, May 2015 (Web), The 2014 Myanmar Population and Housing Census (Seikkyi Khanaungto Township) – The Union Report, October 2017 (Web), The 2014 Myanmar Population and Housing Census (Ahlone Township) – The Union Report, October 2017 (Web), The 2014 Myanmar Population and Housing Census (Hlinethaya Township) – The Union Report, October 2017 (Web), and The 2014 Myanmar Population and Housing Census (Twantay Township) – The Union Report, October 2017 (Web)

Table 5.35: Sources of Energy for Cooking

Sources of energy for cooking	Yangon region	Seikgyikanaungto Township	Ahlone Township	Twantay Township	Hlaingthayar Township
Electricity	47.1%	47.8%	82.4%	8.2%	41.3%
Firewood	26.2%	24.6%	1%	83.3%	6%
Charcoal	21%	27%	8.9%	3.8%	49.6%
Other	2.6%	0.3%	0.5%	3.8%	1.3%
LPG	2%	Less than 0.1%	0.4	0.1%	0.5%
Biogas	0.5%	0.1%	0.8%	0.2%	0.2%
Coal	0.4%	0.2%	0.2%	0.2%	1.2%
Kerosene	0.1%	-	-	0.5%	Less than 0.1%
Straw/Grass	Less than 0.1%	-	-	-	-

Sources: The 2014 Myanmar Population and Housing Census (Yangon Region) – The Union Report, May 2015 (Web), The 2014 Myanmar Population and Housing Census (Seikkyi Khanaungto Township) – The Union Report, October 2017 (Web), The 2014 Myanmar Population and Housing Census (Ahlone Township) – The Union Report, October 2017 (Web), The 2014 Myanmar Population and Housing Census (Hlinethaya Township) – The Union Report, October 2017 (Web), and The 2014 Myanmar Population and Housing Census (Twantay Township) – The Union Report, October 2017 (Web)

5.5.3.2 Water

Yangon Region

The Irrigation Department of the Ministry of Agriculture and Irrigation has identified three main sources of water in Yangon, including reservoirs, Irrawaddy River and ground water aquifers (Union of Myanmar Ministry of Agriculture and Irrigation, Irrigation Department, 2010). As shown in ***Table 5.36***, about 90% of the water source of the system is surface water from reservoirs and the rest is ground water from tube wells supplemented by the water supply system. Most households on the south bank of the Yangon River purchase drinking water. Local people use the ponds and lakes for domestic water.

Table 5.36: Current Water Sources of Yangon City Water Supply System

Water Sources	Daily Capacity[a]	Water Source	Start-up Year
Hlawga Reservoir	14 MGD	Surface water	1904
Gyobyu Reservoir	27 MGD	Surface water	1940
Phugyi Reservoir	54 MGD	Surface water	1992
Ngamoeyeik WTP (Phase 1)	45 MGD	Surface water	2005
Ngamoeyeik WTP (Phase 2)	45 MGD	Surface water	2014
Yangon Pauk	1 MGD	Groundwater	2000
South Dagon	2 MGD	Groundwater	2009
Thaephyu	1 MGD	Groundwater	2009
YCDC tube wells	16 MGD	Groundwater	-
Total	**205 MGD**	**90% Surface Water + 10% Groundwater**	

Source: Zaw Win Aung, 2014

Note: [a] MGD = Million Gallon per Day

Seikgyikanaungto Township

In the summer (especially around March to April), nearly all households in Seikgyikanaungto depend on the Aung Mingalar Lake due to the scarcity of water. Some poor households use water from the lakes/ ponds within Seikgyikanaungto Township' area in the rainy seasons. Result of interviews also shows that there is no availability of irrigation water in Seikgyikanaungto Township.

Ahlone Township

No agricultural activities take place in the Township. As expected from this result, primary data confirm that there is no irrigation system in place.

Twantay Township

Due to limitation of publically secondary data available, there is no available information on water source, water shortage, and irrigation in Twantay Township.

Hlaingthayar Township

Due to limitation of publically secondary data available, there is no available information on water source, water shortage, and irrigation in Hlaingthayar Township.

Non-Drinking Water

Non-drinking water or non-potable water are rainwater, reclaimed/ recycled water, and grey water. This water is not appropriate for human consumption, but it can be used for doing laundry, toilet, urinal flushing, and cooling tower make up tower[73].

Yangon Region

In 2014, Yangon households mainly accessed non-drinking water via tube well or borehole (***Table 5.37***).

Seikgyikanaungto Township

In Seikgyikanaungto Township, ***Table 5.37*** points out in 2014 that pond and lake were popular source of non-drinking water. Moreover, primary data provides that 73.3% of interviewees use source of purified drinking water as source of water for domestic use, but 26.7% of them use rainwater as non-drinking water. 62.5% of interviewees stated that water from rainwater is sufficiently and of good quality, but 37.5% of them said that water from rainwater is insufficient and has only a fair quality. Periods of insufficient water are February (11.2%), March (33.3%), April (33.3%) and May (22.2%).

Ahlone Township

Table 5.37 shows that tube well or borehole is the main source for non-drinking water in Ahlone Township. Based on primary data, 15% of interviewees use source of purified drinking water as source of non-drinking water, but 85% of interviewees access other sources for non-drinking water, which are tube well, tap water, and well. These sources contain sufficient water. For quality of water, majority of interviewees (76.5%) stated that quality of water is good, but 20.6% of them stated that water is salty and 3% of them think that quality of water is fair.

Twantay Township

Based on ***Table 5.37***, majority of Twantay citizens access non-drinking water via tube well/ borehole.

Hlaingthayar Township

Majority of populations in Hlaingthayar Township access non-drinking water via tube well/ borehole (***Table 5.37***).

Table 5.37: Sources of Non-Drinking Water of Households in Yangon, Seikgyikanaungto, Ahlone, Twantay, and Hlaingthayar Townships

Sources of non-drinking water	Yangon region	Seikgyikanaungto Township	Ahlone Township	Twantay Township	Hlaingthayar Township
Pool/pond/lake	15.7%	99%	-	32.5%	2.9%
Tap water/piped	24.4%	0.1%	19.9%	0.1%	3.1%
Tube well/borehole	51.1%	0.7%	79.6%	37.2%	92.2%
Protected well/spring	4.3%	0.1%	0.1%	5.8%	0.4%
Unprotected well/spring	1.9%	0.1%	-	7.3%	0.2%
Waterfall/rainwater	Less than 0.1%	0.1%	-	Less than 0.1%	Less than 0.1%
River/stream/canal	1.5%	0.1%	Less than 0.1%	17%	0.1%
Other	0.9%	-	0.1%	0.1%	0.8%

[73] http://opus.mcerf.org/application.aspx?id=-6228344935996635278

Sources of non-drinking water	Yangon region	Seikgyikanaungto Township	Ahlone Township	Twantay Township	Hlaingthayar Township
Bottled/purifier water	0.2%	Less than 0.1%	0.2%	Less than 0.1%	0.3%

Sources: The 2014 Myanmar Population and Housing Census (Yangon Region) – The Union Report, May 2015 (Web), The 2014 Myanmar Population and Housing Census (Seikkyi Khanaungto Township) – The Union Report, October 2017 (Web), The 2014 Myanmar Population and Housing Census (Ahlone Township) – The Union Report, October 2017 (Web), The 2014 Myanmar Population and Housing Census (Hlinethaya Township) – The Union Report, October 2017 (Web), and The 2014 Myanmar Population and Housing Census (Twantay Township) – The Union Report, October 2017 (Web)

Drinking Water

Yangon Region

MIMU data indicate in 2014 that Yangon was one of the region in Myanmar that has the highest percentage of people who can access to source of drinking water on premise (82%). At the same time, to reach water source, 14% of Yangon citizens spend less than 10 minute, while 3% and 1% of them spend 11 to 20 minute, and more than 20 minute respectively[74].

Generally, households in Yangon have accessed to drinking water through two main sources (improved sources and unimproved sources), but the percentage of people's usages for each type is slightly fluctuated, based on seasonality. In both dry and rainy seasons, citizens mainly use bottled water as source of drinking water. However, ***Table 5.38*** shows that in rainy reason, rainwater collection becomes the second source of drinking water for large proportion of citizens.

Table 5.38: Sources of Drinking Water of Households in Yangon Region, Based on Seasonality

	Sources of Drinking Water	Yangon region
Dry Season		
Improved Sources	Bottled water	49.7%
	Tube well or borehole	19.2%
	Piped water into yard	4.6%
	Tanker/truck	4.2%
	Piped water into dwelling	3.4%
	Rain water collection	2.3%
	Protected dug-well	1.9%
	Public tab	0.5%
Unimproved Sources	Pool	10.8%
	Other	2.8%
	River	0.6%
	Unprotected well	0.2%
Rainy Season		
Improved	Bottled water	45.7%
	Tube well or borehole	17.3%

[74] The 2017 Myanmar Living Conditions Survey – Central Statistical Organization (CSO), UNDP and World Bank, June 2018 (Web)

	Sources of Drinking Water	Yangon region
	Piped water into yard	3.6%
	Tanker/truck	3.3%
	Piped water into dwelling	3.1%
	Rain water collection	20.8%
	Protected dug-well	1.1%
	Public tab	0.5%
Unimproved sources	Pool	1.7%
	Other	2.3%
	River	0.4%
	Unprotected well	0.2%

Source: The 2017 Myanmar Living Conditions Survey – Central Statistical Organization (CSO), UNDP and World Bank, June 2018 (Web)

Seikgyikanaungto Township

In this township, majority of citizens access drinking water via pool, pond or lake, which is unimproved source of drinking water (***Table 5.39***). In addition, ***Figure 5.27*** shows that in 2018, 73.3% of interviewees use rainwater as drinking water. 68.2% of them thought that quality of drinking water is good, but 31.8% of them perceived that quality of water is fair. Although 81.8% of interviewees stated that water is sufficient, 18.2% of them stated that water is insufficient during January, February, March, April and May (***Figure 5.28***). When water is not supplied to households, the next water source is the donation by association.

Ahlone Township

MIMU data show in 2014 that Ahlone citizens mainly consumed drinking water via bottled/purifier water (***Table 5.39***). ***Figure 5.27*** shows in 2018 that 80% of Ahlone interviewees access drinking water via purified drinking water, but some of interviewees access to drinking water via other sources: well (5%), tap water (7.5%) and tube well (7.5%). These sources contain sufficient amount of water with good quality.

Twantay Township

According to data in ***Table 5.39***, majority of citizens access drinking water via pool/pond/lake, which is unimproved source of water.

Hlaingthayar Township

The largest proportion of Hlaingthayar populations consume drinking water via bottled/ purifier water (***Table 5.39***).

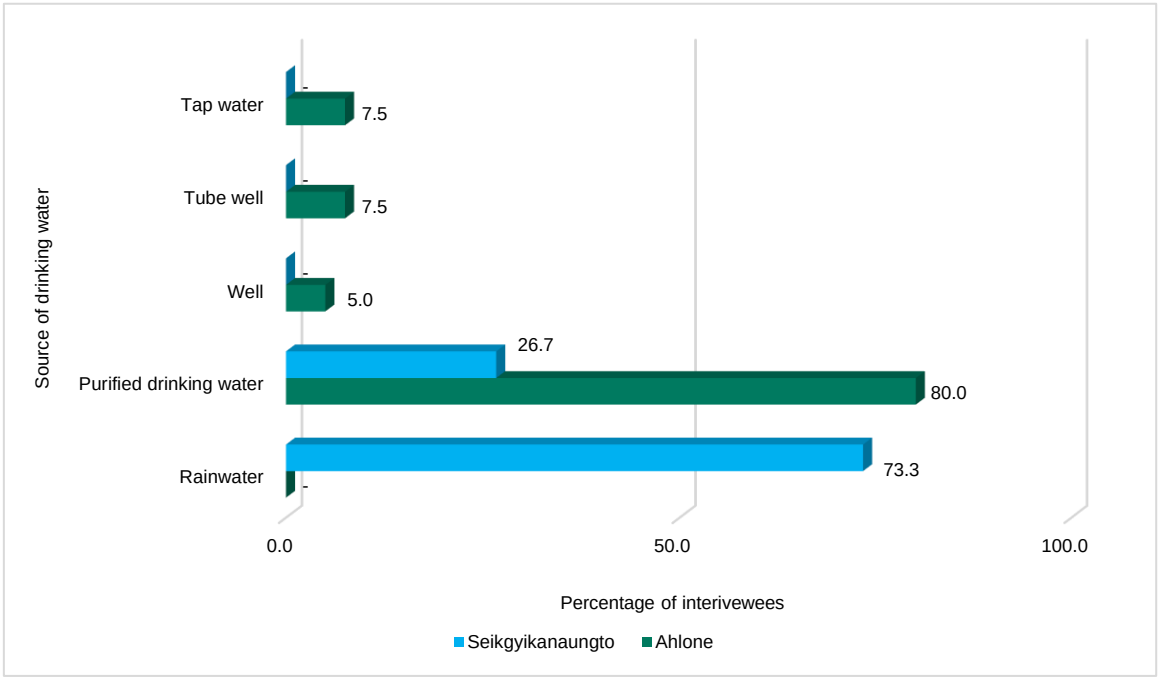
Table 5.39: Sources of Drinking Water of Households in Seikgyikanaungto, Ahlone, Twantay and Hlaingthayar Townships

	Sources of Drinking Water	Seikgyikanaungto Township	Ahlone Township	Twantay Township	Hlaingthayar Township
Improved Source	Bottled/purifier water	3.2%	72.6%	0.6%	66.7%
	Tap water/piped	Less than 0.1%	3.7%	0.1%	8.6%
	Tube well/borehole	0.1%	23.2%	29.5%	15.9%

	Sources of Drinking Water	Seikgyikanaungto Township	Ahlone Township	Twantay Township	Hlaingthayar Township
	Protected well/spring	Less than 0.1%	0.1%	9.5%	0.1%
Unimproved Source	Pool/pond/lake	91.9%	0.1%	43.4%	5.9%
	Waterfall/rainwater	0.9%	-	0.2%	0.1%
	Other	3.9%	0.3%	0.1%	2.7%
	River/stream/canal	-	Less than 0.1%	9.5%	Less than 0.1%

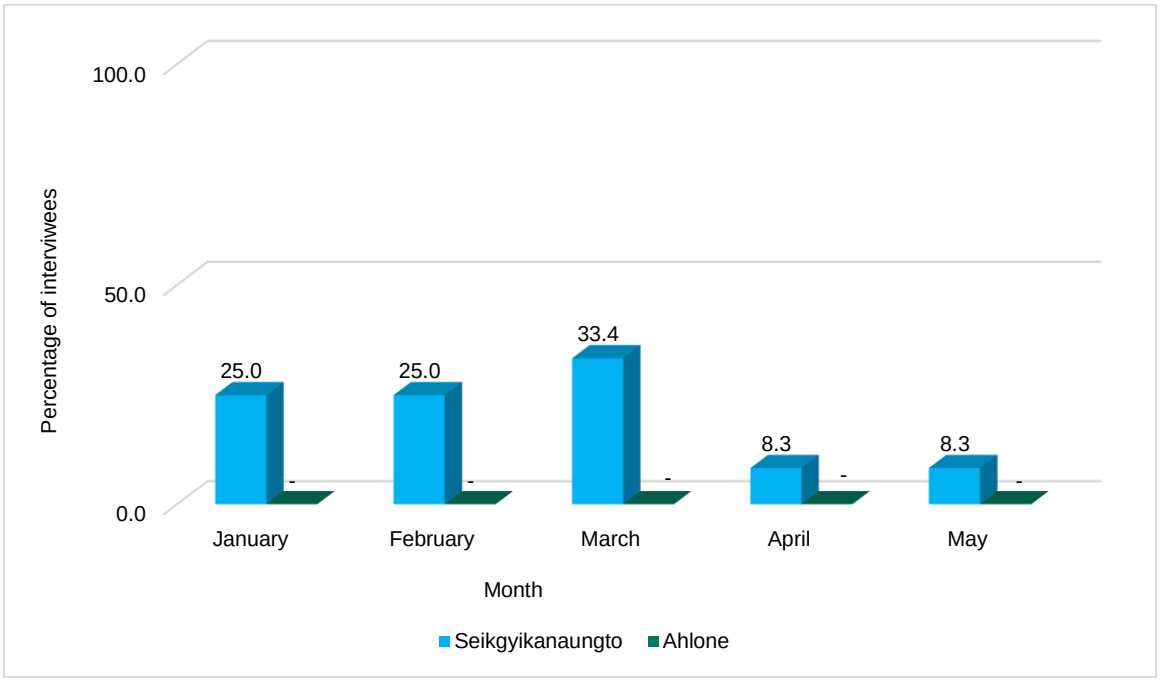
Sources: The 2014 Myanmar Population and Housing Census (Yangon Region) – The Union Report, May 2015 (Web), The 2014 Myanmar Population and Housing Census (Seikkyi Khanaungto Township) – The Union Report, October 2017 (Web), The 2014 Myanmar Population and Housing Census (Ahlone Township) – The Union Report, October 2017 (Web), The 2014 Myanmar Population and Housing Census (Hlinethaya Township) – The Union Report, October 2017 (Web), and The 2014 Myanmar Population and Housing Census (Twantay Township) – The Union Report, October 2017 (Web)

Figure 5.27: Source of Drinking Water in Seikgyikanaungto, and Ahlone Townships



Source: ERM, November 2018

Figure 5.28: Period of Insufficiency of Drinking Water



Source: ERM, November 2018

5.5.3.3 Sanitation and Toilet Facilities

Yangon Region

In Yangon, 68% of total households have accessed to basic sanitation, which is referred to improved, non-shared toilet and hand washing facilities[75]. ***Table 5.40*** shows that in 2014, water seal (improved pit latrine) is the most common toilet facility type in Yangon region. Moreover, more than 90% of populations can access to a place, in which they can wash hand with soap and water[75].

Seikgyikanaungto Township

As shown in ***Table 5.40***, in 2014, majority of citizens have water seal (improved pit latrine). Primary data reveals that in 2018, all of interviewees have flush toilet that emphasizes local people's access to toilet facilities.

Ahlone Township

Table 5.40 shows that in 2014, majority of Ahlone citizens have water seal (improved pit latrine). Result of interviews reveals that in 2018, all of interviewees have flush toilet, highlighting Ahlone citizens' access to toilet facilities.

Twantay Township

In 2014, majority of Twantay citizens have toilet facility in form of water seal (improved pit latrine) (***Table 5.40***) but the number of non-improved toilet facility is higher than in other Townships in the region.

Hlaingthayar Township

Table 5.40 shows that the largest number of populations in this township have water seal (improved pit latrine).

Table 5.40: Toilet Facilities

Types of toilet facilities	Yangon region	Seikgyikanaungto Township	Ahlone Township	Twantay Township	Hlaingthayar Township
Water seal (improved pit latrine)	84.8%	86.1%	72%	72.3%	92.6%
Flush	6.3%	0.2%	25.6%	0.7%	1.7%
None	3.3%	3.9%	0.4%	8.9%	2.4%
Bucket (surface latrine)	2.7%	9%	1.6%	8.8%	0.8%
Pit (traditional pit latrine)	2.6%	0.8%	0.1%	9.1%	2.1%
Other	0.3%	Less than 0.1%	0.3%	0.2%	0.4%

Sources: The 2014 Myanmar Population and Housing Census (Yangon Region) – The Union Report, May 2015 (Web), The 2014 Myanmar Population and Housing Census (Seikkyi Khanaungto Township) – The Union Report, October 2017 (Web), The 2014 Myanmar Population and Housing Census (Ahlone Township) – The Union Report, October 2017 (Web), The 2014 Myanmar Population and Housing Census (Hlinethaya Township) – The Union Report, October 2017 (Web), and The 2014 Myanmar Population and Housing Census (Twantay Township) – The Union Report, October 2017 (Web)

[75] The 2017 Myanmar Living Conditions Survey – Central Statistical Organization (CSO), UNDP and World Bank, June 2018 (Web)

5.5.4 Transportation

Yangon Region

Yangon has lots of different transport infrastructure, including many large to small concrete, paved or dirt roads, five bridges over the Yangon river, one international airport with two terminals and a domestic terminal, railway lines, four ports, buses lines and local taxi services.

More than 100 boats travel across the river from Dala, Seikgyikanaungto or Twantay Townships to Yangon daily between 5:30 am to 8:00 pm. The journey takes around 15 minutes from Seikgyikanaungto or Dala to Yangon. Travelling to Yangon by car can take between 1 and 2 hours (1h from Hlaingtharyar and 2 hours from Seikgyikanaungto). In 2014, there were seven types of transportations, which households had and used for travelling from place to place. Among these types, bicycle was the most used (***Table 5.41***).

Seikgyikanaungto Township

During a previous study in January 2017, about 500 boats were observed within Seikgyikanaungto Township alone. Given the difficulty to use car and the relatively cheap cost and ease of use of boat transport, local community depends on boat transport to reach Yangon City.

Table 5.41 shows that in 2014, bicycle was the main owned and used transport by populations in this township. However, primary data shows that in 2018, motorbike is now the most popular in Seikgyikanaungto (***Table 5.42***). Interviewees in this township also stated that walking is another mode of transportation.

It was identified during focus group discussion with women that the main problem they are facing is security issue due to poor transportation system.

Ahlone Township

In 2014, majority of populations in Ahlone Township used and owned car, truck or van (***Table 5.41***). Primary data in 2018 indicates that majority of citizens still used and owned car (***Table 5.42***). Walking is another mode of transportation, referred by Ahlone interviewees.

Twantay Township

As shown in ***Table 5.41***, in 2014, majority of populations in this township used and owned bicycles for transporting from one place to another place.

Hlaingthayar Township

In 2014, majority of Hlaingthayar citizens used and owned bicycles for transportation (***Table 5.41***).

Table 5.41: Types of Transportation in Seikgyikanaungto, Ahlone, Twantay and Hlaingthayar Townships

Types of transportation	Yangon region	Seikgyikanaungto Township	Ahlone Township	Twantay Township	Hlaingthayar Township
Bicycle	46.2%	45.7%	16.3%	31.8%	49.6%
Motorcycle/moped	13.6%	8.3%	1.3%	19.9%	9.8%
Car/truck/van	7.8%	0.5%	22.9%	1.0%	2.7%
Cart (bullock)	4.8%	0.7%	Less than 0.1%	6.0%	0.3%
Canoe/boat	1.2%	2.9%	Less than 0.1%	5.8%	0.1%
4-wheel tractor	1.2%	Less than 0.1%	Less than 0.1%	1.9%	0.4%
Motor boat	1%	0.5%	0.2%	6.6%	0.1%

Sources: The 2014 Myanmar Population and Housing Census (Yangon Region) – The Union Report, May 2015 (Web), The 2014 Myanmar Population and Housing Census (Seikkyi Khanaungto Township) – The Union Report, October 2017 (Web), The 2014 Myanmar Population and Housing Census (Ahlone Township) – The Union Report, October 2017 (Web), The 2014 Myanmar Population and Housing Census (Hlinethaya Township) – The Union Report, October 2017 (Web), and The 2014 Myanmar Population and Housing Census (Twantay Township) – The Union Report, October 2017 (Web)

Table 5.42: Types of Transportation in Seikgyikanaungto and Ahlone Townships

Types of transportation	Percentage of households	
	Seikgyikanaungto Township	Ahlone Township
Motorbike	100	12.5
Tractor	-	-
Car	-	87.5
Van/ truck	-	-

Source: ERM, November 2018

5.5.5 Cultural Heritage

Yangon Region

Yangon Region has a number of culturally significant areas, particularly Buddhists sites. Pagodas and monasteries found in these areas are considered as important cultural centres for the local communities. There are a number of important designated heritage buildings within 5 km of the Project Site such as the Shwedagon or Sule Pagoda. There is no cultural heritage in the footprint of the Project.

The closest important cultural heritages are Shwedagon pagoda and Sule pagoda, which are approximately 3.5 km, and 3.3 km away from the transmission line respectively. Shwedagon pagoda is constructed on the west bank of the Royal Lake on 114-acre Singuttara Hill in Yangon (***Figure 5.29***). Covered with number of gold plates and diamonds, this pagoda is representing architectures in 2,500

years ago, and being recognized by Myanmar citizens as the most sacred and spectacular Buddhist site in the country[76].

Figure 5.29: Shwedagon Pagoda

Source: Shwedagon Pagoda – Shwedagonpagoda.com (Web)

Sule pagoda is founded since 2,500 year ago in the centre of Yangon, which is connected to two main roads: Sule Pagoda road and the Mahabandoola road (***Figure 5.30***). There is belief that a powerful nat spirit, named Sularata is dwelling in this place. Historically, this cultural area was a highly crucial location, which was used as meeting point of notable movements of activists in Myanmar such as, 1988 uprising and the Saffron Revolution in 2007[77].

[76] Shwedagon Pagoda – Shwedagonpagoda.com (Web)

[77] Sule Pagoda – Birma (Web)

Figure 5.30: Sule Pagoda

Source: Sule Pagoda travel guide – Bestpricevn.com (Web)

Twantay Township

In this township, there are Twante Shwesandaw pagoda, Kan Paw Aye pagoda, and Maung Tee pagoda. Twante Shwesandaw pagoda is where both local people and outsiders visit. Group of tourists and worshippers do not significantly visit this place. Moreover, Kan Paw Aye pagoda (Snake Pagoda) can also be found. This place, where more than 30 live snakes are living, is located at the center of lake.

Maung Tee pagoda is one of ancient religious architectures, and is located proximate to Twantay. In 2008, this pagoda became protected site with being maintained by Yangon division's Department of Archaeology, National Museum and Library (***Figure 5.31***).

Figure 5.31: Cultural Heritages in Twantay

Kan Paw Aye pagoda (Snake Pagoda)

Maung Tee pagoda

Source: https://www.mmtimes.com/news/twante-return-day-trip.html

Hlaingthayar Township

In this township, there is Aung Myay Thar Yar pagoda[78] located closest to the Project Area.

5.5.6 Education

Yangon Region

Basic education system in aforementioned areas is identical to other parts of Myanmar in compliance with the national education system. Thus, years of schooling of people are 11 years, which is so-called 5-4-2 education system. 5-4-2 education system is comprised of 5 years of primary school, 4 years of lower secondary school and 2 years of upper secondary school. However, Myanmar had a 2017 plan to change this education system to be 5-4-3 system in order to be in the same line with most ASEAN countries. This plan will extend years of schooling from 11 years to 12 years. It is written that due to this plan, starting age for schools would be changed from 5 years old to 6 years old because students aged 6 – 10 will be in primary school, while those aged 11 – 14 years old will be in lower secondary school, and aged 15 – 17 years old will be in high or upper secondary schools[79].

The 2014 data shows that in Yangon region, literacy rate of citizens aged of 15 years old and above is 96.6%, which is calculated from literacy rate in men (98%) and women (95.5%)[41]. The total numbers of schools are 2,717 schools, which include 198 high schools, 255 middle schools and 2,264 primary schools[80]. MIMU data show in 2014 that majority of citizens accomplished primary schools (***Table 5.43***). This new educational system was started from the academic year (AY) 2016-2017[81].

Seikgyikanaungto Township

In 2014, literacy rate was recorded at 97%, consisting of literacy rate of men (98.5%) and of women (95.6%)[82]. In this township, there are total 17 schools in this township, comprising of 14 primary schools, 2 middle schools and 1 high school[83]. The majority of populations in this township achieved primary

[78] http://www.yangondirectory.com/en/categories-index/yangon-region/hlaing-thar-yar/665-pagodas/L00207240_000000000_aung-myay-thar-yar-pagoda_18999

[79] The 2014 Myanmar Population and Housing Census - Thematic report on education, June 2017 (Web)

[80] Total Number of Government Schools in States/Regions – Myanmar Information Management Unit, November 2016

[81] https://www.pic.org.kh/images/2017Research/20170523%20Education_Reform_Myanmar_Eng.pdf

[82] The 2014 Myanmar Population and Housing Census (Seikkyi Khanaungto Township) – The Union Report, October 2017 (Web)

[83] Number of Basic Education School in Yangon Region - Myanmar Information Management Unit, August 2012 (Web)

education (***Table 5.43***). However, primary data shows that in 2018, majority of interviewees also finished high school (***Table 5.44***). Data from focus group discussion with women shows that they perceived that girls are more educated than boys.

Ahlone Township

In 2014, literacy rate of men and of women are 99.2% and 97.9% respectively. In combination, literacy rate is 98.5%[84]. In Ahlone, there are total 17 schools, comprising of 9 primary schools, 2 middle schools, and 6 high schools[83]. As provided in ***Table 5.43***, in this township, majority of citizens graduated from university/ college. Again, based on information from focus group discussion with women, girls are perceived to be more educated than boys.

Twantay Township

In 2014, literacy rate in this township is recorded at 94.5%, comprising of 96.2% of males' literacy rate, and 93.0% of females' literacy rate[45]. In Twantay Township, there are 12 high schools, 9 middle schools and 118 primary school[85].

Hlaingthayar Township

MIMU shows in 2014 that in Hlaingthayar Township, literacy rate is 96.8%, dividing into literacy rate of males (98.2%) and females (95.6%)[46]. In this township, there are 6 high schools, 15 middle schools and 37 primary schools[86].

Table 5.43: Levels of Education Completed by Populations (2014)

Levels of education completed	Yangon region	Seikgyikanaungto Township	Ahlone Township	Twantay Township	Hlaingthayar Township
None	243,812	805	718	11,970	19,724
Primary school (Grade 1 – 5)	1,324,522	8,103	4,995	69,929	128,432
Middle school (Grade 6 – 9)	978,392	4,832	6,365	18,888	107,919
High school (Grade 10 – 11)	751,724	2,270	8,052	10,336	59,606
Diploma	18,254	19	242	234	824
University / college	729,473	1,292	12,420	5,984	34,536
Post-graduate and above	43,947	73	969	249	931
Vocational training	9,746	8	142	111	348
Others	42,723	371	166	259	2,970

Source: The 2014 Myanmar Population and Housing Census (Yangon Region) – The Union Report, May 2015 (Web)

Note: The number in the table represents number of populations aged 25 years old and over.

[84] The 2014 Myanmar Population and Housing Census (Ahlone Township) – The Union Report, October 2017 (Web)

[85] Number of Basic Education School in Yangon Region - Myanmar Information Management Unit, August 2012 (Web)

[86] Number of Basic Education School in Yangon Region - Myanmar Information Management Unit, August 2012 (Web)

Table 5.44: Level of Education Completed by Population (2018)

Levels of education completed	Seikgyikanaungto Township	Ahlone Township
None	9.4%	9.9%
Illiterate	-	0.5%
Kindergarten	2.1%	0.5%
Primary school (Grade 1 – 5)	21.6%	15.4%
Middle school (Grade 6 – 9)	27.3%	18.8%
High school (Grade 10 – 11)	30.2%	31.7%
University / college	9.4%	23.3%
Monastery	-	-

Source: ERM, November 2018

Notes: In questionnaire, senior high school and junior high school choices are given instead of middle school and high school.
Percentage for university/ college is the result of combination between percentage of university, graduate and college as selected by interviewees in questionnaires.

5.5.7 Health, Health-Related Facilities, and Security

Myanmar

The Department of Health in Myanmar is responsible for providing health services to all populations in the country[87]. In 2013, the Irrawaddy writes that "patients in the government's public hospitals have been forced to foot the bill" by giving Yangon General Hospital as an example for requiring patients to pay a bill for equipment, used during their treatment[88]. UNDP (United Nations Development Programme) similarly reports that citizens in Yangon bear more than 80% of costs on health services at public health care facilities[89]. Consequently, many citizens tend to fly to other countries in order to receive accurate diagnosis and treatment since they cannot get correct diagnosis and treatment at hospitals and health care centres in the country[90]. Moreover, in Myanmar, main diseases and health problems are consisted of tuberculosis, underweight in children, malnutrition, Malaria, and AIDs[91].

Yangon Region

In 2016, in Yangon region, there were 85 hospitals, 11,610 sanctioned beds, 12,260 available beds, 527,308 admissions, 525,851 discharges and deaths, 3,537,276 patient days, 16,656 numbers of death, hospital death rate at 3.2%, and 2,516,767 out-patient attendance. Here, hospital death rate is the calculation between number of deaths, and number of discharges and deaths[92]. Sanctioned bed is the official bed capacity of the hospital[93]. Regarding to health facilities and hospitals, almost 70 percent of children in Yangon are born in health facilities[94]. ***Table 5.45*** shows that in 2016, there were fifteen health conditions that caused Yangon citizens to use hospital services.

[87] Health in Myanmar 2012 - Ministry of Health in Myanmar (Web)
[88] Myanmar patients pays the price – Michaels S., August 2013 (Web)
[89] The state of local governance: trends in Yangon – UNDP Myanmar, February 2015 (Web)
[90] Myanmar patients pays the price - The Irrawaddy, August 2013 (Web)
[91] Health, Health Care and Diseases in Myanmar – Facts and Details, May 2014 (Web)
[92] Hospital Statistics Report 2014-16 - Ministry of Health and Sports in Myanmar, June 2018 (Web)
[93] https://www.slideshare.net/zulfiquer732/hospital-statistics-79835548
[94] A snapshot of child wellbeing – UNICEF (Web)

Table 5.45: Causes of Hospitalization in Yangon Region

Causes of hospitalization	Number of populations
Single spontaneous delivery	36,567
Other cataract	19,352
Other and unspecified injuries of head	18,080
Single delivery by caesarean section	15,662
Diarrhoea and gastroenteritis of presumed infectious origin	14,713
Mental and behavioural disorders due to use of alcohol	12,418
Viral infection of unspecified site	11,160
Neonatal jaundice from other and unspecified causes	10,107
Gastritis and duodenitis	8,079
Unspecified abortion	7,324
Pneumonia, organism unspecified	7,165
Stroke, not specified as haemorrhage or infarction	6,911
Unspecified mood [affective] disorder	6,608
Respiratory tuberculosis, not confirmed bacteriologically or histologically	6,135
Acute appendicitis	5,795
All other Causes	339,775

Source: Hospital Statistics Report 2014-16 - Ministry of Health and Sports in Myanmar, June 2018 (Web)

Most of health problems in Yangon region are related to the aforementioned national health issues. In 2017, numbers of Yangon patients, who are experiencing with tuberculosis and being treated under the National Tuberculosis Programme, are more than 32,000 persons[95].

UNICEF reports that in 2015, 24% of children in Yangon region experience with stunting, while 20% and 8% of them are underweight and wasting respectively[96]. WHO wrote “stunting is the impaired growth and development that children experience from poor nutrition, repeated infection, and inadequate psychosocial stimulation”[97]. Wasting is “a symptom of acute undernutrition, usually as a consequence of insufficient food intake or a high incidence of infectious diseases, especially diarrhoea”[98].

Apart from that, 5.7% of Yangon households has least one insecticide-treated net, which can lead some citizens to experience other health problems such as, Malaria[99].

In Yangon region, HIV prevalence was 24.6%, causing this region to be recognized as one of locations with the highest percentage of HIV prevalence in the Southeast Asia Pacific region[100]. The study shows that even though 76.4% of women and 81.7% of men in Yangon acknowledge where they can get diagnosis for HIV, 76.6% of women and 67.3% of men never tested for HIV. They also have knowledge,

[95] TB still a serious threat, says doctors – Kay T. M., October 2018 (Web)

[96] A snapshot of child wellbeing – UNICEF (Web)

[97] https://www.who.int/nutrition/healthygrowthproj_stunted_videos/en/

[98] https://www.who.int/nutrition/nlis_interpretation_guide.pdf

[99] https://themimu.info/sites/themimu.info/files/documents/Survey_Demographic_Health_Survey_2015-16.pdf

[100] HIV and AIDs in Myanmar – Avert, October 2018 (Web)

regarding to HIV/AIDs-preventative methods, including of using condoms and limiting sexual intercourse to one uninfected partners[100].

In 2015, Yangon region was one of locations with the lowest rate in infant mortality in the country – 44 per 1000 live births[101]. Only 67% of total children aged of 12 to 23 year old in Yangon received all basic vaccinations, which are referred to one dose each of BCG (Bacille Calmette Guerin) and measles, and three doses each of DPT (Diphtheria, Pertussis, Tetanus) -containing vaccine and polio[102]. Around 18% of admissions in the Yangon Children's Hospital is due to diarrhoea[103]. During FGD (focus group discussion) with health officer, senior nurse and medical officer, it was found that in Dala, Seikgyikanaungto, and Ahlone townships, most of citizens are vaccinated at childbirth.

Moreover, in this region, there are four forms of disabilities (***Table 5.46***). Among them, visual issues is the most dominant type of disability.

Table 5.46: Disabilities

Types of disabilities	Yangon region	Seikgyikanaungto Township	Ahlone Township	Twantay Township	Hlaingthayar Township
Visual	125,844	825	484	4,365	7,593
Locomotion	109,976	665	807	3,676	6,437
Memory	78,895	425	470	3,053	4,825
Hearing	62,748	381	432	2,028	3,625

Source: The 2014 Myanmar Population and Housing Census (Yangon Region) – The Union Report, May 2015 (Web)

Seikgyikanaungto Township

In Seikgyikanaungto Township, based on ***Table 5.46***, majority of disabled people are dealing with visual disability. However, ***Figure 5.32*** shows that 84.5% of interviewees have a good health status. In addition to dengue fever outbreaks that can be found during rainy season, fever is the disease that most of interviewees have dealt with (***Table 5.47***). None of interviewees had diarrhea last year. Women in Seikgyikanaungto faced several main problems, including cervical cancer, diabetes and hypertension.

In the township, traditional/ private/ mobile clinics can be found. Interviewees travel to these clinics by walking because average distance between their houses and clinics is around 0.6 km. Moreover, township/ station hospitals are available in this township. Citizens reach there by riding a bike or using trishaw with average distance of 0.8 km. Some of interviewees visit doctors at Yangon Child Hospital by using boat services.

Ahlone Township

In Ahlone Township, ***Table 5.46*** shows that from four types of disability, the main one is locomotion. ***Figure 5.32*** shows that 94.1% of interviewees have a good health conditions, but some of them experience with diabetes (***Table 5.47***). It was also found that none of the interviewees had dealt with diarrhea last year.

In this township, there are three hospitals, consisting of the Academy Hospital, the West Yangon General Hospital[104] and the Yangon Children Hospital[105]. Apart from this, traditional/ private and mobile clinics can also be found. Interviewees walk, drive a car or use bus services to see a doctor in these

[101] The 2014 Myanmar Population and Housing Census (Yangon Region) – The Union Report, May 2015 (Web)

[102] Myanmar 2015-16 Demographic and Health Survey (Key findings) – Ministry of Health and Sport (Myanmar), et al. (Web)

[103] https://tci-thaijo.org/index.php/jhealthres/article/download/78346/62760/

[104] Healthcare – Slow O., February 2015 (Web)

[105] Medical Assistance – U.S. Embassy in Burma (Web)

clinics. Average distance between their houses and those places is approximately 0.9 km. In addition, township/ station hospitals are also available in the township. To see a doctor at these hospitals, interviewees walk around 1 km.

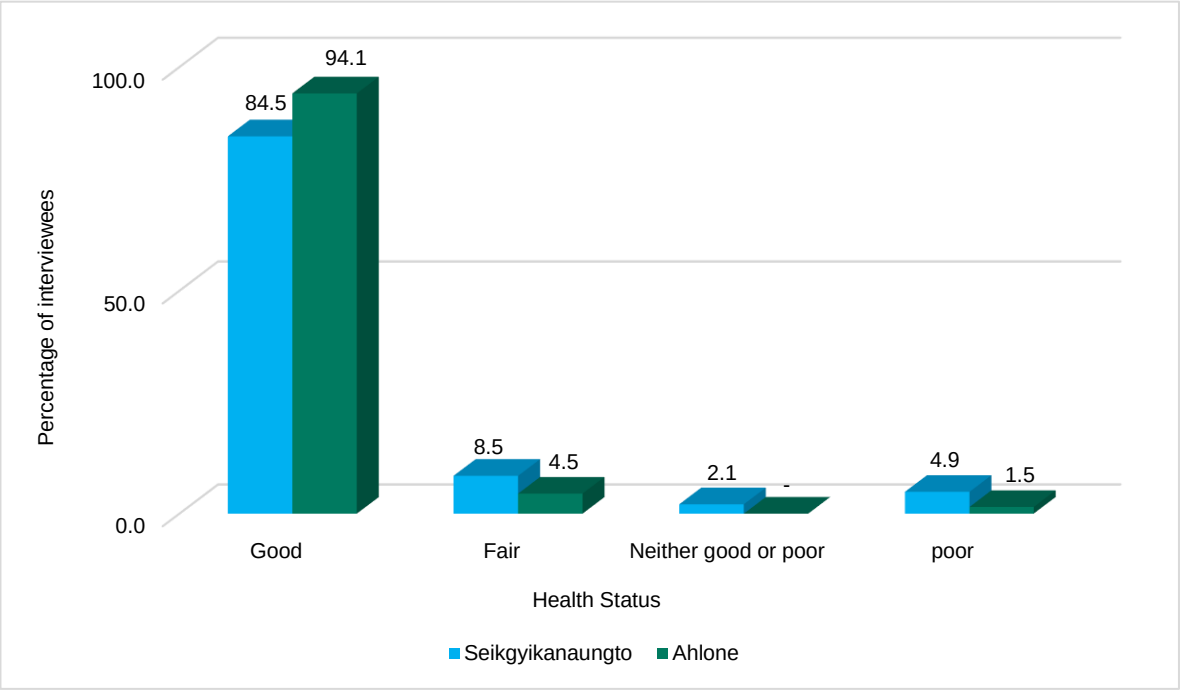
Twantay Township

In this township, among four types of disabilities, the most dominant type is visual issues (***Table 5.46***). Within the township, there is one public hospital (Twantay Public Hospital)[106].

Hlaingthayar Township

In Hlaingthayar Township, there are four types of disabilities, where visual issue is the most dorminant type (***Table 5.46***). Within the township, there are Hlaingthayar Township Hospital[107], Pun Hlaing Siloam Hospital (Yangon)[108], and Hlaingthayar General Hospital[109].

Figure 5.32: Health Status



Source: ERM, November 2018.

[106] https://placesmap.net/MM/Twante-Public-Hospital-2389583/

[107] http://www.yangondirectory.com/en/categories-index/yangon-region/hlaing-thar-yar/484-hospitals-govt/L10711_000000000_hlaing-thar-yar-township-hospital_65481

[108] https://www.punhlaingsiloamhospitals.com/

[109] https://www.myanmaryp.com/company/51773/General_Hospital_[Hlaing_Thar_Yar]

Table 5.47: Diseases in the Last 6 Months

Name of disease	Percentage (%)	
	Seikgyikanaungto Township	Ahlone Township
High blood pressure	8.3	-
Diabetes	-	30.8
Respiratory tract infection	8.3	-
Fever	16.7	15.4
Gout	4.2	7.7
Bronchitis	4.2	-
Heart disease	8.3	15.4
Stomach	8.3	-
Diarrhea	4.2	-
Eye disease	8.3	-
Tuberculosis	4.2	7.7
Paralytic stroke	12.5	-
Indigestion	4.2	-
Cancer	4.2	-
Critical disease	4.2	-
Skin rash/ itches	-	15.4
Hepatitis	-	7.7

Source: ERM, November 2018

5.5.8 Infrastructure, and Amenities

5.5.8.1 Infrastructure

Yangon Region

Yangon has various transport infrastructures, including port, Thilawa deep-water port, airport, roads, bridges, flyovers, highway and Twantay Canal, which connects Yangon River with Irrawaddy River. Importantly, Yangon is the terminus of five railway lines[110]. There are number of roads, connecting Yangon region with other regions in Myanmar as well[111]. Also, it is reported that rural access index (RAI) of Yangon is 60%. According to Asian Development Bank, the Rural Access Index (RAI) is "an internationally used indicator that shows the portion of the rural population that lives less than 2 km away from an all-season road"[112].

Seikgyikanaungto Township

In Seikgyikanaungto Township, there is one road connecting to the rest of city. This road starts from Hlaingtharyar Township and passes through Twantay Township. There is also the bridge, allowing citizens to cross from Seikgyi to Kanaungto. Harbour where boats from other areas, including Maw Tin Harbour or Wardan Jetty will dock can also be found[113]. Moreover, ***Figure 5.34*** shows that majority of

[110] The state of local governance: trends in Yangon – UNDP Myanmar, February 2015 (Web)

[111] Myanmar road network – Logistics Capacity Assessment, May 2018 (Web)

[112] https://www.adb.org/sites/default/files/publication/189079/mya-rural-roads.pdf

[113] 7 day trip ideas for getting out of Yangon – Frontier Myanmar, October 2017 (Blog)

interviewees (60%) stated that type of road surface is concrete. Some of them have paved road connecting to their houses. Overall quality and condition of transportation system of this township is mostly good.

Ahlone Township

In Ahlone Township, there are four main roads – Baho Road, Heavy-Duty Vehicle Commercial Bypass Road, Kyimyindine Kannar Road, and Ahlone Road[114].Yangon circular train can be also found on Ahlone road because Ahlone is one of train stations[115]. Along the road, there are total five bus stops. Ahlone Post Office is located near to Ahlone post office bus stop[116]. Moreover, Ahlone Township also has nine streets as listed below:

1. Min Street;
2. Pa-Day-Thar Street;
3. Shan Yeik Thar Street;
4. Sin Yae Kan Street;
5. Tha-Mar-Daw Street;
6. Thakhin Mya Garden Street;
7. Theint De Street;
8. U Lu Maung Street; and
9. Yama Street[114].

As shown in ***Figure 5.34***, majority of interviewees (72.5%) stated that type of road surface is concrete. Some of them have paved road that connects to their home. Overall quality and condition of transportation system of this township is good.

In the area of Ahlone, three ports can be found near to the Yangon River. Those ports are Asia World Port Terminal[117], Myanmar Industrial Port (MIP)[118] and Ahlone International Port Terminal (A.I.P.T)[119]. Four wharfs can also be discovered as well[120].

Twantay Township

In Twantay, there is the bridge named Pan Hlaing Bridge[121]. There are also concrete[122] and dirt[123] roads. There is a road that links this township to Hlaingthayar Township[51].

[114] Ahlone street – Streets of Myanmar (Web)

[115] Circular train – Birma (Web)

[116] Ahlone, Yangon, Myanmar (Burma) – Latlong (Web)

[117] Asia World Port Terminal – The Yangon Directory (Web)

[118] Yangon port – Myanmar Port Authority (Web)

[119] Ports in Yangon, Myanmar – Global Mars Shipping & Logistics Services Co., Ltd. (Web)

[120] The 2017 Myanmar Living Conditions Survey – Central Statistical Organization (CSO), UNDP and World Bank, June 2018 (Web)

[121] https://myanmar-streets.openalfa.com/streets/%E1%80%95%E1%80%94%E1%80%BA%E1%80%B8%E1%80%9C%E1%80%BE%E1%80%AD%E1%80%AF%E1%80%84%E1%80%BA%E1%80%90%E1%80%B6%E1%80%90%E1%80%AC%E1%80%B8-pan-hlaing-bridge-twantay-yangon

[122] http://www.globalnewlightofmyanmar.com/electricity-improves-livelihoods-of-local-residents-in-twantay-tsp/

[123] https://www.timetravelturtle.com/travel-to-twante-from-yangon-myanmar/

Hlaingthayar Township

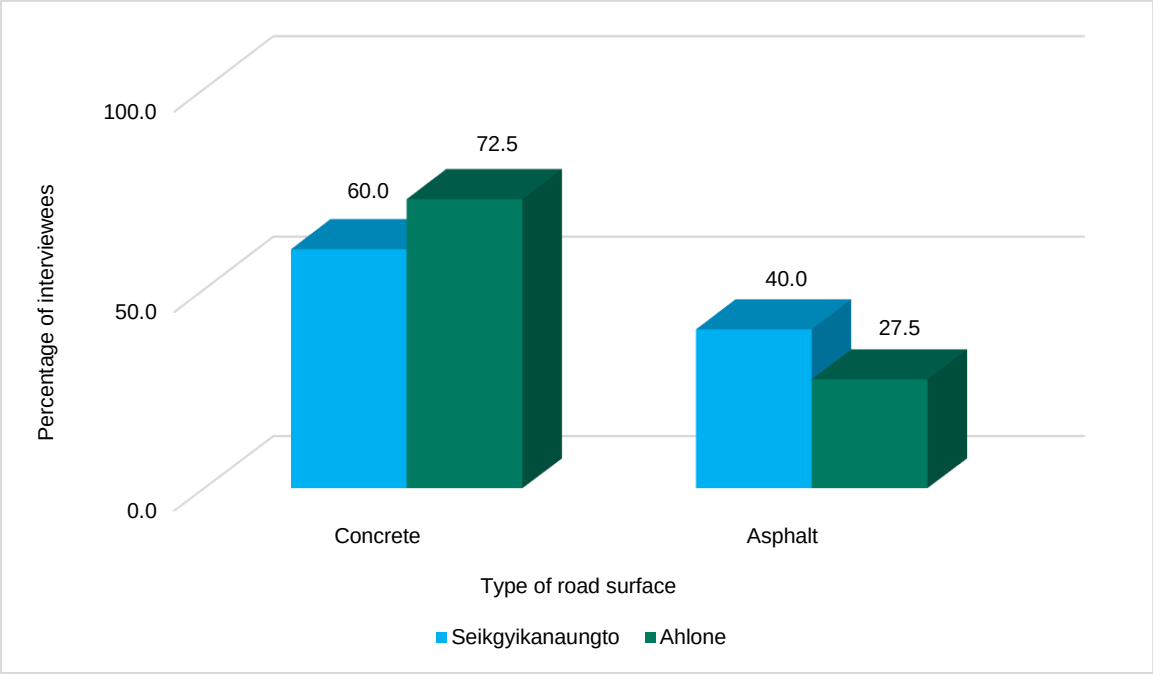
In Hlaingthayar, there are number of roads, including Anawrahta Road, Kyan Sit Thar Road, Kanaung Min Thar Gyi Road, Tabin Shwe Htee Road, Bo Aung Kyaw Road, and Tabinshwehti Road[124]. A road connecting this township to Twantay Township can be found[51].

Figure 5.33: Dirt Road in Twantay

Source: https://www.timetravelturtle.com/travel-to-twante-from-yangon-myanmar/

[124] https://www.openstreetmap.org/way/420090559#map=14/16.8926/96.0528

Figure 5.34: Road Surface



Source: ERM, November 2018

5.5.8.2 Amenities

Yangon Region

From certain proportions of Myanmar citizens, who are aged of 15 and above have accessed to internet, those in Yangon access internet more frequently than those in other regions because 42% of Yangon populations used internet in last 7 days, but 37% of them used internet daily in last 7 days[125]. As shown in ***Table 5.48***, majority of Yangon households widely own smartphones.

Among various regions of Myanmar, Yangon is the location with the highest percentage of households, owing computers (10.9%)[125].

Seikgyikanaungto Township

53.3% of interviewees have accessed to the internet. ***Table 5.49*** shows that in this township, cell phone is the widest available amenity in households.

Ahlone Township

In this township, 80% of interviewees have accessed to the internet. Based on ***Table 5.49***, majority of households own cell phone.

Twantay Township

As shown in ***Table 5.49***, amenity that is widely owned by majority of Twantay citizens is television.

Hlaingthayar Township

As indicated in ***Table 5.49***, majority of populations in this township own television.

[125] The 2017 Myanmar Living Conditions Survey – Central Statistical Organization (CSO), UNDP and World Bank, June 2018 (Web)

Table 5.48: Amenities in Yangon

Types of amenities	Households in Yangon region
Smart phone	91%
Television	75%
Rice cooker	73%
Electric fan	68%
Refrigerator	43%
Charcoal stove	42%
Gas stove	17%
Air conditioner	16%
Keypad phone	11%
Car	10%

Source: The 2017 Myanmar Living Conditions Survey – Central Statistical Organization (CSO), UNDP and World Bank, June 2018 (Web)

Note: above percentage for each type of amenity is individually calculated from total percentage of households

Table 5.49: Amenities in Seikgyikanaungto, Ahlone, Twantay and Hlaingthayar Townships

Types of amenities	Yangon region	Seikgyikanaungto Township	Ahlone Township	Twantay Township	Hlaingthayar Township
Television	71.6%	68.3%	93.5%	52.5%	62.7%
Mobile phone	60.9%	49.6%	92%	32.6%	48%
Radio	25.9%	19.3%	65.5%	39.5%	10.4%
Internet at home	19.1%	11.3%	40.5%	3.8%	8.5%
Computer	11.1%	2.6%	36.9%	1.1%	3.3%
Landline phone	8.2%	5%	24.3%	5.3%	2.8%

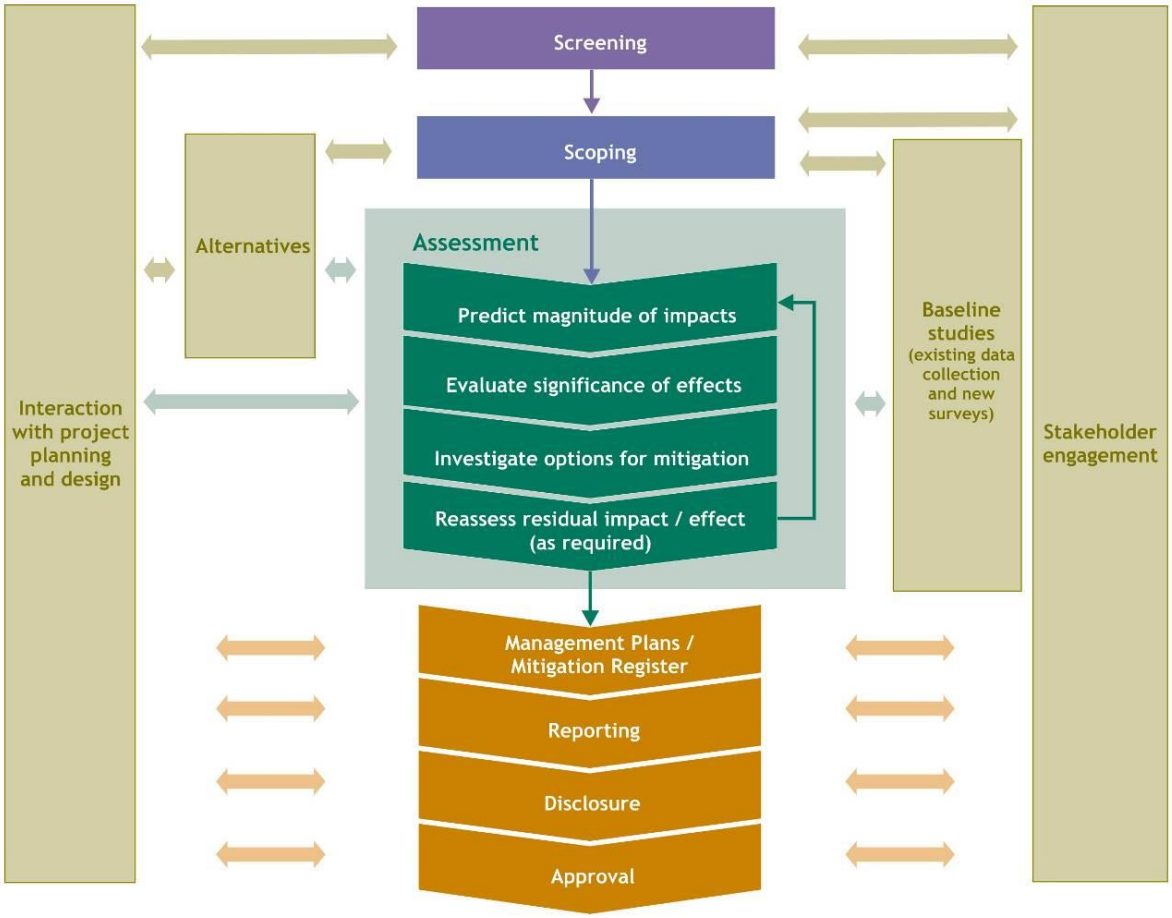
Sources: The 2014 Myanmar Population and Housing Census (Yangon Region) – The Union Report, May 2015 (Web), The 2014 Myanmar Population and Housing Census (Seikkyi Khanaungto Township) – The Union Report, October 2017 (Web), The 2014 Myanmar Population and Housing Census (Ahlone Township) – The Union Report, October 2017 (Web), The 2014 Myanmar Population and Housing Census (Hlinethaya Township) – The Union Report, October 2017 (Web), and The 2014 Myanmar Population and Housing Census (Twantay Township) – The Union Report, October 2017 (Web)

6. IMPACT ASSESSMENT METHODOLOGY

6.1 Introduction

This chapter presents the methodology used to conduct the impact assessment. The impact assessment methodology follows the overall approach illustrated in ***Figure 6.1***. The impact assessment has been undertaken following a systematic process that evaluates the potential impacts the Project could have on aspects of the physical, biological, social/ socio-economic and cultural environment; identifies preliminary measures that the Project will take to avoid, minimise/reduce, mitigate, offset or compensate for potential adverse impacts; and identifies measures to enhance potential positive impacts where practicable.

Figure 6.1: Overall Impact Assessment Process



Source: ERM, 2019

This section also details the methodology applied in the collection and analysis of secondary data used in this Report. Secondary information from TPMC, government sources, non-government organizations (NGOs) and other Project-related stakeholders have been collected to support the preparation of this Report. No primary data was collected for the IEE Study of the Transmission Line.

6.2 Screening Process

At the initial stage of the impact assessment, preliminary information on the Project was provided to understand and determine what legal and other requirements are applicable to the Project. The screening process was conducted with a high-level description of the Project and its associated facilities.

6.3 Scoping Process

As per the Environmental Impact Assessment Procedures, this Project only requires an IEE study and with the nature of an IEE, a scoping report is not required to be submitted. Nevertheless, an informal scoping exercise and process is still needed to determine the scoping of the study. This Scoping stage was undertaken as a means to emphasize the focus on the relevant issues that are most important to the Project planning and action, decision-making and stakeholders' interest. During the scoping stage, potential interactions between the Project, environmental and human resources/receptors were identified and prioritized in terms of their level of potential impacts. ***Table 6.1*** presents the resources/receptors in the scoping stage that will be taken into consideration for its impact and changes from the Project activities. The scoping stage included the review of existing information as well as a site visit to confirm presence of resources/receptors and location of Project components.

Table 6.1: Resources/Receptors and its Respective Potential Impacts Considered in the PPR of this Project

Resources/Receptors	Changes that May Indicate Potential Impacts
Environmental	
Geology	Changes to geology, geomorphology, topography
Soil	Changes to physical properties and soil ecology
Surface water	Changes to physical, chemical or biological quality of rivers and other surface water bodies; Introduction of exotic species, changes in habitat quality, abundance, diversity; Wastewater effluent discharge
Groundwater	Contamination of shallow or deep groundwater resources, change in ground water resources
Fisheries	Changes in fisheries productivity (1 river – crossing over Pun Hlaing River)
Vegetation	Changes to vegetation population, health, species abundance and diversity and impact on endangered and economic species, food chain effects
Wildlife	Changes to wildlife assemblages, impact on endangered and economic species, food chain effects
Air	Emissions of dust and vehicle exhaust
Noise and vibration	Change in noise or vibration levels
Aesthetics	Physical presence of facilities
Waste	Generation of wastes – hazardous and non-hazardous
Social / Socio-economic	
Population and physical displacement	Changes in total population, gender ratio, age distribution. Physical displacement from residence as a result of Project land take, or activities
Social and cultural structure	Disruption in local authority and governance structure; change in social behaviours; alterations to social and cultural networks; intra and inter-ethnic conflict
Economy and employment	Change in national/local economy, employment, standard of living, occupation

Resources/Receptors	Changes that May Indicate Potential Impacts
Resource ownership and use	Temporary or permanent restriction for accessing or using land or water, changes in livelihood activities based on natural resources; changes in ownership of such resources.
Cultural resources	Physical disturbance of shrines, burial grounds, archaeological resources or other desecration or change in access to cultural resources, rituals or celebrations carried out in their premise.
Infrastructure and public services	Improvement or pressure on existing urban/rural infrastructure or services including: transportation; power, water, sanitation, security, waste handling facilities etc.
Community Health and Safety	
Mortality and key health indicators	Change in the mortality profile of the community; changes in life expectancy, birth rates, death rates, maternal mortality rates etc.
Environmental change	Decreased air quality (e.g. NO_x, SO_x, VOC, CO, PM), contamination of surface waters and potable ground water, increased vibration and noise, increased night time light beyond acceptable limits, changes to the visual environment.
Communicable and non-communicable diseases	Change in incidence and /or prevalence of communicable and non-communicable diseases or disease causing factors
Vector borne diseases	Changes in the incidence and or prevalence of vector borne diseases, the density of these vectors and their breeding grounds.
Sexually transmitted diseases	Changes in the incidence and /or prevalence of sexually transmitted diseases and the factors that contribute to this (external workforce, transport routes etc.)
Nutritional status	Changes to nutritional status and food security
Health care/ recreational facilities	Changes in availability of and access to health care and recreational facilities including green space
Psychosocial /lifestyle factors	Drug use/abuse, prostitution, communal violence, crime, suicide and depression; changing expectations of quality of life

Source: ERM, 2019.

6.4 Project Description

In order to determine the scope of the Project features and activities, with consideration to the potential impacts the Project activities has within the Project Study Area, a Project Description chapter (***Chapter 4***) has been prepared. Details of the Project design, information, specification during the construction and operation phase as well as unplanned event from the Project activities, are provided in ***Chapter 4*** of this IEE Report.

6.5 Baseline Condition

To provide the context and supplement the potential impacts of the Project, a description of physical, biological, social/socio-economic and cultural conditions with the absence of the Project is presented through desktop research and information provided by the Project Proponent. Note that no primary data or baseline sampling is required for an IEE Study but some primary data collected in Yangon Region from the ESIA Study for Ahlone Power Plant Expansion Project has been adapted to supplement the baseline condition.

6.6 Stakeholder Engagement

An effective engagement process for an IEE study requires the presentation of the Project, the Project team and the result of the Impact Assessment study to the stakeholders of the Project. This process has assist in understanding and gaining the stakeholder's perspective on the presence of the Project, the identified impacts and proposed mitigation measures. The results of the public engagement activities have been integrated in the final study to reflect stakeholders views.

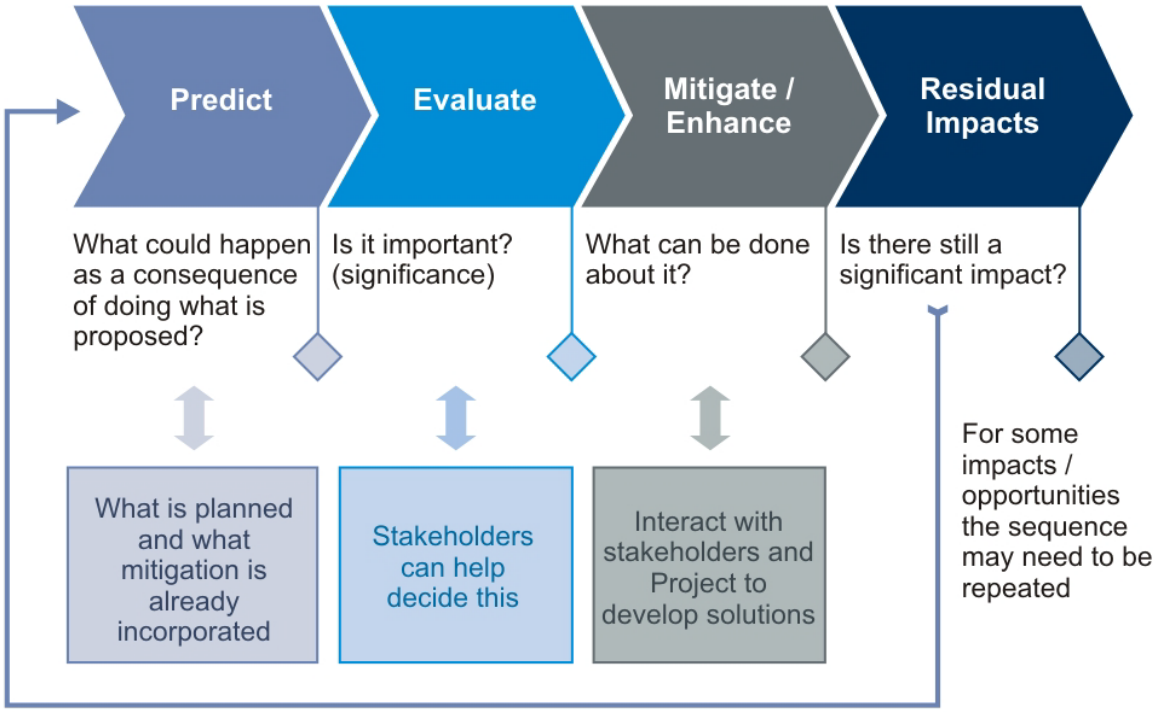
Stakeholder Engagement activities have been undertaken for this Project and the results are presented in ***Chapter 9*** of this Report.

6.7 Impact Assessment Process

Impact identification and assessment covers all phases of the Project (construction, operation and decommissioning). The impact assessment steps are summarized in ***Figure 6.2*** and comprises of:

- Impact Prediction: to determine what could potentially happen to resources/receptors as a consequences of the Project and its associated activities;
- Impact Evaluation: to evaluate the significance of the predicted impacts by considering their magnitude and likelihood of occurrence, and the sensitivity, value and/or importance of the affected resources/receptors;
- Mitigation and Enhancement: to identify appropriate and justified measures to be used for mitigating potential negative impacts and enhance potential positive impacts; and
- Residual Impact Evaluation: to evaluate the significance of potential impacts assuming effective implementation of mitigation and enhancement measures.

Figure 6.2: Impact Assessment Process



Source: ERM, 2018

6.7.1 Prediction of Impacts

Prediction of impacts is essentially an objective exercise to determine what the likelihood is of an impact occurring to an environment as a consequence of the Project and its associated activities. From the potentially significant interactions identified in the scoping stage, the impacts to different resources/receptors are assessed and evaluated. As part of the impact assessment process, various techniques and methods are used to fully understand and predict the impacts, these includes quantitative, semi-quantitative and qualitative techniques.

6.7.2 Evaluation of Impacts

Once the prediction of potential impacts is determined, each individual impact is categorized and characterized in terms of their definition (e.g. type, scale, duration, frequency, extent). The terminology and designations used to describe impact characteristics are shown in ***Table 6.2***.

Table 6.2: Impact Characteristics Terminology, Definition and Designations

Characteristic	Definition	Designations
Type	A descriptor indicating the relationship of the potential impact to the Project (in terms of cause and effect).	■ Direct ■ Indirect ■ Induced
Extent	The “reach” of the potential impact (e.g., confined to a small area around the Project Footprint, projected for several kilometres, etc.).	■ Local ■ Regional ■ International
Duration	The time period over which a resource / receptor is potentially affected.	■ Temporary ■ Short term ■ Long term

Characteristic	Definition	Designations
Scale	The size of the potential impact (e.g., the size of the area with the potential to be damaged or impacted, the fraction of a resource that could potentially be lost or affected, etc.).	[no fixed designations; intended to be a numerical value or a qualitative description of "intensity"]
Frequency	A measure of the constancy or periodicity of the potential impact.	[no fixed designations; intended to be a numerical value or a qualitative description]

Source: ERM, 2019.

The definitions for the type of *designations* are shown in ***Table 6.3***. Definitions for the other designations are resource/receptor-specific, and are discussed in the resource/receptor-specific impact assessment chapters presented later in this Report.

Table 6.3: Definition of Designation Type

Type	Definition
Direct	Potential impacts that result from a direct interaction between the Project and a resource/receptor (e.g., between occupation of a plot of land and the habitats which are affected).
Indirect	Potential impacts that follow on from the direct interactions between the Project and its environment as a result of subsequent interactions within the environment (e.g., viability of a species population resulting from loss of part of a habitat as a result of the Project occupying a plot of land).
Induced	Potential impacts that result from other activities (which are not part of the Project) that happen as a consequence of the Project (e.g., influx of camp followers resulting from the importation of a large Project workforce).

Source: ERM, 2019.

The above characteristics and definitions apply to planned and unplanned events. An additional characteristics that pertains only to unplanned events is *likelihood*. The *likelihood* of an unplanned event occurring is designated using a qualitative scale, as described in ***Table 6.4***.

Table 6.4: Definition of Likelihood Type

Likelihood	Definitions
Unlikely	The event is unlikely but may occur at some time during normal operating conditions.
Possible	The event is likely to occur at some time during normal operating conditions.
Likely	The event will occur during normal operating conditions (i.e., it is essentially inevitable).

Source: ERM, 2019.

Once impact characteristics are defined, the next step in the impact assessment phase is to assign each potential impact a *magnitude*. Magnitude refers to a function of some combination (depending on the resource/receptor in question). Of the following impact characteristics:

- Extent;
- Duration;
- Scale;
- Frequency; and
- Likelihood (for unplanned events only).

Magnitude essentially describes the intensity of the change that is predicted to occur in the resource/receptor as a result of the potential impact. The magnitude designations themselves are universally consistent, but the definition varies depending on the resource/receptor. The universal magnitude designations are:

- Positive;
- Negligible;
- Small;
- Medium; and
- Large.

In the case of a potential positive impact, no magnitude designation (aside from 'positive') is required. It is considered sufficient for the purpose of the impact assessment to indicate that the Project is expected to result in a positive impact, without characterizing the exact degree of positive change likely to occur.

In the case of a potential impacts resulting from unplanned events, the same resource/receptor-specific approach to concluding a magnitude designation is utilized. However, the *likelihood* factor is considered, together with the other impact characteristics, when assigning a magnitude designation.

In addition to characterizing the magnitude of impact, the other principle impact evaluation step is definition of the sensitivity/vulnerability/importance of the impacted resource/receptor. There are a range of factors to be taken into account when defining the sensitivity/vulnerability/importance of the resource/receptor, which may be physical, biological, cultural or human. Other factors may also be considered, such as legal protection, government policy, stakeholder views and economic value. As in the case of magnitude, the sensitivity/vulnerability/importance designations themselves are universally consistent, but the definitions for these designations vary on a resource/receptor basis.

The sensitivity/vulnerability/importance designations used herein for all resources/receptors are:

- Low;
- Medium; and
- High.

Once magnitude of impact and sensitivity/vulnerability/importance of resource/receptor have been characterized, the significance can be assigned for each impact. Impact significance is designated using the matrix shown in ***Table 6.5***.

Table 6.5: Significance of Impact

		Sensitivity/Vulnerability/Importance of Resource/Receptor		
		Low	**Medium**	**High**
Magnitude of Impact	**Negligible**	Negligible	Negligible	Negligible
	Small	Negligible	Minor	Moderate
	Medium	Minor	Moderate	Major
	Large	Moderate	Major	Major

Source: ERM, 2019.

The matrix applies universally to all resources/receptors, and all impacts to these resources/receptors, as the resource/receptor-specific considerations are factored into the assignment of magnitude and sensitivity/vulnerability/importance designations that enter into the matrix. ***Box 1*** provides a summary context of what the various impact significance ratings signify.

It is important to note that impact prediction and evaluation take into account any embedded controls (i.e. physical or procedural controls that are already planned as part of the Project design, regardless of the results of the IA Process). This avoids the situation where an impact is assigned a magnitude based on a hypothetical version of the Project that considers none of the embedded controls.

Box 1: Context of Impact Significances

An impact of **negligible** significance is one where a resource/receptor (including people) will essentially not be affected in any way by a particular activity or the predicted effect is deemed to be 'imperceptible' or is indistinguishable from natural background variations.

An impact of **minor** significance is one where a resource/receptor will experience a noticeable effect, but the impact magnitude is sufficiently small and/or the resource/receptor is of low sensitivity/vulnerability/importance. In either case, the magnitude should be well within applicable standards.

An impact of **moderate** significance has an impact magnitude that is within applicable standards, but falls somewhere in the range from a threshold below which the impact is minor, up to a level that might be just short of breaching a legal limit. Clearly, to design an activity so that its' effects only just avoid breaking a law and/or cause a major impact is not best practice. The emphasis for moderate impacts is therefore on demonstrating that the impact has been reduced to a level that is as low as reasonably practicable (ALARP). This does not necessarily mean that impacts of moderate significance have to be reduced to minor, but that moderate impacts are being managed effectively and efficiently.

An impact of **major** significance is one where an accepted limit or standard may be exceeded, or large magnitude impacts occur to highly valued/sensitive resource/receptors. An aim of IEE is to get to a position where the Project does not have any major residual impacts, certainly not ones that would endure into the long-term or extend over a large area. However, for some aspects there may be major residual impacts after all practicable mitigation options have been exhausted (i.e. ALARP has been applied). An example might be the visual impact of a facility. It is then the function of regulators and stakeholder to weigh such negative factors against the positive ones, such as employment, in coming to a decision on the Project.

6.7.3 Identification of Mitigation and Enhancement Measures

Once the significance of a potential impact has been characterised, the next step is to evaluate what relevant and appropriate mitigation and enhancement measures are warranted. For the purposes of this IEE Study, ERM has adopted the following Mitigation Hierarchy:

- **Avoid at Source, Reduce at Source**: avoiding or reducing at source through the design of the Project (e.g. avoiding by siting or re-routing activity away from sensitive areas or reducing by restricting the working area or changing the time of the activity);
- **Abating on-site**: add something to the design to abate the impact (e.g. pollution control equipment, traffic controls, perimeter screening and landscaping);
- **Abate at Receptor**: if an impact cannot be abated on-site then control measures can be implemented off-site (e.g. noise barriers to reduce noise impact at a nearby residence or fencing to prevent animals straying onto the site);
- **Repair or Remedy (Remediate)**: some impacts involve unavoidable damage to a resource (e.g. agricultural land and forestry due to creating access, work camps or materials storage areas) and these impacts can be addressed through repair, restoration or reinstatement measures; and
- **Compensate in Kind, Compensate Through Other Means**: where other mitigation approaches are not possible or fully effective, then compensation for loss, damage and disturbance might be

appropriate (e.g. planting to replace damaged vegetation, financial compensation for damaged crops or providing community facilities for loss of fisheries access, recreation and amenity space).

The priority in mitigation is to first apply mitigation measures to the source of the potential impact (i.e. to avoid or reduce the magnitude of the potential impact from the associated Project activity). Followed by addressing the resultant effect to the resource/receptor via abatement or compensatory measures or offset the impacts (i.e. to reduce the significance of the effect once all reasonable practicable mitigations have been applied to reduce the impact magnitude).

6.7.4 Residual Impact Evaluation

Once mitigation enhancement measures are declared, the next step in the IEE Process is to assign residual impact significance. This is essentially a repeat of the impact assessment steps discussed above, considering the implementation of the proposed mitigation and enhancement measures.

6.8 Management, Monitoring and Audit

The final stage in the impact assessment process is defining the basic management and monitoring program that are required to identify whether:

1. Impacts or their associated Project components remain in conformance with applicable standards; and
2. Mitigation measures are effectively addressing impacts and compensatory measures and offsets are reducing effects to the extent predicted or desired.

A Register Commitments, which is a summary of all actions which the Project Proponent has committed to executing with respect to environmental/social/health performance of the Project, is also included as part of this Report (***Chapter 12***). The Register of Commitments includes references to mitigation measures, compensatory measures and offsets and management and monitoring activities.

7. IMPACT ASSESSMENT

7.1 Air Quality Impact Assessment

7.1.1 Introduction

During the construction and operation phases, different activities have the potential to generate air emission and pollution, which could lead to impacts on the air quality of the surrounding condition, at local extent. In the Project Study Area, communities settlement in Hlaingthayar Township is identified as the most prominent potential receiving body with hospitals targeted as one of the most sensitive receptors around the Study Area. Therefore, it is important to understand the interaction between impacts generated from construction and operation activities of the Project and the subsequent effects on air quality. This Section presents an evaluation of the potential impacts on air quality associated with the construction and operation of the proposed Project based on the impacts identified during scoping activity.

This Section will also develop management, mitigation and monitoring measures needed to ensure that any identified impacts can be reduced to as low as reasonably practicable. Such measures are presented in this Section and will form part of the overall Environmental and Social Management Plan (ESMP, ***Chapter 10***) for the Project.

7.1.2 Assumptions and Limitations

The assessment of potential impacts related to air quality in this Section is based on the environmental baseline data (presented within ***Section 5.2***), socio-economic baseline data (presented within ***Section 5.4***) and the information available from TPMC at the time of writing. Judgements and assessment have been made based on professional knowledge and previous experience of ERM. It is noted that no quantitative modelling has been undertaken with regards to any elements of the air quality impact assessment. Should there be significant changes in factors such as assumed input data, engineering design of air emission management components of the Project, or agreed assessment criteria, then elements of this impact assessment and associated management, mitigation and monitoring measures may needed to be revised to reflect these changes.

7.1.3 Assessment Methodology

The methodology used for assessing impacts to air quality is aligned with the general impact assessment methodology presented in ***Chapter 6***.

7.1.4 Baseline Summary

The proposed Transmission Line will be routed from Ahlone Township, crossing over the Yangon River into Seikgyikanaungto Township where the direction then move north into Twantay and then ending the Line in Hlaingthayar Township. The regional air shed quality of the Project Study Area is considered poor (due to high $PM_{2.5}$), which is determined to be above the Myanmar annual average air quality standard. As a result, this is categorised as damaging to human health within the region. The likely source of this air pollution in Myanmar is reported as to be inefficient modes of transport, coal fired power plants, combustion of household fuels for cooking, lighting and heating, and industrial agriculture and waste burning and incinerating[126].

The baseline assessment indicates that the existing ambient concentrations of relevant substances in the study area are below the relevant air quality standards. On this basis, the air shed is considered ‘undegraded’.

[126] http://www.mmtimes.com/index.php/national-news/22840-myanmar-s-air-pollution-among-the-worst-in-the-world-who.html

7.1.5 Receptor Identification and Sensitivity

The primary receptor for impacts to air quality from air emission and pollution is humans living in communities within the Study Area and Area of Influence from the degrade of air quality. The Area of Influence can extend depending on the metrological data such as wind speed, wind direction, humidity and air pressure. Highly sensitive receptors is identified to be hospitals, nursing home and kindergarten to primary schools whereby most people that are living here will be highly influential to slight changes of air quality. Within the 250 m Study Area, the only sensitive receptors are a few houses. Overall, this put the Project Location in an area with medium level of receptor sensitivity.

7.1.6 Project Activity

7.1.6.1 Construction Phase

During the construction phase, potential impacts to air quality may arise from the following activities:

- Potential impacts to air quality from earthworks including ground excavation, material removal, transfer and stockpiling;
- Potential impacts to air quality from construction of the main infrastructure including the Transmission Tower; and
- Potential impacts to air quality from track out of dusty materials onto the public road network.

The associated impacts that may arise from construction activities include:

- Dust deposition resulting in the soiling of surfaces including homes and places of business; and
- Elevated PM_{10} concentrations at air sensitive receptors.

Exhaust emissions from on-site plant and equipment (also known as non-road mobile machinery or NRMN) and site traffic are unlikely to impact ambient air quality and have not been considered further.

7.1.6.2 Operation Phase

During the Transmission Line operation phase (anticipated to be 25 years), related activities include the transfer of electricity between the two substations and Transmission Line maintenance activities. Both of these activities are not expected to have any significant impacts towards air quality, therefore, the Transmission Line operation phase will not be assessed.

7.1.6.3 Decommissioning Phase

At present, there are no plans or schedule for decommissioning of the proposed Project. It is likely that the Project facilities will only be decommissioned/ abandoned once it is no longer economical to continue operation, the Transmission Line is rendered redundant and/or no longer required for various reasons or is unsafe to operate. As the development process of the site is yet to fully begin, detailed decommissioning plans have not yet been formulated.

The Project facilities will be designed with decommissioning in mind. In general, facilities and machinery will be designed so that they can be isolated and decommissioned in steps which are in reverse of the installation procedure or which are most convenient to do so. The decommissioning phase activities will therefore be similar to those associated with the excavation/foundation work, installation and civil construction phases.

7.1.7 Assessment of Impacts

7.1.7.1 Impact to Air Quality during Construction Phase

Overview

Dust emissions during the construction phase can vary substantially and will largely depend on the activity being undertaken; the duration of the activity; the size of the site; the meteorological conditions; the proximity and sensitivity of the receptors; and the adequacy of the mitigation measures in place to reduce emissions.

The Institute of Air Quality Management (IAQM) provide specific guidance for defining the dust impact risk from construction sites based on a) the scale and nature of the works; and b) the sensitivity of the receiving area. The premise of the IAQM guidance is that with the implementation of effective site-specific mitigation and management measures, the environmental effect will not be significant in most cases. The guidance also provides screening criteria of 350 m and 50 m from the construction site and access road respectively beyond which impacts are not considered likely.

During construction phase, the use of vehicles and equipment is expected on-site in order to assist the workers in moving around, lifting heavy objects, and other construction activities. The details of expected type of truck, duration and number of trucks used per day is presented in ***Table 7.1***. Additionally, the key pollution generated from this construction activities is particulate matters in both $PM_{2.5}$ and PM_{10} form. This Section will focus mainly on the assessment of this emission.

Table 7.1: Expected Vehicle Used During Construction

Item no.	Type of vehicle	No. of vehicles (Peak/ Average) per day	Duration of use (hours)	Total road length
1	Truck	5/4	5-8	100-200 km/unit/day
2	Pick-up Truck	6/4	5-8	100-200 km/unit/day
3	Concrete Transit Mixer	2/2	4-6	80-150 km/unit/day

Source: TPMC, 2019

Site preparation will be needed for the erection of Transmission Tower. These site preparation activities will include on-site earthworks, land clearance, material handling and stockpiling. Additionally, construction of the main infrastructure will also participate in producing dust as well as the site preparation activities. The total amount of earthworks (excavation) and land clearing activities (anticipated to produce the most dust) is 23,000 m^2 and 10,000 m^2.

A summary of impact significance associated with the construction of the Transmission Line and erection of Transmission Tower (pre-mitigation) is presented in ***Table 7.2***, ***Table 7.3*** and ***Table 7.4***.

Table 7.2: Summary of Dust Risk from the Transmission Line Construction

Potential Impact	Risk [a]			
	Demolition [a]	Earthworks	Construction	Track out
Dust Soiling	*n/a*	Low	Low	Low
Human Health	*n/a*	Low	Low	Low
Ecological	*n/a*	Medium	Low	*n/a*

[a] *As per IAQM approach*
[b] *No demolition required so assessment of risk is not applicable*

Impact Assessment Table

Table 7.3: Impact Assessment Table for Human Health and Nuisance Relating to Transmission Line Construction

Significance of Impact					
Impact	Potential impacts on ambient air quality due to the various activities during construction phase.				
Impact Nature	**Negative**	Positive	Neutral		
	Potential impacts is considered to be adverse (negative).				
Impact Type	**Direct**	Indirect	Induced		
	Potential impacts would likely be direct impacts.				
Impact Duration	Temporary	**Short-term**	Long-term	Permanent	
	Construction is expected to be complete in 25 months, which would be considered short-term.				
Impact Extent	**Local**	Regional	International		
	Potential impacts would be limited to the Project Area and within the local air shed of Yangon.				
Impact Scale	The impact scale is anticipated to be moderate due to the large Project Area covering four (4) Townships and two (2) rivers.				
Frequency	Impacts to air quality could occur intermittently but repeatedly throughout the day for the duration of the construction phase.				
Impact Magnitude	Positive	Negligible	**Small**	Medium	Large
	Based on the above impact characteristics, the impact magnitude is therefore concluded to be small.				
Receptor Sensitivity	**Low**	Medium	High		
	There are 1-10 residential receptors, located <350 m from the site boundary, and only four receptors, located <50 m from the road up to 500 m from the site entrance. The sensitivity of the area is therefore low.				
Impact Significance	**Negligible**	Minor	Moderate	Major	
	From small impact magnitude and low level of receptor sensitivity, the impact significance is therefore negligible.				

Table 7.4: Impact Assessment Table for Ecology Relating to Transmission Line Construction

Significance of Impact				
Impact	Potential impacts on ambient air quality due to the various activities during construction phase.			
Impact Nature	**Negative**	Positive	Neutral	
	Potential impacts is considered to be adverse (negative).			
Impact Type	**Direct**	Indirect	Induced	
	Potential impacts would likely be direct impacts.			
	Temporary	**Short-term**	Long-term	Permanent

Significance of Impact					
Impact Duration	Construction is expected to be complete in 25 months, which would be considered short-term.				
Impact Extent	**Local**	Regional	International		
	Potential impacts would be limited to the Project Area and within the local air shed of Yangon.				
Impact Scale	The impact scale is anticipated to be moderate due to the large Project Area covering four (4) Townships and two (2) rivers.				
Frequency	Impacts to air quality could occur intermittently but repeatedly throughout the day for the duration of the construction phase.				
Impact Magnitude	Positive	Negligible	**Small**	Medium	Large
	Based on the above impact characteristics, the impact magnitude is therefore concluded to be small.				
Receptor Sensitivity	Low	Medium	**High**		
	Agriculture exists < 20 m from the site boundary and < 20 m from the access road up to 500 m from the site entrance. The sensitivity of the area is therefore high.				
Impact Significance	Negligible	Minor	**Moderate**	Major	
	From small impact magnitude and high level of receptor sensitivity, the impact significance is therefore moderate.				

Mitigation Measures

A series of project specific mitigation measures for earthworks, construction and track out are presented below. These are based on the outcome of the dust risk assessment summarised in the baseline Section. Where the assessment predicts negligible and moderate impacts, no site-specific mitigation measures are proposed.

- All dust and air quality complaints will be recorded, the cause identified and appropriate measures such as those presented in this table will be implemented or intensified to reduce dust emissions in a timely manner;
- Watering will be used to suppress wind and physical disturbance dust generation;
- Ensure an adequate water supply on-site for effective dust suppression and mitigation;
- Re-vegetate earthwork and exposed areas as soon as is practicable;
- Use hessian, mulches or tackifier where it is not possible to revegetate, or cover with top soil as soon as is practicable;
- Sand and other aggregates will be stored in bunded areas and will not be allowed to dry out unless this is required for a particular process, in which case additional control measures such as those discussed in ‘General Construction’ will be applied;
- All vehicles will switch off engines when stationary;
- A regular vehicle and machinery maintenance and repair programme will be implemented;
- Ensure that all vehicles entering and leaving the site are covered to avoid fugitive emissions during transport; and
- Regularly dampen/clean the site access and local roads to remove any materials tracked out of the site.

Residual Impacts

Residual impacts would expected to be of **Negligible Negative Impact** significance for human health and nuisance effects.

Residual impacts would expected to be of **Minor to Negligible Negative Impact** significance for ecology.

Monitoring Plan

As detailed in the ESMP chapter (***Chapter 10***), monitoring for air quality during the construction phase should consist of the following:

- Bi-monthly monitoring of PM_{10} and $PM_{2.5}$ at the nearest sensitive receptors during construction phase.

7.1.7.2 Impact to Air Quality during Operation Phase

Overview

During the operation phase of the Transmission Line, related operation and maintenance activities are anticipated to not generate any significant impacts to air quality. Therefore no impact assessment of air quality for Transmission Line during operation phase are to be presented.

7.1.7.3 Impact to Air Quality during Decommissioning Phase

Overview

During the decommissioning phase of the Project, it is anticipated that a number of vehicles, machineries and equipment that will generate air emissions will be operating on-site. This will contribute to the baseline air condition. Additionally, it is expected that the Project activities during decommissioning will be similar to what was presented in the construction phase. However, without proper knowledge of potential development in the area and facilities (recycling of electric materials), it is not possible to establish clearly these mitigations and therefore this should be the subject of a new assessment in time of decommissioning.

7.2 GHG Impact Assessment

7.2.1 Introduction

During the construction and operation phases, different activities have the potential to generate GHG emission, which could lead to impacts on the GHG level of the surrounding area, at local and possibly regional scale. Therefore, it is important to understand the interaction between impacts generated from construction and operation activities of the Project and the subsequent effects on GHG condition.

This Section will also develop management, mitigation and monitoring measures needed to ensure that any identified impacts can be reduced to as low as reasonably practicable. Such measures are presented in this Section and will form part of the overall Environmental and Social Management Plan (ESMP, ***Chapter 10***) for the Project.

7.2.2 Assumptions and Limitations

It is noted that all greenhouse data in this report cannot yet be used for official greenhouse gas inventory reporting[127] until the site is operational and actual operational data would be used for a more precise GHG inventory calculation.

[127] Official greenhouse gas inventory reporting includes Sustainability Reporting, CDP, DJSI or other nationally relevant greenhouse reporting schemes.

All greenhouse gas calculation methodologies have been formulated using accurate calculation methodologies sourced from Intergovernmental Panel on Climate Change (IPCC). These methodologies can be replicated for greenhouse gas inventory use when the Project becomes operational.

In this Section, some assumption are made, as below:

- The GHG assessment for the Project will focus on the construction and operation phases, excluding pre-work and land development phases, as the majority of the Project emission will occur during these periods; and
- This document focuses on CO_2, CH_4 and N_2O emissions, because these are the most prevalent GHGs emitted from industry operations.

7.2.3 Assessment Methodology

The methodology used for assessing impacts to GHG levels is aligned with the general impact assessment methodology presented in ***Chapter 6***.

7.2.4 Baseline Summary

Projected climate changes across Myanmar have been studied based on both General Circulation Model (GCMs) used in the Intergovernmental Panel on Climate Change (IPCC's) fourth assessment, and using dynamic downscaling with regional climate models forced by the GCMs[128].

According to data from the World Resources Institute (2014), Myanmar's total GHG emissions (excluding land use change and forestry) in 2013 were 98.75 million tons of CO_2 equivalent ($MtCO_2$)[129]. The major sectors producing CO_2 emissions are agriculture (65%) and energy (22%).

7.2.5 Receptor Identification and Sensitivity

The direct receptor in the scope of this impact assessment is the global atmosphere. The indirect receptors from climate change due to an increase global greenhouse gas emissions include Myanmar's weather.

In accordance to National Oceanic and Atmospheric Administration, *Global Climate Report – Annual 2018*, during 2018, 11 of 12 monthly global land and ocean temperature departures from average ranked among the five warmest for their respective months, giving way to the fourth warmest year in NOAA's 139-year records, in which the top warmest years are all from the recent years (2015-2017) since the pre-industrial time. The year 2018 began with a La Niña episode present across the tropical Pacific Ocean, transitioning to ENSO-neutral by April 2018[130]. The frequency and intensity of extreme high temperature events are virtually certain to increase in the future as global temperature increases (high confidence). Extreme precipitation events will also very likely continue to increase in frequency and intensity throughout most of the world (high confidence).

Myanmar's Intended Nationally Determined Contribution (INDC)[131] reported that Myanmar is extremely vulnerable to the negative effects of climate change. In 2015, for the third year, Myanmar was ranked globally by studies, as the second most vulnerable country in the world to extreme weather events over the last 20 years. In addition, climate models predict further sustained impacts from climate change in the future, which will further expose Myanmar to the negative impacts of climate change. Thus global GHG emission would highly influence the negative impact on Myanmar.

[128] Intergovernmental Panel on Climate Change. IPCC Fourth Assessment Report (AR4), (2007), Climate Change: Synthesis Report

[129] CAIT Climate Data Explorer – Myanmar. [Online] Available at: http://cait.wri.org/profile/Myanmar [Accessed 15 May 2017].

[130] https://www.ncdc.noaa.gov/sotc/global/201813

[131] https://www4.unfccc.int/sites/ndcstaging/Pages/Home.aspx

7.2.6 Project Activity

7.2.6.1 Construction Phase

During the construction phase, GHG emission may arise from the following activities:

- Potential impacts to air quality from the use of vehicles and equipment.

7.2.6.2 Operation Phase

During the Transmission Line operation phase (anticipated to be 25 years), related activities include the transfer of electricity between the two substations and Transmission Line maintenance activities. Both of these activities are not expected to have any significant impacts towards GHG condition, therefore, the Transmission Line operation phase will not be assessed.

7.2.6.3 Decommissioning Phase

At present, there are no plans or schedule for decommissioning of the proposed Project. It is likely that the Project facilities will only be decommissioned/ abandoned once it is no longer economical to continue operation, the Transmission Line is rendered redundant and/or no longer required for various reasons or is unsafe to operate. As the development process of the site is yet to fully begin, detailed decommissioning plans have not yet been formulated.

The Project facilities will be designed with decommissioning in mind. In general, facilities and machinery will be designed so that they can be isolated and decommissioned in steps which are in reverse of the installation procedure or which are most convenient to do so. The decommissioning phase activities will therefore be similar to those associated with the excavation/foundation work, installation and civil construction phases.

7.2.7 Assessment of Impacts

7.2.7.1 Overview

This Section will assess the various impacts from project activities that is anticipated to have a significant impact towards GHG levels. The Project activities, and their corresponding impacts, that will be assessed are as follows:

- Use of vehicles and equipment; and
- Use of road transport.

7.2.7.2 Impact from GHG during Construction Phase

Overview

During construction phase, the use of vehicles, equipment and generator is expected on-site in order to assist the workers in moving around, lifting heavy objects, and other construction activities. The details of expected type of truck, duration and number of trucks used per day is presented in ***Table 7.5***. Additionally, there will also be a diesel back-up generator on-site to support construction during black-out and power disruption however, it is anticipated that the use of this will be highly unlikely and therefore not assessed in this section.

Table 7.5: Expected Vehicles and Machineries and its GHG Emission

Type of vehicle	Activity Data					Emission Factors (kg CO_2e per ton-km)[132]	GHG Emission	
	Fuel type	No. of vehicles per day	Total road length	Total weight of freight (ton)	Total Working day		(kg CO_2e)	(tonnes CO_2e)
Truck (4-wheel)	Diesel	5	200 km/unit/day	7	600	0.1402[1]	588,840	588.84
Pick-up Truck	Diesel	6	200 km/unit/day	7	600	0.1402[1]	706,608	706.61
Concrete Transit Mixer (Empty)	Diesel	2	75 km/unit/day	8	600	0.0524[2]	37,728	37.73
Concrete Transit Mixer (Full)	Diesel	2	75 km/unit/day	12	600	0.0524[2]	56,592	56.59
Total							1,389,768	1,389.77

Note: Calculation of GHG emissions are based on peak vehicle use, duration and highest travel distance. Assuming one trip per day per vehicle
[1] Emission Factor for truck; [2] Emission Factor for Concrete Transit Mixer

Source: TPMC, 2019

Table 7.6: Road Transport Default Emission and Uncertainty Range

Fuel Type	CO_2 (kg/TJ)			CH_4 (kg/TJ)			N_2O (kg/TJ)		
	Default Emission Factor	Lower	Upper	Default Emission Factor	Lower	Upper	Default Emission Factor	Lower	Upper
Gas/ Diesel Oil	74100	72600	74800	3.9	1.6	9.5	3.9	1.3	12
Natural Gas	56100	54300	58300	92.0	50	1540	3.0	1.0	77
Motor Gasoline	69300	67500	73000	3.8	1.1	13	5.7	1.9	17

Source: IPCC (2006). Table 1.4 in the Introduction chapter and Table 3.2.1 and Table 3.2.2 in the Mobile Combustion chapter of the Energy Volume

[132] http://thaicarbonlabel.tgo.or.th/admin/uploadfiles/emission/ts_11335ee08a.pdf

Impact Assessment Table

Table 7.7: Impact Assessment Table for GHG Emissions during Construction Phase

Significance of Impact					
Impact	Potential impacts on climatic condition due to GHG emissions.				
Impact Nature	**Negative**	Positive	Neutral		
	Potential impacts to GHG condition would be considered to be adverse (negative).				
Impact Type	**Direct**	Indirect	Induced		
	Potential impacts would likely be direct impacts through the release of emissions from fuel combustion.				
Impact Duration	Temporary	Short-term	**Long-term**	Permanent	
	Many of the major greenhouse gases can remain in the atmosphere for tens to hundreds of years after being released.				
Impact Extent	Local	Regional	**International**		
	Greenhouse gases are a global emission and may affect the global climate.				
Impact Scale	The emissions from construction phase are calculated to be 1,389.77 tonnes CO_2e. This emission volume compared to Myanmar's GHG release of 201.5 million tonnes CO_2 equivalent (in 2013), the total GHG release from the Project is considered insignificant.				
Frequency	Emission will be released intermittently, but repeatedly throughout the construction period.				
Impact Magnitude	Positive	**Negligible**	Small	Medium	Large
	Based on the above impact characteristics, the impact magnitude is therefore concluded to be negligible.				
Receptor Sensitivity	**Low**	Medium	High		
	The direct receptor to greenhouse gas is the global atmosphere. The greenhouse effect is enhanced by greenhouse gas emissions of anthropogenic nature. Minor emissions of GHG will be emitted as a result of the Project, and not likely to be significantly change atmospheric GHG concentrations. Receptor sensitivity is therefore rated as Low.				
Impact Significance	**Negligible**	Minor	Moderate	Major	
	From negligible impact magnitude and low level of receptor sensitivity, the impact significance is therefore negligible.				

Mitigation Measures

A series of Project specific mitigation measures for demolition, earthworks, construction and track out are presented below. Where the assessment predicts negligible impacts, no site-specific mitigation measures are proposed.

- Implement same mitigation measures proposed in Air Quality Impact Assessment section (***Section 7.1***) to minimize impacts related to GHG emissions;
- Develop and implement preventive maintenance plan for machines, and engines to ensure combustion efficiency; and
- Develop vehicle maintenance plan.

Residual Impacts

Residual impacts would expected to be of **Negligible Negative Impact** significance.

Monitoring Plan

In accordance to IFC requirements, "quantification of GHG emissions will be conducted by the client annually in accordance with internationally recognized methodologies and good practice" if the GHG emission from the Project exceeds 25,000 tonnes CO_2e per year. However, as summarized in **Table 7.5**, the total amount of GHG emission of the Project is summed to be 1,389.77 tonnes CO_2e per year which is within the GHG emissions according to the applicable requirements (i.e. ADB SPS, EP III and IFC), therefore it is not mandatory to do quantification of GHG emission every year.

7.2.7.3 Impact from GHG during Operation Phase

Overview

During the operation phase of the Project, the GHG emission is considered negligible since there is no major activity that would cause GHG emission under normal operation. Though, there might be GHG emission involved during maintenance activities due to the travelling along the Transmission Line, the GHG generated is as small as a vehicle passing through the Project Area; therefore, could be considered negligible.

7.2.7.4 Impact from GHG during Decommissioning Phase

Overview

During the decommissioning phase of the Project, it is anticipated that a number of vehicles, machineries and equipment that will generate GHG emissions will be operating on-site. This will contribute to the baseline noise condition. Additionally, it is expected that the Project activities during decommissioning will be similar to what was presented in the construction phase. However, without proper knowledge of potential equipment and machinery that is required, it is not possible to establish clearly these mitigations and therefore this should be the subject of a new assessment in time of decommissioning.

7.3 Noise Impact Assessment

7.3.1 Introduction

During the construction and operation phases, different activities have the potential to generate noise emission, which could cause nuisance to people living in the nearby communities and fauna within the Area of Influence. In the Project Study Area, the settlement in Hlaingthayar Township is identified as the nearest community, and the human and fauna living closest to the construction area are perceived as the most sensitive receptors. Therefore, it is important to understand the interaction between impacts generated from construction and operation activities of the Project and the subsequent effects of noise level on the receptors. This Section presents an evaluation of the potential impacts on noise, based on existing noise levels established by the baseline studies, as well as the activities associated with the construction and operation activities of the proposed Project. The activities with significant impacts were identified during scoping activity.

This Section will also present management, mitigation and monitoring measures needed to ensure that any identified impacts can be reduced to as low as reasonably practicable. Such measures are presented in this Section and will form part of the overall Environmental and Social Management Plan (ESMP, ***Chapter 10***) for the Project.

7.3.2 Assumptions and Limitations

The assessment of potential impacts related to noise in this Section is based on the environmental baseline data (presented within ***Section 5.2***), socio-economic baseline data (presented within ***Section 5.4***) and the Project information available from TPMC at the time of writing. Judgements and assessments have been made based on professional knowledge and previous experience of ERM. It is noted that no quantitative modelling has been undertaken with regards to any elements of the noise impact assessment. Should there be significant changes in factors such as assumed input data, engineering design of noise emission management components of the Project, or agreed assessment criteria, then elements of this impact assessment and associated management, mitigation and monitoring measures may needed to be revised to reflect these changes.

This Section focuses purely on the noise condition at local and possibly regional extent with the identified receptors as (livelihood of) human and fauna. However, the impact of noise changes towards human (in terms of livelihood and health) and fauna, if perceived as significant, will be assessed in ***Section 7.9*** and ***Section 7.8***, respectively. It is recognised that there is considerable cross over of impact towards different receptors that are impacted by the noise emission source. With this regard, this Section will be assessing impacts and develop management, mitigation and monitoring measures in relation to reducing impacts to noise level only.

7.3.3 Assessment Methodology

The methodology used for assessing impacts to noise levels is aligned with the general impact assessment methodology presented in ***Chapter 6***.

7.3.4 Baseline Summary

Information on the ambient noise conditions for the Study Area is not publicly available. The background noise levels are considered to be typical of a general rural environment. Sources of noise are likely to be limited to local traffic (e.g. motorbikes, scooters, minivan and private cars), humans (e.g. schools, village halls, local markets) and animals (e.g. dogs, cockerels).

7.3.5 Receptor Identification and Sensitivity

Potential noise sensitive receivers in the area will include settlements and schools. These receivers will be sensitive to noise from the construction of the Project. Construction activities will include vehicle movement, site clearance, excavation, etc.

7.3.6 Summary of Project Activities

7.3.6.1 Construction Phase

During the construction phase, noise emission may arise from the following activities:

- Use of vehicles and equipment;
- Construction and erection of Transmission Tower activities; and
- Use of diesel back-up generator.

These activities are expected to generate noise emission that could impact the livelihood of human and fauna by creating a nuisance or disruption to their everyday lives.

7.3.6.2 Operation Phase

During the Transmission Line operation phase (anticipated to be 25 years), related activities include the transfer of electricity between the two substations and Transmission Line maintenance activities. Both of these activities are not expected to have any significant impacts towards noise level, therefore, the Transmission Line operation phase will not be assessed.

7.3.6.3 Decommissioning Phase

At present, there are no plans or schedule for decommissioning of the proposed Project. It is likely that the Project facilities will only be decommissioned/ abandoned once it is no longer economical to continue operation, the Transmission Line is rendered redundant and/or no longer required for various reasons or is unsafe to operate. As the development process of the site is yet to fully begin, detailed decommissioning plans have not yet been formulated.

The Project facilities will be designed with decommissioning in mind. In general, facilities and machinery will be designed so that they can be isolated and decommissioned in steps which are in reverse of the installation procedure or which are most convenient to do so. The decommissioning phase activities will therefore be similar to those associated with the excavation/foundation work, installation and civil construction phases.

7.3.7 Assessment of Impacts

7.3.7.1 Overview

This Section will assess the various impacts from project activities that are anticipated to have a potentially significant impact towards noise level. The Project activities, and their corresponding impacts, that will be assessed are as follows:

- Use of vehicles and equipment;
- Construction and erection of Transmission Tower activities; and
- Use of diesel back-up generator.

7.3.7.2 Impact to Noise Level during Construction Phase

Overview

During construction phase, the use of vehicles, equipment and generator is expected on-site in order to assist the workers in moving around, lifting heavy objects, and other construction activities. The details of expected type of truck, duration and number of trucks used per day is presented in ***Table 7.8***.

Table 7.8: Expected Vehicles and Machineries Used During Construction

Item no.	Type of vehicle	Noise Level (dBA)	No. of vehicles (Peak/ Average) per day	Duration of use (hours)	Total road length
1	Truck	75	5/4	5-8	100-200 km/unit/day
2	Pick-up Truck	75	6/4	5-8	100-200 km/unit/day
3	Concrete Transit Mixer	79	2/2	4-6	80-150 km/unit/day

Source: TPMC, 2019 and FHWA Roadway Construction Noise Model User's Guide, Final Report, January 2006

As part of the Project, back-up diesel generators are required on-site in order to continue working during blackouts while also serving as a safety check that power source required for heavy machineries will not shut down mid-operation. This could potentially impact the health and safety of the workers and community during construction activities.

Additionally, the construction and erection activity of the Transmission Towers are anticipated to generate a considerable amount of noise emission. The number of Transmission Towers expect to be erected is 70 towers. However, the noise impact from construction activities is anticipated to be relatively quiet and within local extent.

Impact Assessment Table

Table 7.9: Impact Assessment Table for Noise Emission during Construction Phase

Significance of Impact					
Impact	Potential impacts on noise level due to the various activities during construction phase.				
Impact Nature	**Negative**	Positive	Neutral		
	Potential impacts to noise condition would be considered to be adverse (negative).				
Impact Type	**Direct**	Indirect	Induced		
	Potential impacts would likely be direct impacts.				
Impact Duration	**Temporary**	Short-term	Long-term	Permanent	
	Construction is expected to be complete in 25 months, which would be considered short-term but will last only 14 days for each tower which is considered temporary.				
Impact Extent	**Local**	Regional	International		
	Potential impacts are anticipated to be with local extent due to the construction activities are expected to generate noise within a relatively small area and will not expand into regional level.				
Impact Scale	The impact scale is anticipated to be moderate due to the large Project Area covering four (4) Townships. Maximum 79 dBA at nearest sensitive receptor due to vehicles (concrete transit mixer). Noise levels from tower erection is expected to be relatively small in comparison to other noise sources mentioned earlier.				
Frequency	Impacts to noise levels could occur intermittently but repeatedly throughout the day for the duration of the construction phase.				
Impact Magnitude	Positive	Negligible	**Small**	Medium	Large
	Based on the above impact characteristics, the impact magnitude is therefore concluded to be small.				
Receptor Sensitivity	Low	**Medium**	High		
	The primary receptor for impacts to noise levels from noise emission is humans and fauna living in and around the Study Area. The receptors have been identified to be living in a low noise level condition and therefore will be greatly influenced by large machineries increasing the noise level significantly. However, the NSR in this case are not hospital and schools which would have a greater sensitivity level than villages. Overall, this put the Project Location in an area with medium level of receptor sensitivity.				
Impact Significance	Negligible	**Minor**	Moderate	Major	
	From small impact magnitude and medium level of receptor sensitivity, the impact significance is therefore minor.				

Mitigation Measures

A series of Project specific mitigation measures for vehicles, machineries, transportation and construction activities are presented below:

- Normal working hours of the contractor should be between 07:00 and 22:00 hours from Monday to Saturday (except holiday). If work needs to be undertaken outside these hours, it should be limited to activities that do not lead to exceedance of noise criteria at nearby NSRs and avoid early morning and night time construction;

- Only well-maintained equipment should be operated on-site;
- Regular maintenance of equipment such as lubricating moving parts, tightening loose parts and replacing worn out components should be conducted;
- Machines and construction items (e.g. trucks) that may be in intermittent use should be shut down or throttled down between work periods;
- Reduce the number of equipment operating simultaneously as far as practicable;
- Orientate equipment known to emit noise strongly in one direction so that the noise is directed away from receptors far as practicable;
- Noise impacts from activities (such as piling and blasting activities) should be properly reduced by shielded by implementing control measures (e.g. erecting temporary noise barriers and deflectors) whenever applicable;
- Locate noisy plant (such as bulldozers, backhoes, rollers, hydraulic hammer and lorry mounted concrete pump) as far away from receptors as practicable; and
- Avoid transportation of materials on- and off-site through existing community areas.

Residual Impacts

Residual impacts would expected to be of **Negligible Negative Impact** significance.

Monitoring Plan

As detailed in the ESMP chapter (***Chapter 10***), monitoring for noise level during the construction phase should consist of the following:

- Continuous monitoring of noise level in and around the Project Study Area during construction phase at Noise Sensitive Receptors.

7.3.7.3 Impact to Noise Level during Operation Phase

Overview

During the operation phase of the Transmission Line, related operation activities are anticipated to not generate any significant impacts to noise level. However, maintenance activities which occurs during the operation phase may produce nuisance noises but is predicted to be at an insignificant level. Therefore no noise impact assessment for Transmission Line during operation phase are to be presented.

7.3.7.4 Impact to Noise Level during Decommissioning Phase

Overview

During the decommissioning phase of the Project, it is anticipated that a number of vehicles, machineries and equipment that will generate nuisance noise will be operating on-site. This will contribute to the baseline noise condition. Additionally, it is expected that the Project activities during decommissioning will be similar to what was presented in the construction phase. However, without proper knowledge of potential activities, machines, and equipment that will be used in the area, it is not possible to establish clearly these mitigations and therefore this should be the subject of a new assessment in time of decommissioning.

7.4 Soil and Groundwater Impact Assessment

7.4.1 Introduction

During the construction and operation phases, different activities have the potential impact the quality and quantity of soil and groundwater, which could lead to impacting the people living in the nearby communities and flora and fauna in the vicinity. Therefore, it is important to understand the interaction between impacts generated from construction and operation activities of the Project and the subsequent effects on soil and groundwater quantity and quality. This Section presents an evaluation of the potential impacts on soil and groundwater condition based on baseline studies associated with construction and operation activities of the proposed Project. The activities with significant impacts were identified during the scoping activity.

This Section will also develop management, mitigation and monitoring measures needed to ensure that any identified impacts can be reduced to as low as reasonably practicable. Such measures are presented in this Section and will form part of the overall Environmental and Social Management Plan (ESMP, ***Chapter 10***) for the Project.

7.4.2 Assumptions and Limitations

The assessment of potential impacts related to soil and groundwater in this Section is based on the environmental baseline data (presented within ***Section 5.2***), socio-economic baseline data (presented within ***Section 5.4***) and the information available from TPMC at the time of writing. Judgements and assessment have been made based on professional knowledge and previous experience of ERM. It is noted that no quantitative modelling has been undertaken with regards to any elements of the soil and groundwater impact assessment. Should there be significant changes in factors such as assumed input data, engineering design of soil and groundwater management components of the Project, or agreed assessment criteria, then elements of this impact assessment and associated management, mitigation and monitoring measures may needed to be revised to reflect these changes.

This Section focuses purely on the soil and groundwater condition at local and possibly regional extent with the identified receptors as (livelihood of) human and fauna (where these receptors uses soil or groundwater as a resource or habitat). However, the impact of soil and groundwater changes towards human (in terms of livelihood and health) and fauna, if perceived as significant, will be assessed in ***Section 7.9*** and ***Section 7.8***, respectively. It is recognised that there is considerable cross over of impacts towards different receptors that are impacted by the changes of soil and groundwater condition. With this regard, this Section will be assessing impacts and develop management, mitigation and monitoring measures in relation to reducing impacts to soil and groundwater condition only.

7.4.3 Assessment Methodology

The methodology used for assessing impacts to soil and groundwater is aligned with the general impact assessment methodology presented in ***Chapter 6***.

7.4.4 Baseline Summary

Soil characteristics in Yangon are classified as predominantly Gleysol. The Study Area is located on Meadow (Gleysol) and Meadow Alluvial soil (Fluvic Gleysols). The Meadow soil distributes near the river plains where occasional tidal floods occur and are typically non-carbonate, and they usually contain large amount of salts. Meadow Alluvial soil can be found in the flood plains. They have the texture of silty clay loam and are rich in plant nutrients (Union of Myanmar, 2009).

In general the groundwater in the Yangon region is dependent upon natural recharge from rivers and the upper watershed (JICA, 2003). Generally, declining ground water levels in the region are anticipated to have occurred due to associated environmental degradation of water sources as well as uncontrolled excessive pumping of wells.

Groundwater aquifers are typically prone to leaching during the monsoon periods, especially on impervious surfaces, e.g. clay seams, clay layers, bedrocks, etc. Rising groundwater can cause saturation of the soil and can cause very high pore-water pressure in slopes in sedimentary deposits.

Hlaingthayar and Seikgyikanaungto Township are located on a zone I (one) groundwater. Zone I (one) refers to good quality groundwater with high yield. Therefore, we can expect that the groundwater quality in the Study Area is in reasonably good condition with high yield volume for communities and industrial use.

7.4.5 Receptor Identification and Sensitivity

Potential receptors for soil in this proposed Project is soil that are located where Transmission Towers are planned to be built. Soil in these areas are expected to be cleared (if ground condition does not fit well for foundation and construction activities) and foundation and footing work are to be followed. Depending on the type of footing required, the impacts towards soil may varies. Additionally, operation of vehicles and heavy machineries on soil will directly impact the compaction, quality and quantity of the soil. With regards to groundwater, wherever there is an impact to soil, groundwater will be considered as a receptor as well. This is because impact towards soil are connected to groundwater condition and is bound to have similar impacts between the two receptors.

7.4.6 Summary of Project Activities

7.4.6.1 Construction Phase

During the construction phase, impacts to soil and groundwater may arise from the following activities:

- Potential impacts to quality of soil and groundwater from the use of chemicals, concrete and materials on soil surface;
- Potential impacts to quality of soil and groundwater from the use of vehicles and equipment on unpaved roads;
- Potential impacts to quality of soil and groundwater from upgrading and construction of new roads;
- Potential impacts to quality of soil and groundwater from foundation, footing and erection of Transmission Tower; and
- Potential impacts to quality of soil and groundwater from unplanned events such as chemical spills.

7.4.6.2 Operation Phase

During the Transmission Line operation phase (anticipated to be 25 years), related activities include the transfer of electricity between the two substations and Transmission Line maintenance activities. Both of these activities are not expected to have any significant impacts towards soil and groundwater, therefore, the Transmission Line operation phase will not be assessed.

7.4.6.3 Decommissioning Phase

At present, there are no plans or schedule for decommissioning of the proposed Project. It is likely that the Project facilities will only be decommissioned/ abandoned once it is no longer economical to continue operation, the Transmission Line is rendered redundant and/or no longer required for various reasons or is unsafe to operate. As the development process of the site is yet to fully begin, detailed decommissioning plans have not yet been formulated.

The Project facilities will be designed with decommissioning in mind. In general, facilities and machinery will be designed so that they can be isolated and decommissioned in steps which are in reverse of the installation procedure or which are most convenient to do so. The decommissioning phase activities will therefore be similar to those associated with the excavation/foundation work, installation and civil construction phases.

7.4.7 Assessment of Impacts

7.4.7.1 Overview

This Section will assess the various impacts from project activities that is anticipated to have a significant impact towards soil and groundwater quality. The Project activities, and their corresponding impacts, that will be assessed are as follows:

- Use of chemicals, concrete and materials on soil surface;
- Operation of vehicles and heavy machineries on unpaved surface;
- Soil erosion and nutrient stripping from increase surface runoff;
- Less impermeable surface causing reduce of infiltration hence less aquifer recharge;
- Storm water run-off;
- Construction and upgrading of new roads; and
- Laying foundation and footing work on soil surface.

7.4.7.2 Impact to Soil during Construction Phase

Overview

Construction activities will include the use of concrete, chemicals and materials to lay foundation of the Transmission Towers. This activity is anticipated to create direct impacts towards soil and consequently cause potential impacts to groundwater conditions due to leaching. The presence of chemicals and concrete on bare soil surface is likely to cause the soil chemical properties to change depending on the chemicals used, while the physical presence of concrete foundation (6 m x 6 m size) will impact the compaction and texture characteristic of the soil. Moreover, putting a concrete slab on top of soil surface will increase the impermeable area of the Project Study Area which will result in an increase of surface run-off and reduce infiltration capability of the area. As a result, groundwater recharge volume and rate is reduced with correlation to the amount of concrete foundation in the area.

The Project plans to install 70 Transmission Towers with each tower having a concrete foundation area of 243.36 m^2, therefore, a total coverage area of 17,035 m^2.

Additionally, construction and upgrading of new roads will also increase the area of impermeable surface. This is considered to be a significant change of landscape and permeability (from soil surface with great infiltration rate to a concrete surface which has a low permeability) as well as covering a reasonably large area.

With a lower permeability rate and a lower infiltration rate, it is expected that the surface run-off flow rate and volume will increase. This may induce soil erosion and nutrient stripping thus rendering the soil condition to be degraded.

Impact Assessment Table

Table 7.10: Impact Assessment Table for Soil during Construction Phase

Significance of Impact			
Impact	Potential impacts on soil due to the various activities during construction phase causing soil erosion.		
Impact Nature	**Negative**	Positive	Neutral
	Potential impacts to soil would be considered to be adverse (negative).		
Impact Type	**Direct**	Indirect	Induced

	Potential impacts would be direct for soil.			
Impact Duration	Temporary	**Short-term**	Long-term	Permanent
	Construction is expected to be complete in 25 months, which would be considered short-term.			
Impact Extent	**Local**	Regional	International	
	Potential impacts are anticipated to be local extent as construction activities are limited to a small area and the associated impacts are forecasted to not spread to a significant range.			
Impact Scale	The impact scale is anticipated to be moderate due to the large Project Area covering two (2) rivers. The total area of concrete pads for the foundation work is 17,035 m^2.			
Frequency	Impacts to soil condition could occur intermittently but repeatedly throughout the day for the duration of the construction phase. Higher frequency of impact would be during laying the concrete foundation.			
Impact Magnitude	Positive	Negligible	Small	**Medium**	Large
	Based on the above impact characteristics, the impact magnitude is therefore concluded to be medium.				
Receptor Sensitivity	Low	**Medium**	High	
	The receptor prior to the Project construction activities is considered to be in good condition. This was determined from the baseline of the soil where majority of the soil in the Study Area is used for agricultural activities. Overall this put the receptor sensitivity rating at medium.			
Impact Significance	Negligible	Minor	**Moderate**	Major
	From medium impact magnitude and medium level of receptor sensitivity, the impact significance is therefore moderate.			

Table 7.11: Impact Assessment Table for Groundwater during Construction Phase

Significance of Impact				
Impact	Potential impacts on groundwater due to the various activities during construction phase causing potential contamination.			
Impact Nature	**Negative**	Positive	Neutral	
	Potential impacts to groundwater would be considered to be adverse (negative).			
Impact Type	Direct	**Indirect**	Induced	
	Potential impacts would be indirect to groundwater.			
Impact Duration	Temporary	**Short-term**	Long-term	Permanent
	Construction is expected to be complete in 25 months, which would be considered short-term.			
Impact Extent	**Local**	Regional	International	
	Potential impacts are anticipated to be local extent as construction activities are limited to a small area and the associated impacts are forecasted to not spread to a significant range.			
Impact Scale	The impact scale is anticipated to be moderate due to the large Project Area covering two (2) rivers. The total area of concrete pads for the foundation work is 4,079.72 m^2. This is comparatively small to the Project Area.			

Frequency	Impacts to groundwater condition could occur intermittently but repeatedly throughout the day for the duration of the construction phase. Higher frequency of impact would be during laying the concrete foundation with high rainfall events.				
Impact Magnitude	Positive	Negligible	Small	**Medium**	Large
	Based on the above impact characteristics, the impact magnitude is therefore concluded to be medium.				
Receptor Sensitivity	Low		**Medium**	High	
	The receptor prior to the Project construction activities is considered to be in good condition. This was determined from the baseline of the groundwater being rated as a zone I (one). Majority of the groundwater within and around the Study Area is used for domestic purposes with a small portion used for irrigation and agricultural activities. Overall this put the receptor sensitivity rating at medium.				
Impact Significance	Negligible	Minor	**Moderate**	Major	
	From medium impact magnitude and medium level of receptor sensitivity, the impact significance is therefore moderate.				

Mitigation Measures

A series of project specific mitigation measures are tailored to mitigate and manage project construction activity to reduce the impact as low as practicable:

- Exposed soil surfaces should be protected by paving or fill material as soon as possible to reduce the potential of soil erosion;
- Open stockpiles of construction materials or construction wastes on-site should be covered with tarpaulin or similar fabric during rainstorms;
- Delineation of site boundaries to limit the areas to be cleared;
- Scheduling clearance activities (if possible) to avoid extreme weather events such as heavy rainfall, extreme dry and high winds;
- Use methods for minimising sediment runoff, as appropriate to the conditions on-site, including wheel cleaning facilities;
- Design drainage system for the controlled release of storm flows;
- Protect temporary trafficked areas on-site with coarse stone ballast or equivalent;
- Regularly, and particularly following rainstorms, inspect and maintain drainage systems and erosion control and silt removal facilities to ensure proper and efficient operation at all times;
- Provide measures to reduce the ingress of site drainage into excavations. If trenches have to be excavated during the wet season, excavate and backfill them in short sections wherever practicable. Discharge any water pumped out from trenches or foundation excavations into storm drains via silt removal facilities;
- Stabilise exposed areas (for example via mulching), where practicable and appropriate;
- Revegetate areas with temporary land use, conducting progressive rehabilitation;
- Minimize the amount of soil handling;
- Spray water on stockpiles of excavated material or backfill;
- Demarcate routes for movement of heavy vehicles to minimise disturbance of exposed soils and compaction of sub-surface layers;
- Reuse topsoil as much as possible within rehabilitation activities;

- Stripping and placing soils when dry, and not when wet;
- Control erosion through diversion drains, sediment fences, and sediment retention basins; and
- Where topsoil is to be stored for later use in rehabilitation activities, the following basic principles are to be applied:
  - Stockpiles to be separated into topsoil and sub-soil and be located at least 50m from any surface water source or groundwater well;
  - To the extent possible, stockpiles are to be located in areas surrounded by natural wind barriers to minimise the potential for wind erosion;
  - Stockpile storage areas are to be prepared in advance of the removal of topsoil as much as possible; and
  - Topsoil heights are to be restricted in height to 2 m above ground level to minimise wind erosion, and they are only to be partially compacted on the upper layer in order to promote aeration, maintain soil vertical structures, reduce runoff and encourage infiltration.

The following mitigation measures are designed specifically for unplanned events and should be adapted accordingly to the unplanned situtaions:

- Ensuring adequate quality control and quality assurance checks during construction of the ash disposal pond;
- Use of spill or drip trays to contain accidental spills and leaks;
- Use of spill control kits to contain and clean small spills and leaks;
- Storage of chemicals, fuel, and oil in adequately bunded impervious areas, as per international bunding and storage requirements;
- Appropriate management of domestic wastewater;
- Appropriate management, storage and disposal of waste; and
- Implement a training program to familiarise staff with emergency procedures and practices.

Residual Impacts

Residual impacts for soil and groundwater would expected to be of **Minor Negative Impact** significance.

Monitoring Plan

As detailed in the ESMP chapter (***Chapter 10***), monitoring for soil and groundwater during the operation phase should consist of the following:

- Continuous monitoring of soil and groundwater quantity and quality in and around the Project Study Area during construction phase.

7.4.7.3 Impact to Soil and Groundwater during Operation Phase

Overview

During the operation phase of the Transmission Line, related operation activities are anticipated to not generate any significant impacts to soil and groundwater condition. However, maintenance activities which occurs during the operation phase may produce impacts to soil and groundwater but is predicted to be at an insignificant level. Therefore no soil and groundwater assessment for Transmission Line during operation phase are to be presented.

7.4.7.4 Impact to Soil and Groundwater during Decommissioning Phase

Overview

During the decommissioning phase of the Project, it is anticipated that certain activities will cause soil and groundwater contamination on-site. This will contribute to the baseline soil and groundwater quality. Additionally, it is expected that the Project activities during decommissioning will be similar to what was presented in the construction phase. However, without proper knowledge of decommissioning activities that will be carried out, it is not possible to establish clearly these mitigations and therefore this should be the subject of a new assessment in time of decommissioning.

7.5 Surface Water Impact Assessment

7.5.1 Introduction

During the construction and operation phases, different activities have the potential to impact the quality and quantity of surface water, which could lead to impacting the people living in the nearby communities and flora and fauna in the vicinity. This Section presents an evaluation of the potential impacts on surface water condition based on baseline studies and the construction and operation activities of the proposed Project. The activities with significant impacts were identified during scoping activity.

This Section will also develop management, mitigation and monitoring measures needed to ensure that any identified impacts can be reduced to as low as reasonably practicable. Such measures are presented in this Section and will form part of the overall Environmental and Social Management Plan (ESMP, ***Chapter 10***) for the Project.

7.5.2 Assumptions and Limitations

The assessment of potential impacts related to surface water in this Section is based on the environmental baseline data (presented within ***Section 5.2***), socio-economic baseline data (presented within ***Section 5.4***) and the information available from TPMC at the time of writing. Judgements and assessment have been made based on professional knowledge and previous experience of ERM. It is noted that no quantitative modelling has been undertaken with regards to any elements of the surface water impact assessment. Should there be significant changes in factors such as assumed input data, engineering design of surface water management components of the Project, or agreed assessment criteria, then elements of this impact assessment and associated management, mitigation and monitoring measures may needed to be revised to reflect these changes.

This Section focuses purely on the surface water condition at local extent with the identified receptors as surface water bodies (i.e. Yangon and Pun Hlaing River). However, the impact of surface water changes towards human (in terms of livelihood and health) and fauna, if perceived as significant, will be assessed in ***Section 7.9*** and ***Section 7.8***, respectively. It is recognised that there is considerable cross over of impacts towards different receptors that are impacted by the changes of surface water condition. With this regard, this Section will be assessing impacts and develop management, mitigation and monitoring measures in relation to reducing impacts to surface water condition only.

7.5.3 Assessment Methodology

The methodology used for assessing impacts to surface water is aligned with the general impact assessment methodology presented in ***Chapter 6***.

7.5.4 Baseline Summary

A study of source water and drinking water quality in Yangon in 2013 (Hiroshi Sakai, et al, 2013) sampled river waters within ~12 km upstream and ~3 km downstream of the proposed Power Plant. The total coliform level of the river waters in Yangon was close to 50 cfu/ml. Amongst the sampling points on the Yangon River, the sampling point downstream of the Project Site, located at the riverbank

close to a wastewater treatment plant discharge point, has significantly higher (21 fold higher) total coliform level than those sampling points in the centre of the river.

The river is under tidal influence, and becomes brackish during the dry season. The estuary and creeks of the river are navigable by small craft with some areas covered by mangrove forest. There are number of villages, as well as commercial ports located on its banks, therefore, the river is currently used for fisheries, navigation and marine logistic purposes.

The surface water baseline study result shows that during the dry season (February to April), parameters that exceeded the local and/or international standards include TSS, TDS, Iron, and Manganese. Parameters that exceed the local and or international standards during the wet season includes TSS, Iron, Mercury, and Manganese while other parameters are within the respective standards. This baseline demonstrates that the water condition in Yangon River is moderately polluted.

7.5.5 Receptor Identification and Sensitivity

In the Project Study Area, Yangon River and Pun Hlaing River (a tributary of Yangon River) is considered to be the prominent potential receiving bodies. Henceforth, any receptors that utilise these rivers as a mean of transportation, consumption, habitat or other purposes will consequently be affected. Therefore, it is important to understand the interaction between impacts generated from construction and operation activities of the Project and the subsequent effects on surface water quantity and quality.

Potential receptors are water bodies within the Project Study Area whereby two (2) were identified for this proposed Project. One being the Yangon River and the other is Pun Hlaing River. Yangon River is a busy river used for a lot for transportation, fishing and industrial purposes. Pun Hlaing River is a tributary of the Yangon River, running in the northwest direction, separating the Township border of Twantay and Hlaingthayar. Additionally, secondary receptors such as human that uses the surface water (for fishing and transportation) and the aquatic ecosystem will also be impacted. Declining in surface water quality will directly cause degrading of aquatic life and consequently yield in fishing activities.

From the baseline summary, it is identified that the surface water condition of Yangon River (and subsequent Pun Hlaing River as well since this river is a tributary of Yangon River and therefore water condition can assumed to be similar) is moderately polluted hence receptor sensitivity is determined to be Low.

7.5.6 Summary of Project Activities

7.5.6.1 Construction Phase

During the construction phase, impacts to surface water may arise from the following activities:

- Potential impacts to quality of surface water from the use of vehicles and equipment on unpaved roads;
- Potential impacts to quality of surface water from the use of chemicals, concrete and materials nearby the surface water body;
- Potential impacts to quality of surface water from workers and worker camps;
- Potential impacts to quality of surface water from upgrading and construction of new roads; and
- Potential impacts to quality of surface water from the use of boat and vessels for material transportation and construction and erection of Transmission Tower.

7.5.6.2 Operation Phase

During the Transmission Line operation phase (anticipated to be 25 years), related activities include the transfer of electricity between the two substations and Transmission Line maintenance activities. Both

of these activities are not expected to have any significant impacts towards surface water, therefore, the Transmission Line operation phase will not be assessed.

7.5.6.3 Decommissioning Phase

At present, there are no plans or schedule for decommissioning of the proposed Project. It is likely that the Project facilities will only be decommissioned/ abandoned once it is no longer economical to continue operation, the Transmission Line is rendered redundant and/or no longer required for various reasons or is unsafe to operate. As the development process of the site is yet to fully begin, detailed decommissioning plans have not yet been formulated.

The Project facilities will be designed with decommissioning in mind. In general, facilities and machinery will be designed so that they can be isolated and decommissioned in steps which are in reverse of the installation procedure or which are most convenient to do so. The decommissioning phase activities will therefore be similar to those associated with the excavation/foundation work, installation and civil construction phases.

7.5.7 Assessment of Impacts

7.5.7.1 Overview

This Section will assess the various impacts from project activities that is anticipated to have a significant impact towards surface water quality. The Project activities, and their corresponding impacts, that will be assessed are as follows:

- Use of vehicles and equipment on unpaved road can stir up soil and increase the potential of soil material entering the rivers;
- Use of chemicals, concrete and materials nearby the surface water body can contaminate the river water by surface flow during precipitation events and flushing chemicals and other contaminants into the surface water bodies;
- Upgrading and construction of new roads causing increase in impermeable surface thus inducing surface run-off and ultimately increasing of total suspended solids in the surface water bodies;
- Use of boat and vessels for material transportation and construction and erection of Transmission Tower can contaminate the water quality if the activities is not conducted responsibly; and
- Sewage generated on-site if not treated and disposed appropriate may impact the condition of the surface water.

7.5.7.2 Impact to Surface Water during Construction Phase

Overview

During construction activities involving use of concrete, chemicals and materials to lay foundation of the Transmission Towers. This activity is anticipated to create a direct impacts towards surface water quality from introduction of hazardous and non-hazardous chemicals used during the construction phase entering the river system.

Additionally, the physical presence of concrete foundation (6m x 6m size) will increase the impermeable area of the Project Study Area where this will result in an increase of surface run-off rate and volume hence inducing soil inflowing to the rivers. The Project is planned to install 70 Transmission Towers, whereby each tower would need a concrete foundation area of 5.5 m by 5.5 m to 15.6 m by 15.6 m. This would result in an approximate total of 4,079.72 m^2 of area covered by impermeable concrete area. Moreover, construction and upgrading of new roads will also increase the area of impermeable surface. It is anticipated that new road will be needed for the completion of construction phase however, quantity and land coverage which will be replaced with road coverage is unknown at this stage but is expected to be limited. With the increase in road area (acting as an impermeable surface) this will directly increase

surface runoff flow rate and quantity thus enhance the erosion and sedimentation effects. As a result, this will increase the total suspended solids of the river and ultimately reducing the quality of the surface water.

Sewage from construction workers on-site is also identified to potentially impact the surface water if the sewage is not treated and disposed of appropriately. The number of workers anticipated during construction phase is 175 (100 local workers and 75 specialists/expats).

From the estimated number of workers expected on-site, an approximation of domestic wastewater can be projected and is shown in ***Table 7.12***.

Table 7.12: Estimated Wastewater Generated from Workers On-site

Phase	Anticipated Volume	Number of Workers	Total Liquid Waste
Construction	50 litres per employee per day	175	8,750 litres per day

Source: TPMC, 2019; adapted by ERM, 2019

Impact Assessment Table

Table 7.13: Impact Assessment Table for Surface Water during Construction Phase

Significance of Impact				
Impact	Potential impacts on surface water due to the various activities during construction phase from surface runoff and sewage management and generation.			
Impact Nature	**Negative**	Positive	Neutral	
	Potential impacts to surface water would be considered to be adverse (negative).			
Impact Type	**Direct**	Indirect	**Induced**	
	Potential impacts would likely be both direct and induced impacts.			
Impact Duration	Temporary	**Short-term**	Long-term	Permanent
	Construction is expected to be complete in 25 months, which would be considered short-term.			
Impact Extent	**Local**	Regional	International	
	Potential impacts are anticipated to be local extent due to construction activities are limited to a small area and the associated impacts are forecasted to not spread to a significant range. Sewage disposal is expected to be treated and dispose appropriately in the nearby river body.			
Impact Scale	The impact scale is anticipated to be moderate due to the large Project Area covering two (2) rivers. During construction phase, the total volume of domestic liquid waste generated per day is approximately 8,750 litres per day. The total concrete pad coverage area is approximated to be 4,079.72 m^2.			
Frequency	Impacts to surface water condition could occur intermittently but repeatedly throughout the day for the duration of the construction phase. Frequency will also be dependent on the frequency of precipitation events. Frequency of sewage release would be occurring intermittently but repeatedly throughout the day for the duration of the construction phase.			
Impact Magnitude	Positive	Negligible	Small	**Medium**	Large
	Based on the above impact characteristics, the impact magnitude is therefore concluded to be medium.			
Receptor Sensitivity	Low	**Medium**	High	
	The primary receptor for impacts to surface water is Yangon River and Pun Hlaing River. The receptor prior to the Project construction activities is considered to in a polluted condition both Yangon and Pun Hlaing River. Both rivers are mostly used for transportation and fishing activities. Overall, this put the Project Location in an area with medium level of receptor sensitivity.			
Impact Significance	Negligible	Minor	**Moderate**	Major
	From medium impact magnitude and medium level of receptor sensitivity, the impact significance is therefore moderate.			

Mitigation Measures

A series of project specific mitigation measures are tailored to mitigate and manage project construction activity to reduce the impact as low as practicable:

- Exposed soil surfaces should be protected by paving or fill material as soon as possible to reduce the potential of soil erosion;
- Open stockpiles of construction materials or construction wastes on-site should be covered with tarpaulin or similar fabric during rainstorms;
- Use methods for minimising sediment runoff, as appropriate to the conditions on-site, including wheel cleaning facilities;
- Design drainage system for the controlled release of storm flows;
- Protect temporary trafficked areas on-site with coarse stone ballast or equivalent;
- Regularly, and particularly following rainstorms, inspect and maintain drainage systems and erosion control and silt removal facilities to ensure proper and efficient operation at all times;
- Provide measures to reduce the ingress of site drainage into excavations. If trenches have to be excavated during the wet season, excavate and backfill them in short sections wherever practicable. Discharge any water pumped out from trenches or foundation excavations into storm drains via silt removal facilities;
- Stabilise exposed areas, where practicable and appropriate;
- Re-vegetate areas promptly, where practicable and appropriate; and
- Provide measures to prevent the washing away of construction materials, soil, silt or debris into any drainage system of open stockpiles of construction materials.
- Debris and refuse generated on-site should be collected, handled and disposed of properly to avoid entering the receiving waters. Stockpiles of cement and other construction materials should be kept covered when not being used;
- Oils, fuels and chemicals should only be used and stored in designated areas which have pollution prevention facilities. The bund should be drained of rainwater after a rain event;
- The oil contaminated water will be collected and handled by local licensed waste water sub-contractors (if available, to be determined at the later stage);
- On-site oil-water separators and holding facilities should be installed to accommodate and unanticipated releases of oily water; and
- Surface run-off from bunded areas should pass through oil/water separators prior to discharge to the storm water system.

The following mitigation measures are specifically designed to manage sewage generated on-site from the workforce:

- Where no public sewage treatment system is available sanitary waste water will be treated by domestic waste water unit. The EPC contractor will provide the domestic waste water unit which is designed and installed to treat all domestic wash and wastewater and sewage during construction. All effluents shall comply with Myanmar NEQ guidelines for emissions into the environment, as appropriate;
- All other chemical waste or oil contaminated water will be collected and sent off-site for appropriate treatment, local treatment facilities to be identified.
- Provision of temporary sewage treatment facilities; and

- Sewage from toilets, kitchens and similar facilities should be discharged into a foul sewer or appropriate receiving facility. Wastewater collected from canteen kitchens, including that from basins, sinks and floor drains, should be discharged into foul sewers via grease traps. The foul sewer should then lead to the temporary sewage treatment plant prior to discharge.

Residual Impacts

Residual impacts would expected to be of **Negligible Negative Impact** significance.

Monitoring Plan

As detailed in the ESMP chapter (***Chapter 10***), monitoring for surface water during the construction phase should consist of the following:

- Monitor before and after construction activities have crossed the water body.

7.5.7.3 Impact to Surface Water during Operation Phase

Overview

During the operation phase of the Transmission Line, related operation activities are anticipated to not generate any significant impacts to surface water. However, maintenance activities which occurs during the operation phase may produce impacts to surface water but is predicted to be at an insignificant level. Therefore no surface water assessment for Transmission Line during operation phase are to be presented.

7.5.7.4 Impact to Surface Water during Decommissioning Phase

Overview

During the decommissioning phase of the Project, it is anticipated that certain activities will cause surface water contamination on-site. This will contribute to the baseline surface water quality. Additionally, it is expected that the Project activities during decommissioning will be similar to what was presented in the construction phase. However, without proper knowledge of decommissioning activities that are to be carried out, it is not possible to establish clearly these mitigations and therefore this should be the subject of a new assessment in time of decommissioning.

7.6 Waste Impact Assessment

7.6.1 Introduction

During the construction and operation phases, different is anticipated to generate different type of waste, which could lead to impacting the people living in the nearby communities and flora and fauna in the vicinity. Therefore, it is important to understand the interaction between impacts generated from construction and operation activities of the Project and the subsequent effects on the existing waste management facilities. This Section presents an evaluation of the potential impacts on existing waste management network based on baseline studies associated with construction and operation activities of the proposed Project. These activities with significant impacts were identified during scoping activity.

This Section will also develop management, mitigation and monitoring measures needed to ensure that any identified impacts can be reduced to as low as reasonably practicable. Such measures are presented in this Section and will form part of the overall Environmental and Social Management Plan (ESMP, ***Chapter 10***) for the Project.

7.6.2 Assumptions and Limitations

The assessment of potential impacts related to waste in this Section is based on the environmental baseline data (presented within ***Section 5.2***), socio-economic baseline data (presented within ***Section***

5.4) and the information available from TPMC at the time of writing. Judgements and assessment have been made based on professional knowledge and previous experience of ERM. It is noted that no quantitative modelling has been undertaken with regards to any elements of the waste impact assessment. Should there be significant changes in factors such as assumed input data, engineering design of waste management components of the Project, or agreed assessment criteria, then elements of this impact assessment and associated management, mitigation and monitoring measures may needed to be revised to reflect these changes.

This Section focuses purely on the waste related component at local extent. It is recognised that there is considerable cross over of impacts towards different receptors that are impacted by the changes of waste condition. Matters pertaining to waste life cycle, waste entering surface water, storage and management of waste will be assessed in this Section. With this regard, this Section will be assessing impacts and develop management, mitigation and monitoring measures in relation to reducing impacts from waste and to the existing waste management facility and network.

7.6.3 Assessment Methodology

The methodology used for assessing impacts from waste and to existing waste management facility and network is aligned with the general impact assessment methodology presented in ***Chapter 6***.

7.6.4 Baseline Summary

According to the World Bank [133] the solid waste generation in Myanmar was 5,616 tonnes/day increasing to 21,012 tonnes/day by 2025. Mandalay, Yangon and Nay Pyi Taw generate the majority of the waste (55%); Yangon produces the most of the waste (1,981 tonnes/day).The countries municipal solid waste is generated from households (60%), markets (15%), commercial (10%), hotel (2%), garden (5%) and others (8%).

The generation of waste within the Study Area is a mixture of domestic, agricultural and industrial waste. In term of waste in the Project Area. Solid waste disposal is the responsibility of each household. Burning, landfilling and disposal into the nearest stream are common practice in the Project Study Area. Waste disposal areas exist in Hteinpin, Dawai Chang, Shwepyithar, Mingalardon, Dala, and Seikyi Khanaungato. Henceforth, any other receptors that utilise these landfills for waste management will consequently be affected.

7.6.5 Receptor Identification and Sensitivity

With regards to waste impacts on receptors, these would include improper disposal of chemicals and materials at inappropriate land, water source and nearby human. Therefore, the will be local water sources.

In terms of the existing waste management network, according to the Yangon City Development Committee (YCDC), the major landfill sites in Yangon that are currently in operation and their respective capacities are shown in ***Table 7.14***.

[133] The World Bank (2012) A Global Review of Solid Waste Management [Online] Available at: http://siteresources.worldbank.org/INTURBANDEVELOPMENT/Resources/336387-1334852610766/What_a_Waste2012_Final.pdf [Accessed 12 April 2017]

Table 7.14: Major Landfill Sites in Yangon

Location	Capacity (tonnes/day)
Hteinpin	1,080
Dawai Chang	843
Shwepyithar	61
Mingalardon	43
Dala	33
SeikyiKhanaungato	4

Source: YCDC, 2016

This put the existing waste management facility in the Study Area at risk of not having sufficient capacity to manage additional waste generated from the Project construction activities.

7.6.6 Summary of Project Activities

7.6.6.1 Construction Phase

The EPC contractor appointed by TPMC will carry out construction of the Transmission Line. The construction phase for the Transmission Line installation is expected to take 25 months. The number of workers on-site during construction phase is anticipated to be 175 persons.

During the construction phase, impacts from waste generated and to existing waste management network may arise from the following activities:

- Potential impacts from improper waste storage, management, treatment and disposal;
- Potential impacts from additional waste quantity generated by construction especially site clearance;
- Potential impacts from introduction to new type of waste for existing waste management facilities to manage;
- Potential impact from the use of chemicals, concrete and materials nearby surface water body; and
- Potential impact from releasing waste and wastewater from boats and vessels.

7.6.6.2 Operation Phase

During the Transmission Line operation phase (anticipated to be 25 years), related activities include the transfer of electricity between the two substations and Transmission Line maintenance activities. Both of these activities are not expected to have any significant impacts towards waste, therefore, the Transmission Line operation phase will not be assessed.

7.6.6.3 Decommissioning Phase

At present, there are no plans or schedule for decommissioning of the proposed Project. It is likely that the Project facilities will only be decommissioned/ abandoned once it is no longer economical to continue operation, the Transmission Line is rendered redundant and/or no longer required for various reasons or is unsafe to operate. As the development process of the site is yet to fully begin, detailed decommissioning plans have not yet been formulated.

The Project facilities will be designed with decommissioning in mind. In general, facilities and machinery will be designed so that they can be isolated and decommissioned in steps which are in reverse of the installation procedure or which are most convenient to do so. The decommissioning phase activities will therefore be similar to those associated with the excavation/foundation work, installation and civil construction phases.

7.6.7 Assessment of Impacts

7.6.7.1 Overview

This Section will assess the various impacts from project activities that is anticipated to have a significant impacts from waste generation and to existing waste management facility. The Project activities, and their corresponding impacts, that will be assessed are as follows:

- During construction phase, both hazardous and non-hazardous waste are expected to be generated on site from construction activities (including from boats and vessels). These waste will need to be stored appropriately to prevent leakages and spills, managed accordingly to the waste requirements and monitor of the effluent during disposal stage at the designated point of discharge;
- Currently there are six landfill sites located around the Project Area being used by local communities to manage majority of their waste production, however, these facilities are also being used by local communities and the additional generation of waste may impact the capacity of waste management for the region; and
- Waste that are produced by the Project construction and operation activities may of type and component that the existing waste management facilities are not familiar with and therefore does not have the tools, technology or capability of responsibly handling the waste. Hence, this may impact the efficiency of the existing facilities and puts the facilities in a risk from breach of containment and other unplanned events.

7.6.7.2 Impact from Inappropriate Storage of Domestic Waste during Construction Phase

Overview

During construction phase, various activities are expect to generate waste. This Section will consider only domestic solid and liquid waste as well as biomass waste. These waste can potentially impact surface water quality if not stored, treated and disposed responsibly.

From the estimated number of workers expected on-site, an approximation of domestic solid waste can be projected and is shown in ***Table 7.17***.

Table 7.15: Estimated Solid Waste Generated from Workers On-site

Phase	Anticipated Quantity	Number of Workers	Total Solid Waste
Construction	1.65 kg per employee per week	175	288.75 kg per week

Source: TPMC, 2019; adapted by ERM, 2019

From the estimated number of workers expected on-site, an approximation of domestic wastewater can be projected and is shown in ***Table 7.16***.

Table 7.16: Estimated Wastewater Generated from Workers On-site

Phase	Anticipated Volume	Number of Workers	Total Liquid Waste
Construction	50 litres per employee per day	175	8,750 litres per day

Source: TPMC, 2019; adapted by ERM, 2019

For construction and erection of Transmission Towers, it may be required to perform a site clearance and preparation depending on the terrain of the construction area. This will therefore generate biomass waste where the EPC management plan is to either give it to local communities used for firewood or dispose in an incinerator on-site. Approximately, a total of 200 m^3 of biomass waste will be generated during this phase. Moreover, construction waste is expected to occur from the construction activity. The volume of construction waste is not yet defined but the volume is expected to be insignificant.

Impact Assessment Table

Table 7.17: Impact Assessment Table for Impact from Inappropriate Storage of Waste during Construction Phase

Significance of Impact					
Impact	Potential impacts on surface water, soil, groundwater, air quality due to improper waste management during construction phase.				
Impact Nature	**Negative**	Positive	Neutral		
	Potential impacts to the receptors would considered to be adverse (negative).				
Impact Type	**Direct**	Indirect	Induced		
	Potential impacts would likely be direct impacts.				
Impact Duration	Temporary	**Short-term**	Long-term	Permanent	
	Construction is expected to be complete in 25 months, which would be considered short-term.				
Impact Extent	**Local**	Regional	International		
	Potential impacts are anticipated to be local extent due to construction activities are limited to a small area and the associated impacts are forecasted to not spread to a significant range.				
Impact Scale	The impact scale is anticipated to be moderate due to the large Project Area covering four (4) townships and two (2) rivers. During construction phase, it is approximated that 288.75 kg per week of domestic solid waste and 8,750 litres per day of domestic wastewater will be generated. Additionally, 200 m^3 biomass waste is anticipated to be generated (where most of this will be sold to locals.				
Frequency	Waste impact could occur intermittently but repeatedly throughout the day for the duration of the construction phase. Frequency of sewage release would be occurring intermittently but repeatedly throughout the day for the duration of the construction phase.				
Impact Magnitude	Positive	Negligible	**Small**	Medium	Large
	Based on the above impact characteristics, the impact magnitude is therefore concluded to be small.				
Receptor Sensitivity	Low	**Medium**	High		
	The primary receptor for impacts to surface water is Yangon River and Pun Hlaing River. The receptor prior to the Project construction activities is considered to in a polluted condition both Yangon and Pun Hlaing River. Both rivers are mostly used for transportation and fishing activities. However, soil and groundwater within the region are considered to be of good quality whereby majority of the land in the Study Area and the associated Area of Influence is used for agricultural activities. Overall, this put the Project Location in an area with medium level of receptor sensitivity.				

Significance of Impact				
Impact Significance	Negligible	**Minor**	Moderate	Major
	From small impact magnitude and medium level of receptor sensitivity, the impact significance is therefore minor.			

Mitigation Measures

The following measures will be put in place for the Project during the construction phase:

- All waste collection and storage measures as detailed within ***Section 7.4*** and ***Section 7.5*** (Surface Water, Soil and Groundwater) will be implemented;
- Ensure the integrity of wastewater storage unit to avoid leaking of wastewater and odor to the surrounding receptors;
- Establish waste management priorities and hierarchy at the outset of activities based on an understanding of potential environmental, health and safety risks and impacts;
- Use appropriate waste containers and build secondary containment around chemical or waste storage on-site to avoid spillage of waste and leakage of leachate during waste storage on-site;
- Use only appropriate waste collectors if can be identified;
- Minimise windblown litter and dust during the transportation of waste by either covering the load on the trucks or by transporting the waste in enclosed trucks;
- Siting of chemical and waste storage should consider nearby receptors, i.e. site away from watercourses or portable water sources;
- Segregate and store different types of waste in different containers, skips or stockpiles to enhance reuse or recycling of material and their proper disposal;
- Properly store the construction materials to minimise the potential damage or contamination of the materials;
- Enforce rules that prevent inappropriate materials going into the sanitary wastewater stream;
- Design discharge point to be furthest away from sensitive receptors;
- When transporting biomass waste, ensure to minimise windblown litter and dust during transportation of waste by either covering the load on the trucks or by transporting the waste is enclosed trucks;
- Designate suitable areas of the worksites for segregation and storage of the various materials;
- Any biomass not taken by the local community is to be appropriately stored (or immediately mulched) for later use within site stabilisation and rehabilitation activities;
- Site clearance and preparation is to be designed and conducted in a manner that requires minimum removal of vegetation;
- Conduct regular maintenance and upkeep of the incinerator to maintain its efficiency and consequently minimise emission;
- Minimising smoke emission from burning by controlling moisture content of the biomass waste prior to burning;
- Hazardous waste from the Project shall be disposed at appropriate facilities. The EPC Contractor should store and dispose of the hazardous waste in accordance with the applicable guidelines. The EPC Contractor should report the hazardous waste treatment arrangements to the local authorities (if required);
- Segregate hazardous waste from non-hazardous waste;

- Hazardous waste should be stored so as to prevent or control accidental releases to air, soil and water resources. Where practicable:
  - the storage area should be clearly labelled and demarcated;
  - readily available information on chemical compatibility should be provided to employees, including labelling each container to identify its contents;
  - hazardous waste should be stored in a manner that prevents the commingling or contact between incompatible wastes and allows for inspection between containers to monitor leaks or spills;
  - hazardous waste should be stored in closed containers away from direct sunlight, wind and rain;
  - hazardous waste storage area should be have an impermeable floor and containment, of capacity to accommodate 110% of the volume of the largest waste container;
  - hazardous waste storage areas have adequate ventilation, fire prevention system (if needed);
- Spill response and emergency plans should be prepared and implemented to address the potential accidental release of hazardous waste;
- On-site and off-site transportation of waste should be conducted so as to prevent or minimise spills, release and exposures to employees and public;
- Disposal of hazardous waste should be via an appropriated hazardous waste collector;
- Maintenance facilities should be located on hard standing surfaces within a bunded area. Sumps and oil interceptors should be provided. Maintenance of vehicles and equipment involving activities with potential for leakage and spillage should only be undertaken within areas appropriately equipped to control these discharges;
- Where onsite treatment of waste is conducted, the waste shall be stored and contained so as to ensure no material is released to the environment and river, and waste streams are segregated; and
- Segregate different type of biomass waste to manage and dispose each waste type with an appropriate method. Additionally, ensure no hazardous materials and chemicals are in the biomass waste during the incineration. Location of incinerators and burning area are to be designated furthest away from sensitive receptors and where burning can be controlled easier in case of loss of containment.

Residual Impacts

If the recommended mitigation measures are implemented, residual impact significance would be **Negligible Negative Impact**.

Monitoring Plan

As detailed in the ESMP chapter (***Chapter 10***), monitoring for surface water during the operation phase should consist of the following:

- Unplanned audit of contractors against WMP twice a year; and
- Weekly monitoring of on-site segregation, storage, management and disposal procedure.

7.6.7.3 Impact from Waste Generation on Existing Waste Management Network and Facilities during Construction Phase

Overview

Waste generated from construction activities are plan by the EPC to be sent to landfill while other hazardous waste are treated on site and dispose at a designated discharge point. It is estimated that a total of 150 – 200 m^3 of non-hazardous waste will be generated during this phase (with no hazardous waste anticipated). Some example of these waste include wires, cables, metal scraps, paint and oil. Currently, landfills within the region has the capability of managing 2,064 tonnes per day of landfill waste.

Impact Assessment Table

Table 7.18: Impact Assessment Table for Impacts of Waste Generation on Existing Waste Management Network and Facilities during Construction Phase

Significance of Impact					
Impact	Potential impacts on existing waste management network and facilities from generation of waste from the Project activities during construction phase.				
Impact Nature	**Negative**	Positive	Neutral		
	Potential impacts to the receptors would considered to be adverse (negative).				
Impact Type	**Direct**	Indirect	Induced		
	Potential impacts would likely be direct impacts.				
Impact Duration	Temporary	**Short-term**	Long-term	Permanent	
	Construction is expected to be complete in 25 months, which would be considered short-term.				
Impact Extent	**Local**	Regional	International		
	Potential impacts are anticipated to be local extent due to the chosen landfill sites are within local region only.				
Impact Scale	The impact scale is anticipated to be moderate as it is expected that the construction activities will generate a reasonably large amount of waste (type that are chosen to be sent to landfill).				
Frequency	Frequency of impact will be dependent on the frequency of waste transportation from the Project Site to the designated waste management facilities as well as the amount of waste generated and waste storage area.				
Impact Magnitude	Positive	Negligible	**Small**	Medium	Large
	The impact magnitude is likely to be small because the anticipated amount of non-hazardous waste generated during construction phase is only 150 – 200 m^3, considered to be small volume of waste compared to the landfill capacity.				
Receptor Sensitivity	Low	Medium	**High**		
	The existing waste management facility in the Study Area at risk of not having sufficient capacity to manage additional waste generated from the Project construction activities. Therefore the receptor sensitivity is considered to be high				
Impact Significance	Negligible	Minor	**Moderate**	Major	
	From small impact magnitude and high level of receptor sensitivity, the impact significance is therefore moderate level.				

Mitigation Measures

The following measures will be put in place for the Project during the construction phase:

- All waste collection and storage measures as detailed within ***Section 7.4*** and ***Section 7.5*** (Surface Water and Soil and Groundwater) will be implemented;
- Devise and implement appropriate waste management plan to store and dispose waste appropriately. The waste management plan is expected to include specific requirements to manage, avoid, reduce and reuse waste during the construction phase of the Transmission Line for all of the waste streams identified;
- Prior to construction commencing, TPMC is to engage with local authorities and other stakeholders to determine the capacity of the local waste management network to absorb the new waste streams during construction;
- A waste management plan is to be developed which includes specific requirements to manage, avoid, reduce and reuse waste during the construction phase for all of the waste streams identified;
- Education of all workers on site shall be undertaken to avoid, reduce, and reuse waste where possible;
- Waste clean-up measures are to be undertaken on at least a fortnightly basis to collect any waste or unused materials from the construction site. A waste management plan will be prepared and followed during the construction phase;
- Monitoring of appointed waste contractors using chain-of custody documentation for the disposal of waste to ensure that it is able to be disposed of in an environmental responsible manner and in accordance with all prevailing regulations;
- The appointed waste contractor shall report on an annual basis on any cross-boundary transport of waste;
- Processes should be designed and operated to prevent or minimize the quantities of wastes generated and hazards associated with the waste generated;
- Implement recycling plans by considering waste production processes and identify potential recyclable material and identify of products that can be reintroduce into the manufactory process or external markets by other industrial process operation;
- Explore opportunities for reuse of inert construction waste (excavated soil and rock) within the Project site or other construction projects. The removed soil during site preparation will be utilised as far as possible for surface cover at places on the Site where backfilling takes place, with the rest (together with vegetation wastes) being contracted for disposal;
- Segregate, prior to disposal, construction waste, steel and other metals, to the extent practicable, for re-use and recycling to minimise the quantity of waste to be disposed of to the dump site;
- Implement a construction materials inventory management system to minimise over-supply of the construction materials, which lead to disposal of the surplus materials at the end of the construction period;
- Minimise over ordering and waste of materials such as ready mixed concrete and cement grouts;
- Where practicable, adopt processes which generate reduced quantities or even no hazardous waste, or less dangerous types of hazardous waste; and
- Introduce and implement, where practicable, a recycling plan for biomass waste to reduce the amount of biomass required to be burnt. This may include identifying potential market or appropriate industry to reintroduce the biomass as part of their resource consumption.

Residual Impacts

If the recommended mitigation measures are implemented, residual impact significance would be **Negligible Negative Impact**.

Monitoring Plan

As specified in the ESMP chapter (***Chapter 10***), monitoring of waste during construction phase should consist of the following:

- Monitoring of waste segregation, transportation and disposal practices in the project activity areas and disposal location, as to be defined in a Waste Management Plan to be prepared specifically for the Project; and
- Monitoring of appointed waste contractors using chain-of custody documentation, as to be defined in a Waste Management Plan to be prepared specifically for the Project.

7.6.7.4 Impact from Waste during Operation Phase

Overview

During the operation phase of the Transmission Line, related operation activities are anticipated to not generate significant amount of waste. However, maintenance activities which occurs during the operation phase may produce waste but is predicted to be at an insignificant amount. Therefore no impact from waste assessment for Transmission Line during operation phase are to be presented.

7.6.7.5 Impact from Waste during Decommissioning Phase

Overview

During the decommissioning phase of the Project, it is anticipated that related activities will generate waste on-site. This will contribute to the baseline noise condition. Additionally, it is expected that the Project activities during decommissioning will be similar to what was presented in the construction phase. However, without proper knowledge of the type and amount of waste, it is not possible to establish clearly these mitigations and therefore this should be the subject of a new assessment in time of decommissioning.

7.7 Visual Impact Assessment

7.7.1 Introduction

The development of the Project will be introducing a number of new elements into the existing visual environment. This Section presents a qualitative assessment of impacts to visual amenity (assessed as one of the interrelated effects on population and how various groups experience and perceive changes in the values attributed to the landscape). During the construction and operation there will be a range of activities which have the potential to change how various people will perceive/see the landscape. The key visually sensitive receptors within the vicinity of the proposed Project have been identified in the Baseline ***Chapter 5*** and this Section undertakes an assessment of predicted impacts to these during construction and operation.

This Section will also develop management, mitigation and monitoring measures needed to ensure that any identified impacts can be reduced to as low as reasonably practicable. Such measures are presented in this Section and will form part of the overall Environmental and Social Management Plan (ESMP, ***Chapter 10***) for the Project.

7.7.2 Assumptions and Limitations

The assessment of potential visual impacts related to social receptors in this Section is based on the environmental baseline data (presented within ***Section 5.2***), socio-economic baseline data (presented within ***Section 5.4***) and the information available from TPMC at the time of writing. Judgements and assessment have been made based on professional knowledge and previous experience of ERM. It is noted that no quantitative modelling has been undertaken with regards to any elements of the visual impact assessment. Should there be significant changes in factors such as assumed input data, engineering design of Transmission Towers, or agreed assessment criteria, then elements of this impact assessment and associated management, mitigation and monitoring measures may needed to be revised to reflect these changes.

This Section focuses purely on the visual related component at local extent. It is recognised that there is considerable cross over of impacts towards different receptors that are impacted by the changes of visual condition. With this regard, this Section will be assessing impacts and develop management, mitigation and monitoring measures in relation to reducing impacts from visual components.

7.7.3 Assessment Methodology

The methodology used for assessing impacts to visual component is aligned with the general impact assessment methodology presented in ***Chapter 6***.

7.7.4 Baseline Summary

The general topography of the Study Area is fairly flat with elevation differences between 0-5 meters. Three townships that the Project intersects are mostly brownfield and greenfield with a few settlements. The sensitive receptors are locals living in the nearby area of the Project, which are:

- Kyun Ka Lay;
- Kyi Seik;
- Ka Pyo;
- Kin;
- Kha Yan Wa;
- Ma Myo Su;
- Kha Lauk Kha Lu;
- Auk Ta Mar Ta Kaw;
- Htein Kone;
- Ta Man Gyi Ta Khun Taing;
- Kun Tar
- Tet Thit; and
- Gyaung Waing Gyi.

7.7.5 Receptor Identification and Sensitivity

The only village that is within the Project Study Area (250 m around the Transmission Line) is Kyun Ka Lay in Hlaingthayar Township.

7.7.6 Summary of Project Activities

7.7.6.1 Construction Phase

During the construction phase, impacts to visual component may arise from lighting during construction activities or safety lighting at night causing nuisance to the surrounding communities.

7.7.6.2 Operation Phase

During the Transmission Line operation phase (anticipated to be 25 years). The physical presence of the Transmission Tower and Transmission Line will degrade the quality of scenery for the surrounding people.

7.7.7 Assessment of Impacts

7.7.7.1 Impact on Visual Component of Transmission Line during Construction Phase

Overview

Visual impacts during site formation and construction phase will be caused by earthworks, light emissions disturbance and physical presence of facilities as they are erected.

Impact Assessment Table

Table 7.19: Impact Assessment Table for Visual Component during Construction Phase

Significance of Impact				
Impact	Potential impacts on visual component by nearby receptors that is within the Area of Influence from the Project construction activities.			
Impact Nature	**Negative**	Positive	Neutral	
	Potential impacts to the receptors would considered to be adverse (negative).			
Impact Type	**Direct**	Indirect	Induced	
	Potential impacts would likely be direct impacts.			
Impact Duration	Temporary	**Short-term**	Long-term	Permanent
	Construction is expected to be complete in 25 months, which would be considered as temporary duration.			
Impact Extent	**Local**	Regional	International	
	Light emissions, disturbance and physical presence of the Transmission Towers will be largely confined of the Project Sites although some light emissions will be visible further away.			
Impact Scale	Impact scale gets larger as the construction progresses. The end of construction phase, the Project Study Area will expand to a total area of 56,784m^2.			
Frequency	Frequency of impact will be constant throughout the construction phase until the Project is built.			
Impact Magnitude	Positive	Negligible	Small	**Medium**	Large
	Based on the above impact characteristics, the impact magnitude is therefore concluded to be medium.			

Significance of Impact				
Receptor Sensitivity	**Low**	Medium	High	
	Receptors within the Study Area and the associated Area of Influence comprised of small villages with relatively small populations; therefore, the receptor sensitivity is rated as low.			
Impact Significance	Negligible	**Minor**	Moderate	Major
	From medium impact magnitude and low level of receptor sensitivity, the impact significance is therefore minor level.			

Mitigation Measures

The following mitigation measures should be implemented to mitigate the impacts:

- Provide soft landscaping (i.e. tree, low shrub and ground cover planting) within available space within the Project Site to accommodate visual landscape of the receptors to consist of more greeneries to offset the presence of the Transmission Tower. Plant as soon as practical during construction phase;
- Minimize the extent of construction areas and including temporarily affected areas;
- Minimize clearing of vegetation as far as practical. Existing large trees (if any) should be retained as far as practical. Those that fall outside the earthworks area must be retained. Felled trees should be compensated for where possible; and
- Reinstatement of temporarily affected areas which will no longer be required for the operational stage (e.g. contractor camp, laydown areas, etc.), to suitable pre-construction condition as soon as practical after use (e.g. using landscaping with suitable vegetation).

Residual Impacts

If the recommended mitigation measures are implemented, residual impact significance would be **Negligible Negative Impact**.

Monitoring Plan

The following monitoring plan should be implemented to monitor and control the impacts:

- Provide contact information of relevant authorities and the Project Proponent in order to report grievance where appropriate and necessary corrective or compensatory actions.

7.7.7.2 Impact on Visual Component of Transmission Line during Operation Phase

Overview

Visual impacts during operations will be caused by the physical presence of the proposed Transmission Towers and Line as well as the light emissions associated to the structure.

Impact Scale Thought Process

The sensitive receptor in this case is located fairly close to the Project Location and therefore will require a thorough impact scale assessment to be made. A direct correlation between actual height of Transmission Tower, distance between Transmission Tower and the receptor and perceived height[134] of the Transmission Tower from a different distance will be drawn.

[134] Perceived height refers to the height a person is able to observe of an object or structure at a different distance but is not the actual height of the object or structure

The height of a Transmission Tower for this Project is 35-45 m. If the Transmission Tower is observed at 1 m away from the Transmission Tower base, the Transmission Tower perceived height will approximate to be 45 m. Moreover, the closest receptor for this Project is located roughly 180 m away from the Transmission Line and thus a Transmission Tower. A direct correlation of distance and perceived can be drawn using the intercept theorem. Intercept theorem states that:

"If a line is parallel to side of a triangle which intersects the other sides into two distinct points, then the line divides those sides in proportion."[135]

Therefore, it can be calculate from the adaptation of intercept theorem that:

$$\frac{Y_2}{Y_1} = \frac{X_2}{X_1}$$

Where:

X_1 is distance from Transmission Tower to observer 1;

Y_1 is observed height of Transmission Tower by observer 1;

X_2 is distance from Transmission Tower to observer 2; and

Y_2 is observed height of Transmission Tower by observer 2.

However, since this is a reverse proportion whereby, the further away the object, the smaller it should be seen, henceforth, the proportion relationship will need to be inverse to become:

$$\frac{Y_2}{Y_1} = \frac{X_1}{X_2}$$

By rearranging to find Y_2, the equation is translated to:

$$Y_2 = \frac{Y_1 \times X_1}{X_2}$$

By substituting:

X_1 by 1 meter;

Y_1 by 45 meters; and

X_2 by 180 meters.

The following answer can be achieved:

$$Y_2 = \frac{45 \times 1}{180} = 0.250\ m = 25.0\ cm$$

Therefore, it can be determined that at the closest village, the resident perceive a Transmission Tower height of 25.0 cm or 0.250 m from the ground.

Additionally, the angle of view in order to see the top of the Transmission Tower can be found by using trigonometry. The following equation is used to in order to find the angle of view for the top of the Transmission Tower:

$$\tan\theta = \frac{O}{A}$$

Where:

O is the height of the actual height of the Transmission Tower; and

A is distance from Transmission Tower to observer.

By rearranging to find θ, the equation is translated to:

[135] https://www.toppr.com/guides/maths/triangles/basic-proportionality-theorem-and-equal-intercept-theorem/

$$\theta = \tan^{-1}(\frac{O}{A})$$

By substituting:

O by 45 meters; and

A by 180 meters.

The following answer can be achieved:

$$\theta = \tan^{-1}(\frac{45}{180}) = 14.04°$$

Therefore, it can be determined that receptors at the closest village can observe the peak of the Transmission Tower at 14.04° above the ground level.

Impact Assessment Table

Table 7.20: Impact Assessment Table for Visual Component during Operation Phase

Significance of Impact					
Impact	Potential impacts on visual component by nearby receptors that is within the Area of Influence from the Project operation activities.				
Impact Nature	**Negative**	Positive	Neutral		
	Potential impacts to the receptors would considered to be adverse (negative).				
Impact Type	**Direct**	Indirect	Induced		
	Potential impacts would likely be direct impacts.				
Impact Duration	Temporary	Short-term	**Long-term**	Permanent	
	Operation phase is expected to continue for 25 years which is considered as long-term.				
Impact Extent	**Local**	Regional	International		
	Physical presence of the Transmission Towers will be largely confined of the Project Site.				
Impact Scale	From the “Impact Scale Thought Process” section, it can be determined that the impact scale is to be considered as significant.				
Frequency	Frequency of impact will be constant throughout the operation phase until the Project is built.				
Impact Magnitude	Positive	Negligible	Small	Medium	**Large**
	The impact magnitude is likely to be large due to the large size of the Project structure.				
Receptor Sensitivity	**Low**	Medium	High		
	Receptors within the Study Area and the associated Area of Influence comprised of small villages with a few number of people living in them therefore the receptor sensitivity is rated as low.				
Impact Significance	Negligible	Minor	**Moderate**	Major	
	From large impact magnitude and low level of receptor sensitivity, the impact significance is therefore moderate level.				

Mitigation Measures

The following mitigation measures should be implemented to mitigate the impacts:

- Visual screening e.g. surround perimeter of site with native trees (can be compensatory trees for any felled during construction);
- Maintain soft landscaping (i.e. tree, low shrub and ground cover planting) within available space in the Project Site; and
- Maintain all structural facilities in good repair.

Residual Impacts

If the recommended mitigation measures are implemented, residual impact significance would be **Minor Negative Impact**.

Monitoring Plan

As specified in the ESMP chapter (***Chapter 10***), monitoring of visual impact during construction phase should consist of the following:

- Provide contact information of relevant authorities and the Project Proponent in order to report grievance where appropriate and necessary corrective or compensatory actions.

7.8 Biodiversity Impact Assessment

7.8.1 Introduction

The development of the Project will be introducing a number of new elements into the existing environment. This Section presents a purely qualitative assessment of impacts to the biodiversity aspect (including fauna, flora, birds, and marine species). During construction and operation (and maintenance) phase there will be a range of activities which have the potential to change the biodiversity values and conditions. The key sensitive receptors within the vicinity of the proposed Project have been identified in the baseline ***Chapter 5*** and this Section undertakes an assessment of predicted impacts to these during construction and operation.

This Section will also develop management, mitigation and monitoring measures needed to ensure that any identified impacts can be reduced to as low as reasonably practicable. Such measures are presented in this Section and will form part of the overall Environmental and Social Management Plan (ESMP, ***Chapter 10***) for the Project.

7.8.2 Assumption and Limitations

The assessment of potential impacts related to biodiversity and ecosystem services in this Section is based on the environmental baseline data (presented within ***Chapter 5***), socio-economic baseline data (presented in ***Chapter 5***) and the information available from the Project Proponent at the time of writing. Judgements and assessments have been made based on professional knowledge and previous experience of ERM.

7.8.3 Assessment Methodology

The significance of impacts has been evaluated using a standardized approach based on ERM's Impact Assessment Standard. This Standard has been determined based on the requirements of IFC PS6. It is based on the relationship between the magnitude of impact and nature of receptor (sensitivity).

The significance of the impacts has been assessed using the approach and methodology as described in ***Chapter 6***. The criteria for sensitivity to and magnitude of the impact to Terrestrial Biodiversity (habitat & species) are defined in ***Table 7.21*** to ***Table 7.24***.

Table 7.21: Sensitivity Criteria for Biodiversity – Habitat

Sensitivity	Definition
Low	Habitats with no, or only a local designation/ recognition, habitats of significance for species listed as Least Concern (LC) on IUCN Red List of Threatened Species, habitats which are common and widespread within the region, or with low conservation interest based on expert opinion.
Medium	Habitats within nationally designated or recognised areas, habitats of significant importance to globally Vulnerable (VU), Near Threatened (NT), or Data Deficient (DD) species, habitats of significant importance for nationally restricted range species, habitats supporting nationally significant concentrations of migratory species and/ or congregatory species, and low value habitats used by species of medium value.
High	Habitats within internationally designated or recognised areas, habitats of significant importance to globally Critically Endangered (CR) or Endangered (EN) species, habitats of significant importance to endemic and/ or globally restricted-range species, habitats supporting globally significant concentrations of migratory species and/ or congregatory species, highly threatened and/ or unique ecosystems, areas associated with key evolutionary species, and low or medium value habitats used by high value species.

Source: ERM, 2012.

Table 7.22: Magnitude Criteria for Impacts to Biodiversity – Habitat

Magnitude	Definition
Negligible	No existing habitat is affected
Small	Affects only a small area of habitat, such that there is no loss of viability/ function of the habitat.
Medium	Affects part of the habitat, but does not threaten the long term viability/ function of the habitat.
Large	Affects the entire habitat, or a significant proportion of it, and the long term viability/ function of the habitat is threatened.

Source: ERM, 2012.

Table 7.23: Sensitivity Criteria for Biodiversity – Species

Sensitivity	Definition
Low	Species and sub-species of LC on the IUCN Red List, or not meeting criteria for medium or high value.
Medium	Species on IUCN Red List as VU, NT, or DD, species protected under national legislation, nationally restricted range species, nationally important numbers of migratory, or congregatory species, species not meeting criteria for high value, and species vital to the survival of a medium value species.
High	Species on IUCN Red List as CR, or EN. Species having a globally restricted range (i.e. plants endemic to a site, or found globally at fewer than 10 sites, fauna having a distribution range (or globally breeding range for bird species) of less than 50,000 km2), internationally important numbers of migratory, congregatory species, key evolutionary species, and species vital to the survival of a high value species.

Source: ERM, 2012.

Table 7.24: Magnitude Criteria for Impacts to Biodiversity – Species

Magnitude	Definition
Negligible	No species is affected
Small	Effect does not cause a substantial change in the population of the species, or other species dependent on it.
Medium	Effect causes a substantial change in abundance and/ or reduction in distribution of a population over one, or more generations, but does not threaten the long term viability/ function of that population, or any population dependent on it.
Large	Affects entire population, or a significant part of it causing a substantial decline in abundance and/ or change in and recovery of the population (or another dependent on it) is not possible either at all, or within several generations due to natural recruitment (reproduction, immigration from unaffected areas).

Source: ERM, 2012.

7.8.3.1 Scoping of Likely Impacts to Biodiversity Values

Table 7.25 broadly defines the types of threats to biodiversity values that have potential to occur as a result of this Project. These threats to biodiversity are derived from IFC PS6 and relate to the activities that are likely to occur during construction and post construction phases.

Table 7.25: Types of Threats to Biodiversity Values

Term	Description
Loss of habitat	Permanent loss of habitat or species due to permanent or temporary site activities.
Disturbance or displacement of individuals ■ Light; ■ Noise; and ■ Vibration impacts	Temporary disturbance to, or displacement/exclusion of a species from foraging habitat due to construction activities, and operational and maintenance activities. Permanent impacts from light, noise and vibration sources on surrounding habitats during operation causing disturbance and displacement and changes in behaviour
Barrier creation, fragmentation and edge effects	Permanent and temporary creation of barriers to the movements of animals, especially fish, but also mammals, reptiles and amphibians and invertebrates and plants with limited powers of dispersal. Fragmentation of habitat, or permanent /temporary severance of wildlife corridors between isolated habitats of importance for biodiversity. Impacts that occur when a habitat is exposed to a different adjacent habitat type or structure. These impacts can include increased risk of parasitism or disease, increased risk of predation, adverse microclimate conditions (including drying out and subsequent fire risk), and competition from invasive species
Degradation of habitat ■ Dust; and ■ Water pollution. Invasive species	Disturbance or damage to adjacent habitat and species caused by changes in microclimate, vulnerability to predation and invasion and overall changes in conditions that can lead to a change in the community and its values for flora and fauna. This can include increased exposure to noise, light and dust. Introduction or spreading of alien species during the construction works.

Term	Description
Mortality – vehicle strike, hunting and poaching	Mortality of individual fauna species as a result of vehicle or machinery strike or falling debris during clearing activities. Mortality to individual fauna species as a result of worker influx and hunting/poaching of extant fauna

7.8.3.2 Biodiversity Impact Typology

The scoping and screening of potential Project impact identified a number of Project aspects and activities that have potential impacts to biodiversity values. Whilst the potential impacts relate to a combination of Project aspects/activities and biodiversity threats, they can be summarised into a number of key potential impacts according to the biodiversity threat type. These impacts can relate to habitat areas, specific species or both.

These impact assessment types are further explored in relation to the biodiversity values identified within the Project Area and outlined in the physical and biological baseline (**Chapter 5**) and the specific Project activities/aspects.

This Section discusses on the nature of impacts to biodiversity values at it relates to the characteristics of the Project Area as determined by assessing the impacts of the Project Description (**Chapter 4**). The information has been used to inform the evaluation of the significance of the impact in the impact assessment summary tables following each impact assessment type. Impact assessments have been undertaken for both the construction and operation phase.

ERM has utilised the mitigation hierarchy to outline avoidance, mitigation and compensation (offset) requirements as required by the IFC PS6. **Table 7.26** scopes the impacts likely during the construction, operational and decommissioning phases of the Project. The impact assessment for these impact types are further assessed below.

Table 7.26: Scoping of Potential Impacts during Construction and Operational Phases

Type of Impact	Direct/ Indirect	Operational Phase
Permanent and temporary loss of habitat	Direct	No
Temporary disturbance or displacement of fauna	Direct	Continuing from construction phase
Temporary degradation of habitat	Indirect	Continuing from construction phase
Mortality – vehicle strike, hunting and poaching	Direct	Reassessed for operational phase

Notes:
***Yes**: considered to be likely impacts during the phase*
***No**: considered that there will be no impacts or negligible impacts during the phase*
***Continuing from construction/operation phase**: the impact is likely to continue from the operation phase and the mitigations outlined are appropriate to manage impacts during construction and/or operational phase.*
***Reassessed for operational phase**: the impact is likely to be different during the phase and hence is reassessed based on the likely impacts. Additional mitigations may be outlined to apply to this phase.*

7.8.4 Summary of Project Activities

The following potential impact types have been screened into this impact assessment:

- Permanent and temporary habitat loss;
- Temporary disturbance or displacement of fauna;
- Temporary and permanent barrier creation, edge effects and fragmentation

- Degradation of habitat;
- Mortality of resident species; and
- Mortality of Avifauna.

7.8.5 Permanent and Temporary Habitat Loss

The impacts from the loss of habitat within the Project Area during the construction and operation phase are predominately related to the construction of infrastructure necessary for the Project. Habitat is an important aspect to support the lifecycles of fauna identified with the Project Area. This includes habitat for breeding, foraging and roosting. Removal of the habitat reduces the habitat available to resident species and the ecological value of the area.

Habitat will be cleared for all Project components, including Natural Habitat and Modified Habitat. Clearing and Habitat disturbance will be associated with the construction of the Transmission Line.

7.8.5.1 Baseline Summary

The distribution of habitat within the AoI consists of both Natural Habitat and Modified Habitat. The Project Area consists of Modified Habitats being agriculture and village land classes. The area of Natural Habitat and Modified Habitat within the AoI and Project Area are shown in ***Table 7.27*** below.

Table 7.27: Natural Habitat and Modified Habitat within the AoI and Project Area

Habitat Type	Area of Influence (ha)
Natural Habitat	45.73
Modified Habitat	1,085.84

7.8.5.2 Proposed Project Activity

Clearing of land for the construction and operation of the Transmission Line and associated facilities will remove vegetation cover available for species within the Project Area.

7.8.5.3 Receptor Identification and Sensitivity

The receptor for habitat loss is Modified Habitats that have a Low sensitivity. No species of conservation significance were identified within Modified Habitats around the Project Area.

7.8.5.4 Impact Assessment Table

Table 7.28: Impact Assessment Table on Habitat Loss

Significance of Impact				
Impact	Potential impacts on biodiversity values due to habitat loss around the Project Area during construction and operation phase.			
Impact Nature	**Negative**	Positive	Neutral	
	Potential impacts to the receptors would considered to be adverse (negative).			
Impact Type	**Direct**	Indirect	Induced	
	Potential impacts would likely be direct impacts.			
	Temporary	Short-term	Long-term	**Permanent**

Significance of Impact					
Impact Duration	Construction is expected to be complete in 25 months, which would be considered as temporary duration. Operation phase is expected to last for 25 years, but the result of the impact is deemed to be permanent.				
Impact Extent	**Local**	Regional	International		
	The clearing of habitats will be restricted to local extent.				
Impact Scale	It is anticipated that the impact will be limited to the Project Area during construction and operation. A total of 5,585 km^2 (558,500 ha) will be cleared during construction and operation. The habitat will be agricultural land classes that are considered to be Modified Habitat.				
Frequency	Frequency of impact will be constant throughout the construction and operation phase of the Project.				
Impact Magnitude	Positive	Negligible	Small	Medium	**Large**
	Based on the above impact characteristics, the impact magnitude is therefore concluded to be large.				
Receptor Sensitivity	**Low**	Medium	High		
	Majority of the Study Area are modified habitat which are considered to have low sensitivity.				
Impact Significance	Negligible	Minor	**Moderate**	Major	
	From large impact magnitude and low level of receptor sensitivity, the impact significance is therefore moderate level.				

7.8.5.5 Mitigation Measures

The following mitigation measures should be implemented so as to reduce the significance of the impact:

- A community program is to be established with adjacent landowners to replant mangrove forest along foreshore areas and re-establish coastal vegetation on non-utilised public land and private land (with consent of the land-owner). This program will re-establish habitat within the EBA suitable for the endemic bird trigger species;
- Strict rules against clearing vegetation will be imposed on all Project staff, workers, and all contractors and personnel engaged in or associated with the Project, with penalties levied, including fines and dismissal, and prosecution under the relevant laws;
- The Project Proponent shall be directly responsible for dissemination to its staff and workers of all rules, regulations and information concerning restrictions related to unauthorised clearing of vegetation, as well as the punishment that can expected if any staff or worker or other person associated with the Project violate rules and regulations;
- The planned clearance area for the construction and operation works shall be clearly identified and marked to avoid accidental clearing; and
- Use of the access road should be restricted to construction and operation vehicles only. Checkpoints should be used to manage access and inspect vehicles for timber and forest products taken from the Project Area.

7.8.5.6 Residual Impact

Based on the implementation of the proposed mitigation measures, the significance of the impact on Project infrastructure and activities is considered to be a **Minor Negative Impact** post mitigation.

7.8.5.7 Comparison with applicable regulations, standards and guidelines

The applicable standard is the IFC Performance Standard 6. Paragraph 15 of the PS requires clients to apply the mitigation hierarchy to projects (avoid, mitigate and offset impacts to biodiversity values). The Project Area is located mostly within Modified Habitat and hence satisfies the requirement to avoid Natural Habitat and Critical Habitat as required by the Mitigation Hierarchy.

7.8.5.8 Monitoring plan

The construction and operation Contractor, will schedule and implement a routine inspection program throughout construction and operation period to monitor vegetation clearing extent.

7.8.6 Temporary Disturbance or Displacement of Fauna and Flora

Disturbance and displacement of species during construction and operation will be primarily caused by light, noise and vibration impacts during construction and operation activities. The use of machinery during day and night time operation will result in increases of light, noise and vibration impacts.

7.8.6.1 Baseline Summary

Species detected at the project location include species with a wide distribution and are classified as Least Concern or Not Evaluated according to the IUCN Red List. ***Table 7.29*** is a count species summary with different red list category (for more details of the species refer to ***Table 5.3***).

Table 7.29: Summary of Number of Species per Different Red List Category

Taxonomic group	Number	IUCN Red List Category
Birds	7	EN
Birds	6	CR
Birds	6	VU
Fishes	1	CR
Mammals	4	VU
Mammals	3	EN
Plants	1	VU
Reptiles	2	VU

EN – Endangered
CR – Critical
VU – Vulnerable

7.8.6.2 Proposed Project Activity

The use of machinery, human presence and subsequent light, noise and vibration impacts during construction and operation.

7.8.6.3 Receptor Identification and Sensitivity

The Project Area is considered to be Modified Habitat. Additionally, no threatened or endangered bird species were identified in the Project Area. The sensitivity of the receptor is therefore considered to be Low.

7.8.6.4 Impact Assessment Table

Table 7.30: Impact Assessment Table on Disturbance and Displacement of Fauna and Flora

Significance of Impact				
Impact	Potential impacts on biodiversity values due to disturbance and displacement of fauna and flora around the Project Area during construction and operation phase.			
Impact Nature	**Negative**	Positive	Neutral	
	Potential impacts to the receptors would considered to be adverse (negative).			
Impact Type	**Direct**	Indirect	Induced	
	Potential impacts would likely be direct impacts.			
Impact Duration	**Temporary**	Short-term	**Long-term**	Permanent
	Construction is expected to be complete in 25 months, which would be considered as temporary duration. Operation phase is expected to last for 25 years, and therefore the impact is deemed to be long-term duration.			
Impact Extent	**Local**	Regional	International	
	The disturbance and displacement of fauna and flora will be restricted to local extent.			
Impact Scale	The scale of effect due to disturbance and displacement of fauna in terrestrial habitats is likely to be within the Project Area and the adjacent habitat within the Area of Influence and is hence defined to be a small scale impact.			
Frequency	Frequency of impact will be constant throughout the construction and operation phase of the Project.			
Impact Magnitude	Positive	Negligible	Small	**Medium**	Large
	Based on the above impact characteristics, the impact magnitude is therefore concluded to be medium.			
Receptor Sensitivity	**Low**	Medium	High	
	The receptors are mostly Least Concern species so the sensitivity is considered to be Low.			
Impact Significance	Negligible	**Minor**	Moderate	Major
	From medium impact magnitude and low level of receptor sensitivity, the impact significance is therefore Minor level.			

7.8.6.5 Mitigation Measures

The following mitigation measures should be implemented so as to reduce the significance of the impact:

- Operational vehicles will be maintained in accordance with industry standard to minimise unnecessary noise generation;
- Traffic signs will be maintained on all roads depicting speed limits;
- Access to facilities, including the access road should be restricted to operational vehicles only;
- For operational areas requiring night-time lighting, lights will be used only where necessary and will be directed toward the subject area and away from habitat areas where possible;
- Commitment will be made to raise awareness of the operator work force regarding flora and fauna values and make arrangements for restriction of hunting and poaching; and

- Additional mitigation measures are outlined in the next assessment section in relation to impacts from potential collision with the Transmission Line to conservation significant bird species.

7.8.6.6 Residual Impact

Based on the implementation of the proposed mitigation measures, the significance of the impact on Project infrastructure and activities is considered to be a **Negligible Negative Impact** post mitigation.

7.8.6.7 Comparison with applicable regulations, standards and guidelines

The applicable standard is the IFC Performance Standard 6. Paragraph 15 of the PS requires clients to apply the mitigation hierarchy to projects (avoid, mitigate and offset impacts to biodiversity values). The Project area is located within Modified Habitat and hence satisfies the requirement to avoid Natural Habitat and Critical Habitat as required by the Mitigation Hierarchy.

7.8.6.8 Monitoring plan

The following monitoring measures will be applied during construction:

- Records are to be kept and regularly reviewed (3 monthly basis) during construction on the application of the fencing and hoarding implementation;
- Regular inspections (weekly during construction) during the dry season to determine the level of dust deposition on vegetation surrounding the Project Area. Where excessive dust on vegetation is identified, and rain is not forecast within the next 5 days, vegetation should be washed using a water truck;
- Records are to be kept and regularly reviewed (3 monthly basis) on the planting of indigenous flora and fauna on disturbed areas; and
- Monitoring if rehabilitation success/failure is to occur on all replanting sites. Monitoring is to consist of regular inspections (3 monthly basis) to determine plant establishment. Where plant establishment is determined to have failed, reestablishment is to occur.

7.8.7 Temporary and Permanent Barrier Creation, Edge Effects and Fragmentation

7.8.7.1 Baseline Summary

Construction activities relating to linear infrastructure have potential to create a temporary barrier to fauna movement (for some fauna groups). This includes construction of the access roads, erection of Transmission Line and other infrastructure. Most other Project components are discrete areas that may be navigated around by fauna that may be moving through. The construction of access roads and Transmission Line will primarily be within Modified Habitat, however the Project area is not located within any Endemic Bird Areas. However, passing bird species are likely to be temporary impacted during construction and reduced during operation.

Temporary and permanent barrier creation will occur during construction. This will include the erection of fences and hoardings around construction sites, and also construction of linear infrastructure (such as the access road and transmission line). This may impact the movement of fauna within the landscape, particularly bird species.

Edge effects are an indirect impact of land clearing during construction and throughout operation and can have temporary and permanent impacts. Where vegetation clearing occurs, adjacent vegetation and habitats can be exposed to changes in noise, light (natural or artificial), dust, humidity and temperature factors as well as increased competition from predators and invasive species. The impact of edge effects to habitat value and forest composition has been widely recognised as a contributor to habitat degradation and impacts to biodiversity. In extreme cases the effects have potential to alter the

habitat characteristics of the ecotone and influence suitable habitat for native flora and fauna (including threatened species).

Both Natural and Modified Habitats surrounding the Project Area may be temporarily impacted due to Project construction from dust and pollution. This will be most pronounced along the Transmission Line and road construction routes where vehicles movements along dirt roads will likely increase dust impacts. The primary impact will be dust deposition on flora within close proximity of construction sites.

Fragmentation of habitats can occur where currently link habitats are disconnected through the construction of Project components. Fragmentation reduces the continuity of habitat and hence the ability for fauna to move within and between habitats patches. The resulting impact can cause reductions in foraging and breeding habitats. Species with limited home ranges may have a reduction in available area, leading to conflict over resources or negative interactions over territories.

Fragmentation of existing habitats within the Project Area is not considered to be a significant impact as the infrastructure design does not lead to isolation of habitat patches and is primarily within Modified Habitat. The area of mangroves along the immediate shoreline which is considered to be Natural Habitat will not be impacted.

The distribution of habitat within the AoI consists of both Natural Habitat and Modified Habitat. The Project Area consists of Modified Habitats being agriculture and village land classes. The area of Natural Habitat and Modified Habitat within the AoI and Project Area are shown in ***Table 7.31*** below.

Table 7.31: Natural Habitat and Modified Habitat within the AoI and Project Area

Habitat Type	Project Area (ha)	Area of Influence (ha)
Natural Habitat	0	45.73
Modified Habitat	1.705	1,085.84

The area of land use within the AoI and Project Area are shown in below ***Table 7.32***.

Table 7.32: Land Use within the AoI and Project Area

Land use	Project Area (ha)	Area of Influence (ha)
Agricultural land	1.52	969.23
Urban and residential areas	0.073	71.13
Standing water/waterlogged areas	-	0.17
Scrub land and disturbed land	0.097	38.13
The Yangon River (and its associated tributaries)	-	35.58
Mangrove	-	10.16
Roads	0.015	7.17
Total	**1.705**	**1131.57**

7.8.7.2 Proposed Project Activity

Clearing of land for the construction and operation of the Transmission Line and associated facilities will remove vegetation cover available for species within the Project Area. Physical presence of the Transmission Line.

7.8.7.3 Receptor Identification and Sensitivity

The Project Area is considered to be Modified Habitat. Additionally, no threatened or endangered bird species were identified in the Project Area. Mangroves habitat are rated as high sensitivity receptor, however, the Project construction and operation activities does not interfere with the mangrove habitat area. Additionally, it is anticipated that the construction and operation of the Transmission Line will not have any interactions or impacts to the mangrove habitat. The sensitivity of the receptor is therefore considered to be low.

7.8.7.4 Impact Assessment Table

Table 7.33: Impact Assessment Table on Temporary and Permanent Barrier Creation, Edge Effects and Fragmentation

Significance of Impact					
Impact	Potential impacts on biodiversity values due to temporary and permanent barrier creation, edge effects and fragmentation around the Project Area during construction and operation phase.				
Impact Nature	**Negative**	Positive	Neutral		
	Potential impacts to the receptors would considered to be adverse (negative).				
Impact Type	Direct	**Indirect**	Induced		
	Potential impacts would likely be indirect impacts.				
Impact Duration	**Temporary**	Short-term	Long-term	**Permanent**	
	Construction is expected to be complete in 25 months, which would be considered as temporary duration. Operation phase is expected to last for 25 years, but the impact is deemed to be permanent.				
Impact Extent	**Local**	Regional	International		
	The temporary and permanent barrier creation, edge effects and fragmentation will be restricted to local extent.				
Impact Scale	The scale of effect due to temporary and permanent barrier creation, edge effects and fragmentation is likely to be within the Project Area and the adjacent habitat within the Area of Influence and is hence defined to be a small scale impact.				
Frequency	Frequency of impact will be constant throughout the construction and operation phase of the Project.				
Impact Magnitude	Positive	Negligible	**Small**	Medium	Large
	Based on the above impact characteristics, the impact magnitude is therefore concluded to be small.				
Receptor Sensitivity	**Low**	Medium	High		
	The receptors are mostly Least Concern species so the sensitivity is considered to be Low.				
Impact Significance	**Negligible**	Minor	Moderate	Major	
	From small impact magnitude and low level of receptor sensitivity, the impact significance is therefore negligible level.				

7.8.7.5 Mitigation Measures

The following mitigation measures should be implemented so as to reduce the significance of the impact:

- The use of fencing and hoarding during construction is to be kept to a minimal around the Project construction sites;
- Measures to control dust are to be utilised to limit generation of dust and hence deposition onto vegetation surrounding the construction areas;
- Planting of native indigenous flora, including mangroves along the shoreline adjacent to the road and construction sites is to occur to reduce impacts to connectivity along the shoreline; and
- Appropriate rehabilitation of disturbed areas using native vegetation is to occur to facilitate movement of fauna species.

7.8.7.6 Residual Impact

Based on the implementation of the proposed mitigation measures, the significance of the impact on Project infrastructure and activities is considered to be a **Negligible Negative Impact** post mitigation.

7.8.7.7 Comparison with applicable regulations, standards and guidelines

The applicable standard is the IFC Performance Standard 6. Paragraph 15 of the PS requires clients to apply the mitigation hierarchy to projects (avoid, mitigate and offset impacts to biodiversity values). The Project area is located within Modified Habitat and hence satisfies the requirement to avoid Natural Habitat and Critical Habitat as required by the Mitigation Hierarchy.

7.8.7.8 Monitoring plan

Regular inspections of the application of require mitigation and management measures.

No specific monitoring of species or habitats is required.

7.8.8 Degradation of Habitats

A range of Project activities have the potential to lead to degradation of native flora and fauna habitats during construction. These include: transportation of materials, site foundation activities, use of cement and erection of Transmission Line. In general the impacts will cause: dust; runoff; release of potential contaminants and pollutions. These impacts will occur throughout all Project components; however the majority of the impacts will occur within the vicinity of the construction site.

During construction, activities have the potential to generate dust which may settle on vegetation adjacent to the construction areas. Excessive dust deposition on flora may act to suppress growth through limiting photosynthesis and the dusted foliage may also become unpalatable for foraging fauna. The construction activities will be temporary (lasting for approximately 25 months) and dust generation is likely to be localised to active work areas. The extent of dust spread may be dependent on the wind speed and direction during the dust generation period. Rainfall will generally remove dust from the foliage.

Runoff and maintenance of access roads will expose earth areas to be vulnerable to erosion (wind and/or runoff). Runoff erosivity is likely to be higher during the wet season. Where maintenance of the access road is located adjacent to a natural watercourse (in this case Yangon River), runoff will be directed towards the closest watercourse. Erosive processes transport sediment downstream depositing mobilized sediment downstream/downslope of habitat (both aquatic and terrestrial). This indirect impact has potential to degrade downstream habitat areas or alter habitat characteristics, and as such influencing suitability for native flora and fauna communities.

Accidental release or spill of these materials can be toxic to flora and fauna locally and downstream if substances are released into the aquatic environment. Flows from hazardous and non-hazardous storage facilities have the potential to carry contaminants and pollutants substantial distance downstream. Construction activities such as refuelling, storage and other activities that require handling

oil and hazardous substances, are undertaken at risk of accidental release. This will be most distinct adjacent to storage area and vehicles.

Invasive species (flora and fauna) have the potential to be introduced or spread throughout the Project Area through increased movement of people, vehicles, machineries, vegetation and soil. Impact within Natural Habitat areas adjacent to the project will be susceptible.

7.8.8.1 Baseline Summary

Given the limited secondary data available at the local level, primary data collected through biodiversity survey for another project (Ahlone LNG Power Plant Project) whereby the Study Area is located in Ahlone, Seikgyikanaungto and Dala Townships were used for additional context. It was noted that habitats that were sampled as part of the ESIA Study are widespread and hence the baseline results are applicable to the Transmission Line Study Area as well. Invasive species have been identified within the biodiversity survey. These species are shown in ***Table 7.34*** below.

Table 7.34: Invasive species within the Ahlone LNG Power Plant Project Area

S/N	Scientific Name	Common Name	Origin
1	*Ficus religiosa* L.	Bo tree, Lagat, Pipal, Bawdi-nyaung	India/ Native
2	*Mimosa invisa* Martius ex Colla M.pigra M.pudica L.	Senstitive plant, Tigayon	South America Mexico, Amazon Tropical America
3	*Alternanthera philoxeroides*	Alligator weed	Temperate South America
4	*Leucaena leucocephala*	white leadtree, jumbay, river tamarind, subabul,white popinac, Bawza-gaing, Awai-yar	Mexico and northern Central America
5	*Eichhornia crassipes*	common water hyacinth	Amazon Basin
6	*Acacia auriculiformis*	Ear-leaf acacia	Papua New Guinea, Indonesia and Australia
7	*Albizia saman*	Rain tree	Central America, northern South America

Source: ERM, 2018.

7.8.8.2 Proposed Project activity

Construction and operation activities causing degradation of habitats from dust, runoff, release of contaminants and invasive species.

7.8.8.3 Receptor Identification and Sensitivity

Majority of the Project Area is considered to be Modified Habitat. The sensitivity of the receptor is therefore considered to be Low.

7.8.8.4 Impact Assessment Table

Table 7.35: Impact Assessment Table for Degradation of Habitats

Significance of Impact					
Impact	Potential impacts on biodiversity values due to degradation of habitats from construction and operation activities.				
Impact Nature	**Negative**	Positive	Neutral		
	Potential impacts to the receptors would considered to be adverse (negative).				
Impact Type	Direct	**Indirect**	Induced		
	Potential impacts would likely be indirect impacts.				
Impact Duration	**Temporary**	Short-term	**Long-term**	Permanent	
	Construction is expected to be complete in 25 months, which would be considered as temporary duration. Operation phase is expected to last for 25 years, and therefore the impact is deemed to be long-term duration.				
Impact Extent	**Local**	Regional	International		
	The degradation of habitats will be restricted to local extent.				
Impact Scale	The scale of degradation of habitats is likely to be within the Project Area and the adjacent habitat within the Area of Influence and is hence defined to be a small scale impact.				
Frequency	Occurs only once.				
Impact Magnitude	Positive	**Negligible**	**Small**	Medium	Large
	Based on the above impact characteristics, the impact magnitude is therefore concluded to be small to negligible.				
Receptor Sensitivity	**Low**	Medium	High		
	Majority of the Project Area is modified habitat so the sensitivity is considered to be Low.				
Impact Significance	**Negligible**	**Minor**	Moderate	Major	
	From negligible to small impact magnitude and low level of receptor sensitivity, the impact significance is therefore negligible to minor level.				

7.8.8.5 Mitigation Measures

The following mitigation measures should be implemented so as to reduce the significance of the impact:

- Construction and operation (and maintenance) and domestic waste will be appropriately stored and disposed of to avoid attracting native and alien species to the construction and worker camp areas;
- For areas in direct runoff path to a watercourse, sediment and erosion control devices will be installed and maintained until vegetation replanting can occur to stabilise disturbed soil surfaces;
- Oil, chemical and solid waste will be stored, and handled and disposed of by appropriately licenced waste management contractors;
- Sediment and erosion control measures are to be used in all areas of construction to minimise soil contaminated runoff entering waterways;
- All light sources are to be directed away from areas of Natural Habitat where feasible;

- Invasive species management measures should be implemented in accordance to avoid introduction of weeds to natural and modified habitat areas;
- Speed limits to maximum of 40 km/hr for construction and operation vehicles will be enforced to limit noise and dust generation; and
- Construction and operation (and maintenance) materials and chemicals will be appropriately secured to avoid accidental release to the natural environment (wind and water erosion).

7.8.8.6 Residual Impact

Based on the implementation of the proposed mitigation measures, the significance of the impact from Project infrastructure and activities is considered to be a **Negligible Negative Impact** post mitigation

7.8.8.7 Comparison with applicable regulations, standards and guidelines

The applicable standard is the IFC Performance Standard 6. Paragraph 12 requires the application of appropriate mitigation measures to reduce impacts on biodiversity values. Paragraphs 21 to 23 require the management of invasive alien species within Natural Habitats.

7.8.8.8 Monitoring plan

Regular inspections of the application of require mitigation and management measures.

No specific monitoring of species or habitats is required.

7.8.9 Mortality of Resident Species

Mortality of resident species can occur through vehicle and machinery strike as well as hunting and poaching from construction and maintenance activities. Fauna mortality can occur during construction activities (e.g. excavation, vehicle movement) in the event individuals are struck by vehicles and machinery.

It is likely that most individuals will disperse from construction activity locations into adjacent habitats as a result of noise and other disturbance however some less mobile species may experience a localised reduction in abundance during this period, such as amphibians, reptiles and small mammals.

With greater human activity in the Project Area and increased access points to the Natural Habitats there is a risk of increased hunting and poaching activities leading to fauna mortality from workers and also local people who may have access to habitats that were previously restricted. Through increased ease of access, hunting and poaching may increase.

7.8.9.1 Baseline Summary

No significant species were detected from the baseline study.

7.8.9.2 Proposed Project activity

Impacts on resident species during construction and operation, including vehicle machinery strike and hunting and poaching by workers and local people.

7.8.9.3 Receptor Identification and Sensitivity

Table 5.3 identifies species of conservation significant within the species grid location.

7.8.9.4 Impact Assessment Table

Table 7.36: Impact Assessment Table of Mortality of Resident Species

Significance of Impact					
Impact	Potential impacts on biodiversity values due to increase of mortality of resident species from construction and operation activities.				
Impact Nature	**Negative**	Positive	Neutral		
	Potential impacts to the receptors would considered to be adverse (negative).				
Impact Type	**Direct**	Indirect	Induced		
	Potential impacts would likely be direct impacts.				
Impact Duration	**Temporary**	Short-term	**Long-term**	Permanent	
	Construction is expected to be complete in 25 months, which would be considered as temporary duration. Operation phase is expected to last for 25 years, but the result of the impact is deemed to be permanent.				
Impact Extent	**Local**	Regional	International		
	The increase of mortality of resident species will be restricted to local extent.				
Impact Scale	The scale of mortality of resident species is likely to be within the Project Area and the adjacent habitat of the resident species and is hence defined to be small scale impact.				
Frequency	Occurs only once.				
Impact Magnitude	Positive	**Negligible**	**Small**	Medium	Large
	Based on the above impact characteristics, the impact magnitude is therefore concluded to be small to negligible.				
Receptor Sensitivity	**Low**	Medium	High		
	Majority of the Project Area is modified habitat with minimal significance species therefore the sensitivity is considered to be low.				
Impact Significance	**Negligible**	**Minor**	Moderate	Major	
	From negligible to small impact magnitude and low level of receptor sensitivity, the impact significance is therefore negligible to minor level.				

7.8.9.5 Mitigation Measures

The following mitigation measures should be implemented so as to reduce the significance of the impact:

- Speed limits to maximum of 40 km/hr for construction and operation vehicles will be enforced to minimise potential for fauna strike;
- Commitment will be made to raise awareness of values of important species and habitat areas to construction and operation work force and arrangements will be made for restriction of poaching and forest product collection by staff;
- Access restriction should be applied to Project facilities for non-construction and operation vehicles;
- Hunting wild animals will be strictly prohibited for Project staff, workers, all contractors and personnel engaged in or associated with the Project, with penalties levied, including fines and dismissal, and prosecution under relevant laws for clearing vegetation; and
- Fishing and using of illegal fishing gear anywhere along the stream will be prohibited.

7.8.9.6 Residual Impact

Based on the implementation of the proposed mitigation measures, the significance of the impact from Project construction and operation phase is considered to be a **Negligible Negative Impact** post mitigation

7.8.9.7 Comparison with applicable regulations, standards and guidelines

The applicable standard is the IFC Performance Standard 6. Paragraph 15 of the PS requires clients to apply the mitigation hierarchy to projects (avoid, mitigate and offset impacts to biodiversity values). The Project area is located within Modified Habitat and hence satisfies the requirement to avoid Natural Habitat and Critical Habitat as required by the Mitigation Hierarchy.

7.8.9.8 Monitoring plan

Regular inspections of the application of require mitigation and management measures.

No specific monitoring of species or habitats is required.

7.8.10 Mortality of Avifauna

Impact to fauna during operation may persist with potential impacts to infrastructure causing local mortality of individuals. This is likely to occur with avifauna striking the Transmission Line during construction and operation.

Whilst no bat species were identified during the baseline study, it is likely that bats would forage over the rice paddies during dawn and dusk. Individuals may collide with the Transmission Line, causing mortality of individuals. Similarly, bird species may collide with the Transmission Line during flight.

7.8.10.1 Baseline Summary

Given the limited secondary data available at the local level, primary data collected through biodiversity survey for another project (Ahlone LNG Power Plant Project) whereby the Study Area is located in Ahlone, Seikgyikanaungto and Dala Townships were used for additional context. It was noted that habitats that were sampled as part of the ESIA Study are widespread and hence the baseline results are applicable to the Transmission Line Study Area as well.

7.8.10.2 Proposed Project activity

Physical presence of Transmission Line during erection and operation.

7.8.10.3 Receptor Identification and Sensitivity

Table 7.37 shows bird species identified around the Project Area. All of the bird species identified were classified under IUCN as Least Concerned therefore the receptor sensitivity is considered as Low.

Table 7.37: Bird Species Identified for LNG Power Plant (Ahlone) Project Located (Located Nearby to the proposed Project)

Species	Common name	Family	IUCN Status
Corvus splendens	House Crow	Covidae	LC
Aegithina tiphia	Common Iora	Aegithinidae	LC
Passer domesticus	House Sparrow	Passeridae	LC
Lonchua punctulata	Scaly-Breasted Munia	Ploceidae	LC
Streptopelia chinensis	Spotted Dove	Columbidae	LC

Species	Common name	Family	IUCN Status
Acridotheres tristis	Common Myna	Sturnidae	LC
Columba livia	Rock Pigeon	Columbidae	LC
Pycnonotus blanfordi	Streak Eared Bulbul	Pycnonotidae	LC
Lanius bucephalus	Bull-Headed Shrike	Laniidae	LC
Riparia paludicola	Plain Martin	Hirundinidae	LC
Cypsiurus balasiensis	Asian Palm Swift	Apodidae	LC
Haliastur indus	Brahminy Kite	Accipitridae	LC
Milvus migrans	Black Kite	Accipitridae	LC
Egretta garzetta	Little Egret	Ardeidae	LC
Ardeola grayii	Indian Pond Heron	Ardeidae	LC

Note:
NE - Not Evaluated
VU - Vulnerable
DD - Data Deficient
LC - Least Concern
NL- Not Listed

7.8.10.4 Impact Assessment Table

Table 7.38: Impact Assessment Table of Mortality of Avifauna

Significance of Impact					
Impact	Potential impacts on biodiversity values due to increase of mortality of Avifauna from construction and operation activities.				
Impact Nature	**Negative**	Positive	Neutral		
	Potential impacts to the receptors would considered to be adverse (negative).				
Impact Type	**Direct**	Indirect	Induced		
	Potential impacts would likely be direct impacts.				
Impact Duration	**Temporary**	Short-term	**Long-term**	Permanent	
	Construction is expected to be complete in 25 months, which would be considered as temporary duration. Operation phase is expected to last for 25 years, but the result of the impact is deemed to be permanent.				
Impact Extent	**Local**	Regional	International		
	The increase of mortality of avifauna will be restricted to local extent.				
Impact Scale	The scale of mortality of resident species is likely to be within the Project Area and the adjacent habitat of the resident species and is hence defined to be small scale impact.				
Frequency	Occurs only once.				
Impact Magnitude	Positive	Negligible	**Small**	Medium	Large
	Based on the above impact characteristics, the impact magnitude is therefore concluded to be small.				
	Low	Medium	High		

Significance of Impact				
Receptor Sensitivity	Bird species identified around the Study Area are categorised as Least Concern therefore the sensitivity is considered to be low.			
Impact Significance	**Negligible**	Minor	Moderate	Major
	From small impact magnitude and low level of receptor sensitivity, the impact significance is therefore negligible level.			

7.8.10.5 Mitigation Measures

The following mitigation measures should be implemented so as to reduce the significance of the impact:

- Use of bird deflectors on the length of the power line. The deflectors will increase line visibility by thickening the appearance of the line for easier detection by avifauna;
- Moveable markers of contrasting colours (e.g. black and white) that protrude above and below the line, and be placed 5-10 m apart;
- Removing the thin neutral or earth (shield) wire above the high voltage transmission line where feasible, and where this is not possible, marking the line to make it more visible;
- Minimising the vertical spread of power lines. Having lines in a horizontal plane reduces collusion risk;
- Habitat manipulation to influence flight activity and bird behaviour, e.g. tree lines under the high voltage lines to increase visibility;
- Insulating cables close to poles, at least 70 cm on both sides and around perching areas, and up to at least 140 cm; and
- Hanging insulators under cross arms and poles, provided the distance between a likely perch (mainly the transmission tower crossarm) and the energised parts (conductors) is at least 70 cm.

7.8.10.6 Residual Impact

Based on the implementation of the proposed mitigation measures, the significance of the impact from Project construction and operation phase is considered to be a **Negligible Negative Impact** post mitigation.

7.8.10.7 Comparison with applicable regulations, standards and guidelines

The applicable standard is the IFC Performance Standard 6. Paragraph 15 of the PS requires clients to apply the mitigation hierarchy to projects (avoid, mitigate and offset impacts to biodiversity values). The Project area is located within Modified Habitat and hence satisfies the requirement to avoid Natural Habitat and Critical Habitat as required by the Mitigation Hierarchy.

7.8.10.8 Monitoring plan

Regular inspections of the application of require mitigation and management measures.

No specific monitoring of species or habitats is required.

7.9 Social Impact Assessment

7.9.1 Introduction

Settlements located closest to the Project infrastructure are likely to experience negative and positive impacts as a result of the Project activities, including economic opportunities, social and environmental changes, lifestyle changes, and changes to community health and safety. Other social receptors located further from the Project may also benefit or experience negative impacts from the Project.

The predicted impacts to the social environment as a result of the proposed Transmission Line are described in this Section. The presence of economical, industrial, touristic and religious activities within the Study Area have all been considered as part of the assessment of impacts.

This Section also develops management, mitigation and monitoring measures needed to ensure that any identified impacts can be avoided, reduced, mitigated to as low as reasonably practical or compensated for. Such measures are presented and will form part of the overall Environmental and Social Management Plan (ESMP, ***Chapter 10***) for the Project.

7.9.2 Assumption and limitations

The assessment of potential impacts related to the social environment in this Section is based on the physical, biological, environmental and social baseline data (presented within ***Chapter 5*** of this report) and the information available from the Project Proponent at the time of writing the report. Judgements and assessments have been made based on professional experience of similar projects in similar settings and previous general experience of ERM.

Limited secondary data focused on the Project area was available and the baseline draws from a range of secondary data at the national, regional and township level. Secondary data information has been gathered from various sources including ministries, regional authorities, the Myanmar Information Management Unit (MIMU), other relevant studies or previous studies conducted for the Project or in the area.

The social impact assessment was thus conducted based on the data collected through sources described above.

7.9.3 Assessment methodology

The Social Area of Influence (SAoI) is defined as the area inhabited or used by stakeholders and likely to be positively or negatively affected by the Project. This includes short, long term or permanent changes, as well as direct, induced or indirect impacts. The SAoI includes:

- The Project site(s) and related facilities that TPMC develops or controls and the additional areas in which aspects of the environment could conceivably experience significant impacts;
- Associated facilities that are not developed and funded as part of the proposed Project, but are essential for the Project and without which the Project cannot proceed, and the associated areas in which the environment could conceivably experience significant impacts;
- Areas potentially affected by cumulative impacts resulting from other developments known at the time of the ESIA, further planned phases of the Project or any other existing circumstances; and
- Areas potentially affected by impacts from predictable (but unplanned) developments as a result of the proposed Project (i.e., induced activities), occurring at a later stage or at a different location.

Box 2 provides a definition of the concept of area of interest from good practice guidance.

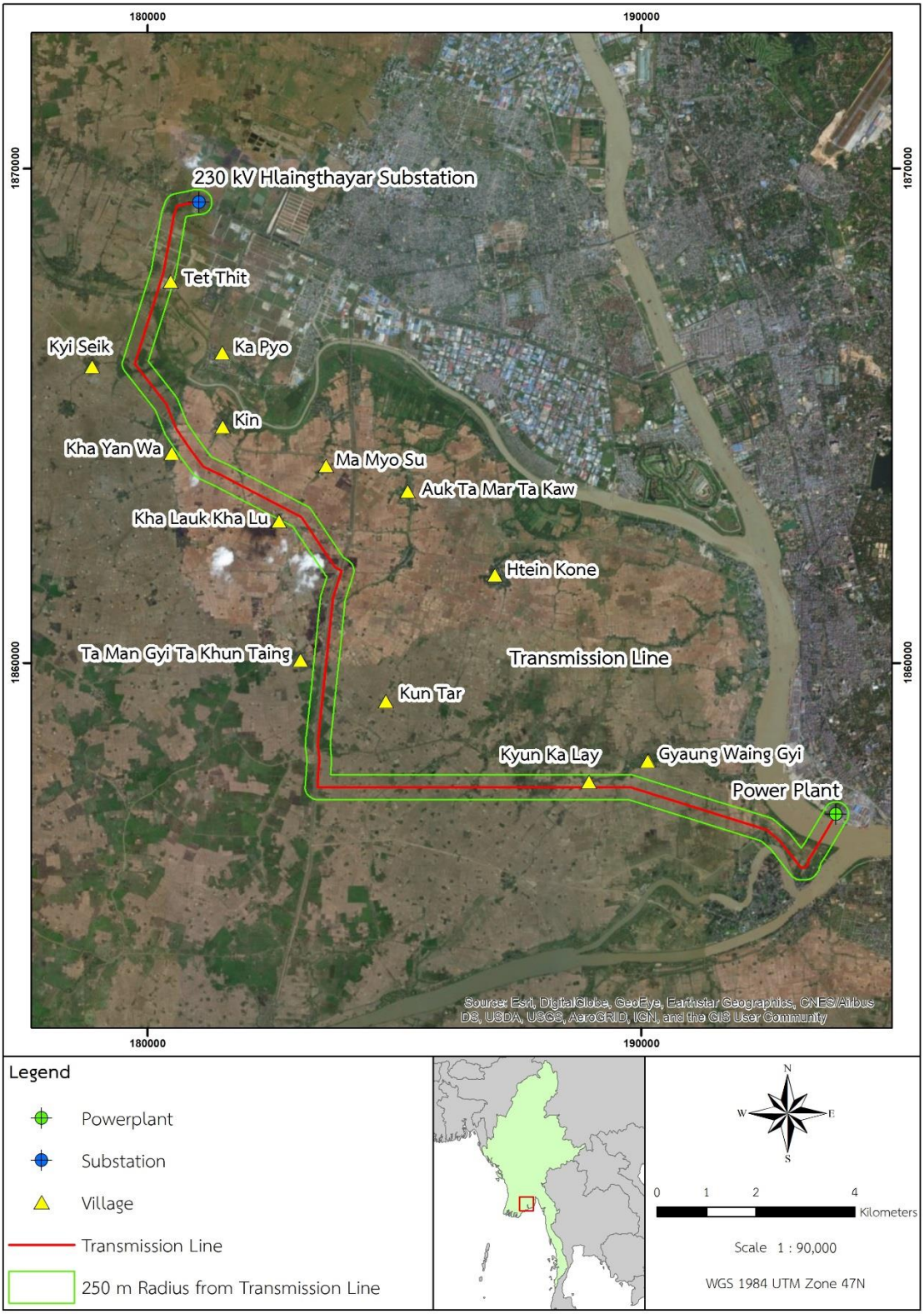
Box 2: IFC Definition of Area of Influence

The project's area of influence includes the primary project site(s) and related facilities that the client (including its contractors) develops or controls; associated facilities that are not funded as part of the project (funding may be provided separately by a client or a third party including the government), and whose viability and existence depend exclusively on the project and whose goods or services are essential for the successful operation of the project; areas potentially impacted by cumulative impacts from further planned development of the project; and areas potentially affected by impacts from unplanned but predictable developments caused by the project that may occur later or at a different location. The area of influence does not include potential impacts that would occur without the project or independently of the project.

Source: IFC PS1, 2006

For the Transmission Line, based on this definition, experience with similar project, the social baseline in the area, and the human use identified, the area to be considered for social impact has been established at 250 m each side of the Transmission Line. This area allows to include all socio-economic activities that may be potentially impacted by the Transmission Line activities during construction, operation and decommissioning phases. The SAoI of the Transmission Line is shown in ***Figure 7.1***.

Figure 7.1: TPMC Transmission Line Social Area of Influence



Source: ERM, 2019

7.9.4 Impact on Employment

Baseline summary

Unemployment rate is low in the Yangon region with 4.1% of people in age of working without activity. According to secondary data research, the percentage of unemployment rate of Seikgyikanaungto, Ahlone, Twantay and Hlaingthayar are 4.6%, 4.8%, 3.5%, and 2.4% respectively. Previous study indicates that 3% of Seikgyikanaungto interviewees declare themselves without working capacities. While 16.8% of Seikgyikanaungto interviewees are daily laborers, 7.7% of Ahlone interviewees are daily laborers. In addition, few of Seikgyikanaungto and Ahlone interviewees have experienced in manual labor, and vehicle/ machinery maintenance, but interviewees with experiences in wielding and general construction can be only found at Seikgyikanaungto Township.

Receptor Identification and Sensitivity

There is a potential for local people to be employed on unskilled jobs during construction and operations. Approximately 25% of Seikgyikanaungto interviewees have either teacher certificate or computer certificate. For Ahlone interviewees, 31.3% of them have driver license, 18.8% of them have computer certificate and 6.2% of them have teacher certificate. This means, with the people unemployed, that all unskilled jobs and some semi-skilled or skilled jobs can be proposed to local people.

In terms of indirect employment, the realization of opportunities will depend not only on the Project, but also on the initiative and business acumen of local entrepreneurs. Services for the employee (restaurant, shop) should benefit from the Project, in particular the 21% of Seikgyikanaungto interviewees and 23% of Ahlone interviewees who own their own business in retail or trading sectors. It is likely that the worker camp established during the construction phase will require a few additional unskilled workers who will be sourced locally as well as services to also be sourced locally.

7.9.4.2 Impact during Construction

Project Activities during Construction

The construction of the Transmission Line Facility is estimated to be around 25 months. The Project will require 60 workers for foundation work, 40 workers for tower erection and 75 for cable pulling and installation phases. Amongst those 175 workers, 100 are expected to be local unskilled or semi-skilled workers. This number will drop to only a few employee during operation as this phase only involve periodic inspections and management of system and structural components as well as ROW.

In addition, the Project will require goods and services throughout construction. There are opportunities for local businesses to provide these goods and services (e.g. construction equipment, food for the workers). As a result, existing local businesses may expand or new businesses may be established locally to meet these demands – providing employment opportunities. This is referred to as indirect employment.

The resulting impacts (e.g. increase in employment opportunities, increase in income for local people employed by the Project) were assessed as a **positive** one.

Impact Assessment table

Significance of Impact			
Impact	Potential impacts on Employment.		
Impact Nature	Negative	**Positive**	Neutral
	Potential impacts to the receptors would considered to be positive.		
Impact Type	**Direct**	**Indirect**	Induced
	Potential impacts would likely be direct and indirect impacts.		

Mitigation Measures

In order to maximise the benefits from this impact for the local population, wherever possible, the workforce will be sourced from areas close to the Project after a training and selection process; and thereafter at a regional or national level. Given that levels of educational achievement and formal employment experience in relevant sectors is low within the SAoI, it is assumed that the majority of the available local labour may be unskilled or at most semi-skilled. The Project will develop a Sourcing, Procurement and Recruitment Management Plan which will be developed for this Project with the aim to promote benefits to locals from recruitment and procurement activities for the Project (including information, training and engagement).

Monitoring Plan

Monitoring of the local content should be done at the beginning of the construction phase to ensure maximum opportunities are given to local population.

7.9.4.3 Impact during Operation

Project Activities during Operation

The number of workers required during operation is limited to a few technicians involved in periodic inspections and management of system and structural components as well as ROW. The impact will be a Negligible positive impact. TPMC should, as for the construction phase, ensure that opportunities are provided to local people first based on a skill and need basis.

7.9.5 Impacts from Economical Displacement

Baseline summary

In Seikgyikanaungto, 47% of total area is agricultural area. In Twantay, 92% of total area is agricultural areas. In Hlaingthayar, 19% of total area is agricultural area. In Twantay Township, agriculture is the main livelihood activity with rice being the main crop.

In Hlaingthayar Tonwship, varieties of rice are grown and rice-rice cropping sequence is the most common rotation. In 2017, 800 acres of farmland were lost to industrial zone.

Receptor Sensitivities

Seikgyikanaungto, Twantay and Hlaingthayar farmers, whose fields are in the proposed Transmission Line location will be prevented from cultivating on location of ROW and transmission tower during construction activities as well as on the path of access roads. After construction is finished, local farmers will be able to continue cultivating on restricted agricultural area of ROW, except agricultural area under transmission tower (transmission tower foundation).

As agriculture is an important livelihood, in particular in Twantay Township, and area for agriculture have been transformed into industrial zone already in the recent past, it is expected that receptors will have a high sensitives to impact on agricultural land.

7.9.5.2 Impact during Construction and Operation

Project Activities during Construction

- The Transmission Line alignment is located almost entirely within rice paddies as well as above rivers and some mangroves area. It is currently estimated that around 70 transmission towers will be built across Twantay, Hlaingthayar and Seikgyikanaungto townships with destination at Ahlone power plant. The construction footprint will be limited to a 46 m width of ROW with the exception for construction of temporary construction access roads. In addition, transmission tower foundations of up to 6 m by 6 m will be required.

As a result of the Project there will be:

- Temporary loss of livelihoods associated with the temporary loss of land used for annual crops i.e due to access roads, ROW, construction camp or laydown areas; and
- Permanent loss of livelihoods associated with the permanent loss of land used for annual crops i.e for agricultural land at the transmission tower location.
- There is no specific Project activities during operation that will affect agricultural activities, except the presence of transmission tower concrete footing on local farmers' agricultural fields, which will already be experienced during the construction phase.

The impact of the Project pre-mitigation on economical displacement during construction phase is considered a **Moderate Negative Impact**.

Impact Assessment table

Significance of Impact

Impact	Potential impacts on Economical Displacement				
Impact Nature	**Negative**	Positive	Neutral		
	Potential impacts to the receptors would considered to be adverse (negative).				
Impact Type	**Direct**	Indirect	Induced		
	Potential impacts would likely be direct impacts.				
Impact Duration	Temporary	**Short-term**	Long-term	**Permanent**	
	Potential impacts of Economical Displacement will last either only during construction phase or will be permanent.				
Impact Extent	**Local**	Regional	International		
	The increase of mortality of avifauna will be restricted to local extent.				
Impact Scale	The total area to be impacted by the construction of the project is maximum 17,000 m^2 permanently impacted for the tower footing as well as 12,000 m^2 and 253 acres temporarily impacted for the construction camp, access roads and the ROW.				
Frequency	The impact will occurs 24/7 during the construction phase.				
Impact Magnitude	Positive	Negligible	**Small**	Medium	Large
	The impact magnitude is small as the area to be impacted is small, in particular compare to the total area available for agriculture in Seikgyikanaungto, Twantay and Hlaingthayar townships and the short term duration of the impact or very small area permanently impacted.				

Significance of Impact				
Receptor Sensitivity	Low	Medium	**High**	
	The overall sensitivity of the receptors is High as agriculture is the main livelihood in Twantay Township where the longest portion of the transmission line is located.			
Impact Significance	Negligible	Minor	**Moderate**	Major
	The significance is likely to be Moderate.			

Mitigation Measures

In order to reduce negative impact for receptors, they will be informed and provided with prior notice about Project and construction activities.

- Land Acquisition should be minimised to the extent possible both in terms of geographical size and duration; and as such, whe no activities are being undertaken, exclusions of agricultural activities should be lifted;
- When possible, TPMC will propose to recruit for unskilled jobs in priority stakeholders whose land is being impacted during construction phase;
- TPMC will develop a Land Acquisition Procedure for identification and compensation of assets being impacted. This prooocedure will cover all potential assets and livelihood activities impacted by the Project activities, compensation plan, and roles and responsibilities (i.e. Land Acquisition Committee);
- TPMC will compensate stakeholders whose land is temporarily or permanently impacted during construction and operation using market price with a premium (to compensate for the change);
- TPMC will compensate stakeholders whose crops is being impacted during construction using market price;
- TPMC will return land temporarily impacted to its initial state after construction phase, including ensuring contaminated land due to unplanned event (leak) is removed and/or treated appropriately;
- TPMC will use an external specialist to identify market price for the type of land and crops being impacted by project activities; and
- TPMC will need to develop and implement a Stakeholder Engagement Plan as part of the Project. The plan should include measures to notify local stakeholders in advance of any particularly activities on agricultural areas. This will ensure stakeholders anticipate (and can appropriately respond to) the change and limitation of uses of agricultural areas. The Project should also develop a Grievance Mechanism to collect grievances from local stakeholder whose agricultural activities are affected by the Project activities.

Residual Impacts

Based on the implementation of the proposed mitigation measures, the significance of the impact is considered to be a **Minor Negative Impac**t post mitigation.

Monitoring Plan

TPMC will need to monitor weekly the grievance log to identify any specific grievance related to agricultural activities.

During construction, TPMC will monitor monthly the employment of stakeholders whose land has been temporarily or permanently impacted by Project activities. If these people refused job offers from the Project, TPMC will engage yearly with them for the first 4 years after start of construction to ensure their livelihood has not been significantly impacted negatively by the Project.

7.9.6 Impacts to Traffic and Transport

Baseline summary

In Seikgyikanaungto, majority of citizens mostly use a bicycle or motorbike. In Twantay and Hlaingthayar, majority of citizens use a bicycle.

In Seikgyikanaungto Township, the concrete road network in the Township is considered well developed. All of Seikgyikanaungto interviewees agreed that overall quality and condition of transportation system is mostly good.

The main road going north to south from the Yangon-Pathein road to Twantay is a large paved road that sees limited traffic every day. Most people living in Seikgyikanaungto and Twantay township uses boat transportation to travel to Yangon.

Receptor Sensitivities

Although there are no alternative road to travel from Seikgyikanaungto and Twantay Townships to the Yangon-Pathein road, the receptors will have a limited sensitivity to the impact as the roads to be used for transport of material, equipment and workers are larges and not the preferred transport route for local population to travel to Yangon. Users of the Hlaing River Road and bridge would also have limited sensitivity as the road is large, well maintain on most of the portion to be used by the Project and alternative side roads are available in case of heavy traffic.

7.9.6.2 Impact during Construction and Operation

During 25 months of construction phase, 3 types of vehicles are expected to be used for the transportation of material. Heavy construction trucks (maximum 5 trucks) and light pick-up trucks (maximum 6 trucks) travelling between 100 and 200 kilometers per day (5 to 10 rotations per day) and concrete transit mixer trucks (2) travelling between 80 and 100 kilometers per day.

Expected routes of transportation of Project vehicles will be from either the Ahlone International Port, the Asia World Port or the Myanmar International Terminal Thilawa (MITT) to different area of the transmission line alignment. This include using the Hlaing River road, main road connecting the west side of the Yangon River to Yangon center.

No Project activity will impact on traffic and transport during operation phase.

Impact Assessment table

Significance of Impact

Impact	Potential impacts on traffic and transport			
Impact Nature	**Negative**	Positive	Neutral	
	Potential impacts to the receptors would considered to be adverse (negative).			
Impact Type	**Direct**	Indirect	Induced	
	Potential impacts would likely be direct impacts.			
Impact Duration	Temporary	**Short-term**	Long-term	Permanent
	Potential impacts on traffic and transport will last only during construction phase.			
Impact Extent	**Local**	Regional	International	
	This impact will be experienced only locally on the roads used by Project construction vehicles.			
Impact Scale	The total area to be impacted is approximately 20 km long.			
Frequency	The impact will occurs regularly every day during the construction phase.			

Significance of Impact					
Impact Magnitude	Positive	Negligible	**Small**	Medium	Large
	The impact magnitude is small as the road network is in good condition in this area, with wide roads and the number of expected trucks and light vehicles represent only a small portion of existing traffic on the main road, but the impact will be experienced regularly during the 25 month of construction phase.				
Receptor Sensitivity	**Low**	Medium	**High**		
	The overall sensitivity of the receptors is low as either alternative exist for road transport or it is not considered the main transport mode for most of the local communities.				
Impact Significance	**Negligible**	Minor	Moderate	Major	
	The significance is considered Negligible.				

Mitigation Measures

As the impact is negligible, no specific mitigation measures will be implemented by the Project for impact on Traffic and Transport. But the Project will implement a Stakeholder Engagement Plan developed for the LNG Power Plant Project in Ahlone, Seikgyikanaungto and Dala Townships. The plan will include measures to notify local stakeholders in advance of any particularly activities on local roads or near to local roads. This will ensure stakeholders anticipate (and can appropriately respond to) the change and limitation of uses on local roads. The Project will also use the Grievance Mechanism developed for the LNG Power Plant Project to collect grievances from local stakeholder whose regular transport is affected by the Project activities.

7.9.7 Impacts from Environmental Emissions (noise, dust, vibration)

Baseline summary

There is no published data on the current condition of the air shed, noise or vibration in the SAoI. ERM have used result from ERM studies for the Ahlone LNG Power Plant Project located next to the Project area to extrapolate on the condition in the transmission line Project SAoI.

It is considered that the air shed in the Project SAoI is non-degraded, meaning that all parameters are below the limit fixed by the NEQ. It is also expected that in some part of the SAoI, the noise level exceed the Myanmar standard for at least one time period. Possible sources of high noise levels include traffic activities, human activities, rain/weather events, religious activities (i.e. bell sound), and agricultural activities (i.e. grain mill). Vibrations are expected to be limited to the vehicle traffic on the local roads.

The predominant annual wind direction is north easterly, with average speed at 8.8 - 11 meter per seconds.

Receptor Sensitivities

Three villages in particular are located within 400 meters from the transmission line ROW, Gyaung Waing Guy, Ma Myo Su and Kha Yan Wa, respectively 310 m, 396 m and 191 m. Although Kha Yan Wa is the closest, it is also located up wind compare to the Project site and would therefore be expected to experience less impact from dust and noise. The other 2 villages are located further away (more than 300 meters for the nearest house), but downwind of the Project ROW. Houses can be made

7.9.7.2 Impact during Construction and Operation

The construction of the Project will generate:

- Noise: which can result from a variety of onsite activities (e.g. construction of infrastructure, reversing sensors on large vehicles). Noise can lead to hearing loss and disrupt community

activities (such as sleep). Ongoing disruptions have been linked to increases in depression and anxiety;

- Vibrations: which can result from construction activities (e.g. piling, drilling, operation of compressors and generators). Vibrations if strong enough can damage the foundation of nearby infrastructure (e.g. businesses, community centers, monastery); and
- Dust: which can be generated through vegetation clearing, site grading, driving on dry, dirt roads. This can impact the surrounding air quality, disrupting the amenity value of an area and potentially impacting community health (e.g. further aggravating existing respiratory illnesses).

Noise and Vibrations will be mainly experienced during the foundation work if Pile Foundation are selected (this will be determined based on soil investigation) which will last for approximately 5 days for each tower.

Dust impacts will be experienced during the clearing of the ROW which will last for 3 month as well as at every passage of truck on the access roads which will be temporary dust roads.

The impact of the Project pre-mitigation on environmental emission during construction phase is considered a **Minor Negative Impact**.

There is no Project activities expected to create environmental emissions during operation phase.

Impact Assessment table

Significance of Impact					
Impact	Impact from Environmental Emissions				
Impact Nature	**Negative**	Positive	Neutral		
	Increase of environmental emissions has the potential to result in negative impacts in the local area.				
Impact Type	**Direct**	Indirect	Induced		
	The impact is direct.				
Impact Duration	**Temporary**	Short-term	Long-term	Permanent	
	Potential impacts on traffic and transport will last only during construction phase.				
Impact Extent	**Local**	Regional	International		
	The impact is limited within the local area.				
Impact Scale	The impact scale is small.				
Frequency	The impact will occurs every day during day time during from month 7 of construction phase.				
Impact Magnitude	Positive	Negligible	**Small**	Medium	Large
	The impact magnitude is likely to be small with a limited number of days with impact of noise and vibration and a limited number of movement of trucks and light vehicles on the dirt roads.				
Receptor Sensitivity	Low	**Medium**	**High**		
	The vulnerability of receptor is likely to be medium, due to the proximity to some villages, the potential effect of dust on agricultural areas or water supply (pond and lake) and material used in local houses nearby susceptible to be damaged by vibration in case of piling.				
Impact Significance	Negligible	**Minor**	Moderate	Major	
	The significance is considered minor.				

Mitigation Measures

Mitigation measures have already been proposed in the Air Quality and Noise Impact Assessment sections but TPMC will also need to develop and implement a Stakeholder Engagement Plan as part of the Project. The plan should include measures to notify local stakeholders in advance of any particularly noisy activities (e.g. pile driving). This will ensure stakeholders anticipate (and can appropriately respond to) the disruption associated with noise. The Project should also develop a Grievance Mechanism to collect grievances from local stakeholder impacted by noise, dust and vibration.

Residual Impacts

Assuming that the management measures proposed in the Air Quality and Noise Impact Assessment sections are implemented and monitored over time, the residual impact was assessed as **Negligible and negative**.

Monitoring Plan

Monitoring of air quality and noise have been described in the relevant chapters. In addition, TPMC will need to monitor weekly during construction the grievance log to identify any specific grievance related to environmental emissions.

7.9.8 Impacts on Community Health and Safety

Baseline summary

General health status in all the Townships in the SAoI is considered good by the local population which also has access to health facilities, including Yangon health facilities. The people in the area are also regularly exposed to a new pool of germs due to their regular trip to Yangon which experience constant movement of population from within Myanmar and abroad.

There are no data showing a particular incidence of respiratory diseases in the area.

Traffic in the SAoI is not intense, but people have experienced both light and heavy construction trucks travelling on the roads before.

Receptor Sensitivities

The entire population within the Project SAoI is a potential receptor of this impact. In particular this includes the population interacting directly with the Project staff such as restaurant and shop owners near the construction camp, households of project staff, and medical staff. People with disability, young children and old people are particularly at risk if exposed. The low density of population reduce the risk of epidemic but people living directly near the proposed Project site will be at risks in case of an epidemic within the workforce.

7.9.8.2 Impact during Construction and Operation

The presence of TPMC workforce may result in interactions between the workforce and local people. Out of 175 workers for the Project, 100 are expected to be local, already living in the area or from close Townships.

In the event of an outbreak of an airborne (e.g., TB) or food-borne illness among the workers, the area where local workers live, and any settlement visited by Project workforce may also become susceptible to these infectious diseases. An increase in the transmission of communicable diseases may occur as the result of the introduction of workers into the area and creation of vector habitat (worker camps).

If left untreated communicable diseases can lead to long-term health issues and/ or in some instances death. In other words, the impact can be characterized as being long-term and in some instances permanent.

The construction activities will create environmental emissions which may impact on community health and safety, in particular, disruption of sleep from light construction near residential area, and impact to building structure or aggravation of respiratory illness from the operation of drill rig and vegetation clearing activity.

The risk of injuries will also increase during construction activities of the Transmission Line (including derrick, ROW, and stringing of ground wire and line conductor) associated with the presence of mechanical equipment, movement of equipment, material and workers by road. Increased vehicle traffic, including vehicles operated by TPMC and their contractors increases the risk of accidents and injuries (up to and including deaths).

Unplanned event (including falling of transmission tower, falling of electric wire or electric shock may also affect local people, who are living proximate to the Transmission Line, and local farmers who cultivate around the Transmission Tower. As no houses are under or close by the ROW, electromagnetic fields (EMF) have been scoped out of this impact.

The impact of the Project pre-mitigation on community health and safety during construction phase is considered a **Minor Negative Impact**.

As impacts from electro-magnetic fields have been scoped out, there is no specific Project activities during operation that will affect community health and safety other than unplanned event.

Impact Assessment table

Significance of Impact

Impact	Impact on Community Health and Safety			
Impact Nature	**Negative**	Positive	Neutral	
	Increase of communicable diseases in the local area is negative.			
Impact Type	**Direct**	**Indirect**	Induced	
	The impact is direct and indirect in the case of an epidemic.			
Impact Duration	Temporary	Short-term	**Long-term**	**Permanent**
	The impact could be long lasting, even permanent, if left untreated or resulting in death.			
Impact Extent	**Local**	Regional	International	
	The effect of the impact will be mainly experienced by local population living directly along the proposed Transmission Line location or the construction camp.			
Impact Scale	The impact scale is medium as although the number of people directly impacted is small, the potential for an epidemic to impact a large population exist.			
Frequency	The impact likely occurs during the construction phase with the rare frequency.			
Impact Magnitude	Positive	Negligible	Small	**Medium**	Large
	The impact magnitude is likely to be medium as the potential changes for the local population can have long term adverse consequences but will be rare and at a medium scale.			
Receptor Sensitivity	**Low**	Medium	**High**	
	The vulnerability of receptor is Low due to the awareness of local population, capacity to access to medical facilities nearby and expected higher level of existing immunity.			
Impact Significance	Negligible	**Minor**	Moderate	Major
	The significance is considered minor.			

Mitigation Measures

The following mitigation measures should be implemented so as to reduce the significance of the impact:

- TPMC will notify local people about location of accommodation camp and construction activities of the Transmission Line;
- TPMC will annually check quality and condition of both electric wire, transmission legs and transmission tower;
- TPMC will notify local people 2 weeks in advance about date and duration of construction activities;
- TPMC will provide warning sign around the Transmission Tower in order to increase awareness and warn local people about risks;
- TPMC will put traffic cone around the Project vehicles or machines used during construction activities to indicate as safe zone for vehicles;
- TMPC will provide appropriate lights on construction vehicles/ machines to indicate their presences;
- TMPC will provide a warning sign of construction activities at least 500m on the road before the location of construction activities;
- Training for all workers on the transmission routes and common symptoms of communicable diseases. This can help reduce the potential for workers to unknowingly transmit communicable diseases. This may also help to increase knowledge within Project SAoI – e.g. through the training of workers that have been sourced from the local area;
- Establish amenities at the worker camp to help minimize the interaction between the workforces (particularly temporary construction workers) and local villagers. This includes recreation facilities and health care infrastructure;
- Undertake pre-employment screening to ensure fitness for work. It is important that the pre-screening process does not result in discrimination, but instead is used as a tool to minimize the transmission of communicable diseases;
- Vector management procedures, including measures to reduce the presence of vector habitat and consideration of whether pesticides will be utilized to reduce the presence of vectors onsite;
- Provision of onsite health care and medical facilities, to ensure that basic medical attention and first aid treatment can be sought during the hours that the work is being undertaken at the Project site. This will also help reduce the potential pressure on local health care facilities;
- Pre-placement medical examination of all workers, supported by periodic medical examinations. A regular voluntary Worker Medical Screening Program onsite and a Monitoring and Evaluation (M&E) system. In addition a workplace policy and training and awareness programme on risks described above and prevention and mitigation of HIV impacts will be implemented with Project staff;
- Develop and implement a Workforce Code of Conduct. The Workforce Code of Conduct will be adhered to by all Contractors and TPMC employees. Any employee or Contractor found in violation of the Code shall face disciplinary hearing which may result in dismissal. Include in the code specific measures that target anti-social behaviour, such as becoming involved with commercial sex workers;
- Ensure there is access to free condoms (including female condoms) at the worker camp to promote safe sexual practices;
- Conduct information, education and communication campaigns amongst Project personnel on hygiene and sanitation;

- The EPC contractor should develop an effective Waste Management Plan that ensures adequate and legally acceptable control and management of transport and disposal of all wastes on and off site;
- Accommodation should be provided to external workers in accordance with international good practice on workers' accommodation, including IFC / EBRD standards to prevent transmission of diseases associated with poor living conditions;
- The Project should implement measures to reduce the presence of standing water onsite through environmental controls and source reduction to avoid the creation of new breeding grounds;
- All the mitigation presented in the air quality and noise impact assessment chapter will be implemented;
- The Project should develop a Traffic Management Plan covering vehicle safety, speed limits on roads, driver and passenger behaviour, use of drugs and alcohol, hours of operation, rest periods and location of rest stops and accident reporting and investigations;
- Require Project drivers to be trained in defensive driving within the previous 3 years;
- All vehicles used for the project should be regularly serviced and maintained;
- Local speed limits should be adhered to when travelling through communities by all Project related traffic. Such speed limits will have the added advantage of reducing dust emissions;
- Undertake consultation with communities along key transport routes to inform them about the potential for increased traffic movements prior to any changes;
- TPMC will develop and implement a Stakeholder Engagement Plan as part of the Project. The Project will also include a Grievance Mechanism to collect grievances from local stakeholder affected by the Project activities; and
- The Project will ensure that signs are put up around construction sites advising people of the risks associated with trespass. All signs should be in diagram form to ensure those with low levels of literacy understand the signs.

Residual Impacts

Once management measures have been implemented, it is predicted that the impact will become **Negligible Negative Impact** during construction due to the potential for long term or permanent impact in case of accident.

Monitoring Plan

Monitoring of impact on Community Health and Safety will be done through:

- Annual check of warning sign at the construction site and on the towers;
- Bi-monthly review of training log during construction to confirm all employee are trained on the company H&S standard;
- Monitoring and review of accidents/ incidents due to construction activities; workers' health by daily monitoring and monthly review of near-misses, incidents, occupational diseases, dangerous occurrences, accidents at project activity areas and construction workers camp, as per construction phase Health and Safety Plan, which will be prepared by the EPC contractor;
- Daily monitoring of construction area, worker camp and surrounding (standing water, fence, warning sign);
- Regular unplanned audit related to the worker code of conduct (alcohol and drug use, speed limit, activities linked with local population);
- Bi-yearly unplanned audit of waste management contractors and facilities;

- Monthly visual inspection of first aid facilities and records, review of employment records and health insurance subscription records; and
- Weekly review of grievance log.

7.9.9 Impacts on Occupational Health and Safety

Baseline summary

Health and safety standards in the construction sector are relatively low in Myanmar. National occupational safety and health legislation is very limited with the main laws to consider for the Project being the Prevention and Control of Communicable Diseases Law (Law No. 1/95), Law Amending the Factories Act 1951 (Pyidaungsu Hluttaw Law No. 12/2016) and Prevention From Danger of Chemical and Associated Materials Law, 2013 (28/2013). Myanmar has ratified 23 out of 189 ILO conventions. Experience of industrial health and safety standards is limited in the Project SAoI except for those who have experience working at the industrial ports.

Receptor Sensitivities

International employees are likely to have a better understanding of national and international health and safety standards, and therefore understand the relevance of any training and mitigation measures and appropriate working conditions. Employees sourced from the SAoI may have a higher sensitivity to the impact due to a poorer understanding of OHS standards and working conditions, and lower education levels.

7.9.9.2 Impact during Construction and Operation

For the Transmission Line construction, the workforce will be 175 workers (including 100 local workers and 75 expat workers). The nature of the activities mean that there is the potential for accidents and injuries to occur if occupational health and safety systems are not developed and strictly enforced for all Project personnel.

The potential impacts on the workers of the Project are likely to result from the construction activities including derrick, ROW, stringing of ground wire and line conductor, Project vehicle movement, falling objects, and working at height, which may lead to injury or fatalities during the construction phase of the Project. Without effective Health and Safety practice in place, these potential impacts are likely to increase in proportion to increase in activity.

Unplanned event (including falling of transmission tower, electric shock) could affect workers who are working directly or proximately to the Transmission Line.

Impact during operation are limited compare to those identified for construction phase and include falling of transmission tower and electric shock.

The impact of the Project pre-mitigation on occupational health and safety during construction phase is considered a **Moderate Negative Impact**.

Impact Assessment table

Significance of Impact			
Impact	Impact on Occupational Health and Safety		
Impact Nature	**Negative**	Positive	Neutral
	The potential increase in Health and safety of workforce and Labour and working conditions are negative.		
Impact Type	**Direct**	Indirect	Induced
	The impact is direct.		

Significance of Impact

Impact Duration	Temporary	Short-term	**Long-term**	**Permanent**
	Impact has the potential to have a long lasting effect with injured workers being unable to work for a long time or even permanent in case of accident crippling or killing workers.			
Impact Extent	**Local**	Regional	International	
	The impact is limited to the workers of the Transmission Line.			
Impact Scale	The impact scale is small.			
Frequency	The impact likely occurs during the construction with a rare frequency.			
Impact Magnitude	Positive	Negligible	Small	**Medium**	Large
	The impact magnitude is potentially medium with long term impact but with a rare frequency and small scale.			
Receptor Sensitivity	Low	**Medium**	**High**	
	The vulnerability of receptor is likely to be medium with unskilled staff not aware of H&S risks and best practice.			
Impact Significance	Negligible	Minor	**Moderate**	Major
	The significance is likely to be Moderate due to the potential duration and gravity of the impact but the rare frequency of the impact.			

Mitigation Measures

The Project will develop and implement a Construction Occupational Health and Safety Management Plan (OHSMP) in line with good industry practice and corporate policies.

- The Contractor will prepare and implement a Health and Safety Plan prior to commencing work. This plan will include method statements for work activities, plant utilisation, construction sequence and safety arrangements;
- Measures will be implemented to reduce the likelihood and consequence of the potential hazards. This shall include (but not limited to) the following hazards:
  - Falling from height;
  - Falling into water;
  - Entanglement with machinery;
  - Tripping over permanent obstacles or temporary obstructions;
  - Slipping on greasy walkways;
  - Falling objects;
  - Asphyxiation;
  - Explosion;
  - Contact with dangerous substances;
  - Electric shock;
  - Variable weather conditions;
  - Lifting excessive weights; and
  - Traffic operations.
- Competent and adequately resourced sub-contractors will be used where construction activities are to be sub-contracted;

- All persons working on the construction site will be provided information about risks on Site and arrangements will be made for workers to discuss health and safety with the Contractor;
- The Contractor will prepare and implement a Health and Safety Plan prior to commencing work. This plan will include method statements for work activities, construction sequence and safety arrangements;
- All workers will be properly informed, consulted and trained on health and safety issues;
- Personal Protective Equipment (PPE) shall be worn at all times on the construction Site. This shall include appropriate safety shoes, safety eyewear, and hard hats. Non-slip or studded boots will be worn to minimize the risk of slips;
- Before starting work all the appropriate safety equipment and the first-aid kits will be assembled and checked as being in working order. Breathing apparatus if necessary will be tested at regular intervals in the manner specified by the manufacturer;
- All lifting equipment and cranes will be tested and inspected regularly. All hoist ways will be guarded;
- All scaffolding will be erected and inspected in conformity with the Factories Act (1951) and the appropriate records maintained by the Contractor;
- When there is a risk of drowning lifebelts shall be provided and it shall be ensured that personnel wear adequate buoyancy equipment or harness and safety lines, and that rescue personnel are present when work is proceeding (near the water extraction point);
- The Contractor shall provide appropriate safety barriers with hazard warning signs attached around all exposed openings and excavations;
- The EPC contractor will comply with the IFC Performance Standard 2, local regulation and ILO conventions signed by Myanmar; and
- TPMC will develop and monitor an internal standard to guide labour practices and apply this to supply chain to ensure that no child and/or forced labour will be employed by the EPC contractor and its sub-contractors.

In addition an OHS monitoring programme should be put in place to verify the effectiveness of prevention and control strategies and a worker grievance mechanism developed and implemented.

Residual Impacts

Based on the implementation of the proposed mitigation measures, the significance of the impact is considered to be a **Minor and Negative Impact** post mitigation.

Monitoring Plan

Monitoring of impact on Occupational Health and Safety will be done through:

- Six monthly review of training log to confirm all employee are trained on the company H&S standard;
- Monitoring and review of accidents/ incidents due to construction activities; workers' health by daily monitoring and monthly review of near-misses, incidents, occupational diseases, dangerous occurrences, accidents at project activity areas and construction workers camp, as per construction phase Health and Safety Plan, which will be prepared by the EPC contractor;
- Development of an Occupational health and safety monitoring and surveillance programme; and
- Weekly review of worker grievance log.

7.9.10 Impacts to Cultural Heritage

Baseline summary

There are no known cultural heritage site within the footprint of the Project site. The history of the site also support the absence of such site or any cultural or religious use.

In Twantay, the main cultural heritage sites located nearest to the proposed Project site is Twante Shwesandaw pagoda, Kan Paw Aye pagoda, and Maung Tee pagoda. Twante Shwesandaw pagoda. The nearest religious site is the Pagoda of Kha Yan Wa located 160 metres away from the ROW.

Receptor Sensitivities

The vast majority of the population in the Project SAoI is Buddhist and regularly attend the monastery for ritual or weekly praying.

7.9.10.2 Impact during Construction and Operation

The Project activities that may have impact on cultural heritage sites during construction are the same as the ones described in the impacts from environmental emissions sections. This include all activities that may create noise, dust or vibration impacts. Additionally, impact on transport and traffic can impact local people normal travel to a religious site.

No Project activity is expected to impact cultural heritage during the operation phase.

The impact of the Project pre-mitigation on cultural heritage during construction phase is considered a **Negligible Negative Impact**.

Impact Assessment table

Significance of Impact

Impact	Impact on Cultural Heritage				
Impact Nature	**Negative**	Positive	Neutral		
	The potential impact on cultural heritage are negative.				
Impact Type	**Direct**	Indirect	Induced		
	The impact is direct.				
Impact Duration	Temporary	**Short-term**	Long-term	Permanent	
	The potential impact on cultural heritage are negative.				
Impact Extent	**Local**	Regional	International		
	The impact is limited to the area directly.				
Impact Scale	The impact scale is small.				
Frequency	The impact likely occurs from time to time during 3-5 days for 25 month during construction.				
Impact Magnitude	Positive	Negligible	**Small**	Medium	Large
	The impact magnitude is considered small with the nearest settlement 160 metres away and not downwind compare to the proposed Project site.				
Receptor Sensitivity	**Low**	Medium	**High**		
	The vulnerability of receptor is likely to be low due to distance from the proposed Project site and the quality of the construction of the Pagoda and other religious site.				
	Negligible	Minor	Moderate	Major	

Impact Significance	The significance is considered to be Negligible.

Mitigation Measures

All the measures described in the Impacts from Environmental Emissions and traffic sections will be implemented for impact by environmental emissions. In addition:

- The EPC contractor during construction will monitor the state of any cultural heritage closest to the project site. If damage is done to the buildings by vehicle of the Project, compensation (in kind or in cash) should be organised to restore the building to its state before the damage occur;
- The EPC contractor will develop the construction planning in discussion with the nearest temple/monastery in order to make sure that any Project activity near the monastery (e.g transport of large equipment) do not take place during special religious activities; and
- TPMC will develop and implement a Stakeholder Engagement Plan as part of the Project. The Project will also include a Grievance Mechanism to collect grievances from local stakeholder affected by the Project activities.

Monitoring Plan

Monitoring of impact on cultural heritage will be done through:

- Monitoring and review of accidents/ incidents due to construction activities;
- Six monthly review of training log; and
- Weekly review of grievance log.

8. SUMMARY OF IMPACT ASSESSMENT

This section will provide a summary of the significance of impacts for all physical and social receptors within ***Chapter 7***. The following receptors that will be summarized are listed below:

- Section 7.1: Air Quality;
- Section 7.2: Green House Gas;
- Section 7.3: Noise;
- Section 7.4: Soil and Groundwater;
- Section 7.5: Surface Water;
- Section 7.6: Waste;
- Section 7.7: Visual;
- Section 7.8: Biodiversity; and
- Section 7.9: Social.

The significance of impact for all physical and social receptors are summarized in ***Table 8.1***.

Table 8.1: Summary of the Significance of Impact for Physical, Biodiversity and Social Receptors

Receptors	Impact Name	Phase	Impact Significance	
			Pre-mitigation	Post-mitigation
Air	Human health	Construction	Negligible	Negligible
	Ecology	Construction	Moderate	Minor to Negligible
GHG	Construction	Construction	Negligible	Negligible
Noise	Construction	Construction	Minor	Negligible
Surface Water	Construction	Construction	Moderate	Negligible
Soil and Groundwater	Soil	Construction	Moderate	Minor
	Groundwater	Construction	Moderate	Minor
Waste	Inappropriate storage of waste	Construction	Minor	Negligible
	Waste generation	Construction	Moderate	Negligible
Visual	Physical presence	Construction	Minor	Negligible
	Physical presence	Operation	Moderate	Minor
Biodiversity	Permanent and Temporary Habitat Loss	Construction and Operation	Moderate	Minor
	Temporary disturbance or displace of fauna	Construction	Minor	Negligible
	Temporary and Permanent Barrier Creation, Edge effects and Fragmentation	Construction and Operation	Negligible	Negligible
	Degradation of Habitat	Construction and Operation	Negligible to Minor	Negligible

Receptors	Impact Name	Phase	Impact Significance	
			Pre-mitigation	Post-mitigation
	Mortality of resident species	Operation	Negligible to Minor	Negligible
	Mortality of Avifauna	Operation	Negligible	Negligible
Social	Employment	Construction	Positive	
	Economic Displacement	Construction	Moderate	Minor
	Traffic and transport	Construction	Negligible	Negligible
	Environmental emission	Construction	Minor	Negligible
	Community health and safety	Construction	Minor	Negligible
	Occupational health and safety	Construction	Moderate	Minor
	Cultural Heritage	Construction	Negligible	Negligible

9. CUMULATIVE IMPACT ASSESSMENT

9.1 Introduction

“Cumulative impacts are those that result from the successive, incremental, and/or combined effects of an action, project, or activity when added to other existing, planned, and/or reasonably anticipated future ones” (IFC, 2013). The multiple and successive environmental and social impacts caused by existing activities or conditions, combined with the possible incremental impacts that could result from future proposed and/or planned projects, can potentially generate greater cumulative impacts than would be expected in the case of a single project (IFC, 2013). According to the IFC, the assessment and management of cumulative impacts is appropriate when there is concern that a project or activity under consideration could contribute to generating cumulative impacts on one or more valued environmental and social component (VEC) (IFC, 2013).

This chapter presents the cumulative impact assessment (CIA) for the Project conducted to evaluate the potential contribution of the Project towards the cumulative impacts on the resources identified as VECs. Following good international industry practice, this CIA follows the IFC’s Good Practice Handbook—Cumulative Impact Assessment and Management: Guidance for Private Sector in Emerging Markets (the “Handbook”) (IFC, 2013). The Handbook provides a methodology for identifying the most significant cumulative impacts; the methodology includes a desktop review of publicly available information and consultation with key stakeholders. This methodology focuses on environmental and social components, referred to in the handbook as VECs, which are: (1) rated as “critical” by potential project-affected communities and/or the scientific community; and (2) cumulatively impacted by the project under evaluation, by other projects, and/or by natural environmental and social external drivers (IFC, 2013). The methodology is considered consistent with the IFC Performance Standards (PS), especially PS 1—Assessment and Management of Environmental and Social Risks and Impacts, and PS 6—Biodiversity Conservation and Sustainable Management of Living Natural Resources (IFC, 2012).

9.2 Objectives and Scope

The overall objective of this CIA is to identify and assess the contribution by the Project to cumulative impacts in the Project AOI. It is based on information included in the environmental and social baseline from the EIA study undertaken for the Project in 2018, information presented throughout prior chapters of this IEE, information provided by the Project Proponent, and information available in the public domain. The specific objectives are to:

- Identify VECs that could be impacted cumulatively in areas potentially affected by the Project, considering input from stakeholders through consultation process and the scientific community;
- Identify other existing and planned project and external environmental and social drivers that could cumulatively impact VECs;
- Undertake a high-level assessment of potential cumulative impacts on VECs, considering the Project and the other identified existing and planned projects and external drivers in the area; and
- Recommend a management framework for the integrated management of potential cumulative impacts.

9.3 Methodology

9.3.1 Definitions of Key Terminology in CIA

The following are definitions for key terminology used in the CIA (IFC, 2013).

Cumulative Impact: Impacts that result from the successive, incremental, and/or combined effects of an action, project, or activity added to other existing, planned, and/or reasonably anticipated actions, projects, or activities. For practical reasons, the identification, assessment, and management of

cumulative impacts are limited to those effects generally recognized as important on the basis of scientific concern and/or concerns of affected communities.

CIA: Process to identify and evaluate cumulative impacts.

Other Projects: Existing, planned, or reasonably expected future developments, projects and/or activities potentially affecting VECs.

External Drivers: Sources or conditions that could affect or cause physical, biological, or social stress on VECs, such as natural environmental and social drivers, human activities, and external stressors. These can include climate change, population influx, natural disasters, or deforestation, among others. These are typically less defined and planned than Other Projects.

VEC: Environmental and social components considered as important by the scientific community and/or project-affected communities. VECs may include:

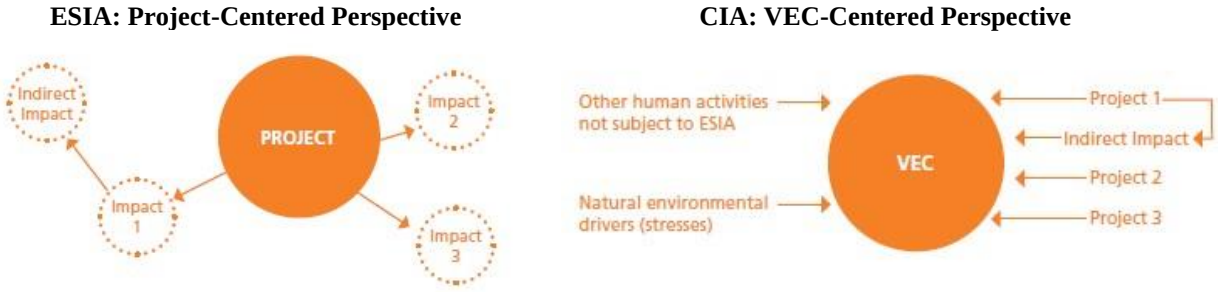
- Physical features, habitats, wildlife populations (e.g., biodiversity, water supply);
- Ecosystem services (e.g., protection from natural hazards, provision of food);
- Natural processes (e.g., water and nutrient cycles, microclimate);
- Social conditions (e.g., community health, economic conditions); and
- Cultural heritage or cultural resources aspects (e.g., archaeological, historic, or traditional sites).

VECs reflect the public and scientific community's "concern" or special interest about environmental, social, cultural, economic, or aesthetic values. VECs are considered the ultimate recipients of cumulative impacts because they tend to be at the ends of ecological pathways.

9.3.2 Overall CIA Approach

Unlike an ESIA, which focuses on a project as a generator of impacts on various environmental and social receptors, a CIA focuses on VECs as the receptors of impacts from different projects and activities (see ***Figure 9.1***). In a CIA, the overall resulting condition of the VEC and its related viability are assessed.

Figure 9.1: ESIA vs CIA Perspective

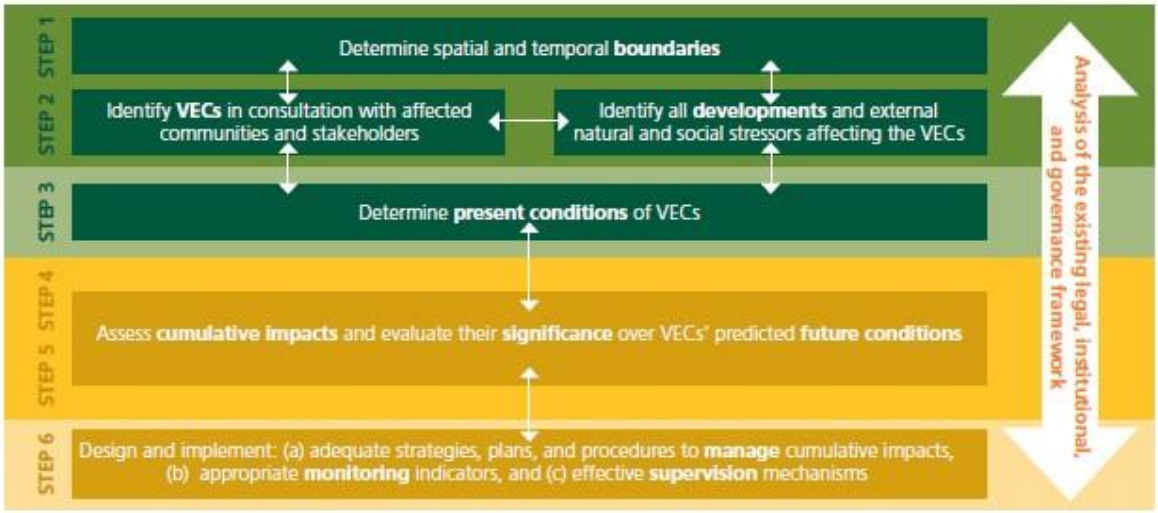


Source: IFC, 2013

CIA = cumulative impact assessment; ESIA = Environmental and Social Impact Assessment; VEC = valued environmental and social component

This CIA follows the Handbook's six step methodology (***Figure 9.2***). The process is iterative and flexible, with some steps having to be revisited in response to the results of others. For example, the VEC selection step usually needs to be adjusted after the potential impacts of the project are identified. The steps are described in detail below.

Figure 9.2: Summary of IFC's Cumulative Impact Assessment Methodology



Source: IFC, 2013

VEC = Valued environmental and social component

9.3.3 Limitation

The Handbook takes into consideration the limitations that a private developer may face carrying out a CIA as part of an IEE, or difficulties encountered in compiling such information. The limitations applicable to this CIA include: (1) incomplete information about other projects and activities (e.g., the information is not available in the public domain); (2) uncertainty with respect to the implementation of future projects; and (3) difficulty in establishing thresholds or limits of acceptable change for VECs, and therefore the significance of cumulative impacts.

9.3.4 Determination of Spatial and Temporal Boundaries

Table 9.1 presents the spatial boundary of the CIA.

Table 9.1: Project Areas of Influence

Area of Influence (AoI)	Area (ha)
Avifauna Study Area (Radius 250 m)	558,500
Community Study Area (Radius 250 m)	558,500
Terrestrial Habitat Study Area	1,131.57

Source: ERM, 2019

AoI = Area of Influence; ha = hectares.

9.3.5 Identification of VECs, Other Projects, and External Drivers

9.3.5.1 VECs

To be included in a CIA, a VEC must first be confirmed to be valued by other identifiable stakeholder group and/or the scientific community. Secondly, the VEC must be reasonably expected to be affected by *both* the project components under evaluation (i.e. the Transmission Line) and combination of other projects and/or external drivers.

The scoping activity considered potential Project impacts across a range of abiotic, biotic, and social components that were identified during the Project screening and scoping phase. In addition, input from stakeholders has been collected as part of the IEE stakeholder engagement and consultation process. Engagements activities included interaction with governmental authorities, communities, population groups, and social organization present in the AOI. The engagement of consultation strategy, a joint knowledge building process, allowed for the progressive identification of risk and impacts, information sharing, and participation during the preparation of the IEE.

9.3.5.2 Other Projects

Through a thorough review of publicly available information, existing and future planned projects and activities located within the spatial and temporal boundaries of the CIA, having the potential to result in cumulative impacts on identified VECs were identified. ***Section 9.4.1***, Other Projects, describes the identified other projects.

9.3.5.3 External Drivers

Regionally present external drivers and stressors were identified through the Scoping Study-generated information and publicly available information. ***Section 9.4.2***, External Drivers, describes the identified external drivers.

9.3.6 Description of VEC Conditions

The baseline conditions of the selected VECs were characterized based on the data presented in the environmental and social baseline sections of the current IEE (see ***Section 9.5.2***, VEC Description). The VEC baselines provide information on the VECs' current conditions and anticipated resilience against external stressors and potential impacts (cumulative impacts and sources of stress) and thus provide an indication of their viability and sustainability.

9.3.7 Assessment of Cumulative Impacts on VECs

CIAs are future-oriented and project contributions are assessed as the difference between the expected future condition of the VEC in the context of all possible known stressors plus the project under evaluation. This step of the CIA assesses the future conditions of the VECs, considering the Project, other projects, and external drivers. If the residual impact on a VEC was rated above **Minor** for at least

one potential impact associated with Project activities (refer to ***Chapter 8***, Impact Assessment, for residual impact significance ratings) the VEC was identified as potentially eligible for the CIA.

The results of the CIA are presented in tabular format in ***Section 9.6***, Assessment of Cumulative Impacts on VECs. The significance of cumulative impacts is not evaluated in terms of the magnitude of change, but instead in terms of VEC response and the resulting condition and sustainability. If cumulative impacts do not exceed the VEC threshold, the development of the project under assessment is considered acceptable. Given the intrinsic limitations of CIAs carried out by a private developer, (see ***Section 9.3.3***, Limitations), the present study was not intended to obtain sufficient baseline information to establish thresholds of the selected VECs and therefore establish the significance of the cumulative impacts. Instead, based on the Project Scoping Report (ERM, 2018), and the current ESIA-generated information and publicly available information, cumulative impacts were categorized by priority using the following definitions:

- **High Priority:** The VEC is expected to be or is currently being adversely impacted by other projects and/or external drivers and the future addition of the Project could incrementally contribute to the potential adverse impact. Actions should be implemented in the short term to mitigate potential adverse cumulative impacts on the VEC.
- **Medium Priority:** The VEC could potentially be impacted by other projects and/or external drivers, and the Project could potentially incrementally contribute to the adverse impact. Actions should be implemented in the medium term to mitigate potential adverse cumulative impacts on the VEC.
- **Low Priority:** The VEC is not expected to be potentially impacted by other projects and/or external drivers, and therefore the Project impacts would not be expected to contribute to an adverse cumulative impact. No actions are required to mitigate potential adverse cumulative impacts on the VEC beyond Project mitigation measures.

9.3.8 Cumulative Impact Management Framework

Internationally recognized good practices for managing cumulative impacts include:

- “Effective application of the mitigation hierarchy (avoid, reduce, and remedy) in the environmental and social management of the specific contributions of a project to expected cumulative impacts; and
- Undertaking best efforts to engage, leverage, and/or contribute in multi-stakeholder collaborative initiatives or discussion groups to implement management measures that are beyond the capacity and responsibility of any individual project developer” (IFC, 2013).

Project design features and management measures included in the current IEE provide a means to mitigate the specific contributions of the Project to effects on VECs, following the mitigation hierarchy (refer to mitigation measures in ***Chapter 7***, Impact Assessment; and ***Chapter 10***, Environmental and Social Management Plans). Supplementing these controls and management measures, the CIA provides recommendations for the Project Sponsor to apply in the context of the Project to further manage potential cumulative impacts on the VECs.

9.4 Other Projects and External Drivers

9.4.1 Other Projects

There is an existing 120 MW natural gas power plant located within the Project site boundary (***see Figure 4.1***) currently operated and owned by the Project Proponent. The existing CCPP started its operation in April 2013 and is comprised of 2 Combined Cycle Gas Turbine (CCGT) units (121 MW total). The existing CCPP was given a 30-year concession period for Build-Operate-Transfer (BOT) with the Myanmar Electric Power Enterprise; the generated power is supplied to the Hlaingthayar sub-station via a 230 kV overhead transmission line.

9.4.1.1 New Yangon City

Driven by the New Yangon Development Company Ltd. (NYDC), the New Yangon City is expected to ultimately occupy a land mass of approximately 680 km^2 to the west and south of Yangon (as shown in ***Figure 9.3***). NYDC aspires to build world-class urban infrastructure (e.g., integrated community hubs, improved public transport, 100% reliable utility services with a focus on renewables, and smart city technology). There are two development phases planned for New Yangon City:

Phase 1: located in a semi-urban to rural area in Seikgyi-Kanaungto, Twante and Kyee-Myin-Daing Townships to the west of Yangon. Covering an area of approximately 90 km^2, the master plan for Phase 1 includes the following:

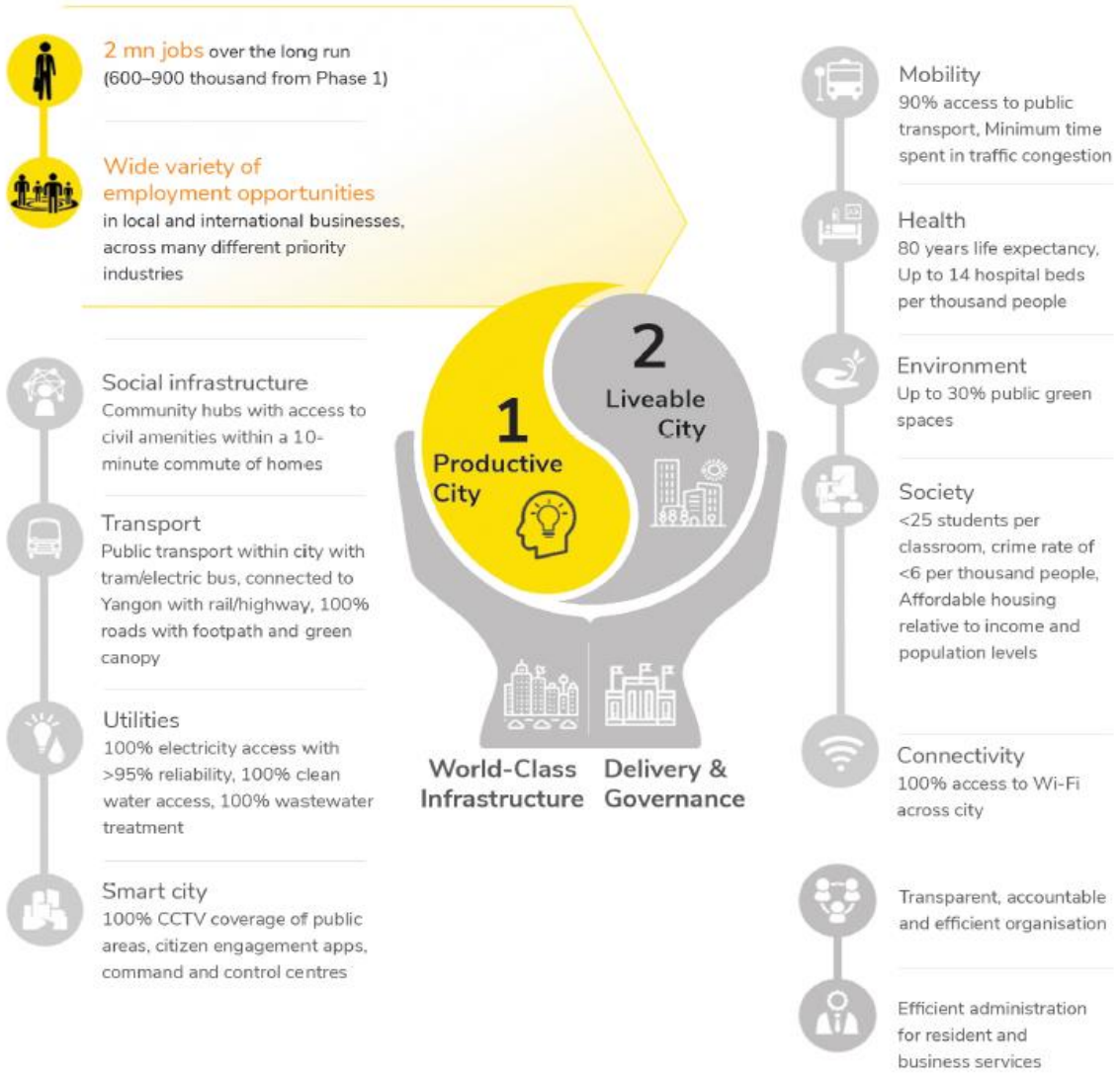
- Infrastructure projects: two bridges 26 km of artery roads, power (a 1x230 kV transformer substation and transformer and distribution lines), water and wastewater systems, and a 13 km^2 industrial zone;
- Social projects and aspects: urban village (resettlement) areas, existing village and settlement areas;
- Supporting aspects: green spaces and waterways; and
- Phase 1 development is projected to support the creation of 600-900 thousand jobs in total.

Phase 2: will cover a land area of approximately 600 km^2. Infrastructure improvements to enhance trading connectivity and boost economic opportunities for the Ayeyawady Region. Phase 2 of the New Yangon City project expects to generate 1-1.2 million jobs.

Figure 9.3: New Yangon City Layout

Source: NYDC, 2018

Figure 9.4: New Yangon end-state aspirations



Source: NYDC, 2018

9.4.2 External Drivers

9.4.2.1 Climate change

Myanmar ranked second out of 183 countries most affected by extreme weather events between 1995 and 2014 in the Global Climate Risk Index (Kreft, 2016). Recent extreme weather events such as Cyclone Nargis in 2008, riverine flooding in 2015 and extreme heat waves in 2010 have had disastrous impacts on the society, ecology and economy of the country. Climate change threatens to compound the frequency and intensity of these events and, more importantly, to alter the conditions to which human and natural systems have adapted over millennia.

Myanmar's climate is projected to shift dramatically in the coming decades, having a lasting and significant impact on Myanmar's ecosystems and, in turn, on human health, agriculture, food security, infrastructure, local livelihoods and the larger economy. During extreme events in urban areas, failures in one infrastructure system—such as energy, transportation, or water infrastructure—can quickly cause failures in other systems, leading to broad and rapidly emerging crises. (Horton, et al. 2016)

9.4.2.2 Cyclones

An average of 10 tropical cyclones form each year in the Bay of Bengal, of which only 6.4% reach land in Myanmar. Since 1990, the total number of tropical cyclones reaching Myanmar has increased, and there has been a rise in tropical cyclone events occurring just before the monsoon season, while those occurring after the monsoon season have decreased. (Horton, et al. 2016).

Nargis hit Myanmar's Ayeyarwady Delta region on May 2, 2008, and ranks among the world's deadliest cyclones ever to make landfall. An estimated 140,000 people were killed. The storm surge was estimated to be 3 to 4 meters high and reached 50 km upstream from the mouth of the Yangon. Much of the damage to buildings resulted from the very high wind speeds and intense wave action, as well as inland flooding via irrigation channels connected to the main waterways. (Horton, et al. 2016).

9.5 VEC Selection and Description

9.5.1 Selection of VECs

Potentially eligible VECs were analyzed against the following criteria: (1) confirmed to be valued by an identifiable stakeholder group (in the case of local communities, identified by a representative number of communities in the AOI) and/or the scientific community; (2) reasonably expected to be potentially impacted by the Project (i.e., at least one residual impact significance rating above **Minor**); and (3) reasonably expected to be potentially impacted by some combination of other projects and/or external drivers. ***Table 9.2*** summarizes the VECs selected for this CIA.

Table 9.2: Selected VECs for Inclusion in CIA

VEC	Potentially Valued by Stakeholder or Scientific Community	Potentially Affected by the Project	Potentially Affected by One or More Other Projects	Potentially Affected by one or More External Drivers
Socio-economic condition	Yes	Yes	Yes	Yes
Terrestrial habitats	Yes	Yes	Yes	Yes
Avifauna	Yes	Yes	Yes	Yes
Surface and groundwater	Yes	Yes	Yes	Yes

CIA = cumulative impact assessment; VEC = valued environmental and social component
- = Cannot determine reasonably expected potential impacts based on the existing information.

Several environmental and social receptors or components were not selected as potentially eligible for the CIA because they were not identified as components of value or concern by stakeholders; not reasonably expected to be significantly impacted by the Project; or not reasonably expected to be potentially impacted by some combination of other projects and/or external drivers.

9.5.2 VEC Baseline Status

9.5.2.1 Socio-economic Conditions

In Yangon, many citizens are hired to work in industrial, commercial and trading sectors, but certain of them living in rural areas work in the livestock rearing, fisheries and agricultural fields. Principal exports of Yangon are rice, teak, and metal ores[136] coming from other part of Myanmar. Revenue and

[136] Yangon (Myanmar) - Encyclopaedia Britannica (Web)

expenditure for 2017-2018 fiscal year in Yangon are 382,585.316 million Kyats and 424,280.667 million Kyats respectively[137].

9.5.2.2 Terrestrial Habitats

The terrestrial Project Area appears to be largely modified land with negligible ecological value. The majority of land has been converted mainly for agriculture.

Table 9.3: Natural Habitat and Modified Habitat within the AoI and Project Area

Habitat Type	Area of Influence (ha)
Natural Habitat	45.73
Modified Habitat	1,085.84

Source: ERM, 2019

9.5.2.3 Avifauna

Bird species of conservation significance found within the species grid location from the Integrated Biodiversity Assessment Tool (IBAT) are outlined in ***Table 5.3*** with six (6) listed under critically endangered, seven (7) listed under endangered and six (6) listed as vulnerable. The species that were categorized as critically endangered are:

- Spoon-billed Sandpiper;
- Yellow-breasted Bunting;
- Nias Hill Myna;
- White-rumped Vulture;
- Slender-billed Vulture; and
- Red-headed Vulture.

The following table shows the criticality of bird loss from either electrocution or collisions from a study conducted on behalf of NABU (Nature and Biodiversity Conservation Union); none of which are found in the above list of critically endangered bird species within the Biodiversity Study Area.

Table 9.4: Criticality of Bird Losses due to Electrocution or Collisions with Transmission Line

Bird Species	Due to Electrocution	Due to Collisions
Loons (*Gaviidae*) and Grebes (*Podicipedidae*)	A	C
Shearwaters, Petrels (*Procellariidae*)	A	B-C
Bobbies, Gannets (*Sulidae*)	A	B-C
Pelicans (*Pelicanidae*)	B	C-D
Cormorants (*Phalacrocoracidae*)	B	C
Herons, Bitterns (*Ardeidae*)	B	C
Storks (*Ciconidae*)	D	D

[137] Budget information for 2017-2018 Fiscal Year (Citizen's budget) – The Myanmar Information Management Unit (MIMU), 2017 (Web)

Bird Species	Due to Electrocution	Due to Collisions
Ibisses (*Threskiornithidae*)	B	C
Flamingos (*Phoenicopteridae*)	A	C
Ducks, Geese, Swans, Mergansers (*Anatidae*)	A	C
Raptors (*Accipitriformes* and *Falconiformes*)	C-D	B-C
Partridges, Quails, Grouses (*Galliformes*)	A	C-D
Rails, Gallinules, Coots (*Rallidae*)	A	C-D
Cranes (*Gruidae*)	A	C-D
Bustards (*Otidae*)	A	D
Shorebirds / Waders (*Charadriidae* + *Scolopacidae*)	B	C-D
Skuas (*Sterkorariidae*) and Gulls (*Laridae*)	B	C
Terns (*Sternidae*)	A-B	C
Auks (*Alcidae*)	A	C
Sandgrouses (*Pteroclididae*)	A	B
Pigeons, Doves (*Columbidae*)	C	C
Cuckoos (*Cuculidae*)	A	C
Owls (*Strigiformes*)	B-C	C
Nightjars (*Caprimulgidae*) and Swifts (*Apodidae*)	A	C-D
Hoopoes (*Upudidae*) and Kingfishers (*Alcedinidae*)	B	C
Bee-eaters (*Meropidae*)	A-B	C
Rollers (*Coraciidae*) and Parrots (*Psittadidae*)	B	C
Woodpeckers (*Picidae*)	B	C
Ravens, Crows, Jays (*Corvidae*)	C-D	B-C
Medium-sized and small songbirds (*Passeriformes*)	B	C

Source: Dieter Hass et. al., n.d.[138]

A – no casualties reported or likely
B – casualties reported, but no apparent threat for the respective bird population
C – regionally or locally large amount of casualties; however, these losses can still be compensated within the bird population
D – casualties are a major mortality factor; individual species are threatened towards extinction, regionally or on larger scale

9.5.2.4 Surface Water and Groundwater

Surface Water

The total coliform level of the river waters in Yangon was close to 50 cfu/ml. Amongst the sampling points on the Yangon River, the sampling point downstream of the Project Site, located at the riverbank

[138] http://birdsandpowerlines.org/cm/media/Protecting_birds_on_powerlines.pdf

close to a wastewater treatment plant discharge point, has significantly higher (21 fold higher) total coliform level than those sampling points in the centre of the river. The main use of surface water is for transportation and domestic use by the local community as well as industrial use.

Groundwater

Hlaingthayar and Seikgyikanaungto Township are located on a zone I (one) groundwater. Zone I (one) refers to good quality groundwater with high yield. Additionally, the high yield is sourced from Arzanigone sand rock (1000 – 1100 gph) and Valley fill deposits (6000 – 10000 gph) with total dissolved solids of 60 -200 ppm and 50 – 200 ppm, respectively (Khin Kay Khaing, 2011[139]). Therefore, we can expect that the groundwater quality in the Study Area is in reasonably good condition with high yield volume for communities and industrial use.

9.6 Assessment of Cumulative Impacts on VECs

Table 9.5 summarizes the assessment of cumulative impacts for the VECs identified as eligible for the CIA. The cumulative impacts discussed consider potential impacts assessed for the Project (for further details see ***Chapter 4***, Project Description, and ***Chapter 7***, Impact Assessment), other projects (see ***Section 9.4.1***, Other Projects), and external drivers (see ***Section 9.4.2***, External Drivers). Priority ranking is established for each VEC and the estimated cumulative impacts, based on the definition established in ***Section 9.3.7***, Assessment of Cumulative Impacts on VECs.

In summary, **High** priority cumulative impacts, where VECs are expected to be adversely impacted by other projects and/or external drivers, and the Project could incrementally contribute to the potential adverse impact, and therefore actions should be implemented in the short-term, were identified for the following VECs: socio-economic conditions, terrestrial habitat, birds (avifauna), and surface water and groundwater. The other VECs are deemed as **Low** priority cumulative impacts, where the VECs are not expect to be potentially impacted by other projects and/or external drivers, and therefore the Project impacts would not be expected to contribute to adverse cumulative impacts.

As CIAs are not static and given the level of uncertainty of the potential other projects, it is recommended that future CIA efforts identify and confirm specific and reasonably expected other projects and update the assessment of cumulative impacts accordingly.

[139] http://www.myanmar-education.edu.mm/wp-content/uploads/2013/05/13_Khin_Kay_Khaing.pdf

Table 9.5 Cumulative Impact Assessment

VEC	Potential Impacts from the Project	Potential Impacts from Other Projects	Potential Impacts from External Drivers	Cumulative Impact	Priority Ranking
Socio-economic conditions	**Construction Phase of the Transmission Line:** Potential impacts due to increase in potential employment to local people thus job creation for the communities over a short term.	**New Yangon City Project** *Construction Phase:* relocation of Urban Village and loss of farmland. Employment generation and increased economic activities. *Operation Phase*: increase in access and connectivity, job creation for the local people.	Climate change poses risks to critical infrastructure systems in Myanmar, such as energy, transportation, buildings, water supply and wastewater, and telecommunications also pose a direct risk to livelihoods that depend on them.	The receptors in this development will be local communities situated in Yangon and nearby smaller communities within the site Study Area. People within this area may be positively impacted by higher chance of getting employment by the upcoming development and projects.	**Medium**
Terrestrial Habitat	**Construction and Operation Phase of the Transmission Line:** Potential impacts due to erection and the physical presence of the Transmission Tower causing loss and disruption of terrestrial habitat area.	**New Yangon City Project** Construction and Operation phases: the expansion and physical presence causing disruption and loss of terrestrial habitat area. Additional release of pollutants during operation phase into the surrounding terrestrial habitat producing nuisance to the biodiversity thus degrading the terrestrial habitat quality.	Climate change risks can impact the quality of the habitat which may render the biodiversity residing the in the area to be forced to move away and find new habitats.	The receptors in the event that the developments occurs, terrestrial habitat will be disturbed within the 250 m of the Transmission Line project area as well as the New Yangon City Project development area (with additional buffer radius from the project site). These biodiversity will be forced to relocate to a more suitable habitat.	**Low**
Avifauna (Birds)	**Construction and Operation Phase of the Transmission Line:** Potential impacts due to erection and the physical presence of the Transmission Tower	**New Yangon City Project** Construction and Operation phases: the additional release of GHG into the surrounding airshed may impact the birds as well as higher generation of $PM_{2.5}$ and PM_{10} could raise health risk for	Climate change risks can impact the quality of the habitat which may render the avifauna residing the in the area to be forced to move away and find new habitats.	The receptors (birds) in this event of multiple developments will be disturbed avifauna that reside in the surrounding area and disrupt the pathway of migratory birds. However, the Project Study Area does not	**Medium**

VEC	Potential Impacts from the Project	Potential Impacts from Other Projects	Potential Impacts from External Drivers	Cumulative Impact	Priority Ranking
	causing risk to avifauna residing and flying through the area.	the avifauna within the project area.		overlap with any known KBA or Protected Area.	
Surface water and Groundwater	**Construction Phase of the Transmission Line:** Impacts from construction activities that may impact the quality and quantity of surface water and groundwater available to secondary receptors such as human.	**New Yangon City Project** Construction and Operation phases: may release hazardous and pollutants that could potentially contaminate local surface water bodies and the associated groundwater.	Cyclones can potentially directly impact the surface water body by introducing biomass and other physical component that could contaminate the quality of the water.	Within the study area of the Transmission Line and the New Yangon City development, the largest and most concerning water body is the Yangon and Pun Hlaing River. The cumulative impact of the three component can cause significant damage to the surface water (and less to groundwater) if appropriate mitigation and management measures is not implemented.	**Medium**

9.7 Cumulative Impacts Management Framework

In the following sections, recommendations are provided for each of the impacts at Project level.

Refer to point 7.9.2 in ***Table 10.1*** in ESMP Chapter (***Chapter 10***) for mitigation measures regarding socio-economic impacts.

Refer to point 7.8.5 in ***Table 10.1*** in ESMP Chapter (***Chapter 10***) for mitigation measures regarding avifauna impacts.

Refer to point 7.4.1, 7.4.2 and 7.5.1 to 7.5.4 in ***Table 10.1*** in ESMP Chapter (***Chapter 10***) for mitigation measures regarding surface water and groundwater impacts.

10. ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

Through a systematic assessment, the IEE has identified a number of significant environmental and social impacts which may potentially result from the construction and operation of the Project. In order to manage and mitigate these impacts, a range of measures have been developed to reduce the overall residual impacts to acceptable levels and as low as reasonably practicable. Implementing and tracking the effect of these management and mitigation measures is an essential element to ensuring that the assessed residual impact levels are confirmed.

10.1 Objectives

The key objectives of this Environmental and Social Management Plan (ESMP) are to:

- Collate the various mitigation and management measures developed throughout the IEE into a single point;
- Identify all of the detailed management plans which will need to be developed for implementation throughout the various phases of the Project;
- Define monitoring requirements to determine the efficacy of all mitigation and management measures; and
- Provide clarity to all stakeholders as to what impacts have been identified, how they will be mitigated and managed, and through what means.

10.2 Scope of this ESMP

The scope of this ESMP covers both construction and operation phases of the Project, which have the potential to affect, positively or negatively, the environment and communities in which the Project Proponent and/or its contractors/sub-contractors will operate.

For decommissioning, the detailed mitigation measures will be determined at later stage when the future of the infrastructures is known. In addition, a Decommissioning Management Plan framework will be developed.

As required by this ESMP, a range of detailed management plans will be developed and implemented for each specific phase of the Project. The responsibility for the implementation of these plans will lay variously with the Project Proponent, contractors and sub-contractors. It is noted that this is only a framework ESMP into which the full range of management and monitoring activities will eventually fit into.

In addition, it is to be noted that environmental, social and governance (ESG) considerations are embedded in the Project Proponent's business decisions and processes. As TPMC does not have a specific set of sustainability or HSE goals or code of conduct, the ESMP for the Project will also align with TTCL Code of Conduct and HSE Goal and Objectives, which are presented in ***Box 3*** and ***Box 4***, respectively. The Project will also follow these policies and specific actions will be planned to align with them.

Box 3: Sustainability Policy of the Project Proponent

1. Comply with laws and regulations of the countries of business operation and with internal corporate rules, with the highest standards of honesty, integrity and fairness.

   - We realize and comply with applicable laws, regulations and the highest ethical standards in performing our global business to achieve our customer's satisfaction and our own continued growth.

   - We observe internal corporate rules and maintain good communication with supervisors and co-workers to achieve corporate success.

   - We uphold the highest ethical standards to enhance the social trust which is essential to achieve our business goals.

2. Respect humanity of the people in the world, free from discrimination and harassment.

   - We realize and respect the history, culture and customs of each country in which we operate.

   - We respect human rights and refrain from discrimination by race, religion, creed, gender, social status, nationality, age, disability, etc.

   - We maintain a work environment that is free from discrimination and harassment. Great care is taken not to cause recourse to legal proceeding as a consequence of discrimination, harassment, abuse of power, etc.

3. Comply with international arrangements governing global business operations.

   - We realize and comply with international agreements pertinent to our global operations including, inter alia, export and import regulations and tax laws.

   - We recognize the differences in business practices and legal structures in each country in which we operate and conduct our business with the highest standards of integrity and ethics.

4. Comply with international treaties and laws and regulations for environmental conservation and protection, and place the highest priority on health, safety, security and environment.

   - We recognize that environmental conservation is given high priority in the 21st Century. We endeavor to minimize the environmental impact from our global engineering business and aim to harmonize industrial and economic development with environmental conservation.

   - We shall endeavor to develop technologies and products that contribute to environmental conservation.

   - We are committed to the standards of quality, health, safety and security that are essential for TTCL to be recognized as a socially reliable company.

5. Respect intellectual properties, patented or otherwise, of customers, partners and others and protect those of TTCL.

   - We recognize the value of confidential and proprietary information of TTCL. We protect such information in accordance with our Information Security Policy.

   - We shall not divulge confidential information of TTCL to any third parties. We shall not use confidential and proprietary information for personal interests or any purposes against the interests of TTCL.

   - We treat the intellectual property as well as confidential and proprietary information of our customers, partners and other with the greatest care in accordance with applicable laws and regulations.

6. Do not commit unfair business transactions such as insider trading of stocks, in compliance with laws and regulations of the countries of business operation.

- In the event we obtain confidential information relating to TTCL, our customers or partners, both domestic and abroad, we shall not trade stocks/shares/securities of the entity to which the confidential information relates, (insider trading) until such information becomes the public domain.

7. Keep accurate, complete and timely financial and accounting records, in compliance with laws and regulations of the countries of business operation.

   - We keep accurate, complete and timely financial accounting records. Fraudulent or misleading records are strictly prohibited.

   - We disclose our corporate information on a timely basis in accordance with applicable laws and regulations to protect investors.

8. Do not stand against the overall interests of TTCL, and with the highest standards of ethics draw a line between public and private.

   - We do not act against the interest of TTCL for the purpose of pursuing personal or and third party's interests.

   - We place the highest priority to the continued growth of TTCL and to our contribute to the societies. We shall not put private interests ahead of the interests of TTCL.

9. Comply with laws and regulations of countries of business operation in dealing with customers, partners and stakeholders, and observe the highest standards of ethics in conducting business anywhere in the world.

   - We observe the highest ethical standards and the applicable laws and regulations that prohibit offering benefits, including, inter alia, money, gifts, meals and entertainment to any government officials or any other persons who have similar capacities.

   - We observe the highest ethical standards and shall not offer excessive benefits including, inter alia, money, gifts, meals and entertainment to our customers, partners and stakeholders that are beyond ethical business practice

   - We shall not accept any benefits from our customers, partners and stakeholders that are beyond ethical business practice or may impair the interests of TTCL.

10. Oppose resolutely any antisocial influences and do not submit to their demands.

    - We resolutely oppose any unlawful or unethical practices, for example corporate racketeering, and shall not make unlawful or unethical settlements, financial or otherwise, as a consequence of such practices.

11. Report immediately and in good faith to the upper management level of any known or suspected violation of this Code of Conduct.

    - All the Personnel have a duty to report, immediately and in good faith, any known or suspected violation of this Code of Conduct to the upper management level.

    - We are responsible for cooperating in the fact-finding investigation related to the reported violation.

    - In the event that a serious violation is proven, the offender and his or her supervisor may be subject to disciplinary action.

    - It is the responsibility of the management of TTCL to ensure that no retaliation of any kind shall be taken against those Personnel who reported a violation or cooperated, in good faith, with the fact-finding investigation.

Source: TTCL, 2019

Box 4: Health, Safety and Environment Goal and Objectives

Transmission Line for the LNG Power Plant (Ahlone) Project HSE Goal is to maintain an injury free workplace with minimal adverse impact of the environment. Prevent community and promote resource conservation associate with project execution.

The project HSE objectives are established followings;

1. TTCL shall carry out project management and construction management activities in compliance with the applicable legal and other HSE requirements as specified in the contract.
2. TTCL shall perform and manage construction work in safe manner to achieve the safety target of “No Lost time Accident”
3. Project incidence rates should not exceed the following value;
    a. IFR (Incidence frequency rates), 3.7
    b. ISR (Incidence severity rates), 37
4. TTCL shall perform construction work by taking into account for the Environmental impact protection and complaint from the community shall be “Zero”.

Source: TTCL, 2018

10.3 Summary of Impacts and Mitigation / Management Measures

Key environmental and social impacts have been identified and reported in the following sections of ***Chapter 5***, ***Chapter 6*** and ***Chapter 7***:

- Air Quality;
- Greenhouse Gas (GHG);
- Noise;
- Soil and Groundwater;
- Surface Water;
- Waste;
- Landscape and Visual;
- Biodiversity; and
- Social and Health.
- ***Chapter 8*** on Cumulative Impacts also identify key environmental and social impacts.

A summary of mitigation measures identified for the construction and operation phases of the Project are presented in ***Table 10.1*** for the Transmission Line. This also identifies lead responsibility for implementing the mitigation measures and sources of funds for such implementation. Many of the mitigation measures suggested during the construction phase of the Project are associated with good construction and housekeeping practices. Most of the mitigation measures for the operation phase (such as those for air emissions and noise generation) of the Project are already incorporated into the Project design specifications.

The construction phase of the Project is anticipated to start end-2019 and be completed in the region of 25 months, whereas the operation phase of the Project is 25 years, as per the Power Purchase Agreement.

The Project Proponent will be responsible for ensuring that the mitigation measures in the ESMP are implemented throughout the life span of the Project.

10.4 Detailed Management Plan

Based upon the outcomes of the IEE, detailed management plans are required to guide the Project Proponent and its contractors in the implementation of all mitigation and management measures. This is essential to ensure that the key outcomes of the impact assessment process are put in place throughout the life of the Project, and their overall efficacy tracked. These detailed management plans will include all the mitigation measures included in this ESMP chapter and will be leveraged by EPC contractors in developing their own management plans. The management plans to be prepared are the Project Proponent and its Contactors commitment to the mitigation and management measures.

As identified with the summary of impacts and mitigation and management measures, the following detailed management plans are considered necessary to effectively implement the outcomes of the IEE throughout the life of the Project:

- Air Quality Management Plan;
- Vehicle Management and Maintenance Plan;
- Traffic Management Plan;
- Noise and Vibration Management Plan;
- Surface Water Management Plan;
- Soil and Groundwater Management Plan;

- Biodiversity Action Plan;
- Waste Management Plan (Hazardous Waste);
- Waste Management Plan (Non Hazardous Waste);
- Emergency Response Plan (including Community Emergency Response Plan);
- Worker Occupational Health and Safety Management Plan;
- Stakeholder Engagement Plan (including Grievance Management Plan);
- Land Acquisition Plan and Procedure;
- Community Health Management Plan;
- Workers' Accommodation Management Plan;
- Local Recruitment and Procurement Plan;
- Influx Management Plan;
- Worker Training Plan (including Induction Training Program);
- Cultural Heritage Chance Find Procedure;
- Security Plan; and
- Decommissioning Management Plan Framework.

It is intended that these documents will be prepared to cover the site clearance and construction phases of the Project. Prior to operation commencing documents will be developed to cover the operation phase and when details are known for decommissioning, Decommissioning Management Plan Framework will be developed.

Specific plans will be disclosed to stakeholders at the appropriate time.

It is to be noted that commitments and framework for the implementation of Emergency Response Plan (ERP) and Stakeholder Engagement Plan (SEP), including Grievance Management Plan, have been disclosed to the relevant stakeholders during the public consultation during June 2019.

10.5 Environmental and Social Monitoring Program

Monitoring is a means of verifying overall effectiveness of the management and mitigation measures contained within the management plans listed above. Key objectives of the monitoring process are to:

- Confirm effectiveness of management and mitigation measures;
- Ensure compliance with Applicable Standards (Myanmar NEQ, IFC Performance Standards and IFC EHS Guidelines) and the Project Proponent's objectives;
- Monitoring the status of, and impacts on, identified sensitive receptors;
- Provide an early warning that any of the control measures or practices are failing to achieve their desired performance and ensure changes can be implemented to remedy these practices;
- Determine whether environmental and social changes are attributable to Project activities, or as a result of other activities or natural variation; and
- Provide a basis for continual review and improvements to Project design and execution.

10.5.1 Performance Indicators and Monitoring Schedule

Physical, biological and social environmental management components of particular significance have been identified as performance indicators. A comprehensive monitoring plan for each performance indicator has been prepared for all phases of the Project and is presented in ***Table 10.2*** for the Transmission Line. It shall be noted that the proposed Transmission Line is on Build and Transfer

scheme. The Project Proponent will be responsible for “Build and Transfer” to MOEE, while MOEE will be operating the transmission line; therefore, no monitoring programme required for operation phase.

This includes the tentative parameters to be measured, methods to be utilised, sampling locations, frequency of measurements, detection limits, cost and responsibilities for implementation and supervision.

However, it is to be noted that the detailed and specific monitoring measures will be developed and included within the relevant management plans. The monitoring components of the various management plans will be refined and finalised during plan development.

Impact monitoring will be undertaken during the life of the Project to verify the predicted levels of residual impacts from the Project and the effectiveness of the various management plans.

10.5.2 Reporting Mechanism for Environmental and Social Monitoring Program

A robust reporting system will provide the Project with the necessary feedback mechanisms to ensure quality and timely implementation of the works. The reporting system will ensure regular flow of information from the Project site to the Project headquarters and, as necessary, to regulatory authorities and funding agencies. The reporting system will provide a mechanism to ensure that the measures proposed in the Project’s ESMP are implemented.

Prior to the commencement of the construction activities, the Project Proponent will finalise the format and frequency for reporting on the status and progress of environmental and social monitoring.

During construction and operation phases, it is recommended that the report shall be submitted to the relevant authorities and funding agencies on a regular basis. Frequency will be agreed with relevant authorities and funding agencies.

However, it is recommended that the Project Proponent shall submit the report to the relevant authorities and funding agencies on six-monthly basis during construction and on annually basis during operation.

The format will be designed to meet all the compliance conditions associated with the local and international requirements. The contractor will be required to submit the duly filled up reporting form on the agreed frequency to the Project Proponent.

Table 10.1: Environmental and Social Management Plans for the Transmission Line

No.	Project Stage/ Affected Aspect	Project Activity and affected area	Potential Impacts	Proposed Mitigation Measures (if applicable)	Responsibility for Mitigation implementation	Responsibility for supervision of mitigation implementation	Reporting Requirements	Mitigation Cost Source
Site Preparation and Construction Phase								
7.1.1	Air Quality	Construction activities	Impact to air quality due to dust emissions	■ All dust and air quality complaints will be recorded, the cause identified and appropriate measures such as those presented in this table will be implemented or intensified to reduce dust emissions in a timely manner; ■ Watering will be used to suppress wind and physical disturbance dust generation; ■ Ensure an adequate water supply on-site for effective dust suppression and mitigation; ■ Re-vegetate earthwork and exposed areas as soon as is practicable; ■ Use hessian, mulches or tackifier where it is not possible to revegetate, or cover with top soil as soon as is practicable; ■ Sand and other aggregates will be stored in bunded areas and will not be allowed to dry out unless this is required for a particular process, in which case additional control measures such as those discussed in 'General Construction' will be applied; ■ All vehicles will switch off engines when stationary; ■ A regular vehicle and machinery maintenance and repair programme will be implemented; ■ Ensure that all vehicles entering and leaving the site are covered to avoid fugitive emissions during transport; and ■ Regularly dampen/clean the site access and local roads to remove any materials tracked out of the site.	Appointed EPC Contractor	On site Project Management team and designated EHS team	Monthly report to the Project Proponent	EPC Contractor Cost
7.2.1	GHG	Construction activities	Impact to GHG levels due to GHG emissions	■ Similar mitigation measures that was proposed for air quality during construction activities can be applied for GHG emissions; ■ Develop and implement preventive maintenance plan for machines, and engines to ensure combustion efficiency; and ■ Develop vehicle maintenance plan.	Appointed EPC Contractor	On site Project Management team and designated EHS team	No monitoring required	EPC Contractor Cost
7.3.1	Noise	Construction activities	Impact to noise levels due to noise emission	■ Normal working hours of the contractor should be between 07:00 and 22:00 hours from Monday to Saturday (except holiday). If work needs to be undertaken outside these hours, it should be limited to activities that do not lead to exceedance of noise criteria at nearby NSRs and avoid early morning and night time construction; ■ Only well-maintained equipment should be operated on-site; ■ Regular maintenance of equipment such as lubricating moving parts, tightening loose parts and replacing worn out components should be conducted; ■ Machines and construction items (e.g. trucks) that may be in intermittent use should be shut down or throttled down between work periods; ■ Reduce the number of equipment operating simultaneously as far as practicable; ■ Orientate equipment known to emit noise strongly in one direction so that the noise is directed away from receptors far as practicable;	Appointed EPC Contractor	On site Project Management team and designated EHS team	Continuous monitoring of noise level in and around the Project Study Area during construction phase	EPC Contractor Cost

No.	Project Stage/ Affected Aspect	Project Activity and affected area	Potential Impacts	Proposed Mitigation Measures (if applicable)	Responsibility for Mitigation implementation	Responsibility for supervision of mitigation implementation	Reporting Requirements	Mitigation Cost Source
				■ Noise impacts from activities (such as piling and blasting activities) should be properly reduced by shielded by implementing control measures (e.g. erecting temporary noise barriers and deflectors) whenever applicable; ■ Locate noisy plant (such as bulldozers, backhoes, rollers, hydraulic hammer and lorry mounted concrete pump) as far away from receptors as practicable; and ■ Avoid transportation of materials on- and off-site through existing community areas.				
7.4.1	Soil and Groundwater	Construction activities	Impact to soil and groundwater due to soil erosion	■ Exposed soil surfaces should be protected by paving or fill material as soon as possible to reduce the potential of soil erosion; ■ Open stockpiles of construction materials or construction wastes on-site should be covered with tarpaulin or similar fabric during rainstorms; ■ Delineation of site boundaries to limit the areas to be cleared; ■ Scheduling clearance activities (if possible) to avoid extreme weather events such as heavy rainfall, extreme dry and high winds; ■ Use methods for minimising sediment runoff, as appropriate to the conditions on-site, including wheel cleaning facilities; ■ Design drainage system for the controlled release of storm flows; ■ Protect temporary trafficked areas on-site with coarse stone ballast or equivalent; ■ Regularly, and particularly following rainstorms, inspect and maintain drainage systems and erosion control and silt removal facilities to ensure proper and efficient operation at all times; ■ Provide measures to reduce the ingress of site drainage into excavations. If trenches have to be excavated during the wet season, excavate and backfill them in short sections wherever practicable. Discharge any water pumped out from trenches or foundation excavations into storm drains via silt removal facilities; ■ Mulch to stabilise exposed areas, where practicable and appropriate; ■ Revegetation areas with temporary land use, conducting progressive rehabilitation; ■ Minimize the amount of soil handling; ■ Stabilise exposed areas; ■ Stripping and placing soils when dry, and not when wet; ■ Control erosion through diversion drains, sediment fences, and sediment retention basins; ■ Spray water on stockpiles of excavated material or backfill; and ■ Demarcate routes for movement of heavy vehicles to minimise disturbance of exposed soils and compaction of sub-surface layers.	Appointed EPC Contractor	On site Project Management team and designated EHS team	Continuous monitoring of soil and groundwater quantity and quality in and around the Project Study Area during construction phase	EPC Contractor Cost
7.4.2	Soil and Groundwater	Construction activities	Impact to soil and groundwater from soil removal	■ Reuse topsoil as much as possible within rehabilitation activities; ■ Where topsoil is to be stored for later use in rehabilitation activities, the following basic principles are to be applied: - Stockpiles to be separated into topsoil and sub-soil and be located at least 50m from any surface water source or groundwater well;	Appointed EPC Contractor	On site Project Management team and designated EHS team	Continuous monitoring of soil and groundwater quantity and quality in and around the Project Study Area during construction phase	EPC Contractor Cost

No.	Project Stage/ Affected Aspect	Project Activity and affected area	Potential Impacts	Proposed Mitigation Measures (if applicable)	Responsibility for Mitigation implementation	Responsibility for supervision of mitigation implementation	Reporting Requirements	Mitigation Cost Source
				- To the extent possible, stockpiles are to be located in areas surrounded by natural wind barriers to minimise the potential for wind erosion; - Stockpile storage areas are to be prepared in advance of the removal of topsoil as much as possible; and - Topsoil heights are to be restricted in height to 2 m above ground level to minimise wind erosion, and they are only to be partially compacted on the upper layer in order to promote aeration, maintain soil vertical structures, reduce runoff and encourage infiltration.				
7.5.1	Surface Water	Construction activities	Impact to surface water from soil erosion	■ Develop and implement similar mitigation measures as impact to soil and groundwater from soil erosion; ■ Exposed soil surfaces should be protected by paving or fill material as soon as possible to reduce the potential of soil erosion; ■ Open stockpiles of construction materials or construction wastes on-site should be covered with tarpaulin or similar fabric during rainstorms; and ■ Use methods for minimising sediment runoff, as appropriate to the conditions on-site, including wheel cleaning facilities.	Appointed EPC Contractor	On site Project Management team and designated EHS team	Continuous monitoring of surface water quantity and quality in and around the Project Study Area during construction phase.	EPC Contractor Cost
7.5.2	Surface Water	Construction activities	Impact to surface water from surface runoff	■ Design drainage system for the controlled release of storm flows; ■ Regularly, and particularly following rainstorms, inspect and maintain drainage systems and erosion control and silt removal facilities to ensure proper and efficient operation at all times; ■ Provide measures to reduce the ingress of site drainage into excavations. If trenches have to be excavated during the wet season, excavate and backfill them in short sections wherever practicable. Discharge any water pumped out from trenches or foundation excavations into storm drains via silt removal facilities; ■ Mulch to stabilise exposed areas, where practicable and appropriate; ■ Re-vegetate areas promptly, where practicable and appropriate; and ■ Provide measures to prevent the washing away of construction materials, soil, silt or debris into any drainage system of open stockpiles of construction materials.	Appointed EPC Contractor	On site Project Management team and designated EHS team	Continuous monitoring of surface water quantity and quality in and around the Project Study Area during construction phase.	EPC Contractor Cost
7.5.3	Surface Water	Construction activities	Impact to surface water from pollution	■ Debris and refuse generated on-site should be collected, handled and disposed of properly to avoid entering the receiving waters. Stockpiles of cement and other construction materials should be kept covered when not being used; ■ Oils, fuels and chemicals should only be used and stored in designated areas which have pollution prevention facilities. The bund should be drained of rainwater after a rain event; ■ The oil contaminated water will be collected and handled by local licensed waste water sub-contractors (if available, to be determined at the later stage); ■ On-site oil-water separators and holding facilities should be installed to accommodate and unanticipated releases of oily water; and ■ Surface run-off from bunded areas should pass through oil/water separators prior to discharge to the storm water system.	Appointed EPC Contractor	On site Project Management team and designated EHS team	Continuous monitoring of surface water quantity and quality in and around the Project Study Area during construction phase.	EPC Contractor Cost

No.	Project Stage/ Affected Aspect	Project Activity and affected area	Potential Impacts	Proposed Mitigation Measures (if applicable)	Responsibility for Mitigation implementation	Responsibility for supervision of mitigation implementation	Reporting Requirements	Mitigation Cost Source
7.5.4	Surface Water	Construction activities	Impact to surface water from sewage	■ Where no public sewage treatment system is available sanitary waste water will be treated by domestic waste water unit. The EPC contractor will provide the domestic waste water unit which is designed and installed to treat all domestic wash and wastewater and sewage during construction. All effluents shall comply with legal guidelines for emissions into the environment, as appropriate; ■ All other chemical waste or oil contaminated water will be collected and sent off-site for appropriate treatment, local treatment facilities to be identified; ■ Provision of temporary sewage treatment facilities; and ■ Sewage from toilets, kitchens and similar facilities should be discharged into a foul sewer or appropriate receiving facility. Wastewater collected from canteen kitchens, including that from basins, sinks and floor drains, should be discharged into foul sewers via grease traps. The foul sewer should then lead to the temporary sewage treatment plant prior to discharge.	Appointed EPC Contractor	On site Project Management team and designated EHS team	Continuous monitoring of surface water quantity and quality in and around the Project Study Area during construction phase.	EPC Contractor Cost
7.6.1	Waste	Construction activities	Impact from biomass waste	■ When transporting biomass waste, ensure to minimise windblown litter and dust during transportation of waste by either covering the load on the trucks or by transporting the waste is enclosed trucks; ■ Designate suitable areas of the worksites for segregation and storage of the various materials; ■ Any biomass not taken by the local community is to be appropriately stored (or immediately mulched) for later use within site stabilisation and rehabilitation activities; and ■ Site clearance and preparation is to be designed and conducted in a manner that requires minimum removal of vegetation.	Appointed EPC Contractor	On site Project Management team and designated EHS team	Monitoring of waste segregation, transportation and disposal practices in the project activity areas Monitoring of appointed waste contractors using chain-of custody documentation,	EPC Contractor Cost
7.6.2	Waste	Construction activities	Impact from incineration of waste	■ Conduct regular maintenance and upkeep of the incinerator to maintain its efficiency and consequently minimise emission; ■ Minimising smoke emission from burning by controlling moisture content of the biomass waste prior to burning; ■ Hazardous waste from the Project shall be disposed at appropriate facilities. The EPC Contractor should store and dispose of the hazardous waste in accordance with the applicable guidelines. The EPC Contractor should report the hazardous waste treatment arrangements to the local authorities (if required); and ■ Segregate hazardous waste from non-hazardous waste.	Appointed EPC Contractor	On site Project Management team and designated EHS team	Monitoring of waste segregation, transportation and disposal practices in the project activity areas Monitoring of appointed waste contractors using chain-of custody documentation,	EPC Contractor Cost
7.6.3	Waste	Construction activities	Impact from hazardous waste	■ Hazardous waste should be stored so as to prevent or control accidental releases to air, soil and water resources. Where practicable: - the storage area should be clearly labelled and demarcated; - readily available information on chemical compatibility should be provided to employees, including labelling each container to identify its contents; - hazardous waste should be stored in a manner that prevents the commingling or contact between incompatible wastes and allows for inspection between containers to monitor leaks or spills; - hazardous waste should be stored in closed containers away from direct sunlight, wind and rain;	Appointed EPC Contractor	On site Project Management team and designated EHS team	Monitoring of waste segregation, transportation and disposal practices in the project activity areas Monitoring of appointed waste contractors using chain-of custody documentation,	EPC Contractor Cost

No.	Project Stage/ Affected Aspect	Project Activity and affected area	Potential Impacts	Proposed Mitigation Measures (if applicable)	Responsibility for Mitigation implementation	Responsibility for supervision of mitigation implementation	Reporting Requirements	Mitigation Cost Source
				- hazardous waste storage area should be have an impermeable floor and containment, of capacity to accommodate 110% of the volume of the largest waste container; - hazardous waste storage areas have adequate ventilation, fire prevention system (if needed); and ■ Segregate different type of biomass waste to manage and dispose each waste type with an appropriate method. Additionally, ensure no hazardous materials and chemicals are in the biomass waste during the incineration. Location of incinerators and burning area are to be designated furthest away from sensitive receptors and where burning can be controlled easier in case of loss of containment.				
7.6.4	Waste	Construction activities	Impact from unplanned event related to waste	■ Spill response and emergency plans should be prepared and implemented to address the potential accidental release of hazardous waste; ■ On-site and off-site transportation of waste should be conducted so as to prevent or minimise spills, release and exposures to employees and public; and ■ Maintenance facilities should be located on hard standing surfaces within a bunded area. Sumps and oil interceptors should be provided. Maintenance of vehicles and equipment involving activities with potential for leakage and spillage should only be undertaken within areas appropriately equipped to control these discharges.	Appointed EPC Contractor	On site Project Management team and designated EHS team	Monitoring of waste segregation, transportation and disposal practices in the project activity areas Monitoring of appointed waste contractors using chain-of custody documentation,	EPC Contractor Cost
7.6.5	Waste	Construction activities	Impact from improper wastewater management	■ Where onsite treatment of waste is conducted, the waste shall be stored and contained so as to ensure no material is released to the environment and river, and waste streams are segregated.	Appointed EPC Contractor	On site Project Management team and designated EHS team	Monitoring of waste segregation, transportation and disposal practices in the project activity areas Monitoring of appointed waste contractors using chain-of custody documentation,	EPC Contractor Cost
7.7.1	Visual and Landscape	Construction activities	Impact to visual landscape from physical presence of Transmission Line	■ Provide soft landscaping (i.e. tree, low shrub and ground cover planting) within available space within the Project Site. Plant as soon as practical during construction phase; ■ Minimize the extent of construction areas and including temporarily affected areas; ■ Minimize clearing of vegetation as far as practical. Existing large trees (if any) should be retained as far as practical. Those that fall outside the earthworks area must be retained. Felled trees should be compensated for where possible; and ■ Reinstatement of temporarily affected areas which will no longer be required for the operational stage (e.g. contractor camp, laydown areas, etc.), to suitable pre-construction condition as soon as practical after use (e.g. using landscaping with suitable vegetation).	Appointed EPC Contractor	On site Project Management team and designated EHS team	Provide contact information of relevant authorities and the Project Proponent in order to report grievance	EPC Contractor Cost
7.8.1	Biodiversity	Construction activities	Impact to biodiversity from habitat loss	■ Strict rules against clearing vegetation will be imposed on all Project staff, workers, and all contractors and personnel engaged in or associated with the Project, with penalties levied, including fines and dismissal, and prosecution under the relevant laws; ■ The Project Proponent shall be directly responsible for dissemination to its staff and workers of all rules, regulations and information concerning restrictions related to unauthorised clearing of vegetation, as well as the punishment that can expected if any staff or worker or other person associated with the Project violate rules and regulations;	Appointed EPC Contractor	On site Project Management team and designated EHS team	The construction and operation Contractor, will schedule and implement a routine inspection program throughout construction and operation period to monitor vegetation clearing extent.	EPC Contractor Cost

No.	Project Stage/ Affected Aspect	Project Activity and affected area	Potential Impacts	Proposed Mitigation Measures (if applicable)	Responsibility for Mitigation implementation	Responsibility for supervision of mitigation implementation	Reporting Requirements	Mitigation Cost Source
				■ The planned clearance area for the construction and operation works shall be clearly identified and marked to avoid accidental clearing; and ■ Use of the access road should be restricted to construction and operation vehicles only. Checkpoints should be used to manage access and inspect vehicles for timber and forest products taken from the Project Area.				
7.8.2	Biodiversity	Construction activities	Impact to biodiversity from disturbance or displacement of fauna	■ Operational vehicles will be maintained in accordance with industry standard to minimise unnecessary noise generation; ■ Traffic signs will be maintained on all roads depicting speed limits; ■ Access to facilities, including the access road should be restricted to operational vehicles only; ■ For operational areas requiring night-time lighting, lights will be used only where necessary and will be directed toward the subject area and away from habitat areas where possible; and ■ Commitment will be made to raise awareness of the operator work force regarding flora and fauna values and make arrangements for restriction of hunting and poaching.	Appointed EPC Contractor	On site Project Management team and designated EHS team	Records are to be kept and regularly reviewed (3 monthly basis) during construction on the application of the fencing and hoarding implementation. Regular inspections (weekly during construction) during the dry season to determine the level of dust deposition on vegetation surrounding the Project Area. Records are to be kept and regularly reviewed (3 monthly basis) on the planting of indigenous flora and fauna on disturbed areas. Monitoring if rehabilitation success/failure is to occur on all replanting sites. Monitoring is to consist of regular inspections (3 monthly basis) to determine plant establishment.	EPC Contractor Cost
7.8.3	Biodiversity	Construction activities	Impact to biodiversity from degradation of habitat	■ Construction and operation (and maintenance) and domestic waste will be appropriately stored and disposed of to avoid attracting native and alien species to the construction and worker camp areas; ■ For areas in direct runoff path to a watercourse, sediment and erosion control devices will be installed and maintained until vegetation replanting can occur to stabilise disturbed soil surfaces; ■ Oil, chemical and solid waste will be stored, and handled and disposed of by appropriately licenced waste management contractors; ■ Sediment and erosion control measures are to be used in all areas of construction to minimise soil contaminated runoff entering waterways; ■ All light sources are to be directed away from areas of Natural Habitat where feasible; ■ Invasive species management measures should be implemented in accordance to avoid introduction of weeds to natural and modified habitat areas;	Appointed EPC Contractor	On site Project Management team and designated EHS team	Regular inspections of the application of require mitigation and management measures.	EPC Contractor Cost

No.	Project Stage/ Affected Aspect	Project Activity and affected area	Potential Impacts	Proposed Mitigation Measures (if applicable)	Responsibility for Mitigation implementation	Responsibility for supervision of mitigation implementation	Reporting Requirements	Mitigation Cost Source
				■ Speed limits to maximum of 40 km/hr for construction and operation vehicles will be enforced to limit noise and dust generation; and ■ Construction and operation (and maintenance) materials and chemicals will be appropriately secured to avoid accidental release to the natural environment (wind and water erosion).				
7.8.4	Biodiversity	Construction activities	Impact to biodiversity from increase mortality of resident species	■ Speed limits to maximum of 40 km/hr for construction and operation vehicles will be enforced to minimise potential for fauna strike; ■ Commitment will be made to raise awareness of values of important species and habitat areas to construction and operation work force and arrangements will be made for restriction of poaching and forest product collection by staff; ■ Access restriction should be applied to Project facilities for non-construction and operation vehicles; ■ Hunting wild animals will be strictly prohibited for Project staff, workers, all contractors and personnel engaged in or associated with the Project, with penalties levied, including fines and dismissal, and prosecution under relevant laws for clearing vegetation; and ■ Fishing and using of illegal fishing gear anywhere along the stream will be prohibited.	Appointed EPC Contractor	On site Project Management team and designated EHS team	Regular inspections of the application of require mitigation and management measures.	EPC Contractor Cost
7.8.5	Biodiversity	Construction activities	Impact to biodiversity from increase mortality of avifauna	■ Use of bird deflectors on the length of the power line. The deflectors will increase line visibility by thickening the appearance of the line for easier detection by avifauna; ■ Moveable markers of contrasting colours (e.g. black and white) that protrude above and below the line, and be placed 5-10 m apart; ■ Removing the thin neutral or earth (shield) wire above the high voltage transmission line where feasible, and where this is not possible, marking the line to make it more visible; ■ Minimising the vertical spread of power lines. Having lines in a horizontal plane reduces collusion risk; ■ Habitat manipulation to influence flight activity and bird behaviour, e.g. tree lines under the high voltage lines to increase visibility; ■ Insulating cables close to poles, at least 70 cm on both sides and around perching areas, and up to at least 140 cm; and ■ Hanging insulators under cross arms and poles, provided the distance between a likely perch (mainly the transmission tower crossarm) and the energised parts (conductors) is at least 70 cm.	Appointed EPC Contractor	On site Project Management team and designated EHS team	No monitoring required	EPC Contractor Cost
7.9.1	Social	Construction	Impact on employment	In order to maximise the benefits from this impact for the local population, wherever possible, the workforce will be sourced from areas close to the Project after a training and selection process; and thereafter at a regional or national level. Given that levels of educational achievement and formal employment experience in relevant sectors is low within the SAoI, it is assumed that the majority of the available local labour may be unskilled or at most semi-skilled. The Project will develop a Sourcing, Procurement and Recruitment Management Plan which will be developed for this Project with the aim to promote benefits to locals from recruitment and procurement activities for the Project (including information, training and engagement).	Appointed EPC Contractor	On site Project Management team and designated EHS team	Monitoring of the local content should be done at the beginning of the construction phase to ensure maximum opportunities are given to local population.	EPC Contractor Cost
7.9.2	Social	Construction	Impact from economical displacement	■ Land take should be minimised to the extent possible both in terms of geographical size and duration; and as such, whe no activities are being undertaken, exclusions of agricultural activities should be lifted;	Appointed EPC Contractor	On site Project Management team and	TPMC will need to monitor weekly the grievance log to identify any specific	EPC Contractor Cost

No.	Project Stage/ Affected Aspect	Project Activity and affected area	Potential Impacts	Proposed Mitigation Measures (if applicable)	Responsibility for Mitigation implementation	Responsibility for supervision of mitigation implementation	Reporting Requirements	Mitigation Cost Source
				■ When possible, TPMC will propose to recruit for unskilled jobs in priority stakeholders whose land is being impacted during construction phase; ■ TPMC will develop a Land Acquisition Plan separately for the identification and compensation of assets being impacted. This document will cover all potential assets and livelihood activities impact from Project activities, compensation plan, and roles and resppponsibilities. ; ■ TPMC will compensate stakeholders whose land is temporarily or permanently impacted during construction using market price with a premium (to compensate for the change); ■ TPMC will compensate stakeholders whose crops is being impacted during construction using market price; ■ TPMC will return land temporarily impacted to its initial state after construction phase, including ensuring contaminated land due to unplanned event (leak) is removed and/or treated appropriately; ■ TPMC will use an external specialist to identify market price for the type of land and crops being impacted by project activities; and ■ TPMC will need to develop and implement a Stakeholder Engagement Plan as part of the Project. The plan should include measures to notify local stakeholders in advance of any particularly activities on agricultural areas. This will ensure stakeholders anticipate (and can appropriately respond to) the change and limitation of uses of agricultural areas. The Project should also develop a Grievance Mechanism to collect grievances from local stakeholder whose agricultural activities are affected by the Project activities.		designated EHS team	grievance related to agricultural activities. During construction, TPMC will monitor monthly the employment of stakeholders whose land has been temporarily or permanently impacted by Project activities.	
7.9.3	Social	Construction	Impact to traffic and transport	The Project will implement a Stakeholder Engagement Plan developed for the LNG Power Plant Project in Ahlone, Seikgyikanaungto and Dala Townships. The plan will include measures to notify local stakeholders in advance of any particularly activities on local roads or near to local roads. This will ensure stakeholders anticipate (and can appropriately respond to) the change and limitation of uses on local roads. The Project will also use the Grievance Mechanism developed for the LNG Power Plant Project to collect grievances from local stakeholder whose regular transport is affected by the Project activities.	Appointed EPC Contractor	On site Project Management team and designated EHS team	No reporting required.	EPC Contractor Cost
7.9.4	Social	Construction	Impacts from environmental emissions	Mitigation measures have already been proposed in the Air Quality and Noise Impact Assessment sections but TPMC will also need to develop and implement a Stakeholder Engagement Plan as part of the Project. The plan should include measures to notify local stakeholders in advance of any particularly noisy activities (e.g. pile driving). This will ensure stakeholders anticipate (and can appropriately respond to) the disruption associated with noise. The Project should also develop a Grievance Mechanism to collect grievances from local stakeholder impacted by noise, dust and vibration.	Appointed EPC Contractor	On site Project Management team and designated EHS team	Monitoring of air quality and noise have been described in the relevant chapters. In addition, TPMC will need to monitor weekly during construction the grievance log to identify any specific grievance related to environmental emissions.	EPC Contractor Cost
7.9.5	Social	Construction	Impacts on community health and safety	■ TPMC will notify local people about location of accommodation camp and construction activities of the Transmission Line; ■ TPMC will annually check quality and condition of both electric wire, transmission legs and transmission tower; ■ TPMC will notify local people 2 weeks in advance about date and duration of construction activities;	Appointed EPC Contractor	On site Project Management team and designated EHS team	Monitoring of impact on Community Health and Safety will be done through: ■ Annual check of warning sign at the construction site and on the towers;	EPC Contractor Cost

No.	Project Stage/ Affected Aspect	Project Activity and affected area	Potential Impacts	Proposed Mitigation Measures (if applicable)	Responsibility for Mitigation implementation	Responsibility for supervision of mitigation implementation	Reporting Requirements	Mitigation Cost Source
				■ TPMC will provide warning sign around the Transmission Tower in order to increase awareness and warn local people about risks; ■ TPMC will put traffic cone around the Project vehicles or machines used during construction activities to indicate as safe zone for vehicles; ■ TMPC will provide appropriate lights on construction vehicles/ machines to indicate their presences; ■ TMPC will provide a warning sign of construction activities at least 500m on the road before the location of construction activities; ■ Training for all workers on the transmission routes and common symptoms of communicable diseases. This can help reduce the potential for workers to unknowingly transmit communicable diseases. This may also help to increase knowledge within Project SAoI – e.g. through the training of workers that have been sourced from the local area; ■ Establish amenities at the worker camp to help minimize the interaction between the workforces (particularly temporary construction workers) and local villagers. This includes recreation facilities and health care infrastructure; ■ Undertake pre-employment screening to ensure fitness for work. It is important that the pre-screening process does not result in discrimination, but instead is used as a tool to minimize the transmission of communicable diseases; ■ Vector management procedures, including measures to reduce the presence of vector habitat and consideration of whether pesticides will be utilized to reduce the presence of vectors onsite; ■ Provision of onsite health care and medical facilities, to ensure that basic medical attention and first aid treatment can be sought during the hours that the work is being undertaken at the Project site. This will also help reduce the potential pressure on local health care facilities; ■ Pre-placement medical examination of all workers, supported by periodic medical examinations. A regular voluntary Worker Medical Screening Program onsite and a Monitoring and Evaluation (M&E) system. In addition a workplace policy and training and awareness programme on risks described above and prevention and mitigation of HIV impacts will be implemented with Project staff; ■ Develop and implement a Workforce Code of Conduct. The Workforce Code of Conduct will be adhered to by all Contractors and TPMC employees. Any employee or Contractor found in violation of the Code shall face disciplinary hearing which may result in dismissal. Include in the code specific measures that target anti-social behaviour, such as becoming involved with commercial sex workers; ■ Ensure there is access to free condoms (including female condoms) at the worker camp to promote safe sexual practices; ■ Conduct information, education and communication campaigns amongst Project personnel on hygiene and sanitation; ■ The EPC contractor should develop an effective Waste Management Plan that ensures adequate and legally acceptable control and management of transport and disposal of all wastes on and off site; ■ Accommodation should be provided to external workers in accordance with international good practice on workers' accommodation, including IFC / EBRD standards to prevent transmission of diseases associated with poor living conditions;			■ Bi-monthly review of training log during construction to confirm all employee are trained on the company H&S standard; ■ Monitoring and review of accidents/ incidents due to construction activities; ■ Daily monitoring of construction area, worker camp and surrounding (standing water, fence, warning sign); ■ Regular unplanned audit related to the worker code of conduct (alcohol and drug use, speed limit, activities linked with local population); ■ Bi-yearly unplanned audit of waste management contractors and facilities; ■ Monthly visual inspection of first aid facilities and records, review of employment records and health insurance subscription records; and ■ Weekly review of grievance log.	

No.	Project Stage/ Affected Aspect	Project Activity and affected area	Potential Impacts	Proposed Mitigation Measures (if applicable)	Responsibility for Mitigation implementation	Responsibility for supervision of mitigation implementation	Reporting Requirements	Mitigation Cost Source
				■ The Project should implement measures to reduce the presence of standing water onsite through environmental controls and source reduction to avoid the creation of new breeding grounds; ■ All the mitigation presented in the air quality and noise impact assessment chapter will be implemented; ■ The Project should develop a Traffic Management Plan covering vehicle safety, speed limits on roads, driver and passenger behaviour, use of drugs and alcohol, hours of operation, rest periods and location of rest stops and accident reporting and investigations; ■ Require Project drivers to be trained in defensive driving within the previous 3 years; ■ All vehicles used for the project should be regularly serviced and maintained; ■ Local speed limits should be adhered to when travelling through communities by all Project related traffic. Such speed limits will have the added advantage of reducing dust emissions; ■ Undertake consultation with communities along key transport routes to inform them about the potential for increased traffic movements prior to any changes; ■ TPMC will develop and implement a Stakeholder Engagement Plan as part of the Project. The Project will also include a Grievance Mechanism to collect grievances from local stakeholder affected by the Project activities; and ■ The Project will ensure that signs are put up around construction sites advising people of the risks associated with trespass. All signs should be in diagram form to ensure those with low levels of literacy understand the signs.				
7.9.6	Social	Construction	Impacts on occupational health and safety	■ The Contractor will prepare and implement a Health and Safety Plan prior to commencing work. This plan will include method statements for work activities, plant utilisation, construction sequence and safety arrangements; ■ Measures will be implemented to reduce the likelihood and consequence of the potential hazards. This shall include (but not limited to) the following hazards: - Falling from height; - Falling into water; - Entanglement with machinery; - Tripping over permanent obstacles or temporary obstructions; - Slipping on greasy walkways; - Falling objects; - Asphyxiation; - Explosion; - Contact with dangerous substances; - Electric shock; - Variable weather conditions; - Lifting excessive weights; and - Traffic operations.	Appointed EPC Contractor	On site Project Management team and designated EHS team	Monitoring of impact on Occupational Health and Safety will be done through: ■ Six monthly review of training log to confirm all employee are trained on the company H&S standard; ■ Monitoring and review of accidents/ incidents due to construction activities; ■ Development of an Occupational health and safety monitoring and surveillance programme; and ■ Weekly review of worker grievance log.	EPC Contractor Cost

No.	Project Stage/ Affected Aspect	Project Activity and affected area	Potential Impacts	Proposed Mitigation Measures (if applicable)	Responsibility for Mitigation implementation	Responsibility for supervision of mitigation implementation	Reporting Requirements	Mitigation Cost Source
				■ Competent and adequately resourced sub-contractors will be used where construction activities are to be sub-contracted; ■ All persons working on the construction site will be provided information about risks on Site and arrangements will be made for workers to discuss health and safety with the Contractor; ■ The Contractor will prepare and implement a Health and Safety Plan prior to commencing work. This plan will include method statements for work activities, construction sequence and safety arrangements; ■ All workers will be properly informed, consulted and trained on health and safety issues; ■ Personal Protective Equipment (PPE) shall be worn at all times on the construction Site. This shall include appropriate safety shoes, safety eyewear, and hard hats. Non-slip or studded boots will be worn to minimize the risk of slips; ■ Before starting work all the appropriate safety equipment and the first-aid kits will be assembled and checked as being in working order. Breathing apparatus if necessary will be tested at regular intervals in the manner specified by the manufacturer; ■ All lifting equipment and cranes will be tested and inspected regularly. All hoist ways will be guarded; ■ All scaffolding will be erected and inspected in conformity with the Factories Act (1951) and the appropriate records maintained by the Contractor; ■ When there is a risk of drowning lifebelts shall be provided and it shall be ensured that personnel wear adequate buoyancy equipment or harness and safety lines, and that rescue personnel are present when work is proceeding (near the water extraction point); ■ The Contractor shall provide appropriate safety barriers with hazard warning signs attached around all exposed openings and excavations; ■ The EPC contractor will comply with the IFC Performance Standard 2, local regulation and ILO conventions signed by Myanmar; and ■ TPMC will develop and monitor an internal standard to guide labour practices and apply this to supply chain to ensure that no child and/or forced labour will be employed by the EPC contractor and its sub-contractors.				
7.9.7	Social	Construction	Cultural heritage	■ The EPC contractor during construction will monitor the state of any cultural heritage closest to the project site. If damage is done to the buildings by vehicle of the Project, compensation (in kind or in cash) should be organised to restore the building to its state before the damage occur; ■ The EPC contractor will develop the construction planning in discussion with the nearest temple/monastery in order to make sure that any Project activity near the monastery (e.g transport of large equipment) do not take place during special religious activities; and ■ TPMC will develop and implement a Stakeholder Engagement Plan as part of the Project. The Project will also include a Grievance Mechanism to collect grievances from local stakeholder affected by the Project activities.	Appointed EPC Contractor	On site Project Management team and designated EHS team	Monitoring of impact on cultural heritage will be done through: ■ Monitoring and review of accidents/ incidents due to construction activities; and ■ Weekly review of grievance log.	EPC Contractor Cost
Operation and Maintenance Phase								

No.	Project Stage/ Affected Aspect	Project Activity and affected area	Potential Impacts	Proposed Mitigation Measures (if applicable)	Responsibility for Mitigation implementation	Responsibility for supervision of mitigation implementation	Reporting Requirements	Mitigation Cost Source
7.7	Visual and Landscape	Operation activities	Impact to visual landscape from physical presence of Transmission Line	■ Visual screening e.g. surround perimeter of site with native trees (can be compensatory trees for any felled during construction); ■ Maintain soft landscaping (i.e. tree, low shrub and ground cover planting) within available space in the Project Site; and ■ Maintain all structural facilities in good repair.	Designated HSE team	HSE Department Manager	Provide contact information of relevant authorities and the Project Proponent in order to report grievance	TPMC Operation Cost
7.8	Biodiversity	Maintenance activities	Impact to biodiversity from human disturbance	■ Scheduling activities to avoid breeding and nesting seasons for any critically endangered or endangered wildlife species.	Designated HSE team	HSE Department Manager	Regular inspection of the application of require mitigation measures.	TPMC Operation Cost
7.9.1	Social	Operation	Impact from economical displacement	■ Land take should be minimised to the extent possible both in terms of geographical size and duration; and as such, whe no activities are being undertaken, exclusions of agricultural activities should be lifted; ■ TPMC will develop a Land Acquisition Plan separately for the identification and compensation of assets being impacted. This document will cover all potential assets and livelihood activities impact from Project activities, compensation plan and management committee; ■ TPMC will compensate stakeholders whose land is temporarily or permanently impacted during operation using market price with a premium (to compensate for the change); ■ TPMC will use an external specialist to identify market price for the type of land and crops being impacted by project activities; and ■ TPMC will need to develop and implement a Stakeholder Engagement Plan as part of the Project. The plan should include measures to notify local stakeholders in advance of any particularly activities on agricultural areas. This will ensure stakeholders anticipate (and can appropriately respond to) the change and limitation of uses of agricultural areas. The Project should also develop a Grievance Mechanism to collect grievances from local stakeholder whose agricultural activities are affected by the Project activities.	Designated HSE team	HSE Department Manager	TPMC will need to monitor weekly the grievance log to identify any specific grievance related to agricultural activities. TPMC will monitor monthly the employment of stakeholders whose land has been temporarily or permanently impacted by Project activities.	TPMC Operation Cost
7.9.2	Social	Operation	Impact to traffic and transport	■ Notify local stakeholders in advance of any particularly activities on local roads or near to local roads. This will ensure stakeholders anticipate (and can appropriately respond to) the change and limitation of uses on local roads. The Project will also use the Grievance Mechanism developed for the LNG Power Plant Project to collect grievances from local stakeholder whose regular transport is affected by the Project activities.	Designated HSE team	HSE Department Manager	No reporting required.	TPMC Operation Cost
7.9.4	Social	Operation	Impacts from environmental emissions	■ Mitigation measures have already been proposed in the Air Quality and Noise Impact Assessment sections but TPMC will also need to develop and implement a Stakeholder Engagement Plan as part of the Project. The plan should include measures to notify local stakeholders in advance of any particularly noisy activities (e.g. pile driving). This will ensure stakeholders anticipate (and can appropriately respond to) the disruption associated with noise. The Project should also develop a Grievance Mechanism to collect grievances from local stakeholder impacted by noise, dust and vibration.	Designated HSE team	HSE Department Manager	Monitoring of air quality and noise have been described in the relevant chapters. In addition, TPMC will need to monitor weekly the grievance log to identify any specific grievance related to environmental emissions.	TPMC Operation Cost
7.9.5	Social	Operation	Impacts on community health and safety	■ TPMC will annually check quality and condition of both electric wire, transmission legs and transmission tower;	Designated HSE team	HSE Department Manager	Monitoring of impact on Community Health and	TPMC Operation Cost

No.	Project Stage/ Affected Aspect	Project Activity and affected area	Potential Impacts	Proposed Mitigation Measures (if applicable)	Responsibility for Mitigation implementation	Responsibility for supervision of mitigation implementation	Reporting Requirements	Mitigation Cost Source
				■ TPMC will provide warning sign around the Transmission Tower in order to increase awareness and warn local people about risks; ■ Training for all workers on the transmission routes and common symptoms of communicable diseases. This can help reduce the potential for workers to unknowingly transmit communicable diseases. This may also help to increase knowledge within Project SAoI – e.g. through the training of workers that have been sourced from the local area; ■ Undertake pre-employment screening to ensure fitness for work. It is important that the pre-screening process does not result in discrimination, but instead is used as a tool to minimize the transmission of communicable diseases; ■ Vector management procedures, including measures to reduce the presence of vector habitat and consideration of whether pesticides will be utilized to reduce the presence of vectors onsite; ■ Provision of onsite health care and medical facilities, to ensure that basic medical attention and first aid treatment can be sought during the hours that the work is being undertaken at the Project site. This will also help reduce the potential pressure on local health care facilities; ■ Pre-placement medical examination of all workers, supported by periodic medical examinations. A regular voluntary Worker Medical Screening Program onsite and a Monitoring and Evaluation (M&E) system. In addition a workplace policy and training and awareness programme on risks described above and prevention and mitigation of HIV impacts will be implemented with Project staff; ■ Develop and implement a Workforce Code of Conduct. The Workforce Code of Conduct will be adhered to by all Contractors and TPMC employees. Any employee or Contractor found in violation of the Code shall face disciplinary hearing which may result in dismissal. Include in the code specific measures that target anti-social behaviour, such as becoming involved with commercial sex workers; ■ Ensure there is access to free condoms (including female condoms) at the worker camp to promote safe sexual practices; ■ Conduct information, education and communication campaigns amongst Project personnel on hygiene and sanitation; ■ Accommodation should be provided to external workers in accordance with international good practice on workers' accommodation, including IFC / EBRD standards to prevent transmission of diseases associated with poor living conditions; ■ The Project should implement measures to reduce the presence of standing water onsite through environmental controls and source reduction to avoid the creation of new breeding grounds; ■ All the mitigation presented in the air quality and noise impact assessment chapter will be implemented; ■ The Project should develop a Traffic Management Plan covering vehicle safety, speed limits on roads, driver and passenger behaviour, use of drugs and alcohol, hours of operation, rest periods and location of rest stops and accident reporting and investigations; ■ Require Project drivers to be trained in defensive driving within the previous 3 years; ■ All vehicles used for the project should be regularly serviced and maintained; ■ Local speed limits should be adhered to when travelling through communities by all Project related traffic. Such speed limits will have the added advantage of reducing dust emissions;			Safety will be done through: ■ Annual check of warning sign at the site and on the towers; ■ Bi-monthly review of training log to confirm all employee are trained on the company H&S standard; ■ Monitoring and review of accidents/ incidents; ■ Daily monitoring of worker camp and surrounding (standing water, fence, warning sign); ■ Regular unplanned audit related to the worker code of conduct (alcohol and drug use, speed limit, activities linked with local population); ■ Bi-yearly unplanned audit of waste management contractors and facilities; ■ Monthly visual inspection of first aid facilities and records, review of employment records and health insurance subscription records; and ■ Weekly review of grievance log.	

No.	Project Stage/ Affected Aspect	Project Activity and affected area	Potential Impacts	Proposed Mitigation Measures (if applicable)	Responsibility for Mitigation implementation	Responsibility for supervision of mitigation implementation	Reporting Requirements	Mitigation Cost Source
				■ Undertake consultation with communities along key transport routes to inform them about the potential for increased traffic movements prior to any changes; ■ TPMC will develop and implement a Stakeholder Engagement Plan as part of the Project. The Project will also include a Grievance Mechanism to collect grievances from local stakeholder affected by the Project activities; and ■ The Project will ensure that signs are put up around sites advising people of the risks associated with trespass. All signs should be in diagram form to ensure those with low levels of literacy understand the signs.				
7.9.6	Social	Operation	Impacts on occupational health and safety	■ Measures will be implemented to reduce the likelihood and consequence of the potential hazards. This shall include (but not limited to) the following hazards: - Falling from height; - Falling into water; - Entanglement with machinery; - Tripping over permanent obstacles or temporary obstructions; - Slipping on greasy walkways; - Falling objects; - Asphyxiation; - Explosion; - Contact with dangerous substances; - Electric shock; - Variable weather conditions; - Lifting excessive weights; and - Traffic operations. ■ All workers will be properly informed, consulted and trained on health and safety issues; ■ Personal Protective Equipment (PPE) shall be worn at all times on site. This shall include appropriate safety shoes, safety eyewear, and hard hats. Non-slip or studded boots will be worn to minimize the risk of slips; ■ Before starting work all the appropriate safety equipment and the first-aid kits will be assembled and checked as being in working order. Breathing apparatus if necessary will be tested at regular intervals in the manner specified by the manufacturer; ■ All lifting equipment and cranes will be tested and inspected regularly. All hoist ways will be guarded; ■ All scaffolding will be erected and inspected in conformity with the Factories Act (1951) and the appropriate records maintained by the Contractor; ■ When there is a risk of drowning lifebelts shall be provided and it shall be ensured that personnel wear adequate buoyancy equipment or harness and safety lines, and that rescue personnel are present when work is proceeding (near the water extraction point); and	Designated HSE team	HSE Department Manager	Monitoring of impact on Occupational Health and Safety will be done through: ■ Six monthly review of training log to confirm all employee are trained on the company H&S standard; ■ Monitoring and review of accidents/ incidents; ■ Development of an Occupational health and safety monitoring and surveillance programme; and ■ Weekly review of worker grievance log.	TPMC Operation Cost

No.	Project Stage/ Affected Aspect	Project Activity and affected area	Potential Impacts	Proposed Mitigation Measures (if applicable)	Responsibility for Mitigation implementation	Responsibility for supervision of mitigation implementation	Reporting Requirements	Mitigation Cost Source
				■ TPMC will develop and monitor an internal standard to guide labour practices and apply this to supply chain to ensure that no child and/or forced labour will be employed by the EPC contractor and its sub-contractors.				
7.9.7	Social	Operation	Cultural heritage	■ TPMC will develop and implement a Stakeholder Engagement Plan as part of the Project. The Project will also include a Grievance Mechanism to collect grievances from local stakeholder affected by the Project activities.	Designated HSE team	HSE Department Manager	Monitoring of impact on cultural heritage will be done through: ■ Monitoring and review of accidents/ incidents; and ■ Weekly review of grievance log.	TPMC Operation Cost

Table 10.2: Environmental and Social Monitoring Programme for the Transmission Line

Project Stage/ Affected Component	Potential Impact	Parameters to be Monitored	Location	Measurements	Frequency	Responsibility	Cost
Site Preparation and Construction Phase							
	General	General compliance with mitigation measures presented in the ESMP and as specified in EPC Contractor Manual	Project activity areas and construction workers camp	Visual inspection of all active work areas	Daily	EHS Team of EPC Contractor	EPC Contractor Cost (included in Capex cost)
7.1	Air Quality	PM2.5, PM10	Nearest Sensitive Receptors to active construction area	As per DMP requirements (PM2.5 and PM10)	Bi-monthly	EPC Contractor	EPC Contractor Cost (included in Capex cost)
7.3	Noise	Noise levels in Leq, Leq day, Leq night and hourly Leq	Identified NSRs within 250 m from the Project boundary	24-hour	Once during peak noisy construction activities where NSR are located within 250m	3rd Party Environmental Consultant	EPC Contractor Cost (approx. ~2,000 USD / time)
7.4	Soil	pH, salinity, NH_4^+, total P, heavy metals	Construction site or laydown area or spill area	Standard analytical methods	In the event of any leakage or spillage of hazardous substances, oil, or toxic chemicals	3rd Party Environmental Consultant	EPC Contractor Cost (approx. ~2500 USD / time)
	Groundwater	pH, Electrical Conductivity, Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Total Nitrogen, Total Phosphorus, Oil & Grease, Total Suspended Solids(TSS), Total Coliform Bacteria (TCB), Total Chromium (Cr), Copper (Cu), Iron (Fe), Zinc (Zn), Lead (Pb), Cadmium (Cd), Mercury (Hg); Arsenic (As).	At nearest ground water extraction pump from Transmission Line construction area	Standard analytical methods	Every 6 month or upon complaint from local stakeholders	3rd Party Environmental Consultant	EPC Contractor Cost (approx. ~2500 USD / time)
7.5	Surface Water	pH, Electrical Conductivity, Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Total Nitrogen, Total Phosphorus, Oil & Grease, Total Suspended Solids(TSS), Total Coliform Bacteria (TCB), Total Chromium (Cr), Copper (Cu), Iron (Fe), Zinc (Zn), Lead (Pb), Cadmium (Cd), Mercury (Hg); Arsenic (As).	Water bodies/channel (upstream and downstream of the Transmission Line alignment)	Standard analytical methods	Before and After construction activities have crossed the water body/channel	3rd Party Environmental Consultant	EPC Contractor Cost (approx. ~2500 USD / time)
7.6	Waste	Implementation of Waste Management Plan (WMP)	Project activity areas and construction workers camp, transport assets and disposal areas	Compliance to the WMP	Unplanned audit of contractors against WMP twice a year	EHS Team of EPC Contractor	EPC Contractor Cost (included in Capex cost)

Project Stage/ Affected Component	Potential Impact	Parameters to be Monitored	Location	Measurements	Frequency	Responsibility	Cost
					Weekly monitoring of on-site segregation, storage, management and disposal procedure		
7.7	Visual and Landscape	Complaint from Stakeholders	NA	Number of Complaint	Weekly during construction and yearly during operations	EHS Team of EPC Contractor or TPMC during operation	EPC Contractor Cost (included in Capex cost) and TPMC Opex Cost
7.8	Biodiversity	Vegetation clearing extent	Within and around the Project Study Area	Extent of vegetation clearing in area unit.	Weekly during construction and yearly during operations	EHS Team of EPC Contractor or TPMC during operation	EPC Contractor Cost (included in Capex cost) and TPMC Opex Cost
	Biodiversity	Efficiency of mitigation measures	Within and around the Project Study Area	Review of records on the application of the fencing and hoarding implementation; Level of dust deposition on vegetation surrounding the Project Area. Review of records on the planting of indigenous flora and fauna on disturbed areas; Rehabilitation success/failure on all replanting sites.	Weekly during construction for dust deposit and Every 3 month during construction for femcing and hoarding, planting of indigenous species and rehabilitation status.	EHS Team of EPC Contractor or TPMC during operation	EPC Contractor Cost (included in Capex cost) and TPMC Opex Cost
7.9	Social	Local Content	NA	Number of local employees	Once at the beginning of construction.	EHS Team of EPC Contractor	EPC Contractor Cost (included in Capex cost)
7.1		Number and resolution of grievances	NA	Compliance of resolution duration of grievance with Grievance Mechanism	Weekly	EHS Team of EPC Contractor	EPC Contractor Cost (included in Capex cost)
7.2		Livelihood of PAP	NA	Employment of PAP or livelihood of PAP	Monthly for employment of PAP Yearly for livelihood level	EHS Team of EPC Contractor 3rd Party social consultant	EPC Contractor Cost (included in Capex cost) approx. 5,000 USD/ year
7.3	Community Health and Safety	Construction site and tower signs H&S Trainings Accident log Worker code of conduct implementation Waste management facilities Grievances	Project activity areas and construction workers camp, transport assets and disposal areas	Visual confirmation	Daily for signs Yearly for tower signs Bi-monthly for training log Monthly for accident log Monthly unplanned audit for worker code of conduct Bi-yearly for waste management facilities Weekly for Grievance log	EHS Team of EPC Contractor or TPMC during operation	EPC Contractor Cost (included in Capex cost) and TPMC Opex Cost
7.4	Occupational Health and Safety	H&S Training Accident log Worker grievance log	Project activity areas and construction workers camp.	Visual Confirmation	Bi-monthly for training log Monthly for accident log Weekly for Grievance log	EHS Team of EPC Contractor or TPMC during operation	EPC Contractor Cost (included in Capex cost) and TPMC Opex Cost
7.5	Cultural heritage	Accident log Training Grievance	Project activity areas and construction workers camp.	Visual Confirmation	Bi-monthly for training log Monthly for accident log Weekly for Grievance log	EHS Team of EPC Contractor or TPMC during operation	EPC Contractor Cost (included in Capex cost) and TPMC Opex Cost

10.6 Institutional Setting and Implementation Arrangements

10.6.1 Construction Phase

The ESMP will be included in the construction contract and the contractor will be responsible for implementation of the measures associated with design and construction. The Project Proponent's staff, specifically the EHS Officer and Site Engineer, will monitor the implementation of these mitigation measures by the contractors at the site. These officers will be responsible for the field level monitoring of the Project.

The roles and responsibilities of the Project Proponent and EPC Contractor for implementation and monitoring have been outlined in ***Table 10.3.***

Table 10.3: Roles and Responsibilities of Project Proponent and EPC Contractor

Project Proponent	EPC Contractor
Obtaining statutory clearances required during pre-construction stage of the Project	Obtaining permits required during the construction stage
Overall Project co-ordination and management through EPC Contractor and supported by the third party environmental consultants	Joint verification with the Project Proponent and Third Party Environmental Consultant for review of ESMP implementation
Interaction and reporting to the respective department of Government of Myanmar	Interaction with the Project Proponent and appointed supervision consultant, if any
Interaction and reporting to lenders	Filling of reporting formats as per the reporting schedule and submission to the Project Proponent
Effective implementation of ESMP and monitoring of ESMP implementation	Environmental monitoring through Third Party Environmental Laboratory
Carryout verification/ supervision exercises during the construction phase of the Project for implementation of ESMP	Preparation of various plans for effective implementation of ESMP by the Sponsor
Keeping records of all permits obtained by EPC Contractor	Management of labour camp and to provide drinking water, sanitation facility
Overall supervision of ESMP implementation	
Approval of plans prepared by EPC Contractor	
Addressing grievances of local community and information dissemination	
Environmental monitoring through laboratory	

While the EPC Contractor or a particular party is responsible for physical implementation of the mitigating measures, the whole implementation process requires supervision, checking, documentation and verification so that problems are identified and properly addressed before they get out of hand. In order to ensure proper execution of the ESMP, implementation reviews will be conducted by the Project engineer such as the weekly construction meetings, construction log book, monthly and other construction reports etc. Records of these minutes of the weekly meeting, monthly reports and special reports on implementation of the mitigating measures will also be maintained and available for review by the Project management. It is suggested to identify documents and records that require templates and accordingly suitable templates shall be developed, which shall include but not limited to policies, procedures and work instructions, meeting minutes, monitoring results, training attendance records, emergency contract lists, action plans etc. Further, all these templates shall be communicated to all

potential users. All these records will be archived at the Project office and will be maintained by the EHS officer. All documents and records shall be archived with a unique identifier so that they can be distinguished from any other material and can be easily retrieved. The Sponsor will document the process for creating, allocating and approving unique identifiers and will communicate this to relevant staff.

10.6.2 Operation Phase

During Operation Phase, the Project Proponent, especially the EHS team and operation team will be fully responsible for implementation of the ESMP. The Project Proponent's staff, specifically the EHS Officer and Engineer, will monitor the implementation of these mitigation measures.

10.7 Training

10.7.1 Construction Phase

Prior to commencement of major civil works at site, a suitably qualified in-house/ external expert will be appointed by the EPC contractor in consultation with the Sponsor to develop and deliver a training program on implementation of the ESMP, monitoring and reporting will be conducted in line with the applicable reference framework for the Project. The training will include the following topics:

- Environment, Health and Safety Policy of the EPC contractor;
- Environment and fundamentals of environmental pollution in relation to the Project;
- EHS management plans prepared by the EPC Contractor;
- Do's and Don'ts for the construction workers;
- Safety procedures and guidelines;
- Internal reporting and response system;
- Hazardous chemicals and waste handling;

In addition, specific training will be provided to the team involved in environmental and social monitoring and reporting, which will include:

- Applicable environmental and social guidelines and standards;
- Sampling site selection guidelines in line with environmental monitoring plan;
- Sample collection, storage, transportation and analysis procedures;
- Solid and hazardous waste management;
- Quality assurance and quality control;
- Environmental monitoring report preparation

The training will help in capacity building and implementation of the ESMP during the construction phase of the Project. It will also help in ensuring internal and external monitoring and verification of the environmental and social performance of the Project. The timeframe for reporting and verification during the construction phase will be agreed between the Project Proponent, the relevant authorities and the Lenders.

10.7.2 Operation Phase

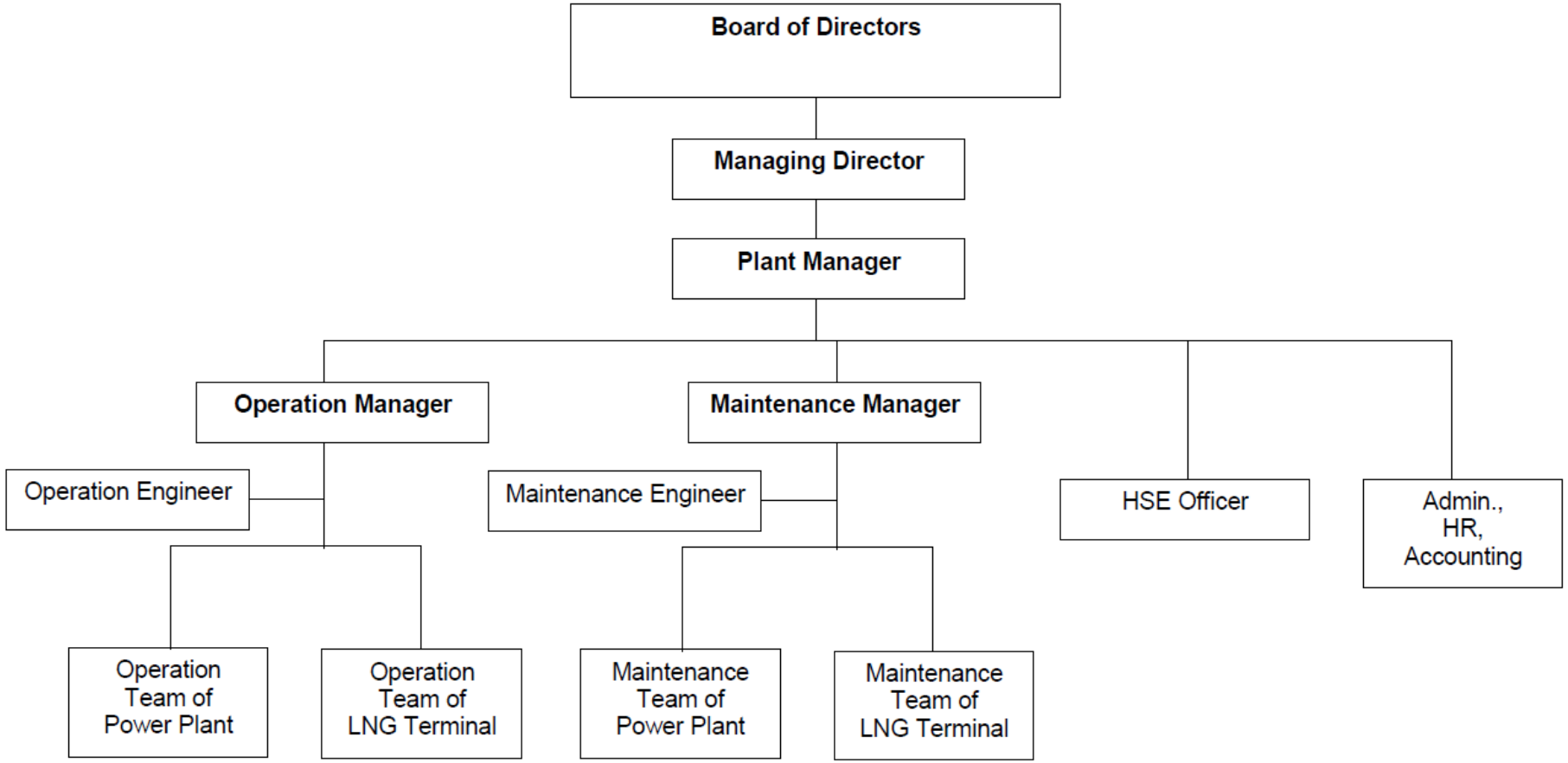
Prior to the commencement of the Transmission Line operation, a suitably qualified in-house/ external environmental expert will be engaged by the Sponsor to develop and deliver a training program on operation phase environmental and social monitoring and reporting. The topics will be mostly same as that during the construction phase. However, it will also include following modules, which are specific to the operation phase:

- Continuous emission monitoring;
- Hazardous chemicals and waste management; and
- Occupational health and safety programs, including Emergency Response Plan for both employee and nearby communities.

The training will help in capacity building and implementation of the ESMP during the operation phase of the Project. It will also help in ensuring internal and external monitoring and verification of the environmental and social performance of the Project. The timeframe for reporting and verification during the construction phase will be agreed between the Project Proponent, the relevant authorities and the potential Lenders.

The Project Proponent's overall Project organisation chart, the Project Proponent's organisation chart, are shown in ***Figure 10.1***. Furthermore, on-site staff during operation phase will be shared with the Power Plant staff therefore, there will be no permanent staff for the Transmission Line.

Figure 10.1: TPMC's Overall Project Organisation Chart



Source: TPMC, 2018

Note that the Transmission Line team will be shared with Power Plant team during both construction and operation and therefore will use the same Organisation Chart.

10.8 Plans for Construction and Operation Phase of the Project

10.8.1 Construction Phase

Prior to the beginning of major site works, the EPC contractor in cooperation with the Project Proponent will develop the following plans:

10.8.1.1 Emergency Response Plan

A site specific emergency response plan will be prepared for soil clean-up, decontamination and any accidental spill management.

10.8.1.2 Health and Safety Plan

The EPC Contractor will prepare and implement a Health and Safety Plan prior to commencing work. This plan will include method statements for work activities, Transmission Line utilisation, construction sequence and safety arrangements. Measures will be implemented to reduce the likelihood and consequence of the following hazards:

- Falling from height;
- Falling into water;
- Entanglement with machinery;
- Tripping over permanent obstacles or temporary obstructions;
- Slipping on greasy or oily walkways;
- Falling objects;
- Asphyxiation;
- Explosion;
- Contact with dangerous substances;
- Electric shock;
- Variable weather conditions;
- Lifting excessive weights; and
- Traffic operations.

10.8.1.3 Construction Environmental and Social Management Plan (Site Specific Plan)

The EPC Contractor will prepare and implement a Construction Environmental and Social Management Plan prior to commencing work to manage the construction related environmental and social aspects.Please refer to Section 10.4 for detailed site specific plans required.

10.8.1.4 Traffic Management Plan

The EPC Contractor will prepare and implement Traffic Management Plan prior to commencing work to manage the construction traffic. This will be required towards prevention of local traffic disruptions, avoid peak hours rush and prevent accidents. Movement of all heavy equipment and vehicles from Jetty to Project site needs to be coordinated with the logistics team of the Project Proponent and in discussion with relevant local authorities. This will also include waterways traffic for construction vessels and vessels transporting equipment and material.

Additionally, it is to be noted that the detailed management plans as specified in ***Section 10.4*** will also be developed prior commencing activities in relation to such plans.

10.8.2 Operation Phase

During the operation phase of the Project, the Project Proponent will develop the following plan/ management systems for effective operation of the Transmission Line:

10.8.2.1 HSE and Social Management System

The Project Proponent will develop and implement an HSE and Social Management System (HSE & SMS) to international guidelines for the entire Transmission Line premises and its impact zones (project area of influence as defined under IFC PS) within sixteen (16) months of commissioning the Transmission Line.

10.8.2.2 Waste Management Plan

For effective segregation, handling, storage and disposal of solid and hazardous wastes generated from the Transmission Line operations, a waste management plan will be developed by the Project Proponent.

10.8.2.3 Spill Response and Emergency Plan

The Project Proponent will prepare a spill response and emergency plan to address accidental spillages or release of hazardous wastes.

10.8.2.4 Emergency Response and Disaster Management Plan

Based on the outcome of the consequence analysis as well as detailed quantitative risk assessment of the Project after finalisation of project design, emergency response and disaster management plans will be developed by the Project Proponent. These will define protocols to be followed in the event of emergencies or disasters in order to limit the impact on the employees and the local community. The plan will address both on-site and off-site emergency situations due to the operation of the different component of the project. The plans will disclose potential disasters and potential risks from the Transmission Line to the local community as well as the plan of action on emergency protocol in the event of any such eventuality. These will also include awareness programs for the Project personnel, local community and local administration.

Additionally, it is to be noted that the detailed management plans as specified in ***Section 10.4*** will also be developed prior commencing activities in relation to such plans.

10.8.3 Budget

The EPC Contractor and the Project Proponent will allocate separate budget for environmental and social management plan implementation, training, environmental monitoring, analysis and reporting, verification monitoring and capacity building. It should be noted that costs for many in-built mitigation measures, such as, acoustic enclosures for noise control, water and wastewater treatment, etc., are already included in the EPC contract cost estimate and/or operating cost estimates. In addition, separate budget will be allocated for CSR activities, which will be conducted by the Sponsor for community development.

10.9 Updating of ESMP

This ESMP will be updated, revised and reviewed internally on regular basis to ensure particularly that ESMP continuing suitability, adequacy and effectiveness regarding the Project commitment to continual improvement. The ESMP of the Project will be monitored and reviewed on half-yearly basis.

Furthermore, in the event of an unanticipated impact and design change with respect to the Project Standards (including Myanmar Government and IFC requirements); the ESMP would be updated as necessary.

11. PUBLIC CONSULTATION AND DISCLOSURE

This Chapter describes the stakeholder engagement activities undertaken during the development of the IEE. It includes key issues raised by stakeholders and how each of these issues has been addressed in the IEE.

The engagement process has been designed to meet both Myanmar legal requirements (per the Environmental Impact Assessment Procedure No. 616/2015) for public participation, and international requirements for engagement as outlined by the IFC Performance Standards.

11.1 Methodology and Approach

11.1.1 Purpose of the Consultation

The first step in establishing a dialogue is identifying the Project stakeholders. Stakeholders are persons or groups who are directly or indirectly affect by a project, and those who may have interest in and/or the ability to influence a project's outcomes (either positively or negatively).

The Project team is committed to undertaking a process that delivers an inclusive and continuous dialogue with the Project stakeholders during the IEE. The objectives of this engagement is to:

- Identify all those affected or interested in the Project to ensure they are included in the engagement process;
- Ensure understanding through an open, inclusive culturally appropriate and transparent engagement process. Information has been disclosed as early and as comprehensively as possible;
- Involving stakeholders in the scoping of issues, the assessment of impacts, the generation of mitigation and management measures and the finalization of IEE Report. Stakeholders also played an important role in providing local knowledge and information for the baseline to inform the impact assessment;
- Build relationships and trust through open dialogue and engagement. Establish transparency of TPMC activities to build trust with stakeholders;
- Engagement vulnerable peoples and groups by having an inclusive approach to consultation. Some stakeholders need special attention in such a process due to their vulnerability;
- Manage expectations with respect to proposed Project benefits. The engagement process served as a mechanism for understanding and managing stakeholder and community expectations, where the latter will be achieved disseminating accurate information in an accessible way; and
- Ensuring compliance. The process is design to ensure compliance with both Myanmar regulatory requirements and international best practice.

11.1.2 Identification of Relevant Stakeholders and Potential Issues

A stakeholder mapping exercise was undertaken to identify the Project stakeholders as well as issues likely to be of concern to them. A key part of this process was identifying individuals and groups who may find it difficult to participate as well as those who may be differentially or disproportionately affected by the Project because of their marginalised or vulnerable status.

The mapping exercise was developed based on a desktop review of maps detailing the Project site and surrounding land uses/ activities. Stakeholders were prioritized based on their expected level of interest in the Project and capacity to influence the Project.

By identifying the Project stakeholders early, the IEE team was able to tailor the engagement approach to meet the needs and expectations of the stakeholders – e.g. address the issues of most concern to stakeholders during meetings.

Table 11.1 provides the list of Project stakeholders that were identified during the mapping exercise. This includes villages located in close proximity to the Project site and/ or its associated facilities.

Table 11.1: List of Project Stakeholders

Stakeholder Group	Stakeholder
Union Government	Ministry of Natural Resources and Environmental Conservation (MONREC) Ministry of Electricity and Energy (MOEE) Electric Power Generation Enterprise (EPGE) Myanmar Investment Commission (MIC) Myanmar Port Authority (MPA) Ministry of Agriculture, Livestock and Irrigation (MALI) Ministry of Labour, Immigration and Population (MLIP) Ministry of Social Welfare, Relief and Resettlements (MSWRR)
Regional Authorities	Department of Electrical Power Planning (DEPP) Chief Minister Office
Township Authorities (Hlaingthayar, Twantay, Seikgyikanaungto, Ahlone).	General Administration Department (GAD) Department of Livestock, Fisheries and Rural Development Department of Irrigation and Agriculture Department of Electric Power Department of Industry and Trade Department of Social Welfare, Relief and Resettlements Department of Labor Water Utilization Department Municipal Department Tax and Revenue Department Development Committee
Communities Stakeholders	Village Tract Leaders Local villagers – Tet Thit; Kyi Seik; Ka Pyo; Kin; Kha Yan Wa; Kha Lauk Kha Lu; Ma Myo Su; Auk Ta Mar Ta Kaw; Ta Man Gyi Ta Khun Taing; Kun Tar; Htein Kone; Kyaun Ka Lay; Gyaung Waing Gyi. Farmers within local villages Women's group representatives within local villages Youth representatives within local villages Healthcare workers within local villages and regional health care facilities Community based organisations Vulnerable groups (e.g. landless, poor) within the local villages
NGO, Media, Academia	Myanmar Environment Rehabilitation-Conservation Network (MERN) Biodiversity and Nature Conservation Association (BANCA) Ecosystem Conservation and Community Development Initiative (ECCDI), Yangon Or Environmental Conservation and Livelihood Outreach Foundation (ECLOF), Yangon Yangon University
Business	Yangon Industrial Port Yangon Ferry Operators

Source: ERM, 2019.

11.1.3 Overall Approach and Scope of Engagement for the Impact Assessment

Under Section 7 of the Environmental Conservation Law and Articles 52 and 53 of the Environmental Conservation Rules of the Republic of the Union of Myanmar, the Project Proponent is required to

undertake an IEE to obtain an Environmental Compliance Certificate (ECC) for the proposed Transmission Line development and operation. The EIA Procedure (dated 29 December 2015) sets out the requirements for development, assessment and subsequent monitoring of an IEE, which are illustrated in ***Figure 11.1***, including the consultation requirements, which are discussed below.

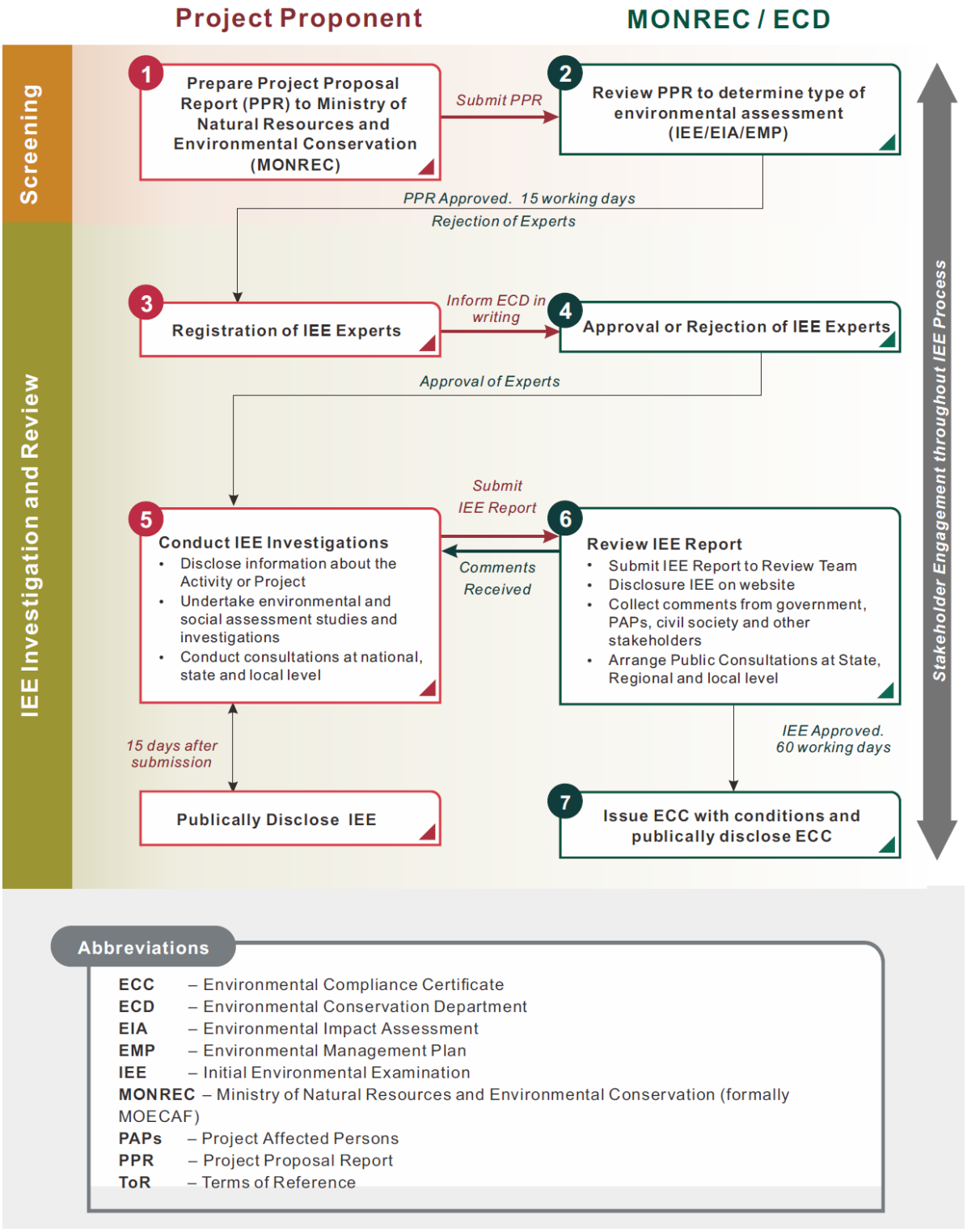
According to Article 34 the EIA Procedure (2015), the Project Proponent shall ensure the following public consultation and participation process are carried out:

- Immediately upon commencement of the IEE, disclose relevant information about the proposed Project to the public and civil society through the Project or Project Proponent's website(s) and local media, including by means of the prominent posting of legible sign boards at the Project site which are visible to the public, and comply with technical guidelines issued by the Ministry; and
- Arrange the required complement of consultation meetings as advised by the Ministry, with local communities, potential PAPs, local authorities, community based organizations, and civil society, and provide appropriate and timely explanations in press conferences and media interviews.

According to Article 39 the EIA Procedure (2015), the Project Proponent shall ensure the following public consultation and participation process are carried out:

- Disclose the IEE Report to the public on the Ministry and/ or Department website(s), and/or through other appropriate media;
- Invite comments and suggestions on the IEE Report from all relevant parties including relevant government organizations, institutions, civil society organization, and PAPs, as appropriate;
- Arrange public consultation meetings at the local level, at which the Project Proponent shall present the IEE Report; and
- Collect and review all comments and recommendations received, and forward the same to the Ministry to enable it to make a final decision on approval of the IEE Report.

Figure 11.1: Role of the Project Proponent on Stakeholder Engagement in the IEE Process as Defined by the EIA Procedure



Source: ERM, 2018.

Different Project stakeholders have been engaged at a number of points during the development of the IEE. The focus of the engagement activities has been to:

- Introduce the Project and provide ongoing updates as the design of the Project is further refined;
- Provide an overview of the likely impacts and proposed management measures and corresponding monitoring activities;
- Gather stakeholder insights and input, including feedback on the identified impacts, proposed management measures and monitoring activities; and
- Respond to key issues raised by stakeholders.

11.1.4 Format and Content of Consultation Meetings

The stakeholder consultation meetings were structured as follows:

- Introductions and information disclosure – introduce the Project Proponent, the IEE process and the stakeholder engagement process, the potential environmental and social impacts and mitigation to help the stakeholders understand the Project and the Project Proponent's intention for engagement; and
- Question and answer session for all stakeholders in the township meeting to raise concerns, comments or ask questions to which the EIA consultant and Project Proponent can directly respond.

Invitation cards for consultation meetings were distribuited to meeting attendees through GAD, and disclosure of the meeting details were published on the Project Proponent's website as follows: https://www.ttcl.com/news/activities/view/114; the disclosure is also shown in ***Figure 11.2***. Consultations were conducted on 29 and 30 October 2019.

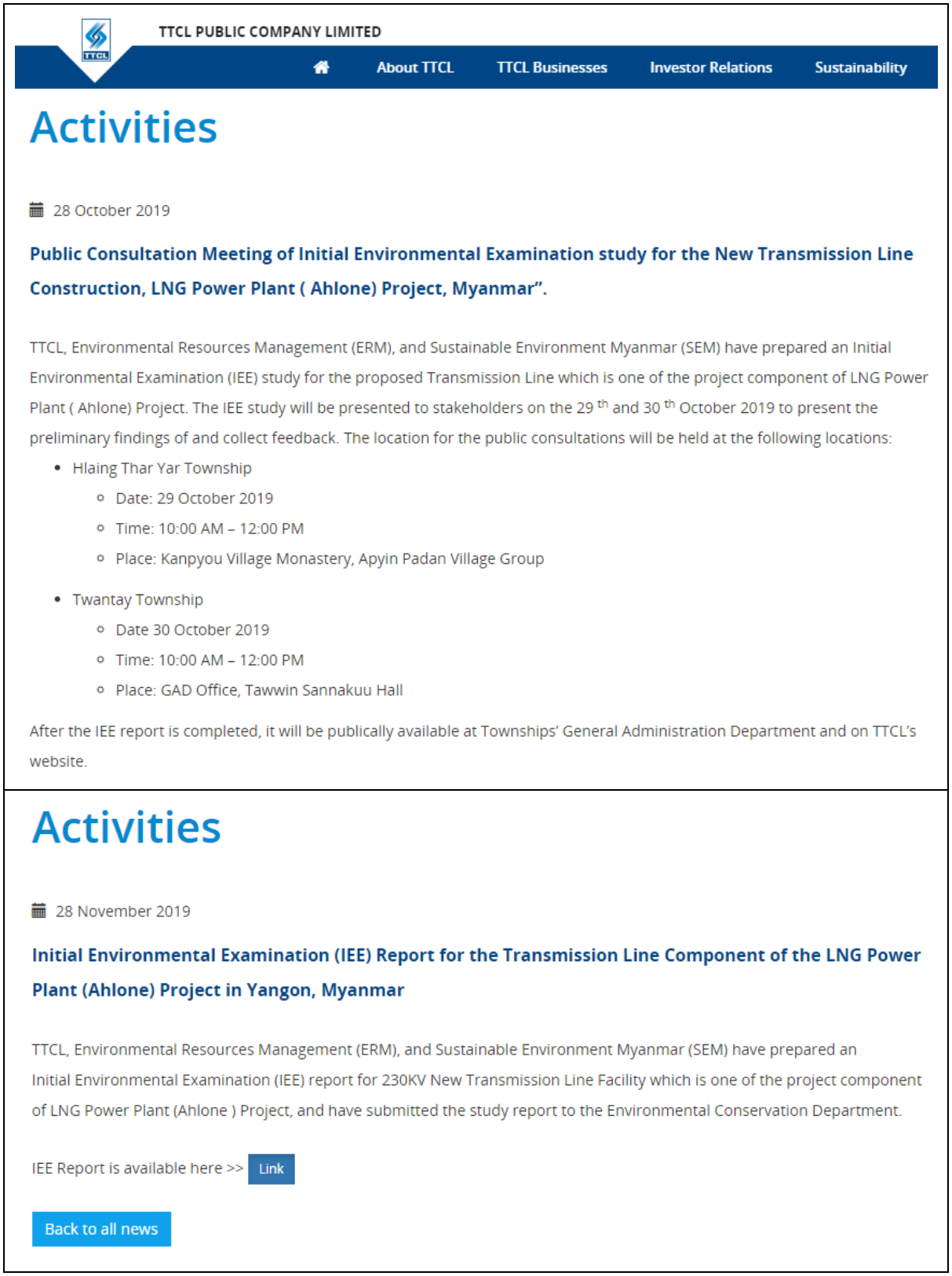
The press release announcing the engagement was published in The Global New Light of Myanmar (English) and The Mirror (Burmese) on 10 Novermber (see ***Figure 11.3***).

All information was communicated through use of visual media (including posters and power point presentations) and was provided in local Myanmar language. The presentation can be found in ***Appendix F***.

Stakeholders were also given time to share their concerns and views and any further clarification they required at the end of the meetings. Any queries raised by the stakeholders were responded to, and also noted to feed into the impact assessment process for the IEE.

In addition, full IEE report in English with Myanmar summary is also disclosed in the Project Proponent's website; https://www.ttcl.com/news/activities/view/118 on 28 November 2019 (***Figure 11.3***). IEE report in English with Myanmar summary have diclosed to the general public through relevant township dminstrator office.

Figure 11.2: Public Disclosure on Project Proponent Website



Source: TPMC, 2019.

Figure 11.3: Public Consulation Press Release

INITIAL ENVIRONMENTAL EXAMINATION OF THE TRANSMISSION LINE FOR THE 388 MW COMBINED CYCLE POWER PLANT (AHLONE)

TTCL Power Myanmar Company Limited (TPMC) is planning to build a 388 MW Combined Cycle Power Plant supplied in Natural Gas. The project consists of three main components, which includes the Liquefied Natural Gas (LNG) power plant in Ahlone, the LNG receiving facility in Dala, and natural gas (NG) pipeline in Dala and Seikgyikanaungto, as well as a 24km Electric Transmission Line as associated facility in Twantay and Hlaingtharyar Townships.

Under the Environmental Conservation Law and Rules of the Republic of the Union of Myanmar, TPMC is required to undertake a n Initial Environmental Examination (IEE) for the electric power transmission system in order to obtain an Environmental Compliance Certificate (ECC). Environmental Resources Management (ERM), and Sustainable Environment Myanmar (SEM), on behalf of TPMC, are currently undertaking the IEE Study, which includes baseline surveys and public consultations. The IEE will be conducted in accordance with the EIA Procedure (2015). Public consultations have been conducted at the following locations:

- ❖ Hlaing Thar Yar Township
  - Place: Kanpyou Monastery, Kanpyou Village, Apyin Pagan Village Group.
  - Date: 29 October 2019.
- ❖ Twantay Township
  - Place: General Administration Department (GAD) Office, Tawwin Sannakuu Hall.
  - Date: 30 October 2019.

After the IEE report is completed, it will be publically available at Townships' GAD and on TPMC's website as follows: http://www.ttcl.com.

၃၈၈ မဂ္ဂါဝပ်ရှိ ပေါင်းစပ်စွမ်းအင်သုံး ဓာတ်အားစက်ရုံ (အလုံ) ၏ ချိတ်ဆက် ဓာတ်အားလိုင်း အတွက် တနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း

TTCL Power Myanmar Company Limited (TPMC) သည် ၃၈၈ မဂ္ဂါဝပ်ရှိ သဘာဝ ဓာတ်ငွေ့သုံး ပေါင်းစပ်စွမ်းအင်ဓာတ်အားပေးစက်ရုံအား တည်ဆောက်ရန် စီစဉ်နေပါသည်။ အဆိုပါစီမံကိန်းတွင် အလုံမြို့နယ်တွင် တည်ဆောက်မည့် အရည်ဖွဲ့ သဘာဝဓာတ်ငွေ့ (LNG) သုံးဓာတ်အားပေးစက်ရုံ၊ ဒလမြို့နယ်တွင် တည်ဆောက်မည့် LNG လက်ခံသိုလှောင် အဆောက်အဦး၊ ဒလ နှင့် ဆိပ်ကြီးခေနာင်တို့မြို့နယ် တို့တွင် တည်ဆောက်မည့် သဘာဝဓာတ်ငွေ့ (NG) ပိုက်လိုင်း နှင့် တွံတေး နှင့် လှိုင်သာယာ မြို့နယ်တို့တွင် တည်ဆောက်မည့် ဆက်စပ် ၂၄ ကီလိုမီတာ ချိတ်ဆက်ဓာတ်အားလိုင်း တို့ ပါဝင်မည် ဖြစ်ပါသည်။

ပြည်ထောင်စုသမ္မတ မြန်မာနိုင်ငံတော်၏ စည်းမျဉ်းဥပဒေများ နှင့် ပတ်ဝန်းကျင်ထိန်းသိမ်းရေး ဥပဒေများ အရ TPMC သည် ချိတ်ဆက် ဓာတ်အားလိုင်း တည်ဆောင်ရေး အတွက် ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဆိုင်ရာ လိုက်နာဆောင်ရွက်မှု သ က်သေခံ လက်မှတ် (ECC) ရရှိရန်အတွက် ကနဦးပတ်ဝန်းကျင် ဆ နး်စစ်ခြင်း (IEE) အားဆောင်ရွက်ရမည် ဖြစ်ပါသည်။ TPMC ၏ ကိုယ်စားပြု Environmental Resources Management (ERM) နှင့် Sustainable Environment Myanmar (SEM) တို့မှ ကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း အတွက် အခြေခံအချက်အလက်တိုင်းတာရေး နှင့် လူထုတွေ့ဆုံဆွေးနွေးပွဲများကို ဆောင်ရွက်နေပါသည်။ ကနဦးပတ်ဝန်းကျင် ဆ နး်စစ်ခြင်းအား ပတ်ဝန်းကျင်ထိခိုက်မှု ဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ထုံးလုပ်နည်း ၂၀၁၅ အတိုင်း ဆောင်ရွက်မည်ဖြစ်ပါသည်။ လူထုတွေ့ဆုံ ဆွေးနွေးပွဲများကို အောက်ပါနေရာများတွင် ဆောင်ရွက်ပြီး ဖြစ်ပါသည်။

- ❖ လှိုင်သာယာ မြို့နယ်
  - နေရာ: ကန်ပြို
    ဘုန်းကြီးကျောင်း၊ ကန်ပြို ကျေးရွာ၊ အပြင်ပဒန်းကျေးရွာအုပ်စု။
  - အချိန်: ၂၉ အောက်တိုဘာ ၂၀၁၉။
- ❖ တွံတေး မြို့နယ်
  - နေရာ: အထွေထွေအုပ်ချုပ်ရေးမှူးရုံး၊ တော်ဝင် စန္ဒကူး ခန်းမ။
  - အချိန်: ၃၀ အောက်တိုဘာ ၂၀၁၉ ။

IEE အစီအရင်ခံစာပြုစုပြီးပါက မြို့နယ်အုပ်ချုပ်ရေးမှူးရုံးများ နှင့် TPMC ဝဘ်ဆိုဒ်စာမျက်နှာ http://www.ttcl.com တို့တွင် အများပြည်သူမှ ဖတ်ရှုနိုင်မည် ဖြစ်ပါသည်။

Source: ERM, 2019.

11.2 Summary of Consultation Activities Undertaken for the IEE Process

Representatives from the four townships affected by the Project were invited to attend public consultation meetings. Representatives from the following villages were invited, and attended the relevant township meeting:

- Tet Thit;
- Kyi Seik;
- Ka Pyo;
- Kin;
- Kha Yan Wa;
- Kha Lauk Kha Lu;
- Ma Myo Su;
- Auk Ta Mar Ta Kaw;
- Ta Man Gyi Ta Khun Taing;
- Kun Tar;
- Htein Kone;
- Kyaun Ka Lay; and
- Gyaung Waing Gyi.

The meetings were conducted on 29 and 30 October 2019. Stakeholders invited also included Chief Minister and state Government, concerns regional level ECD and GAD, Members of Parliament, Township GAD, village administrators, and local communities. The date, time, location, stakeholder and purpose of each meeting is provided in ***Table 11.2***. It should be noted that that consultation activities on 14 June 2019, in Dala Township, were combined with the ESIA's public consulation no. 2.

The consultation aimed to inform the various stakeholders about the Project and to provide an opportunity for them to voice out their concerns and suggestions. Their comments and suggestions have been included in this revised version of the IEE.

Table 11.2: Consultation Activities Undertaken during IEE

Date, time	Location	Stakeholder	Number of Participants
14 June 2019	Thin Zaya Naw Ya Htar Hall, Dala Township	■ GAD (Construction, Project, Health Care, Piping, Agriculture, Administration, Fire service, Water and Sanitation, MONREC, and Ward Administration Department) ■ MOE ■ Parliament Member (Regional Gov't) ■ Regional ECD ■ Red Cross Society ■ Village Leader ■ Elder people ■ Villagers	143
29 October 2019	Hlaing Thar Yar Township: Kanphyar Monestery, Apyin Padan Village Group	■ Atwin Padan Village ■ West Yangon Technology University ■ Kan Pyo Village ■ MOEE ■ Kann Pyo Village ■ Thae Kwin Village ■ Apyin Padan Village ■ Atwin Padan Village ■ Myit Kyo Kan Kwat Thit	160
30 October 2019	Twantay Township: GAD Office, Tawwin Sandakuu Hall	■ Tamangyi Village ■ Ministry of Education ■ Jaung Wine Village ■ MOE	90

Source: TPMC, ERM, 2019.

11.3 Result of Consultation

The following ***Table 11.3*** summarises the key issues and concerns raised in public consultation meetings and presents the responses provided in the revised IEE report. Photographic evidence of public consultation activities in Hlaingthayar and Twantay are shown in ***Figure 11.4***, ***Figure 11.5***, ***Figure 11.6***, ***Figure 11.7***, ***Figure 11.8***, ***Figure 11.9***, and ***Figure 11.10***. The signed sheet is shown in ***Appendix G***. The Minutes of Meeting is shown in ***Appendix H***.

Table 11.3: Key Concerns and Question Raised during Public Consultation

Questions	Stakeholder	Response	Reference/response in IEE
Who will monitor the EMP, and how will TTCL follow the commitments presented in the PowerPoint?	Name: Dr. Aung Aung Position: West Yangon Technological University (WYTU) Electrical Engineering Department	TTCL: MOEE will monitor, ERM will provide support and prepare mitigation measures so TTCL can implement during Project activities. ERM: ECD will also monitor.	N/A
What is the width of the tower? Worried TTCL will not build the towers as presented in the slides.	Name: Mr. Khin Maung Myint Position: Village leader for TaManGyi village	TTCL and MOEE confirmed the information as presented in the slides.	N/A
When will the project start?		TTCL: Will only start when TTCL gets the power purchase agreement.	N/A
Concerned about harvesting, because this is rice season.		MOEE and TTCL: will take his concern into consideration.	N/A
Is there any compensation to the damage caused to the farmland and crops?		MOEE: Land compensation committee has the compensation framework with the amount to be paid for impact to crops. The final amount will be multiplied by three. Will provide compensation for crops to landowners who have crop land in the Project area, even if there is no crop being grown at the moment. There's another type of compensation for access road. Will only provide compensation for crops, those who have production where access road will pass.	N/A
What is the safety distance [ROW] between the transmission line tower and settlements?		MOEE: According to MOEE rules and regulation, ROW is 75 ft from the tower centre. The Transmission Line will not cross any settlements, only farmland and main road in NYDC area. No need to worry about the settlements.	N/A
Concerned about damages caused by the TL on farmland and houses	Village leader of Kan Village	MOEE: Yes, it will be the same.	N/A

Questions	Stakeholder	Response	Reference/response in IEE
Previous compensation considered the area of 150 feet (diameter); will this project consider the same scheme?			
What is the amount of compensation for damages?	Name: Myint Zaw Lwin Position: Village leader for Khayanwa village	MOEE: if there are any damages (impact) to the farmland there is compensation; the amount will be based on the production (crops). Maximum of three times the compensation for damages.	N/A
Worried that land will not be returned to original state due to construction activities (i.e. piling, holes, not leveling the land) as has happened in the past.		MOEE: Apologized and guarantee it will not happen again. MOEE will strictly instruct TTCL so that will not happen again. TTCL: TTCL will make sure that the contractor responsible for construction activities will follow the instruction to return the land to previous state, including leveling.	N/A

Figure 11.4: Hlaingtharyar Public Consultation Photographs (Presentation by TPMC)

Source: TPMC, 2019.

Figure 11.5: Hlaingtharyar Public Consultation Photographs (Presentation by ERM)

Source: TPMC, 2019.

Figure 11.6: Hlaingtharyar Public Consultation Photographs (Meeting Attendees)

Source: TPMC, 2019.

Figure 11.7: Twantay Public Consultation Photographs (Presentation by TPMC)

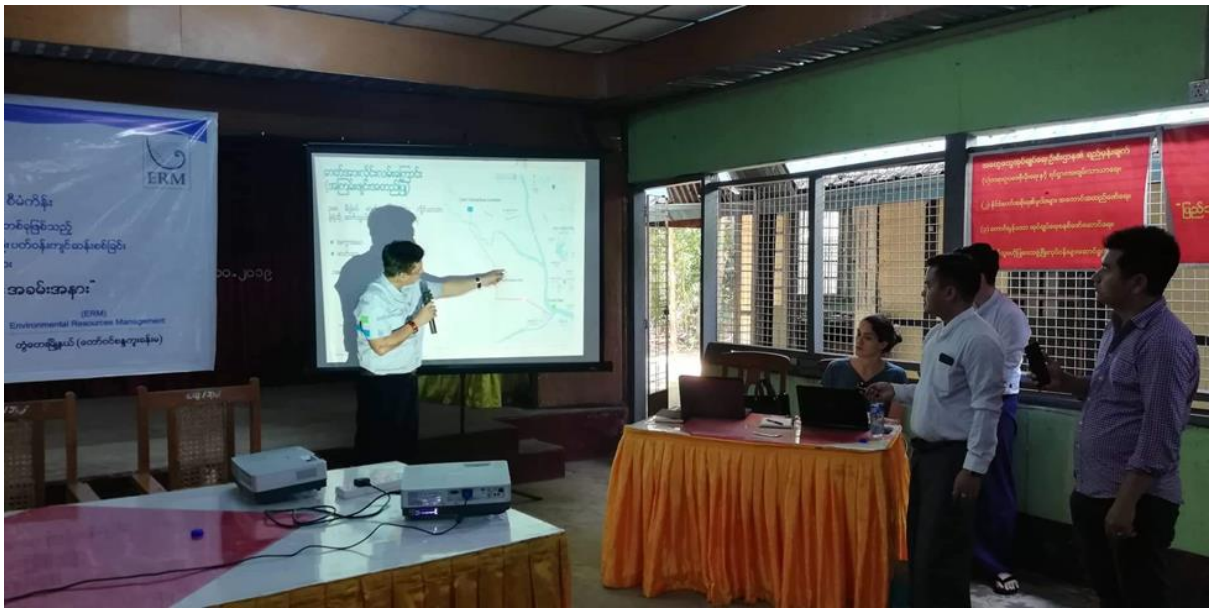
Source: TPMC, 2019.

Figure 11.8: Twantay Public Consultation Photographs (Presentation by ERM)

Figure 11.9: Twantay Public Consultation Photographs (Meeting Attendees)

Source: TPMC, 2019.

Figure 11.10: Twantay Public Consultation Photographs (Q&A Session)



Source: TPMC, 2019.

11.4 Ongoing Consultations

Stakeholder consultation undertaken to date confirmed that potential impacts as a result of Project Activities will be small in scale and of limited extent.

Future engagement activities will consist of the following:

- Further disclosure of the Project information and IEE Report, including opportunities to provide feedback through Project Grievance Mechanism;
- Engagement with relevant regional officials/ authorities and government organizations on the outcomes of the IEE; and
- Ongoing communications with interested and potentially affected stakeholders during the construction phase.

All engagement and monitoring activitites with stakeholders stated above, including grievance mechanism management will be responsible by *TPMC Public Relation Team*.

Responsible in charge person : U Htet Aung Mon

Position : Public Relation lead

Contact : +95 9974953914

12. CONCLUSION AND RECOMMENDATIONS

This Initial Environmental Examination report has been prepared based on technical information provided by the Project Proponent, existing studies reports relevant to the Project, site visit, existing baseline environmental monitoring from project within the same region and the stakeholder engagement.

Through this process an assessment has been conducted of the potential environmental and social impacts attributable to the construction and operation phases of the Project. Qualitative and quantitative (where possible) assessments of impacts have been presented, significance of each potential impact has been identified, and mitigation measures to minimize and reduce the impacts have been recommended.

The subsequent impacts from emissions at vehicles and machineries is to be controlled and the emission level at identified air sensitive receivers (ASRs) during construction are considered as negligible. Monitoring will be implemented by the Project proponent to ensure emission are maintain below 25 ppm at all time and do not impact the airshed significantly.

With regards to impacts to surface water, soil and groundwater, it is noted that the assessment of such impacts for this Project is highly important due to the Project's vicinity to the Yangon and Pun Hlaing River. Additionally, the local population rely heavily on the surface water, soil and groundwater resources within the Project Area and surroundings for their health and livelihood. Moreover, the biodiversity impacts aspect from the Project is deemed to be insignificant. Within the Project Study Area, no key biodiversity area or important bird area were found and thus the significance of the biodiversity impacts is lowered.

Although a number of potential environmental, social and health impacts were identified, the assessments found that impacts are typically short term in duration and have minor residual significance after implementation of mitigation measures. The potential for impacts is well understood with little or no evidence of adverse consequences on the majority of environmental, social or health receptors provided that adequate in-place controls and/or mitigation measures are implemented. The suggested mitigation measures in the ESMP are well established amongst international practice, and proven to be effective in managing any impacts that might occur to acceptable levels.

In terms of social aspect, the results from initial stakeholder engagement indicate that the Project has received support from local people and other stakeholders. Stakeholders appreciated that in addition to providing a reliable power supply to the region, the Project will have several other benefits such as supporting economic growth in the region, potential employment (direct and indirect) and that the negative impacts can be easily mitigated.

Cumulative environmental impacts particularly on air quality and community health and safety have also been assessed taking into consideration the existing industrial facilities and future potential development present in the Study Area. The environmental and social assessment of the Project ascertains that the Project is unlikely to cause any significant environmental and social impacts. Many of the impacts are localized and short-term or temporary in nature and can be readily addressed by some embedded control measures in the engineering design of the Project as well as additional mitigation measures as suggested in the Environmental and Social Management Plan (ESMP).

In addition, the ESMP has been prepared as part of this report to manage and mitigate such impacts, a range of measures have been developed to reduce the overall impacts to acceptable levels and as low as reasonably practicable.

The effective implementation of the ESMP and adherence with the Myanmar NEQ and IFC guidelines will assist in minimizing the environmental impacts to acceptable levels.

However, the Project Proponent and the EPC Contractor will develop the Site Specific Management Plans as detailed in the ESMP Chapter and ensure the appropriate implementation of proposed mitigation measures and monitoring programme and report to ECD and other external parties (where

required) to demonstrate the Project Proponent's commitment to ensure the environmental, social and health impacts are minimized to the As Low As Practicable (ALAP) level. In addition, the Project Proponent will ensure the continue engagement activities with relevant stakeholders throughout the Project life cycle.

13. STATEMENT OF COMMITMENT

TPMC will at all times comply fully with the commitments, mitigation measures and monitoring plans that have been presented in this IEE Report.

TPMC shall fully implement the ESMP, all Project commitments, and conditions, and is liable to ensure that all contractors and subcontractors of the project comply fully with all applicable Laws, including the Environmental Conservation Law (2012), Environmental Conservation Rules and Environmental Impact Assessment Procedure (2015), as well as the ESMP, Project commitments and conditions.

TPMC and ERM hereby endorese and confirm to the Ministry of Natural Resources and Environmental Conservation:

1. the accuracy and completeness of the IEE/ESMP;
2. Confirm and undertake to Ministry of Natural Resources and Environmental Conservation that the IEE/ESMP has been prepared in strict compliance with applicable Environmental Conservation Law, Rules and Procedures, and TOR for the IEE; and
3. Confirm and undertake to Ministry of Natural Resources and Environmental Conservation that the established project company (TPMC) in respect of the Transmission Line Project shall at all times comply fully with the commitments, mitigation measures and plans in the EIA report.

The signed commitment letter is shown in ***Appendix I***.

APPENDIX A PROJECT PROPOSAL REPORT SUBSMISSION LETTER

บริษัท ทีทีซีแอล จำกัด (มหาชน)
TTCL PUBLIC COMPANY LIMITED
COMPANY REGISTRATION NO. 0107551000185
27th-30th FLOOR, SERMMIT TOWER, 159/41-44 SUKHUMVIT 21, ASOKE ROAD,
NORTH KLONGTOEY, WATTANA, BANGKOK 10110 THAILAND
TEL. +66 (0) 2260-8505 FAX. +66 (0) 2260-8525-6

To,
U Hla Maung Thein
Director General
Environmental Conservation Department,
Office 53 Naypyidaw,
The Republic of the Union of Myanmar

Letter No: TTCL136 /18 H/O
Date: 24th December 2018

Project: **LNG Power Plant (Ahlone) Project**

Subject: **Submission of Project Proposal Report for Initial Environmental Examination (IEE) Study for the Development of 230kV Transmission Line between LNG Power Plant (Ahlone) project in Ahlone Township, and sub-station in Hlaingthayar Township, Yangon Region.**

Reference: Letter No: TTCL 112/18 H/O, Appointment of Third Party Consultant for IEE, dated 11.Oct.2018

TTCL Public Company Limited (TTCL) is pleased to attach herewith the Project Proposal report for the proposed development of 230KV Transmission Line which is one of the project components of LNG Power Plant (Ahlone) Project, Yangon, Myanmar.

This Project Proposal Report has been prepared by the Project Proponent and Environmental Resources Management (ERM), as per section 7 of the Environmental Conversation Law, Article 52 and 53 of the Environmental Conversational Rules of the Republic of the Union of Myanmar, and Annex 1 of the EIA procedure, dated 29th December 2015.

Should you require further information, please do not hesitate to contact Mr. Htet Aung Mon via htetaung.m@ttcl.com or phone on +95 9974953914 or +95-1-371963.

Attached with (A) Project Proposal report for Transmission Line for the LNG Power Plant (Ahlone) Project in Yangon, Myanmar.

Best Regards,

Ms. Suratana Trinratana
Senior Vice President
TTCL Public Company Limited

Copy to:
1. Director General, Department of Electric Power Planning, Office 27 ,MOEE , Naypyidaw
2. Director General, Department of Power Transmission and System Control, Office 27, MOEE, Naypyidaw
3. Chairman, Steering Committee for the Development of LNG Power Plant Projects, Office 27, MOEE, (Naypyidaw)
4. TTCL's office file

JOY OF ENGINEERING AND ACHIEVEMENT

APPENDIX B ERM TRANSITIONAL CONSULTATION REGISTRATION SUBSMISSION

Environmental
Resources
Management

179 Bangkok City Tower
21st Floor, South Sathorn Road
Tungmahamek, Sathorn
Bangkok, 10120, Thailand
Tel : (66-2) 679-5200
Fax : (66-2) 679-5209
ermsiam@erm.com
http://www.erm.com

June 3, 2016

Natural Resource and Environmental Impact Assessment Division (NR-EIA),
ECD-MONREC,
No.53 Building,
Oattara Thiri Township,
Nay Pyi Taw,
Myanmar 15011

ENVIRONMENTAL RESOURCES MANAGEMENT (ERM)
ERM-Siam Co., Ltd.
- Transitional Consultant Registration Submission -

Dear Sirs,

In accordance with Article 17 to 22 of the EIA Procedure, the Consultant Registration process sets out so as to verify and ensure qualification of the consultants who wish to undertake an EIA or IEE studies. Currently, the full-scale "*Consultant Registration Scheme*" is under development. For the transitional period until the Scheme issued, the Environmental Conservation Department of the Ministry of Natural Resources and Environmental Conservation (ECD-MONREC) has provided guidance of the "*Transitional Consultant Registration*" in accordance with Article 17 (a) of EIA Procedure.

ERM-Siam Co., Ltd and a number of employees would like to continue undertaking IEE/EIA studies in Myanmar. As such, we have followed the *Transitional Consultant Registration* process provided by MONREC on their website (http://www.ecd.gov.mm/?q=node/292).

Please find enclosed the hard copies of the *Transitional Consultant Registration* forms for ERM-Siam Co., Ltd (Organization).

We have also sent electronic copies of the above applications to your NR-EIA email address. Should you have any queries, please do not hesitate to contact me or Becky Summons (ratchanee.phensri@erm.com).

For ERM-Siam Co., Ltd.

ERM-Siam Co.,Ltd.

Nat Vanitchyangkul
Managing Partner
Tel: +66 2 679 5200
E-mail: nat.vanitchyangkul@erm.com

Registered office
ERM-Siam Co., Ltd.
179 Bangkok City Tower
21st Floor, South Sathorn Road
Tungmahamek, Sathorn
Bangkok, 10120, Thailand

Registered number
0105539126954

A member of the ERM Group

TRANSITIONAL CONSULTANT REGISTRATION FORM FOR ORGANIZATION

This form was set out by ECD-MOECAF in accordance with Article 17 (a) of EIA Procedure No. 616/2015, i.e. smooth application and registration for organization who wishes to undertake an IEE / EIA study during the transitional period — until coming into force of "Consultant Registration Scheme".

SECTION A – ORGANIZATIONAL PROFILE

Information of the Representative of the Organization

Full Name (Sur name, Given name)	Nat Vanitchyangkul
Courtesy Title (Prof, Dr, Mr., Mrs., Ms)	Mr.
Position	Managing Partner
Date of birth	09 September 1971
Identity card number (Citizen in Myanmar)	N/A
Passport number (Foreigners only)	AA1000644
Name of Organization	ERM-Siam Co., Ltd
Company Registration Number issued by Ministry of National Planning and Economic Development**	N/A

* A copy of ID card or Passport shall be attached to this form.
** A copy of the certificate of incorporation shall be attached to this form.

Office Address:

179 Bangkok City Tower 24th Floor South Sathorn Road,
Thungmahamek, Sathorn, Bangkok 10120

Postcode: 10120 Country: Thailand

Contact Information:

Telephone (office):+66 2 679 5200 E mail: ermsiam@erm.com

Fax (office): +66 2 679 5209 Mobile phone: +66 81 921 8488

SECTION B – PEOSONAL PROFILE OF THE CONSULTANTS IN THE ORGANIZATION (SELECTED CONSULTANTS)

Serial No.	Full Name	Courtesy Title	Date of birth	Identify card number (Citizen in Myanmar only)*	Passport Number (Foreigner only)**	Job title
1	Nat Vanitchyangkul	Mr.	07 Sep 1971	N/A	AA1000644	Managing Partner
2	Plerngtape Chamikorn	Mr.	15 Jan 1973	N/A	AA4764492	Partner
3	Kamonthip Ma-oon	Ms.	13 Jun 1983	N/A	AA3307616	Principal Consultant
4	Prasit Vaiyavajamai	Mr.	02 Apr 1974	N/A	AA3205601	Principal Consultant
5	Christopher Brown	Mr.	31 Jan 1980	N/A	GA251918	Principal Consultant
6	David Nicholson	Mr.	31 May 1972	N/A	PE0377277	Principal Consultant
7	Noppadol Sangiampaisalsuk	Mr.	24 Aug 1976	N/A	AA5507054	Principal Consultant

* A Copy of ID card must be attached to this form.
** A Copy of Passport must be attached to this form.

Serial No.	Full Name	Area of Expertise*
1	Nat Vanitchyangkul	Risk Assessment and Hazard Management
2	Plerngtape Chamikorn	Risk Assessment and Hazard Management
3	Kamonthip Ma-oon	• Environmental and Social Impact Assessment • Environmental and Social Management Plan • Feasibility Studies • Waste Management
4	Prasit Vaiyavajamai	• Waste Management, • Facilitation of meeting • Others (climate change) •
5	Christopher Brown	• Water Pollution Control • Groundwater and Hydrology • Noise and Vibration • Others (Project Management of EIAs)
6	David Nicholson	• Ecology and Biodiversity
7	Noppadol Sangiampaisalsuk	• Legal Analysis; • Risk Assessment and Hazard Management • Other – EHS management system

Area of Expertise
a) Air Pollution Control;
b) Ecology and Biodiversity;
c) Facilitation of meeting;
d) Geology and Soil;
e) Ground water and Hydrology;
f) Land use;
g) Legal Analysis;
h) Meteorology, Modeling for Air Quality;
i) Modeling for Water Quality;
j) Noise and Vibration;
k) Risk Assessment and Hazard Management;
l) Socio-Economy;
m) Water Pollution Control
n) Waste Management; and
o) Others

* The Consultants are allowed to select up to four (4) areas (at least one (1) area shall be selected) from the list of areas of expertise.

SECTION C : ACADEMIC QUALIFICATIONS*

Serial No. : 1 **Full name of the Selected Consultant: Nat Vanitchyangkul**

Year Started	Year completed	Full or part time	Course title	Institution	Title of degree / certificate**	Description of subject areas studied
1994	1996	Full	MEngSc (Civil)	Curtin University of Technology, Perth, Western Australia	MEngSc (Civil)	Engineering and environmental management including quality management and control.
1993	1995	Full	PostGradDip EIA	Murdoch University, Perth, Western Australia	PostGradDip EIA	Environmental impact assessment and environmental policy and laws.
1990	1994	Full	BSc (Hons) Industrial Chemistry	King Mongkut's Institute of Technology North Bangkok, Bangkok	BSc (Hons) Industrial Chemistry	Chemistry and chemical engineering

* Every Selected Consultant listed in 'Section B - PEOSONAL PROFILE OF THE CONSULTANTS OF THE ORGANIZATION ' must fill in this form.
** Please ensure copies of certificates or any proof of the academic qualification are enclosed. If those supporting evidence is written in other than Myanmar or English language, those shall be provisionally translated into Myanmar or English language.

SECTION D : WORKING EXPERIENCE*

Serial No. : 1 **Full name of the Selected consultant: Nat Vanitchyangkul**

Period	Organization or client	Position	Responsibilities	Verification Source – contact details of the organization/ client
1999-Present	ERM-Siam Co., Ltd.	Managing Partner	Nat Vanitchyangkul is the Managing Partner of ERM Office in Bangkok, Thailand. He is responsible for the overall management of Thailand operations, and performs the role as Partner-in-Charge for the Corporate Sustainability Program for ERM's managed accounts, including overseeing the management of medium to large scale projects in order to ensure the quality of ERM's service and deliverables to clients. During the course of his career, Nat has visited over 800 industrial facilities and construction sites and developed and led many EHS site investigations, audits, management training courses, seminars and workshops. His experience also includes ESG compliance assurance, environmental and social audits and due diligence, environmental impact assessments, strategic, process and performance benchmarking. He acted as an ISO 14001 Lead Assessor for the international certification body of ERM Group, namely ERM Certification and Verification Services (ERM CVS). He has conducted a number of ISO 14001 certification assessments on behalf of ERM-CVS.	ERM-Siam Co., Ltd

*Every selected Consultant listed in 'Section B - PEOSONAL PROFILE OF THE CONSULTANTS OF THE ORGANIZATION ' must fill in this form.

SECTION C : ACADEMIC QUALIFICATIONS*

Serial No. : 2 **Full name of the Selected Consultant: Plerngtape Chamikorn**

Year Started	Year completed	Full or part time	Course title	Institution	Title of degree / certificate**	Description of subject areas studied
1994	1998	Full	Environmental Engineering	University of Melbourne, Australia,	MEngSc in Environmental Engineering	Environmental Engineering
1989	1993	Full	Chemical Engineering	King Mongkut's Institute of Technology Thonburi, Bangkok	BEng in Chemical Engineering	Chemistry and Chemical Engineering

* Every Selected Consultant listed in 'Section B - PEOSONAL PROFILE OF THE CONSULTANTS OF THE ORGANIZATION ' must fill in this form.
** Please ensure copies of certificates or any proof of the academic qualification are enclosed. If those supporting evidence is written in other than Myanmar or English language, those shall be provisionally translated into Myanmar or English language.

SECTION D : WORKING EXPERIENCE*

Serial No. : 2 **Full name of the Selected consultant: Plerngtape Chamikorn**

Period	Organization or client	Position	Responsibilities	Verification Source – contact details of the organization / client
1999-Present	ERM-Siam Co., Ltd.	Partner	Mr Chamikorn acts as Partner and Practice Leader for Performance & Assurance and Transaction Service for ERM Thailand Business Unit. Mr Chamikorn has extensive experience mainly in the development and implementation of Environmental, Health and Safety (EHS) Management Systems and Compliance Assurance for a number of leading corporations and local companies. Mr Chamikorn has carried out a number of EHS compliance audits and provided regulatory review services for various industries. Mr Chamikorn has also undertaken a number of environmental performance assessments for leading corporations in Thailand such as Siam Cement Group covering petrochemical, cement, pulp & paper and building material business units.	*Mr. Nat Vanitchyangkul* *ERM-Siam Co., Ltd* *179 Bangkok City Tower, 24th Fl.* *South Sathorn Road,* *Tungamahamek, Bangkok*

*Every selected Consultant listed in 'Section B - PEOSONAL PROFILE OF THE CONSULTANTS OF THE ORGANIZATION 'must fill in this form.

SECTION C : ACADEMIC QUALIFICATIONS*

Serial No. : 3 **Full name of the Selected Consultant: Christopher Robert Brown**

Year Started	Year completed	Full or part time	Course title	Institution	Title of degree / certificate**	Description of subject areas studied
2015	2015	Full time	Executive Study	Judge Business School, University of Cambridge, UK	General Management Programme	Essential strategic knowledge, skills and insight to drive team performance. An understanding of the concepts and fundamental principles in key management disciplines, and how to apply them to improve decision-making within the organisation.
2005	2006	Full time	Environmental Engineering and Business Management	Imperial College, London	MSc. (DIC) in Environmental Engineering and Business Management	Environmental Engineering Business Management
2001	2005	Full time	Environmental Engineering,	Chulalongkorn University, Thailand	BEng. in Environmental Engineering	Environmental Engineering

* Every Selected Consultant listed in 'Section B - PEOSONAL PROFILE OF THE CONSULTANTS OF THE ORGANIZATION ' must fill in this form.
** Please ensure copies of certificates or any proof of the academic qualification are enclosed. If those supporting evidence is written in other than Myanmar or English language, those shall be provisionally translated into Myanmar or English language.

SECTION D : WORKING EXPERIENCE*

Serial No. : 3 **Full name of the Selected consultant: Christopher Brown**

Period	Organization or client	Position	Responsibilities	Verification Source – contact details of the organization / client
2013– Present	ERM – Siam Co.,Ltd. (Bangkok, Thailand)	Principal Consultant	Business Development Team Management Project Management Clients Management	Nat Vanitchyangkul
2011 – 2013	Dorsch Consult Asia Co.,Ltd. (Bangkok, Thailand)	Director/ Environmental Engineer	Business Development Team Management Project Management Clients Management	*Dorsch Consult Asia Co.,Ltd. (Bangkok, Thailand)*
2007 – 2010	Hyder Consulting Co.,Ltd. (London, UK)	Environmental Engineer	Business Development Team Management Project Management Clients Management Detailed Design Risk Management/ Risk Register	Hyder Consulting Co.,Ltd. (London, UK)
2006 – 2007	Grontmij Co., Ltd. (Reading, UK)	Environmental Engineer	Project Management Detailed Design of Water Treatment Plants Support EPC Contractors during construction phase	Grontmij Co., Ltd. (Reading, UK)

*Every selected Consultant listed in 'Section B - PEOSONAL PROFILE OF THE CONSULTANTS OF THE ORGANIZATION ' must fill in this form.

SECTION C : ACADEMIC QUALIFICATIONS*

Serial No. : 4 **Full name of the Selected Consultant: Prasit Vaiyavatjamai**

Year Started	Year completed	Full or part time	Course title	Institution	Title of degree / certificate**	Description of subject areas studied
1992	1996	Full time	Civil Engineering	Kasetsart University, Thailand	Bachelor of Science	Civil engineering
1999	2001	Full time	Environmental Engineering	University of Wisconsin at Madison, USA	Master of Science	Environmental Engineering
2009	2010	Part time	MBA	Thammasat University	MBA	MBA

* Every Selected Consultant listed in 'Section B - PEOSONAL PROFILE OF THE CONSULTANTS OF THE ORGANIZATION ' must fill in this form.
** Please ensure copies of certificates or any proof of the academic qualification are enclosed. If those supporting evidence is written in other than Myanmar or English language, those shall be provisionally translated into Myanmar or English language.

SECTION D : WORKING EXPERIENCE*

Serial No. : 4 **Full name of the Selected consultant: Prasit Vaiyavatjamai**

Period	Organization or client	Position	Responsibilities	Verification Source – contact details of the organization / client
1996-1998	Sino Thai Engineering and Consultant	Civil Engineer	Supervise the construction of new Ministry of Foreign Affair buildings	Human Resource at Sino Thai Engineering
2001-2003	Weaver Boos Consultant, Chicago, Illinois, USA	Staff Engineer	Preparation of the site plan, facility permits and development of air permits and new Subtitle D landfills in Illinois, USA	Human Resource at Weaver Boos Consultant
2004-2006	S2L Incorporated, Florida, USA	Project Engineer	Preparation of the applications for operation permit, closure plan and permit, Title V Air operation permit, and quality assurance for disposal facilities in Florida, USA	Human Resource at S2Li
2006-2007	Waste Management Siam, Thailand	Project Manager	Manage environmental audit team, mange two operation teams for day to day operation work, implement new projects	Human Resource at WMS
2007-2008	Mitsubishi UFJ Securities	Consultant	Provide consultancy to carbon credit projects in Thailand	Human Resource at Mitsubishi UFJ Securities
2008-2013	Carbon Partners Asiatica	Consultant and Director	Provide consultancy to carbon credit projects in Thailand, Vietnam, and other SEA countries	Human Resource at Carbon Partners Asiatica
2013-current	ERM-Siam	Principal Consultant	Provide consultancy and lead the team for sustainability and climate change topics	Human Resource at ERM

*Every selected Consultant listed in 'Section B - PEOSONAL PROFILE OF THE CONSULTANTS OF THE ORGANIZATION ' must fill in this form.

SECTION C : ACADEMIC QUALIFICATIONS*

Serial No. : 5 **Full name of the Selected Consultant: Christopher Robert Brown**

Year Started	Year completed	Full or part time	Course title	Institution	Title of degree / certificate**	Description of subject areas studied
2005	2007	Full	MSc in Environmental Engineering	University of Calgary	Master of Science	- Hydrology - Water Pollution - Water Treatment Technologies - Wastewater Treatment Technologies - Environmental Science - Air Pollution and Control
1998	2002	Full	BSC in Manufacturing Engineering	University of Calgary	Bachelor of Science	General engineering and scientific principles

* Every Selected Consultant listed in 'Section B - PEOSONAL PROFILE OF THE CONSULTANTS OF THE ORGANIZATION ' must fill in this form.
** Please ensure copies of certificates or any proof of the academic qualification are enclosed. If those supporting evidence is written in other than Myanmar or English language, those shall be provisionally translated into Myanmar or English language.

SECTION D : WORKING EXPERIENCE*

Serial No. : 5 **Full name of the Selected consultant: Christopher Brown**

Period	Organization or client	Position	Responsibilities	Verification Source – contact details of the organization / client
2013-Present	Environmental Resources Management, Bangkok, Thailand	Principal Consultant	• Management and delivery of environmental impact assessments (EIAs). • Project management • Client liaison • Analysis and technical review • Planning baseline sampling field operations • Budget management	Nat Vanitchyangkul | Managing Partner | ERM-Siam, Co Ltd 179 Bangkok City Tower, 24th Fl | South Sathorn Road, Thungmahamek, Sathorn, Bangkok 10120 | Thailand T (662) 679 5200 ext. 121 | M (668) 9921 8488 | F (662) 679 5209
2009-2013	International Environmental Management, Bangkok, Thailand	Project Manager	• Coordinated and managed EIAs and Site Assessments	International Environmental Management Co., Ltd. 8th Floor, The Fifth Building 5 Soi Pipat, Silom Rd. Bangrak, Bangkok, THAILAND 10500 Tel: 66(2) 636-6390~9, Fax: 66(2) 236-6276
2008-2009	Technology, Service and Consulting 1656, Bangkok, Thailand	Water Resources Engineer	• Led projects involving groundwater and marine monitoring, and wastewater treatment. • Performed water distribution network modeling and pipe leak detection for the Metropolitan Waterworks Authority of Bangkok.	*N/A*
2005-2007	Westhoff Engineering Resources, Calgary, Canada	Water Resources Engineer	• Erosion and Sediment Control Specialist. • Contributed to design manuals for Low Impact Development (LID) and Water Sensitive Urban Design (WSUD).	*N/A*
2002-2003	Galvanic Applied Sciences,	Mechanical	• Research and Development	*N/A*

	Calgary, Canada	Engineer	Assistant. Designed a portable humidity analyzer prototype. • Authored operating manuals for a moisture analyzer and a gas chromatograph. • Quality control internal auditor for ISO 9001:2000 certification.	

*Every selected Consultant listed in 'Section B - PEOSONAL PROFILE OF THE CONSULTANTS OF THE ORGANIZATION ' must fill in this form.

SECTION C : ACADEMIC QUALIFICATIONS*

Serial No. : 6 **Full name of the Selected Consultant: David Nicholson**

Year Started	Year completed	Full or part time	Course title	Institution	Title of degree / certificate**	Description of subject areas studied
1989	1992	Full Time		University of Newcastle, New South Wales, Australia	Bachelor of Applied Science (Environmental Assessment and Management)	Water Resource Management; Plant Systematics and Ecology
2005	2007	Part Time		University of Sydney, Australia Australian and New Zealand School of Government	Executive Masters in Public Administration (with Merit)	International Politics and Development; Government and Business Ethics; and Financial Management

* Every Selected Consultant listed in 'Section B - PEOSONAL PROFILE OF THE CONSULTANTS OF THE ORGANIZATION ' must fill in this form.
** Please ensure copies of certificates or any proof of the academic qualification are enclosed. If those supporting evidence is written in other than Myanmar or English language, those shall be provisionally translated into Myanmar or English language.

SECTION D : WORKING EXPERIENCE*

Serial No. : 6 **Full name of the Selected consultant: David Nicholson**

Period	Organization or client	Position	Responsibilities	Verification Source – contact details of the organization / client
2014 - Present	Environmental Resources Management Siam Co.	Principal Consultant	Lead the Energy Sector Team; Lead the ERM Biodiversity Practice for APAC	Nat Vanitchyungul, Office Managing Partner, ERM Siam
2010- 2014	Environmental Resources Management Australia and New Zealand	Principal Consultant	Lead the Impact Assessment and Planning Team; Lead the ERM Biodiversity Practice for APAC	Perry Cohn, Partner ERM ANZ, +61 2 8584 8888
2007- 2010	Department of Environment, Climate Change and Water (NSW Australia)	Manager Biodiversity and Vegetation Programs	Lead the development and implementation of biodiversity and vegetation management programs in NSW	Steve Beaman, Manager Waste Programs +61299955000
2002 -2007	Department of Environment and Conservation (NSW Australia)	Manager Forestry Policy and Regulation	Lead the development and implementation of forestry policy and regulation of forest industries in NSW	Steve Beaman, Manager Waste Programs +61299955000
1998 - 2002	Department of Environment and Conservation (NSW Australia)	Principal Policy Officer	Develop policy on conservation and water resources management for the NSW government	Steve Beaman, Manager Waste Programs +61299955000
1995 -1998	Environment Protection Authority (NSW Australia)	Policy Advisor/Senior Policy Advisor	Develop policy on conservation and water resources management for the NSW government	Steve Beaman, Manager Waste Programs +61299955000

1992 - 1995	Waverley and Wingecarribee Councils	Environment Officer	Provide monitoring and community support for environmental management for local government	General Manager, Wingecarribee Council +612 *4868 0888*

*Every selected Consultant listed in 'Section B - PEOSONAL PROFILE OF THE CONSULTANTS OF THE ORGANIZATION ' must fill in this form.

SECTION C : ACADEMIC QUALIFICATIONS*

Serial No. : 7 **Full name of the Selected Consultant: Noppadol Sangiampaisalsuk**

Year Started	Year completed	Full or part time	Course title	Institution	Title of degree / certificate**	Description of subject areas studied
1998	2000	Full time	Environmental Engineering	Sirindhorn International Institute of Technology, Bangkok, Thailand	M.Eng. (Civil)	
1994	1998	Full time	Construction Engineering	King Mongkut's Institute of Technology Ladkrabang, Bangkok, Thailand	B.Eng. (Construction)	

* Every Selected Consultant listed in 'Section B - PEOSONAL PROFILE OF THE CONSULTANTS OF THE ORGANIZATION ' must fill in this form.
** Please ensure copies of certificates or any proof of the academic qualification are enclosed. If those supporting evidence is written in other than Myanmar or English language, those shall be provisionally translated into Myanmar or English language.

SECTION D : WORKING EXPERIENCE*

Serial No. : 7 **Full name of the Selected consultant: Noppadol Sangiampaisalsuk**

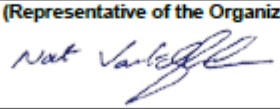
Period	Organization or client	Position	Responsibilities	Verification Source – contact details of the organization / client
2005-Present	ERM-Siam Co., Ltd.	Principal Consultant	Noppadol is a member of Performance and Assurance and Transaction Service (PATS) team. The scope of his responsibilities includes providing consultancy related to planning and development of strategic environmental, health and safety (EHS) management in accordance with corporate management standards and international standards e.g. ISO 14001 and OHSAS 18001. He is also responsible for leading the EHS management system audit, performance assessment and safety culture improvement program as well as EHS due diligence assessment for clients in various kinds of industry. His experiences include EHS management, development and implementation of EHS management standards and system, EHS performance & compliance audit and assessment, compliance assurance, safety culture improvement program, VOC emission inventory and management program, sustainability indicator and data management & verification, and EHS due diligence assessment for various clients in Southeast Asia region. His key sectors are oil & gas, chemical, mining and manufacturing.	ERM-Siam Co., Ltd.
2003-2005	Berli Jucker Public Company Limited	Marketing and Business Development Engineer	Develop environmental and energy business through establishment of client relationship; obtaining project requirements; coordinate with overseas	Berli Jucker Public Company Limited, Thailand

			and local suppliers and contractors to gather new/appropriate technology, know-how and product; conducting conceptual design and cost estimation for the turnkey environmental and energy related projects.	
2001-2003	Skanska Lundby AB	Quality, Environmental, Health and Safety Engineer	Establish and administer quality, environmental and health & safety management system for the underground wastewater collection pipeline construction project of Bangkok.	Skanska AB, Sweden

*Every selected Consultant listed in 'Section B - PEOSONAL PROFILE OF THE CONSULTANTS OF THE ORGANIZATION ' must fill in this form.

SECTION E : DECLARATION

I hereby apply for registration and agree to observe and abide by the Code of Conduct specified in the final part of this form. I certify that the statements contained in this form and the supporting evidence are correct to the best of my knowledge and belief.

Signature (Representative of the Organization) :	Date :
	3 June 2016

CODE OF CONDUCT

The registered organization is obliged to improve the standing of the environmental impact assessment profession by rigorously observing the following Codes of Conduct. Failure to conform may result in suspension or deregistration. All key consultants shall:

To act professionally, accurately and in an unbiased manner;

Strive to increase the competence and prestige of the environmental impact assessment profession;

Assist those under my supervision (if relevant) in developing their management, professional and environmental impact assessment skills;

Not to represent conflicting or competing interests and to disclose to any client or employer any relationship that may influence my judgment;

Not to accept any inducement, commission, gift or any other benefit from any interested party or knowingly allow colleagues to do so;

Not to intentionally communicate false or misleading information that may compromise the integrity of any EIA / IEE study; and

Not to act in a manner detrimental to the reputation of any of the stakeholders including the Ministry and the client.

FOR OFFICE USE ONLY

Date received:

Recorded by:

Attachment:

- ☐ Copy of ID card or Passport of the Representative and every selected Consultant
- ☐ Professional Resume of the Representative and every selected consultant
- ☐ Copies of certificate / any proof for academic qualification (written in or translated into Myanmar or English language)
- ☐ Copy of the certificate of incorporation

Additional comments, notes or recommendations (attached if necessary):

APPENDIX C TPMC'S HSE PLAN AND PROCEDURES

AHLONE 2

ISSUED
8 OCT 2018
TTCL PUBLIC COMPANY LIMITED

HSE PLAN PROCEDURE

PROJECT DOC. NO. F050-MNL-028

FOR INFORMATION

LNG POWER PLANT (AHLONE) PROJECT

TTCL JOB NO. F-050

Total (Including this Page): 24 sheets

0	24-Sep-18	For Information				
REV.	DATE	DESCRIPTION	MADE	CHECKED	APPROVED	AUTH'D

For Project Use only

Originator	Distribution	PW	PR	MA	ME	PP	EE	IN	CV	QC	PC	Proj	Site	Owner	Total
Project	No. of Copy	-	-	-	-	-	-	-	-	1	-	ORG.	1	1	4

บริษัท ทีทีซีแอล จำกัด (มหาชน)
TTCL PUBLIC COMPANY LIMITED

Revision History Sheet

Rev.	Date	Description
0	September 24, 2018	For Information

CONTENTS

Page

1. GENERAL 5

1.1 PURPOSE 5

1.2 SCOPE 5

1.3 DEFINITION 5

2. HSE MANAGEMENT SYSTEM 6

2.1 HSE GOAL AND OBJECTIVE 7

2.2 HSE POLICY, MANAGEMENT SYSTEM STANDARD AND REFERENCE DOCUMENTS 7

2.2.1 TTCL HSE POLICY 7

2.2.2 HSE MANAGEMENT SYSTEM STANDARD 10

2.2.3 REFERENCE DOCUMENTS 10

3. HSE ORGANIZATION AND RESPONSIBILITIES 10

3.1 HSE ORGANIZATION 10

3.2 HSE RESPONSIBILITIES 10

4. HSE REQUIREMENTS 14

4.1 HEALTH REQUIREMENTS 14

4.2 HSE REQUIREMENTS 15

4.2.1 SAFETY REQUIREMENTS 15

4.2.2 ENVIRONMENT REQUIREMENTS 16

4.3 PROJECT SITE SECURITY 19

5. HAZARD IDENTIFICATION, RISK ASSESSMENT AND 20

ENVIRONMENTAL ASPECT IDENTIFICATION & IMPACT DETERMINATION

CONTENTS Page

6. HAZARD AND ENVIRONMENTAL ASPECT COMMUNICATION 21

7. HSE TRAINING 21

8. HSE INSPECTION AND MANAGEMENT PATROL 21

8.1 PROJECT HSE INSPECTION AND MANAGEMENT PATROL 21

8.2 TTCL INTERNAL AUDIT 21

8.3 CONSTRUCTION EQUIPMENT INSPECTION 22

9. HSE MEETING 22

10. ACCIDENT/INCIDENT REPORT 23

11. EMERGENCY PREPAREDNESS AND RESPONSE 23

12. SUPPORTIVE PROCEDURES 24

13. APPENDIX 24

APPENDIX 1: Project HSE Objective (English Version)

APPENDIX 2: Project HSE Objective (Thai Version)

APPENDIX 3: Typical Project Organization

APPENDIX 4: TTCL HSE Management and Control Organization

1. GENERAL

1.1 PURPOSE

The purpose of this plan is to establish HSE management System, HSE requirements, HSE rules and regulations, HSE organization and responsibilities, and provide the HSE guidelines for accident incident prevention and environmental impact protection.

This plan establishes the minimum requirements for HSE execution of **LNG POWER PLANT (AHLONE) PROJECT** and establishes safe working practices and standards which shall be implemented on the site.

Depending upon the location of the site, it is likely that some conflict will arise between the requirements of the procedure and the Laws governing HSE at work in the country. In such even, the subcontractors shall apply the more stringent of the regulations at all times.

1.2 SCOPE

The scope of this document is to establish the minimum requirements for HSE execution, define the HSE standard, HSE organization, plan, rules and regulation, responsibilities and implementation guideline for construction phase of **LNG POWER PLANT (AHLONE) PROJECT**

1.3 DEFINITION

In this HSE plan, the following words and expressions are used, and they have the respective meaning hereby assigned to them, except where the context otherwise requires.

"CONTRACTOR" means **TTCL PUBLIC COMPANY LIMITED.** is onshore construction consortium member who perform the "Engineering Procurement and Construction (EPC) of the project.

"OWNER" means **TTCL POWER MYANMAR COMPANY LIMITED .(TPMC)** employing construction in connection with the "Engineering Procurement and Construction (EPC) of the project.

"SITE" means the place or places so designated by owner for construction of the project including places adjacent thereto which are for storage and assembly of equipment and materials.

"SUBCONTRACTOR(S)" means the subcontractor(s) employed by contractor or the owner in connection with the construction of the project.

"HSE" means Occupational Health, Safety and Environment.

"HSE MS" means Occupational Health, Safety and Environmental Management System
"Standard" means HSE standard which requires condition, or the adoption or use of one or more practices, operations or process, reasonably necessary or appropriated to safe employee healthful and environmental impact protection, such as TIS etc.

"Construction Phase" means Construction activities comprising direct (prefabrication assembly, pre-commissioning up to mechanical completion, and other activity specified in Contract) and indirect (scaffolding, transport at site, maintenance of equipment etc.).

"OHSAS" means Occupational Health Safety Assessment Standard.

"TIS" means Thailand Industrial Standard.

"ISO" means International Organization for Standardization

"EIA" means Environmental Impact Assessment. The EIA report is identify the environmental sensitivities and impacts relevant to the project and environmental impact protection requirement.

"Hazard" means intrinsic property or ability of something (e.g. work materials, equipment, work methods and practices) with potential to cause harm.

"Risk" means compiling result of hazard severity and its likelihood that has potential to cause harm.

"3R Principle" means Waste Management Principle: Reduce, Reuse and Recycle.

"PTA" means Pre Task Analysis.

"PPE" mean Personnel Protective Equipment.

"ERT" means Emergency Response Team.

2. HSE MANAGEMENT SYSTEM

The HSE Management System is summarized in this plan which defines the HSE principle requirements associated with the TTCL / Sub-Contractor and any others to be practiced at construction worksites of the project at all time, to ensure safely working environment for occupational health preservation, accident / incident prevention and environmental impact protection would be achieved.

2.1 HSE GOAL AND OBJECTIVE

LNG POWER PLANT (AHLONE) PROJECT HSE Goal is to maintain an injury free workplace with minimum adverse impact of the environment. Prevent community and promote resource conservation associate with project execution.

The project HSE objectives are established followings;

1) TTCL shall carry out project management and construction management activities in compliance with the applicable legal and other HSE requirements as specified in the contract.

2) TTCL shall perform and manage construction work in safe manner to achieve the safety target of "No Lost time Accident"

3) Project incidence rates should not exceed the following value;
IFR (incidence frequency rates), 3.7
ISR (incidence severity rates), 37

4) TTCL shall perform construction work by taking into account for the Environmental impact protection and complaint from the community shall be "Zero".

The Project HSE Objectives are shown in Appendix 1 and 2.

2.2 HSE POLICY, MANAGEMENT SYSTEM STANDARD AND REFERENCE DOCUMENTS

2.2.1 TTCL HSE POLICY

TTCL Top Management considers Occupational Health, Safety and Work Place Environment issues concerned with all employees, subcontractors, customers and the community to be the utmost importance. TTCL Top Management has developed, implemented and maintained the Occupational Health, Safety and Environmental Management system and committed to provide direction and necessary resource to ensure the desirable HSE goal and objectives, including the full compliance with Thailand HSE regulation, relevant standards and requirements would be achieved.

To clearly and concisely communicated; the TTCL HSE policy and objectives are communicated to all project's personnel, subcontractor and vender through TTCL Management messages, newsletters, Pre-Mobilization Meeting, HSE awareness or HSE training program and HSE campaigns.

The TTCL HSE policy shows as the following:

บริษัท ทีทีซีแอล จำกัด (มหาชน)
TTCL PUBLIC COMPANY LIMITED
COMPANY REGISTRATION NO. 0107551000185
27th-30th FLOOR, SERMMIT TOWER, 159/41-44 SUKHUMVIT 21, ASOKE ROAD,
NORTH KLONGTOEY, WATTANA, BANGKOK 10110 THAILAND
TEL. +66 (0) 2260-8505 FAX. +66 (0) 2260-8525-6

As of June 18, 2015

HSE POLICY

TTCL Public Company Limited is a leading engineering contractor that specializes in design, engineering, procurement, construction and commissioning of turnkey projects for both industrial and process plants including related facilities. The company is most active in the fields of chemicals, petrochemicals, oil and gas, fertilizers and power generation plants.

The safety of our employees, partners, concerned parties and environmental protection are our highest priorities. TTCL is committed to maintain an injury free workplace with minimum adverse impact of the environment. With recognition to the importance of Occupational Health, Safety and Environmental Management, the company has introduced the Occupational Health, Safety and Environmental Management System as part of this commitment.

In order to achieve our desired goals, the President & CEO has established a HSE Policy Statement. This policy states:

1. *All company activities shall comply with all HSE legal and other applicable requirements.*
2. *HSE Policy and related HSE information shall be communicated to employees, partners and concerned parties to make them understand their duties and responsibilities regarding the Occupational Health, Safety and Environmental Management System and perform their tasks correctly.*
3. *HSE Objectives for the company and projects shall be established. A monitoring, measurement and control system shall be established to monitor HSE performance.*
4. *HSE Procedures and documentation for each project and functional organizations shall be established and implemented so that all activities are performed safely with concern for the environment.*
5. *The necessary resources shall be provided to support the implementation of the Occupational Health, Safety and Environmental Management Systems.*
6. *Top management shall review the HSE Policy and objectives annually for its effectiveness and suitability and seek out the opportunity for improvement of the Occupational Health, Safety and Environmental Management Systems.*

Hironobu Iriya
President& CEO
TTCL Public Company Limited

บริษัท ทีทีซีแอล จำกัด (มหาชน)
TTCL PUBLIC COMPANY LIMITED
COMPANY REGISTRATION NO. 0107551000185
27th-30th FLOOR, SERMMIT TOWER, 159/41-44 SUKHUMVIT 21, ASOKE ROAD,
NORTH KLONGTOEY, WATTANA, BANGKOK 10110 THAILAND
TEL. +66 (0) 2260-8505 FAX. +66 (0) 2260-8525-6

ณ วันที่ 18 มิถุนายน 2558

นโยบาย ด้านอาชีวอนามัย ความปลอดภัยและสิ่งแวดล้อม

บริษัท ทีทีซีแอล จำกัด (มหาชน) เป็นหนึ่งในผู้นำด้านธุรกิจวิศวกรรมบริการและรับเหมาก่อสร้างแบบครบวงจร มีความเชี่ยวชาญในการให้บริการออกแบบ, วิศวกรรมบริการ, จัดซื้อ จัดหาวัสดุอุปกรณ์และรับเหมาก่อสร้างแบบเบ็ดเสร็จ สำหรับภาคอุตสาหกรรมและโรงงาน รวมถึงสิ่งสนับสนุนอำนวยความสะดวกต่างๆ ในการผลิต โดยลูกค้าส่วนใหญ่เป็นกลุ่มโรงงานเคมี ปิโตรเคมี โรงกลั่นน้ำมันและก๊าซ โรงปุ๋ยและโรงไฟฟ้า เป็นต้น

บริษัทฯ ให้ความสำคัญอย่างสูงสุดต่อความปลอดภัยและอาชีวอนามัยของพนักงาน, คู่ค้า, ผู้ที่มีส่วนเกี่ยวข้องต่างๆ รวมถึงการป้องกันผลกระทบต่อสิ่งแวดล้อม บริษัทฯ จึงแสดงเจตนารมณ์ที่จะสร้างและรักษาไว้ซึ่งสภาพการทำงานที่ปลอดภัย ไม่มีการบาดเจ็บหรือการเจ็บป่วยจากการทำงาน และป้องกันการเกิดผลกระทบต่อสิ่งแวดล้อม

ด้วยความตระหนักถึงความสำคัญของระบบการบริหารจัดการด้านอาชีวอนามัย ความปลอดภัยและสิ่งแวดล้อม บริษัทฯ จึงได้นำเอาระบบการบริหารจัดการด้านอาชีวอนามัย ความปลอดภัยและสิ่งแวดล้อมเข้ามาเป็นส่วนหนึ่งในการดำเนินงานของบริษัทฯ และเพื่อให้บรรลุตามเป้าหมายที่ตั้งไว้ ประธานเจ้าหน้าที่บริหารและกรรมการผู้จัดการใหญ่ของบริษัทฯ จึงได้กำหนดนโยบายอาชีวอนามัย ความปลอดภัย และสิ่งแวดล้อมไว้ดังนี้

1. การดำเนินงานของบริษัทฯจะต้องสอดคล้องกับกฎหมาย และข้อกำหนดอื่นๆที่เกี่ยวข้องในด้านอาชีวอนามัย ความปลอดภัยและสภาพแวดล้อมในการทำงานและการป้องกันผลกระทบต่อสิ่งแวดล้อม
2. นโยบาย ข้อมูล ข่าวสาร ด้านอาชีวอนามัย ความปลอดภัยและสิ่งแวดล้อมจะต้องถูกสื่อสารไปยังพนักงาน คู่ค้าและผู้มีส่วนเกี่ยวข้องเพื่อให้เข้าใจ บทบาทหน้าที่ความรับผิดชอบและปฏิบัติได้อย่างถูกต้อง
3. วัตถุประสงค์ด้านอาชีวอนามัย ความปลอดภัยและสิ่งแวดล้อมของบริษัทฯและโครงการทุกแห่งรวมถึงระบบการติดตาม, วัดผลและควบคุมจะต้องถูกกำหนดขึ้น เพื่อติดตามประสิทธิผลของการดำเนินงาน ด้านอาชีวอนามัย ความปลอดภัยและสิ่งแวดล้อม
4. ระเบียบปฏิบัติและเอกสารที่เกี่ยวข้องในด้านอาชีวอนามัย ความปลอดภัย และสิ่งแวดล้อมของบริษัทฯ และโครงการจะต้องถูกจัดทำขึ้นและนำไปปฏิบัติตาม เพื่อให้การดำเนินกิจกรรมต่างๆ ของบริษัทฯ เป็นไปด้วยความปลอดภัยและคำนึงถึงสิ่งแวดล้อม
5. ทรัพยากรต่างๆที่จำเป็น จะได้รับการสนับสนุนให้เพียงพอต่อการดำเนินงานตลอดจนการดูแลรักษาและปรับปรุงพัฒนาระบบการบริหารจัดการด้านอาชีวอนามัย ความปลอดภัยและสิ่งแวดล้อม
6. นโยบาย และวัตถุประสงค์ด้านอาชีวอนามัย ความปลอดภัยและสิ่งแวดล้อมของบริษัทฯ จะต้องถูกทบทวนโดยผู้บริหารระดับสูงเป็นประจำทุกปี เพื่อทบทวนประสิทธิผลของการดำเนินงาน และความเหมาะสมกับสภาวการณ์ของนโยบาย และวัตถุประสงค์ ดังกล่าว รวมถึง มองหาโอกาสในการปรับปรุงและพัฒนา ระบบการบริหารจัดการด้านอาชีวอนามัย ความปลอดภัยและสิ่งแวดล้อมของบริษัทฯ

นายฮิโร โนบุ อิริยา
ประธานเจ้าหน้าที่บริหารและกรรมการผู้จัดการใหญ่
บริษัท ทีทีซีแอล จำกัด (มหาชน)

2.2.2 HSE MANAGEMENT SYSTEM STANDARD

The Occupational Health, Safety and Environmental Management system apply to LNG POWER PLANT (AHLONE) PROJECT. All personnel who involved with "the Project" worksites and activities are required to comply with the requirements of these HSE Management systems.

2.2.3 REFERENCE DOCUMENTS

The followings documents shall be used as applicable or for reference together with this HSE Plan.

(a) TTCL HSE Manual and Company Procedure (QM-130 and QPs)
(b) Contract Documents / Project Specifications
(c) TTCL applicable Supportive Procedure and Supportive Reference (SP and SR)
(d) Occupational Health and Safety Management system standards TIS18001 /OHSAS 18001 and Environmental Management System Standards ISO 14001currently revision.
(e) Others specific requirements and standards applicable to the project.

3. HSE ORGANIZATION AND RESPONSIBILITIES

3.1 HSE ORGANIZATION

TTCL Project Management shall establish Project HSE Organization sufficiently resourced and assigned competent person, to manage the HSE aspects of the Project within TTCL responsibility. For implementation and measure the effectiveness of the HSE system. Typical Project Organization is shown in Appendix 3.

3.2 HSE RESPONSIBILITY

TTCL PROJECT MANAGER (PM)

PM is responsible for assuring the implementation of HSE Policy, HSE Plan, HSE procedure and instruction to ensure that safe operation are performed by TTCL, Subcontractors including the compliance with Thailand HSE regulation, relevant standards and requirements.

PM shall coordinate with HSEM for provide the preventive plan for hazardous material handling and the demarcation and lay-out of areas for storage of various materials, in the particular where dangerous materials or substances are concerned.

PM is responsible for Environmental Management System during project site construction prior are minimize environmental impact and increase efficiently preventive measurement and ensuring all persons in project have environmental awareness

TTCL CONSTRUCTION MANAGER (CM)

CM is responsible for the execution of HSE procedure and instruction that safe operationsare performed by TTCL, Subcontractors including visitors and concerned persons.

CM in cooperative with HSEM, is responsible to appoint the competent persons to carry out routine or periodic inspection to construction equipments and activities inclusive of following; (but not limited to)

- Electrical equipments and appliance including hand tools.
- Scaffolding, temporary platforms ladders (Access and Egress).
- Cranes, Lifting appliance and Lifting gear / shackle.
- Heavy vehicle and Fork lift.
- Excavation including support and access
- Confined Space working
- Radiography Work
- Fire Fighting
- Spill kit

TTCL Commissioning Manager

Commissioning Manager shall supersede CM function on handed over and equipment. For grey area concern which its scope is not clear separated then it shall be co responsible by Commissioning Manager and CM. Following are Commissioning Manager responsible (but not limit to);

a) Ensure that hazards of working in commissioning are or equipment are identified and adequate preventive / protective measures are in place prior to work.
b) Approve JSA and risk assessment and Permit to Work for commissioning work and work which will be performed in commissioning area.
c) Provide adequate protection for person working on commissioning equipment from hazardous stored energy e.g. Training , LOTO, warning sign, hard barricade, appropriate PPE,etc.

TTCL Commissioning Engineer

Commissioning Engineer shall be responsible (but not limit to);

a) Review JSA and risk assessment and Permit to Work for commissioning work any work performed in commissioning area or equipment.
b) Administrative control of LOTO.
c) Check and confirm that the equipment is complete isolated and de-energized them release the Permit to Work.

TTCL HSE MANAGER/ LEADER (HSEM)

HSEM is responsible to develop an effective HSE management program;

- To establish project HSE procedures and instruction covering project activities, to ensure effective compliance with the company HSE policy, Project HSE requirements.
- Develop and implement the HSE program, organize HSE meetings, collect and report and analyze HSE performance against objective and identify initiative for implement where necessary with training.

- To establish and implement HSE promotion program.
- To implement risk assessment and environmental impacts determination and control.

HSEM shall responsible to following;

1. Ensure risk identified and risk assessment, environmental aspects identification and impacts determination are communicated to TTCL PM and Subcontractor Representatives and all concern parties including Owner.
2. Monitor and maintain the HSE performance of the Project.
3. Close contact with TTCL PM, Subcontractor Representative on the Project to enforces HSE standard practice and responsible to provide HSE feedback to TTCL PM.
4. Ensure all TTCL's Subcontractors are complying with the Project HSE requirements.
5. Ensure that Subcontractor's appointed Safety Officers who are qualified and capable of performing the duties assigned.
6. Appoint HSE competent persons or inspectors to carry out routine or periodic HSE inspection to identify unsafe action, unsafe condition, environmental aspects and take corrective action, to assure reporting of all incident and accident.
7. Ensure TTCL, Subcontractors are carry out periodic inspections of all tools and equipments and relevant records are maintained.
8. Ensure all HSE meetings; PTA toolbox talks and any required meetings are conducted and reported to all concerned.

TTCL SAFETY OFFICER (SFO)

Safety Officer Professional level (SFO) shall responsible to

1. Provide HSE training to project personnel and ensure that all project personnel have attended the HSE induction and others specific HSE training required.
2. Ensure that TTCL, Subcontractors are in full compliance with the HSE requirements under scope of works being conducted on the project, in relation to Project specific HSE rule and regulation, HSE Plans and Procedures.
3. Ensure all first aid equipments, safety equipments, spill kit, security facilities are maintained in good condition and in sufficient quantities and necessary training provided.
4. Report to HSEM for HSE matter within the project.
5. Analysis HSE statistic and provide the report to HSEM.

TTCL ENVIRONMENTAL ENGINEER (ENV)

Environmental Engineer (ENV) shall responsible to

1. Provide HSE training to project personnel and ensure that all project personnel have attended the HSE induction and others specific HSE training required.
2. Ensure that TTCL, Subcontractors are in full compliance with the HSE requirements under scope of works being conducted on the project, in relation to Project specific HSE rule and regulation, HSE Plans and Procedures.
3. Overall implementation of Waste Management, monitoring and report to HSEM and PM of any issue concerns.
4. Assist Subcontractor plans and coordinates the works for effectively implement the requirements of the procedure.
5. Ensure the required HSE records are generated and available for review by TTCL HSEM.
6. Ensure that waste management data shall be reported in weekly basis.

7. Prepare supportive document and coordinate with Project Owner for waste generator licensed requisition from DIW.

TTCL Supervisor and Engineer

SV or EN (Regardless of main contractor or subcontractor) shall responsible to;

a) Implementation of safety measure indicated in risk control plan and risk reduction plan are in place prior to work
b) Prepare and/ or review work method statement, Job Safety Analysis & Risk Assessment (JSA/RA)
c) Work preparation; right tool and equipments, adequate number and skilled of workers
d) Check and confirm condition of construction equipments, clearance of hazard in working area, skill and readiness of workers and lead tool box talk to commence daily work
e) On the training to workers of safe work and instruction to correct use of PPE
f) Direct responsible to his subordinate (and / or lower tier subcontractor) workers safety for any arising incident e.g. emergency situation therefore he shall keep record of manpower and report to HSE center accordingly.

TTCL SAFETY SUPERVISOR (SSV)

Safety technician level (SSV) shall responsible to

1. Ensure that the project HSE policy, requirements, procedure and HSE working practice are fully understood and being effectively applied.
2. Create healthy and safely working condition and environmental impact prevention throughout the project.
3. Conduct HSE inspection and reporting to Safety Officer.

SUBCONTRACTOR MANAGEMENT REPRESENTATIVE

Subcontractor Management Representatives shall responsible to

1. Ensure that Subcontractor's project HSE plan and procedure has been established and that it is adequate for Project HSE requirement,
2. Ensure that Subcontractor's project HSE plan and procedure are fully implemented and maintained,
3. Monitor their HSE performance and take appropriate corrective / preventive action if need.

SUBCONTRACTOR SAFETY OFFICER/ENVIRONMENTAL ENGINEER

Subcontractor Safety Officer/Environmental engineer shall responsible to

1. Ensure that their HSE Plan and Procedures are fully implemented and comply with the project HSE requirements,
2. Ensure that all risk assessment and significant environmental aspect are identified on the project and communicate to their employees,
3. Implement and maintain Daily Tool Box Talk and HSE Meeting,
4. Practice in the HSE inspection program and HSE promotion programs,
5. Report all HSE matter to Subcontractor Representatives.

EMPLOYEES / WORKER

All employees / workers at all levels are involved in accident prevention and environmental impact protection. Individual employee actions are the key to achievement

of HSE Goal and objectives. They have a duty to themselves and their follow employees to exercise care and good judgment in preventing accidents, avoiding hazards to health and environmental protection.

Each employee / worker is responsible for their health protection, safety and environmental impact protection and that of their co-worker whilst on the project, the responsibilities of individual worker / employee is following;

- To attend project HSE training.
- To attend a daily / weekly toolbox talk to be aware and understand the HSE requirement in the area.
- To ensure they have the correct PPE for executing work, and used it correctly.
- To ensure all tools and equipments work properly and have been inspected before used.
- To execute work in accordance with the HSE procedure and instruction.
- To report any unsafe action or unsafe condition or environmental aspect& impact to their immediate supervisor and / or HSE personnel immediately.
- Participate in and support the HSE Policy, and their site HSE promotion program.

4. HSE REQUIREMENTS

4.1 HEALTH REQUIREMENTS

TTCL develop the health requirement for occupational health preservation and protection to ensuring good occupational health for project's personnel.

General Provision

Project's personal hygiene is importance, so the temporary office and all facilities, working area, equipments / tools and storage area shall be kept in hygienic conditions.

EIA Requirements

Owner and TTCL must comply with EIA Requirements

Health Medical Facilities and First Aid

- TTCL shall provide First Aid Center, First Aid Staff and First Aid Equipments in accordance with Thailand Regulation or applicable local legislation.
- TTCL shall provided personnel First Aid instruction and training such as basic CPR/First Aid from Professional Nurse according to specific work risk.
- TTCL shall manage to acquire medical service from nearest hospital as need.
- TTCL shall arrange initial first aid with 1 emergency vehicle at the construction area for hospitalizing purpose in accordance with Thai Regulation

Welfare Facilities

- TTCL shall construct toilet for construction workers not less than those required by the Ministerial Regulation No. 2 issue under the factory Act A.D. 1992 together with the proper waste water treatment using septic tanks and cesspools.

Sanitation

- TTCL shall provide sufficient covered garbage container at the proper location to ensure adequate storage capacity and prevent litter accumulating.

- TTCL shall provide sufficient signage and containers for materials to be reused or recycled to ensure proper segregation and storage capacity, enabling the maximum reuse and recycling of material.
- TTCL shall provide sufficient signage and containers for hazardous waste and hazardous materials to avoid spillage to the environment, By safe storage, collection and disposal in accordance with Thailand regulation.
- TTCL shall collect and dispose of all wastes and recycle them in accordance with Thailand regulation.
- TTCL shall treatment of each area as necessary to prevent the breeding of insects and vermin.
- TTCL shall contact the local government authorized agencies to collect all garbage for disposal

Substances Hazardous to Health

- TTCL establish the minimum requirements for controlling substances that may be hazardous to health, which will address the instruction for handling of
- chemical, potentially toxic and hazardous materials required at each worksite.

4.2 HSE REQUIREMENTS

4.2.1 SAFETY REQUIREMENTS

- TTCL shall develop and implement HSE Management System.
- TTCL Project Manager responsible for maintain ratio of Safety Supervisor per project workforce at 1:50. (To be adjusted as per project requirement)
- The qualified safety supervisor shall as a minimum, be qualified by having attend a course approved by Ministry of Labor for Safety Practitioner.
- TTCL shall develop the project HSE procedure and instruction for identification and elimination of construction hazards, HSE incentives which focus on recognizing and awarding positive HSE activities which eliminate potential hazard incidents, the enhancement of workforce HSE behavior and awareness, and elimination of all personnel injury.

The project's HSE procedures, HSE instructions would be covered owner' HSE requirements and communicated to subcontractors by various methods such as class room training, Tool box talk, documents, CD Rom etc., to ensure that all subcontractors are acknowledged and comply with HSE procedures shall be at least as followings (But not limited to);

- Risk Assessment & JSA
- PPE provided and using guidelines.
- Incident and Emergency Response Plan
- Fire Prevention
- Excavation
- Scaffolding
- Fall Protection
- Lifting Rigging and Crane Operation

- Equipment Inspection
- Electrical Inspection and Grounding
- Compressed Gas Cylinder Handling
- Permit to Work
- Energy Isolation
- Hazard Communication
- Pressure Test
- Etc.
- TTCL will develop and implement necessary HSE Training Program for project personnel.
- TTCL will implement Work Permit system associate with Risk Assessment and Job Safety Analysis.
- TTCL will develop and implement HSE inspection and audit program to ensure project worksite achieves a safe working condition for accident and incident prevention.
- TTCL will maintain HSE statistics and generate weekly, monthly report to all concerned.
- TTCL and Subcontractors shall provide the PPE as defined standard by legal for their employee as followings;

Uniform: Trousers and Long Sleeves shirt

Mandatory basic PPE;

- Safety Helmet with chin strap (Bearing the name or logo of company and color to be agreed with TTCL).
- Safety Shoes
- Safety Glasses
- Specific PPE as required by circumstance (SDS or JSA);
- Hearing Protection
- Specific Hand protection as required
- Goggle
- Rubber boots with toe protection
- Safety harness and lifeline, include fall arrester
- Filtered eye protection for welding
- Respirator equipment as required by circumstance
- Chemical suit
- Etc. as work related.

4.2.2 ENVIRONMENTAL PROTECTION REQUIREMENTS

EIA (Project Environmental Impact Assessment)

Project Environmental Impact Assessment (EIA) mitigation measure shall be implement by all project's personnel.

Environmental Impact Control

TTCL shall provide the "Environmental Control and Management Plan" for environmental impact control system of the project, this plan will meet the following

principle:

- Prevent adverse impacts on human health and the environment.
- Reduce wastes and emissions to achieve reduction goals and manage a product's life cycle from inception to final disposal.
- Prevent Soil and Groundwater contamination.
- Control noise levels which are nuisance to project personnel and communities.
- The Facility should be low impact on the community. (e.g. Noise, Light, Odors, Smoke, Dust, etc.).
- Meet applicable regulatory requirement.

And this plan shall address the EIA mitigation measure issue; this plan will be included environmental monitoring and testing program (if required in project EIA monitoring measure) such as water sampling, noise monitoring, and emission monitoring and ambient monitoring.

Waste Management (Solid waste and Liquid waste)

- TTCL shall develop the Waste Management Plan for the project. This plan provides guideline and minimum requirements for handle, collection and separation of waste, offsite disposal method and management. Waste Management Plan established in accordance with project EIA mitigation measure, Industrial Estate requirements (if any) and 3R principle for reduce waste.
- All solid waste would be registered and the disposition would be done through an approved waste disposal company.
- For the draining of sanitary and chemical waste water, water used for the spraying or rinsing of equipment during project construction phase shall be authorized by owner and Industrial Estate.
- Prohibit littering or discarding construction material into the water drainage system.
- Site runoff shall pass though an over/under weir and be monitoring for contaminants.

Air Management

- The operation of the combustion installation or combustion engines (e.g. aggregates, welding machine, engine-driving pump, etc.) shall be in compliance with the Thailand regulation requirement.
- No waste oils may be used as fuel. Only standard fuels that can be obtained commercially may be used (e.g. light fuel oil, butane, propane, natural gas and petrol).
- The combustion installation shall be safely operated and not result in an increase of the fire risk.
- When certain activities may result in the emission of dangerous substances, the work method shall be determined beforehand.
- Open fires (with the exception of flame torch and acetylene welding/cutting and roofing burners) are forbidden.
- TTCL, Subcontractors shall keep construction machine and vehicle in good condition to reduce the pollutant emission.
- TTCL, Subcontractors shall provide canvas to cover the trucks carrying during construction material transportation to the project for material falling protection or prevent dust dispersion.
- TTCL, Subcontractors shall clean up the access roads or public roads if construction materials drop or spill during transportation.

Noise Control

Noise control measure will be applied to all project equipment by using low noise equipment where practicable. Where high noise cannot be reduced following method can be applied.

- Hydraulic piling hammers will be used wherever practicable in preference to diesel driven hammer.
- Acoustic shielding will be employed to contain the high noise levels in defined project boundaries.
- Silencers will be fitted during blow down and drying of lines and vessels during pre-commissioning.

Prior to the commencement of noisy or vibration operation TTCL Construction Manager (CM) shall inform intended working hours to owner. Noise and vibration monitoring program will be developed by TTCL.

Wastewater Management

The following mitigation measures are presented for minimizing impact from wastewater handling and disposal;

- Construction equipment and vehicle washing to be carried out at designed areas provided with wash water collection systems. Alternatively, equipment and vehicle washing may be carried out at off-site locations (such as central workshops of contracting companies), where adequate facilities are available. The wash water collection system will typically include settling tanks for separation of suspended solids and oil& grease. The floating oil& grease is to be removed using skimmers or soaking pads and collected in drums. The water after settling is to be routed to Sewage treatment plant (STP) for treatment.
- Sewage generated on-site to be collected through underground pipes into holding tanks, from where the sewage will be routed to onsite sewage treatment plant or alternatively transport periodically by vacuum trucks and transferred to an approved sewage treatment plant to the site for treatment and disposal;
- The hydro test water need to be collected in the lined pond and the water to be tested for any contaminants. If the collected hydrotest water is found not to be contaminated, and further if the water quality conforms to land discharge standards, then the water can be discharged on to the land in small quantities. The discharge will be done in a way as to avoid drainage from large areas. However, if the water is found contaminated then it is to be evaporated in the pond, else it is to be treated in the wastewater treatment plant after the plant is operational.
- Accidental spillages of hazardous substances to be immediately remediated to prevent contaminated runoffs and potential contamination of soil and groundwater;
- Waste consignment notes to be prepared and documented for transportation of wastewater (sanitary and other wastewater), if any, to offsite treatment facilities.

Soil, spill containment and clean-up

- Spillage of any harmful substance shall be immediately reported to TTCL and owner representative in charge. Where the potential for spill is evident, the appropriate spill kit shall be provide and readily for use. The necessary training should be provided to ERT.

- All chemical substance that can leach out, as well as all liquid, shall be stored in such a way that any leaks shall not cause a risk of soil contamination (e.g. placement in a vat, double tanks, etc.).
- The used of any fueling device which may be locked open for hands free operation is prohibited. All fueling devices shall be carrying out with 100% hand control.
- If leak causes soil contamination, it shall be cleaned up immediately. The clean up costs (namely, carry out of analysis, soil drillings and the clean up operation itself) shall be paid for by the polluter. (PPP; Polluter Pay Principle).
- The moving of soil or modifying the level of the grounds is only permitted after written confirmation from owner representative in charge.
- The storage of chemical is not allowed on the site. The sole exception on this rule is made when the products are needed for executing activities. At the working point, a storage of max 24 hours is permitted given they are stored on a safe
  (e.g. fire, explosion, pollution etc.) and environmentally aware way (see soil). When the storage of big quantities imposes itself, this shall be discussed with and put down in writing by owner representative and TTCL person in charge and Environment Consultant Service Company.

Traffic Management Plan

The main aim of traffic management plan is to assist TTCL and subcontractor employees in complying with all applicable traffic and transportation requirements during construction state. Furthermore the propose of this plan is to provide the framework for movement of equipment, workers and local community to/from the project site.

- The employees including the drivers are to be trained on the driving requirement to be followed for the project;
- The movements of heavy vehicles and equipment are to be planned in such a way such as to avoid peak hours on main roads in order to minimize traffic congestion;
- Training on defensive driving are to be provided for drivers. The drivers are also to be trained on emergency response measures and requirements;
- Approved transporters are to be used for transportation of hazardous materials and heavy equipment/goods.
- TTCL shall provide security officer for 24 hours, who responsibly to monitor, check and control traffic of construction area.

4.3 PROJECT SITE SECURITY

TTCL shall arrange appropriate security system and develop site security plan for the project and lay down area.

5. HAZARD IDENTIFICATION, RISK ASSESSMENT AND ENVIRONMENTAL ASPECTS IDENTIFICATION& IMPACTS DETERMINATION

The identification of hazards, risk assessment/ environmental aspect identification& impact determination and management of the risk/ impact in order to achieve the HSE a goal is incorporated into the general management principles and working procedure. The system is

designed to identify hazards/ environmental aspects during associated with construction activities and execution of the work. In addition, the system is also designed to cover identification of hazard/ environmental aspect in the facilities.

The planning, identification and communication of risk assessment/ environmental aspect & impact determination and risk/ impact management takes place in a number of forums, e.g.

- Routine and non-routine activities.
- Department meeting.
- Supervision of work activities.
- Job Safety Analysis (JSA) and Hazard Identification system.
- Internal, second party and third party audits.
- Management review meetings.
- Planned inspection and patrol.
- Project and contract meetings

All project employees and line supervisors are responsible for identification and elimination of hazards/ environmental aspects.

Communications of hazards/ environmental aspects and controls: individuals identifying a hazard/ environmental aspect are responsible for taking immediate action and eliminate the hazard/environmental aspect it selves whenever possible. If unable to eliminate the hazard/ environmental aspect, the individual will ensure that the situation is highlighted as a warning to others and will notify concerned supervisor, HSE personnel or management to initiate the corrective action.
The recording of hazards/ environmental aspects identification and corrective actions taken or planned will be maintained in a number of ways, e.g. JSA records, Accident reports, HSE Audit Reports, Inspection reports, Minutes of meetings, Tool box Talk records, etc. The HSE Department will maintain these records and, in addition, will maintain a Corrective Action Log, which will summarize all corrections, which have been identified and indicate the current status of corrective actions.

All outstanding corrective actions with regard to HSE record in the various records will be assigned to a responsible person for close-out and will be followed up by the HSE Department to ensure that they are closed out in a timely manner.
All hazards and risks/ environmental aspects and impacts identified will be reviewed and objectives and priorities set for their resolution. Personal will be identified as responsible for successful resolution in a timely manner.

The determination of controls uses the results of risk assessment/ environmental impact determination for consideration which is given to reduce the risks/ environmental impacts according to the following hierarchy as Elimination, Substitution, operational controls, Signage or warnings, PPE etc.

6. HAZARD AND ENVIRONMENTAL ASPECT COMMUNICATION

TTCL shall communicate to all project personnel whom using or handle of chemical and hazardous substances.

7. HSE TRAINING

TTCL is responsible for conducting preliminary and continuous HSE training for all personnel in order to develop and maintain personal interest in the HSE program and to train personnel in the safe practices and work procedures.

TTCL shall identified the training need for Project persons, including subcontractors and other concerned, and initiate a training program to demonstrate that the person involved are suitably qualified and competent.

8. HSE INSPECTION AND AUDIT PROGRAM

8.1 PROJECT HSE INSPECTION AND MANAGEMENT PATROL

TTCL shall develop the HSE inspection and management patrol program which Site HSE inspection shall be conducted daily by TTCL and subcontractor Safety officer/Environmental Engineer.

In addition periodical management patrol, which performed by TTCL Site Managements, Superintendents, Supervisors, HSE personals and Subcontractor's representative should be conducted weekly, to observe and verify the effectiveness of
HSE control measure employed on site.

All discrepancies noticed during HSE inspection and Management Patrol shall be promptly report to TTCL Project Manager, Subcontractor Representatives and concerned HSE personnel who will take immediately correction and provide corrective / preventive action to prevent recurrence. The records shall be properly filed.

TTCL as well as owner representative has the right to stop any work or acts which are considered to be dangerous without any obligation. All TTCL and Subcontractors personnel shall promptly comply with the instructions of TTCL and/or owner representative at all times.

8.2 TTCL INTERNAL AUDIT

The "Internal Audit" shall be performed to verify the effective implementation of Occupational Health and Safety Management System (OHSAS 18001 / TIS 18001), Environmental Management System (EMS, ISO 14001) to ensure that the control measures applied to associate risk/ environmental impact and HSE activities are properly executed.

"Internal Audit" shall be performed in accordance with the predetermined schedule on the certain scope, taking the project activities into consideration.

The audit findings shall be recorded and the audit result shall be sent to the TTCL PM, and project organization concerned. In case Nonconformity has been found in the audit, the "Corrective Action Request" (CAR) shall be issued to concerned person for correction or rectification and prevention of recurrence.

8.3 CONSTRUCTION EQUIPMENT INSPECTION

Construction Equipment such as cranes, lifting equipment, electrical appliances and vehicles shall be inspected when brought into the site.

Related certification or third party / authority inspection documents (if any) shall be submitted and proven identification shall be displayed on the equipment. And also this construction equipment on the site shall be inspected by designated personnel at specified intervals (minimum 3 month / time). Inspection records on check lists shall be kept as evidences.

9. HSE MEETING

considers HSE meetings a highly important part of the HSE Management System in that they permit HSE communication to take place between management and employees, and vice versa.

AIMS AND PURPOSE OF HSE MEETINGS

- A team orientated and transparent communication tool.
- An economical use of time in disseminating HSE information.
- An opportunity to contribute ideas, suggestions for HSE improvements.
- A tool for continuing education and motivation of the workforce.
- A tool to maximize proactive HSE performance at work.
- To openly discuss sound HSE practice and emphasize areas that needs improvement.
- Better understanding of SITE related HSE issues for line Management/ supervision.

AGENDA

HSE meetings provide a communications flow on HSE matters. Topics to be discussed shall include, but are not limited to:-

- Review/ Discuss Management HSE concerns.
- Review/ Discuss Employee HSE concerns.
- Review/ Discuss Accident/incident investigation.
- Reporting and follow-up status of unsafe acts, conditions and practices with discuss action and corrective action (s) to expedite closure.
- Review/ Discuss all fire and emergency situations and potential hazards/ significant environmental aspects since the last HSE meeting.
- Review/ Discuss Work procedures.
- To remind the important objective of personal protective equipment.
- Additional Requisition HSE awareness training program.
- Propose the HSE Incentive program, and related campaign(s).
- Review/Discuss Site Security program.

ATTENDANCE

1) HSE Weekly Meeting

The meetings shall be attended by owner representative, TTCL and all subcontractors HSE representatives and consider to invite concerned Subcontractors Supervisors.

2) HSE Committee Monthly Meeting

The Committee meeting shall be attended by owner representative, TTCL PM /CM, HSEM, Safety officers/Environmental Engineer and all Subcontractor Representatives and HSE personnel.

The committee agenda shall focus on the following:

- Review of past months meeting minutes.
- Actions taken.
- High-risk work or activity/ high significant environmental aspects
- Current activities and problem areas.
- Accident review and corrective actions.
- Future activities.

HSE committee meeting attendance is mandatory for each Subcontractor.

MINUTES OF MEETING

Minutes of Meeting shall be recorded by TTCL Safety officer/Environmental Engineer, reviews by TTCL HSEM and approved by TTCL PM then distributed to all members. It shall be responsibility of all committee members to ensure that the topics discussed at these meeting's are, where required, disseminated appropriately and effectively. Subcontractors shall take the necessary action to promptly implement HSE committee directives and recommendations.

10. ACCIDENT/INCIDENT REPORT

All accident / incident, which occur at or in association with the Project, will be reported and investigated as following.

- Near miss and first aid reported by incident initial report
- Injury, illness, property damage, environmental accident and all fire incident case reported by incident initial report and followed with detail investigation report

TTCL shall develop the accident/incident investigation and report procedure for identify the primary causes to prevention the re-occurrence by root cause analysis method.

11. EMERGENCY PREPAREDNESS AND RESPONSE

TTCL shall develop the project emergency response plan and procedure which suitable for project requirements and situation.

Project's Emergency Response Team (ERT) would be appointed and trained and resourced with required rescues equipment.

Emergency drill including all fires case, spills, other environmental& safety related issues would be conducted once a year.

12. SUPPORTIVE PROCEDURES

Specific details of HSE implementation would be described in the following supportive procedures;

1. F050-MNL-047 : Risk Assessment, JSA &EIA Tool Box Talk Procedure

2. F050-MNL-049 : Confined Space Entry Procedure
3. F050-MNL-061 : Pressure Test Procedure
4. F050-MNL-048: Permit to Work Procedure
5. F050-MNL-051 : Control of Hazardous (Lockout/ Tagout) Procedure
6. F050-MNL-024 : Environmental Control and Management Plan
7. F050-MNL-026: Waste Management Plan
8. F050-MNL-029 : Site Security Procedure
9. F050-MNL-050 : Personal Protective Equipment Procedure

13. APPENDIX

APPENDIX 1: Project HSE Objective (English Version)

APPENDIX 2: Project HSE Objective (Thai Version)

APPENDIX 3: Typical Project Organization

APPENDIX 4: TTCL HSE Management and Control Organization

บริษัท ทีทีซีแอล จำกัด (มหาชน)
TTCL PUBLIC COMPANY LIMITED

PROJECT TITLE

HSE OBJECTIVE

FOR PROJECT "LNG POWER PLANT (AHLONE) PROJECT''

JOB NO. "F-050"

The HSE Objectives, for Project "LNG POWER PLANT (AHLONE) PROJECT" are defined as follow;

1) *TTCL shall carry out project management and construction management activities in compliance with the applicable legal, and other HSE requirements as specified in the contract.*

2) *TTCL shall perform and manage construction work in safe manner to achieve the safety target of "No Lost time Accident"*

3) *Project incidence rates should not exceed the following value;*

   ***IFR** (incidence frequency rates), 3.7*

   ***ISR** (incidence severity rates), 37*

4) *TTCL shall perform construction work by taking into account for the environmental impact protection and complaint from the community shall be "**Zero**",*

.....

(.....)

Project Manager

TTCL Public Company Limited

APPENDIX 2

บริษัท ทีทีซีแอล จำกัด (มหาชน)
TTCL PUBLIC COMPANY LIMITED

PROJECT TITLE

วัตถุประสงค์ด้านอาชีวอนามัย ความปลอดภัยและสิ่งแวดล้อม

โครงการ "LNG POWER PLANT (AHLONE) PROJECT"

โครงการเลขที่ "F-050"

โครงการฯ ได้กำหนดวัตถุประสงค์ด้านอาชีวอนามัย ความปลอดภัยและสิ่งแวดล้อมของโครงการ "LNG POWER PLANT (AHLONE)PROJECT" ไว้ดังต่อไปนี้

1) บริษัท ทีทีซีแอล จำกัด (มหาชน) จะบริหารและดำเนินการก่อสร้างโครงการฯภายใต้การดำเนินการที่สอดคล้องกับกฎหมายและข้อกำหนดด้านอาชีวอนามัย ความปลอดภัยและสิ่งแวดล้อมอื่นๆที่บังคับใช้กับโครงการหรือตามที่ได้ตกลงกันไว้ในสัญญาจ้าง

2) บริษัท ทีทีซีแอล จำกัด (มหาชน) จะดำเนินการ ก่อสร้างโครงการฯ ให้เป็นไปด้วยความปลอดภัย โดยปราศจากอุบัติเหตุถึงขั้นหยุดงาน (No Los Time Accident)

3) บริษัท ทีทีซีแอล จำกัด (มหาชน) จะควบคุมค่าดัชนีด้านความถี่ และความรุนแรงของอุบัติเหตุในโครงการฯ ตามที่ได้ตั้งเป้าหมายไว้ ดังต่อไปนี้

IFR (ดัชนีความถี่ของอุบัติเหตุ), 3.7

ISR (ดัชนีความรุนแรงของอุบัติเหตุ), 37

4) บริษัท ทีทีซีแอล จำกัด (มหาชน) จะดำเนินการก่อสร้างโดยความตระหนักถึงความสำคัญในการบริหารจัดการ ด้านการป้องกันผลกระทบต่อสิ่งแวดล้อม ทั้งนี้จะต้องไม่มีข้อร้องเรียนจากชุมชน

.....

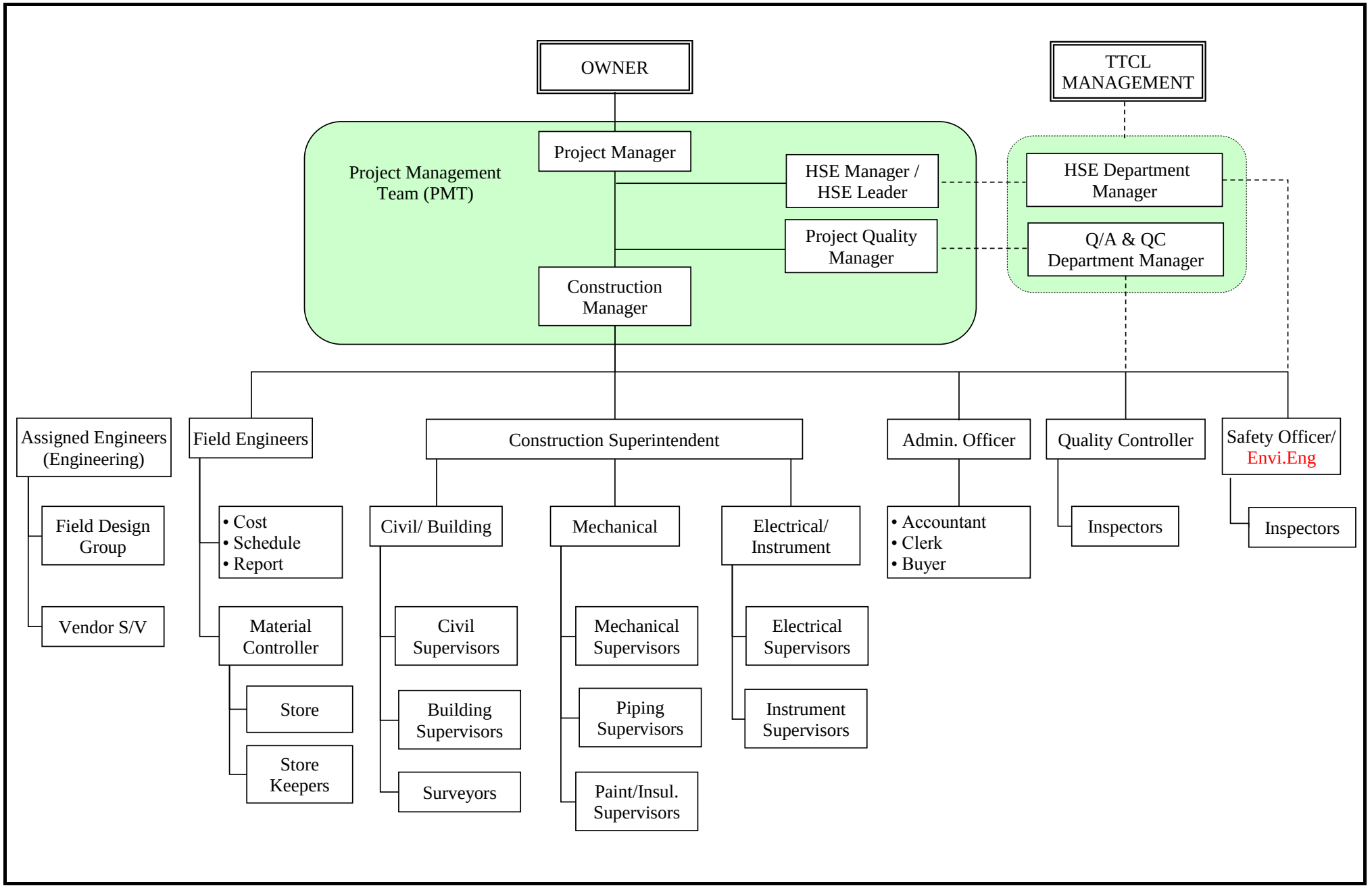
(.....)

ผู้จัดการโครงการ

บริษัท ทีทีซีแอล จำกัด (มหาชน)

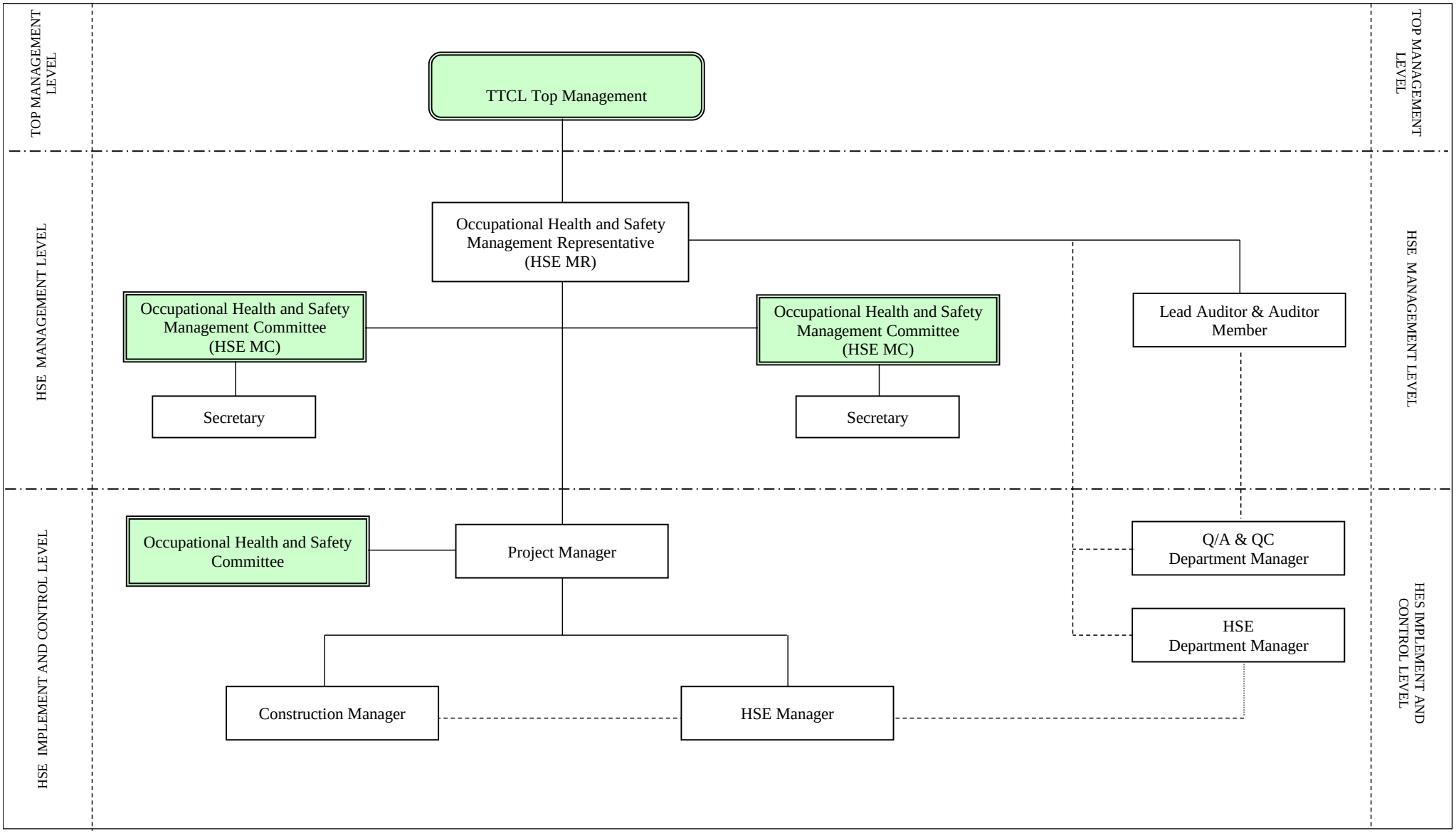
APPENDIX-3

Typical Project Organization



APPENDIX-4

TTCL Occupational Health and Safety Management and Control Organization



APPENDIX D NOTICE TO PROCEED

The Republic of the Union of Myanmar

Ministry of Natural Resources and Environmental Conservation

Environmental Conservation Department

Office Number (53), Naypyitaw.

Letter No: EIA- 2/ Petroleum (2339/2018)

Date: 26 December, 2018

To

TTCL PUBLIC COMPANY LIMITED

Subject: **Responding confirmation of Third Party to Environmental Resources Management (ERM) & Sustainable Environment Myanmar (SEM) who will comply IEE about 230 KV Transmission Line from Ahlone to Hlaingtharyar for TTCL Public Co., Ltd**

Reference: (1) Letter No. TTCL 112/18 H/O, of TTCL Public Co., Ltd on 11.10.2018

(2) Ministry Letter No. (Forest) 3 (2)/ 16 ((D) (4548/2018) on 30.11.2018

1. Refer as per subject, TTCL Public Company Limited requested to allow to conduct IEE report for 230 KV Transmission Line from Ahlone to Hlaingtharyar by Third Party who are Environmental Resources Management (ERM) & Sustainable Environment Myanmar Co., Ltd (SEM) according reference letter No (1). After ECD reviewed and forwarded to Ministry office, then Ministry office allow to respond as per reference letter No (2).

2. We, ECD found out that Third Party who ERM (Hong Kong) & SEM will conduct IEE for propose project had registered certificate. Many specialist members will participate as Environmental and Social Impact Assessment, Transmission and Distribution Studies, Climate Change Adaptation and Carbon Credits, Risk Management, De-contamination, Decommissioning and Demolition, Health and Safety, Terrestrial Biodiversity, Marine and Coastal Surveys, Stakeholder Engagement, Public/ Community Consultation and disclosure, Resettlement, Pipeline Routing Studies, Atmospheric Dispersion Modeling, Aquatic Discharge Modeling, Site Investigation and Remediation, Environmental Management Planning, Oil Spill Contingency Planning. And also SEM has experiences and many specialists will participate as Energy, Public Consultation & Stakeholder Engagement, Floral Ecology, Aquatic Ecology, IT Engineering, Environmental Geology, Cultural Heritage and Social.

3. Therefore, there has no objection for Third Party who are Environmental Resources Management (ERM) & Sustainable Environment Myanmar Co., Ltd (SEM) for conducting of IEE for Transmission Line from Ahlone to Hlaingtharyar in Yangon Division for TTCL Public Company Limited .

XXXXX

On Behalf of DG

U Soe Naing

Director

Copy to-

MONREC, Union Office No. (28)

Director, ECD Yangon Division

Office received, Letter series, Case File

ပြည်ထောင်စုသမ္မတမြန်မာနိုင်ငံတော်အစိုးရ
သယံဇာတနှင့်သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဝန်ကြီးဌာန
ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာန
ရုံးအမှတ်(၅၃)၊ နေပြည်တော်

စာအမှတ် ၊အီးအိုင်အေ-၂/၂(၂၃၃၉/၂၀၁၈)
ရက်စွဲ ၊၂၀၁၈ခုနှစ် ဒီဇင်ဘာလ ၂၆ ရက်

သို့

TTCL Public Co., Ltd

အကြောင်းအရာ။ **TTCL Public Co., Ltd မှ ဆောင်ရွက်မည့် ၂၃၀ ကေဗွီ အလုံမှ လှိုင်သာယာသို့ လျှပ်စစ်ဓာတ်အားလိုင်း သွယ်တန်းခြင်းလုပ်ငန်းအတွက် ကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း ဆောင်ရွက်ရန် တတိယအဖွဲ့အစည်းအဖြစ် Environmental Resources Management (ERM) နှင့် Sustainable Environment Myanmar Co., Ltd (SEM) အား ငှားရမ်းအပ်နှံခြင်းနှင့် စပ်လျဉ်း၍ သဘောထားမှတ်ချက်ပြန်ကြားခြင်း**

ရည်ညွှန်းချက်။ (၁) TTCL Public Co., Ltd ၏ ၁၁.၁၀.၂၀၁၈ ရက်စွဲပါ စာအမှတ်၊ TTCL 112/18 H/O

(၂) ဤဝန်ကြီးဌာန၊ ပြည်ထောင်စုဝန်ကြီးရုံး၏ ၃၀.၁၁.၂၀၁၈ ရက်စွဲပါ စာအမှတ်၊ (သစ်တော)၃(၂)/၁၆(ဃ)(၄၅၄၈/၂၀၁၈)

၁။ အကြောင်းအရာပါကိစ္စနှင့်ပတ်သက်၍ TTCL Public Co., Ltd မှ ရန်ကုန်တိုင်း ဒေသကြီး၊ အလုံမြို့နယ်မှ လှိုင်သာယာမြို့နယ်သို့ ၂၃၀ ကေဗွီ လျှပ်စစ်ဓာတ်အားလိုင်း သွယ်တန်းခြင်းလုပ်ငန်းအတွက် ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ငန်းများ ဆောင်ရွက်ရန် Environmental Resources Management (ERM) နှင့် Sustainable Environment Myanmar Co., Ltd (SEM) အား တတိယအဖွဲ့အစည်းအဖြစ် ငှားရမ်းအပ်နှံခြင်းနှင့် စပ်လျဉ်း၍ စီစစ်ပြီး သဘောထား ပြန်ကြားပေးနိုင်ပါရန် ရည်ညွှန်း(၁) ပါ စာဖြင့် တင်ပြလာခြင်းအပေါ်စီစစ်၍ ပြည်ထောင်စုဝန်ကြီးရုံးသို့ ဆက်လက်တင်ပြရာ ဝန်ကြီးရုံးမှ ရည်ညွှန်း(၂) ပါစာဖြင့် ပြန်ကြားခွင့်ပြုကြောင်း အကြောင်းကြားလာပါသည်။

၂။ တင်ပြလာသော တတိယအဖွဲ့အစည်းဖြစ်သည့် Environmental Resources Management (ERM) - Hong Kong သည် ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာနမှ ကြားကာလ အကြိမ်ပေး လုပ်ကိုင်သူ မှတ်ပုံတင်ခြင်းအထောက်အထားလက်မှတ် ထုတ်ပေးထားသည့် ကုမ္ပဏီဖြစ်ကြောင်း စီစစ်တွေ့ရှိရပြီး ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း ဆောင်ရွက်မည့် အဖွဲ့ဝင်များတွင် Environmental and Social Impact Assessment, Transmission and Distribution Studies, Climate Change Adaptation and Carbon Credits, Risk Management, De-contamination,

Decommissioning and Demolition, Health and Safety, Terrestrial Biodiversity, Marine and Coastal Surveys, Stakeholder Engagement, Public/community Consultation and Disclosure, Resettlement, Pipeline Routing Studies, Atmospheric Dispersion Modelling, Aquatic Discharge Modelling, Site Investigation and Remediation, Enviromental Management Planning, Oil Spill Contingency Planning စသည့် နယ်ပယ်ဆိုင်ရာ ကျွမ်းကျင်ပညာရှင်များ ပါဝင်ကြောင်း စိစစ်တွေ့ရှိရပါသည်။ ထို့ပြင် Sustainable Environment Myanmar Co., Ltd (SEM) သည် ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာနမှ ကြားကာလ အကြံပေး လုပ်ကိုင်သူ မှတ်ပုံတင်ခြင်း အထောက်အထားလက်မှတ် ထုတ်ပေးထားသည့် ကုမ္ပဏီဖြစ်ကြောင်း စိစစ်တွေ့ရှိရပြီး ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း ဆောင်ရွက်မည့် အဖွဲ့ဝင်များတွင် Energy, Public Consultation & Stakeholder Engagement, Floral Ecology, Aquatic Ecology, IT Engineering, Environmental Geology, Cultural Heritage and Social ဆိုင်ရာ ကျွမ်းကျင်ပညာရှင်များ ပါဝင်ကြောင်း စိစစ်တွေ့ရှိရပါသည်။

၃။ သို့ဖြစ်ပါ၍ TTCL Public Co., Ltd မှ ဆောင်ရွက်မည့် ရန်ကုန်တိုင်းဒေသကြီး၊ အလုံမြို့နယ်မှ လှိုင်သာယာမြို့နယ်သို့ ၂၃၀ ကေဗွီ လျှပ်စစ်ဓာတ်အားလိုင်းသွယ်တန်းခြင်း လုပ်ငန်းအတွက် ကနဦး ပတ်ဝန်းကျင်ဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ငန်းများ ဆောင်ရွက်ရန် တတိယအဖွဲ့အစည်းအဖြစ် Environmental Resources Management (ERM) နှင့် Sustainable Environment Myanmar Co., Ltd (SEM) အား ငှားရမ်းအပ်နှံခြင်းအပေါ် ကန့်ကွက်ရန်မရှိကြောင်း အကြောင်းကြား အပ်ပါသည်။

ညွှန်ကြားရေးမှူးချုပ် (ကိုယ်စား)
(စိုးနိုင်၊ ညွှန်ကြားရေးမှူး)

မိတ္တူကို

ပြည်ထောင်စုဝန်ကြီးရုံး၊ သယံဇာတနှင့်သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဝန်ကြီးဌာန၊ ရုံးအမှတ် (၂၈)

ညွှန်ကြားရေးမှူး၊ ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာန၊ ရန်ကုန်တိုင်းဒေသကြီး ရုံးလက်ခံ၊ မျှောစာတွဲ၊ အမှုတွဲချုပ်။

APPENDIX E LIST OF INVASIVE SPECIES

Table 1: List of Invasive Species

Species	Kingdom	Phylum	Class	Order	Family	System
Abrus precatorius	Plantae	Magnoliophyta	Magnoliopsida	Fabales	Fabaceae	Terrestrial
Acacia longifolia	Plantae	Magnoliophyta	Magnoliopsida	Fabales	Fabaceae	Terrestrial
Acacia mangium	Plantae	Magnoliophyta	Magnoliopsida	Fabales	Fabaceae	Terrestrial
Acanthophora spicifera	Plantae	Rhodophyta	Florideophiceae	Ceramiales	Rhodomelaceae	Marine
Acridotheres tristis	Animalia	Chordata	Aves	Passeriformes	Sturnidae	Terrestrial
Adenanthera pavonina	Plantae	Magnoliophyta	Magnoliopsida	Fabales	Fabaceae	Terrestrial
Aedes aegypti	Animalia	Arthropoda	Insecta	Diptera	Culicidae	Terrestrial
Albizia julibrissin	Plantae	Magnoliophyta	Magnoliopsida	Fabales	Fabaceae	Terrestrial
Alpinia zerumbet	Plantae	Magnoliophyta	Liliopsida	Zingiberales	Zingiberaceae	Terrestrial
Alternanthera philoxeroides	Plantae	Magnoliophyta	Magnoliopsida	Caryophyllales	Amaranthaceae	Terrestrial
Alternanthera sessilis	Plantae	Magnoliophyta	Magnoliopsida	Caryophyllales	Amaranthaceae	Terrestrial
Anas platyrhynchos	Animalia	Chordata	Aves	Anseriformes	Anatidae	Freshwater_terrestrial
Anoplolepis gracilipes	Animalia	Arthropoda	Insecta	Hymenoptera	Formicidae	Terrestrial
Anoplophora chinensis	Animalia	Arthropoda	Insecta	Coleoptera	Cerambycidae	Terrestrial
Anser anser	Animalia	Chordata	Aves	Anseriformes	Anatidae	Freshwater_terrestrial
Ardisia crenata	Plantae	Magnoliophyta	Magnoliopsida	Primulales	Myrsinaceae	Terrestrial
Arundo donax	Plantae	Magnoliophyta	Liliopsida	Cyperales	Poaceae	Terrestrial
Brontispa longissima	Animalia	Arthropoda	Insecta	Coleoptera	Chrysomelidae	Terrestrial
Caesalpinia decapetala	Plantae	Magnoliophyta	Magnoliopsida	Fabales	Fabaceae	Terrestrial
Carassius auratus	Animalia	Chordata	Actinopterygii	Cypriniformes	Cyprinidae	Freshwater
Cardamine flexuosa	Plantae	Magnoliophyta	Magnoliopsida	Capparales	Brassicaceae	Terrestrial

Species	Kingdom	Phylum	Class	Order	Family	System
Casuarina equisetifolia	Plantae	Magnoliophyta	Magnoliopsida	Casuarinales	Casuarinaceae	Terrestrial
Channa marulius	Animalia	Chordata	Actinopterygii	Perciformes	Channidae	Freshwater
Chromolaena odorata	Plantae	Magnoliophyta	Magnoliopsida	Asterales	Asteraceae	Terrestrial
Cipangopaludina chinensis	Animalia	Mollusca	Gastropoda	Architaenioglossa	Viviparidae	Freshwater
Clarias batrachus	Animalia	Chordata	Actinopterygii	Siluriformes	Clariidae	Freshwater
Clarias gariepinus	Animalia	Chordata	Actinopterygii	Siluriformes	Clariidae	
Colubrina asiatica	Plantae	Magnoliophyta	Magnoliopsida	Rhamnales	Rhamnaceae	Terrestrial
Columba livia	Animalia	Chordata	Aves	Columbiformes	Columbidae	Terrestrial
Ctenopharyngodon idella	Animalia	Chordata	Actinopterygii	Cypriniformes	Cyprinidae	Freshwater
Cyprinus carpio	Animalia	Chordata	Actinopterygii	Cypriniformes	Cyprinidae	Freshwater
Dalbergia sissoo	Plantae	Magnoliophyta	Magnoliopsida	Fabales	Fabaceae	Terrestrial
Diaphorina citri	Animalia	Arthropoda	Insecta	Hemiptera	Psyllidae	Terrestrial
Dioscorea bulbifera	Plantae	Magnoliophyta	Liliopsida	Liliales	Dioscoreaceae	Terrestrial
Eichhornia crassipes	Plantae	Magnoliophyta	Liliopsida	Liliales	Pontederiaceae	Terrestrial
Epipremnum pinnatum	Plantae	Magnoliophyta	Liliopsida	Arales	Araceae	Terrestrial
Ficus microcarpus	Plantae	Magnoliophyta	Magnoliopsida	Urticales	Moraceae	Terrestrial
Gallus gallus	Animalia	Chordata	Aves	Galliformes	Phasianidae	Terrestrial
Gambusia affinis	Animalia	Chordata	Actinopterygii	Cyprinodontiformes	Poeciliidae	Freshwater
Hemidactylus frenatus	Animalia	Chordata	Reptilia	Squamata	Gekkonidae	Terrestrial
Herpestes javanicus	Animalia	Chordata	Mammalia	Carnivora	Herpestidae	Terrestrial
Hiptage benghalensis	Plantae	Magnoliophyta	Magnoliopsida	Polygalales	Malpighiaceae	Terrestrial
Hygrophila polysperma	Plantae	Magnoliophyta	Magnoliopsida	Scrophulariales	Acanthaceae	Terrestrial

Species	Kingdom	Phylum	Class	Order	Family	System
Hypophthalmichthys nobilis	Animalia	Chordata	Actinopterygii	Cypriniformes	Cyprinidae	Freshwater
Imperata cylindrica	Plantae	Magnoliophyta	Liliopsida	Cyperales	Poaceae	Terrestrial
Lespedeza cuneata	Plantae	Magnoliophyta	Magnoliopsida	Fabales	Fabaceae	Terrestrial
Leucaena leucocephala	Plantae	Magnoliophyta	Magnoliopsida	Fabales	Fabaceae	Terrestrial
Limnocharis flava	Plantae	Magnoliophyta	Liliopsida	Alismatales	Limnocharitaceae	Terrestrial
Limnophila sessiliflora	Plantae	Magnoliophyta	Magnoliopsida	Scrophulariales	Scrophulariaceae	Terrestrial
Lotus corniculatus	Plantae	Magnoliophyta	Magnoliopsida	Fabales	Fabaceae	Terrestrial
Lutjanus kasmira	Animalia	Chordata	Actinopterygii	Perciformes	Lutjanidae	Marine
Macaca mulatta	Animalia	Chordata	Mammalia	Primates	Cercopithecidae	Terrestrial
Maconellicoccus hirsutus	Animalia	Arthropoda	Insecta	Hemiptera	Pseudococcidae	Terrestrial
Melilotus alba	Plantae	Magnoliophyta	Magnoliopsida	Fabales	Fabaceae	Terrestrial
Misgurnus anguillicaudatus	Animalia	Chordata	Actinopterygii	Cypriniformes	Cobitidae	Freshwater
Monomorium floricola	Animalia	Arthropoda	Insecta	Hymenoptera	Formicidae	Terrestrial
Monopterus albus	Animalia	Chordata	Actinopterygii	Synbranchiformes	Synbranchidae	Freshwater
Neyraudia reynaudiana	Plantae	Magnoliophyta	Liliopsida	Cyperales	Poaceae	Terrestrial
Nypa fruticans	Plantae	Magnoliophyta	Magnoliopsida	Asterales	Asteraceae	Terrestrial
Oreochromis	Animalia	Chordata	Actinopterygii	Perciformes	Cichlidae	Freshwater
Oreochromis aureus	Animalia	Chordata	Actinopterygii	Perciformes	Cichlidae	Freshwater
Oryctes rhinoceros	Animalia	Arthropoda	Insecta	Coleoptera	Scarabaeidae	Terrestrial
Paederia foetida	Plantae	Magnoliophyta	Magnoliopsida	Rubiales	Rubiaceae	Terrestrial

Species	Kingdom	Phylum	Class	Order	Family	System
Paratrechina longicornis	Animalia	Arthropoda	Insecta	Hymenoptera	Formicidae	Terrestrial
Paspalum scrobiculatum	Plantae	Magnoliophyta	Liliopsida	Cyperales	Poaceae	Terrestrial
Passer domesticus	Animalia	Chordata	Aves	Passeriformes	Passeridae	Terrestrial
Persicaria perfoliata	Plantae	Magnoliophyta	Magnoliopsida	Polygonales	Polygonaceae	Terrestrial
Poecilia reticulata	Animalia	Chordata	Actinopterygii	Cyprinodontiformes	Poeciliidae	Freshwater
Porphyrio porphyrio	Animalia	Chordata	Aves	Gruiformes	Rallidae	Freshwater_terrestrial
Prosopis	Plantae	Magnoliophyta	Magnoliopsida	Fabales	Fabaceae	Terrestrial
Psittacula krameri	Animalia	Chordata	Aves	Psittaciformes	Psittacidae	Terrestrial
Pycnonotus jocosus	Animalia	Chordata	Aves	Passeriformes	Pycnonotidae	Terrestrial
Python bivittatus	Animalia	Chordata	Reptilia	Squamata	Pythonidae	Terrestrial
Raffaelea lauricola	Fungi	Ascomycota	Sordariomycetes	Ophiostomatales	Ophiostomataceae	Terrestrial
Rattus exulans	Animalia	Chordata	Mammalia	Rodentia	Muridae	Terrestrial
Rottboellia cochinchinensis	Plantae	Magnoliophyta	Liliopsida	Cyperales	Poaceae	Terrestrial
Rubus niveus	Plantae	Magnoliophyta	Magnoliopsida	Rosales	Rosaceae	Terrestrial
Rumex crispus	Plantae	Magnoliophyta	Magnoliopsida	Polygonales	Polygonaceae	Terrestrial
Rusa unicolor	Animalia	Chordata	Mammalia	Artiodactyla	Cervidae	Terrestrial
Senegalia catechu	Plantae	Magnoliophyta	Magnoliopsida	Fabales	Fabaceae	Undefined
Solenopsis geminata	Animalia	Arthropoda	Insecta	Hymenoptera	Formicidae	Terrestrial
Streptopelia decaocto	Animalia	Chordata	Aves	Columbiformes	Columbidae	Terrestrial
Suncus murinus	Animalia	Chordata	Mammalia	Insectivora	Soricidae	Terrestrial
Syzygium cumini	Plantae	Magnoliophyta	Magnoliopsida	Myrtales	Myrtaceae	Terrestrial

Species	Kingdom	Phylum	Class	Order	Family	System
Tapinoma melanocephalum	Animalia	Arthropoda	Insecta	Hymenoptera	Formicidae	Terrestrial
Terminalia catappa	Plantae	Magnoliophyta	Magnoliopsida	Myrtales	Combretaceae	Terrestrial
Trachycarpus fortunei	Plantae	Magnoliophyta	Liliopsida	Arecales	Arecaceae	Terrestrial
Trogoderma granarium	Animalia	Arthropoda	Insecta	Coleoptera	Dermestidae	Terrestrial
Tubastraea coccinea	Animalia	Cnidaria	Anthozoa	Scleractinia	Dendrophylliidae	Marine
Viverricula indica	Animalia	Chordata	Mammalia	Carnivora	Viverridae	Terrestrial
Xyleborus glabratus	Animalia	Arthropoda	Insecta	Coleoptera	Curculionidae	Terrestrial
Xylosandrus mutilatus	Animalia	Arthropoda	Insecta	Coleoptera	Scolytidae	Terrestrial
Yersinia pestis	Bacteria	Proteobacteria	Gammaproteobacteria	Enterobacteriales	Enterobacteriaceae	Terrestrial
Zizania latifolia	Plantae	Magnoliophyta	Liliopsida	Cyperales	Poaceae	Terrestrial
Ziziphus mauritiana	Plantae	Magnoliophyta	Magnoliopsida	Rhamnales	Rhamnaceae	Terrestrial
Zosterops japonicus	Animalia	Chordata	Aves	Passeriformes	Zosteropidae	Terrestrial

Source: GISD, 2019

APPENDIX F PRESENTATION SLIDES

LNG ဓာတ်အားပေးစက်ရုံ
စီမံကိန်း(အလုံ) အတွက်
230KV ဓာတ်အားလိုင်းသွယ်တန်းရေး

၂၉ ၊၃၀ အောက်တိုဘာလ ၊ ၂၀၁၉

The business of sustainability

ERM

ရည်ရွယ်ချက်များ

- စီမံကိန်းအကောင်အထည်ဖော်မည့် အဖွဲ့အစည်းကို ဖော်ပြပေးရန်
- စီမံကိန်း၏ နောက်ဆုံးအချက်အလက် များကို တင်ပြပေးရန်
- ကနဦးပတ်ဝန်းကျင် ဆန်းစစ်သည့် အဖွဲ့အစည်းကို တင်ပြမိတ်ဆက်ပေးရန်
- ဆန်းစစ်လေ့လာမှု၏ ရလဒ်များကို တင်ပြပေးရန်
- ကနဦးပတ်ဝန်းကျင ဆန်းစစ်လေ့လာမှု စာတမ်း၏ ထိခိုက်မှုလျော့ချရေး အစီအမံများနှင့် စပ်လျဉ်း၍ ပြည်သူလူထု၏ သဘောထား၊ အကြံပြုချက်များကို လေ့လာရန်

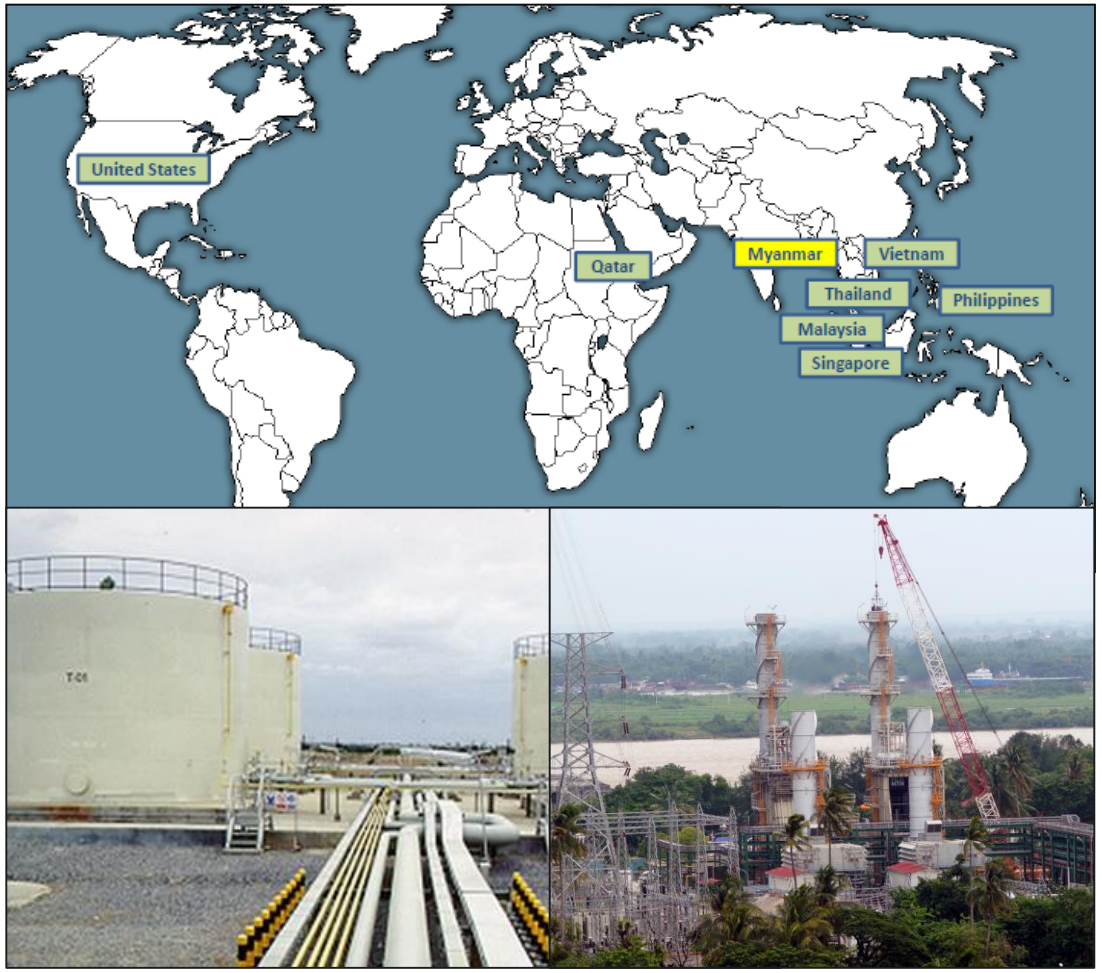
TTCL Power Myanmar Company Limited (TPMC)

TPMC

TPMC is a subsidiary of TTCL Public Company Limited. TPMC was established to carry out the Operation & Maintenance of this proposed project.

TTCL

- TTCL Public Company Limited (TTCL) is the first integrated Engineering, Procurement and Construction company in Thailand as well as an investor especially in power sector.
- Established in 1985 by Toyo Engineering Corporation (TEC), a leading Engineering Company from Japan.
- 8 Subsidiary and Affiliate Companies in 3 continents around the world.
- Its experience in Myanmar include:
  - Aviation Fuelling System for the Mandalay International Airport in 1997.
  - 121MW Combined Cycle Gas Turbine Power Plant in Ahlone, Yangon in 2012.
  - Oil & Gas Terminal Construction in Thilawa Industrial Zone in 2018



TTCL’s Business

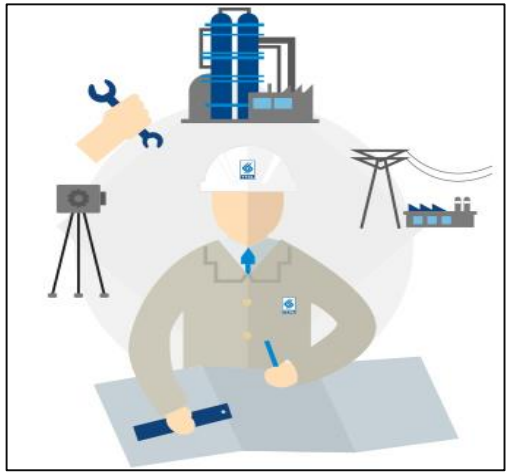
Engineering – **2,700 staffs**, Offer all areas of engineering fields.

Procurement – **30 years experience**, Strong network with suppliers.

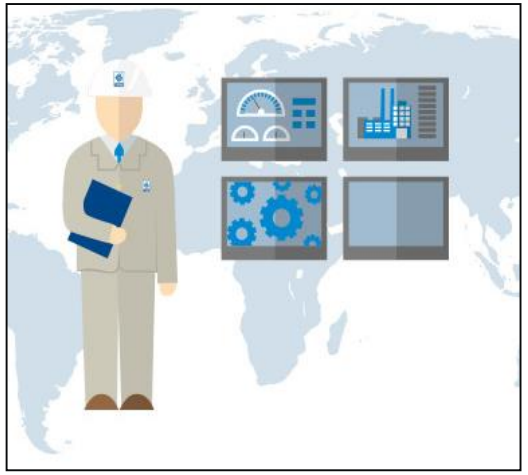
Construction – **230 successful projects**, Proven work quality records.

Investment – **7 projects worldwide,** especially in power sector

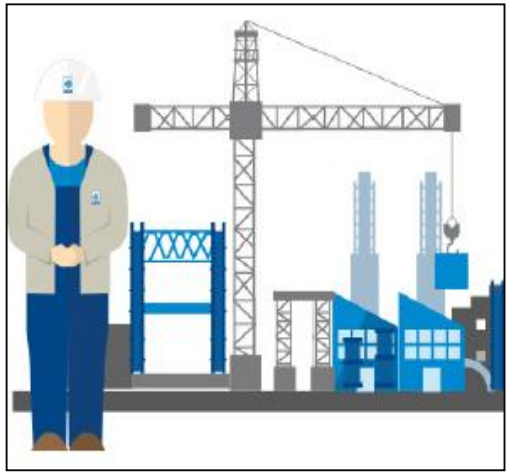
Engineering



Procurement



Construction



TTCL Worldwide Experiences

TTCL is trusted by many leading international company around the world.

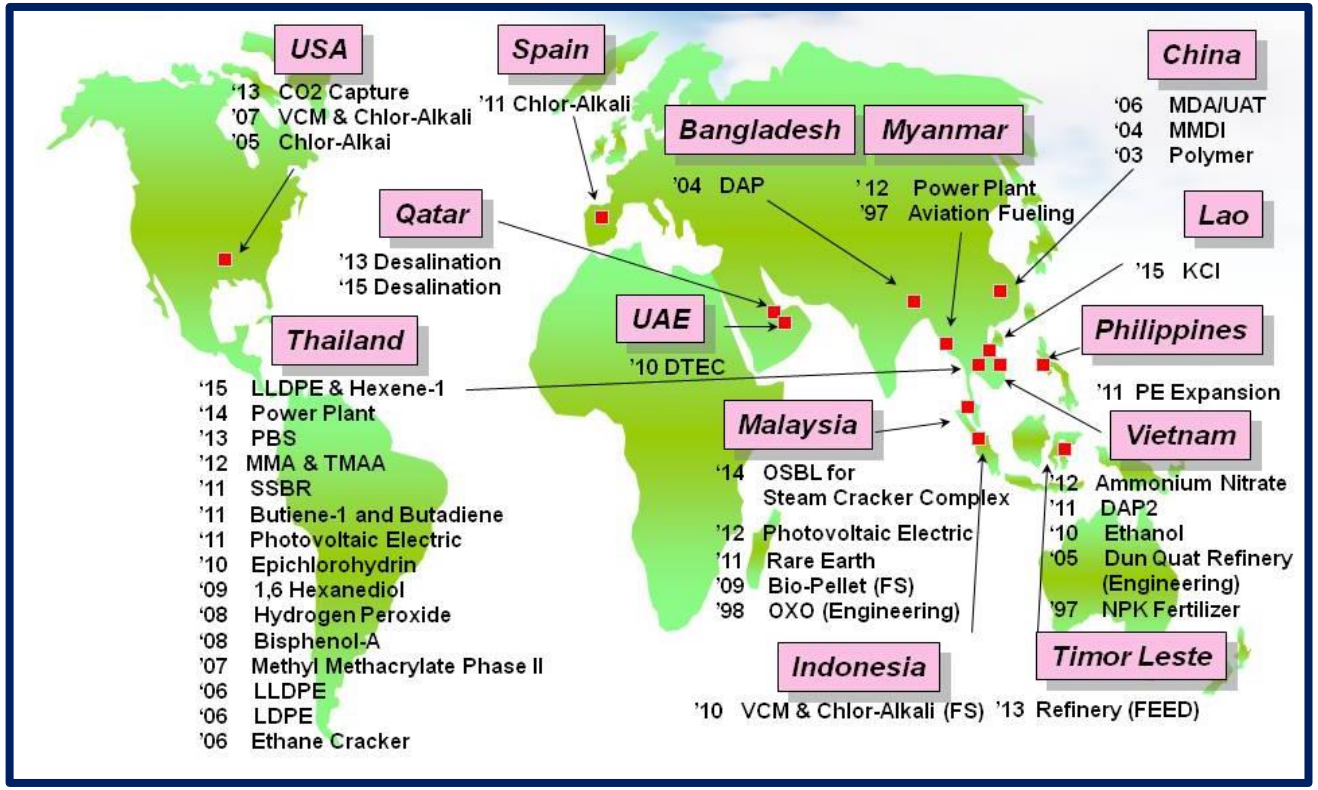
PETRONAS

SOLVAY

ptt GLOBAL CHEMICAL

TOSHIBA

Bayer



စီမံကိန်း၏အဓိကအစိတ်အပိုင်းများ

- ၃၈၈ မဂ္ဂါဝပ် သဘာဝဓာတ်ငွေ့သုံး ပေါင်းစပ်လည်ပတ်စွမ်းအင်စက်ရုံတစ်ခုကို လက်ရှိအလုံဓာတ်အားပေးဝင်းတွင်းအတွင်း တပ်ဆင်ခြင်း
- အဓိကလောင်စာဖြစ်သော သဘာဝဓာတ်ငွေ့ရည် (LNG)ကို ပြည်ပမှ လောင်စာရည်သယ် သင်္ဘောများဖြင့် တင်သွင်းသယ်ယူခြင်း
- LNG သိုလှောင်ဆိပ်ကမ်းနှင့် ဓာတ်အားပေးရုံသို့ သွယ်တန်းမည့် ဂက်စ်ပိုက်လိုင်း တည်ဆောက်ခြင်း
- ၂၃၀ ကေဗွီ ဓာတ်အားပေးလိုင်း အသစ် သွယ်တန်းခြင်း
- ထွက်ရှိသော လျှပ်စစ်ဓာတ်အားကို မြန်မာမဟာဓာတ်အားလိုင်းသို့ တင်ပို့သွားမည်ဖြစ်ပါသည်။

ဓာတ်အားလိုင်းလမ်းကြောင်း (အကြမ်းဖျင်းအတည်ပြု)

ဥရေ မီဂျိဟပ် ဓာတ်အားပေးစက်ရုံမှ လှိုင်သာသာ ခွဲရုံသို့ ဆက်သွယ်မည့် ဓာတ်အားလိုင်း

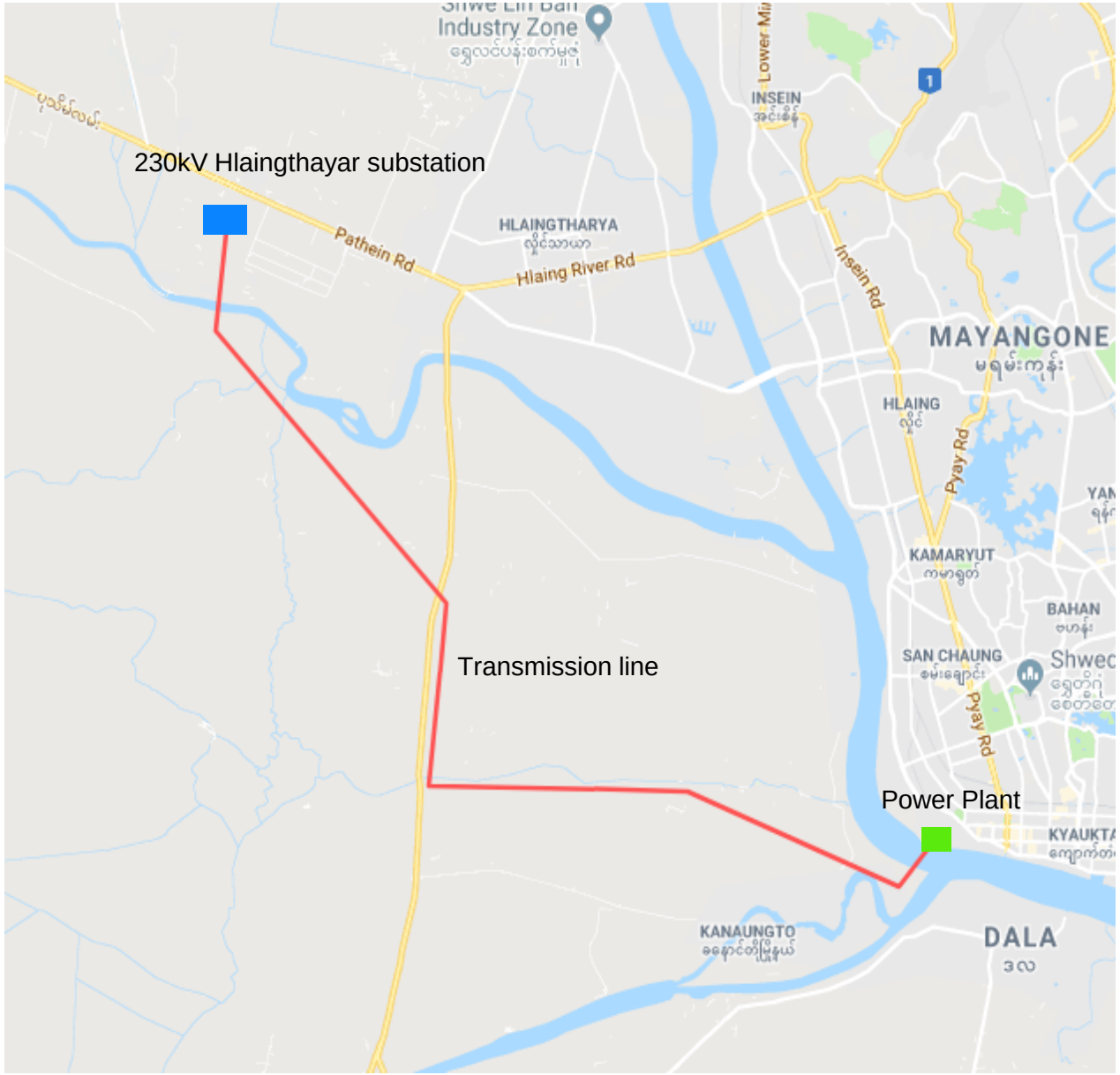
- အကွာအဝေး : ၂၈ ကီလိုမီတာခန့်
- ဓာတ်အား : ၂၃၀ KV

သင်္ကေတ

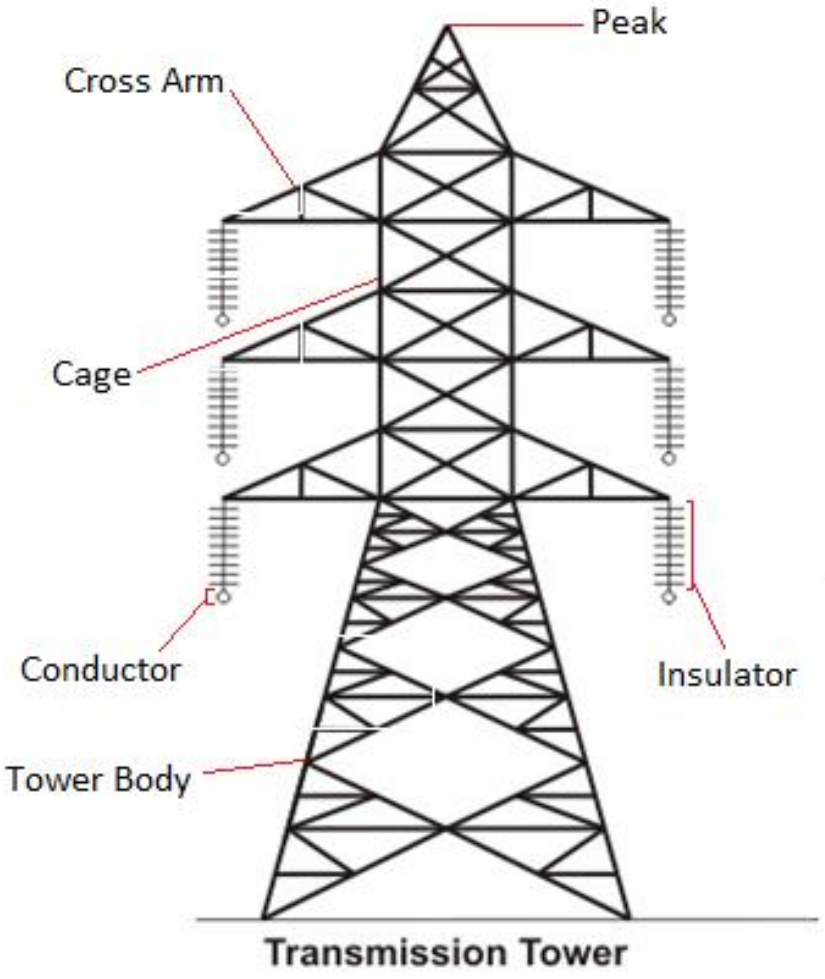
ဓာတ်အားပေးစက်ရုံ

ခွဲရုံ

ဓာတ်အားလိုင်း



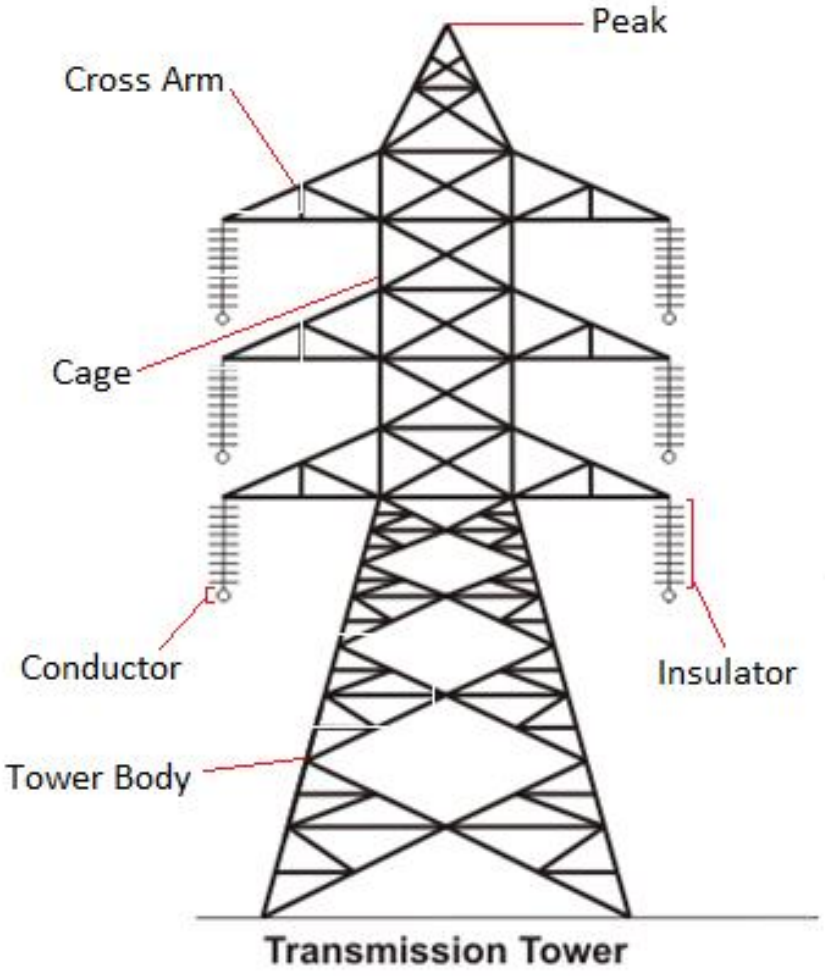
Transmission Line



Typical Key Components:

- Peak - earth shield wire and OPGW are connected here
- Cross Arm- hold the insulator
- Cage - portion between tower body and peak
- Tower Body
- Conductor - deliver electricity from one point to another
- Insulator - holds the conductor

Transmission Line



Design	Distance
Transmission Tower height	52 m
Diameter at ground	5 x 5 – 15.6 x 15.6 m
Distance from lowest conductor to ground	11.0 m
Width of cross arm	7.0 – 13.0 m
Distance from centre of tower to conductor	3.7 - 6.5 m

ဆန်းစစ်ခြင်းဆိုင်ရာလိုအပ်ချက်

ပတ်ဝန်းကျင် ထိန်းသိမ်းရေးဥပဒေ၏ အပိုင်း ၇ နှင့် ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဆိုင်ရာ နည်းဥပဒေ ပုဒ်မ ၅၂ နှင့် ၅၃ အရ TPMC သည် စီမံကိန်းအတွက် ပတ်ဝန်းကျင်ဆိုင်ရာဆန်းစစ်ချက် ပြုလုပ်ဆောင်ရွက်ရန် လိုအပ်ပါသည်။

ပတ်ဝန်းကျင် ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ထုံးလုပ်နည်း (၂၀၁၅) မှ နောက်ဆက်တွဲ (က) အရ အဆိုပြုစီမံကိန်းတွင် အောက်ပါနယ်ပယ်အတိုင်းအတာများပါဝင်ပါသည်။

- LNG လက်ခံရာ ဂိတ်၊ ပိုက်လိုင်းများ နှင့် ဓာတ်အားပေးစက်ရုံအတွက် ပတ်ဝန်းကျင် ထိခိုက်မှု ဆန်းစစ်ခြင်း
- ဓာတ်အားလိုင်းသွယ်တန်းခြင်းအတွက် ကနဦးပတ်ဂန်းကျင်ဆန်းစစ်ခြင်း

ကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်းဆိုင်ရာ လေ့လာခြင်း

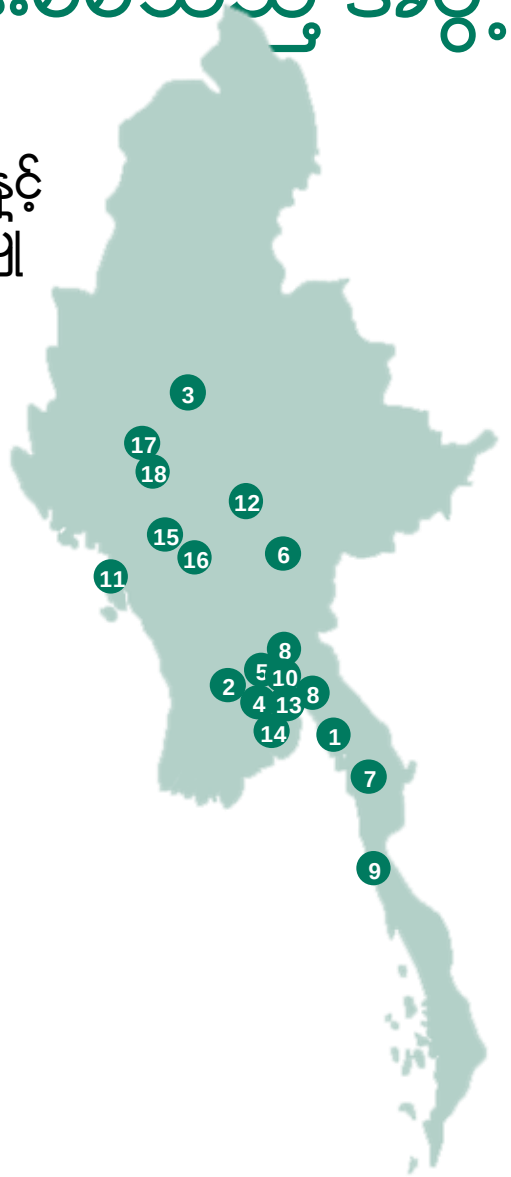
ပတ်ဝန်းကျင် ထိခိုက်မှုဆန်းစစ်ခြင်း လေ့လာချက်များကို အောက်ဖော်ပြပါ နှင့်အညီ ဆောင်ရွက်သွားပါမည်။

- မြန်မာနိုင်ငံ စည်းမျဉ်းများ
- International Finance Corporation (IFC), World Bank Group နှင့် အခြားဆက်စပ်နေသော လမ်းညွှန်းချက်များ အစရှိသည့် နိုင်ငံတကာ စံချိန်စံညွှန်းများ

ပတ်ဝန်းကျင်ထိခိုက်မှု ဆန်းစစ်သည့် အဖွဲ့အစည်း

ကျွမ်းကျင်မှုပတ်ဝန်းကျင်ထိခိုက်မှု
ဆန်းစစ်လေ့လာချက်များကို မြန်မာ့သယံဇာတနှင့်
ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဌာန၏အသိအမှတ်ပြု
လက်မှတ်ရတတိယအဖွဲ့အစည်းဖြစ်သည့်

Environmental Resources Management
(ERM) က ဆောင်ရွက်ခြင်းဖြစ်ပါသည်။



ERM's Selected Project Experience – Power Sector:

1. Scoping and High-level Environmental and Social Impact Assessment (ESIA) ESIA - 1,280 MW Thermal (Coal) Power Plant - Mon State
2. Initial Environmental Evaluation (IEE) - 500 MW Thermal (Combined Cycle Gas) Power Plant - Ayeyarwady Region
3. Scoping and ESIA – Myingyan 250 MW Thermal (Combined Cycle Gas) Power Plant - Mandalay Region
4. ESIA – 300 MW HFO Power Plant - Yangon
5. IEE – 50 MW HFO Power Plant – Bago Region
6. ESIA – 1280 MW Thermal (Coal) Power Plant – Kayin State
7. ESIA – 200 MW Thermal (Gas) Power Plant - Tanintharyi Region
8. EIA – 60 MW HFO Power Plant – Bago Region
9. ESIA – FSRU, 1,200 MW Thermal (Gas) Power Plant and 400km 500kV Transmission Line - Tanintharyi Region
10. ESIA – FSRU, 1,000 MW Thermal (Gas) Power Plant and 135 km 500kV Transmission Line – Yangon Region
11. ESIA – FSRU and 2,300 MW Thermal (Gas) Power Plant and 500km 500kV Transmission Line – Rakhine State
12. ESIA – 230 MW Hydropower Plant – Shan State
13. EIA - Gas to Power Plant Project - Yangon Region
14. ESIA - Power plant, Gas Pipeline and LNG Terminal - Yangon Region
15. ESIA - 113 MW Wind Farm and 58km Transmission Line - Magway Region
16. ESIA - 50 MW Wind Farm and 115km Transmission Line - Magway Region
17. ESIA - 50 MW Wind Farm and 19km Transmission Line - Magway Region
18. ESIA - 50 MW Wind Farm and 49km Transmission Line - Magway Region

The ESIA /IEE Team

ကျွန်စီမံကိန်းအတွက် ERM သည် Sustainable Environment Myanmar Co.,Ltd (SEM) နှင့် အတူတကွ ဆောင်ရွက်လျက် ရှိပါသည်။

SEM သည် ပတ်ဂန်းကျင်ဆန်းစစ်မှုဆိုင်ရာ လုပ်ငန်းများနှင့် ပတ်သတ်၍ (ERM) ကို ကူညီပံ့ပိုးပေးမည့် မြန်မာလုပ်ငန်းလိုင်စင် ကိုင်ဆောင်ထားသည့် အတွေ့အကြုံရင့် အဖွဲ့အစည်းဖြစ်သည်။

ERM Key Personnel involved in Preparation of the Scoping Study

Name	Project Role
Ms. Kamonthip Ma-oon	Partner in Charge
Dr. Robin Kennish	Project Technical Director
Mr. Vincent Lecat	Project Manager and Social Specialist
Mr. Chris Brown	Soil / Water Specialist
Mr. David Nicholson	Biodiversity Specialist
Mr. Edmund Taylor	Air Quality Specialist
Ms. Khinsusu Naing	Public Consultation Specialist
Ms. Sarinya Rangsipatcharayut	GHG Specialist
Ms. Sylvia Jagerroos	Marine Specialist
Ms. Mandy To	Noise Specialist
Ms. Peggy Wong	Cultural Heritage Specialist
Ms. Kanokphorn Chaivoraphorn	Health Specialist

SEM Key Personnel involved in Preparation of the Scoping Study

Name	Project Role
Mr Zaw Naing Oo	Managing Director
Mr Maung Chit	Project Manager
Ms Nan Cherry	Social Specialist
Daw Naing Naing Win	Local Ecology Expert

IEE နှင့်စီမံကိန်း လုပ်ငန်းစဉ်များ (အခြေပြ ဇယား)

Apr 18 — Sep 18 | November 2018 | December 2018 | October 2019 | November 2019

Submission of PPR

အများပြည်သူနှင့် တိုင်ပင်ဆွေးနွေးပွဲ

သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဌာနသို့ အစီရင်ခံစာ တင်သွင်းခြင်း

IEE လုပ်ငန်းစဉ်များ

Stakeholder Engagement

၁။ စီစစ်ခြင်းသည် စီမံကိန်းအမျိုးအစားခွဲခြားရန်နှင့် မည်သည့်ပတ်ဝန်းကျင်ဆန်းစစ်ခြင်းအမျိုးအစားတွင် ပါဝင်သင့်ကြောင်း စီစစ်ရန်ဖြစ်သည်။
စီမံကိန်းအဆိုပြုချက်အစီရင်ခံစာကို ၁၄ ရက် ဒီဇင်ဘာ ၂၀၁၇ ခုနှစ်တွင် သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေး ဌာနသို့ တင်သွင်းခဲ့ပြီးဖြစ်ပါသည်။

၂။ အခြေခံအချက်အလက်ကောက်ယူခြင်းသည် အဆိုပြုစီမံကိန်းဧရိယာရှိ သဘာဝပတ်ဝန်းကျင်နှင့် ဒေသခံလူထုအကြောင်း နားလည်နိုင်ရန်နှင့် ၎င်းတို့အပေါ် မည်သို့သက်ရောက်မှုရှိနိုင်သည်ကို သိရှိရန်ဖြစ်သည်။ ခြောက်သွေ့ရာသီ နှင့် စိုစွတ်ရာသီ ၂ ခုတွင် စစ်တမ်းကောက်ယူခဲ့ပါသည်။

၃။ သတင်းအချက်အလက်များ ထုတ်ဖော်တင်ပြခြင်းကို အဆင့် ၂ ဆင့် ခွဲခြားထားပါသည်။
အဆင့် ၁ - IEE အစီရင်ခံစာ မူကြမ်းကို အများပြည်သူသိရှိစေရန် ထုတ်ဖော်တင်ပြရန်
အဆင့် ၂ - အပြီးသတ် IEE အစီရင်ခံစာကို စိစစ် သုံးသပ်ရန်နှင့် ဆုံးဖြတ်ချက်များပြုလုပ်နိုင်ရန် မြန်မာနိုင်ငံ အစိုးရအဖွဲ့သို့ တင်ပြရန်

၄။ သက်ရောက်မှု ဆန်းစစ်ခြင်းသည် ဆက်စပ်သက်ရောက်မှုအဆင့် ဖော်ထုတ်ဆန်းစစ်ရန်နှင့် ထို ဆက်စပ်သက်ရောက်မှုများကို လျော့နည်းစေရန်ဆောင်ရွက်သည့် လုပ်ငန်းများကိုဖော်ပြရန်ဖြစ်သည်။

We are here

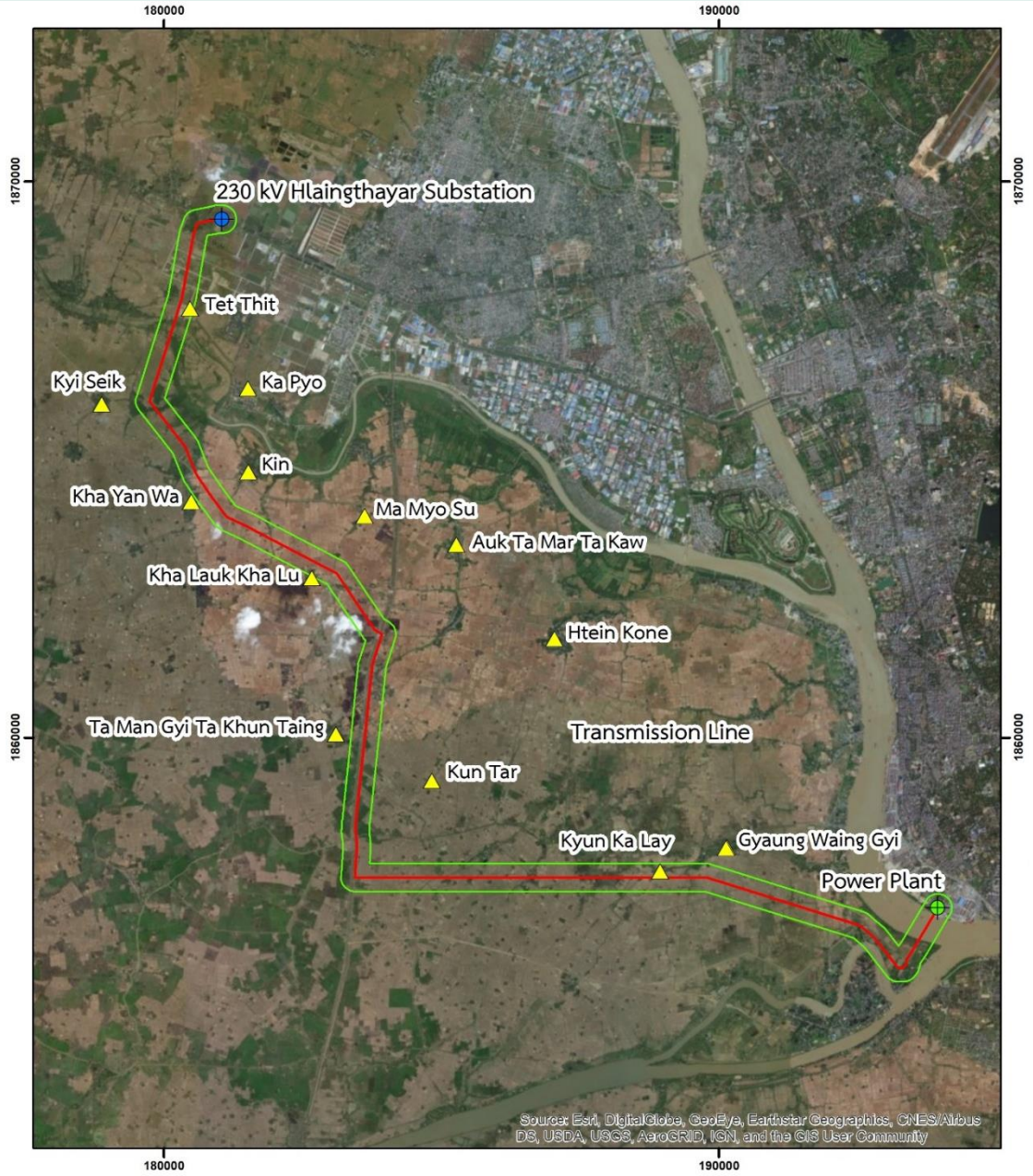
ကနဦးအခြေအနေများ

အကျဉ်းချုပ်

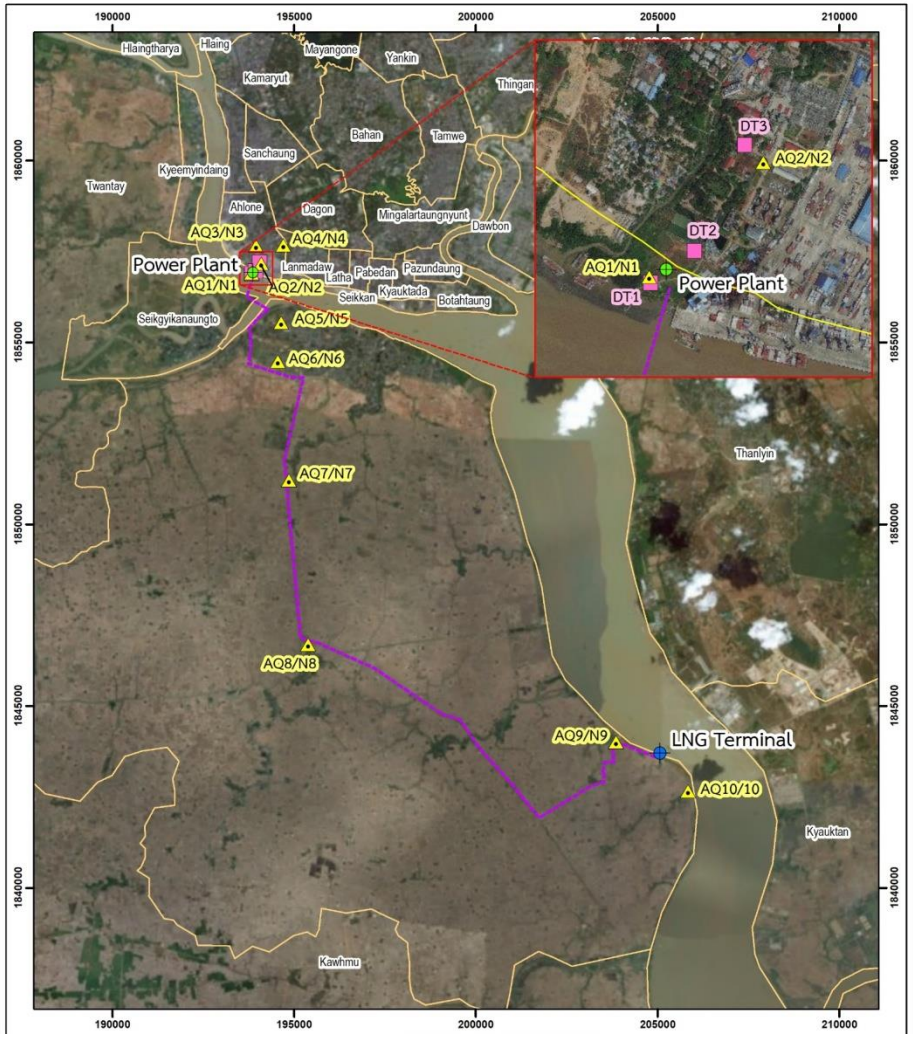
လေ့လာသည့်ဧရိယာ

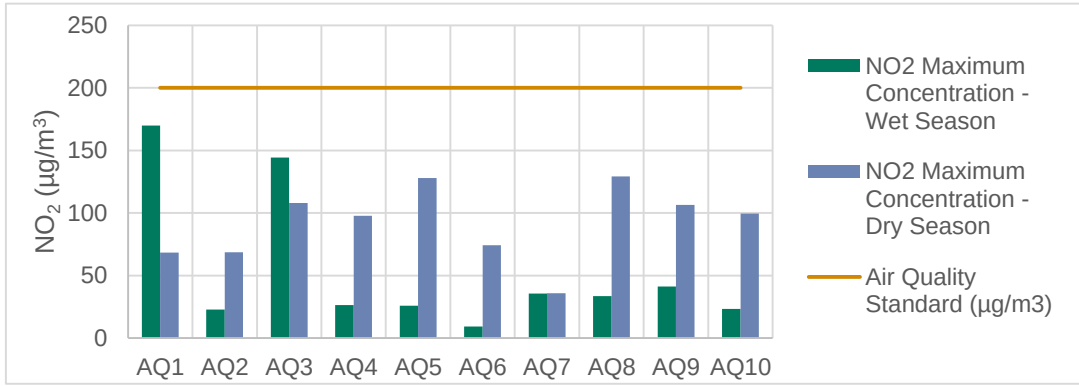
Legend

- Powerplant
- Substation
- Village
- Transmission Line
- 250 m Radius from Transmission Line



လေထုအရည်အသွေး

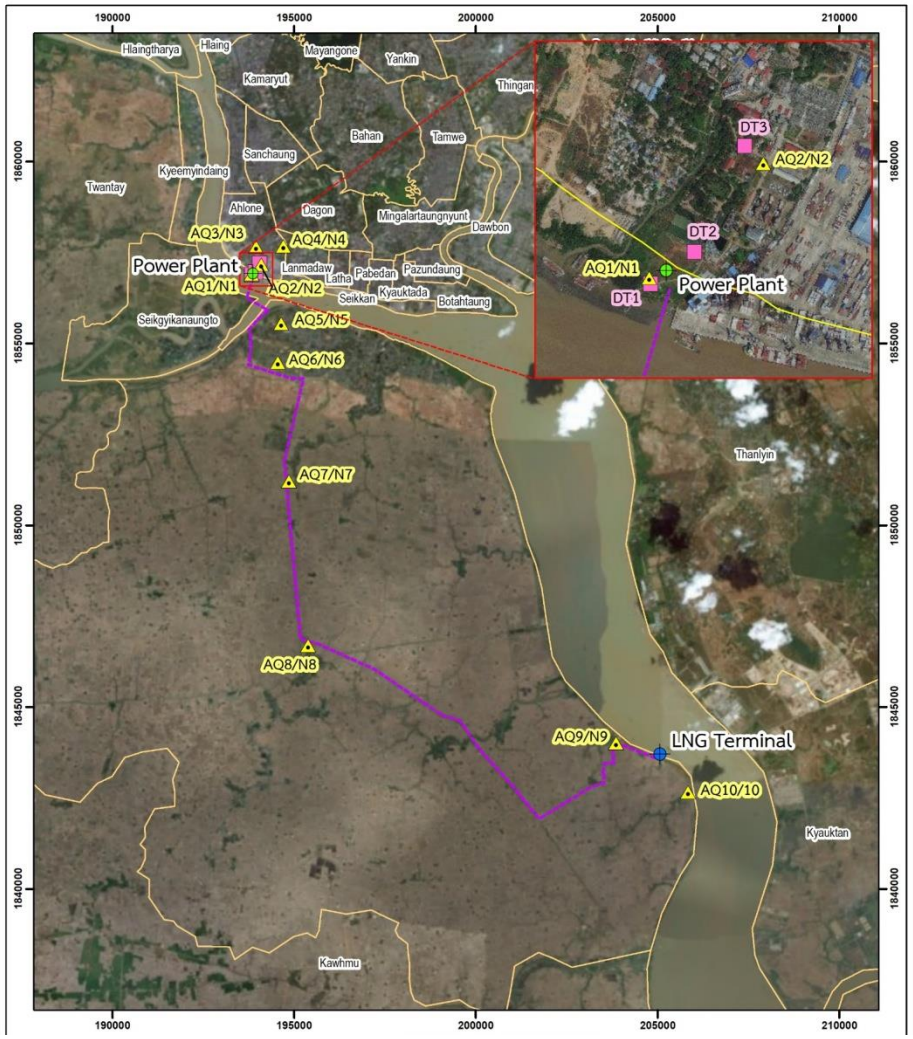




စမ်းသပ်မှုအရ လေ့လာသောပတ်ဝန်းကျင်၏ မူလလေထုအရည်အသွေးမှာ မြန်မာနိုင်ငံ/ နိုင်ငံတကာ စံသတ်မှတ်ချက်၏ အထက်တွင်ရှိနေပါသည်။

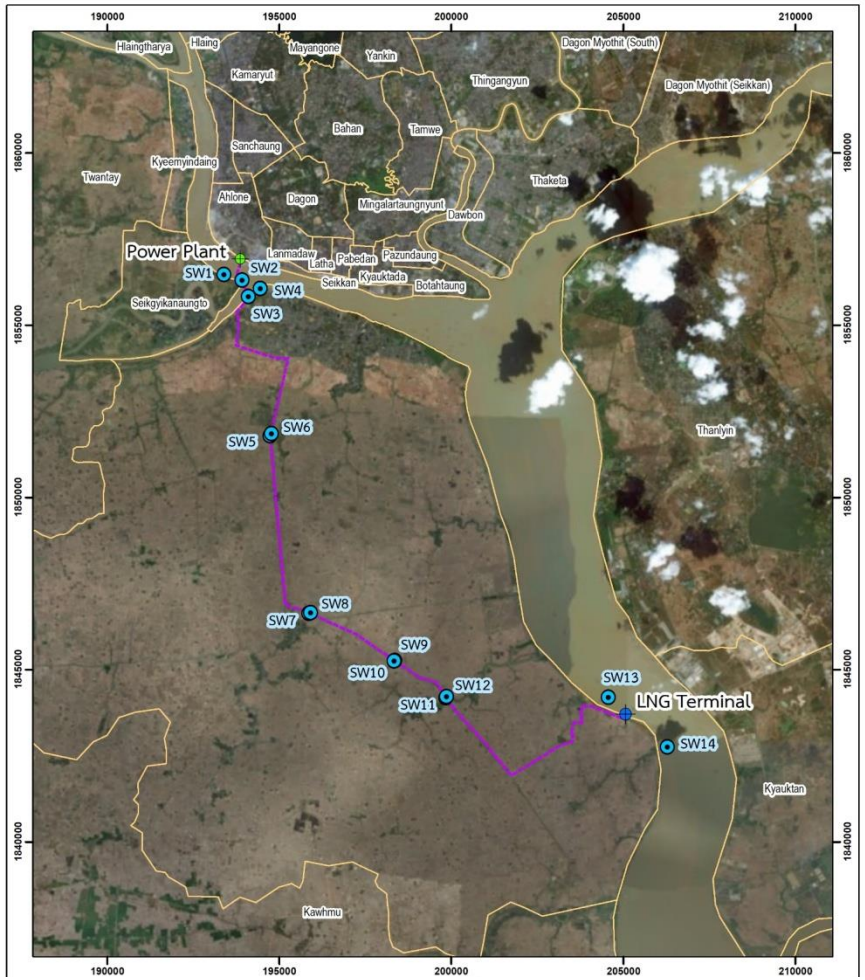
ထို့ကြောင့် မပျက်စီးသေးသောလေထု အဖြစ်သုံးသပ်ပါသည်။

ဆူညံသံ



စမ်းသပ်မှုအရ လေ့လာသောဧရိယာ၏ နေရာအတော်များများတွင် စက်ရုံလုပ်ငန်းများနှင့် သယ်ယူပို့ဆောင်ရေး ကဲ့သို့သော လုပ်ငန်းများကြောင့် ဆူညံသံ သတ်မှတ်စံနှုန်းထက် ကျော်လွန်နေပြီး ဖြစ်ပါသည်။

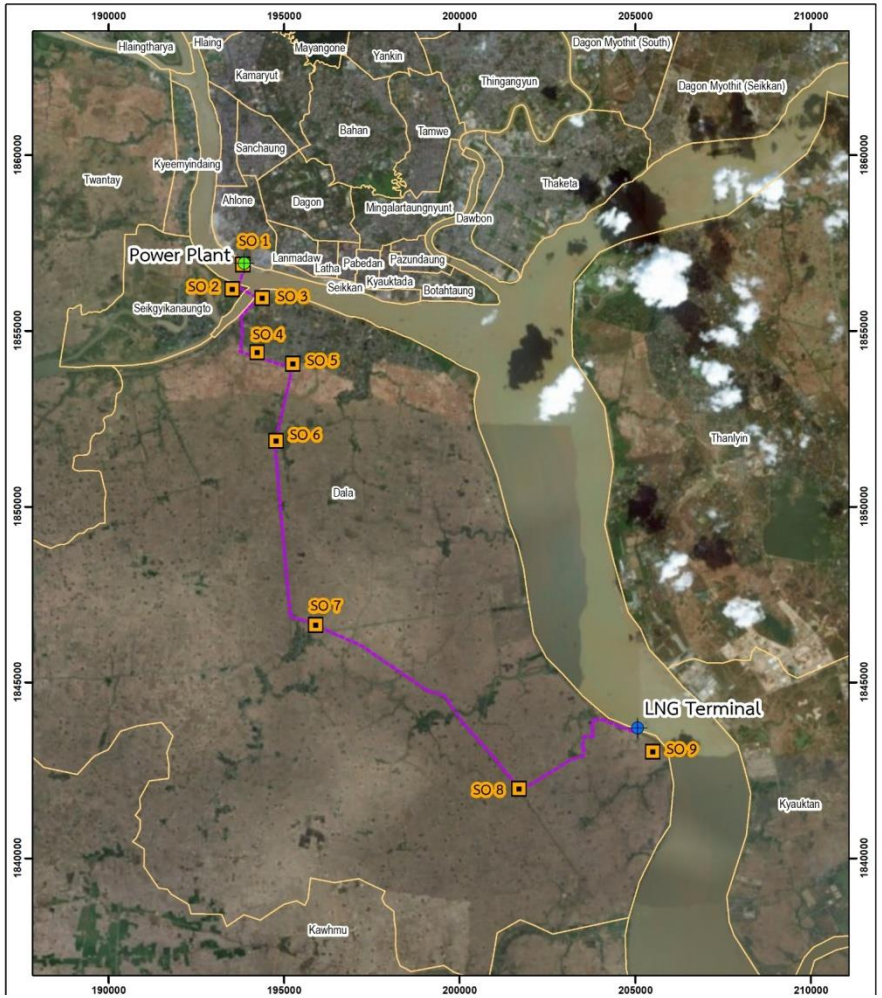
မြေပေါ်ရေအရည်အသွေး



ခြောက်သွေ့၊ စိုစွတ် နှစ်ရာသီတွင် စမ်းသပ်မှုအရ လေ့လာသောဧရိယာ၏ နေရာအတော်များများတွင် အနည်အနှစ်နှင့် Maganese ပါဝင်မှုမှာ မြန်မာနိုင်ငံ၏ စံချိန်စံညွှန်းထက် ကျော်လွန်နေသည်ကို တွေ့ရှိရပါသည်။

အခြားသော ဒြပ်များပါဝင်မှုမှာ မြန်မာနိုင်ငံ၏ စံချိန်စံညွှန်း အောက်တွင်သာ ရှိပါသည်။

မြေဆီလွှာ အရည်အသွေး

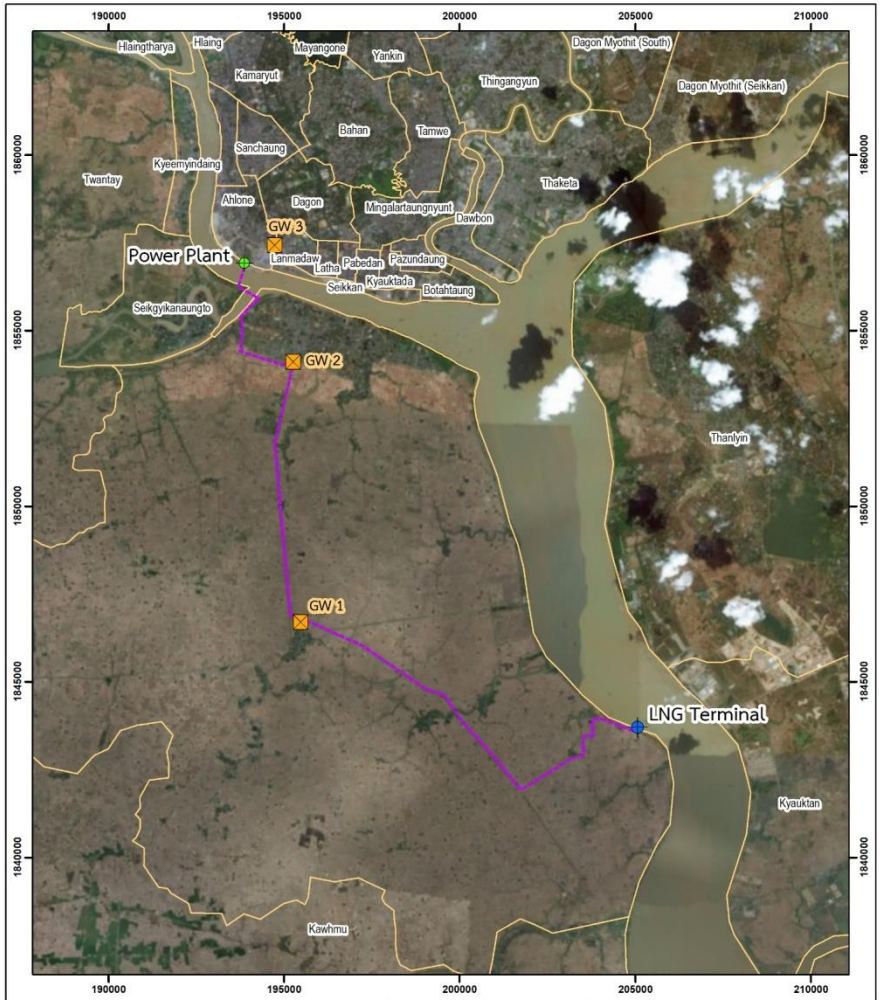


စမ်းသပ်ဧရိယာ SO 2 ၏ အေပါ်ယံမြေလွှာ တွင် copper ပါဝင်မှုများနေပြီး ၊ အောက်ခံမြေလွှာတွင်လည်း Mercury ပါဝင်မှုကျော်လွန်များပြားနေပါသည်။

စမ်းသပ်ဧရိယာ SO 4 ၏ အောက်ခံမြေလွှာတွင် copper ပါဝင်မှုများပြားနေပါသည်။

အခြားစမ်းသပ်ဧရိယာများ၏ မြေဆီလွှာအရည်အသွေးမှာ သတ်မှတ်စံနှုန်းအတွင်း ဖြစ်ကြောင်းတွေ့ရှိရပါသည်။

မြေအောက်ရေ



စမ်းသပ်ဧရိယာ GW1 နှင့် GW2 ၏မြေအောက်ရေ အရည်အသွေးတွင် iron (Fe) ဓာတ်ပျော်ဂင်မှုမြန်မာနိုင်ငံ သတ်မှတ်စံနှုန်းထက် ကျော်လွန်နေပါသည်

အမှုန်အမွှားပါဂင်မှုမှာလည်း United States Environmental Protection Agency (EPA) ၏ စံနှုန်းထက်ကျော်လွန်နေပါသည်။

အခြားသော ဒြပ်များပါဂင်မှုမှာ မြန်မာနိုင်ငံ၏ စံချိန်စံညွှန်း အောက်တွင်သာ ရှိပါသည်။

ဇီဝမျိုးစုံမျိုးကွဲများ

- ရန်ကုန်မြစ်နှင့် လမုတောဧရိယာအနည်းငယ်ကို သဘာဝအတိုင်းဖြစ်သော ဇီဝမျိုးကွဲများမှီခိုရာအဖြစ် လေ့လာသုံးသပ်ပါသည်။
- အခြားသော ဧရိယာများမှာ ပြုပြင်အသုံးပြုပြီးသော မြေများဖြစ်ကြပါသည်။

Habitat Type	Study Area (ha)
Natural Habitat	0.20
Modified Habitat	3.02

လူမှုဝန်းကျင်စစ်တမ်း (လှိုင်သာယာမြို့နယ်)

- မြေအသုံးချမှု : စိမ်းလန်းဇရိယာ (၁%) , အများပြည်သူဆိုင်ရာ (၂%) ၊ကစားကွင်း (၂%) ၊ မြေလွတ် (၃%) ၊ရေဇရိယာ (၈%) ၊ စိုက်ပျိုးဇရိယာ (၁၉%) ၊စက်မှုနယ်မြေ(၁၉%) ၊ လူနေဇရိယာ (၂၂%) ၊ တိုးတက်ပြောင်းလဲဆဲ (၂၄%)
- စာတတ်မြောက်နှုန် း (၉၆.၈%) ၊ ယောကျ်ား ၉၈.၂% နှင့် မိန်းမ ၉၅.၆%
- စာသင်ကျောင်း : အထက်တန်းကျောင်း ၆ ခု ၊ အလယ်တန်းကျောင်း ၁၅ ခု ၊ မူလတန်းကျောင်း ၃၇ ခု
- ဆေးရုံဆေးခန်း : လှိုင်သာယာမြို့နယ်ဆေးရုံ ၊ ပန်းလှိုင်ဆေးရုံ ၊ လှိုင်သာယာအထွေထွေဆေးရုံ

လူမှုဝန်းကျင်စစ်တမ်း (တွံတေးမြို့နယ်)

- မြေအသုံးချမှု : မြေလွတ် (၂%) ၊ရေဇရိယာ (၃%) ၊ စိုက်ပျိုးဇရိယာ (၉၂%) ၊ လူနေဇရိယာ (၃%) ၊
- စာတတ်မြောက်နှုန် း (၉၄.၅%) ၊ ယောကျ်ား ၉၆.၂% နှင့် မိန်းမ ၉၃%
- စာသင်ကျောင်း : အထက်တန်းကျောင်း ၁၂ ခု ၊ အလယ်တန်းကျောင်း ၉ ခု ၊ မူလတန်းကျောင်း ၁၁၈ ခု
- ဆေးရုံဆေးခန်း : တွံတေးဆေးရုံကြီး
- ဒေသစီးပွားရေးနှင့် အသက်မွေးဝမ်းကျောင်း : စိုက်ပျိုးရေးအဓိက (ဆန်စပါးနှင့် ဟင်းသီးဟင်းရွက်စိုက်ပျိုးခြင် း ၊ရေသျှင်းမွေးမြူခြင်း

လူထုပါဂင်ဆွေးနွေးပွဲ

ကနဉီးပတ်ဝန်းကျင် ဆန်းစစ်ခြင်း လူထုပါဝင်ဆွေးနွေးပွဲ

နေ့ရက်	နေရာ	ခန်းမ	အချိန်
၂၉-၁၀-၂၀၁၉	လှိုင်သာယာမြို့နယ်	ကမ်းပြိုရွာ ဘုန်းတော်ကြီးကျောင်း ၊ အပြင်ပဒန်း ကျေးရွာအုပ်စု	၁၀:၀၀ - ၁၂:၀၀ နာရီ
၃၀-၁၀-၂၀၁၉	တွံတေးမြို့နယ်	မြို့နယ်အုပ်ချုပ်ရေးမှူးရုံး ၊ တော်ဝင်စန္ဒကူးခန်းမ	၁၀:၀၀ - ၁၂:၀၀ နာရီ

လျှပ်စစ်ဓာတ်အားလိုင်း သွယ်တန်းသည့်ကာလတွင် သက်ရောက်နိုင်ခြေများ

သက်ရောက်နိုင်မှုများအကျဉ်းချုပ် - လျှပ်စစ်ဓာတ်အားလိုင်း သွယ်တန်းခြင်း

သက်ရောက်နေရာ	သက်ရောက်မှု ရင်းမြစ်	သက်ရောက်မှုအတိုင်းအတာ
လေထုအရည်အသွေး	အမှုန်အမွှား	မရှိသလောက် မှ အသင့်အတင့်
ဇီဝမျိုးစုံမျိုးကွဲများ	သက်ရှိသတ္တဝါများ ယာယီအနှောင့်အယှက်ဖြစ်မှု သို့မဟုတ် နေရာရွှေ့ပြောင်းရမှု ၊နေရင်းဒေသအရည်အသွေးကျဆင်းခြင်း ဒေသရှိမျိုးစိတ်သေစေနိုင်ခြင်း	မရှိသလောက် မှ အသင့်အတင့်
ဆူညံသံ	ဆောက်လုပ်ရေး	အသင့်အတင့်
မြေပေါ်ရေ အရည်အသွေး	ဆောက်လုပ်ရေး	အသင့်အတင့်
မြေဆီလွှာနှင့်မြေအောက်ရေ	စီမံကိန်းနေရာ ရှင်းလင်းခြင်း	အသင့်အတင့်
စွန့်ပစ်အညစ်အကြေး	Domestic, Hazardous and non-hazardous wastes	အနည်းငယ် မှ အသင့်အတင့်
မြင်ကွင်း	အဆောက်အဦများ	အသင့်အတင့်
လူမှုပန်းကျင်	အလုပ်အကိုင်	ပိုမိုကောင်းမွန်
လူမှုပန်းကျင်	စီးပွားရေးဆိုင်ရာ ပြန်လည်နေရာချထားမှုနှင့် လုပ်ငန်းခွင်ကျန်းမာရေးနှင့် ဘေးကင်းလုံခြုံရေး	အသင့်အတင့်
လူမှုပန်းကျင်	ယာဉ်လမ်းကြောင်းများ၊ လူထုကျန်းမာရေး နှင့် ဘေးကင်းလုံခြုံရေး နှင့် ယဉ်ကျေးမှုဆိုင်ရာ အမွေအနှစ်	မရှိသလောက် မှ အနည်းငယ်

ဆောက်လုပ်ရေးကာလအတွက် အကြံပြု သက်ရောက်မှုလျော့ကျစေမည့် အစီအမံများ

လေထုအရည်အသွေး ထိခိုက်မှု လျော့ကျစေမည့် အကြံပြုနည်းလမ်းများ

- သက်ရောက်မှုလျော့ချရေးအတိုင်းအတာများကို အကောင်အထည်ဖော်ဆောင်ရွက်ခြင်းဖြင့် လေထုအရည်အသွေးဆိုင်ရာ မကျေနပ်မှု ကိစ္စရပ်များကို ဖြေရှင်းခြင်း
- ဖုန်၊အမှုန် ပျံ့လွင့်မှုမရှိစေရန် ရှင်းလင်းပြီးမြေပေါ်တွင် ရေဖျန်းခြင်း
- သဲ ကဲ့သို့သော အမှုန်ပျံ့လွင့်စေတတ်သော အရာများကို အကာနံရံများဖြင့်ထားရှိ၍ ဖြစ်နိုင်ပါက အမြဲရေဖြန်းပေးခြင်း
- လွင့်ပျံ့စေတတ်သော ပစ္စည်းများ လုပ်ငန်းသုံးယာဉ်များဖြင့် သယ်ယူပို့ဆောင်ချိန်တွင် လုံခြုံစွာအုပ်မိုးထားစေခြင်း
- ယာဉ်များ ပစ္စည်းတင်ချချိန်တွင် စက်သတ်ထားစေခြင်း
- ဟင်းလင်းပြင် မြေနေရာများကို အပင်စိုက်ပျိုးပေးခြင်း သို့မဟုတ် အခြား materials တစ်မျိုးမျိုးဖြင့် ဖုံးအုပ်ထားခြင်း

ဇီဝမျိုးစုံမျိုးကွဲများအား သက်ရောက်မှု လျော့ကျစေမည့်အကြံပြုနည်းလမ်းများ

- လမုတောနှင့် ကမ်းရိုးတန်းပေါက်ပင်များ ပြန်လည်စိုက်ပျိုးရန် အသင်းအဖွဲ့ဖြင့် စီမံဖန်တီးခြင်း
- စီမံကိန်းဟန်ထမ်းများ။ အလုပ်သမားများနှင့် ကန်ထရိုက်တာများအား သဘာဝပေါက်ပင်ခုတ်ထွင်ခြင်းကို တင်းကျပ်သည့် စည်းမျဉ်းစည်းကမ်းထားရှိပေးခြင်း
- သဘာဝပေါက်ပင်များ အားမှားယွင်းရှင်းလင်းမှု မလုပ်မိစေရန် ရှင်းလင်းရန်လိုအပ်သည့် မြေနေရာအား မြင်သာထင်ရှားသည့်အမှတ်အသားဖြင့် မှတ်သားခြင်း
- လုပ်ငန်းသုံးယာဉ်များကို သတ်မှတ်ထားသည့် အမြန်နှုန်းဖြင့်သာ လမ်းကိုအသုံးပြုစေခြင်း
- ဇီဝမျိုးစုံမျိုးကွဲများကို တန်ဖိုးထား ကာကွယ်တတ်သော အသိရှိစေရန် စီမံကိန်းဟန်ထမ်းများအား လှုံ့ဆော်အသိခြင်း
- သဘာဝပေါက်ပင်များကောင်းမွန်စွာပြန်လည် ပေါက်ရောက်သည်အထိ ရေတိုက်စားနိုင်သည့်နေရာများအား မြေလွှာထိန်းအကာအရံများ ထားရှိကာကွယ်ပေးခြင်း

ဇီဝမျိုးစုံမျိုးကွဲများအား သက်ရောက်မှု လျော့ကျစေမည့် အကြံပြုနည်းလမ်းများ

- စီမံကိန်းဝန်ထမ်းများ၊ အလုပ်သမားများနှင့် ကန်ထရိုက်တာများအား သဘာဝပေါက်ပင်ခုတ်ထွင်ခြင်းကို တင်းကျပ်သည့် စည်းမျဉ်းစည်းကမ်းထားရှိပေးခြင်း ၊ ဒဏ်ကြေးသတ်မှတ်ခြင်း နှင့်ထိရောက်စွာအရေးယူခြင်း ၊ သက်ဆိုင်ရာဥပဒေနှင့်အညီ အရေးယူခြင်း
- ဇီဝမျိုးစုံမျိုးကွဲများကို တန်ဖိုးထား ကာကွယ်တတ်သော အသိရှိစေရန် စီမံကိန်းဝန်ထမ်းများအား လှုံ့ဆော်အသိပေးခြင်း ၊ ဒေသခံသတ္တဝါများကို အမဲလိုက်ခြင်း အခွင့်မရှိပဲဖမ်းယူခြင်းမှ တားမြစ်ခြင်း
- သဘာဝပေါက်ပင်များ အားမှားယွင်းရှင်းလင်းမှု မလုပ်မိစေရန် ရှင်းလင်းရန်လိုအပ်သည့် မြေနေရာအား မြင်သာထင်ရှားသည့်အမှတ်အသားဖြင့် မှတ်သားခြင်း

ဆူညံသံလျော့ကျစေမည့်အကြံပြုနည်းလမ်းများ

- ပစ္စည်းအသယ်အပို့ယာဉ်များကို နေ့အချိန်တွင်သာ လူနေရပ်ကွက်များ ပြင်ပမှ ဖြတ်သန်းစေရန် စနစ်တကျ အချိန်ဇယားထားရှိခြင်း
- အသံလုံ အကာအရံများ ထားရှိခြင်း
- အလုပ်ချိန်အား ဂုနာရီမှ ၁၀နာရီအထိ သတ်မှတ်ခြင်း၊ တနင်္ဂနွေမှ စနေနေ့ (ပိတ်ရက်များမှလွဲ၍)
- ဆူညံသံလျှော့ချနိုင်ရန် ဆောက်လုပ်ရေးလုပ်ငန်းခွင်တွင် အသုံးပြုသော စက်ပစ္စည်းများ၏ အရေအတွက်နှင့်အနေအထားအား ထိန်းချုပ်ခြင်း၊ နှင့်
- လုပ်ငန်းခွင်အတွင်းတွင် ကောင်းမွန်၍ ပုံမှန်စစ်ဆေးထိန်းသိမ်းထားသော ကိရိယာ၊ စက်ပစ္စည်းနှင့် ဆောက်လုပ်ရေးပစ္စည်းများသာ အသုံးပြုခြင်း

မြေပေါ်ရေ အရည်အသွေး ထိခိုက်မှုလျော့ကျစေမည့် အကြံပြုနည်းလမ်းများ

- မြေလွှာပြန်းတီးမှု မဖြစ်ပေါ်စေရန် သင့်လျော်သည့် နည်းလမ်းအသုံးပြုရန် e.g. wheel cleaning facilities and control drainage system;
- ရေနုတ်မြောင်းစနစ် ၊ရေတိုက်စားမှု ကာကွယ်သည့်စနစ် ၊ အနည်စစ် စနစ်များကို မပြတ် ပြုပြင်ထိန်းသိမ်းပေးခြင်း
- ဆီ၊လောင်စာနှင့် ဓာတုပစ္စည်းများကို သတ်မှတ်ထားသည့် နေရာများတွင်သာ အသုံးပြုခြင်း ၊ သိုလှောင်ခြင်း
- ဆီစစ်စကာစနစ် ၊ ဆီပေ့ရေ ထိန်းသိမ်းသည့် စနစ်များထားရှိခြင်း။ သို့မဟုတ် သင့်လျော်သည့် ကန်ထရိုက်တာကို တာဂန်ယူစွန့်ပစ်စေခြင်း

မြေလွှာနှင့်မြေအောက်ရေထိခိုက်မှု လျော့ကျစေမည့်အကြံပြုနည်းလမ်းများ

- မြေဟင်းလင်းပြင်၊ အသုံးပြုလက်စ ကုန်ပစ္စည်းများ ၊ ဆောက်လုပ်ရေးသုံးပစ္စည်းများ ၊ စွန့်ပစ်ပစ္စည်းများရှိပါက ယာယီချထားသော ပစ္စည်းများရှိပါက သင့်တော်သလို ဖုံးအုပ်ခြင်း၊ စွန့်ပစ်ခြင်းများ
- မြေသယ်ယူမှုကို နည်းနိုင်သမျှနည်း၍သာ ပြုလုပ်ခြင်း
- မြေလွှာပျက်စီးမှုနှင့် အပေါ်ယံမြေလွှာကျစ်ဖင်မှုကို ကာကွယ်ရန် လုပ်ငန်းသုံးယာဉ်ကြီးများအတွက် လမ်းကြောင်းသီးသန့်သတ်မှတ်ပေးခြင်း
- မြေလွှာပြန်တီးမှုကို ကာကွယ်ရန် လမ်းကြောင်းလွှဲရေထုတ်စနစ်ထားခြင်း ၊ အနည်ပို့ချမှုကို လျော့ချရန် အရံအတားများ ပြုလုပ်ပေးခြင်း

စွန့်ပစ်ပစ္စည်း သက်ရောက်မှုလျော့ကျစေမည့် နည်းလမ်းများ

- စွန့်ပစ်ပစ္စည်း ဖိတ်ကျခြင်း ၊အမှုန်အမွှားများ ပျံ့လွင့်ခြင်းမှ ကာကွယ်ရန် စွန့်ပစ်ပစ္စည်း သယ်ယာဉ်များကို လုံခြုံစွာ ဖုံးအုပ်ပြီးမှသာ သယ်ယူပို့ဆောင်စေခြင်း
- စွန့်ပစ်ပစ္စည်းအမျိုးအစားခွဲ၍ သင့်လျော်သည့် ကွန်တိန်နာများနှင့် သုံးရေ၊သောက်ရေ အရင်းအမြစ် ဝေးရာတွင် သိမ်းဆည်းခြင်း
- အသုံးမလိုသည့် biomass များကို ဆိုဒ်အတွင်း မြေညို၊မြေဖို့ ရန်အတွက် အသုံးပြုခြင်း
- စီမံကိန်းမြေနေရာ ရှင်းလင်းရာတွင် သဘာဝပေါက်ပင်များ ပျက်စီးမှုကို အနည်းဆုံးဖြစ်စေရန် သတိထားဆောင်ရွက်ခြင်း
- အန္တရာယ်ရှိ စွန့်ပစ်ပစ္စည်းများကို စနစ်တကျ သန့်စင်စွန့်ပစ်ခြင်း
- အန္တရာယ်ရှိ စွန့်ပစ်ပစ္စည်းများ နှင့် သာမန်စွန့်ပစ်ပစ္စည်းများကို စနစ်တကျခွဲခြားထားရှိခြင်း

စွန့်ပစ်ပစ္စည်း သက်ရောက်မှုလျော့ကျစေမည့် နည်းလမ်းများ

- စွန့်ပစ်ပစ္စည်းသိုလှောင်မှုနှင့် စွန့်ပစ်မှုအတွက် စွန့်ပစ်ပစ္စည်းများထိန်းချုပ်ရေး အစီအစဉ်များအား အကောင်အထည်ဖော်ဆောင်ခြင်း
- စွန့်ပစ်ပစ္စည်းထိန်းချုပ်မှု စည်းမျဉ်းစည်းကမ်းများကို ဆိုဒ်အတွင်း အလုပ်သမားများကို လေ့ကျင့်ပြသပေးခြင်း
- စွန့်ပစ်ပစ္စည်းထိန်းချုပ်မှု လုပ်ငန်းစဉ်များ စည်းမျဉ်းများနှင့်အညီလုပ်ဆောင်မှု ရှိ/မရှိ သေချာစေရန် စွန့်ပစ်ပစ္စည်းကန်ထရိုက်တာအား စောင့်ကြည့်စစ်ဆေးခြင်း
- လုပ်ငန်းခွင်ဆောက်လုပ်ရေးတွင် စွန့်ပစ်ပစ္စည်းအနည်းဆုံးသာ ထွက်ရှိစေရန် စနစ်တကျ ဒီဇိုင်းဆွဲခြင်း
- စွန့်ပစ်ပစ္စည်း ထွက်ရှိမှုနည်းစေရန် Material အမျိုးအစားအလိုက် ပြန်လည်အသုံးချနိုင်မည့် အစီအစဉ်ရှိစေခြင်း (biomass အပါအဝင်)

မြင်ကွင်း ၊ရှုခင်းပျက်စီးခြင်းများအပေါ် သက်ရောက်မှုလျော့ကျစေမည့် နည်းလမ်းများ

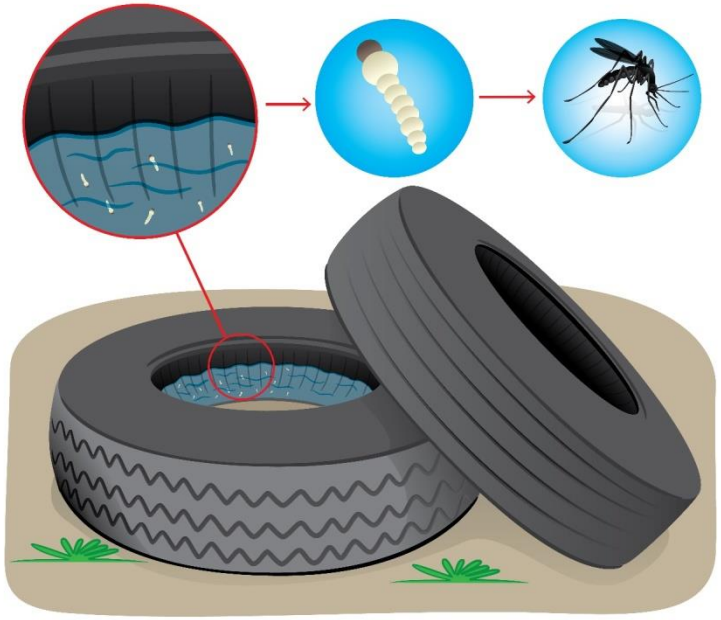
- မြင်ကွင်းသာယာစေရန် လုပ်ဆောင်ခြင်း (လုပ်ငန်းခွင်အတွင်း နေရာလပ်များတွင် သစ်ပင်၊ ချုံတောနှင့် မြေပြင်ဖုံးအုပ်သော အပင်များစိုက်ပျိုးခြင်း အစရှိသဖြင့်)
- ဆောက်လုပ်ရေးဇရိယာနှင့် သဘာဝအရပေါက်ရောက်သောအပင်များ ရှင်းလင်းခြင်းအား သင့်လျော်မှုနှင့်ကန့်သတ် လျှော့ချခြင်း၊ နှင့်
- ယာယီပျက်စီးသွားသော ဇရိယာများအား ပြန်လည်ထိန်းသိမ်းခြင်း

အသက်မွေးမှု လုပ်ငန်းများအတွက် အကြံပြုသည့် နည်းလမ်းများ

- စီမံကိန်း၏အနီးဆုံးနေရာမှ အလုပ်သမားအင်အားများကို ဦးစွာစုဆောင်းပြီး အချက်အလက်မျှဝေခြင်း၊ လေ့ကျင့်ပေးခြင်းနှင့် ခန့်အပ်ခြင်းများ လုပ်ဆောင်ခြင်း
- မြေသိမ်းရခြင်း နည်းနိုင်သမျှနည်းစေရန်နှင့် ဆောက်လုပ်ရေးကာလယာယီထိခိုက်သော မြေများကိုလည်း ဆောက်လုပ်ရေးပြီးစီးသည်နှင့် မူလအခြေအနေအတိုင်း ပြန်လည်အပ်နှံရန်
- ပိုင်ဆိုင်မှုဆုံးရှုံးခြင်းများအား သတ်မှတ်ခြင်းနှင့် သက်သာစေမည့် နည်းလမ်းများနှင့် နှစ်နာကြေးပေးခြင်း နည်းလမ်းများပါဝင်သော ပြန်လည်ထူထောင်ရေးအစီအစဉ်အား ဖွဲ့စည်းရန် ကြားနေအဖွဲ့အစည်းအား ငှားရမ်းခြင်း
- မည်သည့်စီမံကိန်း သက်ရောက်မှုများကြောင့် ဖြစ်ပေါ်လာသော နစ်နာမှုများကို စီမံခန့်ခွဲသော အစီအစဉ်များနှင့် ညှိနှိုင်းသောအစီအစဉ်များ အကောင်အထည် ဖော်ဆောင်ခြင်း
- အနီးအနားမှဆိုင်များသို့ ဒေသခံလူများ ဖြတ်သန်းသွားလာ နိုင်ရန် လူကူးလမ်းငယ်များTPMC မှလုပ်ဆောင်ပေးခြင်း
- ဆောက်လုပ်ရေးအချိန်အတွင်း ထိခိုက်သွားသော လုပ်ငန်းများနှင့် ကုမ္ပဏီများအား TPMC မှပြန်လည် လျော်ကြေးပေးခြင်း

အသင်းအဖွဲ့ နှင့် လုပ်ငန်းခွင်ဆိုင်ရာကျန်းမာရေးနှင့် လုံခြုံရေးအတွက် နည်းလမ်းများ

- ဓာတ်အားလိုင်းဆောက်လုပ်မည့် လုပ်ငန်းကိစ္စရပ်များနှင့် ယာယီအလုပ်သမားတန်းလျားနေရာကို ဒေသခံများအား အသိပေးခြင်း
- Transmission Line ၏ တာဂါတိုင်ခြေများ ၊ ဓာတ်အားကြိုးများ၏ အရည်အသွေးကို နှစ်စဉ်စစ်ဆေးပေးခြင်း
- အန္တရာယ် ဖြစ်နိုင်ချေ ရှိသော နေရာများနှင့် ဘေးကင်းလုံခြုံသည့်နေရာများကို သတိပြုမိစေရန် သတိပေးဆိုင်းဘုတ်များ နှင့် ပစ္စည်းများကို စီမံကိန်းဧရိယာအနီး (၅၀၀ မီတာအကွာ) တွင် ထားရှိပေးထားခြင်း
- ရောဂါသယ်ဆောင်သော အင်းဆက်ပိုးမွှားပေါက်ဖွားရာနေရာများကို ရှင်းလင်းခြင်း (ခြင်လောက်လန်းပေါက်ပွားသည့်နေရာများ);
- လုပ်ငန်းခွင်အတွင်း ကျန်းမာရေး စောင့်ရှောက်ပေးခြင်းနှင့် ဆေးဝါးအထောက်အပံ့များ ဖန်တီး ထားရှိ ပေးခြင်း



- တစ်ကိုယ်ရေနှင့်ပတ်ဝန်းကျင်သန့်ရှင်းရေး၊ မိလ္လာနှင့်ရေဆိုးစနစ်တို့အတွက် စီမံကိန်းဝန်ထမ်းများကို သတင်းအချက်အလက်များပေးခြင်း၊ ပညာပေးခြင်းနှင့် အကြောင်းကြားခြင်းဆိုင်ရာ စည်းရုံးနှိုးဆော်ရေးများ ပြုလုပ်ပေးခြင်း
- နိုင်ငံတကာဆိုင်ရာ အလေ့အကျင့်ကောင်းများနှင့်အညီ ပြည်ပမှအလုပ်သမားများကိုနေထိုင်ရာနေရာများ ထောက်ပံ့ပေးခြင်း
- ယာဉ်လမ်းကြောင်းဆိုင်ရာ စီမံခန့်ခွဲမှု အစီအစဉ်များပြုလုပ်ခြင်း
- လူထုကျန်းမာရေးနှင့်ဘေးကင်းလုံခြုံရေးနှင့် ဆက်စပ်နေသော သက်ရောက်မှုမှန်သမျှအတွက် ညှိနှိုင်းဆောင်ရွက်ရေးအစီအစဉ်များ နှင့် နစ်နာချက်စီမံခန့်ခွဲရေးအစီအမံများကို TPMC မှ အကောင်အထည်ဖော်ဆောင်ရွက်ခြင်း

- ဆောက်လုပ်ရေးမစတင်မီ ကျန်းမာရေးနှင့် ဘေးကင်းလုံခြုံရေးအစီအမံများကို ပြင်ဆင်ခြင်းနှင့် အကောင်အထည်ဖော်ခြင်း
- လုပ်ငန်းခွင်အတွင်း ဖြစ်နိုင်ခြေရှိသော အန္တရာယ်များဆိုင်ရာ သတင်းအချက်အလက်များကို ဆောက်လုပ်ရေးလုပ်ငန်းခွင်ရှိအလုပ်သမားများအားလုံးကို အသိပေးခြင်း
- ဆောက်လုပ်ရေးလုပ်ငန်းခွင်အတွင်း ဘေးအန္တရာယ်ကာကွယ်ရေး အသုံးအဆောင်များ ကို အချိန်ပြည့်ဝတ်ဆင်ထားခြင်း
- အန္တရာယ်ရှိနိုင်သော နေရာဝန်းကျင်တွင် သတိပေးသင်္ကေတများပါသော သင့်လျော်သည့် လုံခြုံရေးဆိုင်ရာ အတားအဆီးများကို ကန်ထရိုက်တာများမှ ထားရှိပေးခြင်း
- IFC Performance Standard 2၊ ဒေသဆိုင်ရာစည်းမျဉ်းနှင့် နိုင်ငံတကာအလုပ်သမားအဖွဲ့မှ အစည်အလာများကို EPC ကန်ထရိုက်တာမှ လိုက်နာခြင်း

စောင့်ကြည့်လေ့လာခြင်း

- ဆောက်လုပ်ရေးလုပ်ငန်းစဉ်အတွင်း စောင့်ကြည့်လေ့လာရေးအစီအစဉ်များ (လေထု၊ ဆူညံသံ၊ မြေပေါ်ရေ၊ မြေအောက်ရေ၊ မြေသား)
- စီမံကိန်းလည်ပတ်နေစဉ်အတွင်း စောင့်ကြည့်လေ့လာရေးအစီအစဉ်များ (လေထု၊ ဆူညံသံ၊မြေပေါ်ရေ၊ မြေအောက်ရေ)
- လုပ်ငန်းခွင် စစ်ဆေးသူများ
- ကန်ထရိုက်တာများ၏ လုပ်ငန်းစဉ်များကို စစ်ဆေးခြင်း
- အစီရင်ခံခြင်း
- စစ်ဆေးခြင်း
- နစ်နာချက်တိုင်ကြားနိုင်မည့်နည်းလမ်းများ
- စီမံကိန်းသက်ဆိုင်သူများနှင့် တိုင်ပင်ဆွေးနွေးခြင်း

စီမံကိန်း သက်ဆိုင်သူများနှင့် ညှိနှိုင်းဆွေးနွေးသွားမည့် လုပ်ငန်းစဉ်

စီမံကိန်း သက်ဆိုင်သူများနှင့်ညှိနှိုင်းဆွေးနွေးသွားမည့် လုပ်ငန်းစဉ်

ညှိနှိုင်းဆွေးနွေးခြင်း အစီအစဉ်ကို IEE အစီရင်ခံစာကို အတည်ပြုချိန်မှ စီမံကိန်းသက်တမ်းတစ်လျှောက် ဆက်လက်ဆောင်ရွက်သွားမည်ဖြစ်သည်။ ဆက်လက်ဆောင်ရွက်ရန် ရှိသည်များမှာ

- စီမံကိန်းသက်ဆိုင်သူများ၏ အကြံပြုချက်များကို IEE အစီရင်ခံစာ ၏ စီမံကိန်းကြောင့် ပတ်ဝန်းကျင်ထိခိုက်မှုများလျော့ကျစေမည့် အစီအမံများကဏ္ဍတွင် ထည့်သွင်းပါရှိစေခြင်း
- IEE အစီရင်ခံစာအား အများပြည်သူသိရှိအောင် ထုတ်ဖော်ပေးခြင်း
- စီမံကိန်းဆောက်လုပ်ရေးကာလတွင် ညှိနှိုင်းဆွေးနွေးပေးခြင်း
- စီမံကိန်းလည်ပတ်ကာလတွင် ညှိနှိုင်းဆွေးနွေးပေးခြင်း
- နစ်နာချက်များ တိုင်ကြားခွင့်ရှိမည့် အစီအစဉ် အကောင်အထည်ဖော်ပေးခြင်း

Grievance Mechanism

- စီမံကိန်း နှင့်ပတ်သတ်၍ သက်ရောက်မှုခံရသူအားလုံးမှ တိုင်ကြားလိုခြင်း၊ အကြံပေးလိုခြင်းများ ရှိပါက အချိန်မရွေး တင်ပြ နိုင်ပါသည်။
- ပတ်ဂန်းကျင်၊ လူမှုဂန်းကျင်ထိခိုက်မှု ဆန်းစစ်သည့် လုပ်ငန်းစဉ်အတွင်း တစ်စုံတစ်ရာ မကျေနပ်ချက်၊ အကြံပေးလိုချက် ၊ မေးလိုချက် များ ရှိပါကလည်း လုပ်ထုံးလုပ်နည်းလျော်ညီစွာ တင်ပြနိုင်ပါသည်။
- အသေးစိတ်ကို လူထုပါဂင်ဆွေးနွေးပွဲ(၁) လက်ကမ်းစာစောင်တွင် ဖော်ပြခဲ့ပြီးဖြစ်ပါသည်။
- ယခုရှင်းလင်းပွဲအတွက် အကြံပြုလွှာကို ဖြန့်ဝေပေးအပ်ခဲ့ပြီး ဖြစ်ပါသည်။

Contact:

ERM
MariaRita.Borba@erm.com
MyatMon.swe@erm.com

TPMC
Tel: +95 997 495 3914
Mail: htetaung.m@ttcl.com

ကျေးဇူးတင်ပါသည်။

The business of sustainability

ERM

APPENDIX G SIGNED SHEET FROM THE ENGAGMENT MEETINGS

LNG သုံးလျှပ်စစ်ဓါတ်အားပေးစက်ရုံ စီမံကိန်း၏ အစိတ်အပိုင်း တစ်ခုဖြစ်သည့်

Transmission Line တည်ဆောက်ရေးလုပ်ငန်းနှင့် ပတ်သတ်ပြီး ကနဦး ပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း

အစီရင်ခံစာ (IEE) လုပ်ငန်းစဉ်များအား ဒေသခံပြည်သူလူသို့ ရှင်းလင်းတင်ပြခြင်း အခမ်းအနား

နေရာ- လှိုင်သာယာမြို့နယ် နေ့ရက်။ ၂၀၁၉ ခုနှစ်၊အောက်တိုဘာလ ၂၉ရက်

စဉ်	အမည်	နေရပ်လိပ်စာ (မြို့နယ်/ ကျေးရွာ)	ဖုန်းနံပါတ်	လက်မှတ်	မှတ်ချက်
၁။	ဦးစိုး	အတွင်ပမာ	၀၉ ၇၈၃၉၇၀၆၆၇		
၂။	ဒေါ်မိုးမြဲ	〃 〃	၀၉-၂၅၆၆၂၆၇၀၆		
၃။	Daw Aye	YYTU	၀၆-76273555		
၄။	ဒေါ်စန်းဝင်း	သဲကွင်း ကမ်းပြိုL	09-774043308	ဒေါ်စန်းဝင်း	
၅။	ဦးသူရိန်(ကွင်း)	ဦးဝိုးကုန်ကို (မြို့ပ) DPTSC	05-4034606598		
၆။	ဦးထွန်းမင့်	ကမ်းပါးကျေးရွာ			
၇။	မခင်မခင်းမောင်း	ကမ်းပြိုနှင့်သဲကွင်း	09-958225557		
၈။	မမေခိုင်	ကမ်းပြိုသဲကွင်း	09-96 1888853	မေ	
၉။	ဦးအောင်ဇေယျ	ကမ်းပြိုသဲကွင်း	09-780249814		
၁၀။	ဒေါ်ဝင်းလွင်	ကမ်းပြိုL	-	လွင်	
၁၁။	ဦးတိုးလှိုင်	〃	-		
၁၂။	ဒေါ်သစ်လွင်	ကမ်းပြိုL	-	သစ်၊	
၁၃။	ဒေါ်သင်းဝင်း	〃	-	သင်း	
၁၄။	ဒေါ်စံပယ်	ကမ်းပြိုL	-	စံပယ်	
၁၅။	ဒေါ်ခိုင်မာ	ကမ်းပြိုL	-	ခိုင်မာ	
၁၆။	ဒေါ်တင်နု	ကမ်းပြိုL	-	နု	

LNG သုံးလျှပ်စစ်ဓါတ်အားပေးစက်ရုံ စီမံကိန်း၏ အစိတ်အပိုင်း တစ်ခုဖြစ်သည့်

Transmission Line တည်ဆောက်ရေးလုပ်ငန်းနှင့် ပတ်သတ်ပြီး ကနဦး ပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း

အစီရင်ခံစာ (IEE) လုပ်ငန်းစဉ်များအား ဒေသခံပြည်သူလူသို့ ရှင်းလင်းတင်ပြခြင်း အခမ်းအနား

၁၇။	ကိုးဝင်းခိုင်	ကမ်းကြို			
၁၈။	သန်းဆိုလင်	〃			
၁၉။	ကျော်ဟိုး	〃			
၂၀	ခေမြမင်း	〃			
၂၁။	သန်းဝေဆာ	〃 ကွက်သစ်			
၂၂။	အေးမမိ	〃			
၂၃။	ခင်မြဒဂု	〃			
၂၄။	စစ်(ပ)ဝင်း	〃			
၂၅။	ကျော်လွင်	〃			
၂၆။	ခင်မာအေး	〃			
၂၇။	ဖြူကြည်ဦး	〃			
၂၈။	ဒီဒီတာ	〃			
၂၉။	သန်းဦး	〃			
၃၀။	တင်ဟု	〃			
၃၁။	ဆေးဦး	〃			
၃၂။	ငယ်(ပ)ဦး	〃			
၃၃။	ဒေမင်းထွေး	〃			
၃၄။	ဖုန်းဆိုင်	〃			
၃၅။	စန်းဆာင မင်းဟိုက်	〃			

LNG သုံးလျှပ်စစ်ဓါတ်အားပေးစက်ရုံ စီမံကိန်း၏ အစိတ်အပိုင်း တစ်ခုဖြစ်သည့်

Transmission Line တည်ဆောက်ရေးလုပ်ငန်းနှင့် ပတ်သတ်ပြီး ကနဦး ပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း

အစီရင်ခံစာ (IEE) လုပ်ငန်းစဉ်များအား ဒေသခံပြည်သူလူသို့ ရှင်းလင်းတင်ပြခြင်း အခမ်းအနား

စဉ်	အမည်	နေရပ်လိပ်စာ (မြို့.နယ်/ ကျေးရွာ)	ဖုန်းနံပါတ်	လက်မှတ်	မှတ်ချက်
၁။	ဦး.ခင်မောင်မြင့်	ကမြို့			
၂။	ကိုဇော်မင်း	ကမြို့			
၃။	ကိုမြင့်သိန်း	ကမြို့			
၄။	ဦး နွယ်ဝင်း	ကမြို့		ဝင်း	
၅။	ဒေါ်ခြိမ်းခင်	သဲကွင်း		ခင်	
၆။	ဦး ကြည်ဌေး	နန်းပညာတက္ကသိုလ်			
၇။	ဦးစော်ဦး	"			
၈။	ဒေါ်ခင်ဇွဲဝိုင်	ကမြို့		ခင်	
၉။	ကိုခင်မောင်	ကွက်သစ်			
၁၀။	မသန္တာမွန်မြင့်မော	သဲကွင်း	"		
၁၁။	ဒေါ်ငွေအေး	ကမ်းပြို့	"	ငွေအေး	
၁၂။	မမြို့ပြို့ဝေ	ကမ်းပြို့	"		
၁၃။	ဒေါ်ခင်ခင်မော်	သဲကွင်း	"	ခင်	
၁၄။	ကိုဦးအုန်းကျော်	ကမ်းပြို့	09431396881		
၁၅။	ဦး သန်းစိုး	ကမ်းပြို့			
၁၆။	ဦး ကျော်လင်း	ကမ်းပြို့	09268773716		

၁၇။	နိုင်းမြင့်ဇော်	ကဖ်းပြို	၀၅၇၀၈၅၀၄၃ 944	ဖေဖော်	
၁၈။	မသန်းစော	ကဖ်းပြို	〃	သူ	
၁၉။	မသောက်နိုင်	ကဖ်းပြို	〃	ခ	
၂၀	နိုင်းအေးကြို	ကဖ်းပြို		ဝမ်းနှ	
၂၁။	နိုင်းကျော်စိုင်	〃	၀၉၄၂၀၂၀၂၅၄၇	ကျော်	
၂၂။	ကိုအောင်သိန်းဇင်	〃	၀၉၇၆၇၃၇၃၉၇၂	ကြိုင်	
၂၃။	မကြူကြူမော	〃	၀၉၇၈၃၅၈၁၀၄၇	မော	
၂၄။	မခင်ဝန်းအေး	သဲကွင်း	〃	ဘဲ	
၂၅။	ဒေါ်ဥမ်းမံ	သဲကွင်း	〃	ဖိုးမုံ	
၂၆။	မအိမူ	သဲကွင်း	〃	ဂ	
၂၇။	စောင်းစေတာတွဲ	ကဖ်းပြို	-	ဆဲ	
၂၈။	နိုင်းဝမာ:ထိုင်း	〃	-	ဂ.	
၂၉။	ဒေါ်တင်းဝမာ:	〃	-	ဝဒ္ဓ!	
၃၀။	သန်းဝန်	〃	-	သ	
၃၁။	ခွန်အားပြုံးသန်	ကဖ်းပြို	၀၇၇၀၈၄၅၁၃၉၅၆	ခဲ	
၃၂။	နိုင်းသောင်းဆိုင်းသေး	ကဖ်းမြို	ဆွေး၇၆၁၃၂၀၀၃	ဆိုင်း	
၃၃။	ဒေါ်ဝင်းညွှန့်	〃	၀၉.4200798l2	ဝင်း	
၃၄။	သစ်ပေါ်ဖေဖော်	〃	-	ဖေဖော်	
၃၅။	နိုင်းမိုးထိုး			မိုးထိုး	
၃၆။	ပြည်ကောင်း			ပြည်	
၃၇။	နိုင်းဇော်ဝင်း			ဇော်ဝင်း	

LNG သုံးလျှပ်စစ်ဓါတ်အားပေးစက်ရုံ စီမံကိန်း၏ အစိတ်အပိုင်း တစ်ခုဖြစ်သည့်

Transmission Line တည်ဆောက်ရေးလုပ်ငန်းနှင့် ပတ်သတ်ပြီး ကနဦး ပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း

အစီရင်ခံစာ (IEE) လုပ်ငန်းစဉ်များအား ဒေသခံပြည်သူလူသို့ ရှင်းလင်းတင်ပြခြင်း အခမ်းအနား

၃၆။	ဝင်း ကို	ကမ်း ကြီး		ဝင်း	
၃၇။	ဂေကြီး ဦးနု	၇			
၃၈။	ကော ဦး ဝင်း	၈			
၃၉။	သန်း မြင့် ဝေး	၅			
၄၀။	ဂေကြီး ကင်	၆			
၄၁။	ဒေါ်ငြိမ်းခိုက်	၆			
၄၂။	ဖိုး ဝန်း	၆			
၄၃။	မြင့်နုင်	၇			
၄၄။	၁၁ဦး စင် မောင်	၂			
၄၅။	ခိုင်း ကံ ဝေး	ကမ်း ကြီး	၀၉.၄၅၀၆၃ ၇၅၀၄		
၄၆။	ခိုင်း ဖိုး စိုး	″	-		
၄၇။	ခိုင်း သိန်း တွင်း	″	၀၉.၇၀၅၄၈ ၆၅၄၄		
၄၈။	ဒေါ် စင် တာ ဝေ	″	၀၉.၆၄၄၆၈ ၁၈၈		
၄၉။	ဒေါ်ဘဘီထွေး	″	၀၉.၄၄၁၄၁ ၈၂၁၃		
၅၀။	ကိုသိန်း ဝေကြီး	″	၀၉.၄၅၀၀၁၇၀၅၄		
၅၁။	ဒေါ် စင် ခင် မိုး	″	၀၉.၇၅၈~~၂၃၆~~ ၀၆၆		
၅၂။	ဒေါ်မိုး ဖိုး ဝ	″	-		
၅၃။				မိုး မိုး ဝ	
၅၄။	ဒေါ်ဆိုင်	″	-	မိုးဆိုင်	

LNG သုံးလျှပ်စစ်ဓါတ်အားပေးစက်ရုံ စီမံကိန်း၏ အစိတ်အပိုင်း တစ်ခုဖြစ်သည့်

Transmission Line တည်ဆောက်ရေးလုပ်ငန်းနှင့် ပတ်သတ်ပြီး ကနဦး ပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း

အစီရင်ခံစာ (IEE) လုပ်ငန်းစဉ်များအား ဒေသခံပြည်သူလူသို့ ရှင်းလင်းတင်ပြခြင်း အခမ်းအနား

နေရာ- လှိုင်သာယာမြို့ နယ်

နေ့ရက်။ ၂၀၁၉ ခုနှစ်၊အောက်တိုဘာလ ၂၉ရက်

စဉ်	အမည်	နေရပ်လိပ်စာ (မြို့နယ်/ ကျေးရွာ)	ဖုန်းနံပါတ်	လက်မှတ်	မှတ်ချက်
၁။	မမြင့်မြင့်ဝေ	ကွမ်းပြိုကျေးရွာ၊ လှိုင်သာယာ၊	09.68501811		
၂။	မဝင်းမာပို	ကမ်းပြိုကျေးရွာ၊ လှိုင်သာယာ	09-77215798		
၃။	ဦးဆေဘုလင်း	ကမ်းပြိုလှိုင်သာယာ	09.762172341		
၄။	ဦးခိုးဦးခြင်	" " "	09-7771566783		
၅။	ဦးကျော်မောင်ဦး	" " "	09-685018776		
၆။	ဦးအောင်ကြို	" " "	09-969486414		
၇။	မြို့မျိုးကျော်	ကမ်းပြိ-၊	09-769271052		
၈။	ဦးမြင့်မောင်	ကတွင်းပင်	09445419544		
၉။	ဦးဆောဝင်းဦ	ဒါတွင်းပင်	09795724114		
၁၀။	ဦးဝင်းနိုင်	ကမ်းပြိုL	-		
၁၁။	ဦးမျိုးမင်း	ကမ်းပြိုL	-		
၁၂။	ဦးနိုင်လင်း	ကမ်းပြိုL	09-799486605		
၁၃။	ဦးမြင့်သန်း	ကမ်းပြိုL	09-778249677		
၁၄။	ဦးထိုးမွန်	ကွက်သစ်	09-7511141514		
၁၅။	ဦးဝေဇ္ဇ ပြင့်	အပြင်ပဒ	09-420244339		
၁၆။	ဦးဇော်ပြင့်	ကမ်းပြိုL	-		

LNG သုံးလျှပ်စစ်ဓါတ်အားပေးစက်ရုံ စီမံကိန်း၏ အစိတ်အပိုင်း တစ်ခုဖြစ်သည့်
Transmission Line တည်ဆောက်ရေးလုပ်ငန်းနှင့် ပတ်သတ်ပြီး ကနဦး ပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း
အစီရင်ခံစာ (IEE) လုပ်ငန်းစဉ်များအား ဒေသခံပြည်သူလူသို့ ရှင်းလင်းတင်ပြခြင်း အခမ်းအနား

၁၇။	ဦး တင်ဇေယ္ဓ	ကမ်းပြိုင်	-		
၁၈။	ဒေါ်ထွေးမုံ	ကမ်းပြိုင်	-	ဒေါ်ထွေးမုံ	
၁၉။	ကြည်ကြည်	ကွက်ဘဆ်	-	ကြည်	
၂၀	ဦး ဝဏ်းဝဏ်း	တလိ	09-254317446		
၂၁။	ဦး ဇော်မင်းထက်	ကမ်းပြိုင်	09-771007097		
၂၂။	ဒေါ်ငွေဝါဆွေထက်နိုင်	ကမ်းပြိုင်	09-268051206		
၂၃။	ဒေါ်သဒ္ဓါမိုးဦး	သဲကွင်းကမ်းပြိုင်	09-420173487		
၂၄။	မြို့ ဒေါ်နီ ဖြစ်ဆေး	ဝဲကွင်းကမ်းပြိုင်	09-684873757		
၂၅။	ဒေါ်ခင်ဆုဝေ	ကမ်းပြိုင်သဲမြို့	09-791626464		
၂၆။	ဒေါ်ဝေဝေကြီး	ကမ်းပြိုသဲကွင်း	09-260454944		
၂၇။	ဒေါ်ခင်ပေမိုင်	ကမ်းပြိုကျေးရွာ	-		
၂၈။	ဒေါ်စုဇင်း	ကမ်းပြိုမြစ်ကြီးကွေ့	-		
၂၉။	မောင်ကျော်မိုး	〃 〃	-		
၃၀။	ဒေါ်ဂွိုက်	ကမ်းပြိုသဲကွင်း	-		
၃၁။	မောင်ဝဏ်းမော်	ကမ်းပြိုကျေးရွာ	-		
၃၂။	ဒေါ်ယဉ်ယဉ်ဖြိုး	ကမ်းပြို	09-254966441		
၃၃။	ဦး တင်ဝင်း	〃	〃 -		
၃၄။	ကျော်ထက်အောင်	〃	09- -		
၃၅။	ပြည့်ဖုံအောင်	〃	-		

LNG သုံးလျှပ်စစ်ဓါတ်အားပေးစက်ရုံ စီမံကိန်း၏ အစိတ်အပိုင်း တစ်ခုဖြစ်သည့်

Transmission Line တည်ဆောက်ရေးလုပ်ငန်းနှင့် ပတ်သတ်ပြီး ကနဦး ပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း

အစီရင်ခံစာ (IEE) လုပ်ငန်းစဉ်များအား ဒေသခံပြည်သူလူသို့ ရှင်းလင်းတင်ပြခြင်း အခမ်းအနား

၃၆။	ဒေါ်စန်းနွဲ့	ကမ်းပြိုရွာ	-		
၃၇။	ဒေါ်အားစန်း	ကမ်းပြိုရွာအလယ်ကွင်း	-		
၃၈။	ဒေါ်ပြပြ	〃	-		
၃၉။	ဒေါ်မှလှဝေ	ကမ်းပြိုရွာ	-		
၄၀။	ဒေါ်ဝဋ္ဌ	〃	-		
၄၁။	ဦးဝေးဘိုး	〃	၀၅.၂၆၄၆၂၆၁၄		
၄၂။	ဒေါ်ပြ	〃	-		
၄၃။	ဒေါ်စင်ဦးရီ	〃	-		
၄၄။	ဦးတင်ကြိုင်	ကမ်းပြိုရွာ	၀၅.၄၂၀၁		
၄၅။	ဒုမ္မာဝင်း	ကမ်းပြိုရွာ	-		
၄၆။	ဦးဘိုးဝေ	ကမ်းပြိုရွာ	၀၅.၄၆၀၀၃၁		
၄၇။	ဦးချမ်းမြင့်	ကမ်းပြိုရွာ	၀၅.၂၆၄၀၆၆၃၂၀		
၄၈။	ဦးဒွိဝင်း	အပြင်ဝင်	၀၅.၇၅၀၆၆၇၅၀၆		
၄၉။	ဦးမျိုးဝေ	ကမ်းပြိုရွာ	၀၅.၄၆၆၂၅၇၂၅၂		
၅၀။	ဒေါ်ထားဝမ	ကမ်းပြိုရွာအလယ်ကွင်း	-		
၅၁။	ဒေါ်စင်ဝေဖွဲ့	ကမ်းပြိုရွာ	၀၅.၇၅၂၀၀၀၇၂၀		
၅၂။	ဦးတင်ဦး	〃	-		
၅၃။	ဦးဒင်ဝေမော်	ကမ်းပြိုရွာ	၀၅.၄၂၁၆၆၇၁၆		
၅၄။	ဦးတိုးမြင့်	ကမ်းပြိုရွာ	-		

LNG သုံးလျှပ်စစ်ဓါတ်အားပေးစက်ရုံ စီမံကိန်း၏ အစိတ်အပိုင်း တစ်ခုဖြစ်သည့်
Transmission Line တည်ဆောက်ရေးလုပ်ငန်းနှင့် ပတ်သတ်ပြီး ကနဦး ပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း
အစီရင်ခံစာ (IEE) လုပ်ငန်းစဉ်များအား ဒေသခံပြည်သူလူသို့ ရှင်းလင်းတင်ပြခြင်း အခမ်းအနား

၅၅။	ဒေါ်သင်းသင်းလွင်	ကမ်းပြိုရေး	-	သခင်	
၅၆။	ဖေဖေကြီး	〃	-	ညီဝ	
၅၇။	ဦးထွန်းလင်း	အဖြူပဒဲ	-		
၅၈။	ဦးဆေးမြင့်တွန်း	အတွင်းပယ်			
၅၉။	ဦးဝေးဇင်း	ကမ်းပြိုရေး	၀၅-၇၈၅၅၅၅	မင်း	
၆၀။	ဦးတင်ဝေအောင်	ကမ်းပြိုရေး	-	ဒေဝဒတ်	
၆၁။	ဦးဘကြီး	ကမ်းပြိုရေး	၀၅-၂၃၂၀၃၀၀		
၆၂။	ဒေါ်ဖိုး	〃	-	ကြည်း	
၆၃။	ကိုစည်ကြီး	〃	-	ကိုဆင်ကြီး	
၆၄။					
၆၅။					
၆၆။					
၆၇။					
၆၈။					
၆၉။					
၇၀။					
၇၁။					
၇၂။					
၇၃။					

LNG သုံးလျှပ်စစ်ဓါတ်အားပေးစက်ရုံ စီမံကိန်း၏ အစိတ်အပိုင်း တစ်ခုဖြစ်သည့်

Transmission Line တည်ဆောက်ရေးလုပ်ငန်းနှင့် ပတ်သတ်ပြီး ကနဦး ပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း

အစီရင်ခံစာ (IEE) လုပ်ငန်းစဉ်များအား ဒေသခံပြည်သူလူသို့ ရှင်းလင်းတင်ပြခြင်း အခမ်းအနား

၉၃။	ဦးစုလှ	ရွာသူကြီး၊ ကင်းတပ်ဆိုက်			
၉၄။	စိုးမာ	〃			
၉၅။	မေရင်မော်	〃			
၉၆။	သွင်သွင်အေး	〃			
၉၇။	ဇံမော်စိုး	ကပ်လျိုရွာ			
၉၈။	ကြင်ဇင်မြ	〃			
၉၉။	သာကီရီဇုလ်	၎			
၁၀၀။	မောင်ဇော	၃			

LNG သုံးလျှပ်စစ်ဓါတ်အားပေးစက်ရုံ စီမံကိန်း၏ အစိတ်အပိုင်း တစ်ခုဖြစ်သည့်
Transmission Line တည်ဆောက်ရေးလုပ်ငန်းနှင့် ပတ်သတ်ပြီး ကနဦး ပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း
အစီရင်ခံစာ (IEE) လုပ်ငန်းစဉ်များအား ဒေသခံပြည်သူလူသို့ ရှင်းလင်းတင်ပြခြင်း အခမ်းအနား

နေရာ- တွံတေးမြို့နယ် - ရပ်ကွက်/ကျေးရွာ

နေ့ရက်။ ၂၀၁၉ ခုနှစ်၊အောက်တိုဘာလ ၃၀ရက်

စဉ်	အမည်	နေရပ်လိပ်စာ (မြို့နယ်/ ကျေးရွာ)	ဖုန်းနံပါတ်	လက်မှတ်	မှတ်ချက်
၁။	မြ၊ ထိုး ကျော်သူ				
၂။	မြ၊ လွင်ခြင်		၀၉.၇၆၆၃၇၇၄		
၃။	မြ၊ ဘဘလေးဘင်				
၄။	မြ၊မောင်၊ မြ၊				
၅။	မြ၊ လေးကြီး				
၆။	မြ၊ ခင်မောင်သွင်				
၇။	မြ၊ ဝေလင်း				
၈။	ဒေါ်ဝေး၊ ဝေး				
၉။	ဒေါ်မိချို				
၁၀။	ဒေါ်ခင်ဝင်း				
၁၁။	ဒေါ်တင်မိုးကို				
၁၂။	မြ: မြင့်မြင့်				
၁၃။	ဒေါ်ဇင်း				
၁၄။	ဒေါ်ခင်ဆွေခြင်				
၁၅။	ဒေါ်သန်း၊သန်းညွှန့်				
၁၆။	မြ၊ ကြည်ဝင်း				

LNG သုံးလျှပ်စစ်ဓါတ်အားပေးစက်ရုံ စီမံကိန်း၏ အစိတ်အပိုင်း တစ်ခုဖြစ်သည့်

Transmission Line တည်ဆောက်ရေးလုပ်ငန်းနှင့် ပတ်သတ်ပြီး ကနဦး ပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း

အစီရင်ခံစာ (IEE) လုပ်ငန်းစဉ်များအား ဒေသခံပြည်သူလူသို့ ရှင်းလင်းတင်ပြခြင်း အခမ်းအနား

နေရာ- တွံတေးမြို့ နယ် ဒဂုံမြို့သစ်

နေ့ရက်။ ၂၀၁၉ ခုနှစ်၊အောက်တိုဘာလ ၃၀ရက်

၁၇။	ဦးမင်းထက်ဦး	ဒဂုံမြို့သစ်	ဆည်ပေါက်ရေး	ဂျပန်	
၁၈။	ဦးကျော်ဇေး	〃		အမှုထမ်း	
၁၉။	ဦးကျော်ဆန်းဦး	〃		ပြင်ဆင်	
၂၀	ဦးဇော်မျိုးဝင်း	〃		ဆရာ	
၂၁။	ဦးကျော်တွန်း	〃		ကောင်စီ	
၂၂။	ဦးကြမ်း	〃		ဦး	
၂၃။	ဦးကောင်းခြိမ်း	〃		ဆရာ	
၂၄။	ဦးမျိုးမင်းဦး	〃		ပန်း	
၂၅။	ဦးဆန်းဇော	〃		ဆရာ	
၂၆။	ဦးဇော်မျိုး	〃		ကောင်စီဝင်	
၂၇။	ဦးကိုကိုဝင်း	〃		ဆရာ	
၂၈။	ဦးဘောင်းဆိုင်	〃		ကျိန်	
၂၉။	ဦးဟိန်းကျော	〃	ဆရာ	Hlaing	
၃၀။					
၃၁။					
၃၂။					
၃၃။					
၃၄။					

LNG သုံးလျှပ်စစ်ဓါတ်အားပေးစက်ရုံ စီမံကိန်း၏ အစိတ်အပိုင်း တစ်ခုဖြစ်သည့်

Transmission Line တည်ဆောက်ရေးလုပ်ငန်းနှင့် ပတ်သတ်ပြီး ကနဦး ပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း

အစီရင်ခံစာ (IEE) လုပ်ငန်းစဉ်များအား ဒေသခံပြည်သူလူသို့ ရှင်းလင်းတင်ပြခြင်း အခမ်းအနား

နေရာ- တွံတေးမြို့ နယ် - ရပ်ကွက်

နေ့ရက်။ ၂၀၁၉ ခုနှစ်၊အောက်တိုဘာလ ၃၀ရက်

၃၅။	မြို့အုပ်ချုပ်ရေး		ဖုန်းနံပါတ်။		
၃၆။	မြို့ နယ်မြေ				
၃၇။	။ ကောင်စီဝင်				
၃၈။	။ ကော်မတီ				
၃၉။	။ ပညာရေး				
၄၀။	။ ဆေးဘက်				
၄၁။	။ အင်အားပြုလုပ်ရေး				
၄၂။	။ အာဏာပိုင်				
၄၃။	။ ရေဆာင်းတန်				
၄၄။	။ ဘဏ္ဍာရေး				
၄၅။	။ ကျေးရွာလယ်ယာ				
၄၆။	။ ရေနံ				
၄၇။	။ မြို့ပြ				
၄၈။	။ ဗဟိုအမှုဆောင်ကော်မတီ				
၄၉။	။				
၅၀။					
၅၁။					
၅၂။					

LNG သုံးလျှပ်စစ်ခါတ်အားပေးစက်ရုံ စီမံကိန်း၏ အစိတ်အပိုင်း တစ်ခုဖြစ်သည့်

Transmission Line တည်ဆောက်ရေးလုပ်ငန်းနှင့် ပတ်သတ်ပြီး ကနဦး ပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း

အစီရင်ခံစာ (IEE) လုပ်ငန်းစဉ်များအား ဒေသခံပြည်သူလူသို့ ရှင်းလင်းတင်ပြခြင်း အခမ်းအနား

နေရာ- တွံတေးမြို့ နယ် ကျန်းကလေး

နေ့ရက်။ ၂၀၁၉ ခုနှစ်၊အောက်တိုဘာလ ၃၀ရက်

၅၃။	မြ၊ကျော်ဦး	ကျန်းကလေး	ဟုပ်ချုပ်ယာဂု၊ ဦး		
၅၄။	မြ၊စိန်ဝေဘဝ	"	ဖြတ်သန်		
၅၅။	မြ၊ဟာက်ထွန်းမြ		"		
၅၆။	မြ၊ခင်ဖေဝင်းဝင်း		"		
၅၇။	မြ၊စန်းဝင်း		"		
၅၈။	မြ၊ဒေဝင်းခိုင်းဆွင်		"		
၅၉။	မြ၊ဒေဝင်းခိုင်းသူ		"		
၆၀။	မြ၊ခိုင်ဖေဝ၊		"		
၆၁။	မြ၊ဆင်းခင်၊စိုးမြင့်		"		
၆၂။	မြ၊ကြိုကြို၊		"		
၆၃။	မြ၊ဟိန်းမင်း၊သတ်		"		
၆၄။	မြ၊သန်းထိုက်စည်		"		
၆၅။					
၆၆။					
၆၇။					
၆၈။					
၆၉။					
၇၀။					

LNG သုံးလျှပ်စစ်ဓါတ်အားပေးစက်ရုံ စီမံကိန်း၏ အစိတ်အပိုင်း တစ်ခုဖြစ်သည့်

Transmission Line တည်ဆောက်ရေးလုပ်ငန်းနှင့် ပတ်သတ်ပြီး ကနဦး ပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း

အစီရင်ခံစာ (IEE) လုပ်ငန်းစဉ်များအား ဒေသခံပြည်သူလူသို့ ရှင်းလင်းတင်ပြခြင်း အခမ်းအနား

နေရာ- တွံတေးမြို့ နယ် (ကံမွာကျေးရွာ)

နေ့ရက်။ ၂၀၁၉ ခုနှစ်၊အောက်တိုဘာလ ၃၀ရက်

၁၁။	ဦးမျိုးအောင်	အုပ်ချုပ်ရေးမှူး	ကံမွာ		
၁၂။	။မျိုးသန့်အောင်	စာရေး၊	။		
၁၃။	။ခြေတွေ	ကြည့်သူ	။		
၁၄။	။ကံခြေ	။	။		
၁၅။	။ကျော်ဦး	။	။		
၁၆။	။ဇော်သောက်၊ဝင်း၊	။	။		
၁၇။	။ဦးသေးဇင်းထော	။	။		
၁၈။	။ပြည့်ဖြိုး၊မြို့	။	။		
၁၉။	။မျိုးမှုန်၊	။			
၂၀။	။ဘဒ္ဒ၊ဝင်းထော	။	။		
၂၁။	။မွတ်ဖ	။	။		
၂၂။	။ဒေါ်ခေါ်ကွေ	။	။		
၂၃။	ဦးဆင်းလေးဖွ	။	။		
၂၄။					
၂၅။					
၂၆။					
၂၇။					
၂၈။					

LNG သုံးလျှပ်စစ်ဓါတ်အားပေးစက်ရုံ စီမံကိန်း၏ အစိတ်အပိုင်း တစ်ခုဖြစ်သည့်

Transmission Line တည်ဆောက်ရေးလုပ်ငန်းနှင့် ပတ်သတ်ပြီး ကနဦး ပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း

အစီရင်ခံစာ (IEE) လုပ်ငန်းစဉ်များအား ဒေသခံပြည်သူလူသို့ ရှင်းလင်းတင်ပြခြင်း အခမ်းအနား

နေရာ- တွံတေးမြို့ နယ် တမံကြီး ;

နေ့ရက်။ ၂၀၁၉ ခုနှစ်၊အောက်တိုဘာလ ၃၀ရက်

၈၉။	မြို့နယ်အောင်ကြီး		ဗျော်ကြွယ်		
၉၀။	မြို့ထိန်လင်း				
၉၁။	မြို့ဒေါ်ကွန်				
၉၂။	မြို့ကလေး ကွန်				
၉၃။	မြို့ကော်မ၀ဲ				
၉၄။	မြို့မျိုးဆန်းဦး				
၉၅။	မြို့ကျော်လင်းထွဋ်				
၉၆။	မြို့မြို့ကမ္ဘ				
၉၇။					
၉၈။					
၉၉။					
၁၀၀။					
၁၀၁။					
၁၀၂။					
၁၀၃။					
၁၀၄။					
၁၀၅။					
၁၀၆။					

LNG သုံးလျှပ်စစ်ဓါတ်အားပေးစက်ရုံ စီမံကိန်း၏ အစိတ်အပိုင်း တစ်ခုဖြစ်သည့်

Transmission Line တည်ဆောက်ရေးလုပ်ငန်းနှင့် ပတ်သတ်ပြီး ကနဦး ပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း

အစီရင်ခံစာ (IEE) လုပ်ငန်းစဉ်များအား ဒေသခံပြည်သူလူသို့ ရှင်းလင်းတင်ပြခြင်း အခမ်းအနား

နေရာ- တွံတေးမြို့ နယ်

နေ့ရက်။ ၂၀၁၉ ခုနှစ်၊အောက်တိုဘာလ ၃၀ရက်

၁၀၇။	မြို့နယ်ဥက္ကဋ္ဌ	ကျေးကျွင်းသူကြီးများ	ဖြန်ယမ်ကုမ္ပဏီ		
၁၀၈။	ဦးထွန်းဦး	ကော်ဆောက်ဘုန်ကြာ.ကျေးရွာ	DPTSC		
၁၀၉။	ဦးဘုပ	ဦးစီးအာဏာရှိ(တောင်/ကျေးလက်)	DPTSC		
၁၁၀။					
၁၁၁။					
၁၁၂။					
၁၁၃။					
၁၁၄။					
၁၁၅။					
၁၁၆။					
၁၁၇။					
၁၁၈။					
၁၁၉။					
၁၂၀။					
၁၂၁။					
၁၂၂။					
၁၂၃။					
၁၂၄။					

LNG သုံးလျှပ်စစ်ဓါတ်အားပေးစက်ရုံ စီမံကိန်း၏ အစိတ်အပိုင်း တစ်ခုဖြစ်သည့်

Transmission Line တည်ဆောက်ရေးလုပ်ငန်းနှင့် ပတ်သတ်ပြီး ကနဦး ပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း

အစီရင်ခံစာ (IEE) လုပ်ငန်းစဉ်များအား ဒေသခံပြည်သူလူသို့ ရှင်းလင်းတင်ပြခြင်း အခမ်းအနား

နေရာ- တွံတေးမြို့ နယ် ဓနုဖြူကုန်း နေ့ရက်။ ၂၀၁၉ ခုနှစ်၊အောက်တိုဘာလ ၃၀ရက်

၁၀၇။	ဦးကြည်ထွဋ်				
၁၀၈။	ဦး ခင်မောင်				
၁၀၉။	ဦး ကျော်ဘော်				
၁၁၀။	မြ ဝင်း ဦး				
၁၁၁။	ဦး ဆင်ဒူ				
၁၁၂။					
၁၁၃။					
၁၁၄။					
၁၁၅။					
၁၁၆။					
၁၁၇။					
၁၁၈။					
၁၁၉။					
၁၂၀။					
၁၂၁။					
၁၂၂။					
၁၂၃။					
၁၂၄။					

APPENDIX H STAKEHOLDER ENGAGEMENT MINUTES OF MEETING

Minutes of Meeting

IEE Public Consultation for Transmission Line for the 388 MW Combined Cycle Power Plant (Ahlone) Project in Yangon, Myanmar

Date: 29 October 2019, 10-12h

Location: Hlaing Thar Yar Township - Kanphyar Monastery, Apyin Padan Village Group

Name	Question/Issue	Answer
Dr Aung Aung (WYTU, Electrical Engineering Dept)	Who will monitor the EMP and how will TTCL follow the commitments presented in the PowerPoint?	TTCL: MOEE will monitor, ERM will provide support and prepare mitigation measures so TTCL can implement during the project activities. ERM: ECD will also monitor.

Minutes of Meeting

IEE Public Consultation for Transmission Line for the 388 MW Combined Cycle Power Plant (Ahlone) Project in Yangon, Myanmar

Date: 30 October 2019, 10-12h

Location: Twantay Township - GAD Office, Tawwin Sandakuu Hall

Name	Question/Issue	Answer
Mr. Khin Maung Myint Village leader for TaManGyi village	What's the width of the tower? Worried TTCL will not build the towers as presented in the slides.	TTCL and MOEE confirmed the information as in the slides presented.
	When will the project start?	TTCL: only will start when TTCL gets the power purchase agreement.
	Concerned about harvesting, because this is rice season.	MOEE and TTCL: will take his concern into consideration.
	Is there any compensation to the damage caused to the farmland and crops?	MOEE: Land compensation committee has the compensation framework with the amount to be paid for impact in crops. The final amount will be multiplied by three. Will receive compensation for crops all landowners who have land in the project area, even if there's no crop at the moment. There's another type of compensation for access road. Only will receive compensation for crops, those who have production where access road will pass.
	What is the safety distance [ROW] between tower and settlements?	MOEE: According to MOEE rules and regulation, ROW is 75 ft from the tower centre. And no transmission lines will cross settlements, only farmland and main road in NYDC area. No need to worry about the settlements.
Village leader of Kan village.	Concerned about damages caused by the TL on farmland and houses Previous compensation considered the area of 150 feet (diameter); will	MOEE: Yes, it will be the same.

	this project consider the same scheme?	
Mr. Myint Zaw Lwin Village leader for Khayanwa village.	What is the amount of compensation for damages?	MOEE: if there are any damages (impact) to the farmland there is compensation; the amount will be based on the production (crops). Maximum of three times the compensation for damages.
	Worried it will happen that land will not be returned to original state due to construction activities (i.e. piling, holes, not leveling the land) as has happened in the past.	MOEE: Apologized and guarantee it will not happen again. MOEE will strictly instruct TTCL so that will not happen again. TTCL: TTCL will make sure that the contractor responsible for construction activities will follow the instruction to return the land to previous state, including leveling.

APPENDIX I COMMITMENT LETTER

TTCL POWER MYANMAR COMPANY LIMITED
REGISTRATION NO. 105690495
168, 16TH FLOOR, CENTRE POINT TOWER,
NO.65, CORNER OF SULE PAGODA ROAD AND MERCHANT STREET,
KYAUKTADA, YANGON, MYANMAR
TEL. +95 (0) 1 371 962 FAX. +95 (0) 1 371 963

Ministry of Natural Resources and Environmental Conservation
Environmental Conservation Department
Office No.(53),
Nay Pyi Taw, Myanmar

Attn: Director General
Environmental Conservation Department

Subject: **Initial Environmental Examination and Environmental Management Plan in respect of the LNG Power Plant (Ahlone) Project (the "IEE including ESMP")**

Dear Sir,

We refer to the captioned IEE/ESMP, which was prepared and finalized by ERM in accordance with the Environmental Conservation Law, Rules and Procedures under the instructions of Ministry of Natural Resources and Environmental Conservation on the 11.May.2021.

We endorse and confirm to Ministry of Natural Resources and Environmental Conservation:

a. the accuracy and completeness of the IEE/ESMP;

b. Confirm and undertake to Ministry of Natural Resources and Environmental Conservation that the IEE/EMP has been prepared in strict compliance with applicable Environmental Conservation Law, Rules and Procedures, and TOR for the IEE;

c. Confirm and undertake to Ministry of Natural Resources and Environmental Conservation that the established project company (TPMC)in respect of the LNG Power Plant (Ahlone) Project shall at all times comply fully commitments, mititagation measures and plans in the IEE report.

(EIA Consultant)

ERM-Siam Co., Ltd.

By _____
Name: Kamonthip Ma-oon
Title: Partner

(Project Proponent)

TTCL Power Myanmar Co., Ltd.

By _____
Name: Mrs. Suratana Trinratana
Title: Managing Director

ERM has over 160 offices across the following countries and territories worldwide

Argentina
Australia
Belgium
Brazil
Canada
China
Colombia
France
Germany
Hong Kong
Hungary
India
Indonesia
Ireland
Italy
Japan
Kazakhstan
Kenya
Malaysia
Mexico
Myanmar
The Netherlands
New Zealand
Norway
Panama
Peru
Poland
Portugal
Puerto Rico
Romania
Russia
Singapore
South Africa
South Korea
Spain
Sweden
Switzerland
Taiwan
Thailand
UAE
UK
US
Vietnam

ERM-Siam Co., Ltd.

179 Bangkok City Tower 24th Floor, South Sathorn Road, Thungmahamek, Sathorn, Bangkok 10120, Thailand

T: (662) 679 5200

www.erm.com

The business of sustainability

ERM