

# Environmental and Social Impact Assessment Guidelines for Hydropower Projects in Myanmar



The Environmental and Social Impact Assessment Guidelines for Hydropower Projects in the Myanmar has been developed for the Ministry of Natural Resources and Environmental Conservation and the Ministry of Electricity and Energy under the International Finance Corporation's (IFC) Hydro Advisory Program which receives support from the Australian Department of Foreign Affairs and Trade. The Guidelines have been prepared by Peter Wulf of ESIA Consult Pty Limited.

## Executive Summary

Myanmar is a resource rich nation with world-renowned biodiversity and abundant natural resources. In recent years, Myanmar has slowly increased its development in hydropower projects to provide power for not only its own people, but for other countries in East and South East Asia. It is expected that there will be significant investment over the medium term due to the recent opening up of the country to foreign investment, the current high level of interest in the hydropower sector, and rising national power demand. However, some of the current and proposed projects are seen as somewhat controversial, including from an environmental and social perspective.

The environmental and social management frameworks in Myanmar are very new. Commencing in 2012, Myanmar has been developing a legal framework for considering the environmental and social impacts of projects. The *Environmental Conservation Law* was passed in 2012. In December 2015, the *Environmental Impact Assessment Procedure 2015* were approved by the Government of Myanmar (Notification No. 616/2015 - 29 December 2015). The *Environmental Impact Assessment Procedure 2015* establish the requirements and procedures for environmental impact assessment, the review, approval and monitoring of projects under the *Environmental Conservation Law 2012*. The *Environmental Impact Assessment Procedure 2015* sets out specific requirements for project screening, the preparation of Initial Environmental Examination (IEE) and Environmental Impact Assessment (EIA – also known as an Environmental and Social Impact Assessment (ESIA)), the appeal process, Environmental Management Plan (EMP – also defined as an Environmental and Social Management Plan (ESMP)), environmental considerations in project approval, monitoring, strategic environmental assessment, and administrative punishment. The *Environmental Impact Assessment Procedure 2015* also contains annexes on the categorisation of Economic Activities for Assessment Purposes; charts illustrating steps in the various project assessment processes, and penalties and administrative punishment.

The *National Environmental Quality (Emission) Guidelines* (29 December 2015) was issued by the Government of Myanmar to provide performance parameters for the regulation and control of air emissions, noise, vibration, and liquid discharges from various sources in order to prevent pollution and thereby protect human and ecosystem health. These Guidelines were primarily based on the World Bank Group's Environmental Health and Safety (EHS) General Guidelines 2007 that provide technical guidance on good international industry pollution prevention practice for application in developing countries. Other related laws and regulations include the *Environmental Conservation Rules 2014*, the *Myanmar National Water Policy 2015* and the *Conservation of Water Resources and River Law 2006*.

This document, the Environmental and Social Impact Assessment Guidelines for Hydropower Projects in the Myanmar (ESIA Guidelines) has been developed based on the need to assess the environmental and social impact of hydropower projects in Myanmar for the Department of Environmental Conservation within the Ministry of Natural Resources and Environmental Conservation (MONREC). The ESIA Guideline has been developed under the International Finance Corporation's (IFC) Hydro Advisory Program which receives support from the Australian Department of Foreign Affairs and Trade (DFAT). The ESIA Guidelines have been developed consistent with the IFC's Performance Standards and Good International Industry Practice.

The general objectives of the overall ESIA Guideline are to provide support for MONREC and promote the sustainable development of Myanmar's natural resources while enhancing basin management planning; and to improve and strengthen the Terms of Reference for environmental and social impacts assessment (ESIA) process and implementation through the development of a Terms of Reference for hydropower projects. The ESIA Terms of Reference are intended to define the scope of the studies required for the preparation of a project's ESIA to allow for consideration and subsequent decision-making on the appropriateness of the pre-construction, construction, operation and decommissioning/rehabilitation of a hydropower project under the *Environmental Conservation Law 2012* and other relevant legislation in Myanmar.

The ESIA Guidelines were developed in consultation with the Government of Myanmar including significant consultation and workshopping with MONREC, the Ministry of Electricity and Energy (MOEE), businesses, development partners, hydropower project proponents and relevant stakeholders including regional and non-government organisations. The format of the ESIA Guidelines is as follows:

**Chapter 1:** Provides decision-makers with an overview and the objections of the ESIA Guideline, about the environmental and social impact assessment requirements contained within the *Environmental Conservation Law 2012* and *Environmental Impact Assessment Procedure 2015*, information about the hydropower sector in Myanmar, an overview of hydropower projects including type, size, design, pre-construction, construction, operation and decommissioning/rehabilitation and associated infrastructure. The chapter also provides an

overview of the general environmental and social impacts associated with a hydropower project, a brief summary on cumulative impacts, how a proponent should engage in public participation, stakeholder engagement and consultation and discussion on some of the benefit sharing and benefit creation options that could be used; and

**Chapter 2:** the Terms of Reference for the undertaking of an ESIA for a hydropower project in Myanmar. It is anticipated that this section of the document will be provided to proponents and their consultants (Third Party) who propose to construct and operate a hydropower project in Myanmar. The Terms of Reference can be produced as a standalone document. This process requires identification and management of impacts from a project on affected communities and stakeholders and the preparation of an international standard ESIA.

For the purposes of understanding and consistency, an Environmental and Social Impact Assessment (ESIA) is the international definition for a joint environmental impact assessment and social impact assessment. An EIA/EIS is a project specific environment impact assessment required by Myanmar law. The *Environmental Impact Assessment Procedure 2015* also refers to an IEE which is essentially a lower level ESIA mainly based on a desk top assessment with limited field work.

## Acronyms

ADB	Asian Development Bank
AP	Affected People
CIA	Cumulative Impact Assessment
CSR	Corporate Social Responsibility
DFAT	Australian Department of Foreign Affairs and Trade
DRD	Department of Rural Development
DPW	Department of Public Works
DOHSAHD	Department of Human Settlements and Housing Development
ECC	Environmental Conservation Committee
ECD	Environmental Conservation Division
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
ESMP	Environmental and Social Management Plan
EQS	Environmental Quality Standard
ESIA	Environmental and Social Impact Assessment – international term for the process of assessing both environmental and social impacts of a project in one assessment
GIS	Geographic Information Systems
GRM	Grievance Redress Mechanism
GoM	Government of Myanmar
IEE	Initial Environmental Examination
IFC	International Finance Corporation
ILO	International Labour Organisation
JICA	Japan International Cooperation Agency
MDB	Multi-lateral Development Bank
MOHA	Ministry of Home Affairs
MOL	Minimum Operating Level
MOEE	Ministry of Electricity and Energy
MONREC	Ministry of Natural Resources and Environmental Conservation
NORAD	Norwegian Agency for Development Cooperation
SIA	Social Impact Assessment
WB	World Bank Group

## Contents

Executive Summary .....	3
Acronyms .....	5
1. Hydropower Power in Myanmar – Advice to Government.....	14
1.1. Overview and Objectives of the Environmental and Social Impact Assessment Guidelines for Hydropower Projects in Myanmar.....	14
1.2. Working together for better environmental and social outcomes for hydropower projects: early and ongoing Government coordination .....	15
1.3. Scope and Relationship to Myanmar Legislation, <i>Environmental Impact Assessment Procedure 2015</i> and Process .....	17
1.3.1. Constitution.....	17
1.3.2. <i>Environmental Conservation Law 2012</i> and <i>Environmental Impact Assessment Procedure 2015</i> .....	17
1.3.3. Laws related to Biodiversity Conservation .....	21
1.3.4. Laws related to Water.....	23
1.3.5. Laws related to National Race.....	23
1.3.6. Laws relating to the Protection of Cultural Heritage.....	25
1.3.7. Customary Lands.....	25
1.3.8. Laws related to Occupational Safety and Health (including Communicable Diseases) .....	27
1.3.9. IFC Performance Standards and the ESIA Guidelines .....	27
1.4. Format of the Environmental and Social Impact Assessment Guidelines.....	28
1.5. Overview of a Hydropower Project .....	29
1.5.1. Important Definitions for Hydropower Projects.....	29
1.5.2. Types of Hydropower Projects.....	31
1.5.3. Size of Hydropower Projects.....	32
1.5.4. Design of Hydropower Projects .....	33
1.5.5. Other Dam Structures.....	34
1.5.6. Associated Activities .....	35
1.5.7. Pre-construction Activities .....	35
1.5.8. Construction Activities .....	36
1.5.9. Operational Activities .....	36
1.5.10. Decommissioning/Rehabilitation Activities.....	37
1.6. General Environmental and Social Impacts associated with a Hydropower Project .....	37

1.6.1. General Area of Influence .....	37
1.6.2. General Environmental Impacts.....	38
1.6.2.1. Air quality.....	38
1.6.2.2. Climate Change.....	38
1.6.2.3. Ecological Impacts.....	38
1.6.2.4. Erosion and Sedimentation.....	41
1.6.2.5. Hydrological Changes.....	42
1.6.2.6. Noise and vibration.....	43
1.6.2.7. Seismic Activity.....	43
1.6.2.8. Soil quality .....	43
1.6.2.9. Water Quality.....	43
1.6.2.10. Biodiversity Offsets .....	44
1.6.3. General Social Impacts.....	45
1.6.3.1. Conflict and Security.....	45
1.6.3.2. Cultural Impacts.....	46
1.6.3.3. Gender.....	47
1.6.3.4. Health .....	47
1.6.3.5. Human Rights.....	48
1.6.3.6. Influx of Workforce.....	48
1.6.3.7. Labour .....	49
1.6.3.8. Livelihoods and Compensation.....	49
1.6.3.9. Race .....	50
1.6.3.1. Resettlement and Compensation.....	51
1.7. Interlinkages between Environmental and Social Impacts.....	53
1.8. Cumulative Impacts associated with Hydropower Projects.....	53
1.9. Transboundary Impacts associated with Hydropower Projects.....	54
1.10. Public Participation, Stakeholder Engagement and Consultation .....	55
1.11. IFC requirements for Free, Prior Informed Consent.....	56
1.12. Community Benefit Sharing and Benefit Creation in Hydropower Projects in Myanmar .....	57
Executive Summary .....	62

2. Terms of Reference for Proponents undertaking Environmental and Social Impact Assessment for Hydropower Projects in Myanmar .....	63
2.1. Introduction to the Environmental and Social Impact Assessment Requirements for Hydropower Projects in Myanmar .....	63
2.2. Definitions .....	63
2.3. <i>Environmental Conservation Law 2012, Environmental Impact Assessment Procedure 2015</i> , ESIA Terms of Reference and Good International Industry Practices for undertaking an Environmental and Social Impact Assessment for a Hydropower Project .....	65
2.4. Overview of initial steps in the Environmental and Social Impact Assessment Process in Myanmar .....	67
2.4.1. Project Proposal .....	67
2.4.2. Scoping Report .....	67
2.5. The Environmental and Social Impact Assessment and Report .....	68
2.6. Executive Summary .....	70
2.7. Introduction .....	71
2.8. Third Party .....	72
2.9. Conflict of Interest Statement .....	72
2.10. Legal, Policy and Institutional Framework .....	72
2.11. Project Description .....	73
2.11.1. Infrastructure Requirements .....	74
2.11.2. Concrete Batching Plant .....	74
2.11.3. Energy .....	74
2.11.4. Water Supply and Storage during construction .....	74
2.11.5. Waste Water .....	75
2.11.6. Staff Facilities and Worker's Camp .....	75
2.11.7. Quarries .....	75
2.11.8. Access Roads .....	75
2.11.9. Transmission Lines .....	75
2.12. Alternatives to the Project .....	76
2.13. Methodology for undertaking a Environmental and Social Impact Assessment .....	76
2.14. Baseline Descriptions/Studies .....	77
2.14.1. Topography, Geology and Soils (including Erosion and Sedimentation) .....	77
2.14.2. Seismicity .....	77



2.14.3. Unexploded Ordinance .....	77
2.14.4. Climate .....	77
2.14.5. Air Quality .....	78
2.14.6. Ambient Light.....	78
2.14.7. Ambient Noise .....	78
2.14.8. Visual Amenity.....	78
2.14.9. Hydrology .....	78
2.14.10. Groundwater and Surface Water Quality .....	78
2.14.11. Terrestrial Flora and Fauna.....	79
2.14.12. Aquatic Flora and Fauna.....	79
2.14.13. Fisheries .....	79
2.14.14. Protected Areas .....	80
2.14.15. Forestry, Agriculture and Land Use (Current and Future).....	80
2.14.16. Public and Private Infrastructure .....	80
2.14.17. Transport.....	80
2.14.18. Land Ownership and Customary Tenure .....	80
2.14.19. Population .....	81
2.14.20. Gender.....	81
2.14.21. Education .....	81
2.14.22. Health.....	82
2.14.23. Labour and Working Conditions.....	82
2.14.24. National Races and Traditional Knowledge .....	82
2.14.25. Vulnerable and Internally Displaced People.....	82
2.14.26. Archaeological and Cultural Heritage.....	82
2.14.27. Religion.....	83
2.14.28. Conflict and Security .....	83
2.14.29. Economic Aspects and Livelihoods.....	83
2.14.30. Institutional and Governance Arrangements.....	83
2.15. Impact and Risk Based Assessment Process.....	83
2.16. Identification of Impacts and Risks .....	84

2.16.1. Pre-Construction and Construction.....	84
2.16.1.1. Air Quality .....	84
2.16.1.2. Greenhouse Gas Emissions .....	84
2.16.1.3. Light.....	85
2.16.1.4. Noise and Vibration.....	85
2.16.1.5. Erosion and Sedimentation.....	86
2.16.1.6. Hydrological Impacts and Environmental Flows.....	86
2.16.1.7. Surface Water Quality and Quantity.....	86
2.16.1.8. Groundwater Hydrology and Quality .....	87
2.16.1.9. Terrestrial Ecosystems.....	87
2.16.1.10. Terrestrial Flora and Fauna .....	87
2.16.1.11. Land Use Change.....	87
2.16.1.12. Forestry and Agriculture .....	87
2.16.1.13. Reservoir Clearance .....	88
2.16.1.14. Aquatic Ecosystems .....	88
2.16.1.15. Aquatic Flora and Fauna .....	88
2.16.1.16. Fisheries.....	88
2.16.1.17. Infrastructure and other Associated Works.....	89
2.16.1.18. Changes in Traffic Conditions.....	89
2.16.1.19. Resettlement, Land Ownership and Customary Tenure .....	89
2.16.1.20. Population Changes .....	90
2.16.1.21. Health Impacts.....	90
2.16.1.22. Gender Impacts .....	91
2.16.1.23. Loss of Livelihood.....	91
2.16.1.24. Labour and Working Conditions .....	91
2.16.1.25. Archaeological and Cultural Heritage .....	91
2.16.1.26. National Races and Traditional Knowledge .....	92
2.16.1.27. Vulnerable and Internally Displaced Groups.....	92
2.16.1.28. Religion.....	92
2.16.1.29. Conflict and Security.....	92

2.16.1.30.	Economic Aspects .....	92
2.16.1.31.	Construction Worker Influx .....	93
2.16.2.	Operation .....	93
2.16.2.1.	Air Quality .....	93
2.16.2.2.	Greenhouse Gas Emissions .....	93
2.16.2.3.	Noise and Vibration.....	93
2.16.2.4.	Geomorphological Changes.....	93
2.16.2.5.	Erosion and Sedimentation.....	94
2.16.2.6.	Hydrological Impacts and Changes to Environmental Flow .....	94
2.16.2.7.	Surface Water Hydrology and Quality .....	95
2.16.2.8.	Groundwater Hydrology and Quality .....	96
2.16.2.9.	Terrestrial Ecosystems.....	96
2.16.2.10.	Terrestrial Flora and Fauna .....	96
2.16.2.11.	Land Use Change.....	96
2.16.2.12.	Forestry and Agriculture .....	96
2.16.2.13.	Aquatic Ecosystems .....	97
2.16.2.14.	Aquatic Flora and Fauna .....	97
2.16.2.15.	Fisheries.....	97
2.16.2.16.	Associated Infrastructure .....	98
2.16.2.17.	Waste .....	98
2.16.2.18.	Health .....	98
2.16.2.19.	Conflict and Security.....	98
2.16.2.20.	Economic Aspects .....	99
2.16.3.	Decommissioning/Project Closure/Rehabilitation .....	99
2.16.3.1.	Removal of Sediment.....	99
2.16.3.2.	Release of Water .....	99
2.16.3.3.	Removal of Infrastructure.....	99
2.16.3.4.	Waste Management.....	99
2.16.3.5.	Rehabilitation .....	100
2.17.	Impacts on and from Climate Change .....	100

2.18.	Consequential Impacts .....	100
2.19.	Cumulative Impacts .....	100
2.20.	Transboundary Impacts .....	102
2.21.	Levels of Uncertainty .....	102
2.22.	Proposed Avoidance, Management, and Mitigation Measures .....	102
2.23.	Offsets .....	103
2.24.	Dam Safety .....	103
2.25.	Public Participation, Stakeholder Engagement and Consultation .....	104
2.26.	Benefit Sharing and Benefit Creation.....	105
2.27.	Company Environmental and Social Management System .....	105
2.28.	Monitoring and Reporting .....	105
2.29.	Conclusion.....	106
2.30.	Information Sources.....	106
2.31.	Reference List and Bibliography .....	107
2.32.	Appendices and Glossary .....	107
2.33.	Environmental and Social Management Plan .....	107
2.33.1.	Commitments.....	108
2.33.2.	Environmental Management and Monitoring .....	108
2.33.3.	Social Management and Monitoring .....	109
2.33.4.	Stakeholder Engagement Plan, Complaints Register and Grievance Redress Mechanism .....	110
2.33.5.	Livelihood Restoration and Improvement Plan .....	111
2.33.6.	Resettlement Action Plan .....	112
2.33.7.	National Races Plan .....	113
2.33.8.	Conflict and Security Plan.....	113
2.33.9.	Emergency Preparedness Plan .....	114
2.33.10.	Budget.....	114
Figure 1	Conventional Hydropower Project.....	32
Figure 2	Run of River Hydropower Project.....	33
Figure 3	Map of Divisions and States in Myanmar .....	52

Table 1 Hydropower Project Sequencing and Environmental and Social Management..... 15

Table 2 Legal, Policy and Institutional Framework content ..... 72

# 1. Hydropower Power in Myanmar – Advice to Government

## 1.1. Overview and Objectives of the Environmental and Social Impact Assessment Guidelines for Hydropower Projects in Myanmar

Myanmar is a resource rich nation with world-renowned biodiversity and abundant natural resources. In recent years, Myanmar has increased its development in hydropower projects to provide power for not only its own people, but for other countries in East and South East Asia. Dams can have significant impacts on the environment broadly. Dam construction inundates riverine habitats upstream and alters seasonal flow regimes and natural sedimentation processes downstream. In addition, dams can have direct impacts on fish migration routes and access to spawning grounds as lack of fish passes or strategies to maintain aquatic communities in downstream. Dam construction can also have indirect impacts on biodiversity, through the relocation of human populations into areas where they place additional pressure on natural resources.

The environmental and social management frameworks in Myanmar are very recent. Commencing in 2012, Myanmar has been developing a legal framework for considering the environmental and social impacts of projects. The *Environmental Conservation Law* was passed in 2012. In December 2015, the *Environmental Impact Assessment Procedure 2015* were approved by the Government of Myanmar (Notification No. 616/2015 - 29 December 2015). The *Environmental Impact Assessment Procedure* establish the requirements and procedures for environmental impact assessment, the review, approval and monitoring of projects under the *Environmental Conservation Law 2012*. The *Environmental Impact Assessment Procedure* sets out specific requirements for project screening, Initial Environmental Examination (IEE), Environmental Impact Assessment (EIA), appeal process, Environmental Management Plan (EMP), environmental considerations in project approval, monitoring, strategic environmental assessment, and administrative punishment. The Procedure also contains annexes on the categorisation of Economic Activities for Assessment Purposes; charts illustrating steps in the various project assessment processes; and Penalties and Other Administrative Punishment. The *National Environmental Quality (Emission) Guidelines* (29 December 2015) was issued by the Government of Myanmar to provide performance parameters for the regulation and control of air emissions, noise, vibration, and liquid discharges from various sources in order to prevent pollution and thereby protect human and ecosystem health. These Guidelines were primarily based on the World Bank Group's Environmental Health and Safety (EHS) General Guidelines 2007 that provide technical guidance on good international industry pollution prevention practice for application in developing countries. Other related laws and regulations include the *Environmental Conservation Rules Notification* (2014), the Myanmar National Water Policy (2015) and the *Conservation of Water Resources and River Law* (2006).

This document, the Environmental and Social Impact Assessment Guidelines for Hydropower Projects in the Myanmar (ESIA Guidelines), have been developed based on the need to assess the environmental and social Impact of hydropower projects in Myanmar for the Department of Environmental Conservation within the Ministry of Natural Resources and Environmental Conservation (MONREC). The ESIA Guideline has been developed under the International Finance Corporation's (IFC) Hydro Advisory Program which receives support from the Australian Department of Foreign Affairs and Trade (DFAT). The ESIA Guidelines have been developed consistent with Myanmar law, the IFC's Performance Standards and Good International Industry Practice.

The general objectives of the overall ESIA Guideline are to provide support for MONREC and promote the sustainable development of Myanmar's natural resources while enhancing basin management planning; and to improve and strengthen the Terms of Reference for environmental and social impacts assessment (ESIA) process and implementation through the development of a Terms of Reference for hydropower projects. The ESIA Terms of Reference are intended to define the scope of the studies required for the preparation of a project's ESIA to allow for consideration and subsequent decision-making on the appropriateness of the pre-construction, construction, operation and decommissioning/rehabilitation of a hydropower project under the *Environmental Conservation Law 2012* and other relevant legislation in Myanmar.

For the purposes of understanding and consistency, an Environmental and Social Impact Assessment (ESIA) is the international definition for a joint environmental impact assessment and social impact assessment. An Environmental Impact Assessment (EIS) is a project specific assessment required by law. The *Environmental Impact Assessment Procedure 2015* also refers to an Initial Environmental Examination (IEE) which is essentially a lower level ESIA mainly based on a desk top assessment with limited field work.

## 1.2. Working together for better environmental and social outcomes for hydropower projects: early and ongoing Government coordination

The current status of hydropower development is managed by the Ministry of Electricity and Energy (MOEE). MOEE undertake strategic planning for the development of hydropower projects; however, until recently, there was limited early assessment of potential environmental and social risks. Notwithstanding this, MOEE acknowledge that there is a critical need to undertake an early environmental and social risk assessment for all hydropower projects. Table 1 provides information on the project cycle for a “normal” hydropower project through the various stages. It highlights the relevant areas where MOEE and MONREC can work together in coordination to identify and manage both the hydropower project and environmental and social issues that generally arise through the development of a project. Table 1 should not be considered to address all the relevant issues; however, it does demonstrate that if there is early consideration of environmental and social issues, this may resolve many of the problems that have been observed with hydropower projects internationally.

**Table 1 Hydropower Project Sequencing and Environmental and Social Management**

Project Phase	Key Development and Implementation Activities	Environmental and Social Management
Concept and Pre-Feasibility Phase	<ul style="list-style-type: none"> <li>• Develop and identify potential opportunities to support the construction and operation of a hydropower project</li> <li>• Develop project’s concept, assess overall benefits and risks and decide whether to proceed</li> <li>• Preliminary assessment of sites for engineering purposes</li> <li>• Preliminary analysis of locations for infrastructure requirements including all ancillary infrastructure such as power line corridors, workers camps etc</li> <li>• Review and evaluation of the main legal, financial and technical issues</li> </ul>	<ul style="list-style-type: none"> <li>• Desktop study to screen and identify significant environmental and social impacts and risks</li> <li>• Screen for consistency with national socio-economic development plans, natural resources and environment strategies, and relevant sector development plans</li> <li>• Undertake risk assessment of environmental and social risks and modify project accordingly to avoid and/or mitigate risks at the high level. The activity has a significant benefit in that it could identify activities that could result in the project not being approved following the preparation of the ESIA and/or reduce the potential for social and conflict issues</li> <li>• Preparation of Project Proposal</li> <li>• Preparation of Scoping Report</li> <li>• Development of Project Specific Terms of Reference based on Chapter 2 of the ESIA Guidelines</li> </ul>
Feasibility	<ul style="list-style-type: none"> <li>• Feasibility studies involve detailed investigations of legal, financial, commercial and technical issues</li> <li>• Identify specific locations for infrastructure requirements including all ancillary infrastructure such as power line corridors, workers camps etc</li> </ul>	<ul style="list-style-type: none"> <li>• Commence baseline studies for the ESIA</li> <li>• Obtain social acceptance of a project through stakeholder engagement and community consultation</li> <li>• Identify land requirements and commence discussion on land acquisition, resettlement etc as required</li> <li>• Identify key alternatives and assess environmental and social impacts and risks of those alternatives</li> <li>• Define environmental and social requirements, mitigation measures and</li> </ul>

Project Phase	Key Development and Implementation Activities	Environmental and Social Management
		<p>costs</p> <ul style="list-style-type: none"> <li>• Identify other existing and future developments and assess possible cumulative impacts and conflicts of interests</li> <li>• Identify potential benefit sharing options should the project proceed</li> </ul>
Detailed Design	<ul style="list-style-type: none"> <li>• Commercial and financial agreements</li> <li>• Permits, concession agreements</li> <li>• Detailed design</li> <li>• Contracting and procurement</li> </ul>	<ul style="list-style-type: none"> <li>• Undertake the environmental and social impact assessment including modelling</li> <li>• Assess and propose best available techniques or technologies (BAT) that will reduce environmental and social issues</li> <li>• Assess and ensure consistency with national, state, regional, township, and district environmental and socio-economic development plans, integrated spatial plans</li> <li>• Secure permits, certificates and requirements for entering into concession agreements</li> <li>• Ensure that environmental and social safeguards are reflected in detailed design specifications</li> <li>• Establish Project environmental and social organisation and prepare procedures, budgets and work plans</li> <li>• Finalise benefit sharing arrangements</li> </ul>
Construction	<ul style="list-style-type: none"> <li>• Construction works</li> <li>• Contractor supervision</li> <li>• Testing and commissioning</li> </ul>	<ul style="list-style-type: none"> <li>• Ensure compliance with approval requirements</li> <li>• Ensure that contractors comply with ESMP</li> <li>• Monitor and ensure that mitigation measures are effective and efficient</li> </ul>
Commercial Operations	<ul style="list-style-type: none"> <li>• Project operations</li> <li>• Maintenance and supply management</li> <li>• Marketing and business administration</li> </ul>	<ul style="list-style-type: none"> <li>• Design and implementation of management and mitigation measures conforming to actual Project operations</li> <li>• Undertaken benefit sharing</li> </ul>
Closure	<ul style="list-style-type: none"> <li>• Decommissioning</li> <li>• Handover</li> <li>• Rehabilitation</li> </ul>	<ul style="list-style-type: none"> <li>• Design and implement rehabilitation measures</li> </ul>

It is recommended that MOEE and MONREC proactively work together in the Concept and Pre-Feasibility Phase to identify potential environmental and social issues and work to alter the project at this stage rather than waiting for the feasibility assessment and environmental and social impact assessment process to be commenced. It is noted that additional modifications may also be made to a project following the baseline and impact assessment.



Further, MOEE and MONREC should utilise the outputs of the IFC funded Strategic Environmental Assessment that is currently being undertaken (2016 to 2017). The Strategic Environmental Assessment will provide a comprehensive database of existing and planned dams (hydro, irrigation and multiple uses). The Strategic Environmental Assessment will be a valuable planning tool to assist all levels of Government to make better informed decisions about hydropower projects.

### **1.3. Scope and Relationship to Myanmar Legislation, *Environmental Impact Assessment Procedure 2015* and Process**

Myanmar has only established a legal framework for considering the environmental and social impacts of projects. The relevant legislation and procedures related to hydropower projects in Myanmar includes but is not limited to the:

- a. *Constitution*;
- b. *Environmental Conservation Law 2012*;
- c. *Environmental Impact Assessment Procedure 2015*;
- d. *Conservation of Water Resources and River Law 2006*;
- e. *Protection of Wildlife and Conservation of Natural Area Law 1994*
- f. *Electricity Law 2014*;
- g. *National Electricity Master Plan – undertaken with the assistance of JICA*; and
- h. *National Electrification Plan – undertaken with the assistance of the World Bank*.

#### **1.3.1. Constitution**

Prior to 2012, Myanmar has established a regime of environmental protection under a range of specific laws as well as policy. The overriding law within Myanmar is the Constitution of the Republic of the Union of Myanmar 2008. Under Article 45, the Constitution requires the Government of Myanmar to protect and conserve the natural environment. Further, Article 390 implies a duty of every citizen of Myanmar to protect the natural environment.

#### **1.3.2. *Environmental Conservation Law 2012* and *Environmental Impact Assessment Procedure 2015***

The Government of Myanmar has enacted legislation, rules and procedures in relation to the undertaking of projects in Myanmar. The principle piece of legislation in relation to environmental and social issues for projects is the *Environmental Conservation Law 2012*. Following the enactment of the law, the *Environmental Conservation Rules 2014* were published.

The *Environmental Conservation Law 2012* has significant provisions that relate to environmental conservation, pollution and other matters. Section 7 of the *Environmental Conservation Law 2012* provides the Ministry with powers relating to the environmental conservation (including pollution). Specifically, the Ministry has a power for prescribing environmental quality standards including standards on emissions, effluents, solid wastes, production procedures, processes and products for conservation and enhancement of environmental quality,<sup>1</sup> specifying categories and classes of hazardous wastes generated from the production and use of chemicals or other hazardous substances in carrying out industry, agriculture, mineral production, sanitation and other activities;<sup>2</sup> prescribing categories of hazardous substances that may affect significantly at present or in the long run on the environment;<sup>3</sup> promoting and carrying out the establishment of necessary factories and stations for the treatment of solid wastes, effluents and emissions which contain toxic and hazardous substances;<sup>4</sup> and managing to cause the polluter to compensate for environmental impact, cause to contribute fund by the organisations which obtain benefit from the natural environmental service system, cause to contribute a part of the benefit from the businesses which explore, trade and use the natural resources in environmental conservation works.<sup>5</sup> Further, under s 10 of the *Environmental*

---

<sup>1</sup> *Environmental Conservation Law 2012*: s 7(d)

<sup>2</sup> *Environmental Conservation Law 2012*: s 7(g)

<sup>3</sup> *Environmental Conservation Law 2012*: s 7(h)

<sup>4</sup> *Environmental Conservation Law 2012*: s 7(i)

<sup>5</sup> *Environmental Conservation Law 2012*: s 7(o)

*Conservation Law 2012*, the Ministry may develop environmental quality standards which include provisions related to the broad definition of pollution. There are further provisions in the *Environmental Conservation Law 2012* that relate to pollution including that s 14, which requires 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

The *Environmental Conservation Law 2012* defines pollution as being

*any direct or indirect alteration, effect of the physical, thermal, chemical or biological properties of any part of the environment including land, water and atmosphere by discharging, emitting or depositing environmental hazardous substances, pollutants or wastes so as to affect beneficial use of environment, or to affect public health, safety or welfare, or animals and plants or to contravene any condition, limitation or prohibition contained in the prior permission issued under this Law.*

Further the *Environmental Conservation Law 2012* also has provisions relating to noise pollution (means the occurrence of sound unit which causes annoyance, fatigue, loss of hearing or interference with the perception of other sounds); pollutant (solid, liquid, or vapour which directly or indirectly alters the quality so as to affect beneficial use of any segment or element of the environment or is hazardous or potentially hazardous to health or causes pollution) and waste (includes solid, liquid, or vapour and also includes anything which is classified as waste in accord with this Law including radioactive substance which is discharged, emitted or deposited in the environment in such volume, constituency or any manner which causes environmental pollution). These are all encompassing definitions.

Pursuant to Articles 52 and 53 of the *Environmental Conservation Rules 2013*, all Projects undertaken in the Republic of the Union of Myanmar by any ministry, government department, organisation, corporation, board, development committee, local government or authority, company, cooperative, institution, enterprise, firm, partnership or individual having the potential to cause significant Adverse Impacts, are required to undertake IEE or EIA and to obtain an ECC in accordance with this Procedure.

*Environmental Conservation Rules 2013* include a number of similar to that of the *Environmental Conservation Law 2012*. Importantly, Article 51 of the *Environmental Conservation Rules 2013* states that the Ministry may assign duty to the Department for enabling to adopt and carry out the environmental impact assessment system. Further, Articles 52 and 53 are relevant in that the Ministry shall determine the categories of plan, business or activity which shall carry out environmental impact assessment and further the Ministry may, so as 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 as the categories which are required to conduct initial environmental examination respectively.

Other relevant provisions include Articles 54 and 55 re the preparation of an environmental impact assessment and the implementation of an environmental management plan. Articles 41 and 42 relate to the hazardous waste while Articles 48, 49 and 50 related to the protection of natural resources and cultural heritages consistent with section 18 of the *Environmental Conservation Law 2012*

MONREC released the *National Environmental Quality (Emission) Guidelines* under notification 615/2015 on 29 December 2015. The *National Environmental Quality (Emission) Guidelines* prescribe specific principles to control noise and vibration, air emission and effluent discharges. The *National Environmental Quality (Emission) Guidelines* are mainly extracted from the International Finance Corporation's (IFC) *Environmental Health and Safety Guidelines* which provide international guidance for different sectors, generally for adoption by developing countries. The *National Environmental Quality (Emission) Guidelines* apply to all projects requiring environmental assessment, with the purpose of controlling pollution and protecting the environment. The rules prescribed under the Guidelines are understood to be achievable at reasonable costs and with existing technology. The *National Environmental Quality (Emission) Guidelines* contain rules that are general in nature, as well as rules that are industry specific. The *National Environmental Quality (Emission) Guidelines* apply to all projects that require an IEE or ESIA. The provisions under the *National Environmental Quality (Emission) Guidelines* also apply to the Environmental Management Plan and Environmental Compliance Certificate of projects. The *National Environmental Quality (Emission) Guidelines* relates to four main areas, these being:

- a. air emission: based on WHO Air Quality Guidelines with additional requirements for small combustion facilities with rated heat input capacity of 3-50 megawatt thermal power

- b. wastewater: based on the Pollution Prevention and Abatement Handbook with additional requirements during project construction phase;
- c. noise levels: for residential, institutional and educational areas, 55 dBA for daytime and 45 dBA for night time. For industrial and commercial areas, 70 dBA for both daytime and night time; and
- d. odour: should not exceed 5-10 odor units at the edge of populated areas in the vicinity of the project.

On 29 December 2015, the now MONREC (formerly Ministry of Environment, Conservation and Forestry) enacted and published the *Environmental Impact Assessment Procedure 2015*. Projects in Myanmar are required to comply with the *Environmental Impact Assessment Procedure 2015*, whether they are undertaken by Government, a multi-lateral bank such as the World Bank, IFC, Asian Development Bank etc or a private proponent. Essentially, there are three levels of assessment established under the *Environmental Impact Assessment Procedure 2015*, that follow the Asian Development Bank model, these being exempt development; and projects that will have environmental and social impacts that would be ranked as Category A or Category B projects, these being projects that need the preparation of an Environmental Impact Assessment (EIA - also known as an Environmental and Social Impact Assessment (ESIA)); or an Initial Environmental Examination (IEE) respectively. Annex One of the *Environmental Impact Assessment Procedure 2015* sets out a list of "Economic Activities" that trigger the requirements of an IEE and/or EIA noting that MONREC can upgrade the requirements from an IEE to an EIA where it deems necessary. A discussion with respect to the economic triggers and hydropower is included later in the ESIA Guidelines.

The *Environmental Impact Assessment Procedure 2015* set out the process for the undertaking and preparation of both an IEE and EIA. There are a number of very general requirements as part of the process which include but are not limited to:

- a. the preparation of a project proposal which is submitted to MONREC;
- b. a decision by MONREC as to the level of assessment required;
- c. the undertaking of the relevant environmental and social studies and impact assessment;
- d. community consultation and stakeholder engagement;
- e. submission of the draft IEE/EIA;
- f. publication of the draft IEE/EIA for community comment; and
- g. review and approval/non-approval of the project and the issuance of an Environmental Compliance Certificate.

These are summarised below.

Screening is the first phase during which the proponent will assess whether the Project or activity is required to undertake an IEE, ESIA or no assessment. In most cases this is a straightforward task but where the proponent is in doubt or in case the Project type is not identified in *Environmental Impact Assessment Procedure 2015* (Annex One), then the proponent should consult with MONREC and request Ministry advice on the matter. The proponent would be required to prepare a Project Proposal and submit that document to MONREC. The Project Proposal should provide the MONREC with a thorough understanding of the project, its location etc and an overview of the existing environment. The Project Proposal should identify the foreseeable impacts that are likely to occur as a result of the project.

Following the submission of the Project Proposal, scoping and the preparation of the Terms of Reference for the project is undertaken. MONREC will make a decision on the level of assessment required based on both the triggers related to economic activities and the likely impacts. MONREC would then advise the Proponent of the level of assessment. The proponent would then be required, through a registered third party consultant to prepare a Scoping Report and Terms of Reference for the undertaking of the impact assessment. After receiving the Scoping Report and Terms of Reference, MONREC has 15 work days to provide comments and require revisions or approve the documents. Approval by MONREC of the Scoping Report and Terms of Reference means that Ministry has considered the Project as presented in the Scoping Report and based on this, accepted the Terms of Reference as a framework for ESIA studies.

This third and fourth phase involve the undertaking of the impact assessment studies and community consultation and stakeholder engagement. Essentially, these can only commence once MONREC has approved the Scoping Report and Terms of Reference, although in practice, these commence when the

Scoping Report and Terms of Reference have been submitted to MONREC. This main phase of the ESIA process involves four steps. Step 1 is the actual undertaking of the ESIA studies and investigations, which must be carried out by a registered third party consultant on behalf of the proponent. During this step, the proponent is required to disclose information about the Project, and conduct community consultation and stakeholder engagement at national, state / regional, township, and local levels with project affected persons (PAP), involved government institutions, and other stakeholders. A discussion on community consultation is contained later in Chapter One of the ESIA Guidelines.

Following the completion of the IEE/ESIA, the document is required to be disclosed. At this time, MONREC will review of the submitted ESIA Report and Environmental and Social Management Plan (ESMP). The review consists of an administrative review followed by a technical review. During the technical review, MONREC will call for comments from concerned stakeholders, arrange consultations at national, state / regional, and township levels and conduct site visits as necessary.

MONREC will then make a decision on the final ESIA Report and its ESMP and either: requires further revisions to the ESIA Report and/or ESMP; approve the ESIA Report and ESMP and issue an Environmental Compliance Certificate (ECC - at the time of writing these ESIA Guidelines, no ECC has been issued for any project); or rejects the ESIA and its ESMP.

Project construction and operation may not commence without a valid ECC (see note above). After obtaining an ECC, the Proponent must proceed with project implementation within two years of the date on which the ECC was issued. A Proponent may request a single extension of an ECC. If the Proponent has not commenced project implementation within this period, the Proponent will have to update, revise and resubmit the ESIA Report and ESMP for renewed review and approval. In cases where MONREC's final decision is a rejection of the ESIA Report and ESMP, then the Ministry will provide reasons for the rejection. MONREC may reject a project if the Ministry considers that the environmental or social impacts are unacceptable, or if the project is materially incompatible with Government policies and strategies for natural resources and environment management.

A further phase only applies to complex projects where MONREC may require the Proponent to prepare and submit a separate ESMP for the construction phase. This is in addition to the ESMP contained in the ESIA Report. If MONREC requires that a Proponent prepare construction ESMP, then the Proponent is not permitted to commence construction works until the Ministry has approved the construction ESMP. In cases of extended project construction phase, the Proponent is required to revise and update the construction ESMP every two years and submit it to MONREC for review and renewal of the ECC.

A final phase, where applicable is project closure. In this phase, the Proponent has an obligation to inform MONREC, PAP and other stakeholders about the implementation of the closure plan for the project. This is required whether the closure is planned or unplanned. In practice, upon completion of the closure activities, the Proponent must prepare a Project Closure Report and submit it to MONREC. The Ministry will then determine if the Proponent has implemented the closure satisfactorily and in accordance with all legal requirements.

There is a difference in the consideration of size of a hydropower project between MOEE and MONREC. MOEE classify hydropower projects as micro (<1MW), small (>1MW to <10MW), medium (>10MW to <30MW) and large (>30MW). By contrast, the *Environmental Impact Assessment Procedure 2015* classify hydropower projects under two distinct assessment requirements, one being an Initial Environmental Examination; and the second being an Environmental Impact Assessment.

<b>Assessment Level</b>	
<b>Initial Environmental Examination</b>	<b>Environmental Impact Assessment</b>
Install capacity of $\geq 1$ MW but <15MW and Reservoir volume (full supply level) <20,000,000m <sup>3</sup> and Reservoir area (full supply level) <400 hectares	Install capacity of >15MW and Reservoir volume (full supply level) >20,000,000m <sup>3</sup> and Reservoir area (full supply level) >400 hectares

Diagrams representing the impact assessment and approval process are contained at the end of the *Environmental Impact Assessment Procedure 2015*, and have been included as an annexure to Chapter Two of the ESIA Guidelines for easy for proponents and all other parties.

### 1.3.3. Laws related to Biodiversity Conservation

Myanmar is a country located at the junction of three different eco-regions; Sino-Himalayan region in the north, Indochinese region in the east and Malayan peninsular in the south. This significant geo-position together with high variations in rainfall, temperature, topography and extensive river systems create diverse forest types in Myanmar, from sub-alpine forest in the north to tropical rain forest in the south. A variety of forest types are home of numerous flora and fauna that consist of more than 11,800 plant species, 258 mammals, 1056 birds, 297 reptiles, 82 amphibians, 775 fresh and marine water fishes, five marine turtles and 52 coral species. Further, Myanmar has several endemic species consisting of one mammal species, six bird species, 21 reptile species, three amphibians and eight plant species.<sup>6</sup> Accordingly, Myanmar is recognised as one of the biodiversity richest countries in the Asia-Pacific region.

Myanmar has a long tradition of biodiversity conservation. The Kings initiated biodiversity conservation as early as 1775 when teak was proclaimed a Royal Tree. The vicinity of the King's palace was declared a refuge area in 1959 for the wild animals in the city of Yadanapon (now Mandalay) under a decreed by King Mindon.<sup>7</sup> The Government enacted the *Elephant Preservation Act* in 1879. The Forestry Department was given responsibility for wildlife protection under the *Burma Forest Act of 1902*, which designated wild animals as "forest produce" and provided for the making of rules to control hunting and fishing in Reserved Forests. The first Game Sanctuaries were established in 1911, but ratified protected areas were not established (Taunggyi Bird Sanctuary) until 1920.<sup>8</sup> In 1927, a post of Game Warden was created within the Forestry Department with specific responsibilities for wildlife conservation and management, including control of keddah operations for capturing wild elephants. The Wildlife Protection Act was enacted in 1936. The post of Game Warden lapsed at the time of the Japanese occupation in 1942 and was never revived.

In early 1980s, the Nature Conservation National Park Project was established under a joint arrangement with the United Nations Development Program and the Forest Department and then modern conservation has rooted. Under the Nature Conservation National Park Project, the Nature and Wildlife Conservation Division was formed under the Forest Department and was responsible for protected area management and biodiversity conservation. Importantly, the Myanmar Forest Policy (1995) mandates an increase in protected areas to 5% of the country's total land with this target being revised to 10% under the 30-year National Forestry Master Plan prepared by MONREC. Myanmar has 37,894km<sup>2</sup> set aside in 38 protected areas representing diverse ecosystems, which cover 5.61% of the total area.

The *Protection of Wildlife and Conservation of Natural Area Law 1994* (and associated rules of 2002) mandate the protection of wild flora and fauna and their habitats and representative ecosystems within Myanmar. The objectives of this law are:

- a. to implement the Government policy for wildlife protection;
- b. to implement the Government policy for natural areas conservation;
- c. 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;
- d. to protect endangered species of wildlife and their natural habitats;
- e. to contribute for the development of research on natural science; and
- f. to protect wildlife by the establishment of zoological gardens and botanical gardens.

Under Section 15 of the *Protection of Wildlife and Conservation of Natural Area Law*, the Director General shall, with the approval of the Minister determine and declare endangered species of wild animal which are to be protected according to the following categories:

- a. completely protected species of wild animals;
- b. normally protected species of wild animals; and

---

<sup>6</sup> Myanmar's National Biodiversity Strategy and Action Plan, 2011

<sup>7</sup> Myanmar's National Biodiversity Strategy and Action Plan, 2011

<sup>8</sup> Myanmar's National Biodiversity Strategy and Action Plan, 2011

- c. seasonally protected species of wild animals.

The List of Protected Species (1996) provides various levels of protecting wild plants and animals according to their designation. Annex III provides a list for completely protected species that may not be hunted except for scientific purposes under special license. Annex IV provides for protected species that may be hunted but only with special permission while Annex V provides for seasonally protected species that are subjected to traditional subsistence hunting by rural communities only during the open (eg, non-breeding) season.

Myanmar has two key forestry laws and policies in place, these being the *Forest Law 1992* and *Forest Policy 1995*. The *Forest Law 1992* supports conservation initiatives, sustainable forestry practices, and socio-economic benefits, and encourages private sector and community participation in forest management. The *Forest Law 1992* highlights forest protection, environmental and biodiversity conservation. *Forest Law 1992* also expands coverage of permanent forest estates and protected areas, and encourages a stronger community participation based approach toward managing natural forests and plantations. The hope is that these new policies will better satisfy the basic needs of Myanmar's rural people. Like all forest policies, the *Forest Law 1992* also provides opportunities for private sector involvement in timber trading and reforestation projects. The main elements of the *Forest Law 1992* include:

- a. to implement the forestry policy of the Government;
- b. to implement the environmental conservation policy of the Government;
- c. to promote public co-operation in implementing the forestry policy and the environmental conservation policy of the Government;
- d. to develop Myanmar's economy, satisfy public food, clothing, and shelter needs, and ensure enjoyment of the forests
- e. to carry out in accordance with international agreements relating to conservation of forests and of environment;
- f. to prevent the dangers of forest destruction and biodiversity loss, fire outbreaks, insect infestation, and plant disease
- g. to simultaneously carry out natural forest conservation and forest plantations development; and
- h. to contribute towards the fuel requirement of the country.

The Forest Rules deal with reserved forest (forest areas reserved for the state and off-limits to development), the declaration of areas as protected public forest, the management of forest land, the establishment of forest plantations, and the procedures for obtaining permission to extract forest produce.

The implementation of the *Forest Law 1992* is facilitated by the *Forest Policy 1995*. This policy is modelled on international policies pertaining to sustainable development and forestry. The *Forest Policy 1995* focuses on sustainable production, satisfying basic needs, institutional strengthening, and improvements in efficiency, forest and biodiversity protection, and participatory forestry. It formalised the commitment and intent of the Government to ensure sustainable development of forest resources while conserving wildlife, plants and ecosystems.

The *Forest Policy 1995* sets specific objectives and measures addressing environmental protection and management, reforestation, forest industry and trade, forest research, institutional strengthening, and people's participation and public awareness. The *Forest Policy 1995* identified six imperatives necessary to achieve Sustainable Forest Management certification, which the government must give the highest priority, in order to achieve broader national goals and objectives. These imperatives are:

- a. protection of soil, water, wildlife, biodiversity and environment;
- b. sustainability of forest resources to ensure perpetual supply of both tangible and intangible forest benefits for all generations;
- c. basic needs of the people for fuel, shelter, food and recreation;
- d. efficiency to harness, in a socio-environmentally friendly manner, the full economic potential of the forest resources;
- e. participation of the people in the conservation and utilization of the forests; and

- f. public awareness about the vital role of the forests in the well-being and socio-economic development of the nation.

The *Forest Law 1992* and *Forest Policy 1995* enabled the development of the *Community Forestry Instructions 1995*, which give legal backing to rural communities to co-manage forests. With respect to policy, Myanmar has established the *National Environmental Policy 1994*. The *National Environmental Policy* aims to achieve harmony and balance between socio- economic, natural resources and environment through the integration of environmental considerations into the development process enhancing the quality of the life of all its citizens. It states that environmental protection is should always be the primary objective in seeking development. Myanmar has also developed an *Agenda 21 Policy 1997* and the *National Sustainable Development Strategy 2009*.

Myanmar also has enacted the *Freshwater Fisheries Law 1991* (State Law and Order Restoration Council Law No. 1/91). This Act covers fishing in freshwater fisheries waters defined as "waters, pond, course, river, stream and lake which is of permanent or temporary nature and in which fish live and thrive and which is situated within the inland boundary along the coast of Myanmar. Under section 36, it is prohibited to erect, construct place, maintain any obstruction such as a dam, bank or weir in a freshwater fisheries waters without the permission of the Department. Under section 38(b), it is prohibited to impair the natural condition of a fishery so as to disrupt the flow of water in the main fishery. Further, section 41 prohibits anyone from altering the quality of water, volume of water or the water -course in a leasable fishery, reserved fishery and creeks contiguous or in water-courses. These are highly relevant to a hydropower project.

#### **1.3.4. Laws related to Water**

Myanmar has a range of measures to manage water resources across the country. These include the Myanmar National Water Policy (approved in February 2014); Myanmar Drinking Water Quality Standard (approved in May 2014) and the Myanmar Water Framework Directives (will be a fundamental document leading to the development of a Water Law). Further, Myanmar has established the National Water Resources Committee which is leading the development of the new Water Law.

Current laws relating to water include the *Conservation of Water Resources and Rivers Law 2006*. The aims of this *Conservation of Water Resources and Rivers Law 2006* include

- a. to conserve and protect the water resources and rivers system for beneficial utilisation by the public;
- b. to smooth and safety waterways navigation along rivers and creeks;
- c. to contribute to the development of State economy through improving water resources and river system; and
- d. to protect environmental impact.

Under the *Conservation of Water Resources and Rivers Law 2006*, no person shall:

- a. carry out any act or channel shifting with the aim to ruin the water resources and rivers and creeks;
- b. cause the wastage of water resources wilfully;
- c. 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;
- d. catch aquatic creatures within river-creek boundary, bank boundary or waterfront boundary with poisonous materials or explosives; and
- e. dispose of disposal soil and other materials from panning for gold, gold mineral dredging or resource production in the river and creek, into the river and creek or into the water outlet gully which can flow into the river and creek.

#### **1.3.5. Laws related to National Race**

The fundamental basis for Myanmar's social safeguards and specifically, ethnic minorities and indigenous peoples (here called national race) needs to start with recognition. The 2008 Constitution makes reference to "Tain Yin Tha" or "national races" which is a collective reference; however it approximates the phrase "ethnic nationalities."

The 2008 Constitution grants some rights to ethnic nationalities. Article 365 provides for the enforceable right of Myanmar citizens to freely develop literature, culture, arts, customs and traditions *'that they cherish'*. Article 365 also provides that *'any particular action which might affect the interests of one or several other of the national races shall be taken...'* only after obtaining the *'settlement of those affected'*. However, these protections and the exercise of these rights are circumscribed as they must be in accordance with the law, which is itself restrictive, and must avoid any act detrimental to national solidarity. Moreover, Article 365 applies only to Myanmar citizens; tens of thousands of indigenous peoples there may not have proper identification documents that would grant them citizenship.

Article 22 of the Constitution, provides for the:

- a. development of language, literature, fine arts and culture of the National races; and
- b. promotion of solidarity, mutual amity and respect and mutual assistance among the National races; and promotion of socio-economic development including education, health, economy, transport and communication, of less-developed National races.

The *Protection of the Rights of National Races Law 2015* gives further effect to Article 22 of the 2008 Constitution, and provides a basis for the government to establish a Minister for National Races. Article 3 of the *Protection of the Rights of National Races Law* includes the purposes of the law: (e) *'to aim for the socio-economic development of less-developed national races including education, health, economics and transportation'*. While Article 3 of the law provides for *'access to equal citizenship rights for all ethnic groups'*, and *'for ethnic groups to have full access to rights enshrined in the Constitution'*, it does not explicitly protect ethnic minorities against discrimination.

The *Protection of the Rights of National Races Law* further states that no one can behave with intent to incite hatred, animosity and disunity among 'national races' and that ethnic rights and entitlements cannot be restricted without a sound reason. Chapter 4 establishes a Minister for National Races to be appointed by the President with the approval of the Union Legislature. The Ministry's mandate in Chapter 5 includes '(e) [to] carry out all round development activities including education, health, economics and transportation of less developed national races for their socio-economic development' and article (j) [to] 'carry out activities to develop, maintain, protect and improve language, literature, arts, culture and traditions of minority and endangered national races'.

Article 5 uses the phrase for indigenous peoples *hta-nay tain-yin-tha* which is not included in the Definitions in Article 1 of the Law and was inserted subsequently during the Parliamentary process. Article 5 states that *'hta-nay tain-yin-tha 'should receive complete and precise information about extractive industry projects and other business activities in their areas before project implementation so that negotiations between the groups and the Government/companies can take place.'*

The *Environmental Impact Assessment Procedure 2015* sets out definitions of environmental impacts and makes specific mention of 'indigenous peoples' (translated in Burmese by another term, *tain-yin-tha myo-nweh-su*):

2(h) **Environmental Impact** means the probable effects or consequence on the natural and built environment, and people and communities of a proposed Project or businesses or activities or undertaking. Impacts can be direct or indirect, cumulative, and positive or adverse or both. For purposes of this Procedure, Environmental Impacts include occupational, social, cultural, socio-economical, public and community health, and safety issues. Moreover, social impacts include Involuntary Resettlement and relating to Indigenous People.

2(v) **Indigenous People** means people with a social or cultural identity distinct from the dominant or mainstream society, which makes them vulnerable to being disadvantaged in the processes of development.

It is not clear where this definition of 'indigenous people' was derived from the ADB as mentioned above, the Burmese word used differs from that in the Ethnic Nationalities Law.



### 1.3.6. Laws relating to the Protection of Cultural Heritage

Myanmar has enacted the *Protection and Preservation of Cultural Heritage Regions Law 1998*. The *Protection and Preservation of Cultural Heritage Regions Law 1998* establishes protection mechanisms for cultural heritage, ancient monuments, architectural structures, shrines, temples, monasteries etc. The objectives of the *Protection and Preservation of Cultural Heritage Regions Law 1998* include:

- 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; and
- f. to carry out protection and preservation of the cultural heritage regions in conformity with the International Convention approved by the State.

Sections 20 and 21 of the *Protection and Preservation of Cultural Heritage Regions Law 1998* is relevant in that it prohibits a person from destroying an ancient monument; willfully altering the original ancient form and structure or original ancient workmanship of an ancient monument; exploring for petroleum, natural gas, precious stones or minerals. carrying out archaeological excavation; building road, constructing bridge, irrigation canal, embankment or extending the same; and digging well, pond, fish-breeding pond or extending the same. This would have significant implications for a hydropower project where matters protected under the *Protection and Preservation of Cultural Heritage Regions Law 1998* were located within the project footprint.

The *Protection and Preservation of Cultural Heritage Regions Law 1998* was amended in 2009, mainly with respect to the changing of the period of existence. The change removed the expression “*that have existed before 1886*” to “*that have existed since 100 years before the date on which the Department made inquiries as an ancient monument/site.*”

### 1.3.7. Customary Lands

There are no laws in Myanmar that provide for the recognition of customary land tenure or clear regulations to determine the ownership and extent of ancestral domains. Many land-related laws span different periods (British colonial period, 1886 – 1948; post-colonial independence, 1948 – 1962 and decades of military rule, 1962 – 2015). While some laws were repealed in 2012, laws pertaining to land are still poorly harmonised. Land laws have been typically sector specific and do consider related and/or previous laws. As such, people appear to be experiencing difficulties in transferring land titles and categories and there is overlapping institutional control in terms of land management which results in confusion.

Laws related to House, Land and Property do not recognise customary rights. There is also confusion on the complex laws pertaining to land. For ethnic nationalities, the laws do not appear to reflect their actual land use. With an unclear legal framework and the tedious and costly process in claiming legitimate ownership of lands, most ethnic nationalities do not have legal land titles.<sup>9</sup> The *Land Acquisition Act 1894* provides the basis for the Government of Myanmar to acquire land for public and other purposes and addresses processes for required notice; procedures for objecting to acquisition; land valuation methods; the process for taking possession of land; the process for appeals; and rules for the temporary occupation of land. The Government has responsibility for carrying out the acquisition and distributing compensation but the funds for compensation are to be provided by the company acquiring the land. Compensation must be paid at market value with adjustments, including for crops, The *Land Acquisition Act 1894* sets out a process for the acquisition of land as follows:

- a. preliminary investigations on the land and procedure for notification of, and objections to be raised by, persons interested in the land (Article 5A);

<sup>9</sup> Karen Human Rights Group (2013). Losing Ground: Land conflicts and collective action in eastern Myanmar, Available at <http://www.khrg.org>

- b. agreement between the company and the Government is to be disclosed in the National Gazette;
- c. notice is to be given to the public (Article 42);
- d. notices are to be posted publicly in the locality of the land (Article 4 (1), Article 9 (1)).
- e. notice to the occupier of the land must be given (Article 9 (3), but only once there is a declaration of intended acquisition.

Although there are provisions for objections to the land acquisition (Article 5A (1)), the President's decision on the objection is final (Article 5A. (2)), giving wide discretionary powers to the President. An 2011 amendment to the *Land Acquisition Act 1894* changed the rate of compensation from 'market value' to "the market value of the land or three years average value of a similar land which exists surrounding it; whichever is more."The current system does not comply with IFC Performance Standard 1 and 5

The *Land Acquisition Act 1894* permit the Government to use compulsory acquisition to acquire land for public purposes and for business purposes. The *Land Acquisition Act 1894* defines neither purpose in detail, leaving landholders vulnerable to losing their land through arbitrary processes. The *National Land Use Policy 2016* goes some way to rectifying these concerns, but more is required. The *National Land Use Policy* established a systematic land management system in order to approve, record and distribute land ownership, land tenure, land value and land use information. The *National Land Use Policy 2016* includes procedures in Part V for Land Acquisition, Relocation, Compensation, Rehabilitation and Restitution. The *National Land Use Policy 2016* also includes a Land Dispute Resolution and Appeal process along with Part VIII which is a section on customary land use rights of Ethnic Nationalities.

The *Farmland Law 2012* pertains to rights and responsibilities to tenure and provides for the processes and management of farmlands. It replaces the repealed *Tenant Farming Law 1963* and *Protection of Peasants' Rights Law 1963* and repeals the *Land Nationalisation Act 1953*, *Disposal of Tenancies Law* and the *Agriculturalist's Rights Projection Law*. The *Vacant, Fallow and Virgin Land Management Law* provides the basis for the allocation and use of virgin, vacant or fallow land or land deemed "abandoned" by a tenant. Under the *Farmland Law 2012* and *Vacant, Fallow and Virgin Land Management Law*, the State remains the ultimate owner of all land. The two laws have received criticisms from concerned farmers and land rights activists in Myanmar as well as from international economists. The main concern is that these land laws will not protect farmers from wide scale land grabs. However, President Thein Sein acknowledged the need for Myanmar to have comprehensive sustainable land use and management policies in order to develop and improve living conditions in rural communities. The President particularly cited uncertainty about land use rights and the prevalent land speculation as two major issues that need to be rectified.

Other laws directly or indirectly related to land management, land use and land as property include:

- a. *Transfer of Property Act 1882* which governs the sale, mortgage, lease, exchange and gift of moveable and immovable property;
- b. *Land and Revenue Act 1879* that deals with the assessment and collection of land taxes;
- c. *Lower Myanmar Town and Village Act 1899* that deals with the land rights in towns and villages and provides for certain rights (such as the right to cultivate and right to sell) relating to hereditary and government lands;
- d. *Partition Act 1893* which governs partition of immovable property
- e. *Registration Act 1909* which governs the registration of dwellings and instruments of immovable property; and
- f. *Protection of the Right of Cultivation Act 1963*, which under certain circumstances protects cultivators against confiscation of their land and their farming implements.

While Myanmar has not ratified the International Labour Organisation's Indigenous and Tribal Peoples Convention 1989 (No. 169), it is still obliged for implementing the rights outlined in the Convention and is subject to monitoring by the International Labour Organisation. The Indigenous and Tribal Peoples Convention provides for the rights of indigenous people to own the land they live on and make decisions about initiatives that affect them. Articles 13 through 16 of the Convention pertain to land rights and that resettlement should as much as possible be avoided unless it is subject to the community's free and informed consent.

### **1.3.8. Laws related to Occupational Safety and Health (including Communicable Diseases)**

There are a number of pieces of relevant legislation in Myanmar related to Occupational Safety and Health. These include the *Public Health Law 1972* which is concerned with protection of people's health by controlling the quality and cleanliness of food, drugs, environmental sanitation, epidemic diseases and regulation of private clinics. The *Nation Drug Law 1992* was enacted to ensure access by the people safe and efficacious drugs. The *Nation Drug Law 1992* describes requirement for licensing in relation to manufacturing, storage, distribution and sale of drugs. It also includes provisions on formation and authorization of Myanmar Food and Drug Board of Authority.

The *Prevention and Control of Communicable Diseases Law 1995* (amended in 2011) describes the functions and responsibilities of health personnel and citizens in relation to prevention and control of communicable diseases. The *Prevention and Control of Communicable Diseases Law 1995* also describes measures to be taken in relation to environmental sanitation, reporting and control of outbreaks of epidemics and penalties for those failing to comply. The law authorises the Ministry of Health to issue rules and procedures when necessary with approval of the government.

The *Narcotic Drugs and Psychotropic Substances Law 1993* provides legislation to control of drug abuse and describes measures to be taken against those breaking the law. Enacted to prevent danger of narcotic and psychotropic substances and to implement the provisions of United Nations Convention Against Illicit Traffic in Narcotic Drugs and Psychotropic Substances. Other objectives of the *Narcotic Drugs and Psychotropic Substances Law 1993* are to cooperate with state parties to the United Nations Convention, international and regional organizations in respect to the prevention of the danger of narcotic drugs and psychotropic substances. According to the *Narcotic Drugs and Psychotropic Substances Law 1993*, the Central Committee for Drug Abuse Control (CCADC), Working Committees, Sectors and Regional Committees were formed to carry out the designated tasks in accordance with provisions of the law. The law also describes procedures relating to registration, medication and deregistration of drug users.

The *Workplace Safety and Health Law 2017* will implement workplace safety and health regulations for all industries, stipulate obligations of the relevant stakeholders to reduce and eliminate workplace accidents and occupational diseases, ensure the early prevention of workplace hazards arising from Myanmar's economic development, raise productivity and establish safe and healthy workplaces in accordance with regional and international standards. The law is applicable construction and engineering projects. The *Workplace Safety and Health Law 2017* sets out duties and responsibilities of employers and employee, the National Workplace Safety and Health Council and administrative penalties and appeals.

### **1.3.9. IFC Performance Standards and the ESIA Guidelines**

It is good international industry practice, that where relevant standards do not exist fully; that performance standards from international organisations such as the IFC are used. Under the current *Environmental Conservation Law 2012*, Rules and *Environmental Impact Assessment Procedure 2015*, MONREC has developed a number of environmental quality standards that are to be used broadly across all sectors and projects in Myanmar. Numerous international entities have assisted in the development of law and policy. Further, as laws and associated procedures/policy documents do not exist for social aspects including but not limited to involuntary resettlement and indigenous peoples (in Myanmar, indigenous people and ethnic minorities are called people of national race), it suggested that some form of standard is adopted until both can be formally established.

As highlighted above, it is good international industry practice, that where relevant standards do not exist, that performance standards recognised as being world's best should be used. The IFC's Performance Standards define a proponent' responsibilities for managing their environmental and social risks. The IFC has eight Performance Standards that are relevant to environmental and social safeguards including:

- a. Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts. This Performance Standard highlights the importance of identifying environmental and social risks and impacts and managing environmental and social performance throughout the life of a project;
- b. Performance Standard 2: Labour and Working Conditions. This Performance Standard recognises that the pursuit of economic growth through employment creation and income generation should be balanced with protection of basic rights for workers;

- c. Performance Standard 3: Resource Efficiency and Pollution Prevention. This Performance Standard recognises that increased industrial activity and urbanisation often generate higher levels of air, water and land pollution and that there are efficiency opportunities;
- d. Performance Standard 4: Community Health, Safety and Security. This Performance Standard recognises that projects can bring benefits to communities, but can also increase potential exposure to risks and impacts from incidents, structural failures and hazardous materials;
- e. Performance Standard 5: Land Acquisition and Involuntary Resettlement. This Performance Standard applies to physical or economic displacement resulting from land transactions such as expropriation or negotiated settlements;
- f. Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources. This Performance Standard promotes the protection of biodiversity and the sustainable management and use of natural resources;
- g. Performance Standard 7: Indigenous Peoples. This Performance Standard aims to ensure that the development process fosters full respect for Indigenous Peoples; and
- h. Performance Standard 8: Cultural Heritage. This Performance Standard aims to protect cultural heritage from adverse impacts of project activities and support its preservation.

Further, with respect to the use of international good practice and for example, the IFC Performance Standards, reference is required to section 7 of the *Environmental Impact Assessment Procedure 2015* specifically states that:

*Projects that involve Involuntary Resettlement or which may potentially have an Adverse Impact on Indigenous People shall comply with specific procedures separately issued by the responsible ministries. Prior to the issuance of any such specific procedures, all such Projects shall adhere to international good practice (as accepted by international financial institutions including the World Bank Group and Asian Development Bank) on Involuntary Resettlement and Indigenous Peoples.*

As there is a requirement that proponents *adhere to good international industry practice*, the use of the IFC Performance Standards for all environmental and social impact assessments for hydropower project provides a basis for the preparation of these ESIA Guidelines. As highlighted above, the current *Environmental Impact Assessment Procedure 2015* only state that the procedures do not relate to involuntary resettlement and indigenous people; however by default, they theoretically include all other aspects of social impact assessment. By using the current *Environmental Impact Assessment Procedure 2015* and the IFC Performance Standards for the development of these ESIA Guidelines, allows for good international industry practice.

#### **1.4. Format of the Environmental and Social Impact Assessment Guidelines**

The format of the ESIA Guidelines is as follows:

**Chapter 1:** Provides decision-makers with an overview and the objections of the ESIA Guideline, about the environmental and social impact assessment requirements contained within the *Environmental Conservation Law 2012* and *Environmental Impact Assessment Procedure 2015*, information about the hydropower sector in Myanmar, an overview of hydropower projects including type, size, design, pre-construction, construction, operation and decommissioning/rehabilitation and associated infrastructure. The chapter also provides an overview of the general environmental and social impacts associated with a hydropower project, a brief summary on cumulative impacts, how a proponent should engage in public participation, stakeholder engagement and consultation and discussion on some of the benefit sharing and benefit creation options that could be used; and

**Chapter 2:** the Terms of Reference for the undertaking of an ESIA for a hydropower project in Myanmar – it is anticipated that this section of the document will be provided to proponents who propose to construct and operate a hydropower project in Myanmar and accordingly it can be produced as a standalone document. This process requires identification and management of impacts from the project on affected communities and stakeholders and the preparation of an international standard ESIA.

## 1.5. Overview of a Hydropower Project

The following sections provide an overview of a hydropower project. It contains descriptions of the types of hydropower projects, the size of hydropower projects, the design, other dam structures and importantly, the associated infrastructure required to construct and operate a hydropower project.

### 1.5.1. Important Definitions for Hydropower Projects

The following section provides information on important definitions and terms used for hydropower projects (in alphabetical order only).

**Access road:** An access road is the road used to reach the hydropower project, as well as any ancillary roads to the various components of the project. Access roads can include roads used to bring construction materials and mechanical and electrical equipment to the site. The length of the access road and its width may have important environmental impacts. They are measured in kilometres of road (km).

**Annual electricity production expected:** The electricity production is the total amount of power produced in a year, taking into account the design capacity of the turbines with the total numbers of hours operated each year. It is measured in gigawatts/year (GWh/year). If the plant is operated at lower than design flows, eg during the dry season, the electricity production would also be lower.

**Area of Influence:** Anticipated extent of direct or indirect potential impacts of the proposed hydropower project

**Bottom and Sediment flushing gates:-**This is the number of gates within a hydropower project. The bottom gates are used for draining the complete reservoir and would be rarely used, eg unless there was an emergency or significant maintenance issue. Sediment flushing may also be done through the bottom gates, although special sediment flushing gates may also be built into the dam structure. These gates are measured by length and width in metres (m).

**Cofferdam:** a temporary enclosure built within, or in pairs across, a body of water and constructed to allow the enclosed area to be pumped out. For dam construction, two cofferdams are usually built, one upstream and one downstream of the proposed dam, after an alternative diversion tunnel or channel has been provided for the river flow to bypass the dam foundation area.

**Construction time:** The construction time is the time taken to construct the hydropower project from the initial site preparation to the start of commercial operation. The time would normally include the initial testing of the plant.

**Dam:** The dimensions of the dam indicate the size of the project. It is measured by length and width in metres (m).

**Design flow:** The design flow is the volume of water required to run the turbines at full capacity. It is the volume of water that will be diverted from the river through the channel to the power house. It is measured in cubic metres/second ( $m^3/s$ ).

**Full Supply Level and Minimum Operating Level:** The Full Supply Level (FSL) is the normal maximum level of the water in the reservoir. The Minimum Operating Level (MOL) is the lowest level to which the reservoir would be used during low flow season. The difference between FSL and MOL is known as the draw down, (expressed in metres). A reservoir level may exceed the FSL for example in the event of floods. The water in the reservoir may also be drawn down below the MOL, eg if the reservoir is being drained for sediment flushing from bottom gates. FSL and MOL are measured in metres above sea level.

**Good Practice:** The exercise of professional skill, diligence, prudence, and foresight that would reasonably be expected from skilled and experienced professionals engaged in the same type of undertaking under the same or similar circumstances globally or regionally.

**Head:** Head is pressure created by the difference in elevation between the intake of a pipeline, and the water turbine. Head can be measured as vertical distance (metres) or as pressure (pounds per square inch, newtons per square meter, etc.). Regardless of the size of your stream, higher head will produce greater pressure; and therefore power at the turbine. Head is an important element of a hydropower project,

particularly for run of river projects. The following provides a short discussion on the different head variations:

- a. Low head, large volume: This is typical for run-of-river dams where the full flow of the river is passed through the turbines over a relatively low head (usually >20 metres);
- b. High head, small volume: The same amount of power may be generated by using a relatively small volume of water and dropping it down a high head from the intake through the penstock to the powerhouse. This type of project is often used when the water is being diverted some kilometres downstream or even into another river basin.
- c. High head, large volume: This is the case for very large storage dams, in which large quantities of power can be generated from the high volumes of water passing through the turbines under the pressure of a reservoir water level that may be over 100 m or more above them.

**Hours of operation/day:** If the plant is operated in peak load mode, it may be operated for 8 or 12 hours/day compared to base load which would run for 24 hours/ day. In the dry season, when there is less water available, the plant may be operated at lower flows, or for a shorter time each day. Hours of operation is always measured by hours/day.

**Installed capacity:** The installed capacity is the designed electrical output of the hydropower project when operating at full load. It is measured in megawatts (MW).

**Intake structure:** The intake structure allows water to be moved from the reservoir and delivered to the penstock and turbines. The intake structure is normally concrete constructed and located in the reservoir. The intake structure can be set at a level just below the MOL so that the turbines can continue to be operated down to MOL. Where there are water quality issues when water is drawn from lower levels, the intakes may include multiple level take-off points to ensure that better quality water is always taken from near the surface. In hydropower projects that divert water from one river to another, the intake structure may be in a completely different location on the reservoir to the main dam.

**Operating head:** The operating head is the height difference between the forebay pond and the turbines in the power house. With the design flow, the capacity of the plant can be defined. Head is measured in metres (m).

**Operating mode:** There are two forms of operating mode, called peak load or base load. Peak load refers to generation to meet the peak demand for electricity; usually during daylight hours. Base load refers to more or less continuous electricity production. This information will show the use of storage capacity in the headpond/reservoir, and the flows diverted through the turbines. With peak load, the flows will tend to be higher, compared to base load flows.

**Operational lifespan:** The operational lifespan of the hydropower project is the expected life of the overall project. Often this is determined by the degree of siltation of the headpond or reservoir rather than the design life of mechanical and electrical equipment, since these can be replaced. It is measured in years.

**Penstock:** The penstock is a set of pipes that ensure uniform flows from the reservoir/diversion to the turbines. The penstock length, measured in metres (m) from the intake to the power house is dependent upon the head. The design flow and the length will determine the specific location of the infrastructure. If the power house is close to the dam as an example, the penstock may be built into the dam and associated structures. If the power house is at the end of a tunnel several kilometres away, the penstock may be a separate structure.

**Power house:** The power house is the large building housing the turbines and control equipment. Its size will be determined by this equipment and structures (hoists etc.) required for maintenance, and any control offices and other facilities. The size of the powerhouse is measured as the area in metres squared (m<sup>2</sup>).

**Reservoir/Headpond:** The reservoir or headpond is the area of land inundate for the storage of water. The reservoir is measured in square hectares as the area (m<sup>2</sup>) and in cubic metres for volume (m<sup>3</sup>).

**Spillways:** A spillway allows for surplus and flood waters to pass downstream to prevent over topping of the dam. The spillway should be designed to pass a recognised maximum flood (the design flood) and should also consider the impacts of climate change in its design. The spillways range from simple, unregulated weir structures to more complex mechanical gates that can be moved to release the surplus water. Specifications

should include the design flood in cubic metres/second ( $m^3/sec$ ), the number of spillways and their dimensions (width and height measured in metres (m)) and type of gates.

**Storage Capacity:** There are two measurements used for storage capacity. These include the total storage volume of water that can be stored in the reservoir and the active water storage volume which is the volume of water which may be used for power generation and is the volume of water stored between the MOL and FSL.

**Switchyard Area:** The switchyard consists of the electricity substation and control structures through which the power is evacuated from the hydropower plant through to the transmission lines. The size of the switchyard is measured as the area in metres squared ( $m^2$ ).

**Tailrace:** The tailrace returns the water to the river after it has passed through the turbines. The length and width (measured in metres (m)) of the tailrace channel depends upon the design flow and location of the power house in relation to the river.

**Tunnel or headrace channel:** The width of the channel is determined by the design flow required. The channel is designed to maintain the head between the intake and power house. The length of the channel, measured in metres (m) will indicate the size and diameter of the structure and accordingly, the footprint where the structure will be located, either above or below the surface. This will show the scale of project.

**Turbines:** The turbines generate electricity by the water flowing through them. There are several types of turbines. Multiple turbines allow more flexibility in operation, especially where there are significant differences between wet and dry season water availability. The rated capacity of the turbines indicates the amount of power that can be generated when operated at full design flow. The capacity of the turbines is measured in megawatts (MW).

**Transmission line:** As with the access road, the transmission line is used to take the power generated by the hydropower project and be made available for use. They are measured in kilometres of road (km) and kilovolts (KV) for the power running through the powerlines.

### 1.5.2. Types of Hydropower Projects

Hydropower projects come in a number of different types and sizes, and these may have different environmental and social impacts. Construction methods also differ re the type and size of the project. Conventional hydropower projects convert the potential energy of contained water through a turbine and generator, which in turn, creates electricity. The electricity extracted from the water depends on the volume and on the difference in height between the source and the water's outflow. This height difference between the dam and the turbine is called the head. The amount of potential energy in water is proportional to the head. A large pipe (the "penstock") delivers water to the turbine.

**Dam Storage projects:** These types of hydropower projects usually have a relatively high dam wall that provides a water storage area for power generation throughout the year. The water is stored at times of high flow in the river/high rainfall and the reservoir (water storage) is used with a more balanced electricity production during the times of low flow. Most storage dams may store and release the water over a single year, although dams can be designed to provide more than one year storage. Alternatively, some dams may only provide storage parts of a year, depending on rainfall and the distribution of the rainfall over the year. A graphical example of a reservoir type hydropower project is shown in Figure 1.

**Run-of-River projects:** These are hydropower projects have small or, potentially no reservoir capacity. A hydropower project that has less than one month storage capacity could be considered as run-of-river. The process involves diverting water from the main river flow through channels that then flow through a canal and/or penstock to spin a turbine. Run-of-river provides a continuous supply of electricity (base load), with some flexibility of operation for daily fluctuations in demand through water flow that is regulated by the facility. One issue with run of river hydropower projects is that they require relatively large head to provide sufficient power generation. A graphical example of a reservoir type hydropower project is shown in Figure 2.

Another form of river diversion project takes water from one river and diverts it to a different river. This is interbasin diversion. In this case, the river where the intake has permanently less water flowing below the dam, whilst the recipient river has increased flow by the same amount or water diverted.

**Pumped storage projects** – A pumped storage hydropower project produces electricity to supply high peak demands by moving water between reservoirs at different elevations. At times of low electrical demand, excess generation capacity is used to pump water into the higher reservoir. When electricity demand is high, water is released back to the lower reservoir through turbines to produce electricity. Pumped-storage projects provide the most commercially important means of large-scale grid energy storage and improve the daily capacity factor of the generation system.

Many hydropower projects have the powerhouse and other facilities located very close to the bottom of the dam. However, some projects divert the water through a channel, pipe or tunnel to the power house which may be located a number of kilometres downstream. This design takes advantage of the topography and bends in the river, so that a high head may be achieved with a relatively short channel from the intake. This type of hydropower plant is a river diversion project and the main concern is the flow left in the river between the dam and the power house. In some projects the dewatered stretch of river may be many kilometres downstream

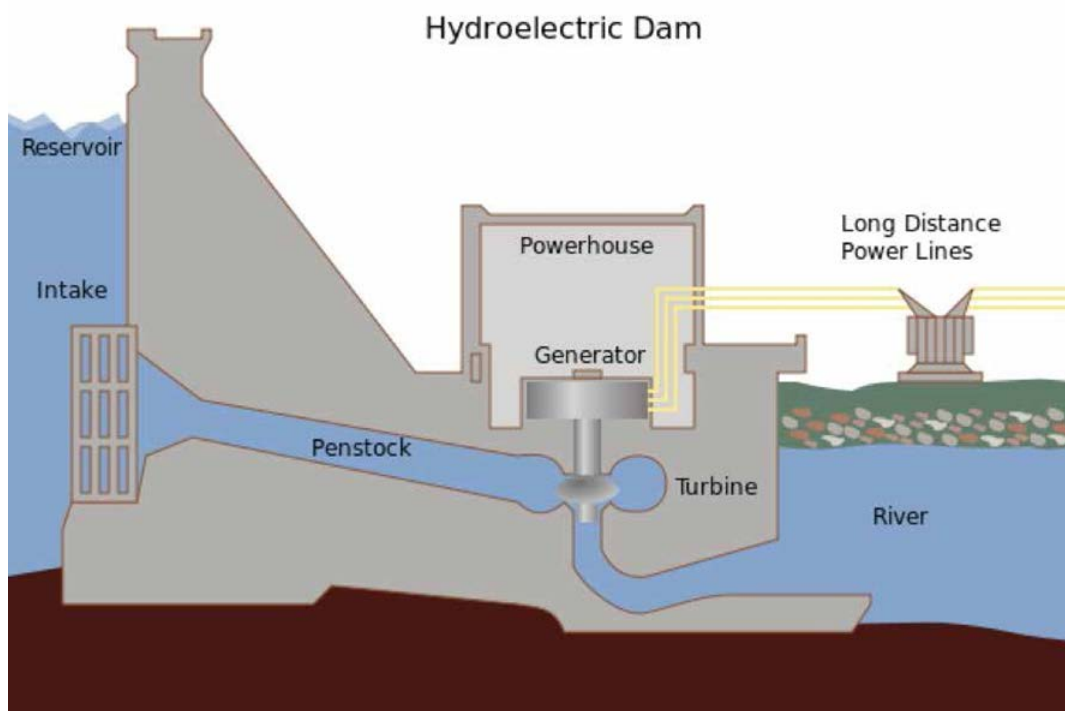


Figure 1 Conventional Hydropower Project

### 1.5.3. Size of Hydropower Projects

The size of a hydropower project is very much dependent on the type of project being designed. For example, run of river projects can be less than one megawatt while a dam with a large water storage reservoir can be as large as 22,500MW (Three Gorges hydroelectric power plant in Yichang, Hubei Province, China). In Myanmar, the largest proposed hydropower project is 7,110MW in Shan State.

The size of a hydropower plant (its installed capacity) is defined by the flow through the turbines, the head. The power potential may be calculated from the following equation:

$$Power = Head \times Flow \times Gravity$$

where power is measured in watts, head in metres, flow in litres/second, and gravity through the water acceleration due to gravity in metres/second/second. The acceleration due to gravity is approximately 9.81 metres/second/second. The potential power will never be achieved because of inefficiencies in the system. Efficiencies of over 85% can be expected when the hydraulic energy of the flowing water is turned into mechanical energy spinning the turbine generator.



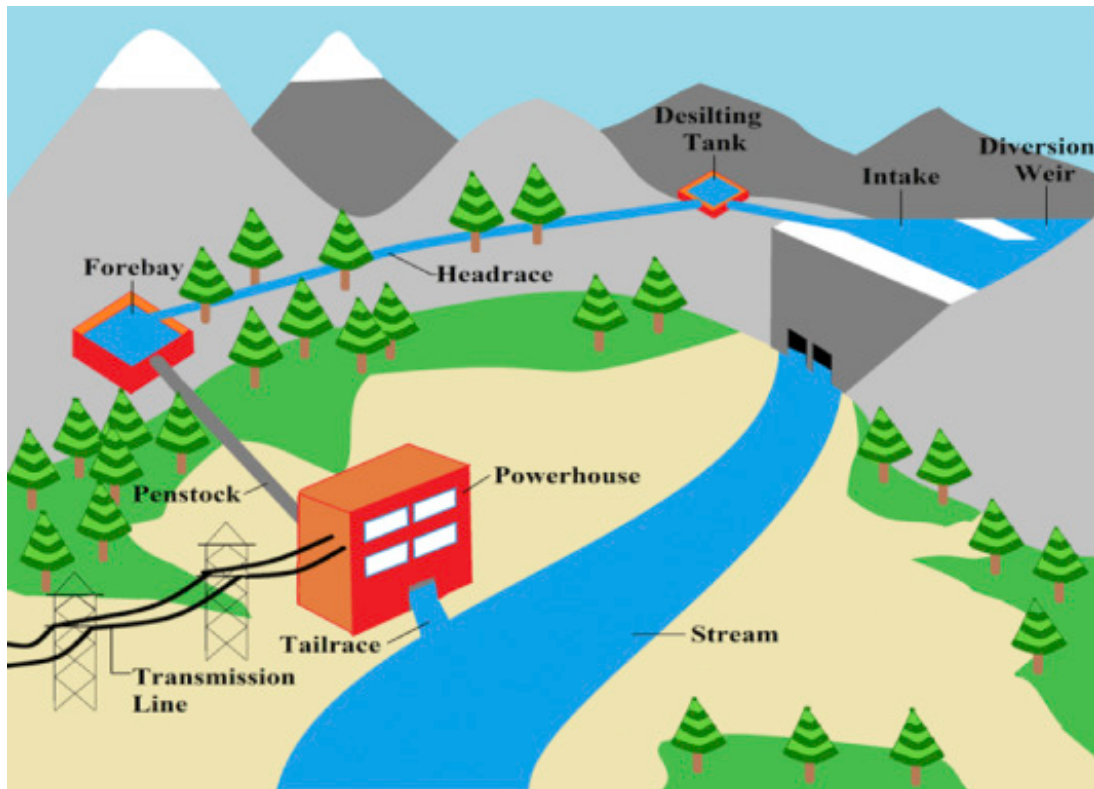


Figure 2 Run of River Hydropower Project

#### 1.5.4. Design of Hydropower Projects

There are three main designs for larger hydropower projects, these being:

- a. Arch dams;
- b. Gravity dams; and
- c. Embankment dams.

An arch-gravity dam or arched dam is a dam with the characteristics of both an arch dam and a gravity dam. It is a dam that curves upstream in a narrowing curve that directs most of the water against the canyon rock walls, providing the force to compress the dam. It combines the strengths of two common dam forms and is considered a compromise between the two. They are made of conventional concrete, Roller Compacted Concrete, or masonry. Arch-gravity dams are not reinforced except at the spillway. A typical example of the conventional concrete dam is the Hoover Dam in the USA. A gravity dam requires a large volume of internal fill. An arch-gravity dam can be thinner than the pure gravity dam and requires less internal fill. An arch-gravity dam incorporates the arch's curved design that is so effective in deflecting the water in narrow, rocky locations where the gorge's side are of hard rock and the water is forced into a narrow channel. Therefore, the span needed for the dam is narrow; the dam's curved design effectively holds back the water in the reservoir using a lesser amount of construction material. When properly situated on an appropriate site, the arch-gravity dam, combining the load resisting qualities of both a gravity dam and an arch dam, inspires the most public confidence because of its appearance of massive permanence. However, curving a gravity dam may make it look stronger, but some of this effect may be psychological factors in operation in making a choice of dam style

A gravity dam is a dam constructed from concrete or stone masonry and designed to hold back water by primarily utilising the weight of the material alone to resist the horizontal pressure of water pushing against it. Gravity dams are designed so that each section of the dam is stable, independent of any other dam section. Gravity dams generally require stiff rock foundations of high bearing strength (slightly weathered to fresh); although they have been built on soil foundations in rare cases. The bearing strength of the foundation limits the allowable position of the resultant which influences the overall stability. The stiff nature of the gravity dam structure is unforgiving to differential foundation settlement; which can induce cracking of the dam structure. Gravity dams provide some advantages over embankment dams. The main advantage being that they can tolerate minor over topping flows as the concrete is resistant to scouring. Large overtopping flows are still a

problem, as they can scour the foundations if not accounted for in the design. A disadvantage of gravity dams is that due to their large footprint, they are susceptible to uplift pressures which act as a de-stabilising force. Uplift pressures (buoyancy) can be reduced by internal and foundation drainage systems which reduces the pressures.

Embankment dams are usually constructed from compacted earth. There are two main types, rock-fill and earth-fill dams. Embankment dams rely on their weight to hold back the force of water, like gravity dams.

There are a number of different construction materials used, including:

- a. Roller-compacted concrete;
- b. Rock-fill;
- c. Concrete-face rock-fill dams; and
- d. Earth-fill.

Roller-compacted concrete or rolled concrete is a special blend of concrete that has the same ingredients as conventional concrete but in different ratios. Roller-compacted concrete is a mix of cement/fly ash, water, sand, aggregate and common additives, but contains little water. The mix is drier and essentially has no slump. Roller-compacted concrete is delivered by trucks or conveyors, spread by machines, and then compacted by vibratory rollers. Roller-compacted concrete was used previously for backfill, sub-base and concrete pavement construction, however, it is currently being used to build concrete gravity dams because the low cement content and use of fly ash cause less heat to be generated while curing than do conventional mass concrete placements. Roller-compacted concrete has numerous time and cost benefits over conventional mass concrete dams; including higher rates of concrete placement, lower material costs and lower costs associated with post-cooling and formwork.

Rock-fill dams are embankments of compacted free-draining granular earth with an impervious zone. The material utilised usually contains a large percentage of large particles hence the term rock-fill. The impervious zone may be on the upstream face and made of masonry, concrete, plastic membrane, steel sheet piles, timber or other material. The impervious zone may also be within the embankment in which case it is referred to as a core. Where clay is used as the impervious material, the dam is referred to as a composite dam. To prevent internal erosion of clay into the rock fill due to seepage forces, the core is separated using a filter. Filters are specifically graded soil designed to prevent the migration of fine grain soil particles. When suitable material is at hand, transportation is minimised leading to cost savings during construction. Rock-fill dams are resistant to damage from earthquakes; however, inadequate quality control during construction can lead to poor compaction and sand in the embankment which can lead to liquefaction of the rock-fill during an earthquake. Liquefaction potential can be reduced by keeping susceptible material from being saturated, and by providing adequate compaction during construction.

A concrete-face rock-fill dam is a rock-fill dam with concrete slabs on its upstream face. A concrete-face rock-fill dam design offers the concrete slab as an impervious wall to prevent leakage and also a structure without concern for uplift pressure. In addition, the concrete-face rock-fill dam design is flexible for topography, faster to construct and less costly than earth-fill dams.

Earth-fill dams are constructed as a simple embankment of well-compacted earth. A homogeneous rolled-earth dam is entirely constructed of one type of material but may contain a drain layer to collect seep water. A zoned-earth dam has distinct parts or zones of dissimilar material, typically a locally plentiful shell with a watertight clay core. Modern zoned-earth embankments employ filter and drain zones to collect and remove seep water and preserve the integrity of the downstream shell zone. Rolled-earth dams may also employ a watertight facing or core in the manner of a rock-fill dam. Because earthen dams can be constructed from materials found on-site or nearby, they can be very cost-effective in regions where the cost of producing or bringing in concrete would be prohibitive.

### **1.5.5. Other Dam Structures**

There are a range of other dam structures that are used for water storage, including agriculture and irrigation projects. These can be similar structures to that discussed in the previous section related to the design of a hydropower project. In these cases, hydropower can be retrofitted with hydropower turbines placed in existing/future irrigation canals, as well as non-powered weirs and irrigation/water-supply dams. The use of existing water resource infrastructure; is of particular importance given Myanmar's large stocks of existing irrigation and water supply dams, as well as the interconnected networks of weirs and canal structures.

Conversely, hydropower projects can be associated with irrigation projects and/or have multiple uses that include irrigation. Where this is the case, the irrigation requirements will have been factored into the design of the hydropower project and the expected changes in the hydrology and allocation of waters will have been taken into account. The quality of the water available for irrigation downstream of the power house may also be an issue. Poor quality water (anoxic) may be released from the reservoir especially after inundation, which should not be used for agriculture, and this may limit the availability of water for irrigation projects. Similarly, water carrying very high sediment loads, eg after sediment flushing, may block irrigation channels and cover crops with sediment.

When a hydropower project is proposed on a river which already supplies irrigation water, the changes in flow resulting from the hydropower project may adversely affect this supply. If the water abstraction point for the irrigation project is located between the dam and the power house, i.e. where the flows in the river are significantly lower, or taken from downstream of a dam in an inter-basin diversion project, then there may not be sufficient water left for the irrigation project.

### **1.5.6. Associated Activities**

Besides the infrastructure storing, diverting and producing the electricity, there are many other associated infrastructure that are needed for a successful hydropower project. These can include but are not limited to:

- a. Access roads;
- b. Diversion Channel
- c. Transmission lines;
- d. Construction worker's camps and their associated needs including health clinics, mess halls, food preparation areas;
- e. Site office;
- f. Lay down areas / store yards;
- g. Maintenance areas; and
- h. Quarries and areas where waste spoil materials are deposited.

Access roads and transmission lines create corridors through the landscapes. The access road may be up to 10 metres wide, but require space on each side for foundations and drainage, so a corridor of at least 30 metres may be required. Large capacity transmission lines often require a 50 – 60 metre wide corridor which has to be cleared of trees over 3 metres. Individual electric towers may have a footprint of 15 x 15 metres. Transmission lines may also have associated roads or tracks to provide access for maintenance.

To construct a larger hydropower project, may require up to 2,500 construction staff. As such, there is a need to provide them accommodation when they are not working. As such, a small town might need to be constructed with all associated infrastructure including but not limited to potable water, washing water, food mess halls, sewerage infrastructure, laundries, etc.

Additionally, there will be a need for lay down areas to store construction equipment etc. Further, if a reservoir wall is to be constructed, raw materials will need to be sourced to build the wall. As such, it is highly likely that a quarry will be needed to source the material from. This same site; or an alternate site may also be needed for the placement of waste spoil during construction.

All these issues should be considered as part of the great project particularly for the ESIA when considering the entire construction of a hydropower project.

### **1.5.7. Pre-construction Activities**

Pre-construction activities for a hydropower project normally involves the geological (eg the drilling of bore/test holes) and hydrological surveys, the assessment of seismic risk, identification of quarrying locations and the quality of the material, the construction of access roads, and baseline surveys of biological and social impacts. These may be quite environmentally and socially intrusive, although the impacts are usually on a small spatial scale and temporary. Further, areas for construction camps and laydown areas will need to be cleared so as construction of those can commence prior to the larger workforce being engaged for the overall project construction.

During this period, it is essential that the community is engaged. Keeping the project area communities informed from the earliest stages of project conception is especially critical in Myanmar given the legacy of distrust and conflict between the government and private sector, and the upland ethnic groups they have often been imposed upon.

### **1.5.8. Construction Activities**

The construction of a hydropower project involves a range of activities. The main construction areas include but are not limited to:

- a. Dam as applicable;
- b. Diversions as applicable;
- c. Channels, penstock and tunnels;
- d. Power house and switchyard;
- e. Construction worker camps;
- f. Transmission lines;
- g. Quarries and areas where waste spoil materials are deposited;
- h. Lay down areas / store yards for the management and storage of construction materials;
- i. Access roads to any/all of these areas.

When constructing a hydropower project, the following activities are undertaken

- a. Site clearance of vegetation and top soils;
- b. Clearance of vegetation in reservoir area;
- c. Provision of temporary cofferdams as applicable to divert the river;
- d. Earthmoving and blasting;
- e. Tunnelling as applicable;
- f. Quarrying and transport of rock, sand and gravel;
- g. Laying of the foundations and concrete formworks;
- h. Laying of channels and pipes
- i. Installation of mechanical and electrical equipment;
- j. Disposal of solid and liquid wastes; and
- k. Vehicle and equipment maintenance.

The construction phase ends with the testing of the equipment before moving into commercial operation. Construction could be up to five years and need as many as 2,500 staff.

### **1.5.9. Operational Activities**

The operational lifespan of a hydropower plant is normally estimated to be 50 to 100 years with low operational and maintenance costs. The turbines are designed to operate continuously and with a minimal maintenance intervention throughout the operational lifespan of the facility. Operational activities are relatively minor by contrast to the construction activities.

During the operational phase of a project, staff would undertake routine maintenance and the operation of the facility could often be done remotely, consequently there would be no need for ancillary buildings to accommodate permanent site personnel. By contrast, most hydropower projects in Myanmar would have staff on site undertaking these activities. A total staff number of about 100 might be required. Vehicles would use the permanent access roads to travel to the power chamber for work. On occasion, maintenance activities would be required on other areas of the project, which may require heavier construction equipment.

On-going sediment flushing/dredging might be required to remove sediment loads that accumulate behind the dam wall. The sediment would need to be monitored and removed to a bunded area downstream.

#### **1.5.10. Decommissioning/Rehabilitation Activities**

As highlighted above, the average hydropower plants should have a life span between 50 to 100 years with low operational and maintenance costs. However, there is the potential for a hydropower project to need to be decommissioned and/or have rehabilitation works undertaken

Decommissioning/Closure is the final phase. It is often difficult to provide an assessment of the impacts of closure because the conditions are likely to have changed significantly. However, it will be important to indicate the expected lifetime of the dam and reservoir, especially in terms of sediment build-up in the reservoir. Should a hydropower project be decommissioned, which is unlikely, all components would need to be disassembled, removed and recycled as far as possible. Depending on the best available technology at the time, any above ground structures should be demolished unless an alternative use is found for them. Decommissioning would have to be undertaken as per the approval conditions and ESMP. The rehabilitation of the disturbed areas would form part of any decommissioning phase. The aim should be to restore the land to its original substratum characteristics (or as near as possible).

Alternatively, there is the potential for larger scale operational and maintenance works that might need to be undertaken. This could include but not be limited to dam wall maintenance that would require the hydropower project to be taken offline for a period, the replacement of turbines and other associated infrastructure. It is likely that this work could be completed within a year and the project continues.

### **1.6. General Environmental and Social Impacts associated with a Hydropower Project**

There is a considerable body of information on the environmental and social impacts of large hydropower world-wide. The following provides an overview of the likely environmental and social impacts. Separate sections have been prepared to provide MONREC and MOEE with an understanding of these impacts and how they should be considered when undertaken an assessment of a project specific ESIA.

#### **1.6.1. General Area of Influence**

The area of influence and/or geographical extent for hydropower projects will vary depending on numerous variables. These include but are not limited to the river basin/catchment, location of a hydropower project, design, size, hydrology, cumulative projects, time of year when an impact might occur and other variables. Determining the area of influence, the spatial (area) and temporal (time) scale can be difficult to determine.

Spatial scales/boundaries define the area where the biophysical and socio-economic impacts are likely to occur and this defines the area where the relevant studies should be conducted. The study area for each environmental and socio-economic component needs to be defined by a geographical area that will properly assess the direct, indirect and cumulative impacts of a project. In a perfect world, the study area should extend beyond the area of influence to provide context for each of the relevant studies.

Likewise, temporal boundaries of a project include all activities from pre-construction, construction, operation and decommissioning of a project.

For most projects internationally, the spatial and temporal scales/study boundaries for undertaking ESIA's for hydropower projects is usually far too small in area and in time. Often proponents will limit their impact area to less than 1km upstream and downstream of a project. This in most cases, is totally inadequate as hydropower projects can have impacts many kilometres away. When considering this, the level of timing of undertaking studies will often be limited to one sampling event (eg dry season), thus potentially being unaware of variations during for example, wet season events. As such, it is critical that the ESIA consider seasonal and annual variations related to environmental and social issues.

When making an assessment of an ESIA, it is therefore critical to have a larger geographic area and that sampling (and modelling) has been undertaken over all seasons as the spatial and temporal conditions will vary and can differ depending on the environmental and social matters. For example,

## **1.6.2. General Environmental Impacts**

The following section provides MONREC and MOEE with a general understanding of the potential environmental impacts associated with a hydropower project. Many of the construction impacts are similar to any large infrastructure projects and require similar provisions for managing and mitigating the environmental impacts. The construction and operational impacts that relate to hydropower and the impact zones are critical to understand the likely impacts; however each impact could be different based on the specific hydropower project design, size etc and the specific location in Myanmar.

The topics are listed in alphabetical order rather than by importance or potential impact.

### **1.6.2.1. Air quality**

Air quality issues related to a hydropower project are usually concerned with dust and particulates in the air caused by the construction and earth moving activities, and along the access haul roads where the transport of quarried materials are brought to the site. Other air quality issues during construction arise from the exhausts of vehicles, generators and other machinery. This should be managed through regular maintenance of all equipment to minimise emissions.

Once the main construction activities cease, the quality of the air around the dam, power house, quarries and access roads will improve since there will no longer be significant airborne dust from the earth moving and construction activities. Nor will there be the same quantity of vehicle exhaust emissions in these areas. Notwithstanding this, there are a number of significant air quality issues that can occur during operation. The impacts are normally associated with air quality during operation and its interdependence with the water quality in the reservoir, especially during the first few years of operation after inundation. If a reservoir is not cleared properly during construction, the breakdown of vegetation in the reservoir can lead to the development of anaerobic conditions in the lower water levels. This can in turn lead to the release of hydrogen sulphide (rotten egg smell). If water is drawn from these lower levels and passed through the turbines, the hydrogen sulphide will be released from solution and cause a lowering of air quality that will then affect neighbouring communities. This can also lead to increased corrosion of exposed metal components of the hydropower plant and discoloration of the concrete.

### **1.6.2.2. Climate Change**

Climate change is an important design factor for all hydropower projects, in particular, the changes in rainfall patterns that have already been observed and are predicted to change significantly over the lifetime of the hydropower project. Rainfall, snowfall and prolonged dry periods all affect the hydrology of the river and thus the production of power. Where climate change results in lower than previous levels of precipitation, then the seasonal hydrograph will provide less water for storage and hydropower generation – the dam and reservoir could be overdesigned, with serious cost implications. If climate change results in higher than previous records of precipitation and run-off, then the hydropower project may benefit from having more secure supply of water for hydropower generation, assuming that there is sufficient storage capacity and installed capacity. There is, thus, a real dilemma for hydropower designers taking into account the uncertainties of climate change with implications for sizing of the reservoir and equipment, costs and overall viability of the project. However, with climate change the likelihood of storm events becoming more frequent and more intense is predicted to increase all over the world. This will have safety implications for the sizing of spillways, storm water storage and the operational rule curves for the reservoir. It will also require early warning systems in place for storm events.

### **1.6.2.3. Ecological Impacts**

Ecological impacts can be separated into a number of different categories, these including:

- a. aquatic ecology;
- b. protected areas and important ecosystems; and
- c. terrestrial ecology.

For the purposes of this topic, the ESIA Guidelines will assess each specific topic separately.

## **Aquatic Ecology**

Aquatic ecosystems and their associated flora and fauna are often the most significantly impacted as a result of a hydropower project. Hydropower projects have the potential to significantly alter aquatic habitat, including changes in water quality, restrict movement or access and potentially remove important spawning grounds. Further, exotic species are known to be extremely good at pioneering modified habitats and this can result in pressure being placed on native species that are ultimately impacted.

Habitats within a river can include in-channel habitats and floodplain wetlands. The in-channel wetlands are those areas of river that become seasonally dry as river levels drop and have rocks and sandbars exposed. The vegetation that grows there consists of reeds, grasses and shrubs that can withstand being flooded as the water levels rise in the wet season. These are usually very productive areas of the river, providing both food and refuge for fish and other aquatic fauna. The floodplain wetlands are covered at times of high flow in the river, when the floodwater overtops the banks. Typically these occur at the bottom end of rivers, near the mouth or confluence with larger rivers. Floodplain wetlands may be affected if the wet season flows are reduced, so that peak flows are smaller and do not reach the floodplains except in years of higher flows. If such wetlands are present in the river on which the hydropower project is located, then further investigation should show where these wetlands are in relation to the hydropower structures and how they will respond to changes in flow induced by the project. The wetlands occurring between the dam and the power house will be the ones most affected. In the case of diversion between rivers, the wetlands in the intake river will be most affected by flow reductions.

It is important to acknowledge that the aquatic flora and fauna in the immediate proximity of the construction sites (dam site and power house) will be completely lost. Downstream of the construction activities there is likely to be significant disturbance due to excess sediments and turbidity in the water, and other changes in water quality as described above. The literature indicates that aquatic invertebrates are can be significantly impacted by changes in the ecosystems and its characteristics that cannot be measured by humans. These will tend to change the aquatic habitats and vegetation and thus, the species using these habitats.

Recent studies in South East Asia have demonstrated that the development of multiple hydropower projects can result in significant reductions in fish biodiversity, with exotic species being those that usually thrive in the modified habitats. Fish and their habitats can also be adversely affected by changes in water quality as a result of hydropower projects. Fisheries and use of rivers and tributaries by important native fish is well known to be an important part of South East Asian Rivers. Rivers often provide extremely important fish habitats that are both critical to the survival of a species, while at the same time, being critical to local subsistence, culture and identity as well as provides a key food source for wildlife.

Many fish migrate up tributaries of larger rivers in order to spawn, and then make their way back to the larger river for other parts of the life cycle. Some rivers on which hydropower project are proposed may be important for fish breeding and spawning, particularly if they have features such as deep pools, rapids and riffles, and in-channel wetland areas. Other rivers may be more difficult for the fish to move up, especially if they have high waterfalls or very steep rapids, that the fish cannot climb. Local information from communities using these rivers is likely to be a critical complement to properly understanding its dynamics. If the river is recognised as important for fish breeding and spawning, and the spawning grounds lie above the dam, then some sort of fish passage would be needed to allow the fish to pass around the barrier. Fish passages are generally possible for low dams and weirs up to about 10 m in height; however on larger dams, they have proved less successful. It is therefore important to understand the fish species living within a river and its ability to use some type of fish passage. It is recommended that the research literature be analysed with respect to particular species that may occur within any specific river in Myanmar.

## **Protected Areas, Critical Habitats and Important Ecosystems**

Many hydropower projects are located in areas that would, prior to their development be considered pristine and/or critical habitat and/or important ecosystems. Critical habitats are those with high biodiversity value including habitats of significant importance to:

- a. critically endangered or endangered species;
- b. to endemic or restricted range species;
- c. habitats supporting globally significant concentrations of migratory species;
- d. highly threatened and unique ecosystems; and

- e. areas associated with key evolutionary processes.

Examples of these in relation to hydropower development are discussed above.

Where a hydropower project is proposed to be located in or near a protected area, critical habitats and/or important ecosystems, additional precautions need to be considered, particularly as to the integrity of the protected area, critical habitat and/or important ecosystems. The significant impacts from large hydropower projects that are likely to impact these environments include but are not limited to:

- a. direct impacts from construction activities of the project within protected areas, including access roads and transmission lines;
- b. inundation of part of the areas by the reservoir;
- c. fragmentation of the protected area, creating barriers for movement of animals and dividing it up into smaller, less ecologically intact parts, due both to access roads, transmission lines and the reservoir itself; and
- d. indirect impacts resulting from increased access to these areas enabling illegal logging and hunting.

If the protected area affected is substantial and endangered species are considered to be at risk, the hydropower project may not be appropriate. Design alternatives in terms of location, height of the dam and size of reservoir, other routes for access and transmission lines need to be considered seriously and compared before any final decisions are taken, in order to minimise the impacts. All of these impacts will lead to degradation of these natural resource assets and loss of biodiversity.

The construction activities are likely to involve considerable disturbance, even at some distance from the sites. These impacts are highly likely to result in more motile species moving away from the area. New access roads and transmission lines will provide access into more remote areas not previously disturbed, and this may add hunting pressure upon endangered species. During construction, certain activities, including blasting or diversion of the river may be particularly damaging for populations of particular threatened or migratory species. It may be appropriate to modify the timing of such activities to cause the least disturbance, especially during breeding seasons or annual migrations.

Construction activities also include clearings and filling of the proposed reservoir area. This may directly endanger species. If the population in the area is relatively small and the habitat requirements quite restricted, the overall population may be threatened. If, for example, the elevation range of a species is low down the hillside, and the filling of the reservoir would force the population up to a higher elevation, they might not survive due to changes in climate, food availability and other matters. This applies particularly to plant species that may have a very restricted range, especially those that are adapted to growing along the riverbanks. Riverine trees are most likely to be lost, and may not easily survive along the banks of the reservoir.

The preferred approach for vegetation removal would be to clear all vegetation from the inundated area and dispose of the timber in a sustainable manner. That could be through the harvesting and sale of the timber, the chipping of excess material so as this could be used during re-vegetation as mulch. To ensure reduced sediment loss as a result of the removal of the vegetation, water entering the reservoir should be controlled upstream and manage water inundation carefully, especially during wet periods.

The IFC Performance Standard 6 on Biodiversity Conservation and Sustainable Management of Living Natural Resources is the most comprehensive of the international environmental safeguards relating to this topic. Performance Standard 6 addresses how developers can sustainably manage and mitigate impacts on biodiversity and ecosystem services throughout the project's lifecycle, aiming to protect and conserve biodiversity, maintaining the benefits of ecosystem services and promoting the sustainable management of living natural resources through the adoption of practices that integrate conservation needs and development priorities. It divides habitats into modified, natural and critical.

Specific consideration should be considered with respect to the siting of a hydropower project where any of the above exist, particularly given the unique flora and fauna of Myanmar. If rare and endangered species are present and their habitats are considered to be at risk, special measures may be required for their added protection.



## **Terrestrial Ecology**

Terrestrial ecosystems and their associated flora and fauna can be significantly impacted as a result of a hydropower project. Hydropower projects have the potential to significantly alter terrestrial habitat, including changes in vegetation, restrict movement or access and potentially remove important feeding and breeding grounds. Further, exotic species are known to be extremely good at pioneering modified habitats and this can result in pressure being placed on native species that are ultimately impacted. Similar issues to those observed for aquatic habitats will occur.

During construction, the main impacts upon terrestrial fauna and flora will be the removal of any vegetation from the construction site(s) and dispersal of any fauna. The loss of this vegetation cover is unavoidable, and if the loss is significant it should be taken with the area inundated by the reservoir in some sort of compensation or biodiversity offset (see 1.6.2.10). If biomass clearance is required in the reservoir, then trees and other vegetation will be cut down and removed (if valuable). Rather than burning, these should be mulched. Quarrying activities with associated blasting may disturb wildlife and drive them away.

During construction and soil movement the conditions are often created for the spread of invasive alien species. These species are often brought in with construction equipment. T

When preparing the ESIA, the proponent should include a comprehensive baseline. This should include all historical flora and fauna known to have occurred in the area. It should be noted that these lists are often an indication of the potential biodiversity in the region. As such, it is important to consider the habitats and ranges used by these species and assess whether the area affected contains such habitats, eg. the likelihood that the species can be found there and undertake baseline surveys confirm the presence of the key species and the risks to these species and their habitats. The baseline survey should indicate the presence of invasive species in the area, and identify possible species likely to invade

### **1.6.2.4. Erosion and Sedimentation**

Hydropower projects can result in both increased erosion and sedimentation, and then during operation, reduced sedimentation.

The majority of erosion and downstream sedimentation from hydropower projects occurs during the construction phase when ground cover and vegetation is cleared. During construction, earthmoving activities and road construction can exacerbate soil erosion, especially in areas already prone to erosion. Whilst this is to be expected at the construction site, accidental erosion may also occur along access roads if there is inadequate attention to design and drainage. This often happens when temporary, and hence lower cost and quality, roads are built. As a result, until the ground is stabilised through natural or artificial means, hydropower projects increase sediment yields through greater erosion and subsequent sediment discharge. This has frequently been observed on many projects, whereby after the vegetation has been removed and catchment areas have been converted to other land uses, increased sediment discharges and associated adverse effects result and can persist for some time. This has significant flow on effects to water quality, and the modification of bed composition which can result in the disappearance of habitats for fish and other freshwater fauna. The development of an armour layer may temporarily arrest the degradation.

By contrast, the development of a dam wall can significantly increase the sediment load retained within the reservoir and result in the change in downstream water quality caused by altered flow patterns. The sedimentation would also cause reduced levels of dissolved phosphorus, total phosphorus, nitrate and ammonium downstream during normal operation. Further, during the early stage of inundation, the nutrients trapped in the reservoir could be a source for algal bloom, which would lead to oxygen depletion at night. High phytoplankton productivity was predicted to occur frequently during the initial several years. Further, the loss of sediment movement can change agricultural activities for example, that have relied for many years on sediment top up during flood events.

One of the major impacts from soil erosion occurs when the eroded soils reach the river and increase the sediments, suspended solids and turbidity in the river. Excessive sediments in the river can extend for many kilometres downstream, and tend to cover aquatic vegetation and habitats, eg gravel beds that are important for the river health and fisheries downstream. Highly turbid water can also drive away fish to cleaner parts of the river, and may cause mortality as the sediments cover aquatic invertebrates and coat the gills of the fish. Changes in sediment movement for example, can change the amount of material and the nutrients attached to the sediment that are available for agricultural activities downstream that can in turn result in significant

impacts on people's livelihoods due to the loss. This could potentially result in lands become unusable over time.

### 1.6.2.5. Hydrological Changes

The hydrological character of the river is the most important piece of information required when determining the potential output of a hydropower plant and the subsequent choices of siting and design. The section will focus on the environmental impacts of a hydropower project with respect to hydrology; not discuss hydrological design of a hydropower plant.

Flow regime influences the water quality, energy cycles, biotic and ecological interactions, and habitat and health of rivers. Environmental flow is critical to support ecological functions. The health and integrity of river systems ultimately depend on the following, which may vary seasonally:

- a. Extreme low flows occur during prolonged dry periods: Extreme low flows are associated with reduced connectivity and limited species migration. During a period of natural extreme low flows, native species are likely to out-compete exotic species that have not adapted fully to very low flows. Maintaining extreme low flows at their natural level can increase the abundance and survival rate of native species, improve habitat during drought, and increase vegetation;
- b. Low flows and/or base flows occur for the majority of the year. Low flows maintain adequate habitat, temperature, dissolved oxygen, and chemistry for aquatic organisms; drinking water for terrestrial animals; and soil moisture for plants. Stable low flows support feeding and spawning activities of fish, offering both recreational and ecological benefits; and
- c. High flow pulses occur after periods of precipitation and are contained within the natural banks of the river. High flows generally lead to decreased water temperature and increased dissolved oxygen. These events also prevent vegetation from encroaching on river channels and can wash out plants, delivering large amounts of sediment and organic matter downstream in the process.

The loss of flow can have catastrophic impacts on a river.

An important element of relating to the hydrological impacts concerns the specific water resource itself and the availability of water within the system. This will depend upon the climate particularly the precipitation that falls on the catchment above the reservoir, the leaching into the soil and other variables. Important considerations include the amount of rain, the quantity of run-off reaching the river at the reservoir site, the size, slope and shape of the catchment area and the soils and groundwater infiltration. Temperature is an important variable as it will determine the rate of evapotranspiration. All these factors should be considered when assessing the overall water balance.

Rivers that is already regulated by either hydropower or irrigation projects are less sensitive to hydrological impacts than those that do not has no such dams or projects. In general, it is better to choose sites on rivers or tributaries that are already impacted by hydropower, than those where the river is running freely. If the proposed hydropower project is sited on an unregulated river, then additional investigation may be required to assess the degree of regulation that will result from the project and the changes in the flow regimes expected. It is critical to consider environmental flows. An excellent source of information on environmental flows consistent with the IFC's (2016) *Internal Good Practice Note: EFlows for Hydropower Projects*.

Many rivers contain important features that are valuable parts of the landscape. These might include sites for tourism or recreation. If the hydropower project is located downstream of such a feature, the reservoir may inundate the feature, eg a waterfall, riffle or pool would be lost. If the feature is located below the reservoir, then its appearance or function may be damaged by a shortage of water, especially during the low flow season. If the feature lies below the power house, then the changes in flow (daily or overall increases) may affect the appearance or function.

It is also important to understand the historical and baseline hydrological status of a river. As is the case in Myanmar, historical hydrological data is not available. Where this is the case, reference to other catchment areas and rivers nearby, where flow measurements have been made, or by hydrological modelling can reduce the potential knowledge gap. It will be important to consider these issues when investigating the potential hydrological changes to a river that might occur when there is limited data.

In general, the water passing through a hydropower plant is not lost, although there may be some evaporation from the reservoir, especially in hot climates. However, storage reservoirs will significantly

change the seasonal pattern of discharge in a river, tending to store water during periods of high flows and releasing more water than the natural system might have previously had during normal low flows.

#### **1.6.2.6. Noise and vibration**

All construction sites create noise levels above the previous ambient levels. During the construction of a hydropower project, the noise includes vibrations from machinery and other noise that is an essential component of any construction process. The use of explosives for blasting rock in the dam site preparation and in quarries will create excessive temporary noise and vibration and disturbance for nearby communities. Quarries may be located at some distance from the dam site.

During operation, noise will be limited to the turbine operating. This is limited by contrast to that observed during construction.

#### **1.6.2.7. Seismic Activity**

Earthquakes present a major hazard for the safety of dams, particularly in Myanmar that has very high seismic activity. In order to prevent the uncontrolled rapid release of water from the reservoir of a storage dam during a strong earthquake, the dam must be able to withstand the strong ground shaking from even an extreme earthquake, which is referred to as the Safety Evaluation Earthquake (SEE) or the Maximum Credible Earthquake (MCE). Large storage dams are generally considered safe if they can survive an event with a return period of 10,000 years, i.e. having a one percent chance of being exceeded in 100 years. Quite apart from the damages that a major earthquake can inflict upon the dam structure, an earthquake can also cause underwater shifts in the sediment accumulated in the reservoir. If the sediment has accumulated near the intakes, blockage with the mobilised sediment can cause severe damage to structures and the delivery of water to the power house and other water users.

#### **1.6.2.8. Soil quality**

There are a number of issues related to soil quality, mainly during construction. There are limited soil quality issues during operation, notwithstanding the loss of sediment and nutrient movement downstream as a result of the reservoir. Earthmoving and quarrying activities can cause significant damage to soil quality. When undertaking construction activities, top soil should be removed with care and stored appropriately for later use during the rehabilitation of the construction site. This is important in locations where the top soil is thin and relatively poor. Prior to any movement, details of soil types and quality in the construction and ancillary infrastructure footprints should be noted.

Soils can also become contaminated as a result of vehicle maintenance areas and fuel and oil storage where accidental spillage can contaminate the soil. The disposal of solid wastes is an issue for all large construction sites, and potentially toxic materials should be removed to special waste disposal sites to prevent contamination of both ground water and soils. The disposal of spoil material from quarrying and earthmoving may also be a significant issue. Spoil is waste material that cannot be used in the construction because it is either not of the required quality or specification, or because it is surplus to requirements.

#### **1.6.2.9. Water Quality**

A range of impacts on water quality may occur at different stages during construction and operation phases of a hydropower project. These impacts can occur to both surface water and groundwater although there are unlikely to be any major impacts or changes in groundwater movements or levels during the construction period. Ground water quality may be affected by accidental spillages of construction materials and oils. Solid waste disposal facilities may give rise to contamination of ground water. Management measures should be similar to those required to maintain surface water quality.

For the purposes of this section, the ESIA Guidelines focus on the impacts of hydropower projects on surface water quality.

There are two periods when the surface water quality will be significantly changed during the construction of large hydropower. The first which are spatially and temporally restricted occur through the diversion of the river by cofferdams. Cofferdams allow parts of the river bed to be successively dewatered so that construction activities can take place. They are temporary in nature and are the cofferdams are removed once the dam has been constructed. The river may be diverted through side tunnels around the dam which

are then blocked off when at river closure eg when the reservoir starts to fill. The diversion of water by cofferdams and tunnels does not cause major change in the overall river hydrology. The main impacts on surface water quality during the construction period are an increase in sediment load, suspended solids and turbidity caused by the site preparation and earth moving.

The second period when the surface water quality is highly likely to change is during the filling of the reservoir. This usually takes place during periods of high flows. Depending on the hydropower project design, all water might be retained within the reservoir (see commentary on hydrology and environmental flow), or some water may be able to continue downstream. In some very large storage reservoirs, the filling of the reservoir may take more than one year. In some instances the reservoir will be filled progressively as the dam is raised. The main impacts that will occur are changes in the flow downstream. As the dam fills, less water is available to flow downstream, so that the river flows downstream of the dam will be lower than normal at that time of year.

During the clearance of vegetation in the reservoir area and during the filling of the reservoir, the process of breakdown of dead vegetation is likely to cause an increase in BOD and COD and depletion of dissolved oxygen. This will reduce water quality, both in the reservoir and in the flow of water downstream. The reservoirs may also become stratified into thermocline and hypolimnion zones. During the early phase of water impoundment, organic matter in the soil and remaining plants will degrade anaerobically, while some chemical components can be expected to leach. The rate of leaching and degradation would like become less, depending on the amount of organic matter remaining in the reservoir, the depth of the impounded water and the effect of the thermocline.

Waste water from the construction worker camps and construction site offices may also cause pollution unless adequately treated. Accidental spillage of construction chemicals, fuel and oil may also cause water pollution. The accidental spillage of freshly mixed concrete into the river can cause serious water pollution and depletion of dissolved oxygen. Washing of concrete mixers directly in the river should be avoided. Specific potential sources of water pollution, such as waste water from construction worker camps, should be identified and waste water treatment facilities provided. Risks of accidental spillage from fuel and oil stores and other liquid construction materials should be managed appropriately, eg through construction of bunds around the stores.

This consequently affects the aquatic environment downstream, where the river receives water released from the reservoir. The direct and cumulative physical impacts on the water quality include increased water depth, increased water retention time, and potential thermal stratification. The changes caused by the hydropower projects have the potential to affect a broad spectrum of water quality parameters for both the impounded water and the water released downstream. Suspended solids will also have a cumulative impact on water quality downstream during construction activities, such as cutting into the hillsides to build the new access road, which could lead to more sediment and landslides. The bare topsoil and excavated debris and rocks caused by the construction activities at the construction site could also contribute to high sediment levels downstream. Uncovered soil will be a major source of sediment, which would be carried by runoff.

### **1.6.2.10. Biodiversity Offsets**

Biodiversity offsets are measureable conservation outcomes resulting from actions designed to compensate for significant residual adverse environmental impacts (usually biological/ecological) arising from project development after the prevention and mitigation measures have been taken. The goal of biodiversity offsets is to achieve no net loss of biodiversity and a preferable net gain on the ground (or in the water) with respect to species composition, habitat structure, ecosystem function and peoples use and cultural values associated with biodiversity.

Offset principles are established through a framework for designing and implementing biodiversity offsets and verifying their success. Biodiversity offsets should be designed to comply with all relevant national and international laws and planned and implemented in accordance with the Convention on Biological Diversity and its ecosystem approach.

There is no mandatory biodiversity offsetting established in Myanmar and there has in the past, been almost no consideration of this topic. Depending on the proponent, voluntary offsetting may be used to compensate for the impacts of a hydropower project. Offsets can be managed in two ways: a) directly through the hydropower developer themselves; or b) through a third party, with the proponent making compensation payments or buying biodiversity credits. Similarly there are two approaches; one focused on conservation or

preservation of the biodiversity; and the other focused on restoration and biodiversity enhancement of degraded areas.

Biodiversity offsetting is most effective if there is a direct relationship between the biodiversity lost and the offset. This relationship can then consider in-kind offsets, or like-for-like, where for example, the stretch of river ecosystem lost would be offset by protection measures on a similar stretch of river in a nearby catchment. This should be protection in perpetuity. Similarly there should be a strong spatial relationship where the offset site is in close proximity to the hydropower project.

The critical step to developing a biodiversity offset plan is to know what is being lost that cannot be avoided or mitigated. There are evolving methods for valuing and comparing the biodiversity lost with what can be used for offsetting, using quality area as the basic unit of assessment, although a common approach is a minimum 2.5 to 1 offset ratio. This for example would result in the protection of 250% the area of that being impacted/lost.

### **1.6.3. General Social Impacts**

Without careful assessment and management, social impacts such as involuntary displacement of communities and breakdown in community cohesion can result from the development of hydropower projects. Identification of potential socio-economic impacts of projects and the development of appropriate planning, monitoring and adaptation strategies, as achieved through social impact assessments, can mitigate negative impacts and achieve more sustainable outcomes.

The Oxfam publication “Using Gender Impact Assessment in Hydropower Development” identifies common issues arising from hydropower developments that will be experienced differently by women and men, including but not limited to:

- a. Forced or involuntary resettlement;
- b. Loss of assets; such as homes, houses, fruit trees, gardens, food stores, community buildings;
- c. Loss of land and productive resources potentially resulting in a loss of livelihood;
- d. Pollution of air, noise, water and soil which result in health impacts;
- e. Health issues;
- f. Risk of sexual exploitation and violence; and
- g. Loss of cultural lands sites and connection to place.

The above are examples only. Given these, the following section provides MONREC and MOEE with a general understanding of the potential social impacts associated with a hydropower project. Many of the construction impacts are similar to any large infrastructure projects and require similar provisions for managing and mitigating the social impacts. The construction and operational impacts that relate to hydropower and the impact zones are critical to understand the likely impacts; however each impact could be different based on the specific hydropower project design, size etc and the specific location in Myanmar. Past practices have resulted in a lack of trust from community with respect to social issues so it is imperative that these are assessed properly.

The topics discussed below are listed in alphabetical order rather than by importance or potential impact.

#### **1.6.3.1. Conflict and Security**

The control and management of natural resources is one of the main causes for conflict in Myanmar and is at the heart of the on-going peace negotiations between the armed ethnic groups and the Government. One of the main natural resource issues has been access to water. Multiple stakeholders, from farmers to factories, are often stretched across national borders, making equitable water management a critical component of the process.

Conflict has occurred Myanmar since the Second World War as a result of a failure to produce stable governance arrangements that incorporate the interests of a broad coalition of ethno-political stakeholders. Historical and contemporary stakeholders and state building processes have disagreed on the centralisation or decentralisation of power, and the degree to which territorial, governance and rights claims of the ethno-political stakeholders should be incorporated. Proposed hydropower developments intersect with these

historical challenges as they concern who has the right to own make decisions, and benefit from development in various subnational geographies.

Myanmar's history demonstrates that large infrastructure projects, such as hydropower dams, can fuel conflict. Civil society has for many years mobilised strong resistance against dam projects, especially on Myanmar's main rivers Irrawaddy, Thanlwin and Salween. The Thanlwin runs through Shan, Kayah, Karen and Mon states which all have planned dam sites within ethnic minority areas. These areas have resident armed groups fighting for autonomy.

As an example of conflict, the proposed Hutgyi dam site has historically been under the control of the Democratic Karen Benevolent Army Brigade 5 (DKBA-5; a splinter of the DKBA, an armed ethnic group). In April 2013, Government forces clashed with the DKBA close to the dam site as the latter refused to leave their nearby base. The 1360-megawatt project is slated for development by a consortium of Thai, Chinese and Myanmar companies, with the electricity generated to be exported to Thailand. Fighting has escalated around the hydropower project, with both groups fighting to control the area. Further details of the issues of conflict are contained with the Peace and Conflict Baseline Assessment as part of the Strategic Environmental Assessment.

Many of the proposed hydropower projects are within or nearby recent conflict zones. Some of the construction plans have been indirectly or directly interlinked with the ceasefire and peace agreement process. Specifically, environmental and social impacts can generate conflict and contribute to delays and cost overruns with socioeconomic risks manifesting as financial risks for proponents. In order to minimise conflict, it is critical that comprehensive ESIA's are prepared and the community engagement during the planning stages. Only then, will conflict be in any way reduced and allow for community buy in.

An important step in the reduction of conflict has been the Panglong 21 Peace Conferences. This first commenced in August 2016 with armed groups. The United Wa State Party walked out of the peace conference. Eight groups signed the Nationwide Ceasefire Agreement in October 2015; however at least ten other armed groups have reservations in signing the Agreement. A second conference was held in February 2017.

### **1.6.3.2. Cultural Impacts**

Myanmar's tangible cultural heritage is one of the richest and most diverse in the Southeast Asia, and is comparable to that of other more notable regional neighbours including Cambodia and Thailand. However, historical events have left a number of important historical and archaeological sites in a neglected state. Living and non-living (structures etc) cultural sites are especially important where there are people of national race and more isolated communities. Myanmar has been heavily influenced by Buddhism and the Mon people. Myanmar culture has also been influenced by its neighbours India and China.

Hydropower projects have the potential to change the traditional culture of the communities completely particularly through resettlement and worker influx. There may be special ceremonies that different communities may need to perform before leaving the areas where they have been living and again when they are resettled to their new host villages. These may be associated with graves of ancestors and other sacred places, or they may be associated with the overall sense of place of these communities. Some peoples are happy for graves to be left to be inundated, others require the graves to be moved and relocated with the community. Such assessment and management measures require sensitive discussions with the affected communities, usually by a social anthropologist.

If the project area or the reservoir contains designated sites, then management measures will be needed to show how the cultural or historic assets will be protected during construction and operation. These should be described in an archaeological and cultural heritage management plan. It may not be possible to define whether the area is archaeologically sensitive, but sometimes archaeological remains turn up when the earth is moved during construction. In such instances, a "chance find" management regime should be established, so that if such remains are uncovered and the relevant Government Ministry and local leaders are informed. Construction should be temporarily halted until the find has been investigated. Contracted construction companies and workers should be informed and obligated to follow this "chance find" management regime.

### 1.6.3.3. Gender

Myanmar has complex gender equality and women's rights; however gender inequalities in law and access to economic opportunities remain an issue. Myanmar's progress provides a good foundation for greater advancement, largely attributable to the combined efforts of government, quasi-government organisations, civil society groups, and development partners. In the 2014 Gender Inequality Index, Myanmar ranked as 85<sup>th</sup> of 187 countries. The Government of Myanmar is a signatory to the *Convention on the Elimination of All Forms of Discrimination against Women*, the Beijing Platform for Action, the International Conference on Population and Development and the Millennium Declaration. Section 347 of the Constitution guarantees all persons equal rights before the law and equal legal protection while s 348 does not discriminate against any Myanmar citizen on the basis of sex. However, Section 352 of the Constitution codifies discrimination by stating: "*nothing...shall prevent the appointment of men to the positions that are suitable for men only.*"

There are also major challenges, which include contradictory messages in the legal framework, the plural legal system with different gender equality and women's rights standards, policy-practice deficits, gaps between sectors (education versus leadership and political participation), highly skewed results within a sector (such as education), and contradictory trends between related sectors (such as education and employment). For the age group of persons 15 years and older, female literacy in 2015 was estimated at 86.9% and male literacy at 92.0%. Primary school enrolment has increased, and gender parity has been achieved at the primary and secondary school levels. However, there remains a shortage of gender statistics and research, a lack of awareness, and limited institutional capacity hinder the development and implementation of effective policies and programmes for the empowerment of women.

In considering this, hydropower is historically a male dominated sector. There are few women working within the industry, particularly in Myanmar. As such, how women are engaged within the hydropower project development process is critical. As a result of this, there are often a large number of single men associated with the construction of a hydropower project. As such, it is critical to understand the gender dynamics of a project area and how women will be involved in the project in a meaningful way while at the same time, ensuring equality and assessing the impacts of changes on women. This will mean ensuring that the proponent established a process that allows for communication to be disseminated to the community and ensure women's inclusion in all activities.

### 1.6.3.4. Health

There are a number of health (including occupational) and safety risks to both the workers and nearby communities as a result of hydropower projects. Further, changes in local lifestyles can have a significant impact on community health and wellbeing.

Construction work exposes workers and potentially the community to a variety of health and safety risks, including but not limited to the physical dangers of construction work, unprotected use of chemicals etc. This should be covered in the Health, Safety and Environment (HSE Policy) of the proponent and the contractors. The health impact assessment section of the ESIA should describe this policy and how it will be implemented on ground. Where possible it should identify any hazardous chemicals that may be used and the provision of PPE (Personal Protective Equipment). Onsite first-aid facilities should be provided. Emergency procedures should be established and staff training undertaken.

More importantly for the local population, community health and safety risks may arise due to the transportation, storage and disposal of materials that are likely to create physical, chemical, biological or radiological hazards. Communities living near construction sites and near transportation routes may also be exposed to these hazards. The ESIA should identify the nearby communities at risk from the different hazards and recommend appropriate precautionary measures.

Accidents may also occur if people from local communities (or general public) gain access to dangerous locations within the construction site. The EIA should identify any original pathways through the construction site area used by local communities and in consultation with the local community stakeholders recommend alternative routes and pathways that can be provided. Even with this management of public access to the construction sites, particularly hazardous areas (deep pits, steep cliffs, waste disposal sites etc.) should be fenced and warning signs posted in local languages.

Where there is an influx of construction works, this can give rise to diseases becoming more prevalent in a community. This can include sexually transmitted diseases where there are interactions between workers and local community members. Changes in water storages can also result in an increase in vector diseases

including mosquitos that may carry viruses such as Zika, Dengue Fever, Ross River Fever and Malaria. Where waste is not stored correctly, this can result in increased numbers of vermin such as rats and mice, which can, if not managed, have impacts on local agriculture etc.

Community health, safety and security are covered under the IFC Performance Standard 4. This standard aims to anticipate and avoid adverse impacts on the health and safety of affected communities during the project life from both routine and non-routine circumstances, and to ensure that the safeguarding of personnel and property is carried out in accordance with relevant human rights principles and in a manner that avoids or minimises the risks to the affected communities. It is important for any hydropower project that a full assessment is undertaken and plans developed to manage these health issues.

### **1.6.3.5. Human Rights**

Within a community, some groups may be more vulnerable to the effects of a hydropower project owing to their gender, ethnicity, age, physical or mental disability, economic disadvantage, level of poverty, or social status. Further, some individuals or groups may be vulnerable to feelings of isolation, insecurity and defencelessness. Regrettably, these people have been significantly affected and have had their human rights degraded in the past in the construction of hydropower projects in Myanmar.

The Constitution lays some foundation for human rights. Further, the Government has established bodies and institutions, including a National Human Rights Commission, to protect constitutionally guaranteed fundamental human rights as their core mandate; a more pluralistic media; and abolition of prepublication and most internet censorship. However, broadly, the issue of human rights is critical with respect to vulnerable people, affected people more broadly, particularly in relation to displacement. Any hydropower project needs to critically consider these issues when undertaking its assessment.

### **1.6.3.6. Influx of Workforce**

The construction of a hydropower project usually involves a large workforce of skilled and unskilled labour. Examples from Myanmar suggested that the number of workers can be as many as 2,500 on site at any time, though exact numbers will vary depending upon the construction stage. It is usually impossible for all of these workers to be sourced locally, and so many will come from other parts of Myanmar, or potentially be international workers. In most cases, where the developer and/or contractor are foreign, significant numbers of the workforce may also be from different countries (eg China). These foreign workers may not speak Burmese and/or the local language and will have cultural differences and requirements. Usually the concession agreement may specify the proportion of local or national workers that must be used.

There will, thus, be a large temporary population influx of workers, families and camp-followers during construction that increases pressure on infrastructure and services, eg water supply and sanitation, food supplies. This puts pressure on the local communities, the infrastructure and facilities, which may not be able to cope. Economic pressures arise from the increase in demand and prices for local food and services. Social pressures may include prostitution and health issues such as sexually transmitted diseases (STDs).

The worker camps should be established with good facilities for accommodation and recreation. They should have good water supply and adequate waste water treatment and solid waste disposal. If local food sources are not readily available, as is likely in many remote locations of Myanmar, most food will have to be brought in from outside. Worker camps should have clinics and all workers should receive public health awareness and training appropriate to the health risks both to themselves and the local communities. The hydropower company's policy for managing workers and the social pressures should be stated where this is available. A conflict resolution mechanism should be established with local community leaders to deal with any issues arising between the worker camps and local communities.

Despite the establishment of specific worker camps and colonies, large construction projects which last a few years often lead to the development of informal settlements and shanty towns. Families and camp followers may settle in the area, living in temporary houses without any facilities for water supply or waste disposal. This leads to a degradation of the local environment such as water pollution, solid waste dumping, cutting of trees for firewood, illegal hunting etc. This can have a significant impact on local communities that have resided in their local environment relatively undisturbed. This can also lead to conflict between workers and the communities in many forms.



An additional issue is that post construction, it is common that construction workers may stay within the area and undertake illegal / unregistered land use activities which can further exacerbate the issues of loss of land.

### **1.6.3.7. Labour**

Myanmar labour law is governed by both old and new laws and regulations, as well as internal policies and practices of the Department of Labour. In practice, employment relations in Myanmar are however heavily influenced by the policies and practices of the Ministry of Labour, Employment and Social Security. Regulations and notices issued by the Ministry of Labour and its departments provide for the interpretation of the existing laws, but also provide for additional requirements imposed on employers. However in considering this, the location of many hydropower projects in Myanmar is within rural communities. Many local communities often live subsistent lifestyles where men predominantly work in agriculture and women are expected to work in agriculture as well as manage the family. A hydropower project can significantly change the labour dynamics of an area with respect to labour conditions and most local people will be unaware of their legal labour rights. Further, as is often the case, international workers are often paid higher wages than their local counterparts and this can result in tensions.

A proponent should be very aware of the issues of labour and how changes in a community can create conflict and unrest. The proponent will need to ensure that there in engagement with the local community and jobs are created where local employment can be generated to therefore maintain economic capital in the community. Proponents should demonstrate how they comply with the IFC Performance Standard 2 on Labour and Working Conditions.

### **1.6.3.8. Livelihoods and Compensation**

A hydropower project can destroy or change the livelihoods<sup>10</sup> of project affected persons and whole communities through the loss or inundation of agricultural and forest land and other means of production and income generation. It may also reduce informal sources of food and income by reducing access to forest land for gathering wild vegetables, firewood, fibre and medicinal plants. It may reduce both the access and availability of fish and other aquatic plants and animals which can provide both nutrition and income. For small businesses, the relocation of a community may disrupt and generally reduce the income flow. For people and communities that are often the poorest, such losses would be disastrous.

A reservoir may become a potentially important fishery. However, the local people are unlikely to have had any experience of lake fishery techniques or equipment. They may require credit facilities for the purchase of boats and equipment and training in the use. Boat landings and fish market facilities may be required at strategic points on the reservoir, although given the isolation of many communities in Myanmar, this may not be an options.

Where communities are not resettled, but lose access to their agricultural and forest land where they generate income, it is essential that a comprehensive livelihoods restoration plan is developed in parallel with resettlement plans (as applicable). It is important that such plans be developed not just for the people who are physically displaced, but also for those who are economically displaced, especially those who lose access to their original livelihoods, eg people living downstream or in the catchment above the reservoir.

In order to develop a comprehensive livelihood restoration plan, it is critical that the proponent undertake focused stakeholder engagement related to livelihoods. The Livelihood Restoration Plan should establish the entitlements of affected persons and/or communities and should ensure that these are provided in a transparent, consistent, and equitable manner. The mitigation of economic displacement will be considered complete when affected persons or communities have received compensation and other assistance according to the requirements of the Livelihood Restoration Plan and this Performance Standard, and are deemed to have been provided with adequate opportunity to re-establish their livelihoods.

Comprehensive socio-economic surveys therefore are critical as part of the ESIA. The surveys should describe the patterns of livelihood, poverty levels and vulnerabilities of the communities in the different impact areas. In addition to agricultural, livestock husbandry, fisheries or forestry practices that yield food and income, and any the other forms of livelihood such as handicrafts, gold panning on the river, tourism and

---

<sup>10</sup> The IFC defines "livelihood" as full range of means that individuals, families, and communities utilise to make a living, such as wage-based income, agriculture, fishing, foraging, other natural resource-based livelihoods, petty trade, and bartering

small businesses should be described. An analysis of the current skills sets available to the community should also be described. Estimates of current household income levels may be made and these can be used later as indicators for achievement of the livelihood restoration plan.

People who face displacement from their land for livelihoods should be compensated for such loss at full replacement cost.<sup>11</sup> There are a range of possible compensation arrangements that should be used:

- a. in cases where land acquisition or restrictions on land use affect commercial structures, affected business owners should be compensated for the cost of re-establishing commercial activities elsewhere, for the lost net income during the period of transition, and for the costs of the transfer and reinstallation of the plant, machinery, or other equipment;
- b. in cases affecting persons with legal rights or claims to land which are recognised or recognisable under national law, replacement property (e.g., agricultural or commercial sites) of equal or greater value should be provided, or, where appropriate, cash compensation at full replacement cost;
- c. displaced persons who are without legally recognisable claims to land should be compensated for their lost assets other than land (such as crops, irrigation infrastructure and other improvements made to the land) at full replacement cost;
- d. in addition to compensation for lost assets, if any, economically displaced persons whose livelihoods or income levels are adversely affected should also be provided opportunities to improve, or at least restore, their means of income-earning capacity, production levels, and standards of living;;
- e. for persons whose livelihoods are land-based, replacement land that has a combination of productive potential, locational advantages, and other factors at least equivalent to that being lost should be offered as a matter of priority;
- f. for persons whose livelihoods are natural resource-based and where the project will restrict their access, measures should be made to either allow continued access to affected resources or provide access to alternative resources with equivalent livelihood-earning potential and accessibility. Where appropriate, benefits and compensation associated with natural resource usage may be collective in nature rather than directly oriented towards individuals or households; and
- g. where the proponent cannot find alternative land, which could be the case in Myanmar given traditional ownership and race issues, alternative income earning opportunities should be provided, such as credit facilities, training, cash, or employment opportunities. Cash compensation alone, however, are usually insufficient to restore livelihoods and should be considered as the least preferred option for compensation.

### 1.6.3.9. Race

Myanmar is populated by a “rich but complex tapestry of peoples” emanating from its strategic location, shared borders with China in the northeast, India in northwest, Bangladesh in the west and Laos and Thailand on east. Its varied people of national race stems from the settlement of inhabitants of different cultural backgrounds who have migrated within the proximity of the Ayeyarwady River. Despite Myanmar’s rich cultural heritage, this has caused in tension and ultimately conflicts within Myanmar which have caused of poverty especially in the border areas. Myanmar’s history has been marred with conflicts between and within ethnic groups and has resulted in ethnic and religious discrimination and persecution, violence, forced resettlement, amongst many other serious violations of human rights<sup>12</sup>. Consequently, the Government of Myanmar has been preoccupied for decades in fighting and appeasing ethnic armies in the world’s longest civil war, which has affected its capacity to achieve the vision of solidarity and “*delivery of equitable economic and social development.*” Due to these conflicts, the ethnic nationalities that live in the frontier areas have been immensely affected, subsisting in dire poverty. Accordingly to the Chin Human Rights Organisation (CHRO), people of national race in Myanmar have been marginalised affecting their livelihood, cultural status and survival due to decades of civil war and militarisation, forced cultural assimilation, lack of adequate healthcare and education, confiscation of people of national race’ lands and overall economic

---

<sup>11</sup> Replacement cost is defined as the market value of the assets plus transaction costs. In applying this method of valuation, depreciation of structures and assets should not be taken into account. Market value is defined as the value required to allow Affected People to replace lost assets with assets of similar value. The valuation method for determining replacement cost should be documented and included in applicable Resettlement and/or Livelihood Restoration plans

<sup>12</sup> Ekeh, C. and Smith, M. (2007). Minorities in Burma. Minority Rights Group International, Available at <http://www.minorityrights.org/>

hardship.<sup>13</sup> Consequently, any future foreign investment should prevent further marginalisation of ethnic nationalities and not aggravate existing conflict.<sup>14</sup>

Based on the 2008 Constitution, Myanmar is made up of seven regions (formerly known as divisions) and seven states named after the seven largest ethnic nationalities who generally reside around its borders. While ethnic nationalities generally live in the States and the mainstream Burmese (Bamar) largely reside in the central regions, ethnic nationalities are found all over the country and the Bamar also settle in the seven states and regions.<sup>15</sup> The current borders are shown in Figure 3.

Myanmar, based on official figures, is made up of 135 national races, of which the main ethnic groups are Kachin, Kayah, Kayin, Chin, Bamar, Mon, Rakhine and Shan. According to CIA, Burmans comprise 68%, Shan 9%, Karen 7%, Rakhine 4%, Chinese 3%, Indian 2%, Mon 2% and others 5%.<sup>16</sup> While these figures are questioned by different groups, there are understandable limitations on information due to past conflicts and militarisation. Displacement of ethnic nationalities makes it virtually impossible to accurately reflect people of national race demographics in Myanmar.

Many of the hydropower projects in Myanmar are located in areas with distinct race. As such, it is critical to understand the complexities of the interaction of a hydropower project and the impact this might have on people of specific races. In February 2015, the law on Ethnic Rights Protection was approved by the President and passed by the Union Parliament. The law states that all of the Ethnic groups who originated in Myanmar are considered to be ethnic people. The objectives of the law are to ensure that people of ethnic groups as determined by the law enjoy equal citizenry rights and that their constitutional rights are met, to protect the culture, language and tradition of ethnic groups, and to develop the least developed regions which include many of the ethnic minorities. The law does not include any statement qualifying equality between women and men of ethnic groups.

### **1.6.3.1. Resettlement and Compensation**

Resettlement is often the most difficult impacts of hydropower projects to resolve effectively and to the satisfaction of all affected persons. Resettlement is often the most controversial of hydropower impacts, and the record of poorly implemented resettlement projects in the past continues to haunt the hydropower sector and the reputation of hydropower proponents. Given hydropower projects are often located in more remote places in Myanmar; the people affected are generally the poorer and more vulnerable sectors of the population. Further, land acquisition is an extremely complex issue in Myanmar, and particularly given past examples, have resulted in significant conflict and a lack of trust.

As a mitigation principle, the requirements for resettlement should be avoided or minimised as far as possible. This may mean re-designing the project, and so it would be important to start the process of assessing the resettlement requirements of a hydropower project at an early stage so that optimisation of the design (eg height of dam) can balance the hydropower potential with the lowest numbers of people to be resettled. This is part of what is recommended in Section 1.2 of the ESIA Guidelines.

Where resettlement is necessary, the IFC Performance Standard 5 covers compensation stating that where displacement cannot be avoided, compensation for loss of assets will be offered at full replacement costs together with other assistance to help them improve or restore their standards of living or livelihoods. Compensation standards should be transparent and applied consistently to all persons and communities affected. The eligibility criteria for compensation are usually classified in three categories, those:

- a. people having legal title to the affected land or assets that they occupy or use;
- b. who do not have formal legal rights to land or assets but have claims to the affected land that is recognised or recognisable under national law; and
- c. who have no legal right or claim to the land or assets they occupy or use.

---

<sup>13</sup> Miley, M. (2008). An Introduction and Overview of the Situation of Indigenous Peoples in Burma, A Report commissioned by Chin Human Rights Organization

<sup>14</sup> Buchanan, J., Kramer, T. and Woods, K., (2013) Developing Disparity: Regional Investment in Burma's Borderlands, Transnational Institute Burma Center Netherlands Available at <http://www.burmalibrary.org/>

<sup>15</sup> Centre for Peace and Conflict Studies. Listening to Voices from Inside: Ethnic People Speak, Available at <http://adsri.anu.edu.au>

<sup>16</sup> CIA World Fact Book, Myanmar, Available at <https://www.cia.gov>



Figure 3 Map of Divisions and States in Myanmar<sup>17</sup>

In Myanmar, this distinction can be blurred given customary land issues and that often title is not formally recognised. Generally, for affected people in the first two categories, compensation should be paid, and for those without legal rights they should be entitled to compensation except for the cost of the land. If they lose the structure of their livelihoods, they should be entitled to compensation. However, as highlighted above, given the circumstances in Myanmar, it may be difficult to make a distinction between each category.

A significant issue for the people being resettled is the fact that generally the natural resources of their new location eg; soil, water etc. may be very different to those that they have been used to. This might require a change in their activities, particularly related to for example, agricultural practices. The more vulnerable sections of the community will have difficulty making these changes, especially if they have low literacy and technical skills

The development of the Resettlement Action Plan will require a more detailed census and inventory of all the persons entitled to compensation and resettlement. The inventory should cover the houses, the land, trees and crops and other fixed assets, such as wells and irrigation projects that will be lost. Community infrastructure should also be recorded. The cut-off date should be clearly announced before the census in order to avoid false claims, and it may be necessary to repeat the census if more than two years have elapsed before land acquisition. The census and inventory should be conducted by social scientists and trained local persons using such tools as structured and semi-structured questionnaires and census and inventory forms, which should be pilot tested before implementation. Female surveyors will be needed for discussions with women in the households.

<sup>17</sup> Centre for Peace and Conflict Studies. Listening to Voices from Inside: Ethnic People Speak, Available at <http://adsri.anu.edu.au>

Throughout the process of the ESIA and development of the Resettlement Action Plan, a comprehensive community engagement plan should be established and implemented. This should cover disclosure of information about the project and the need for resettlement, and provide information about the resettlement options and packages being designed. The involvement of the affected communities in developing and deciding upon the details is essential to ensure acceptance of the resettlement, eg style and design of houses, provision of utilities such as water and electricity, and facilities for health, education, transport.

If people in the project area have to be resettled to another location, they should be offered choices amongst feasible resettlement options, including adequate replacement housing or cash compensation where appropriate, and be provided with relocation assistance suited to the needs of each group. Preference should be given to land-based resettlement, rather than cash payments. Land-based strategies for compensation should consider the productive potential, locational advantage and other factors that are at least equivalent to the land to be acquired. New resettlement sites built for displaced persons must offer improved living conditions, and the existing social and cultural institutions of both the displaced persons. This will require social surveyors, land surveyors and agronomists and water engineers to assess the availability and suitability of the land, as well as discussions and agreements with local government agencies. Some of the characteristics of the potential resettlement sites include proximity to affected areas or sites; most people wish to be resettled as near as possible to their original villages, and with the same community of people; smooth topography, avoiding steep and unstable slopes; with good potential for infrastructure development, with soils suitable for irrigation and sufficient water availability. Above all, the host community's acceptance is required.

Further, it is necessary to have adequate knowledge of where the affected people are going to be moved to. If this is another community, information on that community is needed to ensure that conflict does not occur between the resettled peoples and those already living in the location. Any host community's social and cultural institutions must be respected.

It is important to set a cut-off date for compensation, in order to discourage new people from coming in from outside the affected area to take advantage of the possibility of compensation. The IFC Performance Standard makes it clear that the developer is not required to compensate or assist opportunistic settlers who encroach on the project area after the cut-off date for eligibility. There should also an increment factor built into the compensation formula to discourage the time between surveys and actual displacement. The compensation formula should also include replacement/relocation mechanisms or values for graves, cultural properties and common resources, including community infrastructure, crops, trees and other assets.

The timing of the resettlement plan is critical, because as a principle, no relocation should take place until the resettlement villages have been prepared. It is possible to acquire the land in advance, but allow the affected people to remain on the land and using it until relocation date. Delays in implementation of resettlement can cause delays in filling of the reservoir and start of power generation. During and immediately after the actual relocation process financial and food assistance may be provided to compensate for the immediate loss of income or livelihoods due to the disruption.

## **1.7. Interlinkages between Environmental and Social Impacts**

Environmental and social issues are intrinsically interlinked. A specific environmental impact can often directly and/or indirectly result in an additional environmental impact or alternatively, result in direct and indirect social impacts. For example, the lack of environmental flow can result in a reduction in fish biomass, which can in turn, could result in reduced access to food and/or livelihood for a family that relies on the fishery. This can be commonly called an ecosystem service that has been lost.

When considering all individual environmental and social impacts, an ESIA should identify the interlinkages of relevant impacts and on other environmental and social issues. Only then will an ESIA properly identify all impacts so as MONREC and MOEE can make informed decision on the approval of projects.

## **1.8. Cumulative Impacts associated with Hydropower Projects**

Cumulative impacts are impacts 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. For practical reasons, the identification and management of cumulative impacts are limited to those effects generally recognised as important on the basis of scientific concerns and/or concerns of affected communities. These impacts are incremental effects of past, present, or future activities combined with the

proposed project. Cumulative impacts can cause significant environmental and social impacts when added together; whereas they may often be considered negligible at the individual project level.

Multiple and successive environmental and social impacts from existing projects, combined with the potential incremental impacts resulting from proposed and/or anticipated future projects, can result in significant cumulative impacts that would not be expected in the case of a stand-alone project. Examples of cumulative impacts that could be attributed to a hydropower project in Myanmar include:

- a. Effects on ambient conditions such as the incremental contribution of pollutant air and noise emissions in the airshed given that much of Myanmar is rural communities where air quality is likely to be high and the level of noise will be relatively benign;
- b. Increases in pollutant concentrations in a water body or in the soil or sediments, or their bioaccumulation through both the construction and operation of hydropower projects;
- c. Reduction of water flow in a watershed due to multiple reservoirs that can have multiple impacts on both upstream and downstream users;
- d. Increases in sediment loads on a watershed or increased erosion which can result in the loss, for example, of important sediment for subsistent agriculture that could change livelihood activities for people in Myanmar;
- e. Interference with migratory routes or wildlife movement;
- f. Increased pressure on the carrying capacity or the survival of indicator species in an ecosystem through pushing species into smaller habitats. Internationally, the impacts of this have been that animals, for example, change their behaviours which can increase potential interactions with people;
- g. Reductions in fauna caused by the loss of habitat;
- h. Depletion of forest resources that may have been important livelihood sources through flooding from multiple reservoirs; and
- i. Secondary, consequential or induced social impacts, such as in-migration, from construction workers into a project's area of influence.

As an example for Myanmar, where a number of hydropower projects are to be constructed within the same river/watershed, the cumulative impacts that are commonly observed include those to flora and fauna, on downstream water availability or quality, on watershed sediment dynamics, on navigation for both small and potentially larger vessels, on local communities' livelihoods through the loss of land and changes in the way they undertake their livelihoods, or on adjacent land uses because of increased access from associated roads.

With the potential expansion of hydropower in Myanmar, the multiple projects are likely to incrementally cause significant impacts, and thus it is necessary to properly assess these to reduce their short to long term impacts on the environment and the people living using these areas for their homes and livelihoods. A separate Cumulative Impact Assessment Guideline will be developed for Myanmar in the near future.

## **1.9. Transboundary Impacts associated with Hydropower Projects**

Transboundary impacts are impacts that are observed in a different country or in a different state/province to the country or province where the project is located and regulated. The country or state/province(s) that experience these transboundary impacts could be suffering environmental degradation or social impacts from a development that they can neither control nor receive any benefits from.

There is the potential for the impacts of hydropower projects within Myanmar to result in impacts across-administrative boundaries, although this is clearly dependent on their location within Myanmar. Projects in a number of locations in Myanmar could potentially have transboundary impacts through the construction of reservoir sites and transmission lines. As such, it is critical that the potential impacts are addressed on a broad spatial and temporal scale to understand the impacts.

A common failing of an ESIA is that the studies focus on the immediate impact zones of the construction site and reservoir area, but do not consider the wider implications of the project. As such, it is critical that a hydropower project consider transboundary impacts in a separate section of the ESIA report, and show how these may be addressed should they be likely to occur. Thus transboundary impact assessment should be considering at least the following aspects:

- a. the impacts downstream of seasonal changes in the flow regime which will affect the availability of water for downstream water users at different times of year;
- b. the distance downstream of daily changes in flow due to peaking operations;
- c. the increased control of floods that large storage dams can provide (a benefit), combined with the risks of large flood events due to storms when the reservoirs are full and spillways have to be used unexpectedly;
- d. the loss of sediment being transported downstream and the increased incidence of bed and bank erosion, especially in alluvial reaches of the river, with potential damage to roads and bridges and other infrastructure;
- e. the reduction in sediment reaching flood plains and deltas resulting in changes in the dynamics of the delta and possible regression;
- f. effects of occasional releases of poor water quality upon domestic, agricultural and industrial water supplies downstream and aquatic life;
- g. reduction in the populations of migratory fish unable to reach spawning and nursery grounds upstream; and
- h. implications for downstream fisheries operations and livelihoods.

The assessment will have to consider how far downstream these effects will be felt, and also what other water users such as other hydropower plants; irrigation projects; waste water discharges etc are also contributing to the issue. It is rare that one hydropower plant is the cause of all the impacts and so transboundary assessment should also be with a cumulative impact assessment.

As transboundary impacts occur in different administrative jurisdictions, it may be necessary to consult with and obtain the necessary approvals or no objections from the provinces or countries downstream. There may be significant legal issues, especially relating to water rights, but also responsibility for damages downstream, eg resulting from a water pollution incident from the hydropower project. Reference to the documents coming out of the Espoo Convention on transboundary impact assessment could be helpful.

## **1.10. Public Participation, Stakeholder Engagement and Consultation**

Stakeholder consultation and disclosure of information is a fundamental part of the ESIA process, especially when it comes to the most difficult aspects of hydropower plants; resettlement and compensation. Public participation and stakeholder engagement is a new process in Myanmar and it is common that there is a lack of trust in the process given past issues with large scale infrastructure projects. Given this, communities may refuse to participate in ESIA consultations as they consider that if an ESIA consultation was carried out this would mean the project will go ahead. In some case, communities have disrupted and/or boycott the consultation. Further, people that have attended the consultations often refuse to sign the attendance sheets as they fear that by doing so, they agree with the project. Further, it is very common that local people are shy and do not speak at public meetings as they feel their voices will be drowned out by other outspoken people.

The *Environmental Impact Assessment Procedure 2015* established a formal process for engaging the community within the preparation of an ESIA. It is critical that a proponent ensures that they follow the formal process effectively and that consultation and engagement is extensive. This includes multiple rounds of consultation, public meetings where the project is discussed, the disclosure of documentation and specific engagement particularly with affected peoples. However there is often a significant disparity between the level of consultation and what would be expected for a hydropower project. There is often a lack of understanding of public and/or community/affected people about what an ESIA is and is not, and the different stages including scoping. Further, there is often a significant lack of engagement in anyway

It is critical that the whole range of stakeholders are engaged in the process to reduce protests and conflict. Stakeholders include but are not limited to:

- a. government including union level and sub national levels;
- b. national and local civil society and non-government organisations including but not limited to environmental, governance and security, transparency and accountability, law enforcement, conflict, peace process and ethnic minorities;
- c. local communities and affected peoples;

- d. users of land etc within a specific area that may not be members of the local community;
- e. expert advisory groups;
- f. hydropower developers;
- g. private sector;
- h. universities and research institutions;
- i. international governments providing funding into Myanmar; and
- j. multi-lateral development agencies/banks and other funders of overseas development aid.

Without engaging all stakeholders, there is the potential for information to not be provided for all issues that might result as a result of a hydropower project.

A significant issue in consultation and engagement is language and the use of technical terms during discussions. It is critical that proponents undertake consultation in local languages so as to ensure the community understand. Further, it is critical that there is not a reliance on public meetings and that one on one consultations and focus groups are help with both specific groups and particularly those that are affected by the project, vulnerable groups, women, the elderly and people of national race. There has been, based on current EIAs, a distinct lack of this occurring. Additionally, it is important to engage with local and national civil society to ensure those that may not have a voice, are heard.

Further, there is a critical need to ensure engagement is ongoing for the life of the project. It is extremely common that engagement is only undertaken during the preparation of the ESIA and once that is completed, not formal engagement is undertaken. As such, it is mandatory that a Stakeholder Engagement Plan be prepare that demonstrates the commitment of the proponent to a process of ongoing consultation. There has been in the past a distinct lack of this occurring in Myanmar.

Reference should be made to the IFC Stakeholder Engagement: A Good Practice Handbook for Companies Doing Business in Emerging Markets which provides an excellent process for undertaking consultation.

### **1.11. IFC requirements for Free, Prior Informed Consent**

FPIC is a good faith negotiation process between a proponent and affected peoples including those of a particular race. When undertaking FPIC, it is critical that prior to any activities, there is a mutually accepted process between the proponent and affected peoples, and that there is evidence of agreement between the parties as the outcome of the negotiations. FPIC is not necessary for all projects. FPIC does not necessarily require unanimity and may be achieved even when individuals or groups within the community explicitly disagree.

The IFC Performance Standards No. 7 refers to Indigenous Peoples (in Myanmar, race) and uses the term in the generic sense to refer to distinct groups that have the following characteristics:

- a. self-identification as members of a distinct indigenous cultural group, and recognition of this identity by others;
- b. collective attachment to geographically distinct habitats or ancestral territories in the project area and the natural resources;
- c. customary cultural, economic, social and political institutions that separate them from those of mainstream society; and
- d. a distinct language or dialect, often different from the official language of Myanmar.

If the project area contains or is being used by any groups that may be considered to fall within this definition, then there are special requirements that the project and the ESIA should follow including but not limited to:

- a. avoidance of all adverse impacts;
- b. full participation and consent, and
- c. mitigation and development benefits/benefit creation.



The term “Free, Prior and Informed Consent” (FPIC) is used to describe good faith negotiation between the proponent and the affected communities of indigenous peoples (people of national race). A greater discussion on this is contained in Section 1.11. All consultations should comply with FPIC and be undertaken in a culturally sensitive manner. Further, it is critical that all consultations be in the local language so as a full understanding of the issues can be ventilated by the community.

Where a project is likely to have adverse impacts on affected people; the project should take the following steps:

- a. document efforts to avoid and otherwise minimise the area of land proposed for the project;
- b. document efforts to avoid and otherwise minimise impacts on natural resources and natural areas of importance to affected peoples;
- c. identify and review all property interests and traditional resource uses prior to purchasing or leasing land;
- d. assess and document the affected peoples’ resource use without prejudicing any national race land claim. The assessment of land and natural resource use should be gender inclusive and specifically consider women’s role in the management and use of these resources;
- e. ensure that affected communities are informed of their land rights under national law, including any national law recognising customary use rights; and
- f. offer affected peoples compensation and due process in the case of commercial development of their land and natural resources, together with culturally appropriate sustainable development opportunities, including:
  - (i) providing land-based compensation or compensation-in-kind in lieu of cash compensation where feasible;
  - (ii) ensuring continued access to natural resources, identifying the equivalent replacement resources, or, as a last option, providing compensation and identifying alternative livelihoods if project development results in the loss of access to and the loss of natural resources independent of project land acquisition;
  - (iii) ensuring fair and equitable sharing of benefits associated with project usage of the resources where the client intends to utilise natural resources that are central to the identity and livelihood of affected peoples and their usage thereof exacerbates livelihood risk; and
  - (iv) providing affected peoples with access, usage, and transit on land it is developing subject to overriding health, safety, and security considerations.

By undertaking FPIC, a proponent can demonstrate their commitment to the community in which it proposes to work. All hydropower projects, irrespective of their location in Myanmar should demonstrate FPIC within their ESIA.

## **1.12. Community Benefit Sharing and Benefit Creation in Hydropower Projects in Myanmar**

Local benefit sharing and benefit creation in hydropower projects are the systematic efforts by proponents to sustainably benefit local communities affected by hydropower projects and to ensure there is ongoing benefit creation.

Based on discussions with MOEE, it is understood that the current policy is to have a 2% of profits given to the community as benefit sharing from a hydropower project.

Benefit sharing is sustainable approach for implementing hydropower projects. Benefit sharing should provide equitable development, sustainability, and smooth project implementation for hydropower development. Benefit sharing aims to distribute the benefits of hydropower equitably to river basin residents and across the economy more broadly. Benefit sharing stems from the principle that people who are affected by hydropower projects should be amongst the first to receive benefits from the project, not being the last. For benefit sharing mechanisms to work, the key enabling conditions are government policies, the legal and regulatory framework, corporate social responsibility strategies of development companies, and the capacity of local communities. There are currently no specific benefit sharing policies and/or framework in Myanmar. Stakeholder engagement is essential in initiating and designing benefit sharing programs.

Monetary benefit sharing and non-monetary mechanisms are commonly used in benefit sharing in hydropower projects. Monetary benefit sharing means sharing part of the monetary flows generated by the operation of the hydropower projects with local communities. Commonly used monetary benefit sharing mechanisms include but are not limited to:

- a. direct payments/revenue sharing including through royalties, taxes, fees and negotiated payments;
- b. preferential electricity rates;
- c. payments for environmental or ecosystem services;
- d. a community development fund/program;
- e. employment and supply chain opportunities; and
- f. equity sharing.

Non-monetary benefit sharing refers to the approaches adopted by the proponent for ensuring that local communities benefit from construction and operation of a hydropower project in non-monetary terms. A hydropower project can share benefits with local communities in non-monetary terms, such as improved infrastructure, support for health and education programs, improved access to fisheries and forests, and legal title to land. Examples of non-monetary benefit sharing mechanisms include but are not limited to:

- a. modifying project design and operation;
- b. watershed management;
- c. associated infrastructure and public service investment; and
- d. employment creation.

To ensure that local communities share the social and economic benefits of hydropower projects, benefit sharing arrangements need to be carefully planned and designed as part of the project. A well-designed benefit sharing program should have clear objectives; carefully define the target population; include benefit sharing mechanisms; and identify responsible agencies, as well as implementation arrangements. Generally, the design of a benefit sharing program needs to be consistent with other studies and assessments undertaken as the ESIA; livelihood action plan and a resettlement action plan. It normally includes the following steps:

- a. understanding the impacts of a hydropower project on local communities, particularly affected people;
- b. analyse the legal and regulatory framework and local development context, although it is noted that there is no specific framework currently in Myanmar;
- c. undertake broad and ongoing consultations with all relevant stakeholders;
- d. designing the objectives of benefit sharing and benefit creation programs;
- e. determining the beneficiaries of benefit sharing programs;
- f. designing the types and mechanisms of benefit sharing;
- g. explore benefit sharing arrangements through multiple entry points; and
- h. establishing the implementation arrangements of benefit sharing programs.

As a long-term arrangement, benefit sharing and benefit creation can facilitate local development and as such, benefit creation. If it established effectively, benefit sharing arrangements can respond to unexpected environmental and social in the operation of a hydropower project to ensure local communities receive adequate benefits. Arrangements for the equitable sharing of benefits can offer scope for local communities and all other stakeholders to avoid conflicts and focus on creating synergies to maximise local development opportunities.

There are a number of international frameworks on benefit sharing. For example, the World Bank's Indigenous People (OP 4.10) requires that the borrower includes arrangements to share equitably in the benefits when a project involves the commercial development of natural resources on land or territories that Indigenous Peoples traditionally owned. The policy on Involuntary Resettlement (OP 4.12) requires that resettlement activities should be conceived and executed as sustainable development programs, providing sufficient investment resources to enable the persons displaced by the project to share in project benefits" when involuntary resettlement is unavoidable. The Environmental Assessment (OP 4.01) requires that ESIA

takes into account the natural environment and social aspects, and explores opportunities for environmental enhancement.

It is critical when developing a benefit sharing arrangement that there is a clear distinction between benefit sharing and compensation and mitigation costs. Compensation, whether in the form of monetary value or replacement in-kind, is due to all affected peoples who have suffered losses to their houses, assets and sources of income and livelihoods. Mitigation costs are due to protect the environment by reducing the impact or rehabilitating the assets after the project has been completed. Benefit sharing by contrast recognises that the previous natural resources of an area (the water flow and hydropower potential) have been taken for economic benefit and that the people living in the area have a right to share in that benefit.

Benefits may be shared in both monetary and non-monetary forms. Monetary forms may be derived from taxes and revenues, or contributions to, long-term regional development fund, an environmental fund or to a community development fund. It may take the form of additional long-term compensation for project-affected populations, or some form of partnership between the developers and the local communities. Another monetary mechanism would grant an equity share of the project to local communities, who would thus have a degree of ownership in the project and receive dividends on the profit. Also communities may benefit from preferential low rates of the electricity they consume.

A useful collection of information about benefit sharing is contained within the:

- a. International Energy Agency (2000), *Hydropower and the Environment*;
- b. World Commission on Dams (2000);
- c. Mekong River Commission's *Knowledge Base on Benefit Sharing* (2011); and
- d. World Bank *Guide on Benefit Sharing in Hydropower Projects* (2012)

There are several different approaches to share benefits with project affected communities and residents of river basins where hydropower projects are located depending on the Government's preference. The IFC is supporting the Government of Myanmar with the development of specific Benefit Sharing and Community Governance Guidelines for Hydropower Projects in the country.

# Terms of Reference for the Preparation of an Environmental and Social Impact Assessment for Hydropower Projects in Myanmar



**IFC**

International  
Finance Corporation  
WORLD BANK GROUP

**Australian  
Aid** 



The Terms of Reference for the Preparation of an Environmental and Social Impact Assessment Guidelines for Hydropower Projects in Myanmar has been developed for the Ministry of Natural Resources and Environmental Conservation and the Ministry of Electricity and Energy under the International Finance Corporation's (IFC) Hydro Advisory Program which receives support from the Australian Department of Foreign Affairs and Trade. The Guidelines have been prepared by Peter Wulf of ESIA Consult Pty Limited.

## Executive Summary

Myanmar is a resource rich nation with world-renowned biodiversity and abundant natural resources. In recent years, Myanmar has slowly increased its development in hydropower projects to provide power for not only its own people, but for other countries in East and South East Asia. It is expected that there will be significant investment over the medium term due to the recent opening up of the country to foreign investment, the current high level of interest in the hydropower sector, and rising national power demand. However, some of the current and proposed projects are seen as somewhat controversial, including from an environmental and social perspective.

The environmental and social management frameworks in Myanmar are very new. Commencing in 2012, Myanmar has been developing a legal framework for considering the environmental and social impacts of projects. The *Environmental Conservation Law* was passed in 2012. In December 2015, the *Environmental Impact Assessment Procedure 2015* were approved by the Government of Myanmar (Notification No. 616/2015 - 29 December 2015). The *Environmental Impact Assessment Procedure 2015* establish the requirements and procedures for environmental impact assessment, the review, approval and monitoring of projects under the *Environmental Conservation Law 2012*. The *Environmental Impact Assessment Procedure 2015* sets out specific requirements for project screening, the preparation of Initial Environmental Examination (IEE) and Environmental Impact Assessment (EIA – also known as an Environmental and Social Impact Assessment (ESIA)), the appeal process, Environmental Management Plan (EMP – also defined as an Environmental and Social Management Plan (ESMP)), environmental considerations in project approval, monitoring, strategic environmental assessment, and administrative punishment. The *Environmental Impact Assessment Procedure 2015* also contains annexes on the categorisation of Economic Activities for Assessment Purposes; charts illustrating steps in the various project assessment processes, and penalties and administrative punishment.

The *National Environmental Quality (Emission) Guidelines* (29 December 2015) was issued by the Government of Myanmar to provide performance parameters for the regulation and control of air emissions, noise, vibration, and liquid discharges from various sources in order to prevent pollution and thereby protect human and ecosystem health. These Guidelines were primarily based on the World Bank Group's Environmental Health and Safety (EHS) General Guidelines 2007 that provide technical guidance on good international industry pollution prevention practice for application in developing countries. Other related laws and regulations include the *Environmental Conservation Rules 2014*, the *Myanmar National Water Policy 2015* and the *Conservation of Water Resources and River Law 2006*.

This document, the Terms of Reference for the preparation of an Environmental and Social Impact Assessment Guidelines for Hydropower Projects in the Myanmar (ESIA Terms of Reference) has been developed based on the need to assess the environmental and social Impact of hydropower projects in Myanmar for the Department of Environmental Conservation within the Ministry of Natural Resources and Environmental Conservation (MONREC). The ESIA Terms of Reference has been developed under the International Finance Corporation's (IFC) Hydro Advisory Program which receives support from the Australian Department of Foreign Affairs and Trade (DFAT). The ESIA Terms of Reference have been developed consistent with the IFC's Performance Standards and Good International Industry Practice.

The ESIA Terms of Reference have been developed for large scale hydropower projects that include for example, dam storage, resettlement and other impacts. Depending on the location, size and nature of a hydropower project will depend on the level of compliance with this full Terms of Reference.

The ESIA Terms of Reference were developed in consultation with the Government of Myanmar including significant consultation and workshopping with MONREC, the Ministry of Electricity and Energy (MOEE), businesses, development partners, hydropower project proponents and relevant stakeholders including regional and non-government organisations.

For the purposes of understanding and consistency, an Environmental and Social Impact Assessment (ESIA) is the international definition for a joint environmental impact assessment and social impact assessment. An EIA/EIS is a project specific environment impact assessment required by Myanmar law. The *Environmental Impact Assessment Procedure 2015* also refers to an IEE which is essentially a lower level ESIA mainly based on a desk top assessment with limited field work.

## 2. Terms of Reference for Proponents undertaking Environmental and Social Impact Assessment for Hydropower Projects in Myanmar

### 2.1. Introduction to the Environmental and Social Impact Assessment Requirements for Hydropower Projects in Myanmar

The preparation of an Environmental and Social Impact Assessment (ESIA) is mandated by the *Environmental Conservation Law* (No. 9/2012). Section 42(b) of the *Environmental Conservation Law 2012* allows for the establishment and implementation of a system for environmental and social impact assessments. The *Environmental Impact Assessment Procedure 2015* provide detailed legal guidance on how the ESIA process should work, and outline the structure of the ESIA process, the responsibilities of government agencies and proponents, and the decision-making process surrounding ESIA Report approval.

This ESIA Terms of Reference provides detailed and specific advice to proponents and their consultants regarding the preparation of an ESIA for a hydropower project. The *Environmental Impact Assessment Procedure 2015* classify hydropower projects under two distinct assessment requirements, one being where an Initial Environmental Examination; and the second being where an Environmental Impact Assessment (ESIA) is required to be prepared.

Assessment Level	
Initial Environmental Examination	Environmental Impact Assessment
Install capacity of $\geq 1$ MW but $< 15$ MW and Reservoir volume (full supply level) $< 20,000,000\text{m}^3$ and Reservoir area (full supply level) $< 400$ hectares	Install capacity of $> 15$ MW and Reservoir volume (full supply level) $> 20,000,000\text{m}^3$ and Reservoir area (full supply level) $> 400$ hectares

For the purposes of the ESIA Guidelines, while they have been prepared for projects that require an EIA/ESIA, the Guidelines are applicable for all hydropower projects in Myanmar. Full detailed information on the legal requirements for the undertaking of an ESIA for a hydropower project is contained in Section 2.3.

### 2.2. Definitions

For the purposes of the ESIA Guidelines, there are a number of important definitions should be consistent between Government and proponents. Definitions related to a hydropower project specifically are included in Chapter One of the ESIA Guidelines. The following is a list of some of those definitions. These are in addition to those contained in Chapter One of the ESIA Guidelines.

Adaptation adjustment in natural and/or human systems to a new or changing environment. Adaptation to climate change refers to adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities. Various types of adaptation can be distinguished, including anticipatory and reactive adaptation, private and public adaptation, and autonomous and planned adaptation.

Adverse Impact has the same meaning as assigned to it in the *Environmental Impact Assessment Procedure 2015*.

Applicable Laws all existing or future laws, regulations, treaties and other international obligations of the Republic of the Union of Myanmar applicable to the project /proponent's activities.

Baseline means existing baseline conditions are the current conditions of an area potentially affected by a proposed project. Existing baselines are established prior to pre-construction, construction and operation of a proposed hydropower project in order to evaluate the effects on the environment.

Best/Good Practices means those practices which are recognised by a consensus of relevant stakeholders (including without limitation government, industry, labour, financiers, and academia) as being practices which have been adopted by leading, reputable companies of international standard and which, when carried out

by or in respect of the Project, can be expected further to reduce the adverse Impacts arising from the Project and activities related thereto.

Biodiversity has the same meaning as assigned to it in the *Environmental Impact Assessment Procedure 2015*.

Biophysical is that part of the environment that does not originate with human activities (eg biological, physical and chemical processes); pertaining to the natural environment.

Climate Change is the change of climate that is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods.

Compensation means a monetary payment, or replacement in kind for losses resulting from a development project; the re-creation of lost or damaged habitat and resettlement

Competent Authority is any person or organisation that has the legally delegated or invested authority, capacity, or power to perform a designated function.

Cumulative impacts means the successive, incremental and/or combined effects arising from the Project together with other existing or likely future projects, activities and other developments within a defined spatial and temporal framework. This involves two aspects; the cumulative impacts on the surrounding natural and social environment; and the cumulative impacts on the Project itself.

Ecosystem means the complex of a community of organisms and its environment functioning as an ecological unit.

Emission Limit Value has the same meaning as assigned to it in the *Environmental Impact Assessment Procedure 2015*.

Environment has the same meaning as assigned to it in the *Environmental Conservation Law 2012*.

Environmental Compliance Certificate or ECC has the same meaning as assigned to it in the *Environmental Impact Assessment Procedure 2015*.

Environmental and Social Management Plan has the same meaning as assigned to the term EMP in the *Environmental Impact Assessment Procedure 2015*.

Environmental and Social Impact Assessment is a formal process used to predict the environmental and social consequences (positive or negative) of a project prior to the implementation decision.

Environmental Quality Guideline or EQG has the same meaning as assigned to it in the *Environmental Impact Assessment Procedure 2015*.

Greenhouse Gases are defined to be carbon dioxide, carbon monoxide, nitrous oxide, oxides of nitrogen, methane, and non-methane volatile organic compounds. The Kyoto Protocol also addresses hydrofluorocarbons, perfluorocarbons, and sulphur hexafluoride.

Initial Environmental Examination (IEE) means the initial process undertaken to decide whether or not the potential impacts of a project are significant whether or not it is necessary to carry out EIA and whether or not it is necessary to prepare and submit other stipulated documents.

Involvement means the processes of consultation and dissemination of information on an investment project to collect comments from those who are likely to be affected by, or gain benefits from, the investment project, as well as from those who are interested in the investment project, to be used as references in preparing and deliberating on a report on an IEE or EIA.

Hazard is a source of potential harm, or a situation with a potential for causing harm, in terms of human injury; damage to health, property, the environment, and other things of value; or some combination of these.

Mitigation is an activity aimed at reducing the severity, avoiding or controlling environmental or social impacts associated with a project, through design alternatives, scheduling or other means.



Affected Person has the same meaning as assigned to it in the *Environmental Impact Assessment Procedure 2015*.

Proponent has the same meaning as assigned to it in the *Environmental Impact Assessment Procedure 2015*.

Project Screening has the same meaning as assigned to the term “screening” in the *Environmental Impact Assessment Procedure 2015*.

Residual Impact has the same meaning as assigned to it in the *Environmental Impact Assessment Procedure 2015*.

Risk means the likelihood that harm will actually be done by the realisation of the hazard during the work being carried out or by the way something is used. Risk = Hazard x Exposure.

Risk Assessment is a scientific method of confronting and expressing uncertainty in predicting the future.

Scoping has the same meaning as assigned to it in the *Environmental Impact Assessment Procedure 2015*.

Stakeholder mean any person, legal entity or organisation who/which are interested in, involved in or have interests in a project.

Terms of Reference means Chapter 2 of the ESIA Guidelines

Valued Ecosystem Component (VEC) are any part of the environment and social fabric that is considered important by the proponent, stakeholders, community, environmental and social scientists, anthropologists and Government involved in the assessment process. Importance can be determined on the basis of cultural values or social and/or scientific concern. The attributes related to a VEC can include but are not limited to biological, cultural, ecological, environmental, physical and social issues including but not limited to changes in the livelihoods of affected peoples, resettlement and any other relevant issue that may be considered during the scoping and development of the cumulative impact assessment.

Vulnerability is the degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate variation to which a system is exposed, its sensitivity, and its adaptive capacity.

### **2.3. *Environmental Conservation Law 2012, Environmental Impact Assessment Procedure 2015, ESIA Terms of Reference and Good International Industry Practices for undertaking an Environmental and Social Impact Assessment for a Hydropower Project***

The Government of Myanmar has enacted legislation, rules and procedures in relation to the undertaking of projects in Myanmar. The principle piece of legislation in relation to environmental and social issues for projects is the *Environmental Conservation Law 2012*. Following the enactment of the law, the *Environmental Conservation Rules 2014* were published.

The *Environmental Conservation Law 2012* has significant provisions that relate to environmental conservation, pollution and other matters. Section 7 of the *Environmental Conservation Law 2012* provides the Ministry with powers relating to the environmental conservation (including pollution). Specifically, the Ministry has a power for prescribing environmental quality standards including standards on emissions, effluents, solid wastes, production procedures, processes and products for conservation and enhancement of environmental quality, specifying categories and classes of hazardous wastes generated from the production and use of chemicals or other hazardous substances in carrying out industry, agriculture, mineral production, sanitation and other activities; prescribing categories of hazardous substances that may affect significantly at present or in the long run on the environment; promoting and carrying out the establishment of necessary factories and stations for the treatment of solid wastes, effluents and emissions which contain toxic and hazardous substances; and managing to cause the polluter to compensate for environmental impact, cause to contribute fund by the organisations which obtain benefit from the natural environmental service system, cause to contribute a part of the benefit from the businesses which explore, trade and use the natural resources in environmental conservation works. Further, under s 10 of the *Environmental*

*Conservation Law 2012*, the Ministry may develop environmental quality standards which include provisions related to the broad definition of pollution. There are further provisions in the *Environmental Conservation Law 2012* that relate to pollution including that s 14, which requires 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

The *Environmental Conservation Law 2012* defines pollution as being any direct or indirect alteration, effect of the physical, thermal, chemical or biological properties of any part of the environment including land, water and atmosphere by discharging, emitting or depositing environmental hazardous substances, pollutants and wastes so as to affect beneficial use of environment, or to affect public health, safety or welfare, or animals and plants or to contravene any condition, limitation or prohibition contained in the prior permission issued under the *Environmental Conservation Law 2012*. Further the *Environmental Conservation Law 2012* also has provisions relating to noise pollution (means the occurrence of sound unit which causes annoyance, fatigue, loss of hearing or interference with the perception of other sounds); pollutant (solid, liquid, or vapour which directly or indirectly alters the quality so as to affect beneficial use of any segment or element of the environment or is hazardous or potentially hazardous to health or causes pollution) and waste (includes solid, liquid, or vapour and also includes anything which is classified as waste in accord with the *Environmental Conservation Law 2012* including radioactive substance which is discharged, emitted or deposited in the environment in such volume, constituency or any manner which causes environmental pollution). These are all encompassing definitions.

Pursuant to Articles 52 and 53 of the *Environmental Conservation Rules 2013*, all Projects undertaken in the Republic of the Union of Myanmar by any ministry, government department, organisation, corporation, board, development committee, local government or authority, company, cooperative, institution, enterprise, firm, partnership or individual having the potential to cause significant Adverse Impacts, are required to undertake IEE or EIA and to obtain an ECC in accordance with this Procedure.

*Environmental Conservation Rules 2013* include a number of similar to that of the *Environmental Conservation Law 2012*. Importantly, Article 51 of the *Environmental Conservation Rules 2013* states that the Ministry may assign duty to the Department for enabling to adopt and carry out the environmental impact assessment system. Further, Articles 52 and 53 are relevant in that the Ministry shall determine the categories of plan, business or activity which shall carry out environmental impact assessment and further the Ministry may, so as 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 as the categories which are required to conduct initial environmental examination respectively.

Other relevant provisions include Articles 54 and 55 re the preparation of an environmental impact assessment and the implementation of an environmental management plan. Articles 41 and 42 relate to the hazardous waste while Articles 48, 49 and 50 related to the protection of natural resources and cultural heritages consistent with section 18 of the *Environmental Conservation Law 2012*

MONREC released the *National Environmental Quality (Emission) Guidelines* under notification 615/2015 on 29 December 2015. The *National Environmental Quality (Emission) Guidelines* prescribe specific principles to control noise and vibration, air emission and effluent discharges. The *National Environmental Quality (Emission) Guidelines* are mainly extracted from the International Finance Corporation's (IFC) *Environmental Health and Safety Guidelines* which provide international guidance for different sectors, generally for adoption by developing countries. The *National Environmental Quality (Emission) Guidelines* apply to all projects requiring environmental assessment, with the purpose of controlling pollution and protecting the environment. The rules prescribed under the Guidelines are understood to be achievable at reasonable costs and with existing technology. The *National Environmental Quality (Emission) Guidelines* contain rules that are general in nature, as well as rules that are industry specific. The *National Environmental Quality (Emission) Guidelines* apply to all projects that require an IEE or ESIA. The provisions under the *National Environmental Quality (Emission) Guidelines* also apply to the Environmental Management Plan and Environmental Compliance Certificate of projects. The *National Environmental Quality (Emission) Guidelines* relates to four main areas, these being:

- a. air emission: based on WHO Air Quality Guidelines with additional requirements for small combustion facilities with rated heat input capacity of 3-50 megawatt thermal power
- b. wastewater: based on the Pollution Prevention and Abatement Handbook with additional requirements during project construction phase;
- c. noise levels: for residential, institutional and educational areas, 55 dBA for daytime and 45 dBA for night time. For industrial and commercial areas, 70 dBA for both daytime and night time; and

- d. odour: should not exceed 5-10 odour units at the edge of populated areas in the vicinity of the project.

On 29 December 2015, MONREC as they are (formerly Ministry of Environment, Conservation and Forestry) enacted and published the *Environmental Impact Assessment Procedure 2015*. Projects in Myanmar are required to comply with the *Environmental Impact Assessment Procedure 2015*, whether they are undertaken by Government, a multi-lateral bank such as the World Bank, Asian Development Bank etc or a private proponent. Essentially, there are three levels of assessment established under the *Environmental Impact Assessment Procedure 2015* that follow the Asian Development Bank model, these being exempt development; and projects that will have environmental and social impacts that would be ranked as Category A or Category B projects, these being projects that need the preparation of an EIA (ESIA); or an IEE respectively. Annex One of the *Environmental Impact Assessment Procedure 2015* sets out a list of "Economic Activities" that trigger the requirements of an IEE and/or EIA noting that MONREC can upgrade the requirements from an IEE to an EIA. A discussion with respect to the economic triggers and hydropower is included later in the ESIA Guidelines.

The *Environmental Impact Assessment Procedure 2015* set out the process for the undertaking and preparation of both an IEE and EIA. There are a number of very general requirements as part of the process which include but are not limited to:

- a. the preparation of a project proposal which is submitted to MONREC;
- b. a decision by MONREC as to the level of assessment required;
- c. the undertaking of the relevant environmental and social studies and impact assessment;
- d. community consultation and stakeholder engagement;
- e. submission of the draft IEE/EIA;
- f. publication of the draft IEE/EIA for community comment; and
- g. review and approval/non-approval of the project and the issuance of an Environmental Compliance Certificate.

These are summarised below.

## **2.4. Overview of initial steps in the Environmental and Social Impact Assessment Process in Myanmar**

### **2.4.1. Project Proposal**

Screening is the first phase during which the proponent will check if the Project or activity is required to undertake an (IEE, ESIA or neither. In most cases this is a straightforward task but where the proponent is in doubt or in case the Project type is not identified in *Environmental Impact Assessment Procedure 2015* Annex 1, then the proponent should consult with MONREC and request Ministry advice on the matter.

Screening is the first phase during which the proponent will assess whether the project or activity is required to undertake an IEE, ESIA or no assessment. In most cases this is a straightforward task but where the proponent is in doubt or in case the project type is not identified in Annex One of the *Environmental Impact Assessment Procedure 2015*, then the proponent should consult with MONREC and request Ministerial advice on the matter. The proponent would be required to prepare a Project Proposal and submit that document to MONREC. The Project Proposal should provide the MONREC with a thorough understanding of the project, its location etc and an overview of the existing environment. The Project Proposal should identify the foreseeable impacts that are likely to occur as a result of the project.

### **2.4.2. Scoping Report**

Following the submission of the Project Proposal, scoping and the preparation of the Terms of Reference for the project is undertaken. MONREC will make a decision on the level of assessment required based on both the triggers related to economic activities and the likely impacts. MONREC would then advise the Proponent of the level of assessment. The proponent would then be required, through a registered third party consultant to prepare a Scoping Report and Terms of Reference for the undertaking of the impact assessment. After receiving the Scoping Report and Terms of Reference, MONREC has 15 work days to provide comments and require revisions or approve the documents. Approval by MONREC of the Scoping Report and Terms of

Reference means that Ministry has considered the Project as presented in the Scoping Report and based on this, accepted the Terms of Reference as a framework for ESIA studies.

This third and fourth phase involve the undertaking of the impact assessment studies and community consultation and stakeholder engagement. Essentially, these can only commence once MONREC has approved the Scoping Report and Terms of Reference, although in practice, these commence when the Scoping Report and Terms of Reference have been submitted to MONREC. This main phase of the ESIA process involves four steps. Step 1 is the actual undertaking of the ESIA studies and investigations, which must be carried out by a registered third party consultant on behalf of the proponent. During this step, the proponent is required to disclose information about the Project, and conduct community consultation and stakeholder engagement at national, state / regional, township, and local levels with project affected persons (PAP), involved government institutions, and other stakeholders. A discussion on community consultation is contained in Chapter One of the ESIA Guidelines and later in this Terms of Reference.

Following the completion of the IEE/ESIA, the document is required to be disclosed. At this time, MONREC will review of the submitted ESIA Report and Environmental and Social Management Plan (ESMP). The review consists of an administrative review followed by a technical review. During the technical review, MONREC will call for comments from concerned stakeholders, arrange consultations at national, state / regional, and township levels and conduct site visits as necessary.

MONREC will then make a decision on the final ESIA Report and its ESMP and either: requires further revisions to the ESIA Report and/or ESMP; approve the ESIA Report and ESMP and issue an Environmental Compliance Certificate (ECC); or rejects the ESIA and its ESMP.

Project construction and operation may not commence without a valid ECC (see note above). After obtaining an ECC, the proponent must proceed with project implementation within two years of the date on which the ECC was issued. A proponent may request a single extension of an ECC. If the Proponent has not commenced project implementation within this period, the Proponent will have to update, revise and resubmit the ESIA Report and ESMP for renewed review and approval. In cases where MONREC's final decision is a rejection of the ESIA Report and ESMP, then the Ministry will provide reasons for the rejection. MONREC may reject a project if the Ministry considers that the environmental or social impacts are unacceptable, or if the project is materially incompatible with Government policies and strategies for natural resources and environment management.

A further phase only applies to complex projects where MONREC may require the Proponent to prepare and submit a separate ESMP for the construction phase. This is in addition to the ESMP contained in the ESIA Report. If MONREC requires that a Proponent prepare construction ESMP, then the Proponent is not permitted to commence construction works until the Ministry has approved the construction ESMP. In cases of extended project construction phase, the Proponent is required to revise and update the construction ESMP every two years and submit it to MONREC for review and renewal of the ECC.

A final phase, where applicable is project closure. In this phase, the Proponent has an obligation to inform MONREC, PAP and other stakeholders about the implementation of the closure plan for the project. This is required whether the closure is planned or unplanned. In practice, upon completion of the closure activities, the Proponent must prepare a Project Closure Report and submit it to MONREC. The Ministry will then determine if the Proponent has implemented the closure satisfactorily and in accordance with all legal requirements.

Diagrams representing the impact assessment and approval process are contained at the end of the *Environmental Impact Assessment Procedure 2015*, and have been included as an annexure to Chapter Two of these Guidelines for easy for proponents.

## **2.5. The Environmental and Social Impact Assessment and Report**

An ESIA relies on properly defining those elements of the environment and social matters that may be affected by a proposed development, and on identifying the significance, risks and consequences of the potential impacts of the project at a local, regional and national level. The ESIA will be a significant source of information on which the public and government decision-makers will assess the potential environmental impacts of the project.

The ESIA must provide a description of the existing environment and social fabric in the area affected by the project and any decommissioning / rehabilitation of existing infrastructure, construction, operations and

future decommissioning proposed. All potential impacts on environmental and social values are to be investigated and analysed. The ESIA must present an evaluation of the potential environmental and social impacts using an accepted risk-based methodology and describe proposed measures to avoid, minimise or offset / compensate the expected, likely, or potential impacts. All prudent and feasible alternatives must be discussed in detail and the reasons for selection of the preferred option must be clearly given.

It is expected that extensive ecological and socio-economic investigations will be required to provide sufficient information for the ESIA. The nature and level of investigations must be related to the likely extent and gravity of the potential impacts (likelihood, consequence, magnitude, extent and scale of impacts, including worst case scenarios). All relevant impacts of the project are to be investigated and analysed with commitments to avoid, mitigate and offset / compensate for any adverse impacts to be detailed in the ESIA. This ESIA Guideline will also require significant consultation with all relevant Government and Provincial Ministries and Departments/Agencies, stakeholders, affected persons and the community more generally. Full compliance with the *Environmental Impact Assessment Procedure 2015* and International Finance Corporation Performance Standards is required as defined by the Procedure.

The detail at which the ESIA deals with matters relevant to the project should be proportional to the scale of the impacts on environmental and social values. When determining the scale of an impact, consideration should be given to its intensity, duration, cumulative effect, irreversibility; the risk of environmental harm, social disharmony, displacement, management strategies and offsets / compensation provisions.

In preparing the ESIA, the proponent must consider the following aims of the ESIA and public review process:

- a. to provide a source of information from which Government, affected peoples, interested individuals, stakeholders, and any other individual/groups may gain an understanding of the project;
- b. the need for the project;
- c. the alternatives to the project including the no project alternative;
- d. the environment and social fabric which it could potentially affect;
- e. the impacts that may occur and the measures proposed to be taken to avoid or minimise these impacts;
- f. details of stakeholder engagement and public consultation that has been undertaken in the preparation of the ESIA and details of proposed on-going stakeholder engagement and consultation post the submission of the ESIA;
- g. to provide a forum for government and community to make informed comments on the project; and
- h. to provide a framework in which decision-makers can consider the environmental and social aspects of the project including biophysical, cultural, social, health, heritage, gender, economic, technical and other factors.

The proponent must ensure that the ESIA discusses how it complies with the objects of and the principles of sustainable development and use, as set out in the *Environmental Conservation Law 2012*, *Environmental Impact Assessment Procedure 2015* and these ESIA Guidelines. Where relevant, the ESIA should also address aspects of the World Bank's *Safeguard Policies*,<sup>18</sup> the International Finance Corporation's *Performance Standards*<sup>19</sup> consistent with Article 7 of the *Environmental Impact Assessment Procedures 2015*.

Any and all unknown variables or assumptions made in the assessment must be clearly stated and qualified. The extent to which the limitations, if any, of available information may influence the conclusions of the ESIA must be discussed.

If it is necessary to make use of material that is considered to be of a confidential nature, the proponent should consult with MONREC on the preferred presentation of that material, before submitting it to the Ministry for approval for publication.

The ESIA should be a stand-alone document. It must contain sufficient information from any studies or investigations undertaken to avoid the need to refer to previous or supplementary reports. Headers and / or

---

<sup>18</sup> See [www.worldbank.org/WTA1ODE7T0](http://www.worldbank.org/WTA1ODE7T0) and [www.worldbank.org/OSARUT0MP0](http://www.worldbank.org/OSARUT0MP0)

<sup>19</sup> See [www.ifc.org/performancestandards](http://www.ifc.org/performancestandards)

footers should be used to denote which section the page relates to (e.g. based on the table of contents). Detailed technical information, studies or investigations necessary to support the main text must be included as appendices issued with the ESIA. Any additional supporting documentation and relevant studies, reports or literature not normally available to the public from which information has been extracted must be made available at appropriate locations during the period of public display of the ESIA. Where specific information requirements are set out within this ToR, they should be read as a requirement for as much detail as is appropriate and reasonably available at this stage of planning. The Ministry understands that full details may be difficult to obtain with regard to certain requirements. The ESIA report must clearly identify any gaps in the information presented and include discussion on the effect of these gaps on the overall results of the assessment and possible methods for addressing them.

The ESIA must comprise three elements:

- a. the executive summary as a stand-alone document for public information;
- b. the main text of the document, written in a clear and concise manner so as to be readily understood by general readers; and
- c. appendices containing a copy of these guidelines and detailed technical information and modelling which may include other sensitive commercial or cultural information (as required). It is assumed that the majority of issues will have some form of technical chapter separate from the ESIA.

The format and flow of the ESIA should follow the relevant headings contained within this Terms of Reference of the ESIA Guidelines.

The ESIA must enable affected people, interested stakeholders and MONREC to understand the environmental and social consequences of the proposed development. Information provided in the ESIA must be objective, clear, succinct and, where appropriate, be supported by maps, plans, diagrams or other descriptive detail. The body of the ESIA is to be written in a style that is easily understood by the general reader. Technical language must be avoided wherever possible and a full glossary included. Cross-referencing should be used to avoid unnecessary duplication of text.

The proponent must ensure that the personnel providing information to address this ESIA have the relevant qualifications and experience in their relevant fields (see Sections 2.8). The proponent must also ensure that the information is accurate and that there is no conflict of interest in the person/s providing that information (see Section 2.9).

**It is the responsibility of the proponent preparing the ESIA to identify and address, as fully as possible, all matters relevant to the project and its potential impacts. The proponent is also fully responsible for the accuracy, completeness and soundness of data, information, assessments, mitigation measures and budget allocations presented in the ESIA and Environmental and Social Management Plan (ESMP). The proponent should clearly state and document full endorsement of the ESIA and ESMP, and full commitment to implementing all measures, including the provision of necessary funds and human resources.**

These ESIA Guidelines are not exhaustive as to the level of studies and assessment. The ESIA Guidelines and should not be interpreted as excluding from consideration currently unforeseen matters that emerge as important from environmental and social studies or otherwise during the course of the preparation of the ESIA. These matters should be in addition to the required studies that are identified in this document.

## 2.6. Executive Summary

The Executive Summary must outline the key findings of the ESIA in non-technical terms. The Executive Summary must be prepared in English and Myanmar as per the requirements of the *Environmental Impact Assessment Procedure 2015* and should be prepared in the local language specific to the project area although this is not mandatory. This is very relevant when undertaking public consultation and stakeholder engagement which should always be in the local language.

The Executive Summary must briefly:

- a. state the background and the need for the project;
- b. discuss alternatives and the reasons for selecting the preferred option and rejecting the alternatives;

- c. summarise the construction, operational activities and decommissioning / rehabilitation associated with putting the project into practice;
- d. state the proposed schedule for each key component of the project, the relationships and interdependencies between each stage, the expected duration of each stage and the project as a whole;
- e. provide an overview of the existing regional and local environments, summarising the features of the physical, biological environment relating to the project and associated activities;
- f. provide an overview of the existing regional and local social aspects / values, summarising issues related to cultural, economic, health, land, labour and work conditions, gender and vulnerable communities relating to the project and associated activities;
- g. provide a brief overview of the assessment process as per the requirements of the *Environmental Impact Assessment Procedures 2015* and Good International Industry Practice including but not limited to the International Finance Corporation Performance Standards;
- h. describe the area of influence and rationale for its selection;
- i. describe the expected, likely and potential impacts of the project on the environment and social values during pre-construction, construction, operational and decommissioning phases;
- j. discuss the issues of resettlement and livelihood change including specific numbers of affected people and the relevant measures that will be undertaken to support affected peoples;
- k. highlight any uncertainties related to the data and environmental and social impacts;
- l. summarise the environmental and social protection measures and safeguards, including avoidance, mitigation measures, offsets and monitoring to be implemented for the project;
- m. summarise stakeholder consultation including all relevant Government and Provincial Ministries and Departments / Agencies, all affected peoples, the community, civil society and non-government organisations undertaken in preparing the ESIA;
- n. provide an outline of the environmental and corporate social responsibility record of the proponent;
- o. provide information on the ESMP prepared as part of the project; and
- p. provide information on the relevant plans developed as part of the ESMP.

The Executive Summary must be prepared in both English and Myanmar languages. For projects in for example, Shan State, Karen State, Chin State, Kachin State, etc. where the majority of the project area populations, and perhaps even lawmakers, do not speak Burmese, the Executive Summary should also be translated into the local language

## **2.7. Introduction**

The ESIA is to provide an introduction of the proposed project. This is to include:

- a. the title of the project;
- b. the full name and postal address of the designated proponent;
- c. contractual status of any arrangements, eg Joint Venture etc, Memorandum of Understanding etc;
- d. a clear outline of the project;
- e. the location of the project;
- f. the background to the development of the project;
- g. how the project relates to any other developments (of which the proponent should reasonably be aware) that have been, or are being, taken or that have been approved in the region;
- h. the current status of the project;
- i. the consequences of not proceeding with the project or components of the project; and
- j. an overview of the structure (Table of Contents) of the ESIA consistent with the structure of the ESIA Terms of Reference.

The introduction should include information specific to the above in broad terms. Specifics should be contained within the relevant sections discussed below.

## 2.8. Third Party

Under Myanmar law, only a registered Third Person or Organisation can prepare an ESIA. A Third Person or Organisation must be registered with MONREC under Articles 17 through 22 of the *Environmental Impact Assessment Procedure 2015*.

With respect to the preparation of the ESIA, Articles 45 and 46 of the *Environmental Impact Assessment Procedure 2015* are relevant. The proponent must appoint a registered Third Person or Organisation to carry out the EIA investigation and reporting. Prior to commencement of the EIA, the proponent shall inform the Department in writing as to the identity of the duly registered person(s) and/or organisation it has selected to undertake the EIA investigation and reporting.

Within the ESIA, the proponent must include full details of the Third Party including all names, qualifications, their role, assessment scope and the relevant section of the ESIA where, for example, an individual of the Third Party undertook work in the preparation of the ESIA. This should include all persons that were involved in the project in anyway. The details should be set out as below.

Name	Qualifications	Experience	Role	Sections of ESIA

## 2.9. Conflict of Interest Statement

The Third Party must provide a statement that it has no conflict of interest in the preparation of the ESIA.

## 2.10. Legal, Policy and Institutional Framework

ESIA is mandated by the *Environmental Conservation Law* (No. 9/2012). Section 42 (b) of this *Environmental Conservation Law* allows for the establishment and implementation of a system of environmental and social impact assessment. The *Environmental Impact Assessment Procedure 2015* provide detailed legal guidance on how the ESIA process should be undertaken, and outline the structure of the ESIA process, the responsibilities of government agencies and proponents, and the decision-making process surrounding ESIA Report approval.

The ESIA should contain information on the relevant legislation associated with the pre-construction, construction, operation and decommissioning of the project. The ESIA should provide an outline of all relevant approvals required for the project including but not limited to, development consent, any approvals under Myanmar's legislation, state/local laws and the projected timelines to gain those approvals. The relevant approvals should be set out in tabular format with the approval, the relevant ministry responsible, the information requirements for the approval and the approximate timing to gain the approval. Table 2 provides an overview of the typical content of the Policy, Legal and Institutional Framework section.

**Table 2 Legal, Policy and Institutional Framework content**

Context	Key Content
Applicable Laws	<ul style="list-style-type: none"> <li>• Applicable Myanmar laws, regulations, rules relevant to the project</li> <li>• International Conventions ratified by Myanmar</li> </ul>
Contractual and Other Commitments	<ul style="list-style-type: none"> <li>• Contractual obligations (eg in concession agreements and loan agreements)</li> <li>• Parties to the contractual arrangements and structure</li> <li>• Commitments as a member of associations</li> <li>• Voluntary proponent commitments as part of company corporate policies</li> </ul>
Governing Parameters	<ul style="list-style-type: none"> <li>• Applicable National Environmental Quality (Emission) Guidelines and determination of compliance</li> </ul>



	<ul style="list-style-type: none"> <li>• Applicable national Ambient Environmental Quality Guidelines or Standards and determination of compliance</li> </ul>
Institutional Framework	<ul style="list-style-type: none"> <li>• Roles and responsibilities (only those that are relevant to the Project) of Government institutions involved in environmental and social matters related to the Project.</li> <li>• Linkages to the Project's environmental and social organisation (which is presented in the ESIA Report Project Description section)</li> <li>• Flow diagram showing reporting and communication channels</li> </ul>

## 2.11. Project Description

This section of the ESIA must describe the project in sufficient detail to allow a full understanding of all stages, pre-construction, construction, operation and decommissioning/rehabilitation (including interdependencies between stages) and components of the project and determine potential environmental and social impacts associated with the project. All pre-construction, construction, operational and decommissioning / rehabilitation components of the project (short and long term) must be described in detail. This includes, but is not limited to, the time period over which pre-construction, construction, operational and decommissioning / rehabilitation will take place, details of the locations of each component of the project (i.e. preferably the precise location (including coordinates for all works to be undertaken and/or the footprint area(s)), dimensions of structures to be built and materials, equipment to be used as well as construction access requirements, lay down areas and elements of the project.

The description of the project should include:

- a. all the components and associated infrastructure, including land and aquatic components, transport networks; existing infrastructure and easements on the potentially affected land, all pre-construction activities (eg vegetation clearing, site access, interference with watercourses and floodplain areas, including wetlands), construction; commissioning; operation; related maintenance activities, both long and short term including material disposal requirements; and decommissioning / rehabilitation along with explanation of the anticipated timetable;
- b. the proposed construction methods and details of construction and operational equipment to be used;
- c. the precise location of any works to be undertaken, structures to be built or elements of the project that may have relevant impacts. Aerial photographs, maps, figures and diagrams must be incorporated where appropriate;
- d. any beneficial use or disposal options for surplus excavated material;
- e. include assessment of any directly linked projects that would be required to be delivered by other entities that are necessary to support the project proceeding (for example, concrete batching plant, power, transmission lines, water, sewerage, workers' camp, telecommunications, access roads);
- f. hours of operation for proposed construction works, including night-time works the capacity of high-impact plant and equipment, their chemical and physical processes, and chemicals or hazardous materials to be used;
- g. operation detail (eg hours of operation for project components);
- h. full details of staging of the project including construction timetables;
- i. how the works are to be undertaken and design parameters for those aspects of the structures or elements of the project that may have environmental and social impacts;
- j. the process for the decommissioning / rehabilitation of the project;
- k. details of the sustainability measures that will be employed to minimise the project's carbon footprint; and
- l. any other requirements for approval or conditions that apply, or that the proponent reasonably believes are likely to apply, to the proposed project.

This section should detail, with concept and layout plans, requirements for new infrastructure, or the upgrading and / or relocating of existing infrastructure to service the project. Infrastructure to be considered should include roads, transmission lines, quarries, water supply, energy supply, telecommunications, stormwater, waste disposal and sewerage. Consideration should be given to the likely peak utilisation of

water and wastewater facilities, demand management strategies and when / if additional capacity is required. The impacts of the project's infrastructure requirements on external systems are to be discussed in the ESIA.

Full details on impacts and consultations should be contained within the specific sections below.

The project description should include the following sections as relevant to the specific project.

### **2.11.1. Infrastructure Requirements**

This section should detail, with concept and layout plans, requirements for new infrastructure, or the upgrading and/or relocating of existing infrastructure to service the project. Infrastructure to be considered should include roads, water supply, energy supply, telecommunications, stormwater, waste disposal and sewerage. Consideration should be given to the likely peak utilisation of water and wastewater facilities particularly during construction, demand management strategies and when / if additional capacity is required. The impacts of the project's infrastructure requirements on external systems are to be discussed in the ESIA.

### **2.11.2. Concrete Batching Plant**

The ESIA must provide a full description with maps, concept and layout plans, and the requirements for the concrete batching plant for the construction of the project. The ESIA should include the size, design, water needs, energy consumption, where energy will be sourced; and how the waste will be managed, both material and water. The ESIA should discuss all treatment methods for the residual material.

### **2.11.3. Energy**

During the construction of a hydropower project, there is the need for power to operate equipment including but not limited to concrete batching plants and the worker's camp. The ESIA should describe all energy requirements, including electricity, natural gas, and / or solid and liquid fuel requirements for the construction of the project. The location, design and capacity of power generation and transmission infrastructure for construction should be detailed. The ESIA should indicate the locations of any easements on the infrastructure plan.

### **2.11.4. Water Supply and Storage during construction**

The project description must provide information on the proposed water usage by the project, including details about:

- a. the supply required to meet the demand during construction, including timing of demands;
- b. the capacity of existing water resources to cater for project's requirements and the project's effects on water supply planning;
- c. the quality and quantity of all water supplied to the site during the construction phases based on minimum yield scenarios for water re-use, rainwater re-use and any bore water volumes;
- d. a water balance analysis; and
- e. a site plan outlining projects to be taken in the event of failure of the main water supply.

Estimated rates of supply from each source (average and maximum rates) must be given and proposed water conservation and management measures must be described. A determination of potable and non-potable water demand must be made for the project, including the temporary demands during the construction period. Details should also be provided to describe any proposed on-site water storage and treatment for use by the site workforce during construction and operational phases. The ESIA should provide detailed designs for all infrastructure utilised in the treatment of on-site water including how any on-site water supplies are to be treated, contaminated water is to be disposed of and any decommissioning / rehabilitation requirements and timing of temporary water supply / treatment infrastructure is to occur.

### **2.11.5. Waste Water**

The section should describe all aspect of waste water infrastructure required by the project, including:

- a. options assessed for wastewater treatment;
- b. waste water from the concrete batching plants and other construction requirements;
- c. sewerage systems for the worker's camps;
- d. measures required to mitigate any risks to the environment from discharges and overflows;
- e. the proposed disposal and / or re-use of the waste water and treated effluent and the management of such use. Where applicable, an irrigation plan should be provided detailing where the use of treated effluent is likely to be disposed of rather than release back into aquatic environments. Details of the likely impacts of waste water and treated effluent on surface and groundwater quality should also be provided and how the project will manage operation of the wastewater treatment and disposal system in circumstances of disaster or disruption to power supplies, flooding etc, including determination of the potential emergency waste water / effluent storage that would be required in an extended rain event (one-in-50 and one-in-100-year) wet weather storage, accounting for climate change.

The ESIA should identify way that any waste water should not be released untreated back into the receiving environment.

### **2.11.6. Staff Facilities and Worker's Camp**

The ESIA must provide a full description with maps of the planned construction and operation of camps for staff during the construction, operational and decommissioning phases of the project. This should include a full description of the requirements for the number of staff (and families where relevant) including water, waste and energy requirements and all other accommodation needs such as hospitals, clinics, and child care facilities. The ESIA should provide an overview of all amenities including showers, toilets, laundry and cooking facilities for staff both during and after their shifts. A strategy to ensure no impact on the local community, particularly with respect to the social well-being, particularly of the youth and women should be included in the accommodation planning.

### **2.11.7. Quarries**

The ESIA must provide a full description with maps of the location of all quarry/ies that will be utilised as part of the construction of the reservoir and other associated infrastructure for the hydropower project. When discussing the quarry/ies, the ESIA must include details on the methods used to extract the material; any blasting that may be required; the size of rock to be used; the proposed methods of being the material to the construction site and how the quarry will be rehabilitated once the construction works have been completed.

### **2.11.8. Access Roads**

The ESIA must provide a full description with maps of the location of all access roads that will be built as part of the hydropower project. The ESIA must describe in sufficient details, information on the widths of the roads, the amount of vegetation that will be removed; how that vegetation will be managed for beneficial reuse on site; the grading of the roads; the surface of the final road, if covered; the carry capacity of the road; and the proposed drainage to ensure runoff does not result in water pollution impacts. The ESIA must also include information as to how the access roads will be rehabilitated following the construction of the project, if they are not needed for operation.

### **2.11.9. Transmission Lines**

The ESIA must provide a full description with maps of the location of all transmission lines that will be built as part of the hydropower project. The ESIA must describe in sufficient details, information on the types of towers to be constructed, materials to be used in construction, length and widths of all transmission line corridors, the height of the towers, the location of the towers, the amount of vegetation that will be removed for both the towers and the corridor more broadly; how that vegetation will be managed for beneficial reuse on site; the grading of the land where the towers will be built. The ESIA should include information the proposed maintenance plan for the transmission lines and how access will be undertaken for that maintenance.

## 2.12. Alternatives to the Project

This section of the ESIA must describe, to the extent reasonably practicable, any prudent and feasible alternatives to the hydropower project. For each alternative listed, the proponent should provide the project details, impacts (positive and negative), location, scale, configuration and staging options. Sufficient detail must be provided to make clear why any alternative is preferred to another. This section must describe, but not be limited to the following:

- a. the alternative of taking the no project alternative and/or not proceeding with components of the project;
- b. potential alternative locations for all components of the project as well as different components of the project;
- c. short, medium and long-term environmental, social and economic advantages and disadvantages of the identified options (including the no project option);
- d. potential alternative configuration or scale options for key components of the project including but not limited for example, no reservoir, smaller dam wall, different configuration etc;
- e. a description of options for integrating operations with existing infrastructure where they exist to mitigate impacts on the general environment, important ecosystems etc;
- f. a description of options and/or possible innovations for reducing the total amount of infrastructure involved in the project, such that net impacts on, or risks relating to the environment and social values are reduced;
- g. a comparative description of adverse and beneficial impacts of the development as a whole, each component of the development, and location on the matters protected by the controlling provisions for the project;
- h. a description of how each stage/component would be affected if one and/or more of the stages/components does not occur or is significantly modified;
- i. the reasons for choosing the preferred location and option for the development as a whole, and each key component of the project, must be explained. The explanation must include a comparison of the adverse and beneficial effects used for selecting the preferred location and option, and compliance with the objectives of the *Environmental Conservation Law 2012*;
- j. the advantages and disadvantages of alternatives must be specifically addressed; and
- k. short, medium and long-term environmental, social and economic advantages and disadvantages of each option must be considered.

This section should in no way focus on the economic benefits of the project. It must focus on the environmental and social matters relevant to the project. It should also only focus on how the alternatives will reduce any environmental and social impact, rather than the beneficial environmental and social impacts on the alternative to the project.

This section can be listed in the form of a table with relevant columns for the advantages and disadvantages of each alternative.

## 2.13. Methodology for undertaking a Environmental and Social Impact Assessment

This section of the ESIA should describe the methodologies used for the collection of baseline data. It should clearly describe spatial (local and regional study area) and temporal scales that were used as the area of influence. The ESIA must include a justification and rationale for all boundaries chosen including a reference to which models and data are being used and why.

The ESIA should include the periodicity of data collection consistent with good international industry practice, including seasonal studies, multiple sampling periods to ensure data is collected across all seasons, information on the equipment used to collect data and appropriate chain of custody for all samples collected. These activities all should be undertaken consistent with the *National Environmental Quality (Emission) Guidelines*. All sampling should be representative of the area of influence and include controls, multiple replicates etc. All sampling should be conducted by, or under, the supervision of trained individuals. All sampling activities should be conducted consistent with Good International Industry Practice.

The methodology should include information on the computer software used for measuring relevant issues including but not limited to hydrology to measure river flows etc. Further, details of the software packages for mapping should be included.

All maps must be produced at a sufficiently fine scale and as accurately as possible, considering their primary purpose and end use (for example, to evaluate habitat loss and inform locations of monitoring and reference sites, the key areas where people are currently living etc). This section is also required to identify and reference any relevant (published and unpublished) studies undertaken in the area which will assist in describing patterns and trends in the environment and social matters. This section must link to the project description, potential impacts, and proposed avoidance, mitigation, adaptive management framework and / or offset / compensation measures throughout the life of the project.

## **2.14. Baseline Descriptions/Studies**

This section must provide a description of the project area including all baseline conditions and trends of the terrestrial and aquatic environments both in terms of environmental and socio-economic matters as outlined below. The section should identify factors that influence the environment and social fabric of the area including human-induced and natural factors (for example, climate change and flooding); the quality and quantity of natural variability of environment where adequate data is available or can be sourced; and describe the extent to which the general environment and ecosystems are already stressed by natural and anthropogenic effects. This section should also establish a baseline for all relevant social matters including but not limited to cultural, economic, land, labour and work conditions, gender and vulnerable communities relating to the project area.

Specifically this section should include information on the following topics:

### **2.14.1. Topography, Geology and Soils (including Erosion and Sedimentation)**

The ESIA should describe and map in plan and cross-sections, the geology and landforms, including catchments, of the project area. The ESIA should show geological structures, such as aquifers, faults and economic resources (such as agricultural products) within the area of influence. The ESIA should also describe, map and illustrate soil types and profiles of the project area at a scale relevant to the proposed project. The ESIA should identify soils that would require particular management due to wetness, erosivity, depth, acidity, salinity or other features. The ESIA should also describe the current levels of erosion and sedimentation of water courses in the area of influence. The issue should also discuss the historical characteristic of landslides and landslips in the area of influence.

### **2.14.2. Seismicity**

Earthquakes present a major hazard for the safety of infrastructure in Myanmar and are extremely common. The ESIA should describe and map details of the seismicity of the region. The information should include the number of events, size of events, details of impacts and damage as a result. The ESIA should specifically include mapping of events in proximity to the hydropower project and all associated infrastructure.

### **2.14.3. Unexploded Ordnance**

The ESIA should describe, as best as practicable, the location of all unexploded and used ordnances located in the footprint of the project and the process to be undertaken to remove those from the site in a safe manner. Appropriate mapping should be provided.

### **2.14.4. Climate**

The ESIA should describe the project area's climate patterns that are relevant to the environmental assessment. Climate information should be presented in a statistical form including long-term means along with maximum, minimums and extreme values, as necessary, including consideration of rainfall patterns and storm events. The ESIA should provide a description of the historic weather observations and trends, spatial patterns, frequency, duration and intensity of the natural hazards.

The ESIA should include details of the accepted future projections under projected climate change as determined by the Intergovernmental Panel on Climate Change, regional and national agencies and

organisations, whether the area is considered to be in a high risk area or areas and, if so, briefly identify potential hazards in the project's location.

#### **2.14.5. Air Quality**

The ESIA should describe with appropriate modelling and mapping, the existing air quality on the broader region. This should include data collect across all seasons and discuss any changes in air quality characteristics as a result of inversions, rainfall and other natural and anthropogenic variables.

#### **2.14.6. Ambient Light**

The ESIA should fully describe with appropriate modelling and mapping the characteristics of the existing light sources in proximity to the project including all natural and anthropogenic affects. This should include but not be limited to all other anthropogenic light sources including traffic, residential and commercial areas, etc. Specific sources of light should be identified.

#### **2.14.7. Ambient Noise**

The ESIA should fully describe with appropriate modelling and mapping the characteristics of the existing noise and vibration sources in proximity to the project including all natural and anthropogenic affects. This should include but not be limited to all other anthropogenic noise sources including traffic, commercial areas, residential areas, etc. Specific sources of noise should be identified.

#### **2.14.8. Visual Amenity**

The ESIA should describe and illustrate the visual amenity of the project area. The visual interpretations should include major views, view sheds, outlooks, and features contributing to the amenity of the area, including assessment from private residences and public places such as roads, look-outs and any other specific location.

#### **2.14.9. Hydrology**

The ESIA should describe with appropriate modelling and mapping, the baseline hydrological characteristics of the area of influence. This should include but not be limited to seasonal flows and extreme events including velocity, volumes and any current impediments to flow. Details on all flooding including the average recurrence interval of large events should be discussed. Stream gauges should be used to measure these variables over spatial and temporal scales and up to date data (within previous five years) should be used in the development of all calculations and modelling. It should describe the watershed/catchment including size, slope and shape of the catchment area and the soils and groundwater infiltration. The hydrology should include all surface water flowing in any streams and tributaries feeding into the main river from the catchment and how those matter vary depending upon the rainfall events measured historically in order to understand the variability in the annual flows (e.g. the differences between very wet and very dry years), and the seasonal patterns of flow. The ESIA should also describe existing flood risk for a range of annual exceedance probabilities for the project area of influence.

#### **2.14.10. Groundwater and Surface Water Quality**

The ESIA should provide details of the groundwater and surface water in the area. This should include an overview along with relevant data of important chemical and physical characteristics of surface waters and groundwater within the area. The section should describe seasonal changes in water quality across a range of spatial and temporal scales (eg different periods during the year and different sections of the catchment. Physical and chemical parameters should include but not be limited to pH, dissolved oxygen, temperature, turbidity, conductivity, total dissolved gases, suspended solids, nutrients including nitrogen and other nitrates, phosphates, potassium, ammonia etc (dissolved and in solution), metals etc. These should be collected from riffles, runs and pools as appropriate.

Where relevant, the ESIA should assess marine water intrusion into groundwater where projects are being undertaken in coastal locations.

### **2.14.11. Terrestrial Flora and Fauna**

The ESIA should fully describe the scope, spatial and temporal (survey season/s) and methodologies used for studies and/or surveys used to provide information on the ecosystems/habitat and all flora and fauna in the area of influence. The ESIA should discuss the importance of any habitat (including habitat utilisation) at a local, regional, national and international context, the status of the population (for example, abundance) of all species in the area likely to be affected by the proposed project relative to other areas outside the area likely to be affected. The baseline should include genetic diversity, the viability of the local, regional and overall populations, local and regional representation, conservation and biodiversity values, economic, social and cultural values of species; the extent (in hectares) of any areas of important or unique habitat; and seasonality influences should be included. Show on maps the context of the project site in relation to surrounding vegetation, and ecological communities.

The EIA should list **all** species including historical records, with particular reference to any endangered species (eg. the IUCN Redlist status) likely to be found in the area of influence, and provide an assessment of their populations in these areas. There should be a risk assessment of the selected species, which would include their habitat preferences and distribution, both nationally and within the area of influence, rather than just the specific areas where construction and operation of the hydropower project will occur.

Mapping should be included showing the survey sites and location of species across the area of influence. This should include for example foraging, roosting, resting and nesting / breeding habitats for relevant vertebrate species

### **2.14.12. Aquatic Flora and Fauna**

The ESIA should fully describe and illustrate specific information about the area of influence with respect to all types of aquatic habitats and the flora and fauna using these habitats. Details of the scope, timing (survey season/s) and methodology for studies or surveys used to provide information on the community / habitat in the area of influence should be included. The importance of any habitat (including habitat utilisation) in a local, regional, national and international context, the status of the population (for example, abundance) in the area of influence that are likely to be affected, genetic diversity, the viability of the local, regional and overall populations, local and regional representation, conservation and biodiversity values, economic, social and cultural values of species; the extent (in hectares) of any areas of important or unique habitat; and seasonality influences should be included.

The ESIA should include but not be limited to baseline data on listed threatened species, migratory species and aquatic species and any other species of conservation significance. It should also include a description of biota /biotic habitats, including a map of aquatic habitats (including information on seasonal fluctuations). The baseline should also include location, diversity, abundance and density of different communities and habitats, soft sediment and rocky structure fauna communities (for example, infauna, benthic invertebrates) and those species supported by riffles, runs and pools; including information on species diversity, seasonality and abundance. Maps should include a scale and have contours at suitable increments relevant to the scale, and location. Information on the general abundance of species across the broader landscape should be included.

Where relevant, the ESIA should assess marine flora and fauna consistent with the above where projects are being undertaken in coastal locations.

### **2.14.13. Fisheries**

The ESIA must include information on and mapping of important fishing areas across the area of influence. The ESIA should discuss the species caught both invertebrate and vertebrate, the abundance of these species, life cycles, preferred habitat characteristics, seasonal abundances and diversity and any other relevant information. The ESIA should include information on catch per unit effort from local fisheries; the types of fish caught both commercially and for subsistence, the biomass of these catches and seasonal fluctuations of these catches. For all species, information on preferred habitat and the availability of that habitat in the area of influence should be collected and mapped.

Where relevant, the ESIA should assess marine fisheries consistent with the above where projects are being undertaken in coastal locations.

#### **2.14.14. Protected Areas**

The ESIA should describe in detail, the location, size, and quality of any protected areas within the area of influence. The ESIA should provide a description of the landscape, habitats, and flora and fauna using these areas. The ESIA should describe current activities within these areas including the level of disturbance including but not limited to hunting etc. The significance of any fragmentation should be assessed relevant to the habitats and species with large ranges should be included. Further, the ESIA should discuss the range of habitats in the protected areas and their distribution across the landscape more broadly.

#### **2.14.15. Forestry, Agriculture and Land Use (Current and Future)**

The EIA should describe the existing and potential future types of land use within the area of influence including but not limited to agriculture, forestry, mining, commercial development, plantations etc. This should include the level and range of agriculture and crops that are currently being practiced and the extent of the land being used for these. Grasslands for livestock should also be included. Trends in agriculture should be discussed, include water use, access to water, qualities of water used, crop demand etc. The ownership of operations should also be discussed.

The ESIA should discuss the different types and mode of management of the forestry; whether it is used as commercial production forest or plantation, or as protection forest for watershed management or wildlife habitat. The level of harvesting historically should be discussed including any rehabilitation of the areas. The ownership of operations should also be discussed with respect to land and operational activities. The ESIA should describe other land use activities in the area of influence including government land, residential areas, commercial activities etc and any other relevant land use activity

Mapping should be provided for all of the above over the area of influence at an appropriate scale so as to be understood easily. Mapping should show for example, different crops within the area along with undisturbed, disturbed and cleared forest areas; and all other anthropogenic activities.

#### **2.14.16. Public and Private Infrastructure**

The ESIA should provide a description of all existing and potential future public and private infrastructure in the area of influence. This would include but is not limited to government services and buildings, private and commercial assets, and any other relevant infrastructure. Appropriate mapping should be provided showing the location of the infrastructure.

#### **2.14.17. Transport**

The ESIA should provide an overview of current traffic use of existing roads and for river traffic in the area of influence. This should include an overview of current road infrastructure re road length, width, condition, corridor width, load ratings etc. With respect to river traffic, it should include information on all vessel movements, the number and size of the vessels and what the vessels are transporting eg humans, cargo, bulk liquids etc. The ESIA should discuss the use of these roads and provide traffic counts, what vehicles are current using the roads and the level of road use. Maps should be provided showing the location and connectivity of road infrastructure and river traffic across the area of influence.

#### **2.14.18. Land Ownership and Customary Tenure**

The ESIA should provide a detailed analysis of land ownership (both customary and proprietary) within the area of influence as to who owns the relevant parcels of land and their legal status to the land, identification of various land owning groups and their leadership structure needs to be included. It is acknowledged that information particularly customary land may be difficult to collect.

The ESIA should include the existing and proposed land uses, in and around the project area; any tenures overlying and adjacent to the project site and any to be applied for as part of the project. The ESIA should discuss the locational factors influencing the choice of site, including the risks associated with natural hazards and sensitive environmental areas. The ESIA should also provide mapping of land ownership and any land acquisitions that have occurred within the last five years.



## **2.14.19. Population**

The ESIA should provide an extensive overview of the population characteristics in the area of influence. This information should include but not limited to disaggregated provisional and regional data on age and growth; population diversity; gender distribution; family structure; family size; income; education levels; sanitation; religious practices; ethnicity; food consumption; home ownership; home construction; household assets; health issues including smoking, drinking and drugs habits (including betel nut); levels of physical activity, etc. This section should include tables and figures on current data and likely trends for the future of the area based on a no-project scenario.

The baseline studies of the ESIA should clearly identify these different communities and carry out socio-economic surveys to find out the demographic characteristics of each community, including ethnicity, the numbers and structures of each household, the livelihoods (agricultural, commercial, small industry, public service), different income and poverty levels reflected in the community, and where appropriate seasonal migration for work outside the community and remittances that contribute to the overall economy of the community.

The baseline surveys should also assess the different assets in the community including but not limited to:

- a. built assets or physical capital including houses, community buildings, schools, clinics, mosques and religious buildings, also access roads and bridges;
- b. water supply and sanitation including but not limited to domestic water supply and access to sanitation by household, and irrigation projects;
- c. land assets or natural capital including agricultural fields (irrigated and rainfed), including seasonal cropping patterns and yields, forests (community managed and production forests), timber and fruit trees. Reference should be made to Section 2.14.15;
- d. livestock and animal husbandry including but not limited to the numbers and different types of animals (cattle, buffalos, sheep and goats, pigs and poultry). reference should be made to Section 2.14.15;
- e. fisheries and aquaculture resources including but not limited to the types of fishing, boats and equipment used and seasonal patterns of production and yields. Reference should be made to Section 2.14.13;
- f. other patterns of natural resource use, eg mining, gold panning in the river, eco-tourism, sustainable hunting etc; and
- g. social and institutional capital in terms of governance and legal structures within the villages, health and educational capacity (teachers, nurses, doctors etc.). patterns of land ownership, tenure and use, and other assets should also be described with reference to Section 2.14.16.

Appropriate mapping should be provided for the above.

## **2.14.20. Gender**

The ESIA should provide information and data on sex-disaggregated data on all relevant information with respect to Section 2.14.19 above. The information should include but not be limited seasonal variations in relation to gender, time allocation and the tasks being undertaken by each gender, where the activities are performed, any differences in disability, language, education, literacy, and income generation. This data should be presented in table and graphical ways, along with mapping showing differences within the area of influence.

## **2.14.21. Education**

The ESIA should provide information and data on the level of education across age groups and gender. The information should include the level of education received by members of the communities within the area of influence, access to educational institutions, the number of government and private education facilities, the level of education provided by those facilities and the ease and access to those facilities. Information should be provided on distances from various communities to educational facilities within the area of influence. This data should be presented in table and graphical ways, along with mapping showing differences within the area of influence. Reference should be made to Section 2.14.19 as relevant.

#### **2.14.22. Health**

The ESIA should provide primary and secondary information and data on the level of health across age groups and gender. The information should include the community's health status; any relevant conditions, the level of care available; and provided by any government and/or private facilities and the ease and access to those facilities. Information should be provided on distances from various communities to health facilities within the area of influence. This data should be presented in table and graphical ways, along with mapping showing differences within the area of influence. Reference should be made to Section 2.14.19 as relevant.

#### **2.14.23. Labour and Working Conditions**

The ESIA should provide an overview of current employment opportunities available within the area of influence including population/census data that describe current work practices, potential opportunities for work, and unemployment rates in relation to both age and gender. Reference should be made to the *Workplace Safety and Health Law 2017* as the status of current labour and working conditions. The ESIA should estimate the number of job opportunities from existing projects and programs in the area of influence and estimate the proportion that will be available for local communities. The ESIA should discuss access to skills training and small business development facilities within the local communities. The ESIA should also discuss pay rates for various roles. This data should be presented in table and graphical ways, along with mapping showing differences within the area of influence. Reference should be made to Section 2.14.19 as relevant.

#### **2.14.24. National Races and Traditional Knowledge**

The ESIA should provide an overview of the people of national race living within the area of the projects including details as included with respect to population above. Further, the ESIA should provide an overview of any specific traditions, customs and knowledge that the people of national race hold, including but not limited to rituals, living arrangements, using of bush food, traditional medicines, important language, unique approaches to land and water management and the time frame over when these traditions, customs and knowledge have been used. Further, the ESIA should discuss any relevant literature, education, arts organisations etc that might be proximity of the hydropower project.

#### **2.14.25. Vulnerable and Internally Displaced People**

The ESIA must address the issue of vulnerable populations within the community including any groups that may have greater vulnerability to the effects of a project owing to their gender, ethnicity, age, physical or mental disability, economic disadvantage / level of poverty, or social status. The ESIA must address any individuals / groups that may, as a result of the project be considered vulnerable to feelings of isolation, insecurity and defencelessness. The ESIA should describe the demographic makeup of the vulnerable and internally displaced communities, the proportions of men and women, age structure, proportions of different ethnic groups. The poverty status of the vulnerable and internally displaced communities and households within the community should be described, including both income per capita and household and other measures of poverty as appropriate; eg seasonal food deficit, nutritional status, available income for clothing, health and education etc.

#### **2.14.26. Archaeological and Cultural Heritage**

The ESIA should provide a description of any cultural heritage locations or other relevant matters that relates generally to Myanmar and/or specifically to people of national race living within the area of influence. The cultural heritage issues included but are not limited to traditional ceremony locations, mythological sites, middens, sacrifice locations, cultural buildings or relics, important meeting places, World War II relics, etc. The ESIA should provide the location of these matters.

This data should be presented in table and graphical ways, along with mapping for all of the above within the area of influence.

## **2.14.27. Religion**

The ESIA should provide a discussion on the range and types of religion practiced in the area of influence. The discussion should include a break down on the number of religions, the level of participation, the location of churches, temples, mosques etc within the area of influence, the age and sex-disaggregated data on the level of attendance. The ESIA should also discuss in sufficient detail, all important religious events and activities within the area of influence. This data should be presented in table and graphical ways, along with mapping for all of the above within the area of influence. Reference should be made to Section 2.14.19 as relevant.

## **2.14.28. Conflict and Security**

The ESIA should provide an overview of an overview of any relevant social, conflict and security issues within the area of influence including but not limited to any land rights / tenure issues, political tensions, pressures on existing resources, deterioration of traditional practices including but not limited to changes in diet, fishing, gardening, hunting, use and consider these spatially and temporally. Historical information should be included on the relevant issues, the parties that have been involved, any past, current and proposed activities to reduce the social, conflict and security issues. The ESIA should discuss the Government's current and proposed (if any) interventions to reduce the social, conflict and security issues. This data should be presented in table and graphical ways, along with mapping for all of the above within the area of influence. Reference should be made to Section 2.14.19 as relevant.

## **2.14.29. Economic Aspects and Livelihoods**

The ESIA should provide a substantive overview of the current economic opportunities within the area of influence including but not limited to agriculture, fisheries, etc and any activities that may be current approved but not constructed and any projects that are proposed within the next five years. This includes all government, private sector and international development funded activities. This data should be presented in table and graphical ways, along with mapping for all of the above within the area of influence. Reference should be made to Section 2.14.19 as relevant.

## **2.14.30. Institutional and Governance Arrangements**

The EISA should provide a detailed analysis of the institutional and governance arrangements with respect to the level of community engagement, structures related to the management of the land and other activities. This should include but not be limited to community structures, roles and responsibilities for decision making within the communities within the area of influence, age and sex-disaggregated data on the decision makers, engagement of women in the decision making process.

The ESIA should include tabulated data on these matters including but not limited local legal and non-legal mechanisms etc.

## **2.15. Impact and Risk Based Assessment Process**

The ESIA must include a description and analysis (including relevant risk matrices used) of all the relevant impacts of the project related to the relevant sections identified in the Terms of Reference. Relevant impacts (direct, indirect, cumulative and consequential) are impacts that the project will have or is likely to have on the environmental and social matters of the project area. Impacts during the pre-construction, construction, operational and the decommissioning / rehabilitation phases of the project should be addressed, and the following information provided. The ESIA should include:

- a. a description of the framework used to assess impacts, including risk assessment processes, based on best available practice and any technical data and other information used or needed to make a detailed assessment of the relevant impacts;
- b. a statement as to whether any relevant impacts are likely to be unknown, unpredictable, irreversible or sub-lethal (reversible over time) and what confidence level is placed on the predictions of relevant impacts;
- c. a full description of the potential risks to people and property that may be associated with the project in the form of a preliminary risk assessment for all components of the project and in accordance with relevant standards. The assessment should include potential hazards, accidents, spillages, fire and

abnormal events that may occur during all stages of the project, including estimated probabilities of occurrence; identifying all hazardous substances to be used, stored, processed or produced and the rate of usage; potential wildlife hazards, natural events (eg cyclone, storm tide inundation, flooding, bushfire, landslide, shoreline erosion) and implications related to climate change; how the project may potentially affect hazards away from the project site (eg changing flooding characteristics) and how the project may potentially affect the area's natural disaster management and recovery.

Through the impact assessment sections, reference should be made to Myanmar and international guidelines, performance standards and protocols as to the compliance of the project based on the predicted impacts.

Typical impacts of hydropower projects are described in this section. Not all described impacts will occur for a hydropower project, with the relative significance of impacts will differ from project to project depending upon the site, type, scale, design and operating regime of the project.

## **2.16. Identification of Impacts and Risks**

The proponent should undertake an impact assessment separately and then cumulatively of each time period of the project. For the purposes of the ESIA Guidelines, these have been separated into three distinct time periods, these being pre-construction and construction; operation and decommissioning/rehabilitation. The ESIA should assess the identified impacts below over these time periods; and then discuss the relevant impacts cumulatively over the three temporal scales so as to provide an understanding of the entire potential impacts of the project, spatially and temporally.

### **2.16.1. Pre-Construction and Construction**

The ESIA should undertake an impact assessment of the following issues as a result of pre-construction and construction activities.

#### **2.16.1.1. Air Quality**

The ESIA should provide information with relevant modelling and descriptions on the potential impacts of changes in air quality during pre-construction and construction from the project. This should include the clearing of vegetation for roads, within the reservoir as appropriate, for transmission lines, air emissions from the workers camp, quarries and concrete batching plant. etc.

The investigation of impacts should include but not be limited to how the project might disturb the existing communities as well as the impacts of dust on flora and fauna. The modelling should also demonstrate what impacts the hydropower project will have on the existing population. Where impacts occur, the ESIA should assess how these impacts will be mitigated. The ESIA should note factors such as depth of the reservoir, depth of the intake below the surface, for example at what times of year will the intake water be taken from below the anaerobic layer, and the biomass remaining in the reservoir before inundation. Such factors will enable the risks of hydrogen sulphide release to be assessed during the operational stage. Modelling of these impacts on local communities should be considered.

#### **2.16.1.2. Greenhouse Gas Emissions**

The ESIA should include a full analysis of the relevant climate change impacts that are generated from the pre-construction and construction activities of the project. This should include but not be limited to the loss of vegetation, the release of other greenhouse gases, such as methane, from the reservoir (Methane is a very stronger greenhouse gas with the potential to produce 25 times the effect of CO<sub>2</sub> on global warming over a long period), the types of equipment, fuel types, average consumption and emission loads from the equipment and machinery being used, the emissions and CO<sub>2</sub><sup>-eq</sup> from the concrete batching plant, and impacts from all other construction activities. The ESIA should assess the emission and CO<sub>2</sub><sup>-eq</sup> in terms of local, state, national and international emissions. The ESIA should assess what impact these emissions and losses of carbon storage through for example vegetation clearing and soil degradation might have on Myanmar's international obligations.

### **2.16.1.3. Light**

Communities adjacent to construction sites will experience significant physical disturbance from the light from the construction activities, especially if undertaken at night. Activities at quarries and at the dam site will cause significant light disturbance. The light from construction traffic along access roads becomes both a significant disturbance and a health hazard.

The ESIA should identify with appropriate modelling, the communities and other activities in the area of influence that may be impacted by any light impacts. The ESIA should assess the characteristics of any increased light sources that would be emitted when carrying out the project (point source and general light glows). Light spill that may occur during pre-construction and construction should be assessed. The proponent should predict the impacts of the light spill from the pre-construction and construction activities of the project on the environmental and social values with reference to current and proposed sensitive receptors, using recognised methods. The assessment should include increased traffic, quarry operations and all other activities. The assessment should separately identify the key project components likely to present an impact on light spill for the pre-construction and construction, phases of the project, taking into account the practices and procedures that would be used to avoid or minimise impacts. The impact prediction must address the cumulative impact of the light with other known emissions of light associated with the project and possible future development within the area. Light spill should also be assessed and impacts measured with respect to the workers camp. Modelling of these impacts on local communities should be considered. The management of light spill will need to be discussed with local communities.

Livestock and wildlife may also be disturbed by lighting. The ESIA should assess the impacts of these and other activities on all flora and fauna, both wild and domestic.

### **2.16.1.4. Noise and Vibration**

Communities adjacent to construction sites will experience significant physical disturbance from the noise and vibration, and dust from the construction activities. Blasting in quarries and at the dam site will cause extreme disturbance, especially if carried out frequently and without adequate warning. The dust and vibration from construction traffic along access roads becomes both a significant disturbance and a health hazard.

The ESIA should identify with appropriate modelling, the communities and other activities in the area of influence that may be impacted by any noise and vibration including blasting as necessary. The ESIA should assess the characteristics of any increased noise and vibration sources that would be emitted when carrying out the project (point source and general emissions). Noise and vibration emissions (including fugitive sources) that may occur during pre-construction and construction should be assessed. The proponent should predict the impacts of the noise emissions from the pre-construction and construction activities of the project on the environmental and social values with reference to current and proposed sensitive receptors, using recognised quality assured methods. The assessment should include increased traffic, quarry operations and all other activities. The assessment should separately identify the key project components likely to present an impact on noise and vibration for the pre-construction and construction, phases of the project, taking into account the practices and procedures that would be used to avoid or minimise impacts. The impact prediction must address the cumulative impact of the noise with other known emissions of noise associated with the project and possible future development within the area and the potential impacts of any low-frequency (<200 Hz) noise emissions.

Noise emissions should also be assessed and impacts measured with respect to the workers camp. Modelling of these impacts on local communities should be considered.

Livestock and wildlife may also be disturbed by blasting. The management of blasting activities will need to be discussed with local communities with agreement on fixed blasting times and the warnings to be provided. The ESIA should assess the impacts of these and other activities on all flora and fauna, both wild and domestic.

Consideration should also be given to the increase in underwater noise as a result of the project. This can have a significant impact on aquatic organisms and their use of aquatic ecosystems.

### **2.16.1.5. Erosion and Sedimentation**

The ESIA should provide describe the likely impacts of all components of the hydropower project on erosion and sedimentation. Modelling should be provided to demonstrate any potential impacts with respect to changes in topography, geology and soils in proximity to the project. The impacts should include how the project might disturb the existing soil characteristics, change erosions flow paths, impacts on aquifers, faults and economic resources (such as agricultural products) within the area of influence. This should include the likely direct and indirect impacts on reductions of sediment deposition as a result of natural erosion. The ESIA should also assess, map and illustrate changes that may occur to water courses in the area of influence through inundation and the loss of sediment. The ESIA should also assess the impacts on subsoils as a result of the removal of vegetation and top soils during construction.

### **2.16.1.6. Hydrological Impacts and Environmental Flows**

The construction of a hydropower project can have very significant impacts on the hydrology of a watershed/catchment particularly through the construction of a reservoir.

The ESIA should assess with appropriate modelling and mapping, changes in the baseline hydrological characteristics of the area of influence. The ESIA should assess the likely impacts on a watershed and downstream as a result of changes in hydrology. This should include but not be limited to changes in seasonal flows including velocity and volumes.

The ESIA should include hydrological models as necessary to assess the inputs, movements, changes to quality, exchanges and outputs of all significant quantities and resources of surface water and groundwater that may be affected by the project. The models should address the range of climatic conditions that may be experienced at the site and adequately assess the potential impacts of the project on water resources. The models should include a site water balance and how the project changes the entire water balance of the system.

The ESIA should also include, with appropriate modelling how the project will change the availability of water to the existing and project population. The ESIA should also assess the proposed management of existing and/or constructed water bodies on the project site to maintain water quality and quantity and what that means for the hydrology of downstream users.

The ESIA must discuss proposed environmental flows in terms of the quantity, frequency, timing, and quality of water *and sediment* flows necessary to sustain freshwater and estuarine ecosystems and the human livelihoods and well-being that depend on these ecosystems. Information on the process of process of data analysis and discussion of the physical, chemical, biological, social, resource-economic, economic, biodiversity and land management implications of water-resource developments must be included. The assessment should address the complexity of river ecosystems and their responses to the development of the hydropower project. The assessment and modelling the project's design and location; fine-tuning of operating rules; and generation of metrics for monitoring.

### **2.16.1.7. Surface Water Quality and Quantity**

The ESIA should identify the impacts on the quantity, quality and location of all potential discharges of water and waste water by the project. These include the impacts of point sources (concrete batching points and controlled discharges into aquatic systems; releases from the construction camp in all forms for example, black water, grey water and any other release) or diffuse sources (such as irrigation to land of treated sewage effluent; etc and/ or re-use of treated effluent and the circumstances under which discharges are likely to occur). Modelling should be undertaken to demonstrate the extent of the impacts over the area of influence based on all flow events. The ESIA will also include reference to the storage and treatment of contaminated waters, and potential accidental discharges of contaminants and sediments during construction, operations and decommissioning stormwater run-off from the project.

Construction activities generally result in reduction of surface water quality, especially increasing the suspended solids, but also the possibility of contamination with oils and construction materials. If communities are reliant upon the river for supply of drinking water, or water for washing, watering their animals and for irrigation, then alternative provision may have to be made for water supply for these uses. All biophysical and chemical water quality and quantity base sampling consistent with Section 2.14.10 should be assessed and modelling undertaken based on the likely impacts.

### **2.16.1.8. Groundwater Hydrology and Quality**

The ESIA should include an assessment of the potential impacts on ground water quantity and quality as a result of the pre-construction and construction of the project. The hydrostatic pressure created by the construction of a large reservoir may be transmitted through the ground water to areas downstream of the dam, particularly as the reservoir is filling. This may cause the groundwater levels to rise depending upon the geology and groundwater characteristics. This has been known to cause water logging and soil salinisation downstream of the dam. The ESIA should consider the impacts of these matters occurring with appropriate modelling, with reference to the area of influence.

Where ground water is extracted for either the project and/or for anything related to the communities' activities, for example, the use of groundwater for irrigation of agriculture, the EISA should assess with modelling, any impacts the project might have on the quality and quantity of groundwater.

### **2.16.1.9. Terrestrial Ecosystems**

The ESIA should assess the total area to be disturbed by all pre-construction and construction activities including but not limited to the reservoir, concrete batching plant, access roads, quarries, workers camp etc. The impacted vegetation cover and types (eg forest, woodland, shrub land, grassland etc.) should be assessed, together with any significant species found or likely to be found in the location of the pre-construction and construction sites. The loss of terrestrial ecosystems should be assessed based on the area of influence and assessing the proportion of the terrestrial ecosystems and types found across that area as a percentage of overall particular ecosystems. The typical fauna associated with these types of habitat should be identified with appropriate mapping and modelling included.

### **2.16.1.10. Terrestrial Flora and Fauna**

The ESIA should assess the likely impacts on the biodiversity and natural environment of affected areas arising from the pre-construction and construction of the project. The ESIA should assess all impacts on all fauna and flora terrestrial due to proximity to the projects. The ESIA should include information on the disturbance of existing habitats and the percentage of those habitats in the area of influence.

The EIA should assess the impacts on all species, with particular reference to any endangered species likely to be found in the area of influence, and provide an assessment of their populations in these areas and how they will be impacted by all components in the pre-construction and construction activities of the project. The ESIA should be a risk assessment for each species, which should include the loss of their preferred habitat and distribution, both nationally and within the area of influence. This impact assessment should consider the impact of the hydropower project and whether the species considered is likely to be lost from the area of influence and whether it might cause a change in the overall endangered status of the species (eg. the IUCN Redlist status).

### **2.16.1.11. Land Use Change**

The ESIA should provide specific information on the total area of land needed by all the different components of the project during the pre-construction and construction of the project including but not limited reservoir, power house, access roads, transmission lines; worker camp and the types of land use that will be changed. The ESIA should assess the significance of the land use change, for example by relating the areas of the different types of land use lost to the surrounding area within the area of influence.

The ESIA should assess and map the likely impact with respect to different types of activities and compare that across the area of land use. The ESIA should include for example, the loss of specific agricultural land types; the importance of those land types within the area of influence and the specific impacts this might have on communities and the local economy.

### **2.16.1.12. Forestry and Agriculture**

The ESIA should assess the likely impacts on forested area according to the type of forest (deciduous, pine etc.) and the likely state (good quality production forest, natural, or degraded forest) of the forests as a result of the project. This should include the amount of forested land lost and the specific species that will be removed as part of the project. The ESIA should assess the significance of the loss of forested areas, for example by relating the areas of the forest types within the area of influence.

The ESIA should assess the likely impacts on agricultural land uses according to the type of activity and the likely state including but not limited to good quality production, medium, or degraded agricultural lands as a result of the project. The ESIA should also assess the impacts of the projects on agricultural lands both within the footprint of the project and up and downstream of the project and the impacts of pre-construction and construction. The impacted area should be considered with respect to the area of influence.

#### **2.16.1.13. Reservoir Clearance**

The main area of concern relating to reservoir clearance is with respect to air quality during operation is connected with the water quality in the reservoir, especially during the first few years of operation after inundation. The breakdown of vegetation in the reservoir can lead to the development of anaerobic conditions in the lower water levels can also produce hydrogen sulphide (rotten egg smell). If water is drawn from these lower levels and passed through the turbines, the hydrogen sulphide will be released from solution and cause a lowering of air quality. This can also lead to increased corrosion of exposed metal components of the hydropower plant and discoloration of the concrete. Although there is not a air quality standard for hydrogen sulphide (though there is for sulphur dioxide), there have been instances in other countries where villages immediately downstream of a hydropower plant have had to be evacuated and resettled in part because of air quality issues when operation started. After some years the reservoir conditions and water quality will settle down, and the risks of hydrogen sulphide will reduce. The ESIA should discuss the methods of reservoir clearance and the impacts of reservoir clearance on the local environment. This should include information on what impact reservoir clearance will have on the loss of carbon capture as well as the impact of the type of reservoir clearance proposed by the proponent on water quality, air quality and other activities. The ESIA should fully assess these impacts as part of the pre-construction and construction of the project. This information should be considered in the broader context of Section 2.16.2.1 and 2.16.2.7.

#### **2.16.1.14. Aquatic Ecosystems**

The ESIA should assess the impacts as a result of significant changes as a result of the pre-construction and construction of the project. This should include the impacts of construction on aquatic habitats, the released of waste water and how this might change aquatic ecosystems. The ESIA should assess the impacts of the loss of aquatic habitat features for example deep pools, gravel beds, rapids and riffles, sand bars and in-channel wetlands, seasonally inundated by high water levels and assess their impacts on aquatic ecosystem flora and fauna. The ESIA should assess the likely impacts of the loss of fish spawning, breeding and nursery grounds during construction activities. Mapping should be provided

#### **2.16.1.15. Aquatic Flora and Fauna**

The ESIA should assess the likely and known impacts of the pre-construction and construction activities of the project on aquatic flora and fauna. The impacts that should be assessed include but are not limited to changes in flow; water quality from controlled and uncontrolled releases from for example, the concrete batching plant and workers camp; reductions in available oxygen within the river as a result of low flow from the construction of for example, the cofferdams; and impacts from vegetation clearing resulting to sediment loads being increased in rivers. The ESIA should assess the impacts of the changes of water temperature on aquatic flora and fauna through vegetation clearing. Modelling and mapping for the above should be provided.

#### **2.16.1.16. Fisheries**

With the change from a free flowing river to a reservoir, the fisheries species diversity and abundance will change. The ESIA should undertake an assessment of the potential impacts on fisheries during pre-construction and construction activities of the project. The impact assessment should include an understanding of the likely impacts on particular species. These should include the impacts of access to fisheries as a result of construction activities, impacts on fisheries diversity and abundance as a result of reduced flow and changes in water quality from controlled and uncontrolled releases from for example, the concrete batching plant and workers camp. Relevant modelling should be included.

The ESIA should also assess the known impacts of the barrier effect to migratory fish. The ESIA should assess the likely impacts to migratory fish species generally move upstream to spawn in suitable locations in smaller rivers and streams; and the loss of gravel beds and in-channel wetland areas are favoured habitats. The ESIA should assess the impacts of the loss of access to suitable spawning sites and the overall impact on the populations of these fish in the downstream and upstream reaches. The ESIA should assess a range



of designs to facilitate the passage of migratory fish including but not limited to more conventional vertical slot fish ladders, natural stream by-passes, to fish lifts and transport of migratory fish around the dam to reduce the impacts on fish migration. Relevant mapping should be included.

#### **2.16.1.17. Infrastructure and other Associated Works**

The pre-construction and construction of the project may lead to impacts including but not limited to inundation and/or loss of infrastructure. These may include the loss and/or impacts on:

- a. roads and bridges including but not limited to sections of roads that may be inundated by the reservoir; and these will have to be replaced at an elevation above the reservoir full supply level. some communities may also become isolated on one side of the reservoir with access to the other side;
- b. public buildings and utilities;
- c. agriculture, aquaculture and irrigation facilities; and
- d. business and industry.

The ESIA should assess the impacts of the loss and/or alteration of any infrastructure as a result of the project. The ESIA should identify all road and bridges that will have to be replaced or alternatives provided, and this should be included in the environmental and social management plan budget. Further, the ESIA should identify any public buildings, such as schools, clinics, community meeting places and religious buildings that will be inundated and/or impacted. Electricity and communication lines, water treatment facilities etc should be considered. Further, the ESIA should consider the impacts on small businesses and local industries that will be impacted.

#### **2.16.1.18. Changes in Traffic Conditions**

The ESIA should include a clear description and traffic impact study of the total transport aspects for the project, including but not limited to the transport of equipment, the construction workforce and all inputs and outputs during the pre-construction and construction phase; and how this will likely impacts on existing road infrastructure. The ESIA should provide sufficient information to allow an independent assessment of how existing and planned transport infrastructure will be affected and the flow on impacts on local transport and access to roads etc by local communities. The ESIA should include a description and assessment of the likely impacts from the transport of materials such as cement, reinforcing steel, cables and major items of equipment such as the turbines and spillway gates and what modifications will be required. The ESIA should also assess the likely impacts on traffic through wear and tear on roads and bridges; increased traffic and road usage with congestion, delays and inconvenience for other road users; impacts on road safety and accidents; and the impacts on health aspects from dust and emissions from road use.

The ESIA should include a logistics analysis, and the distances for transport of materials and equipment. The ESIA should summarise this traffic impact study, identifying particularly villages and towns at risk located on transportation routes for construction materials, and providing specific mitigation measures to minimise the risks.

#### **2.16.1.19. Resettlement, Land Ownership and Customary Tenure**

The ESIA must provide information on the exact number of affected peoples that are likely to be impacted by **all** components of the project with appropriate mapping. The ESIA must assess in specific detail the different affected zones, the scale of any resettlement, the approximate number of households being displaced, and the areas of agricultural and other land holdings to be lost during construction of the dam and inundation of the reservoir. The ESIA must include a detailed description of the livelihood patterns and poverty status of the communities and the ethnic mix of the population. The ESIA must also outline the resettlement process for any affected people that may be forcibly removed from their land and demonstrate that consultations have been undertaken with all affected peoples. The ESIA must also provide details that demonstrate that any affected peoples are no worse off.

The EISA must provide information on any land acquisition that is required and the process of obtaining the land and how consultation was undertaken in acquiring the land. If acquisition will be undertaken by the Government of Myanmar, the ESIA must include all information relevant to consultation and negotiation with landholders. If the proponent acquires land, documenting that process should be undertaken by experts in

local land acquisition. Within this information, the ESIA must include title searches as appropriate of the relevant land register.

Reference should be made to relevant legislation and the *National Land Use Policy 2016* concerning resettlement, land ownership and customary tenure and the process of any necessary acquisition of land.

### **2.16.1.20. Population Changes**

The ESIA should provide an extensive overview of the impacts on the population characteristics in the area of influence as a result of the project. This information should include but not limited to provisional and regional data on age and growth; population diversity; sexual distribution, family structure; families size, income; education levels, sanitation, religious practices, ethnicity, food consumption, home ownership, home construction, household assets, health, smoking, drinking and drugs habits (including betel nut), levels of physical activity, etc and how the project could potentially impact on project.

The ESIA must assess the likely impacts on local communities in the transition from a rural village community from the influx of workers for the workers camps. This should include any impacts on local communities from the interaction with workers involved in the pre-construction and construction of the project. This section should include tables and figures on current data and likely trends as a result of the project.

### **2.16.1.21. Health Impacts**

The ESIA must consider all aspects related to community health. The ESIA must address all phases of the project and how it may impact on community health. This includes but is not limited to access to fresh water and other necessary essential matters for normal living. Further, the ESIA must provide information on the proponent's safety policies/procedures for potential accidental and emergency events that may result in health impacts. The ESIA also must address how the project will ensure there is limited impact on the lifestyle and culture of communities in proximity to the project.

To undertake the impact assessment, a health impact assessment should be prepared. The assessment should follow the basic impact assessment process of establishing the baseline health status of the communities, the prevalence of diseases, and mortality rates and morbidity of the population. Mother and child health statistics should be considered. Further, the assessment should include an assessment of psychological impacts on health and related vulnerabilities. The ESIA must identify the main health stresses and diseases that are likely to arise as a result of a hydropower project, and to assess their potential impacts upon the affected communities.

The potential health impacts that must be assessed include but are not limited to:

- a. construction activities causing noise and disturbance to nearby communities;
- b. atmospheric dust along roads and near construction sites and quarries aggravating respiratory disorders;
- c. contamination of drinking water supplies, eg from untreated waste waters from worker camps and solid waste dumping, and from high suspended solids content;
- d. accidents from traffic and construction activities;
- e. emotional and psychological stress during resettlement to new locations;
- f. nutritional disorders due to loss of access to sources of protein and nutrients, eg fish and wild foods and due to disruption and changes in agricultural and other livelihood practices; and
- g. transmitted diseases from contact with large external workforce, including STDs, HIV/AIDS and communicable diseases.

The ESIA should including information on the management of these impacts through appropriately staffed clinics for workers at the worker camps; and for affected communities and host communities both before and during the resettlement process. Permanent facilities should be provided as part of the overall community development packages.

### **2.16.1.22. Gender Impacts**

The ESIA must assess the impacts on gender as a result of the pre-construction and construction activities of the project. The ESIA must assess the impact of women's participation in the workforce and how equitable engagement will be promoted and monitored during pre-construction and construction. The ESIA must assess the impacts of the loss of livelihoods of the project during pre-construction and construction of the project. The ESIA must assess all the potential impacts of unplanned and unwanted pregnancies; sexual transmitted diseases and single mothers. The ESIA must address how the project will ensure the gender exploitation will not occur through hard labour conditions and excessive working hours. The ESIA must also demonstrate how women will have equal rights to that of men and in particular organising their availability around other responsibilities to children and family.

The ESIA will be required to undertake a gender impact assessment to identify the impacts on women and men, with this assessment being part of the development of a gender specific action plan.

### **2.16.1.23. Loss of Livelihood**

The ESIA should assess the impacts of the loss of livelihood as a result of the pre-construction and construction activities of the project. This should include but not be limited to the impact on affected peoples who are no longer able to undertake traditional livelihoods. These include but are not limited to agriculture and horticulture; forest utilisation; hunting; fisheries; livestock; and other sources of income.

The ESIA should assess the impact of the loss of livelihoods in the short, medium to long term with respect to socio-economic factors. The ESIA should assess the impacts of livelihood loss geographically, the value of loss of livelihood and whether that loss included income and subsistence activities; any agreements between the affected peoples and the roles and responsibilities of buyers, sellers, and others; the term of the agreement (time period, fixed-term or on-going etc), and periodicity of the likely loss of payments; and the potential alternative livelihoods of participants and non-participants. The analysis of livelihood implications should address, as far as possible, differentiated impacts on different wealth strata and peoples of national race.

In assessing the impacts on livelihoods, the ESIA should consider the financial; human; natural; social/political and physical aspects of livelihood loss. Appropriate mapping should be provided showing the areas of livelihood loss with respect to each activity.

### **2.16.1.24. Labour and Working Conditions**

The ESIA should assess the potential impacts on labour and working conditions of all employees and affected peoples as a result of the pre-construction and construction of the project. The ESIA should assess the impacts on workers' rights in terms of Myanmar legislation and international convention and instruments, including those of the International Labour Organisation (ILO), guide labour rights etc. The ESIA must include an analysis of the effectiveness of the proponent's human resource policies and implementation and its integration of local employees. The ESIA must also consider national labour-related legislation employers and labour and working condition entitlements between international and local employee, contractors, consultants and agents. The ESIA should assess how it will employ local affected peoples in preference to foreign workers.

### **2.16.1.25. Archaeological and Cultural Heritage**

The ESIA should include an archaeological and cultural heritage impact assessment. The impact assessment should consider all structural and non-structural/traditional assets in the area of influence. The ESIA should assess the impacts of the pre-construction and construction activities on archaeological and cultural heritage include the loss of buildings and other archaeological and cultural heritage sites. Appropriate mapping should be provided to show the location and impacts on these sites. Further, the ESIA should assess the impacts on traditions and living archaeological and cultural heritage which are often especially important where there are people of national race and more isolated communities. The ESIA should assess how the pre-construction and construction activities, including the influx of workers has the potential to change the traditional culture of the communities. The ESIA should assess any impacts to special ceremonies that different communities may need to perform before leaving the areas where they have been living and again when they are relocated to their new host villages. These can be but are not limited to the graves of ancestors and holy saints and other sacred places, or the overall sense of place of

these communities. The assessment should include an analysis of the preferences of affected peoples to the management of these graves etc.

The ESIA should include appropriate mapping identifying the impacted sites.

#### **2.16.1.26. National Races and Traditional Knowledge**

The ESIA must assess any impacts related to people of national race during pre-construction and construction. The ESIA should address the impacts on people of national race where their traditional lifestyle may be impacted through the loss of identity, culture, traditional lands, and natural resource-based livelihoods. The ESIA should include details of all discussions with representative groups including but not limited to the village heads, land owner groups, women's groups, civil society, churches, non-government organisations, provincial government, and in some instances national government members and describe how those discussions have modified the project.

#### **2.16.1.27. Vulnerable and Internally Displaced Groups**

The ESIA must assess the impacts of the project on vulnerable populations within the community including any groups that may have greater vulnerability to the effects of a project owing to their gender, ethnicity, age, physical or mental disability, economic disadvantage / level of poverty, or social status as a result of the pre-construction and construction of the project. The ESIA must address any individuals/groups that may, as a result of the project be considered vulnerable to feelings of isolation, insecurity and defencelessness.

#### **2.16.1.28. Religion**

The ESIA should assess the likely religious changes and impacts on the community broadly and specifically as a result of the influx of workers for the pre-construction and construction of the project. The ESIA should provide a discussion on the range and types of religion practiced in the area of influence. The discussion should include a break down on the number of religions, the level of participation, the location of churches, temples, mosques etc within the area of influence, the age and sex-disaggregated data on the level of attendance and how these might be impacted during pre-construction and construction of the project. This data should be presented in table and graphical ways, along with mapping for all of the above within the area of influence.

#### **2.16.1.29. Conflict and Security**

The construction of a hydropower project has and can have a significant impact on an increase in conflict and security within local communities. The ESIA should assess the likely impact of the pre-construction and construction of the project on the local communities with respect to conflict and security within the community; with the construction workforce and with Government. The ESIA must assess how any potential impacts of for example; the temporary influx of workers from overseas and elsewhere within the Myanmar will impact on the local community. Alternatively, the ESIA should assess the potential impact on the project from potential changes to community cohesion and dynamics due to increased tension between different ethnic groups or communities and impacts on the environment and health and safety issues.

#### **2.16.1.30. Economic Aspects**

The ESIA should assess the potential adverse and beneficial impacts of the project on the local community. This section of the ESIA should assess increased access to economic resources, how the project will impact on local businesses, what impact the influx of foreign workers will have on the local community. The ESIA should assess what involvement if any, these villages will have in providing goods and services to the construction camp and the project more broadly and the impact of this. The ESIA should identify what specific assistance and advice the villages might require in their dealings with the worker camps. There may be small business opportunities, eg restaurants and mechanic services which can be encouraged and the ESIA should assess how the project will provide guidance and leadership to ensure these opportunities are successful. The ESIA should assess the impacts of these activities on the socio-economic balance of the community.

### **2.16.1.31. Construction Worker Influx**

The ESIA should assess the numbers of workers that will be brought in to undertake pre-construction and construction activities. Reference should be made to the information contained in Section 2.11.6 of the Terms of Reference. The ESIA must identify the location and size of worker camps and the numbers of international and national staff, noting there should be a preference for the employment of affected peoples. The ESIA must assess the potential impacts of the influx of construction workers on local communities.

The ESIA should estimate the numbers of families and camp followers that may be expected, and hence the risks and sizes of informal settlements developing. The ESIA should assess the proponent's policy for managing such settlements, including the identification of specific areas and provision of facilities such as water supply and waste disposal. The ESIA should include commitment to remove, clean up and rehabilitate the areas of both, worker camps and informal settlements after the completion of the construction work, according to the requirements of the local communities, who should be consulted about future use of the area. The ESIA should assess the nearest villages, including their population and size and the impacts the construction camp will have on the community.

## **2.16.2. Operation**

The ESIA should undertake an impact assessment of the following issues as a result of operational activities of the project.

### **2.16.2.1. Air Quality**

Once construction activities cease, the air quality is likely to return to ambient conditions. Notwithstanding, the main area of concern relating to air quality during operation is connected with the water quality in the reservoir, especially during the first few years of operation after inundation. The ESIA should assess the likely impacts of the breakdown of vegetation in the reservoir. The ESIA should assess the impacts of the development of anaerobic conditions in the lower water levels and the resulting release of hydrogen sulphide. The ESIA should assess and model this and other air quality impacts including but not limited to the impacts to air quality through the removal and restoration of the construction areas such as the concrete batching plant, laydown areas etc. Appropriate modelling and mapping should be included.

### **2.16.2.2. Greenhouse Gas Emissions**

The ESIA should include a full discussion of the relevant climate change impacts that are generated from the operational activities of the project. This should include but not be limited to the long term loss of vegetation; the release of other greenhouse gases, such as methane, from the reservoir. The ESIA should assess the emission and CO<sub>2</sub><sup>-eq</sup> in terms of local, state, national and international emissions. The ESIA should assess what impact these emissions and losses of carbon storage through for example vegetation clearing and soil degradation might have on Myanmar's international obligations. The ESIA should also assess the potential benefits of the use of hydropower over other conventional and renewable energy sources.

### **2.16.2.3. Noise and Vibration**

The ESIA should assess the noise and vibration impacts from the operation and consider the area of influence. The ESIA should predict the impacts of the noise emissions from the operational activities of the project on the environmental and social values with reference to current and proposed sensitive receptors, using modelling. The assessment should include increased traffic and all other activities. Noise emissions should also be assessed and impacts measured with respect to the ongoing use of the workers camp post construction.

### **2.16.2.4. Geomorphological Changes**

The ESIA should investigate the short, medium and long term impacts of the presence of the project on the flow regime and its alteration of downstream geomorphology and habitats. The ESIA should assess the impacts of river bed and erosion of the river bank which is likely to result of changes in flow associated with daily peaking regimes and the reduction of sediment load. The ESIA should consider the character of the river channel downstream in the area of influence. The ESIA should compare, with appropriate modelling, the estimates of suspended solids content in the river before the project and estimate what it is likely to be as a result of the project. It should assess the risks of bank erosion from a knowledge of the character of the

river channel, the likely changes in daily and seasonal flows and the stream power of the river downstream. Appropriate mapping should be included.

### **2.16.2.5. Erosion and Sedimentation**

The accumulation of sediments in the reservoir can shorten the effective life of the hydropower project by filling up both dead and active storage, and by affecting the overall dam safety. Apart from the initial mobilisation of sediments along the shores of the reservoir during impoundment, most of the sediments come from soil erosion in the catchment, and this sediment is carried into the reservoir at times of high flow in the rivers and tributaries. The ESIA should assess the impacts through modelling associated with sediment trapping in the reservoir including but not limited to:

- a. the effective life of the hydropower project;
- b. delta formation can raise the bed level of the river upstream and cause backing up and flooding of the river;
- c. landslides and land slips;
- d. dam safety issues if the sediments block key parts of the infrastructure;
- e. damage to turbines from passage of sediment-laden water, requiring more frequent replacement;
- f. removal of sediments from the river downstream can cause the “hungry river” syndrome, in which the river after the power house tries to pick up the sediment that it has lost from the bed and banks downstream, causing erosion problems. This can threaten the integrity of infrastructure such as roads and bridges downstream;
- g. removal of the sediments, especially the silts and clay particles which carry nutrients, reduces the fertility of flood plains; and
- h. reduction of overall sediment load in the river can lead to slowing of growth or even recession of the flood plains.

The ESIA should provide an estimate of the quantities of sediment being transported in the river, and the potential accumulation. The downstream effects and cumulative impacts should be considered.

The ESIA should assess the impacts of sediment flushing and/or dredging and how sediment flushing and/or dredging will be managed to ensure high sediment load do not impact on downstream habitats, and kill aquatic animals. The ESIA should also assess how the project will impact on the levels of toxicity through mobilisation should flushing be required.

### **2.16.2.6. Hydrological Impacts and Changes to Environmental Flow**

The ESIA report should assess the changes in the mean flows resulting from the operation of the project. The changes in the annual hydrograph of the river downstream of the project should be modelled and illustrated. The ESIA should also show the operational mode, this being peaking or base load operation and model and illustrate the changes in daily flow regime expected. The ESIA should assess peaking operations and the expected rate of changes in flow and water level at different points downstream (for example immediately downstream of the project over the whole area of influence). For reservoirs, the total storage capacity and its component active and dead storage should be described. This should be related to the mean annual flow and the length of time taken to refill the active storage of the reservoir.

Changes in flow regime also have impacts for the geomorphology, habitats and ecosystem services of the river, its fisheries and downstream water users. The ESIA should provide an analysis of the impacts of these changes downstream. Environmental flow assessments must be included to provide a greater understanding of the downstream flow requirements and thresholds. The assessment of environmental flows should not be based only on the 10% rule; but should consider a range of scenarios based on the IFC's (2016) *Internal Good Practice Note: EFlows for Hydropower Projects*. Reference should be made to Section Hydrological Impacts and Environmental Flows 2.16.1.6 of the Terms of Reference. The scenario assessment should consider for example but not limited to seasonal flow releases to maintain river channels, or to trigger fish migration. The impacts of rapid changes in flow, eg during peak operation that can cause serious bank and bed erosion for kilometres downstream of all components of the project should also be assessed.

For projects involving the diversion from the intake river to another recipient river, then the intake river will have permanently lower flows below the dam. The changes in flow regimes of both rivers will have impacts upon their character, depending upon the size of the diversion in comparison to the original flows in each. Seasonal differences in flow may also be more critical especially in the dry season for the intake river and in the flood season in the recipient river. The ESIA should assess and model the original flows in each river and assess the impacts of the diversion throughout the year. The character of the intake river below the dam until the confluence with a larger river downstream should be described and modelled highlighting the impacts of the changes in flow due to diversion upon the habitats, water use and the fish and fisheries. For the recipient river, the ESIA should assess and model the characteristics and dimensions of the channel, and the ability of the river to receive and disperse the additional flows due to the diversion, especially at times of peak flows. Historic high flood levels and frequency of occurrence in the recipient river will be needed to modelled; with respect to the increased flood risk.

Further, during operation, there is the potential for impacts as a result of for example, an uncontrolled release from the dam that may be dangerous for river users. For example, during peak load operation when there may be sudden increases in flow (within minutes) when the turbines are opened up, and water levels rise rapidly (potentially up to 1 -2 metres within minutes). Such changes in flow can result in significant environmental and social impacts many kilometres downstream, especially fishermen, livestock, people bathing and washing. The impacts of these events should be properly modelled and included in the emergency preparedness plan.

In addition, the ESIA should demonstrate how it has raised awareness of communities downstream about the potential impacts of reduced flow and rapid releases.

#### **2.16.2.7. Surface Water Hydrology and Quality**

Water quality issues during operation may occur in both the reservoir and in the downstream water below the power house. When a reservoir is created, the free-flowing river is changed to a very slowly moving lake. There is significantly less aeration of the water compared to a river, and the biological breakdown of residual vegetation and organic matter brought in from upstream will deplete the oxygen levels in the lower levels of the reservoir. In many reservoirs a thermocline may develop with colder anoxic water kept at the bottom and only the top few meters containing dissolved oxygen. This especially occurs in deep, steep-sided, narrow reservoirs, where mixing is restricted. At certain times of year, this thermocline may break up, for example, when a flush of cold water runs into the reservoir sinking to the bottom quickly which "turns over" the reservoir. This brings the poor quality anoxic water to the surface, and may cause fish kills. If this occurs near the water intake, poor quality water may pass on down through the turbines and into the river downstream.

The ESIA should assess the impacts of water quality and quantity. An assessment of the likelihood of thermocline formation and seasonal break up (using the characteristics of the reservoir shape and depth), and risks of poor water quality being passed from the reservoir into the river downstream should be undertaken. Appropriate modelling should consider reduced oxygen content and parameters associated with anaerobic breakdown of organic matter including but not limited to ammonia, oxides of nitrogen and hydrogen sulphide. The ESIA should also assess the impacts on water quality as a result of increased nutrients, nitrate and phosphate, which may give rise to algal blooms in the reservoir. The risks of algal blooms should be assessed from the nutrient input from the catchment eg from sewage, livestock farming and intensive agriculture.

Where the power house is not directly downstream of the dam, but there is a channel or tunnel leading from the intake to the power house several kilometres downstream, or even diverting the flow to another river, there are potential impacts on river water quality. The ESIA should assess and model the impacts on water quality downstream of all components of the project and the likely indirect impacts on for example, other water user (eg irrigation off takes, or domestic water supply) and fisheries use. The impacts on these should be predicted.

The ESIA should also include a study of water requirements and uses in downstream communities in the area of influence. The changes in water quality and the populations likely to be affected should be estimated.

### **2.16.2.8. Groundwater Hydrology and Quality**

The ESIA should include an assessment of the potential impacts on ground water quantity and quality as a result of the operation of the project. The hydrostatic pressure created by the head of a large reservoir may be transmitted through the ground water to areas downstream of the dam. This may cause the groundwater levels to rise depending upon the geology and groundwater characteristics. This has been known to cause water logging and soil salinisation downstream of the dam. The ESIA should consider the risks of this occurring with appropriate modelling, with reference to previous experience within the region.

If there are risks of raised ground water levels there could be an associated decrease in ground water quality, the ESIA should assess the implications for drinking water. One of the specific issues that have occurred with some dams has been the mobilisation of arsenic from the soils into the ground water. The ESIA should consider the heavy metals and other pollutants levels in groundwater if geological, hydrological and soil chemistry conditions indicate this as an issue.

### **2.16.2.9. Terrestrial Ecosystems**

Once the project is operational, the impacts upon terrestrial resulting from inundation and fragmentation will have been impacted. Notwithstanding, the ESIA should assess the impacts on terrestrial ecosystems and their connectivity from increased access. The ESIA should assess the likely impacts to connectivity of terrestrial ecosystems. The ESIA should assess the likely impacts on future ecosystem health as a result of the project including but not limited to habitat fragmentation and the edge effect. Mapping should demonstrate the extent of these changes and the likely impacts on the ecosystem in the long term.

### **2.16.2.10. Terrestrial Flora and Fauna**

After the completion of construction works, no further land take or inundation will occur and the terrestrial flora and fauna will have an opportunity to recover from the disturbance. Notwithstanding, the ESIA should assess the likely impacts on terrestrial flora and fauna of the following:

- a. increases in hunting pressure, illegal logging and the wildlife trade as a result of increased access;
- b. the impacts of the creation of barriers for movements and migration of land animals, with estimates of the impact on the range requirements of all species;
- c. changes in species diversity as a result of the operation of the project;
- d. the potential for edge effect as a result of clearing for the operation of the project;
- e. the potential for extinction as a result of the operation of the project;
- f. the potential for genetic changes as a result of island biogeography; and
- g. any other relevant identified impacts.

The ESIA should include a risk assessment of the likely impacts of the above in the short, medium and long term as a result of the project. Appropriate mapping should be included.

### **2.16.2.11. Land Use Change**

Once the project is operational, there are unlikely to be any further land take issues. However, the presence of the dam and reservoir may give rise to some changes in land use, particularly if water is made available for irrigation. The ESIA should assess and map any likely impacts to land use during the operational phase of the project. This should include but not be limited to a discussion of the management of areas previously used for construction activities, for example, the workers camp, laydown areas, concrete batching plant etc and what impacts are likely to be associated with the rehabilitation of these areas to be usable again.

### **2.16.2.12. Forestry and Agriculture**

There are unlikely to be further changes in agriculture land and forestry although practices may change with introduction of irrigation associated with the dam and livelihood packages for resettled communities. The ESIA should assess potential impacts of changes in forestry and agricultural practices as a result of the operational phase of the project. This should include issues related to improved access to the catchment which can have the potential to see increases the illegal logging. The ESIA should also consider any



potential changes to soil characteristics as a result of the hydropower project, both upstream of the site and downstream.

### **2.16.2.13. Aquatic Ecosystems**

For aquatic endangered and endemics species, the changes in flow, habitat changes and water quality issues can significantly impact aquatic flora and fauna, particularly any small and vulnerable populations, which could lead to their reduction or loss from the area, or even local/regional/global extinction depending on the species. The ESIA should clearly identify all species that are likely to be affected, and where the impacts could lead to local extinction.

The ESIA should assess the impacts as a result of significant changes from a free flowing river into a slowly moving lake. The river habitats are lost, transformed into lacustrine habitats. The ESIA should assess the impacts of the loss of aquatic habitat features for example deep pools, gravel beds, rapids and riffles, sand bars and in-channel wetlands, seasonally inundated by high water levels and assess their impacts on aquatic ecosystem flora and fauna. The ESIA should assess the likely impacts of the loss of fish spawning, breeding and nursery grounds. The ESIA should assess alternatives to allow access to spawning and nursery areas or populations of these fish will decrease. Mapping should be provided.

### **2.16.2.14. Aquatic Flora and Fauna**

The ESIA should assess the likely and known impacts of the operational activities of the project on aquatic flora and fauna. The impacts that should be assessed include but are not limited to changes in flow (including but not limited to flash flood and seasonal flooding that can result in triggers for fish spawning) that may result in habitats being no longer usable and result in the relocation of aquatic flora and fauna; the impacts of algal blooms within the reservoir caused by high levels of nutrients in the water; other impacts on water quality including but not limited to stagnation of water in pools below the project which can result in both reduced water quality and also provide habitat for pest and vector species; reductions in available oxygen within the river as a result of low flow; the increase in weed species in reservoirs and downstream; the impacts of invasive aquatic species; impacts on species needing sediment as habitat and/or for breeding and the reduction in sediment loads, changes in water quality and temperature due to release of colder, and poor quality water from the reservoir. Further, the ESIA should assess the impacts of the changes of water temperature on aquatic flora and fauna, including in proximity of the powerhouse.

The ESIA should also assess the known impacts of the barrier effect to migratory fish. The ESIA should assess the likely impacts to migratory fish species generally move upstream to spawn in suitable locations in smaller rivers and streams; and the loss of gravel beds and in-channel wetland areas are favoured habitats. The ESIA should assess the impacts of the loss of access to suitable spawning sites and the overall impact on the populations of these fish in the downstream and upstream reaches.

Modelling and mapping for the above should be provided.

### **2.16.2.15. Fisheries**

With the change from a free flowing river to a reservoir, the fisheries species diversity and abundance will change. Potential impacts/changes include:

- a. fish that are able to live and breed in the still water habitats of the reservoir will thrive;
- b. fish that can live in the reservoir and that continue to have access to spawning grounds in the tributaries and seasonal streams will continue to be found in the reservoir. If they do not have access to these spawning areas they will die out;
- c. migratory fish from downstream will be prevented by the project from moving into the reservoir, unless adequate fish passage is provided; and
- d. fish that are adapted to living in fast flowing rivers and streams will move out upstream or die out; and their population are likely to significantly decrease. It is likely that the fish species diversity in the reservoir will significantly decrease.

The ESIA should undertake an assessment of the potential impacts on fisheries based on the baseline assessment. The impact assessment should include an understanding of the likely impacts on particular species and the regimes that will allow for the continued access to all habitats to maintain fisheries

abundances and diversity. The ESIA should include an environmental flow study with appropriate modelling to ensure the design of the project. The ESIA should assess changes on flow regime and to make predictions of likely changes resulting from the changed flows to fisheries. Recommendations should be made for the downstream flow regime to ensure that a healthy river ecology and the ecosystem services are maintained. Further, the ESIA should make an assessment of changes in fisheries diversity found in different sections of the river, whether a reduction and/or increase in diversity and abundance as a result of the project. Further, the ESIA should investigate the impacts of invasive species increasing in abundance.

Relevant mapping should be included.

The ESIA should also assess the impacts of fish stocking of the reservoir and rivers including but not limited the development of fish hatcheries and nurseries. It is important that only endemic species of fish be used for stocking the reservoir, since alien species may become invasive and destroy the natural fish populations.

#### **2.16.2.16. Associated Infrastructure**

The majority of infrastructure is likely to have been constructed prior to operation. Notwithstanding, there are potential impacts can be associated with the operational phase. This may include the construction of new infrastructure including but not limited to houses for operational staff. It may also result in the removal of infrastructure that was part of the construction of the project. The ESIA should consider the impacts of the construction and/or removal of infrastructure and the closing for example, of roads constructed by the project. The ESIA should assess the impacts of the loss and/or alteration of any infrastructure. The ESIA should identify and assess the likely impacts of the closure of roads with respect to community access. When considering whether to close roads etc, the ESIA should consider the impacts of maintaining access including but not limited to access to forested areas that might allow for illegal forestry and increased hunting pressures.

#### **2.16.2.17. Waste**

The ESIA must assess all waste streams during operation. The ESIA must address all phases of the project and how the waste will be managed. This includes but is not limited to waste storage, disposal and the management of any disposal facility. Further, the ESIA must provide information on the proponent's safety policies/procedures for potential waste emergency events including but not limited to discharge into water course, fire and other relevant impacts and events.

#### **2.16.2.18. Health**

The ESIA must assess all aspects related to community health from the operation of the project. The ESIA must address all phases of the project and how it may impact on community health. This includes but is not limited to access to fresh water and other necessary essential matters for normal living. Further, the ESIA must provide information on the proponent's safety policies/procedures for potential accidental and emergency events that may result in health impacts. The ESIA also must address how the project will ensure there is limited impact on the lifestyle and culture of communities in proximity to the project.

The ESIA must identify and assess the main health stresses and diseases that are likely to arise as a result of operation of the hydropower project, and to assess their potential impacts upon the affected communities. This should include impacts associated with air quality from decomposing vegetation in the reservoir and increases in potential conflict as a result of reduced access to natural resources.

#### **2.16.2.19. Conflict and Security**

Hydropower project can have a significant impact on an increase in conflict and security within local communities. The ESIA should assess the likely impact of the operation of the project on the local communities with respect to conflict and security within the community. The ESIA must address how any potential impacts of for example; the reduction in water flow for agriculture might increase conflict for access to resources and how this will impact on the local community and communities downstream. Alternatively, the ESIA should assess the potential impact on the project from potential changes to community cohesion and dynamics due to increased tension between different ethnic groups or communities and impacts on the environment and health and safety issues.

### **2.16.2.20. Economic Aspects**

The ESIA should assess the potential impacts of the project on the local community during the operational phase of the project. This section of the ESIA should assess increased access to economic resources, how the project will impact on local businesses, and what impact the reduction on the worker force will have on the local community. The ESIA should assess what involvement if any, these villages will have in providing goods and services to the operational activities of the project more broadly and the impact of this. This may include both legal and illegal/unregulated activities such as for example, sand mining.

The ESIA should identify what specific assistance and advice the villages might require in their dealings with the loss of income following the downsizing of the workforce. The ESIA should assess the impacts of these activities on the socio-economic balance of the community.

### **2.16.3. Decommissioning/Project Closure/Rehabilitation**

The ESIA should assess the potential impacts associated with the decommissioning/project closure and/or rehabilitation of the project. With respect to decommissioning, the ESIA should assess the impacts of the release of water and significant sediment, the location where waste materials associated with the construction of the project will be relocated to, the potential for significant changes to aquatic and terrestrial environments through the removal of the project; the availability of the previously disturbed land and returning access; and the loss of electricity supply and the social and environmental implications of that

With respect to rehabilitation, the ESIA should assess the environmental and social impacts. These may include but not be limited to the production of waste and the management of that waste, the loss of electricity supply and the social and environmental implications of that during the period of rehabilitation and any other potential impact.

#### **2.16.3.1. Removal of Sediment**

The ESIA must assess the potential impacts associated with the removal of all sediment during decommissioning/project closure. The ESIA must assess the impacts of sediment flushing and/or dredging and how sediment flushing and/or dredging will be managed to ensure high sediment load do not impact on downstream habitats when the project is being decommissioned. The ESIA must discuss the location where the sediment will be disposed of, management of any levels of toxicity through mobilisation should flushing and how the project will ensure that residual sediment is not retained in the project footprint both during decommissioning and post project closure.

#### **2.16.3.2. Release of Water**

The ESIA must assess the controlled and uncontrolled release of water during the decommissioning/project closure. The ESIA must assess the impacts of the water release and how high flows will be managed to ensure no downstream environmental and social impacts including but limited as a result of flooding downstream and significant erosion.

#### **2.16.3.3. Removal of Infrastructure**

The ESIA must assess the removal of all infrastructure associated with the hydropower project. This includes but is not limited to the demolition of the dam wall and associated infrastructure and the potential environmental and social impacts including but not limited to those normally associated with construction impacts contained in Section 2.16.1.

#### **2.16.3.4. Waste Management**

The ESIA must assess the management of all waste associated with the removal of all infrastructure from the hydropower project. The ESIA must assess the beneficial reuse and/or dispose of all infrastructure and identify an appropriate waste disposal facility where material that cannot be beneficially reused will be placed. The impacts should be assessed based on those contained in Section 2.16.1.

### **2.16.3.5. Rehabilitation**

The ESIA must assess the environmental and social impacts associated with an rehabilitation activities. The impacts should be assessed based on those contained in Section 2.16.1.

### **2.17. Impacts on and from Climate Change**

Climate change can have impact on hydropower projects and conversely, while hydropower projects are considered to be renewable energy, the construction of a hydropower project can have some impact on climate change. The ESIA should include information on climate data in a statistical form including long-term averages and extreme values, discussions on consideration of rainfall patterns and storm events that could have the potential for example, to result in an accident or an engineering failure which would have cumulative downstream impacts. Further, the ESIA should assess the greenhouse emissions generated from the construction and operation of the project its lifetime. This includes Type 1, Type 2 and Type 3 emissions. It should also consider the reduction in carbon capture from the removal of vegetation and impacts on soils from all components of the hydropower project. All emissions data should be presented in CO<sub>2</sub>-equivalent (CO<sub>2</sub><sup>-eq</sup>).

### **2.18. Consequential Impacts**

The ESIA should assess and analyse the consequential impacts associated with the pre-construction, construction, operation, and decommissioning/project closure and/or rehabilitation of the hydropower project, including but not limited to:

- a. current traffic numbers and type utilising any existing roads;
- b. where the project will include the development of other new infrastructure, include details on the projected traffic movements at each stage of the project, including at the completion of the project; and
- c. the routes to be used by vehicles;
- d. potential for introduction of invasive species;
- e. potential risk of spills and their management; and
- f. Reduces flows resulting in the loss of water for drinking and agriculture
- g. Reductions in sediment loads downstream and the potential changes in agricultural production;
- h. Reduced forest produce availability, soil erosion, and the loss of intangible benefits
- i. the potential impact of unplanned and unwanted pregnancies;
- j. increases in single mothers with no and / or limited support;
- k. the transfer of STDs including HIV / AIDS through unprotected sex;
- l. transfer of communicable diseases;
- m. alcohol related issues including violence and potentially rape as a result of an increase in income and the use of that money to pay for alcohol etc; and
- n. the unplanned influx of outsiders (extended family and friends) and others looking for work with no housing available.

### **2.19. Cumulative Impacts**

The ESIA should include an assessment of the cumulative impacts of the hydropower project. The likely Valued Ecosystem Components (VEC) that will need to be assessed include:

- a. air and noise;
- b. affected peoples, livelihoods and resettlement;
- c. cultural and ethnic archaeology and heritage;
- d. erosion and sedimentation processes;
- e. fish and aquatic habitats;

- f. natural resources eg agriculture, forestry, land use change etc;
- g. terrestrial habitats eg protected areas, critical habitats; and
- h. water quality and quantity.

When addressing project activities, the proponent should assess all projects within the area of influence in sufficient detail including the stage of each project to allow for the consideration of what VECs might be impacted. All pre-construction, construction, operational and decommissioning / rehabilitation components of the listed projects (short, medium and long term) must be described in detail. This includes, but is not limited to, the time period over which construction will take place, details of the locations of each component of the project (eg. preferably the precise location (including coordinates) of all works to be undertaken and/or the footprint area(s)), dimensions of infrastructure where relevant to be built and the materials used, equipment to be used as well as construction access requirements, lay down areas and elements of the project. The description of all existing and proposed project should include as best as possible:

- a. all the components associated infrastructure; existing infrastructure and easements on the potentially affected land, all pre-construction activities (e.g. vegetation clearing, site access, interference with watercourses and floodplain areas, including wetlands), pre-construction, construction; commissioning; operation; related maintenance activities, both long and short term; and decommissioning / rehabilitation along with explanation of the anticipated timetable;
- b. the proposed construction methods and details of construction and operational equipment to be used for all projects;
- c. the precise location of any works to be undertaken for each project including structures to be built or elements of the project that may have relevant impacts. Aerial photographs, maps, figures and diagrams should be incorporated where appropriate;
- d. include assessment of any directly linked projects that would be required to be delivered by other entities that are necessary to support the project proceeding (for example, power, water, roads);
- e. how all the projects are to be undertaken and conceptual design parameters for those aspects of the structures or elements of the project that may have environmental and social impacts;
- f. the process for the decommissioning/rehabilitation of the projects;
- g. a description of the local and regional economic, social and built context, including historical and future trends and the likely nature and timing of projects including gender and other affected peoples;
- h. a detailed description of social and economic impacts and drivers for the project (including positive and negative impacts);
- i. details of the environmental parameters (incorporating predictions of the impacts to and from climate change and 'worst case scenarios') the structures are designed to withstand, based on the expected life of project;
- j. details of the sustainability measures that will be employed to minimise the project's carbon footprint;
- k. proposed safeguards and mitigation measures to deal with relevant impacts of the project;
- l. any other requirements for approval or conditions that apply, or that the proponent reasonably believes are likely to apply, to all the projects;
- m. to the extent reasonably practicable, any feasible alternatives to the project/s, including if relevant, the alternative of taking no project and with sufficient detail to make clear why any alternative is preferred to another;
- n. any consultation about the project/s including all relevant Government and Provincial Ministries and Departments and stakeholder engagement and any future proposed consultation about relevant impacts of the project/s; and
- o. identification of affected parties, including all communities that may be affected and a description of their concerns.

The ESIA should undertake the cumulative impact assessment consistent with the *Environmental Impact Assessment Procedure 2015* and the requirements of the IFC's *Good Practice Handbook on Cumulative Impact Assessment and Management: Guidance for the Private Sector in Emerging Markets*.

## 2.20. Transboundary Impacts

The impacts of hydropower projects often cross-administrative boundaries. One of the common failings of ESIA is that the studies focus on the immediate impact zones of the construction site and reservoir area, but do not consider the wider implications of the project. Transboundary impacts are generally those that are felt in a different country or in a different province to the country or province where the project is located and regulated. The country or province(s) that experience these transboundary impacts may thus be “paying” through environmental degradation or social impacts, for a development that they can neither control nor receive any benefits from.

The ESIA should consider transboundary impacts of all components of the project. The transboundary impact assessment should be considering at least the following aspects:

- a. the impacts downstream of seasonal changes in the flow regime which will affect the availability of water for downstream water users at different times of year;
- b. the distance downstream of daily changes in flow due to peaking operations;
- c. the increased control of floods that reservoirs can provide, combined with the risks of large flood events due to storms when the reservoirs are full and spillways have to be used unexpectedly;
- d. the loss of sediment being transported downstream and the increased incidence of bed and bank erosion, especially in alluvial reaches of the river, with potential damage to roads and bridges and other infrastructure;
- e. impacts of occasional releases of poor water quality upon domestic, agricultural and industrial water supplies downstream and aquatic life;
- f. reduction in the populations of migratory fish unable to reach spawning and nursery grounds upstream; and
- g. implications for downstream fisheries and agricultural operations and livelihoods.

As transboundary impacts occur in different administrative jurisdictions, the ESIA should discuss legal issues relating to water rights, the responsibility for damages downstream, eg resulting from a water pollution incident from the hydropower project. Reference to the *Convention on Environmental Impact Assessment in a Transboundary Context* (Espoo Convention) should be discussed.

## 2.21. Levels of Uncertainty

The ESIA should describe in specific detail the level of uncertainty in baseline data, uncertainty associated with other proposed projects, and absence of strategic regional, sectoral, or integrated resource planning schemes. The ESIA must define the level of uncertainty and what measures that were adopted to address that uncertainty. The ESIA should take a conservative and/or precautionary approach that explicitly considers uncertainty in how impacts were assessed and why. The ESIA should present an assessment of the overall acceptability of the impacts of the project in light of the residual uncertainties and risk profile.

## 2.22. Proposed Avoidance, Management, and Mitigation Measures

The ESIA must provide information on proposed avoidance, safeguards and mitigation measures to deal with the impacts of the project. Specific and detailed descriptions of proposed measures must be provided and substantiated, based on best available practices and must include the following elements:

- a. identify the level of risk associated with potential impacts already identified and those that require mitigation, monitoring or management to avoid or reduce impacts;
- b. a consolidated list of measures proposed to be undertaken to avoid, prevent, minimise or compensate for the impacts of the project, including a description of proposed avoidance, safeguards and mitigation measures to deal with impacts of the project; an assessment of the expected or predicted effectiveness of the measures and the cost of the mitigation measures;
- c. particular focus must be given to determining factors in the planning of the project so as to avoid damage to the environment and social issues;
- d. outline how any avoidance, safeguards, management and mitigation measures will increase resilience of the environment, ecosystems and social amenity within the region;

- e. demonstrate how impact management and mitigation measures would ensure that the environments and social amenity in the affected region are maintained or improved;
- f. characterise, quantify and address uncertainties that may affect the effectiveness of management measures and therefore on the confidence that biodiversity values would be maintained (or improved) during and after the project;
- g. measures to avoid or minimise disturbance to fauna and flora found around and within the project area;
- h. staff training, including training in relation to environmental and social issues; and
- i. an outline of the ESMP and sub-plans that sets out the framework for continuing management, mitigation and monitoring programs for the relevant impacts of the project, including any provisions for independent environmental and social auditing.

## 2.23. Offsets

Environmental/biodiversity offsets broadly mean measures to compensate for the adverse residual impacts of a project on the environment that compensate for environmental impacts that cannot be adequately reduced through avoidance or mitigation. Offsets do not reduce the impacts of a project. Instead they provide an environmental counterbalance to manage the impacts that remain after avoidance and mitigation measures. These remaining impacts are termed residual impacts.

Offsets are not intended to make projects with unacceptable impacts acceptable; they simply provide an additional tool that can be used during project design and the ESIA process. This section of the ESIA must outline plans to offset the residual potential impacts of the project. Environmental/biodiversity offsets may be appropriate when they:

- a. are necessary to protect or repair impacts to important aspects of the environment, or the environment more broadly;
- b. relate specifically to an important species being impacted; and
- c. seek to ensure that the health, diversity and productivity of the environment are maintained or enhanced.

When identifying offsets, the ESIA should consider a range of options as a means of replacing the areas impacted with areas by replacing them and protecting similar areas of habitat and species. This is not easy within the context of the project. The ESIA should assess options where similar areas of habitat and species composition are not available, how the proponent will undertake ongoing contributions towards the management and protection of the protected area are the minimum form of compensation for this loss. In any case, strict controls limiting the use of access roads with check-points to monitor and enforce illegal logging and the wildlife trade need to be in place.

## 2.24. Dam Safety

Dam safety is a major concern for proponents, Government and the community. The potential causes of dam failure that have occurred in different parts of the world have been due to design problems or wrong operational protocols in the presence of exceptional events, such as landslides in the reservoir, earthquakes, storms and flash floods. The increase in frequency and intensity of such events caused by climate change may also increase the risks.

Consistent with the World Bank Operational Policy (OD/GP 4.37) for the safety of dams, the ESIA should include information on the assessment and review of the design of the project by an independent panel of experts re the investigation, design, construction and operation of the project. The ESIA should include the following sub-plans:

- a. a construction supervision plan;
- b. a quality assurance plan;
- c. an instrument plan;
- d. an operation and maintenance plan; and
- e. an emergency preparedness plan.

The above plans should be a component of the ESMP and included under the emergency preparedness plan. Reference should be made to the Myanmar National Committee for Large Dams and the Myanmar Hydropower Technical Standard developed by the MOEE.

## **2.25. Public Participation, Stakeholder Engagement and Consultation**

The ESIA must include full information on public participation, stakeholder engagement and consultation undertaken about the project consistent with the requirements of the *Environmental Conservation Law 2012*; *Environmental Impact Assessment Procedure 2015*, the *Guidelines for Public Participation in Myanmar's Environmental Impact Assessment Process* and the IFC's *Stakeholder Engagement Good Practice Handbook for Companies doing Business in Emerging Markets*,

The ESIA must demonstrate (through a thorough stakeholder mapping analysis) that the whole range of stakeholders are and will continue to be engaged in the process. Stakeholders include but are not limited to:

- a. government including u regional and state levels;
- b. national and local civil society and non-government organisations including but not limited to environmental, women, governance and security, transparency and accountability, law enforcement, conflict, peace process and ethnic minorities;
- c. local communities and affected peoples;
- d. ethnic armed organisations;
- e. users of land etc within a specific area that may not be members of the local community;
- f. expert advisory groups;
- g. hydropower developers;
- h. private sector;
- i. universities and research institutions;
- j. media;
- k. international governments providing funding into Myanmar;
- l. multi-lateral development agencies/banks and other funders of overseas development aid; and
- m. any other interested party/ies

With respect to public participation, stakeholder engagement and consultation, the ESIA must including:

- a. what consultation has been undertaken about the proposed project, details of the issues discussed, details of frequency, forum and timeframes provided for consultation including with all relevant sectors at central and local levels and specifically noting the views of the affected parties;
- b. all consultation that has taken place during the development of the ESIA including details of frequency, forum and timeframes provided for consultation including with all relevant Government and Provincial Ministries and Departments / Agencies;
- c. already undertaken and proposed consultation about relevant impacts of the project with the community and relevant stakeholders and particularly all affected peoples;
- d. identification of affected parties, including a statement mentioning any communities that may be affected and describing their views on the project. Consultation and engagement must be undertaken with all affected peoples;
- e. how the consultation has specifically targeted vulnerable groups such as women, people with disabilities, elderly, land and squatter settlements and what impact the project will have on them in the short, medium and long term with details how they were included in the decision making process;
- f. what compensation has been paid to any affected peoples, including but not limited to land acquisition as a result of the project;
- g. details on how affected parties comments received during consultations have been addressed in the ESIA; and



- h. any further proposed consultation including with all relevant Government and Provincial Ministries and Departments / Agencies about potential impacts of the project.

The ESIA must demonstrate how stakeholder engagement has been an inclusive and will be a continuous process throughout the life of a project and what level of corporate responsibility and transparency will occur as part of the ongoing process during pre-construction, construction, operation, and decommissioning/project closure and/or rehabilitation. The ESIA must outline how it will encourage local stakeholders including women, vulnerable and people of national race to participate in the project and to empower them to do something practical to address any issues that affect their lives.

The ESIA must also include information about on-going consultation and engagement that will encourage long-term behavioural change for both affected people and the community more broadly. The ESIA must also include details as to how the project will ensure conflict is minimised within the community.

## **2.26. Benefit Sharing and Benefit Creation**

The ESIA should provide detailed information on the proposed benefit sharing and benefit creation mechanisms that are proposed for the project. The ESIA should demonstrate that it has been developed based on broad and ongoing consultations with all affected peoples and relevant stakeholders. The benefit sharing and benefit creation mechanism must have clear objectives; carefully define the target population; include benefit sharing mechanisms; and identify responsible agencies, as well as implementation arrangements. The ESIA should demonstrate how the design of a benefit sharing and benefit creation program is consistent with other outputs of the studies and assessments undertaken as the ESIA; livelihood action plan and a resettlement action plan.

The ESIA should demonstrate how the benefit sharing and benefit creation mechanism will be managed for the life of the project and how and who will ensure its long term sustainability. The mechanism should include appropriate audit of the mechanism on a yearly basis by an independent third party.

## **2.27. Company Environmental and Social Management System**

The ESIA must include the environmental and corporate social responsibility record of the proponent internationally consistent with Article 62 of the *Environmental Impact Assessment Procedures 2015*. The ESIA must include details of any proceedings/fines/actions under any Myanmar and/or other nation's domestic law for the protection of the environment or the conservation and sustainable use of natural resources against the person proposing the project; and/or any social related matter. If the person proposing to take the project is a corporation, details of the corporation's environmental and corporate social responsibility policy and planning framework must be provided for the lifetime of the corporation. The Environmental and Social Management System should include at a minimum, policy; identification of risks and impacts; management programs; organisational capacity and competency; emergency preparedness and response; stakeholder engagement including consultation and information disclosure; external communications and grievance mechanisms; and monitoring and review consistent with the International Finance Corporations Performance Standard 1.

## **2.28. Monitoring and Reporting**

The ESIA must provide information on the monitoring and reporting of the ESMP and associated plans over the lifetime of the project. Appropriate baseline data requirements are to be provided as part of the ESIA to form the basis for baseline measurement and ongoing monitoring of environmental and social parameters in the ESMP. The ESIA must demonstrate that the proposed methods for baseline measurements and subsequent monitoring are based on current good international industry practice and are environmentally and socially scientifically robust and statistically sound to enable diligent and systematic data collection that will deliver unbiased and sound responses. This section must identify parameters to be monitored, the performance indicators to be used to evaluate accuracy of predicted impacts and effectiveness of mitigation measures and offsets / compensation, and management response trigger values and response activities. This section must also identify and describe monitoring programs, procedural and compliance audit programs and reporting requirements and arrangements which will demonstrate the effectiveness of proposed management measures and monitoring. This information should flow through into the development of the ESMP.

The proponent must, in addition to outlining proposed programs, clearly identify what is to be monitored and why. Monitoring programs within the ESMP must be designed to provide objective evidence regarding

activities associated with the project and if these activities are adversely impacting on the environment in the short, medium and long term. Monitoring programs must demonstrate an understanding and consideration of the following:

- a. ecosystems and habitats, flora and fauna (particularly important species / ecological communities and migratory species), air and noise issues and water quality issues as a result of the project;
- b. social factors include gender, vulnerable and peoples national race and cultural heritage issues as a result of the project;
- c. measuring the effectiveness of mitigation and / or rehabilitation and offset /compensation measures;
- d. documenting the difference between predicted and actual impacts;
- e. methods for identification of non-predicted impacts and appropriate reporting and remedial measures;
- f. application and effectiveness of emergency and contingency plans;
- g. review of consultation and management arrangements including with all stakeholders. A diagram showing monitoring and reporting arrangements must be included in the ESIA;
- h. trigger values should be outlined for use in management project and response to adverse project impacts;
- i. outline measures required to ensure that the proposed project avoids the release of hazardous materials as a result of a natural hazard event. This should include details on the safeguards that would reduce the likelihood and severity of hazards, consequences and risks to persons, within and adjacent to the project area(s). Identify the residual risk following application of mitigation measures. The proponent should present an assessment of the overall acceptability of the impacts of the project in light of the residual uncertainties and risk profile;
- j. provide an outline of the proposed integrated emergency management planning procedures (including evacuation plans, if required) for the range of situations; and
- k. the need for monitoring at a fine enough scale to be useful (for example, measurement of particulates with regards to air quality) and for continuous monitoring sufficient to identify any spikes in air, noise, odour, water or other forms of pollution.

In this section, the ESIA should provide a list of all commitments to implement management measures (including any monitoring programs) relevant to the project and its potential impacts. Management practices proposed should be commensurate with the risk and severity of predicted impacts. Proposed management practices may be collated to produce a consolidated management plan.

The ESIA must establish a process of evaluation of the ESMP and associated plans to be undertaken by an independent third party on a yearly basis. The results of the evaluation should be made to available to MOEE, MONREC and public to all stakeholders, particularly affected peoples. Where there is non-compliance with the ESMP, the proponent must provide a process where compliance and corrective actions will be achieved/undertaken within three months of the evaluation.

## **2.29. Conclusion**

The ESIA should include an overall conclusion as to the environmental and social acceptability of the project, including discussion on compliance with the objectives and requirements of the *Environmental Conservation Law 2012* and *Environmental Impact Assessment Procedure 2015*. Reasons justifying undertaking the project in the manner proposed must also be outlined. The conclusion must highlight measures proposed or required to avoid, mitigate or offset / compensate any unavoidable impacts on the environment and social matters.

## **2.30. Information Sources**

Information sources used in the formulation of the ESIA must be provided. This section will describe consultations and studies undertaken in the course of project formulation and preparation of the ESIA, and sources of information and technical data. The following details must be provided for information used in developing the ESIA:

- a. the source of the information;
- b. how recent the information is;

- c. how the reliability of the information was tested; and
- d. what uncertainties and/or gaps (if any) are contained in the information.

A copy of all data and the sampling methodologies must be made available to MONREC for the purpose of peer review on receipt of a written request.

### **2.31. Reference List and Bibliography**

The reference list and bibliography provided in the ESIA is to be accurate and concise and include the address and date accessed of any internet pages used as data sources. Data should be primary sourced rather than secondary sourced.

### **2.32. Appendices and Glossary**

Detailed technical information studies or investigations necessary to support the main text of the ESIA, but not suitable for inclusion in the main text must be included as appendices; for example, detailed technical or statistical information, maps, risk assessment, baseline data, supplementary reports etc. Appendices should provide the complete technical evidence used to develop assertions and findings in the main text of the ESIA. No significant issue or matter should be mentioned for the first time in an appendix, they must be addressed in the main text of the ESIA. A glossary defining technical terms and abbreviations used in the text must be included to assist the general reader.

### **2.33. Environmental and Social Management Plan**

The ESMP is the proponent's commitment to MOEE, MONREC and the community that the project will be implemented in full compliance with applicable environmental and social requirements. The ESMP is also an operational tool for the proponent, guiding the management and monitoring of negative impacts and the enhancement of positive impacts throughout the project's life.

The ESMP must contain a broad ESMP and then specific management plans for all aspects of the project's pre-construction, construction; operations and decommissioning phases.

Appropriate baseline data requirements are to be provided as part of the ESIA to form the basis for baseline measurement and ongoing monitoring of environmental and social parameters. It must be demonstrated that the proposed methods for baseline measurements and subsequent monitoring are based on current good practice and are environmentally and socially scientifically robust and statistically sound to enable diligent and systematic data collection that will deliver unbiased and sound responses. This section must identify parameters to be monitored, the performance indicators to be used to evaluate accuracy of predicted impacts and effectiveness of mitigation measures and offsets / compensation, and management response trigger values and response activities. This section must also identify and describe monitoring programs, procedural and compliance audit programs and reporting requirements and arrangements which will demonstrate the effectiveness of proposed management measures and monitoring.

The proponent must, in addition to outlining proposed programs, clearly identify what is to be monitored and why. Monitoring programs must be designed to provide objective evidence regarding activities associated with the project and if these activities are adversely impacting on the environment in the short, medium and long term. Monitoring programs must demonstrate an understanding and consideration of the following:

- a. trigger values should be outlined for use in management project and response to adverse project impacts;
- b. documenting the difference between predicted and actual impacts;
- c. methods for identification of non-predicted impacts and appropriate reporting and remedial measures;
- d. measuring the effectiveness of mitigation and / or rehabilitation and offset /compensation measures;
- e. application and effectiveness of emergency and contingency plans;
- f. review of consultation and management arrangements including with all relevant Government and Provincial Ministries and Departments / Agencies and the community. A diagram showing monitoring and reporting arrangements must be included in the ESIA;

- g. outline measures required to ensure that the proposed project avoids the release of hazardous materials as a result of a natural hazard event. This should include details on the safeguards that would reduce the likelihood and severity of hazards, consequences and risks to persons, within and adjacent to the project area(s). Identify the residual risk following application of mitigation measures. The proponent should present an assessment of the overall acceptability of the impacts of the project in light of the residual uncertainties and risk profile;
- h. provide an outline of the proposed integrated emergency management planning procedures (including evacuation plans, if required) for the range of situations; and
- i. the need for monitoring at a fine enough scale to be useful (for example, measurement of particulates with regards to air quality) and for continuous monitoring sufficient to identify any spikes in air, noise, odour, water or other forms of pollution.

The ESMP must establish a process of evaluation to be undertaken by an independent third party on a yearly basis. The results of the evaluation should be made public to MOEE, MONREC and all stakeholders, particularly affected peoples. Where there is non-compliance with the ESMP, the proponent must provide a process where compliance and corrective actions will be achieved/undertaken within three months of the evaluation.

### **2.33.1. Commitments**

The ESIA must include a list of commitments consistent with Article 62 of the *Environmental Impact Assessment Procedures 2015* that the proponent will undertake to implement management measures (including any monitoring programs) relevant to the project and its potential impacts through the life of the project. The commitments must be with respect to environmental and social matters. Management practices proposed should be commensurate with the risk and severity of predicted impacts. Proposed management practices may be collated to produce a consolidated ESMP and the specific management and monitoring plans.

### **2.33.2. Environmental Management and Monitoring**

Based on the *Environmental Impact Assessment Procedure 2015*, the ESMP must prepare separate environmental management and monitoring plans for all phases of the project (pre-construction and construction; operation and decommissioning for the following environmental and social matters as part of the project:

- a. air pollution;
- b. noise and vibration;
- c. wastewater;
- d. storm water;
- e. solid waste;
- f. hazardous waste;
- g. hazardous materials;
- h. erosion control;
- i. environmental flow;
- j. biodiversity;
- k. fisheries;
- l. greenhouse gas emissions;
- m. traffic;
- n. archaeological cultural heritage;
- o. emergency preparedness and response;
- p. rehabilitation and re-vegetation;
- q. occupational health and safety;

- r. community health and safety;
- s. community and stakeholder engagement; and
- t. economic development and employment.

Further, the ESMP must have specific plans for the following project activities:

- a. storage facilities;
- b. dam site and powerhouse;
- c. reservoir;
- d. transmission line and substation;
- e. road;
- f. workers camp; and
- g. watershed management.

The Watershed Management Plan should include both a Watershed Rehabilitation Program; and Watershed Conservation Program. The ESIA should investigate potential options in the Watershed Rehabilitation Program including but not limited to identifying deforested or degraded areas within the watershed where there is a high-risk of erosion, and rehabilitate these areas with native vegetation in order to reduce soil erosion and support increased productivity and carbon sequestration. The Watershed Conservation Program should discuss but not limited to participatory community forest management, that would employ locals to help in the sustainable management and monitoring of forest resources; annual monitoring of the watershed to identify areas where illegal extraction may be taking place; and other activities that will protect and/or enhance the capacity of the soil and the environment more generally to retain water through naturally occurring improved vegetation growth; reduce soil erosion through sediment capture; enhance the quality of runoff water; increase groundwater recharge; and provide long-term employment opportunities to affected peoples.

The *Environmental Impact Assessment Procedure 2015* establishes an outline for the general ESMP and the environmental management plans. The ESMP must demonstrate compliance with these requirements.

### **2.33.3. Social Management and Monitoring**

Based on the *Environmental Impact Assessment Procedure 2015*, the ESMP must prepare separate social management and monitoring plans for all phases of the project (pre-construction and construction; operation and decommissioning) for the matters highlighted in Section 2.33.2.

The ESMF must include a Gender Action Plan and Public Health Action Plan to provide for gender risk awareness and compliance. The Gender Action Plan should include actions in increased participation by women in all activities, particularly through community based organisations; provide more equitable access to project and program resources including skills training, technology and government services; demonstrate improved practical benefits for women such as increased income, greater financial security, and more livelihood options; and show how the project will progress toward gender equality, including changing decision making patterns in the household, membership in and leadership of community based organisations, and increased mobility. The Gender Action Plan should include a range of strategic interventions to achieve participation, access to resources, and practical benefits for women. The Gender Action Plan should also provide mechanisms to allow women to participate in project activities, access resources, and benefit from increased income, savings, and improved infrastructure. The Gender Action Plan should be built of significant consultation with women and demonstrate a long term commitment both financially and in people terms to the success of the plan.

The Public Health Action Plan should include background information on the baseline health profile of the project area, factors and patterns considered in the Public Health Action Plan, details of all external health hazards as a result of the project, details on specific health issues during all phases of the project including but not limited to STI and HIV/AIDS and other communicable diseases; tuberculosis; occupational health; management of poverty entrapment, drinking water and sanitation; water born/ vector transmitted diseases; waste disposal and management; psycho-social effects; and perceived health risks of the project. The Public Health Action Plan should have policies and strategies related to sustainability and alignment; network of primary health care facilities; facility and village health management systems; information, education,

communication for health practices; quality of services; child development; human resources; finance and inter-linkages to other safeguard components. The Public Health Action Plan should include full details on all interventions, activities and actions related to public health that will be undertaken over the life of the project and the relevant implementation arrangements and partners that will ensure the action plan is managed correctly. Finally, the action plan should include full details on all reporting and monitoring and the release of that information.

The ESMP should also include mitigation and management of health stresses. Mitigation of pollution-related disorders can be addressed through reducing the sources of the pollution; management of accident risk can be achieved through control of access to hazardous locations and for workers, the provision of safety equipment and training; and the risks of transmitted diseases through health training and awareness, and worker regulations.

#### **2.33.4. Stakeholder Engagement Plan, Complaints Register and Grievance Redress Mechanism**

The ESIA must develop a long term Stakeholder Engagement Plan, Complaints Register and Grievance Redress Mechanism to receive and resolve community concerns, complaints and grievances arising from a project.

The ESIA must provide a comprehensive ongoing Stakeholder Engagement Plan. The Stakeholder Engagement Plan should include the following

1. Introduction
  - a. Purpose and Scope
  - b. Objectives of the Stakeholder Engagement Plan
2. Regulatory and Governance Framework
  - a. Introduction
3. An Overview of Stakeholder Engagement
  - a. What is Stakeholder Engagement?
  - b. Principles for Effective Stakeholder Engagement
  - c. Stakeholder Engagement Considerations
4. Stakeholder Analysis and Identification of Stakeholders
  - a. Stakeholder Analysis
  - b. Defining Stakeholders
  - c. Stakeholder Register
5. Stakeholder Engagement Approach
  - a. Engagement Phases
  - b. ESIA Baseline Engagement Phase
  - c. ESIA Disclosure and Consultation Phase
  - d. Ongoing Engagement
  - e. Post ESIA Disclosure, On-going Consultation and Life of Project Disclosure
  - f. Establishment of Community Liaison Team
  - g. Establishment of Local Consultative Forums
6. Stakeholder Engagement to Date – Current Development
  - a. Stakeholder Engagement Activities
  - b. ESIA Package Scoping Consultation
  - c. Key Issues raised during the scoping consultation
7. Implementation of the Stakeholder Engagement Plan

- a. Resources and Responsibilities
  - b. Community Liaison Unit
  - c. Stakeholder engagement tools and materials
  - d. Monitoring and Evaluation, and Reporting
  - e. Monitoring and Evaluation
  - f. Reporting
8. Monitoring and Review
  9. References

The ESIA should demonstrate how the Stakeholder Engagement Plan has been implemented to understand the views of stakeholders and concerns relating to the project and to collect information about the local environment and community. This information should be taken into account in the assessment and in the identification of appropriate mitigation measures for the project.

A complaints register must be established as part of the project to record any concerns raised by the community during all phases of the project. Any complaint will be advised to the proponent, MOEE and MONREC within 24 hours of receiving the complaint. The ESMP must establish how a complaint will be handled by the proponent so as to resolve the complaint as soon as possible, and thus avoid escalation of issues. However, where a complaint cannot be readily resolved, then it must be escalated the Grievance Redress Mechanism. The Grievance Redress Mechanism should be designed to be problem-solving mechanism with voluntary good-faith efforts. The Grievance Redress Mechanism is not a substitute for the legal process. The Grievance Redress Mechanism must as far as practicable, establish a process to resolve complaints and/or grievances on terms that are mutually acceptable to all parties. When making a complaint and/or grievance, all parties must act at all times, in good faith and should not attempt to delay and or hinder any mutually acceptable resolution.

The ESMP must establish a system where all complaints regarding social and environmental issues can be received either orally (to the field staff), by phone, in complaints box or in writing to the proponent and/or MOEE/MONREC. A key part of the grievance redress mechanism must be the requirement for the project proponent to maintain a register of complaints received at the respective project site offices. All complainants shall be treated respectfully, politely and with sensitivity. The Grievance Redress Mechanism must be designed to ensure that an individual and/or group are not financially impacted by the process of making a complaint. The Grievance Redress Mechanism must provide a budget to cover any reasonable costs in engaging a suitably qualified person to assist in the preparation of a legitimate complaint and/or grievance. Where a complaint and/or grievance is seen to be ineligible, the Grievance Redress Mechanism will not cover these costs. Information about the Grievance Redress Mechanism and how to make a complaint must be placed at prominent places for the information of the key stakeholders.

### **2.33.5. Livelihood Restoration and Improvement Plan**

The ESIA must include as necessary, a Livelihood Restoration and Improvement Plan. Provision within the Plan must be made for diversification of livelihoods, and for a specific focus on developing different livelihood options, particularly for women. An investigation of micro-credit facilities; establishing vocational training programmes and skills development and small business management should be included. The plan should investigate how those trained may also be used or employed during the pre-construction, construction and operation of the project.

The Livelihood Restoration and Improvement Plan must also include targeted interventions that incorporate specific development goals/objectives that are designed to not only manage the impacts from the project, but provide meaningfully improvements to the lives of affected communities. The ESIA should assess potential interventions including but are not limited to include community managed fisheries (both in the form of new ponds as well as targeted conservations/cultivation areas in river systems), home and community vegetable gardens, and community-managed rice/livestock banks.

The plan must demonstrate how the development and subsequent implementation of the Livelihoods Restoration and Improvement Plan has undertaken extensive consultation with all affected communities to understand their wishes and needs. The consultation should be undertaken in small focus group discussions on the detailed requirements may be more effective than large community meetings. The proponent must demonstrate how the Livelihoods Restoration and Improvement Plan will be continuously monitored against

the achievement of the development targets and indicators selected. A great deal of care must be exercised when fixing these targets and indicators; household income is but one of a number of potential indicators.

### **2.33.6. Resettlement Action Plan**

The ESIA must provide a comprehensive ongoing Resettlement Action Plan. The Resettlement Action Plan should include an introduction to the legal frameworks, specifically noting Article 7 of the *Environmental Impact Assessment Procedure 2015*; and IFC Performance Standards.

When establishing the Resettlement Action Plan, the proponent must assess the affected peoples likely to be moved and any community to which they might be moved for all the matters raised in the ESIA. This is to ensure any conflict and other issues that may arise and avoided.

The Resettlement Action Plan must include a socio-economic profile of the affected peoples including but not limited to

- a. demography and population changes;
- b. ethnicity;
- c. social organisation and cultural relations;
- d. infrastructure;
- e. education and school attendance;
- f. literacy;
- g. health;
- h. gender issues;
- i. information and services;
- j. agriculture and horticulture;
- k. forest utilisation;
- l. hunting;
- m. fisheries;
- n. livestock;
- o. other sources of income; and
- p. poverty and vulnerability.

The Resettlement Action Plan should fully assess the level and scope of all land acquisition and resettlement required for the project and the measures to minimise the land acquisition and resettlement. Further, the Resettlement Action Plan must establish an Entitlement Policy Framework, which includes the full consultation and disclosure with all affected peoples; established who is eligible for compensation and/or other assistance and the principle for valuation and compensation unit rates.

The Resettlement Action Plan must also include an entitlement matrix and mitigation measures; how entitlements, assistance and benefits will be assessed; what income restoration and rehabilitation measures will be included; what community resources will be made available; special measures for vulnerable households and people of national race and what project-related employment opportunities might be available to affected people as a first option.

The Resettlement Action Plan must include compensation procedures including but not limited to confirmation survey; the compensation process; how compensation is calculated for all beneficiaries; specifics about individual household consultation; the management of any bank transfers that may be necessary; what documentation is required for providing and receiving compensation; and special measures for vulnerable households; what assistance and training will be provided; and any other relevant measures for people of national race and gender arrangements

The Resettlement Action Plan must include discussion on information disclosure, consultation and grievance redress; information on major consultations with stakeholders; how affected people's preferences



and concerns for compensation and resettlement were addressed, whether as a group and/or as individuals and the grievance redress mechanism. Further, the Resettlement Action Plan must demonstrate social inclusion; with respect to gender and peoples of national race.

The Resettlement Action Plan must establish an internal and external monitoring and reporting framework; an implementation schedule; and budget and financing plan.

The Resettlement Action Plan should demonstrate it has assessed all alternatives to mitigate resettlement and land acquisition. Further, the Resettlement Action Plan must demonstrate that it has fully assessed all desired options based on consultation with affected peoples and:

- a. providing land-based compensation or compensation-in-kind in lieu of cash compensation where feasible;
- b. ensuring continued access to natural resources, identifying the equivalent replacement resources, or, as a last option, providing compensation and identifying alternative livelihoods if project development results in the loss of access to and the loss of natural resources independent of project land acquisition;
- c. ensuring fair and equitable sharing of benefits associated with project usage of the resources where the client intends to utilise natural resources that are central to the identity and livelihood of affected peoples and their usage thereof exacerbates livelihood risk; and
- d. providing affected peoples with access, usage, and transit on land it is developing subject to overriding health, safety, and security considerations.

### **2.33.7. National Races Plan**

The ESMP should include a National Race Plan. The National Race Plan should be built on the premise of Free, Prior and Informed Consent. The National Race Plan should be built on extensive and meaningful consultation. The National Race Plan should highlight mechanism to ensure that people of national race maintain their autonomy, traditions, culture and language with the project area; and/or any location where they are resettled. The National Race Plan should provide beneficiaries with a range of options to access the environment while obtaining socio-economic benefits. The National Race Plan should include options for livelihoods, programs for education and health and demonstrable measures to ensure traditions, cultures and languages are maintained and enhanced. The National Race Plan must demonstrate an ongoing commitment and mechanism to address where benefits and mechanism for peoples of national race do not fully follow the measures and goals of the plan.

### **2.33.8. Conflict and Security Plan**

Conflict and security issue are common in Myanmar, particularly to people of national race. Hydropower project have also resulted in conflict, often associated with the environmental and social impacts on local communities and moreover, as a result of the lack of communication and stakeholder engagement with local communities prior to and during the construction of hydropower projects. The ESMP should include a Conflict and Security Plan. The Conflict and Security Plan should have three essential components of ensuring:

- a. that the local communities are not impacted by conflict and security issues as a result of the project, including but not limited to the influx of foreign workers;
- b. the project's workforce do not suffer from conflict and security issues from local communities; and
- c. that the project is safe from conflict and security that could result in damage to the assets and result in significant impact to the environment and community safety.

The Conflict and Security Plan should provide strategies for the three essential components and how the components will be implemented. The components and strategies should include a matrix of potential issues and how those issues will be managed and the mechanism that will be used. The Conflict and Security Plan should have a strong gender and youth focus and provide:

- a. a plan and programmatic framework that compliments and supports national and the proponent's efforts;

- b. an enabling environment at the local level to improve women and youths activities in conflict prevention and management, peacekeeping, security policy decision-making and ensure the community's human rights are protected;
- c. Strengthen civil society, women's and youth groups with conflict and security prevention policy and decision making;
- d. conflict and security technical assistance, capacity development support and financial resources;
- e. reporting and monitoring of commitments and help to assess progress;
- f. funds to enhance regional commitments to the advancement of conflict and security issues in the region.

The Conflict and Security Plan should be developed on extensive stakeholder engagement based on FPIC. The Conflict and Security Plan should have a solid foundation built on the Stakeholder Engagement

### **2.33.9. Emergency Preparedness Plan**

The Emergency Preparedness Plan must identify the impacts of dam failure, and how the proponent will reduce the consequences of any dam failure. The Emergency Preparedness Plan must defines the roles and responsibilities for risk management; and establish a warning and notification system to address the kinds and scale of emergency predicted. For dam failure, a model of the flood impact zone must be used with a field survey to map:

- a. locations of affected villages downstream;
- b. sensitive community points, such as schools, clinics, community meeting places, mosques and other religious places;
- c. emergency services such as hospitals, fire brigade, police stations (nearby but outside of the flood zone, as well as inside);
- d. infrastructure such as roads and bridges at risk;
- e. local stakeholders in charge of emergency management;
- f. communication systems for local communities, existing and in the event of a dam failure.

The Emergency Preparedness Plan must include information on how stakeholder engagement has been undertaken and the relevant stakeholders that have and will continue to be briefed and trained about their roles and responsibilities in the event of an emergency. Information on funding to be provided to stakeholders and the community with respect to the Emergency Preparedness Plan should be included for the life of the project.

### **2.33.10. Budget**

The ESMP must include relevant budgets for all aspects of the ESMP including but not limited to the undertaking of its commitments; environmental and social monitoring and management; funds required for the complaints and grievance redress mechanisms; life of project ongoing stakeholder engagement.

A separate budget should be established for the Gender Action Plan; Livelihood Restoration Plan, Resettlement Action Plan; National Races Plan; Conflict and Security Plan and Emergency Preparedness Plan. The budget should not include project activity costs with respect to the pre-construction, construction, operation and decommissioning phases of the project.

All budgets should be established in both USD and Myanmar Kyat.