Cumulative Impact Assessment and Management of Renewable Energy Development in the Myitnge River Basin

Terms of Reference

1. Background

Myanmar has a substantial need for power. The country has the lowest grid connected electrification rate in Southeast Asia, with only 38% of the population supplied. It is estimated that at least 500 MW of additional generation capacity is required to come on line annually up to 2030 to meet domestic demand. Additionally, Myanmar's electricity transmission grid requires considerable expansion and upgrading to meet demand.

Hydropower in Myanmar has experienced relatively limited development compared to the country's identified potential total capacity. The total installed capacity of projects of 10 MW and greater (29 projects) is 3,298 MW, accounting for 70% of national energy supply. A further 1,564 MW capacity is under construction in six projects, but several of these are stalled or taking far longer to complete than scheduled. Currently, a total of 43,848 MW capacity is proposed in 69 projects nationally. These projects include six over 2,000 MW capacity each and seven between 1,000-2,000 MW capacity. To date, 80% of hydropower projects have been developed in cascade arrangements within sub-basins, with this geographic distribution driven by load center locations and the limited transmission grid, as well as suitable sub-basin hydrology, topography and geology. Most development has occurred in the Ayeyarwady river basin where 64% of total installed capacity exists.

Myanmar's rivers (see Figure 1) provide a range of benefits and resources to the people of Myanmar. Myanmar ranks fourth in the world in terms of inland fisheries capture. Nationally, freshwater fish harvests produce over 1.3 million tons per year and employ approximately 1.5 million people. Irrigation, water supply, and navigation are other important uses of the water in the country's rivers. The freshwater ecoregion covering the Sittaung and Ayeyarwady river basins also has the highest level of freshwater fish endemism in the eastern Himalayan drainage, and is a critical area for bird migrations as well.

The Ayeyarwady River Basin

The transboundary Ayeyarwady basin has a total drainage area of 412,500 km^2, of which 90.4% (372,905 km^2) lies within Myanmar, around 5.4% (22,195 km^2) is in the People's Republic of China (mostly Yunnan), and 4.2% (17,400 km^2) is situated in India (Manipur and Nagaland). The basin covers around 55.5% of Myanmar's land area, with the major tributaries (in order of basin size) being the Chindwin (97,157 km^2), Myitnge, Mali, N'mai, Mu, Shweli, and Dapein rivers. The Ayeyarwady basin consists of 27 sub-basins. Of these, four sub-basins have multiple existing/under construction projects (Mone Chaung, Myitnge Lower, Shweli, and Zawgyi/Myogyi).

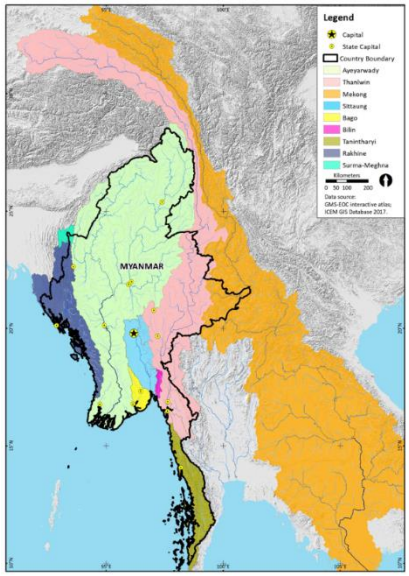

Figure 1: Major river basins in Myanmar

The 2,170-km-long Ayeyarwady River, commencing at the confluence of the Mali and N'mai rivers and flowing into the Gulf of Martaban via the delta, is commonly referred to as having three regions: (i) Chindwin River; (ii) Upper Ayeyarwady; and (iii) Lower Ayeyarwady. The headwaters of the basin flow from mountains and hills along the Myanmar-China border region where elevations exceed 5,000 meters above sea level (masl). River flows are highly seasonal, with 90% of yearly discharge occurring during the monsoon season from May to October.

The Ayeyarwady basin is the largest and most economically significant river basin in Myanmar. Around 34.3 million people (66% of Myanmar's population) live in the basin (2013), with around 1.9 million people residing in the basin in Yunnan and 2.8 million people in India, mainly in Manipur. Population density across the basin varies from just 18 people/km^2 in Kachin State to 60 people/km^2 in the Mandalay region, and more than 180 people/km^2 in the Ayeyarwady Delta region, with the highest population densities concentrated around major cities of Mandalay, Nay Pyi Taw, and Yangon. Almost half (45%) of the basin population in Myanmar live in the central dry zone regions (Mandalay, Sagaing, and Magway), which make up 40% of the basin area.

Myitnge Upper, Myitnge Lower and Zawgyi/Myogyi Sub-basins

The Myitnge River is a major tributary entering the Ayeyarwady from the east with a catchment area of 47,023 km^2. Originating from Mount Loi Swang at an elevation of 1,460 meters on the northern Shan Plateau, the Myitnge River drains the north-west part of the Shan state and joins the Ayeyarwady River a few kilometers downstream of Mandalay City. The Myitnge has two tributaries joining it from the south that are close to the confluence with the Ayeyarwady: the Zawgyi River and the Panlaung Chaung. The Myitnge flows into the Ayeyarwady in the middle of Myanmar's dry zone and is in a region of the country where irrigation is an important water use. The Myitnge Sub-Basin has already been impacted by several HPPs, including five projects currently in operation, one that is currently under construction, and five more under various stages of planning (see Figure 2). There may be other projects under consideration in future. However, the cumulative impacts of these projects from their combined activities have not been adequately assessed, nor have these projects explored opportunities for coordinated operations that might further reduce impacts or improve economic outcomes.

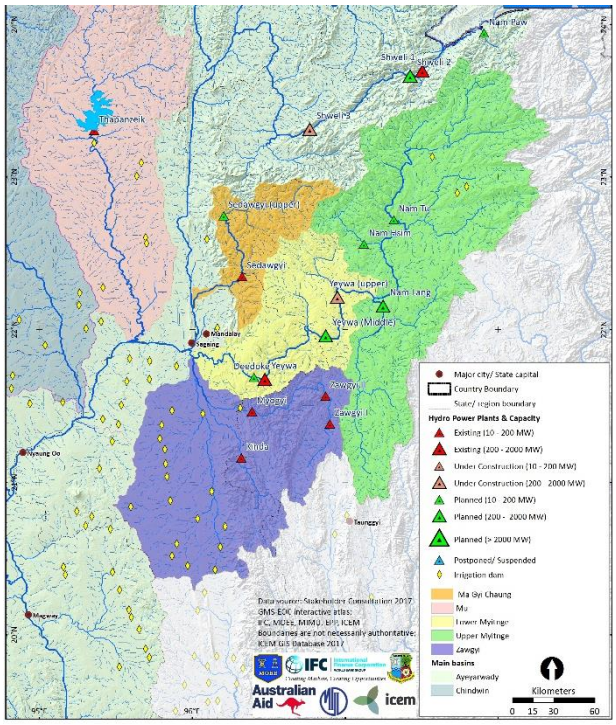

Figure 2: Hydropower and irrigation dam development in the Myitnge sub-basin

The five hydropower plants (>10 MW) that currently exist in the Myitnge sub-basin, one of which is on the Myitnge river, the 790 MW Yeywa HPP, and is also the largest hydropower plant in Myanmar. Three additional HPPs (Zawgyi I, ZawgyiII, Myogyi) are located on the Zawgyi River,

a tributary in the Myitnge river basin, and one (Kinda HPP) is located on the Panlaung Chaung in Taunggyi District, Shan State.

These projects have a total installed capacity of 906 MW, total generation of 3,916 GWh/yr, total storage of 4,790 hm^3, total inundated area of 135.8 km^2, and total reservoir length of 108.4 km.

The 280 MW Upper Yeywa HPP is currently under construction and there are five hydropower projects being considered in the Mytinge sub-basin, two on the Mytinge River and three on tributaries upstream from Upper Yeywa. The planned projects are projected to have a total installed capacity of 1,110 MW, total generation 4,226[1] GWh/yr, total storage of >467 hm^3.

Table 1: Status of Hydropower Projects in the Project Area

Sub-Basin	**Total Catchment Area (km2)**	**Sub-Basin Area – Myanmar (km2)**	**Population/ State/ Regions**	**Existing /Under Construction Projects (MW)**	**Total Exist./ Under Const. (MW)**	**Proposed/ Identified Projects (MW) ROR or Storage**	**Total Proposed (MW)**
Myitnge Lower (& Myitnge Upper[a])	30,517	30,517	1,940,898 Shan Mandalay	Yeywa Upper (280) – const./S Yeywa (790) / S	**1,070**	Yeywa Middle (700) / S Deedoke (60) (MOU) / ROR Nam Tu (100) (MOU) Nam Hsim (30) (MOU) Nam Lang (210) (MOU)	**1100**
Zawgyi/ Myogyi	16,327	16,327	2,099,186 Magway, Mandalay, Sagaing	Zawgyi I (18) / ROR Zawgyi II (12)/ S Myogyi (30) / S Kinda (56) / S	**116**		**0**

Coordinating hydropower project (HPP) site selection to maintain riverine habitats, processes and key ecosystem services is a promising way to avoid negative impacts. Avoidance is the most effective mitigation measure as all other potential measures such as minimization, reduction, restoration, compensation or offsets have significant technical and cost limitations once the HPP site have been selected.

Beyond site selection, HPPs can be developed with different designs (run-of-river, storage) and managed with a range of operating regimes (baseload, daily peaking). The alternatives selected also determine potential tradeoffs, benefits and negative impacts resulting from hydropower. Different types of operations have widely varying impacts on a river's flow, connectivity, sediment transport, and nutrient regimes and the resources or services affected by them, such as fisheries or cultural needs.

Collectively, decisions about which dams to build and how they are designed, operated and coordinated with other renewable power resources will determine the development pathway of the country and whether and how renewables in Myanmar can be advanced in ways that are

[1] This is not complete information.

consistent with broad goals of sustainable development as outlined in Myanmar's Strategic Environmental Assessment.

The current model for hydropower planning and development in Myanmar, as in most other countries, is not designed to manage these complexities nor does the process incorporate integration with other renewables. Recent hydropower planning and development has generated a great deal of controversy due to a lack of adequate stakeholder engagement and consultation, unfair distribution of benefits, and the expected environmental and social impacts. Much of the public perceives that the power sector institutions and investors choose individual projects based strictly on technical and financial criteria and give insufficient attention to cumulative and synergistic environmental and social impacts, trade-offs, and the potential for benefit sharing. In addition, current practice is limited to single-project analyses which do not incorporate basin-wide alternative development scenarios nor does it identify or avoid the suites or portfolios of hydropower projects that could potentially have the most detrimental E&S outcomes.

IFC, in partnership with the Ministry of Electricity and Energy (MOEE) and Ministry of Natural Resources and Environmental Conservation (MONREC), is implementing environmental and social standards in the hydropower sector program in Myanmar. This program is expanding to the broader renewable sector globally and in Myanmar. As part of the program, a country-wide Strategic Environmental Assessment (SEA) which aims to advance a sustainable development pathway for the hydropower sector in Myanmar, is underway. The key function of the SEA is to identify important environmental and social values at a national scale to maintain and avoid significant impacts on these values. In addition, IFC is currently assisting in the development of Environmental and Social Impact Assessment (ESIA) guidelines for individual hydropower projects in Myanmar.

The SEA was completed in July 2018, and it is best followed by cumulative impact assessments of multiple projects in a selected basins or sub-basins currently earmarked for significant hydropower development. Cumulative impacts result from the successive, incremental or combined effects of a project or activity when considered with existing, planned or reasonably anticipated future projects. This analysis could also significantly benefit from a broader look at alternative renewables that could be developed in the same basin, and what role they could play in either worsening, maintaining or reducing cumulative impacts from hydropower development.

When all potential projects are considered together at a landscape level, global experience shows that adverse environmental and social impacts as well as potential benefits and efficiencies can be compounded. Likewise, risks and opportunities that often are not captured in individual-project environmental and social impact assessments rise to the surface. Planning for a system of renewable power projects by assessing trade-offs, diverse objectives and/or valued resources within a basin or sub-basin, can provide opportunities to minimize cumulative impacts on people and nature through project site selection, and optimize energy output and associated capital and operating costs, maintaining the technical feasibility and financial viability of identified projects at the same time.

To advance the vision of environmentally sustainable hydropower planning and development in Myanmar's river basins, it is necessary to enhance basin-wide coordination through a common, multi-stakeholder commitment to a collaborative and integrated cumulative impacts assessment and management process (CIA) that includes trade-off modeling of existing, planned and currently under construction projects.

2. Vision and Objectives of the Project

Vision

Sustainable planning for renewable energy development options in the Myitnge River Basin is founded on clear, multi-stakeholder commitment to assessing and managing cumulative impacts, collaborative monitoring and co-management.

Objectives

1. Plan and execute an integrated assessment of the cumulative impacts of renewable energy[2] development in the Myitnge River Basin, including power optimization and development scenarios.
2. Lead the participatory design of a framework for ongoing river basin co-management in the Myitnge, including collaborative environmental and social impact monitoring and management.
3. Strengthen the capacity of Myitnge River Basin stakeholders in CIA and co-management.

3. Project Scope

The Consultant team is expected to deliver the following Project scope of work, organized according to each of the three key objectives above.

Integrated Cumulative Impact and Power Optimization Assessment

The integrated cumulative impact and power optimization assessment (*'integrated CIA'*) should be conducted based on IFC's Good Practice Handbook on CIA referring to the expected scope, approach and standard methodology for the CIA portions of the Project.

However, this Project includes complementary, additional tasks to the standard CIA process by integrating elements of collaborative river basin power optimization assessment (see Objective 1; Task F). The Integrated Cumulative Impact and Power Optimization Assessment Process to be followed is illustrated by *Figure 3 (TO BE ADDED).*

Task A) Review the regulatory framework

Review the existing legal, institutional and governance framework for renewable energy and natural resource development in the Mytigne River Basin to gain a complete understanding of the regulatory context, Understand the Government's overall vision, power planning and sustainable development objectives for the Myitnge River Basin

Task B) Scope the cumulative impact assessment

Determine spatial boundaries for the assessment with consideration of both relative significance and practical issues of time/resources required for effective inclusion in the assessment:

- The entire mainstem of the Myitnge River and its key tributaries as well as the development areas for solar power generation in the basin (land-based and floating), in case sufficient connection capacity exists at HPP substations. [3]

[22] The Yeywa Hydropower cascade will be the prime focus however other renewable energy sources beyond hydropower will be considered such as solar plants (land-based and floating), in case sufficient connection capacity exists at HPP substations.
[3] Other projects that may be in the concept stage or at pre-feasibility should be considered.

- Place the Myitnge within the broader context of the Ayeyarwady River Basin[4] to understand sediment contributions and migratory fish patterns, and to evaluate how power sector developments in the Myitnge sub-basin affect the demand and influence decisions about infrastructure investments elsewhere in the Ayeyarwady basin.
- Associated infrastructure (e.g. transmission lines, roads) and ancillary activities (e.g. transport of construction materials to the project site).

Determine temporal boundaries for the assessment by considering:
- Appropriate temporal boundaries (e.g. a 10 or 20-year period) for the current and foreseeable basin and power sector development scenarios.
- The anticipated temporal extent of impacts (e.g. 2100).
- The length of long-term climate cycles that may impact on hydrological factors.

Collate completed plans, programs and studies of potential relevance to the CIA.

Identify and verify Valued Ecosystem Components (VECs) in the Myitnge River Basin in consultation with stakeholders. The CIA Good Practice Handbook (GPH) provides a selection of possible VECs for consideration.

Engage stakeholders in at least one 2-day workshop to explore and determine the final spatial and temporal boundaries and VECs based on the different developments and stressors considered over time (refer to *Section 0 'Stakeholder Identification and Consultations'*). Ultimately, professional judgment is required to estimate the appropriate scope and to justify the reasoning behind the boundaries/VECs used.

Task C) Scope activities and environmental drivers for the Base Case Scenario

In collaboration with government of Myanmar, companies and other stakeholders, agree upon existing, proposed and likely future developments and other natural / social stressors within the boundaries established in Task A (the '**Base Case Scenario**') that may affect the VECs in the Myitnge River Basin. These could include:

- Medium- and large-scale hydropower projects
- Small hydro, wind, solar and hybrid power projects
- Large-scale mining, forestry and agriculture
- Other natural / social stressors in the Myitnge River Basin

Task D) Determine present conditions of VECs

Determine present conditions of VECs.
- Consolidate applicable data and information on VECs.
    - Review ESIAs and CIAs (if any) conducted previously across the Myitnge River Basin.
    - Consolidate existing data and information from reports, studies and surveys.
    - Conduct a gap analysis and generate informed estimates to address critical data deficiencies.

[4] Review the Ayeyarwady State of the Basin Assessment (SOBA) 2017.

- Define the existing condition of VECs and provide an understanding of their potential reaction to stress, resilience and recovery times.

Task E) Assess cumulative impacts of the Base Case Scenario

Assess cumulative impacts from the Base Case Scenario and evaluate their significance over VEC's future conditions.

- Consider past, present and future environmental and social impacts and the potential range of environmental variation that may influence VECs' conditions - not solely on expected average conditions (e.g. change in climate patterns and/or predictability).[5]

- Identify and describe potential transboundary impacts and suggest measures for their mitigation.

- Assess significance of known and anticipated cumulative impacts, including the efficacy of existing mitigation, monitoring and management efforts.

- Determine anticipated residual cumulative impacts for the Base Case Scenario.

Please note that Tasks A-E are to be completed immediately.

Task F) Define and develop power generation scenarios for the Myitnge River Basin

Identify and assess power generation scenarios:

- Identify key criteria and parameters for identifying and analyzing power generation scenarios which minimize cumulative impacts whilst still meeting the vision/goals (for example, demand projections indicated in Power Development Plans, if any; sequencing of commissioning), e.g.:

    - Number, size and locations of hydropower projects (HPPs), differentiated by status of design / development; anticipated commencement year, area of study; hydrologic profile and water balance; water users; HPP design (run-of river vs. storage); operational regime (base vs. peak); head utilization mode (diversion vs. powerhouse at the toe of the dam), etc.

    - Conduct a high-level review of available HPP designs, and suggest measures that could mitigate possible environmental and social impacts (e.g. provision of fish ladders, environmental flow releases, sediment flushing, etc.)

    - In order to facilitate the subsequent trade-off analysis, conduct a high-level analysis of CAPEX presented in various HPP design documents, focused on major items from respective bill of quantities. The analysis shall be based on experience from similar projects developed in South-East Asia and international benchmarks. If outliers are identified, suggest measures to address them. Since the studies might have been

[5] 2016. The Nature Conservancy, WWF, and the University of Manchester. Improving hydropower outcomes through system-scale planning: an example from Myanmar. Prepared for the United Kingdom's Department for International Development. 2016. Arlington, Virginia, USA. The study only considered current hydrology and the assessment showed us best efforts to assess how different scenarios / options perform across a range of potential future climatic conditions. Focus should be on relevance of climate change to hydropower operations and revenue (e.g. changes in rainfall or snowfall on flow regimes, sediment loads, effects on operational regime and energy yield, impacts on maintenance costs, etc.). The focus could also speculate on the potential impacts that climate change could have on other renewable sources (e.g. cloud cover, wind patterns, etc.).

developed at different points in time, convert project costs to the same currency, and update/escalate the costs to create the same basis for comparison.

  - Technical, financial and economic criteria / metrics and resource options (e.g. rated and firm power, rated and firm generation, total and live storage of the reservoirs (if a storage scheme), investment value, unit costs ($/kW), LCOEs, IRRs, NPVs, etc.).
  - Hydropower generation and transmission / interconnection infrastructure configurations, considering: internal transmission lines; associated infrastructure and ancillary elements and interconnections to neighboring sub-basins or countries, located in other basins, if of relevance for operation of HPPs in Myitnge River Basin

- Characterize non-power interests in the Myitnge River Basin: Identify non-power interests; specify planning objectives with respect to (cumulative) environmental, social and economic interests.
- Identify integrated river basin development options using scenario analysis, with the focus on renewable energy. When developing scenarios, consider grouping of HPPs to be used across all scenarios, in case of any relevance (e.g. storage plants combined with their compensation basins, cascades of HPPs, etc.). Suggested scenarios should consider multipurpose utilization of reservoirs and impacts of cascading effects (e.g. optimized energy yield for the whole cascade, flood flows to be evacuated, residual flows to be released, sediment transport, etc.), assuming coordinated operation of all plants in the system.
- Conduct trade-off analysis among the possible scenarios, across technical, financial, economic, social and environmental objectives using multi-criteria decision tools. Consider the impact of uncertainty and irreversibility on trade-offs and project sequencing. Assuming considered projects could be developed at a different complexity level of technical design documents, the consultant should propose a proper methodology for comparing those different developments.
- Identify a shortlist of two or three *Scenarios*, covering a range of options / combinations for development of the Myitnge River Basin.

In order to conduct the above tasks, the Consultant is expected to collect and review the hydrological data required for the analysis. In case any gaps and inconsistencies related to collected data are identified, the Consultant is expected to propose measures for their mitigation, and adequately address them.

It should be noted that Andritz Hydro and the Austrian government are carrying out work on cascade management between the Deedoke HPP and the existing Yeywa HPP. The Consultants should consult with Andritz when they begin the power optimization tasks.

Task G) Assess cumulative impacts from the Scenarios

Assess cumulative impacts from the shortlisted Scenarios and evaluate their significance over VEC's future conditions.

Task H) Design cumulative impact management measures and monitoring plans

Design adequate strategies, plans and measures to manage (avoid, minimize, compensate, etc.) cumulative impacts for the Scenarios.

Task I) Provide recommendations to reduce cumulative impacts and optimize power generation

Conduct multi-criteria comparative analysis on the short listed Scenarios based on pre-defined criteria and the outcome from the integrated CIA.

Provide recommendations to optimize power generation and reduce cumulative impacts.
Host a multi-stakeholder workshop to report back on the integrated assessment process and verify / seek buy-in on the integrated CIA recommendations and proposed update to the draft CIA Guidelines.

Complete draft and final Integrated Cumulative Impact and Power Optimization Assessment report, detailing the entire process, findings and outcome.

Task J) Coordinate data management and mapping

Utilize Geographic Information System (GIS) software and any associated database applications to develop maps which illustrate key features as part of the CIA.

Capture data in a spatially-linked database platform and use appropriate GIS mapping tools recognized in Myanmar.

Take into account the scope of work under Objective 2, Task B) *'Facilitate harmonization of data management, mapping and reporting protocols'.*

Myitnge Basin Cumulative Impact Co-Management Platform

The Consultant is required to design a framework for involving the public and private sector in addressing identified cumulative impacts in the Myitnge River Basin, including collaborative environmental and social impact monitoring and management.

The Platform would ultimately aim to enhance collaboration and governance in the Myitnge River Basin by:

(i) Supporting the co-management (avoidance, minimization, compensation, etc.) of environmental and social impacts resulting from multiple or successive developments in the Myitnge River Basin.

(ii) Exploring pro-active and retroactive design modifications to hydropower and other Myitnge River Basin projects (location, timing, technology, etc.) to better coordinate operations and manage cumulative impacts (e.g. through watershed protection / reforestation, water quality monitoring, erosion and sediment control, fish hatcheries, environmental flows (eflows) management, cascading operations and maintenance, etc.).

(iii) Coordinating, to the extent possible, basin-wide approaches and methodologies for environmental and social impacts assessment, monitoring, data analysis, reporting and management.

(iv) Maintaining open communication and engagement with relevant stakeholders.

N.B. The Consultant is not responsible for fully operationalizing the Platform; only for developing its framework and providing foundational capacity building, as described below.

Task A) Design the framework for a Myitnge River Basin Cumulative Impact Co-Management Platform

Building on lessons learned from related initiatives, the Consultant will lead in the participatory design of a framework for a Myitnge River Basin Cumulative Impact Co-Management Platform. The Consultant team will develop the Platform framework through consultation with all relevant stakeholders, including:

- Defining the key features of the Platform, including a governance committee, institutional arrangements (see Section 5 of this ToR), data collection/sharing protocols, privacy/confidentiality arrangements, standard operating procedures and plans for implementation.

- Developing institutional and financial mechanisms to support co-management of common environmental and social challenges, impacts and risks.

- Considering how to build an ongoing or periodic process of power optimization and CIA into the Platform's framework, in order to manage participatory planning for future basin development projects.

- Piloting approaches and learning lessons to inform broader integrated management planning at basin level in Myanmar and elsewhere.

Task B) Facilitate harmonization of data management, mapping and reporting protocols

Develop protocols for the long-term collection, storage and analysis of comparable, high quality, primary and secondary data relating to the Myitnge Basin, including: Specifications for information and communications technology (ICT) such as servers and networking; data collection / sharing protocols; privacy / confidentiality; standardized mapping and reporting protocols / templates; etc. (see Task 1e).

Capacity Building

The Consultant is to strengthen the capacity of Myitnge River Basin renewable energy stakeholders in cumulative impacts assessment and co-management.

Task A) Build the capacity of Government and private developers in CIA and basin co-management through workshops, seminars and on-the-job training

The Consultant should plan and facilitate a 2-day Project Inception and Training Workshop with key stakeholders. The first day of the workshop will cover: Project vision and objectives; institutional arrangements, roles and responsibilities; workplan and schedule; information requirements; etc. The second day will comprise a capacity building seminar, focused on the business case for CIAs - building on IFC and other resources. Finally, the Consultant will conduct a brief capacity building needs assessment of the key Government departments and project developers to inform planning of subsequent capacity building activities.

The Consultant is to use the outcome from that assessment, supplemented by wider stakeholder engagement activities, to prepare a Capacity Building Plan. This Plan should include provisions for simultaneous interpretation for all capacity building sessions and for all final materials to be provided in both English and Myanmar.

After completing the CIA portion of the Project, the Consultant is to develop and deliver a series of three 2-day capacity building sessions with key stakeholders. The sessions should relate directly to the issues identified in the CIA, and create understanding on potential strategies for mitigation and co-management. Recommended sessions are: 1) Key issues emerging from the CIA; 2) Orientation to the Myitnge River Basin Cumulative Impacts Co-Management Platform, and; 3) Integration of power optimization into CIA for sustainable hydropower planning.

If counterpart staff of the Government are assigned to the Project, the Consultant is to facilitate knowledge sharing and on-the-job training to these individuals, where possible.

4. Stakeholder Identification and Consultations

The assessment and management of cumulative impacts is an iterative process, requiring the engagement of key stakeholders through all phases of the Project. This engagement should build on the existing and substantial knowledge base available and collaboration conducted to date with key stakeholder groups.

The Consultant is required to prepare a Stakeholder Engagement Plan (SEP) to guide the consultations in-line with the work schedule for the Project. The preparation of the SEP should involve the identification and mapping of stakeholders and a detailed plan of consultation and communication activities specific to each group, to be implemented by the Consultant. The consultation activities may range from meetings, workshops, forums, telephone calls, on-site discussions, focus groups discussions and surveys. The SEP should be developed in the early stages of the Project, and form part of the Inception Report.

In addition to the inception and draft report workshops, and meetings with government stakeholders, there are a minimum of four key Project activities requiring stakeholder consultations, including:

1. **Definition of parameters:** Definition of the VECs, along with the corresponding temporal and spatial boundaries will require the participation of a range of stakeholders and experts. It is not possible to assess impacts on every VEC, therefore, it will be necessary to define those VECs which are most valued by stakeholders or vital to the functioning of the ecosystem. This would involve stakeholder from the sub-basins and at the national level.

2. **Finalization of scenarios:** The draft power generation scenarios should be presented to the main stakeholders for discussion and agreement before moving to the assessment stages of the project.

3. **Participatory design of the cumulative impacts basin co-management framework:** This will require participation and investments from HPP proponents for data sharing and contributions to on-ground mitigation and management initiatives. It will also require investment from the appropriate Government departments to manage and see through the recommendations of the CIA.

4. **Collaboration with other initiatives:** The Consultant should be aware of any other initiatives being undertaken simultaneously for the Myitnge River Basin, and river and watershed management in Myanmar; most crucially the World Bank-funded AIRBM project. The Consultant should make every effort to understand these initiatives, identify

their relevance to this Project and establish mechanisms to avoid duplicative efforts or stakeholder fatigue. There may be instances wherein the Project will be able to incorporate the findings and outcomes of these initiatives within this Project, and/or identify the need to collaborate with other initiatives. As part of a response to the TOR, the Consultant should note their approach to coordinating with relevant initiatives.

In their response to this ToR, the Consultant will need to propose their approach to stakeholder consultations and engagement activities that will inform the development of the SEP and achieve an adequate breadth of engagement across all identified stakeholders. The Consultant can refer to the IFC's '*Stakeholder Engagement: Good Practice Handbook for Companies Doing Business in Emerging Markets*'.

Not all interested parties need to be involved in all stakeholder consultations as many stakeholders are often resource constrained. There may be layers of engagement for different stakeholder groups. Some stakeholders may only need to be kept informed or be provided feedback throughout the process. A *Myitnge Basin CIA Coordination Group* may be developed for engagements to support collaborative decision-making and empowerment around the Project outcomes. The method of involvement may vary with the different groups. Participation should occur only if there is an added-value outcome, and in some instances disclosure of the Project and its findings may be all that is required. As part of the project, IFC will set up a page within its website to share approved documents and to inform the public.

See the SEP for the Strategic Environmental Assessment for Myanmar's Hydropower Sector.

1. Project Management

Institutional Arrangements

The Consultant will report directly to IFC.

The consultant will be responsible for coordinating and organizing all activities and consultations that fall within the scope of this ToR, including liaising with government and private sector stakeholders in Myanmar.

IFC will facilitate the creation of a multi-stakeholder *Myitnge Basin CIA Coordination Group (CG)* to oversee implementation of the integrated CIA (Objective 1).

The CG will include representatives from private sector developers active in the Myitnge Basin, relevant Government of Myanmar agencies (MOEE, MONREC, DWIR) and IFC.

The CG will meet periodically during the course of the project to enable key stakeholders to efficiently engage in the CIA process, facilitating the sharing of data, reports, management plans and information related to the environmental and social impacts of respective developers' projects.

Work Plan and Schedule

- The anticipated period of project implementation is ***10 months***.
- Mobilization and the integrated CIA portion of the Project (Objective 1) is anticipated to last approximately 6 months of intensive inputs.

- Remaining tasks under Objective 2 and 3 will require intermittent inputs over the remaining 4 months, but may be phased to overlap with the final few weeks of CIA work.
- Consultant teams should be appropriately staffed to ensure sufficient resources to support rapid mobilization and implementation.
- The consultant teams will work from home, Yangon (IFC office) and in the field. Person days should show how many days will be at home and in the field.

Deliverables

The schedule for key deliverable submission is presented in the table below:

Deliverable	**Description**	**Due by***
Inception Workshop (2 days) and Reporting	Day 1: Presentation of proposed Project vision and objectives; institutional arrangements, roles and responsibilities; workplan and schedule of tasks under Objective 1 (Integrated CIA) and Objective 2 (Platform); information/data requirements; etc. Day 2: Seminar focusing on the business case for CIAs; Rapid Capacity Building Needs Assessment. Inception Report including: Project Implementation Plan; Risk/issues Log and Management Plan; Standalone Integrated Cumulative Impacts and Power Optimization Assessment Plan; Summary of Inception Workshop; Stakeholder Engagement Plan; Rapid Capacity Building Needs Assessment Report.	Draft Report: 3 weeks Workshop: 5 weeks Final Report: 6 weeks
Interim Workshop (1 day) and Reporting	Workshop to provide an update on project progress; present findings from Tasks A) - D) under Objective 1; update project workplan; update plan for remainder of Integrated CIA; discuss risk/issues log; conduct a planning session for tasks under Objective 2. Interim Report on items above; Summary of Interim Workshop; Capacity Building Plan.	Draft Report: 12 weeks Workshop: 15 weeks Final Report: 16 weeks
Integrated Cumulative Impacts and Power Optimization Assessment Workshop (1 day) and Report	Workshop to present / verify findings from Tasks A-J under Objective 1 and seek buy-in on the outcomes and recommendations. Integrated Cumulative Impacts and Power Optimization Assessment Report on items above, plus a summary of the workshop proceedings.	Draft Report: 22 weeks Workshop: 25 weeks Final Report: 28 weeks
Framework for Myitnge Basin Cumulative Impact Co-Management Platform	Report on outcome of Tasks under Objective 2	Draft Framework: 30 weeks

Capacity strengthening workshops	3 x 2 day workshops on: 1) Key issues emerging from the CIA 2) Orientation: The proposed Myitnge Basin Platform 3) Power optimization assessment for sustainable hydropower planning 4) And/or other topics with prior approval from IFC.	 30 weeks 34 weeks 35 weeks
Final Project Workshop (1 day) and Reporting	Workshop to provide a Project implementation summary; present summary of final findings and recommendations from Objective 1 and Objective 2; discuss risks/issues/lessons learned for post-Project phase. Final Project Report on items above and annexes: Summary of Capacity Building Workshops; Recommendations to improve CIA Guidelines *(updating the Guidelines is not part of the scope)*. Final Framework for Myitnge Basin Cumulative Impact Co-Management Platform; Summary of Capacity Building Activities and Future Recommendations.	Draft Report: 35 weeks Workshop: 38 weeks Final Report: 42 weeks
Final stakeholder meetings and dissemination	Series of activities to disseminate Project outcomes to stakeholders and ensure awareness of ongoing processes – e.g. Platform; Hydropower Developers' Working Group (HDWG).	40-42 weeks

**in weeks after contract signing*

All draft deliverables should be presented in English, with draft and final deliverables also translated into Myanmar at the Consultant's expense. Translation should be provided for key documents and at workshops to ensure facilitation of materials (including simultaneous translation).

All workshop materials should be provided to IFC for approval at least 2 weeks in advance.

The consulting firm will be required to give an oral presentation and respond to any questions arising at CG meetings.

Final deliverables will be subject to the acceptance of IFC.

All maps generated must be approved by IFC and based on World Bank Group policy.

2. Consultant Qualifications

The Consultant team should be appropriately structured with sufficient resources of qualified international and national consultants to ensure timely mobilization and high quality implementation.

The Consultant team should include an appropriate gender balance.

The Consultant should nominate all specialists required to complete the Project, present the rationale for each position proposed and the envisaged level of (home/field) inputs in person days.

Curriculum Vitae (2 pages maximum) should present tailored information for each key expert and a statement confirming their availability.

Required non-key experts may include translators, interpreters, research assistants and support staff (CVs not required).

Consultants' technical proposals should provide an explanation of how any consortiums or sub-consultants would work together in this Project, outlining who will do what, clarifying lead and supporting roles, and indicating level of input of specialists - full time, part time, short term, etc. The key expertise required in the Consultant team comprises:

International Team Leader / Cumulative Impact Assessment Specialist (Hydropower)

- Master's Degree or higher in Environmental Science, Environmental Engineering or a related field
- At least 10 years of relevant experience in undertaking CIA and/or ESIA for renewable energy projects in multiple countries, particularly cascading hydropower projects
- Understanding of the IFC CIA Good Practice Handbook and IFC Sustainability Performance Standards
- Substantial international experience, in addition to an excellent understanding of hydropower development and river basin co-management in the Greater Mekong Subregion
- Excellent verbal and written communications skills in English.

National Team Leader (Renewable Energy)

- Degree (preferably a Master's Degree) in
- Environmental Science, Environmental Engineering or a related field
- At least 8 years of relevant experience in undertaking CIA and/or ESIA for renewable energy projects
- Experience and an excellent understanding of river basin co-management in Myanmar and/or the Greater Mekong Subregion
- Good verbal and written communications skills in English.
- Local understanding and experience of working with the Myitnge River Basin will be an advantage.

A suitable combination of international and national specialists covering the following areas of expertise:

Water Resources Engineering / Hydrology

- Degree (preferably a Master's Degree) in Water Resources Engineering or Hydrological Engineering
- At least 15 years of relevant experience in water resource management, hydrological and hydraulic modelling for basin management
- Excellent understanding of and/or expertise in issues related to hydropower projects, basin wide hydropower optimization, dam flow releases and impacts associated with developing and operating cascading hydropower projects.
- Experience in Myanmar and/or the Greater Mekong Subregion

Power System Engineer

- Degree (preferably a Master's Degree) in Electrical Engineering
- At least 10 years of relevant experience in power system planning including load forecasting, generation planning / optimization and transmission grid development with a particular focus on hydropower projects.

- International experience with a very good understanding of power system developments in the Greater Mekong Subregion.

Civil Engineering (Hydropower)

- Degree (preferably a Master's Degree) in Hydropower Engineering or Civil Engineering
- At least 15 years of relevant experience in hydropower engineering and civil works associated with hydropower development including HPP related river basin planning/master plans, dam siting, powerhouse site selection, optimization of HPP parameters, cost estimates, dam construction, tunnel construction, workplace health and safety, etc.
- Excellent understanding of identifying impacts associated with optimal dam/powerhouse configuration to minimize cumulative impacts of cascading hydropower projects.
- Experience in Myanmar and/or the Greater Mekong Subregion.

Biodiversity / Ecology

- Degree (preferably a Master's Degree) in Ecology or a related field
- At least 8 years of experience with aquatic and terrestrial biodiversity of relevance to hydropower
- Experience in Myanmar and/or the Greater Mekong Subregion

Social Development

- Degree (preferably a Master's Degree) in Sociology or Anthropology or a related field
- At least 8 years of experience in conducting CIA and/or social impact assessments
- Strong experience in socio-economic analysis of project impacts in Southeast Asia, preferably with indigenous communities in Myanmar or the Myitnge River Basin.

Stakeholder Engagement

- Degree in Communications, sociology, governance or a related field
- At least 8 years of experience in stakeholder consultation/dialogue across Myanmar or the Mekong region.
- Direct experience in the Myitnge River Basin and the hydropower sector is desirable.

GIS specialist

- Relevant Information Technology qualifications
- At least 5 years of experience managing GIS spatial data and mapping