The Kingdom of Cambodia

Environmental and Social Management Framework (ESMF)
For the Rural Electrification and Transmission Project (RETP)

(January 2010)
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1.0 BRIEF PROJECT BACKGROUND

The Rural Electrification and Transmission Project, RETP, is jointly financed by the Kingdom of Cambodia, the International Development Association (The World Bank), the Asian Development Bank (ADB), the Global Environment Facility (GEF) and other private funds. In January 2010, the RETP was restructured and will inter alia, finance the services of a Consulting Firm (the consultant) to prepare the Feasibility Studies (FS), Detailed Engineering Designs (DED) and Bidding Documents (BD), for the following types of renewable energy sub projects: mini and micro hydro power, biomass plants (BP) and solar housing systems (SHS). These documents, the FS, DED and BD and the stated Environmental and Social Safeguards documents required in this ESMF will collectively be known for the purposes of this ESMF as the Package of Documents (PD) for each sub project. This PD in its entirety will be prepared the consultant for each sub project.

The RETP funds will only finance the preparation of the PD for the sub projects and not the implementation of the sub projects. Financing of the sub projects investments will be through the Rural Electrification Fund (REF) and/or local commercial banks.

1.1 Objectives of the Environmental and Social Management Framework (ESMF)

The main objective of the ESMF is to provide the mechanisms for RETP sub projects to comply with the Kingdom of Cambodia’s relevant environmental and social laws, and the World Banks Safeguards policies, thus ensuring that at the time the sub projects are being prepared and appraised, all required environmental and social management measures are established, thereby enhancing the opportunities for sub project sustainability.

The ESMF also seeks to provide detailed technical guidance to the Consultant for preparation of all required environmental and social management plans.

1.2 Assumptions

In designing this ESMF, the following assumptions for each category of sub project were made to ensure relevance for and a close fit to the scale and intensity of the potential issues to be addressed in each type of sub project to satisfy both requirements of the Kingdom of Cambodia and that of the World Bank.

1.2.1 Mini and Micro hydro power type sub projects

- The total cumulative installed capacity of all these types of sub projects would not exceed 7mw.
- The maximum installed capacity for any individual plant will not exceed 2.5mw.
- These will be developed in rural areas with hydro power potential to serve off grid nearby rural communities.
- The Consultant is being recruited to prepare the PD for each hydro power sub project.
- The consultant will be a firm made up of a team of experts comprising environmental and social expertise.
- Each sub project will have to be commercially viable for it to be financed. Environmental and social management costs will be included in the financial and economic analysis for each sub project and will influence commercial viability of the sub project.
These fully designed sub projects will then be owned and implemented by either REF or be competitively offered to the private sector to own and operate.

- The sub projects will not be run-of-river; hence will require intake structures and dry season storage.
- The main sub project components will be; (i) a weir to regulate dry season flows, creating a shallow reservoir (less than 4m deep) all within the existing river channel, (ii) Penstock or open earth channel to transfer intake and return flows, and (iii) a power house.
- No transmission lines will be included in these sub projects, only distribution lines.
- Approximate average cost of individual sub projects is $2m (for an average 1.2mw sized plant)

1.2.2 Solar Home System (SHS) sub projects

The REF will fund the purchase of 12,000 (twelve thousand) SHS units. The units will comprise of the following main items: Solar Panel, Battery for power storage and domestic lighting lamps, and switch board panel. Since this is a nationwide program with a pro poor target, special efforts to provide indigenous minority communities with this benefit will be made. The specifications for these are:

**Solar Panel** – The photovoltaic modules would comprise of no less than 36 series-connected single or poly-crystalline silicon solar cells. Flat plate thin-film modules could also be used. Cells would be laminated between high transmissivity low iron tempered glass and weather resistant back-sheet to protect moisture penetration. The photovoltaic module would have a peak power output of at least the specified rated value respectively under Standard Test Conditions (STC) as defined in IEC 60904-1. The peak power output for thin film modules would be the value after light soaking.

**Battery** - The battery will be sealed valve regulated lead acid (VRLA) and AGM type (Absorbed Glass Mat), either of flat or tubular plate.

**Lamps** - The lamps will be 12V 7W DC energy saving compact fluorescent lamps (CFL) of E27 screw type base. Each lamp should have its own inverter (electronic ballast). Each lamp should be provided with a reflector and a holder that can be installed from the ceiling or attached to the wall.

1.2.3 Biomass Sub Projects

The plants will be no more than few hundred KW (<300kw), will be fueled using agricultural waste such as rice husk and will supply off grid customers using own distribution system. Therefore the scope of this ESMF is limited and restricted by these assumptions.

2.0 RETP INSTITUTIONAL AND IMPLEMENTATION ARRANGEMENTS

2.1 Rural Electrification Fund (REF)

The REF is the implementing agency for these renewable energy type sub projects. The REF is already established and is fully operational. The REF consists of a Board chaired by the Minister of MIME and a secretariat, and its main functions are to implement this component of the RETP and to manage the RETP’s investment fund that will finance the sub project investments.
The consultant preparing the PD will be contracted by and will report to the REF. Once the PD is completed for each sub project, and all approvals, endorsements and licenses are received, sub projects will be submitted to the REF for funding. Sub projects not funded by the REF may also be submitted to local commercial banks for financing. The REF has the option to also implement the sub projects, and sub projects that the REF do not implement, will be offered to the private service providers on a competitive basis.

The REF has a Technical Unit, headed by a Technical Officer with responsibility for the safeguards oversight of each sub project and the RETP will provide Technical Assistance (TA) as needed to carry out these responsibilities.

2.2 Electricity Authority of Cambodia (EAC)

The EAC is the regulator for the sector and inter alia, has the responsibility for issuing licenses to all operators in the sector, in exercise of the powers conferred by Article 7 and 35 of the Electricity Law promulgated by the Royal Decree NS/RKM/021/03, dated February 02, 2001. One of the conditions for license issuance by the EAC to a sub project applicant is proof of written approval/clearance from the Department of Environmental Impact Assessment, Ministry of Environment, and endorsement of the sub project by the Ministry of Industry, Mines and Energy.

2.3 Electricite du Cambodge (EdC)

The EDC is the state owned power utility company and are the dominant actor in the sector and due to the relatively small scale of the sub projects in the RETP, EdC is not expected to be interested in implementing these types of sub projects.

2.4 Ministry of Industry, Mines and Energy (MIME)

The MIME is the coordinating and policy ministry for these three sectors. The Minister of MIME is also the Chairman of the REF board and all sub projects will have to be endorsed by the MIME before they are submitted to the REF for funding.

2.5 Ministry of Environment (MoE)

The MoE has responsibility for reviewing and approving the Environmental Assessments and Environmental Management Plans (EMP) of the sub projects as per the requirements of the Law on Environmental Protection promulgated by Royal Decree NS/RKM/1296/36, dated 24/12/1996 and other sub decrees on Environmental Protection of the Kingdom of Cambodia.

2.6 Private Service Providers (PSP)

A number of licensed PSP already exist in the sector in Cambodia, generating and distributing electricity to rural households through off-grid connections. Under the RETP, PSP’s will continue to have that opportunity and can participate in the project by implementing the sub projects. Under the terms of the RETP, PSP’s will have the opportunity to bid for these sub projects and successful bidders will be awarded the sub projects with already completed PD, prepared by the consultant and funding from either the REF and/or local commercial banks.
PART 1
ESMF REQUIREMENTS FOR HYDROPOWER TYPE SUB PROJECTS
3.0 REQUIREMENTS OF THE GOVERNMENT OF THE KINGDOM OF CAMBODIA

3.1 Land Law

The Constitution of Cambodia provides for land acquisition for public purposes. In Article 20 it states that “Nobody shall be forced to transfer his or her ownership, if forcing is necessary in public interest and if no proper and just indemnity has been paid to owner”. Regarding compensation, Article 40 of the Constitution states that “…The right to confiscate (land) possession from any person shall be exercised only in the public interest as provided for under law and shall require fair and just compensation.”

The new 2001 Land Law provides that no person shall be “deprived of their ownership unless this action is for the public interest consistent with formalities and procedures provided by laws and regulations, and after just and fair compensation”.

3.2 Environment Law

The Law on Environmental Protection and Natural Resource Management, Preah Reach Kram/NS-RKM-1296/36, was enacted on November 18, 1996 is the main protecting the environment and Article 6 of the law specifically requires environmental impact assessment of all proposed projects under procedures determined by sub-decree by the Ministry of Environment. Article 7 of the law states “The Ministry of Environment shall consider and make recommendations on the preliminary Environmental Impact Assessment or Environmental Impact Assessment to relevant competent bodies within a period as determined in the Law on Investment of the Kingdom of Cambodia.” Articles 16, 17 and 18 require public participation and dissemination of information in the EA process and lays procedures for this.
# 4.0 WORLD BANK ENVIRONMENTAL AND SOCIAL SAFEGUARDS POLICY REQUIREMENTS

## 4.1 Triggered Environmental Safeguards Policies

<table>
<thead>
<tr>
<th>Environmental Assessment OP 4.01</th>
<th>These micro and mini hydro power projects will potentially cause significant adverse environmental impacts. Hence OP4.01 is triggered by all sub projects in RETP.</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Environmental Assessment</td>
<td>• Undertake detailed qualitative and quantitative analysis to determine impacts.</td>
</tr>
<tr>
<td>• Environmental Management Plan</td>
<td>• Determine tangible measures to prevent, minimize, mitigate or compensate for these adverse impacts.</td>
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<td>• Requires Public Consultation and Disclosure, for each sub project, as part of the EA process.</td>
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<td>• Requires EMP to address set of mitigation, monitoring and institutional measures to be taken during implementation and operation of the sub projects.</td>
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<table>
<thead>
<tr>
<th>Natural Habitats OP4.04</th>
<th>This policy requires the conservation of natural habitats and specifically prohibits the support of projects that involve significant conversion or degradation of critical natural habitats, as defined by the policy.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Issues addressed as an integral part of the EA and EMP</td>
<td>This policy will apply to all sub projects as activities will include access roads, operation of a weir to manage dry season flows, thereby seasonal flooding of river channels. Also, transfer of flows via penstock or open channels, will disturb land within these corridors.</td>
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<tr>
<td></td>
<td>• EA to identify impacts on biodiversity and species and determine endemism, endangered species, and</td>
</tr>
<tr>
<td></td>
<td>• Determine impacts on these species and propose acceptable mitigation and monitoring measures.</td>
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This policy seeks to avoid the disturbance and or destruction of PCR as defined by the policy, by project activities. PCR include places of worship (temples etc), buried artifacts, cemeteries,
| Physical Cultural Resources (PCR) (OP4.11) | archeological assets, etc.  
Cambodia is endowed with many of these resources throughout the Kingdom, and since the project activities will require seasonal flooding of river channels and fairly significant construction activities, all sub projects will trigger this policy. |
<table>
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<tbody>
<tr>
<td>Issues addressed as an integral part of the EA and EMP</td>
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</table>
- EA to undertake and exhaustive desk review and/or site investigation to pre-identify and locate PCRs.  
- EA/EMP to propose management measures.  
- Include chance finds clause in civil works contracts. |
| Forests (OP4.36) | This policy seeks to address the management, conservation and sustainable development of forest ecosystems and their associated resources. |
| Issues addressed as an integral part of the EA and EMP | This policy prohibits the support of sub projects that would involve significant conversion or degradation of critical forest areas or related critical natural habitats as defined by the policy.  
Sub projects that are located near forest and or are accessed through forests, pose considerable risks to this policy’s requirements and therefore this policy will apply to only those sub projects that pose this risk. |
| - EA will identify these areas in the sub project impact zones and will first seek to avoid impact to these areas by relocating and or re-siting the sub projects or any of its sub components.  
- Where this is not feasible, the EA and EMP will provide tangible mitigation measures to manage impacts on these areas. |

4.2 Triggered Social Safeguards Policies  
Addresses direct economic and social impacts from RETP sub projects that will cause (a) involuntary taking of land resulting in (i) relocation or loss of shelter, (ii) loss of assets or access to assets or (iii) loss of income.
### Involuntary Resettlement (OP4.12)

**Addressed through following policy instruments:**
- Resettlement Policy Framework (RPF)
- Resettlement Action Plans (RAPs)

### Sources or Livelihoods

Sources or livelihoods and (b) involuntary restriction of access to legally designated parks and protected areas resulting in adverse impacts on the livelihoods of the displaced persons.

Sitting of sub projects to be so chosen so as to avoid these impacts altogether or to minimize them to the extent possible. Sub projects that cannot avoid these impacts altogether will trigger this policy requiring the preparation of RAPs.

Community donations of lands is not acceptable in the case of location-specific infrastructure (such as dams or reservoirs).

- RPF already exist for this project.
- RPF is to be followed when preparing sub project RAPs when they are required.
- Consultation with potentially affected people will be required.

### Indigenous Peoples (OP4.10)

**Addressed through the following policy instruments:**
- Ethnic Minority Development Framework (EMDF)
- Ethnic Minority Development Plan (EMDP)

This policy requires the Government of the Kingdom of Cambodia to engage in a process of free, prior and informed consultation with Indigenous peoples, as defined by the policy, affected by the sub project.

The World Bank can only support the sub project where the process of free, prior and informed consultation results in broad community support of the sub project by the affected indigenous groups. If this is the case, then the sub project must include measures to (a) avoid potentially adverse effects on these groups, or (b) when avoidance is not feasible, minimize, mitigate, or compensate for such affects.

This policy further requires that the sub project be designed to ensure that these groups where they are present in the sub project area benefit from the sub project. This means that these groups must be given the opportunity to benefit directly from a sub project in their area through access to electricity from the sub project.
• The EMDF (called an ethnic minority development strategy) was prepared for this project in 2003. This EMDF will be updated for closer alignment of the re-structured project objectives and will include updates in Bank and governmental policies and regulations on indigenous peoples, including their demographics. The updated EMDF is to be followed when preparing sub project EMDPs when they are required. Determination of whether or not to prepare the subsequent EMDPs will be based on a screening for indigenous peoples in proposed project sites that will be carried out by the WB Task Team. The EMDP will include measures to mitigate adverse effects including means to ensure access to project benefits.

• Informed consultation with potentially affected indigenous people/groups will be required.
Rural Electrification and Transmission Project (RETP)
Environment and Social Management Framework (ESMF)

5.0 RETP PROJECT IMPLEMENTATION ARRANGEMENTS

**Step 1: Project Documentation**
- Consultant Team prepares complete package of documents (PD) for each hydropower sub-project.
- The complete PD consists of Feasibility Study Report (FS), Detailed Engineering Design (DED), Environmental Assessment (EA), Environmental Management Plan (EMP), Resettlement Action Plan (RAP), Ethnic Minority Development Plan (EMDP), Operational Plan (OP) and Bidding Documents (BD). The RAP and EMDP may not be always required.

**Step 2: MoE Approval**
- Rural Electrification Fund (REF) to submit EA and EMP to Ministry of Environment (MoE) for approval of these documents.
- Likewise, REF to submit RAP and EMDP to the relevant ministry for approval when required.

**Step 3: MIME Endorsement**
- REF to submit complete PD for each sub-project to the Ministry of Industry Mines and Energy (MIME) for concession endorsement. Minister of MIME is the chairman of the REF.
- MIME endorses sub-project.

**Step 4: Licensing**
- Following endorsement of sub-project by MIME, REF or sub-project PSP operator applies to the electricity regulator, Electricity Authority of Cambodia (EAC), for a license to operate the sub-project.
- EAC issues license (one of the criteria for issuing license is receipt of MoE approval)

**Step 5: Funding Approval**
- REF board approves sub-project for funding.
- Option exists for submission of sub-projects to local commercial banks for funding as well.

**Step 6: Implementation**
- Once funding is secured, the sub-project owner and operator, which can be either the REF or local private sector can start implementing their sub-project in accordance with the PD.
### 6.0 DETAILED ENVIRONMENTAL AND SOCIAL MANAGEMENT PROCESSES TO BE FOLLOWED BY THE CONSULTANT

<table>
<thead>
<tr>
<th>Stage</th>
<th>Action Required</th>
<th>By Whom and How</th>
</tr>
</thead>
</table>
| 1. Carefully and Diligently choose site locations | Choose location based on technical engineering criteria/issues for mini or micro hydro power. Key Issues to be considered that affect site selection and environmental and social impacts are:  
- Access to location.  
- Maximum Head requirement.  
- Wet and Dry Season Water Flows  
- Location of Weir  
- Height of Weir  
- Required Length of temporary (dry season) storage reservoir in river channel.  
- Location of Power House  
- Transfer of flow to Power house by Penstock or Open Channel.  
- Length of Penstock/Open Channel  
- Submerged/underground Penstock or surface  
- Return of Flow from Powerhouse back to river.  
- Distance between point of flow intake on river to return flow on river, i.e., the distance between upstream and downstream points on the river.  
- Need for inter-basin transfer to increase dry season flow.  
- Proximity of potential customers.  
- Distribution Grid requirements. | The Consultant team of Engineers will include qualified Environmental and Social Specialists.  
Environmental and Social Experts on the Team to provide preliminary guidance and to accompany rest of the team on sites visits during this stage and will use detailed geological and other technical maps.  
Selected sites will be identified clearly on these maps. |
| 2. Identify Engineering/Technical Options | Preparation of schematic engineering design drawings, with required plans, sections and elevations of all relevant features such as reservoir, weir, penstock or | The consultant team will prepare schematic Design Drawings. |
### 3. Carry Out Part 1 of Environmental and Social Assessments (which is Analysis of Alternatives)

<table>
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<tr>
<th>open channel, powerhouse and downstream flow management, distribution grids, all on appropriate scaled drawings.</th>
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</table>

Based on scheme design drawings from stage 2 above:

- Under take preliminary (part 1) Environmental Impact Analysis.
- Simultaneously undertake preliminary social assessment to determine (i) land acquisition needs, estimate number of households/peoples who might be affected, how they may be affected, whether by physical relocation, loss of livelihoods and or loss of economic assets, and (ii) presence of Ethnic Minorities, (via a screening exercise to be carried out with the World Bank) estimate numbers of them and how they may be affected.
- Based on preliminary impacts from EA and SA, determine possible mitigation measures for each.
- These mitigation measures are to be based on compliance with all applicable laws of Cambodia and World Bank Safeguards policies.
- Calculate cost estimates of these EA and SA corresponding proposed Mitigation measures.
- Determine which of these EA and SA impacts can be avoided by relocation of some or all of the engineering infrastructure/features of the design and indicate these possible site locations on maps.
- First round consultations may be necessary at this stage with

The consultant EA and SA team experts will undertake these activities using the guidance given in this stage.
| 4. Input findings of EA and SA into Financial and Economic Analysis part of the Feasibility Study and based on results decide whether to return to Stage 1 above or continue to next stage below | Add these environmental and social management costs into the financial and economic analysis to:
- Determine from a financial and economic sense, if sub project is still commercially viable. If Yes, proceed to next steps.
- If No, then consider alternatives proposed in 3 above, which will include relocation of certain features, re-design of the entire sub project and or selection of an entirely new site location.
- May also consider downsizing the sub project to reduce impacts.
- Result of this stage may be to go back to Stage 1 or continue with sub project as is (i.e. existing scheme design) or with modifications, to stage 5. | Entire consultant team (including EA and SA) experts consulting closely with the REF. |

| 5. Finalize EA and Social Documents. | If decision is made to continue to this stage, then more detailed EA and SA work is required to provide adequate level of analysis and details of the impacts and then to prepare the appropriate mitigation plans, also to the required detail. These plans will include;
- Final Environmental Assessment Report (EA).
- Environmental Management Plan (EMP) to be implemented during all four phases of the project which are (i) Design Phase, (ii) Construction Phase (iii) | For the EA and EMP, this ESMF provides key technical information/guidance to the consultants EA team to complete this work. For the completion of the RAPs and EMDPs when required, the consultants SA team will be guided by the Resettlement Policy Framework (RPF) and the Ethnic Minorities Development Framework (EDMF). |
### Rural Electrification and Transmission Project (RETP)

#### Environment and Social Management Framework (ESMF)

<table>
<thead>
<tr>
<th>Operational Phase and (iv) Maintenance Phase.</th>
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<tbody>
<tr>
<td>- Resettlement Action Plans - if required.</td>
</tr>
<tr>
<td>- Ethnic Minority Development Plans – if required.</td>
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<tr>
<td>- Consultations with affected groups to be carried and finalized during preparation of these documents.</td>
</tr>
<tr>
<td>- Final EA, EMP, RAP and EMDP documents are to be translated into Khmer for each project and then to be disclosed publicly, locally in Cambodia.</td>
</tr>
<tr>
<td>- If indigenous minority communities are impacted, these documents will also be made available to them in a manner and location that is accessible by them (i.e., their local language or other forms of communication).</td>
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</table>

| This ESMF and the RPF and EMDF have already been publicly disclosed both locally in Cambodia and at the World Banks infoshop. |
| The EA, EMP, RAPs and EMDP's will all be reviewed and approved for use by the Ministry of Environment for EA plans, before a license is issued by EAC. |

<table>
<thead>
<tr>
<th>6. Finalize F.S., detailed engineering designs and contract documents</th>
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<tbody>
<tr>
<td>Completion of detailed engineering designs incorporating the design stage mitigation measures in the EMP. Construction stage mitigation measures in the EMP will be incorporated into the civil works contracts (specifications, Bills of Quantities and contract clauses) to ensure they are adequately priced and enforceable. Operational and Maintenance Stage mitigation measures will be incorporated into the overall projects Operational plan.</td>
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<thead>
<tr>
<th>Entire Consultant team.</th>
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<tr>
<th>7. Implementation of RAP before sub project starts on site.</th>
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<tbody>
<tr>
<td>For sub project activities on all land affected by involuntary resettlement, the resettlement action plans will have to be implemented in full, before taking of that land by the sub project.</td>
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</table>

| REF to strictly enforce this. |
### 7.0 POTENTIAL ADVERSE IMPACTS

<table>
<thead>
<tr>
<th>Impacts</th>
<th>Main Causes</th>
<th>Location/Sub Project component causing impact</th>
<th>Description of Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disturbance and/or Loss of Habitat</td>
<td>Inundation/flooding of river channel, river banks and potentially adjacent land.</td>
<td>Reservoir area Impoundment of flow due to construction and operation of Weir in the river channel. Penstock and open channel corridor alignments.</td>
<td>Loss of Biodiversity (flora and fauna), including fish species. In addition to biologically losses, economic, livelihood and nutritional losses possible. Impact on human settlements due to loss of land leading to physical relocation of communities, loss of economic assets or access to these assets. Enhanced destruction of otherwise poorly accessible or previously inaccessible forest resources.</td>
</tr>
<tr>
<td>Loss of Physical Cultural Resources (PCR)</td>
<td>Flooding Construction</td>
<td>Throughout project area.</td>
<td>Disturbance and or destruction of PCR’s such as places of worship (temples etc), buried artifacts, cemeteries, archeological etc.</td>
</tr>
<tr>
<td>Deterioration of Water Quality</td>
<td>Large Stagnant water bodies over long time horizons.</td>
<td>Inundated area.</td>
<td>Longer water retention times, de-oxygenation, and flooded biomass. Reduced flows can cause increase in</td>
</tr>
<tr>
<td></td>
<td>Reduced downstream flows.</td>
<td>Locations downstream of the weir.</td>
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</tbody>
</table>

- **Reservoir area**: Impoundment of flow due to construction and operation of Weir in the river channel. Penstock and open channel corridor alignments.
- **Access roads**: Sub project location creating new or improved access to forest resources.
<table>
<thead>
<tr>
<th>Environment and Social Management Framework (ESMF)</th>
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<tbody>
<tr>
<td><strong>Excessive Deposition and Sedimentation.</strong></td>
</tr>
<tr>
<td>Excessive removal of natural vegetation cover on large areas of land/slope faces.</td>
</tr>
<tr>
<td><strong>Upstream face of Weir Construction sites.</strong></td>
</tr>
<tr>
<td>Siltation in the reservoir, reducing capacity of reservoir.</td>
</tr>
<tr>
<td><strong>Downstream Hydrology Changes</strong></td>
</tr>
<tr>
<td>Reduced flows.</td>
</tr>
<tr>
<td>Locations immediately downstream of weir.</td>
</tr>
<tr>
<td>Loss of riparian ecosystems dependant on seasonal natural flooding.</td>
</tr>
<tr>
<td>Loss of fish and other aquatic species.</td>
</tr>
<tr>
<td>Less availability of water for downstream users for irrigation, water supply.</td>
</tr>
<tr>
<td>May exacerbate water pollution.</td>
</tr>
<tr>
<td>Economic effects from loss of navigation access for inland transportation of people and goods (on ferries, barges etc)</td>
</tr>
<tr>
<td><strong>Construction Impacts</strong></td>
</tr>
<tr>
<td>Heavy footprint of Construction Activities</td>
</tr>
<tr>
<td>Mostly Weir, penstock and open channel corridors, access roads and power house location.</td>
</tr>
<tr>
<td>Clearance of natural vegetation, generation and management of large amounts of spoil material, quarry management issues, borrow pits, construction camps,</td>
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</table>
8.0 OPTIONS FOR MITIGATION

The most important environmental mitigation measure for these hydro power type sub projects is good site selection for the Weir and Power House. Use the Analysis of Alternatives part of EA process to make iterative adjustments and re-siting of the weir and power house to minimize as much as technically and economically feasible, the inundated area, water retention times, length of penstock/open channels, reduced downstream flows, involuntary resettlement and access to forest and/or other protected areas.

<table>
<thead>
<tr>
<th>Impacts</th>
<th>Mitigation Measures to consider, for (i) enhanced sustainability, (ii) managing impacts and (iii) complying with Laws of Kingdom of Cambodia and relevant World Bank Policy.</th>
</tr>
</thead>
</table>
| Disturbance and/or loss of habitat          | - Minimize impact all together if possible, through good site selection.  
- Avoid siting in or close to environmentally sensitive habitats.  
- Restrict access to environmentally sensitive areas. Choose location of access carefully with this in mind. Close off construction access roads through sensitive areas after construction is completed  
- Minimize Height of Weir to maximum extent possible.  
- Minimize area in river channel to be flooded.  
- Do not flood areas beyond river channel, such as catchment areas,  
- Site power house as close to Weir location as possible to reduce length of penstock/open channels.  
- Consider trade-offs between underground and surface penstock, size of penstock.  
- Avoid offsetting loss of natural habitats; this is too complicated for subprojects this size. Consider Biomass or Solar Housing Systems in that case.  
- If endemic species and endangered species are to be impacted, avoid this impact altogether, too complicated for sub projects this size to manage. Consider Biomass or Solar Housing Systems in that case.  
- Consider installing a release valve in the Weir to ensure maintenance of riparian flows to sustain ecosystems downstream.  
- WB OP4.04 prohibits siting where significant conversion or degradation of critical natural habitats will occur.  
- Good construction practices.  
- Close monitoring |
| Loss of Physical Cultural Resources (PCR)    | - Avoid /minimize impacts on PCR  
- Where impacts cannot be avoided, provide in-situ |
### Rural Electrification and Transmission Project (RETP)

#### Environment and Social Management Framework (ESMF)

<table>
<thead>
<tr>
<th>Topic</th>
<th>Measures</th>
</tr>
</thead>
</table>
| **Deterioration of Water Quality** | - Reduce retention times.  
- Reduce reservoir areas.  
- Reduce water depths in reservoir.  
- Selectively clear land of biomass before inundation.  
- Reduce length of river impounded.  
- Maintain downstream flows close to seasonal dry season flows as much as possible.  
- During construction control erosion, sediment transportation and deposition through maintenance of natural vegetative cover or synthetic covers.  
- Avoid stock piling of spoil near river banks and cover stock piles during wet seasons. |
| **Downstream Hydrological Changes** | - Need to maintain riparian flows to maintain downstream ecosystems, fish species and other uses downstream.  
- Achieved through strategic management of water releases to closely mimic natural flood patterns as much as possible. Requires control valve mechanism in the Weir.  
- Exact amounts determined in EA process.  
- Discuss with downstream stakeholders as part of consultation process. |
| **Construction Impacts** | - Effective management plans for dust and noise control, spoil, quarry and borrow pit management and construction camps management.  
- Disturbed sites should be restored.  
- Siting or any new access roads should be in the environmentally and socially least sensitive areas. Sensitive areas (forests etc) along the access road should be legally and physically protected on-the-ground.  
- Good drainage of sites and treatment of run-offs required in some cases. |
9.0 REQUIREMENTS FOR SUB PROJECT ENVIRONMENTAL IMPACT ASSESSMENTS (EA) REPORTS

The consultant will conduct the environmental analysis of the sub project in a two part process, consistent with requirements stated in Chapter 6 of this ESMF. The function of each part of the EA process is as follows:

Part 1 of the EA – is to provide an opportunity early in the process to inform and influence the feasibility design stage, so that environmental issues are taken into account before the sub project design is finalized and detailed engineering designs are being prepared.

Part 2 of the EA – to finalize the EA based on final sub project design.

Therefore, the consultant will carry out the following tasks for each Part:

**Part 1 of the EA- Analysis of Alternatives for the Feasibility Study to consider**

- **Task 1** – Baseline Data - Determine and assess the key biophysical and social features in sub projects area of influence. This would be determined through desk study of relevant documents and maps, site interviews, site investigation and surveys, to obtain data on river hydrology, rainfall, presence of environmental sensitive areas such as forests, wetlands, mountainous area, etc, land use, geology, land forms, identification aerial, terrestrial and aquatic flora and fauna species, land users, no. households in the project area, their socio cultural identity, downstream users, downstream ecosystems, etc. The purpose of this is to establish the pre-sub project baseline.

- **Task 2** – Preliminary Impact Analysis – The sub project impact would be the changes to the baseline by the sub project activities. Determine and quantify on a preliminary basis, the adverse environmental impact.

- **Task 3** - Propose Preliminary Mitigation Measures – develop tangible mitigation measures to avoid, reduce or otherwise manage to acceptable levels, in compliance with local requirements, World Bank policies and/or international best practice.

- **Task 4** – Cost estimates of these Mitigation Measures – develop preliminary cost estimates for each mitigation measure proposed.

- **Task 5** – Analysis of Alternatives – develop alternatives to proposed sub project site location, weir ht, reservoir depth and length, etc, technology (i.e. biomass or solar housing systems, etc) including “without sub project “situation with aim of avoiding or reducing impacts. For each alternative, quantify the impacts to the extent possible and estimate costs of mitigation measures where possible.

- **Task 6** – Consultations – The consultant will carry out initial consultations to sensitize potentially impacted people and groups on the sub project impacts and proposed mitigation measures, to obtain their views and to take that into account in the sub project design and in Task 5 above.

- **Task 7** – Temporarily stop EA work and report findings – These are then reported back to the entire consultant team and the REF, and the costs are inputted into the financial and economic analysis to determine what impact the environmental and social management costs of the proposed sub project preliminary design would have on the internal rate of return (IRR) and commercial viability of the sub project.

- **Task 8** – Together with the REF a decision is made to re-site or make changes as suggested in Task 5 above to improve the IRR of the sub project, or to cancel the sub project all together,

- **Task 9** – Based on the decision made in Task 8 above the consultant repeats Task 1-8 above for sub projects that are modified/re-sited or move to Part 2 of the EA process for sub projects with the decision to continue.
Part 2 of the EA – Finalize EA

- **Task 10** – Once a decision is made to continue with the sub project, essentially the consultant will now confirm and finalize the baseline data, complete the qualitative and quantitative impact analysis, details of the mitigation measures and develop more accurate cost estimates, complete consultations and complete the EMP and EA report. The suggested format for the EA report is given below and that for the EMP is in Chapter 10 of this report.

**Suggested Structure of the EA Report**

- Executive Summary
- Sub Project Description
- Baseline Data
- Summary of compliance requirements for applicable local requirements and World Bank safeguards policies
- Analysis of Alternatives
- Environmental Impacts
- Environmental Management Plan – covers mitigation measures, monitoring and instructional arrangements and strengthening.
- Consultations – discusses the methodology used, those consulted, summary of issues raised and how they were addressed by the sub project.
Fig 9.1 illustrating the relationship between the Environmental Assessment Report and the Environmental Management Plan.
10.0 REQUIREMENTS FOR SUB PROJECT ENVIRONMENTAL MANAGEMENT PLANS (EMPS)

The consultant will prepare the EMP, which will be in four parts as shown in the table below.

<table>
<thead>
<tr>
<th>Environmental Management Plan</th>
<th>Design Stage – focus on mitigation measures that need to be incorporated into the detailed engineering design, e.g., adjustments and changes to be made to site location of each sub project component, mechanisms for riparian flow releases (e.g. valve in weir), etc.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Construction Stage – focus on mitigation measures to be taken by contractor during construction. These issues are to be included in the BD (e.g. BoQ, civil works contracts, etc) so that their implementation is enforceable.</td>
</tr>
<tr>
<td></td>
<td>Operation Stage – focus on mitigation measures to be taken during operation of the sub project, such as operation of the reservoir, riparian flow releases, clearance of reservoir before inundation, etc. These issues will need to be incorporated into the operational plan for the sub project.</td>
</tr>
<tr>
<td></td>
<td>Maintenance Stage – present any mitigation measures to be taken during the maintenance of the sub project, such as reservoir cleaning, removal of siltation in the reservoir, etc.</td>
</tr>
</tbody>
</table>
The actual contents of the EMP for each stage can be structured into a matrix such as this:

<table>
<thead>
<tr>
<th>Impacts</th>
<th>Mitigation Measures</th>
<th>Cost of Mitigation Measures</th>
<th>Institutional responsibilities – who will implement when and how</th>
<th>Monitoring Plan – who will monitor that (i) mitigation measures are implemented and (ii) their efficacy so change can be made if necessary.</th>
<th>Cost for Monitoring</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Monitoring Indicators</td>
<td>Who</td>
</tr>
</tbody>
</table>

The consultant can also expand on the issues in the table in text form.
11.0 REQUIREMENTS FOR SUB PROJECT RESETTLEMENT ACTION PLANS

The consultant will prepare the Resettlement Action Plan (RAP), for sub projects that trigger the World Bank’s Operational Policy on Involuntary Resettlement (OP4.12). These RAPs are to be prepared based on guidance given in the Resettlement Policy Framework (RPF).

The suggested format for the structure of the RAP:

Definition of Terms

Scope of Land Acquisition and Resettlement
Socio Economic Information
Objectives, Policy Framework and Entitlements
Consultation, Grievance Redress and Participation
Relocation and Rehabilitation
Income Restoration Strategy
Institutional Framework
Resettlement Budget and Financing
Implementation Schedule
Monitoring and Evaluation

12.0 REQUIREMENTS FOR SUB PROJECT ETHNIC MINORITY DEVELOPMENT PLANS (EMDP)

A screening for indigenous ethnic minority communities will be carried out once project locations are finalized. This screening determines whether EMDPs are developed or not.

For the micro hydro, the EMDP will include measures to mitigate adverse effects including means to ensure access to project benefits.

These EMDPs are to be prepared based on guidance given in the Ethnic Minority Development Framework (EMDF).

The format for the structure of the EMDP is as follows:

(a) Summary of the social assessment findings.
(b) A summary of results of the free, prior, and informed consultation with the affected Indigenous Peoples’ communities that was carried out during project preparation and that led to broad community support for the project.
(c) A framework for ensuring free, prior, and informed consultation with the affected Indigenous Peoples’ communities during project implementation.

(d) An action plan of measures to ensure that the Indigenous Peoples receive social and economic benefits that are culturally appropriate, including, if necessary, measures to enhance the capacity of the project implementing agencies.

(e) When potential adverse effects on Indigenous Peoples are identified, an appropriate action plan of measures to avoid, minimize, mitigate, or compensate for these adverse effects.

(f) The cost estimates and financing plan for this EMDP.

(g) Accessible procedures appropriate to the project to address grievances by the affected Indigenous Peoples’ communities arising from project implementation. When designing the grievance procedures, the borrower takes into account the availability of judicial recourse and customary dispute settlement mechanisms among the Indigenous Peoples.

(h) Mechanisms and benchmarks appropriate to the project for monitoring, evaluating, and reporting on the implementation of the EMDP. The monitoring and evaluation mechanisms should include arrangements for the free, prior, and informed consultation with the affected Indigenous Peoples’ communities.
PART 2
ESMF REQUIREMENTS FOR BIOMASS PLANTS (BP) AND SOLAR HOME SYSTEMS (SHS) SUB PROJECTS
13.0 GUIDELINES FOR BIOMASS PLANTS AND SOLAR HOME SYSTEMS

The potential adverse impacts associated with Biomass Plants and Solar Home Systems will be relatively minor and site specific and thus no formal Environmental Assessment will be required for these types of sub projects. These guidelines are provided to propose measures that need to be taken with regards these types of projects.

BIOMASS SUB PROJECTS

The consultant will prepare and EMP for construction, operational and maintenance stages, using the guidance matrix in Chapter 10.0 of this report. The main environmental issues to consider are:

- Air emissions from pollutant gases from the generating plant- comply with local emissions standards for emitted gases.
- Noise impacts from the generating plant.
- Green House Gas emissions from burning of agricultural waste – determine these and if significant suggest tangible ways offset.
- Storage, transportation and handling of the agricultural waste, such as rice husk, can lead to other forms of land pollution.

SOLAR HOME SYSTEM (SHS)

The RETP will centrally purchase twelve thousand (12,000) SHS units, which will then to be marketed to rural communities. The only environmental concern regarding the SHS is the management the batteries, which have high a Lead (Pb) content in the storage batteries. Serious personal health concerns will arise if lead from these batteries comes into contact with humans, especially children. Therefore, how the batteries are stored, transported, handled during use domestically, and then disposed at the end of the life cycle is crucially important. Experience with similar systems in other developing countries requires that serious measures be taken to avoid exposing people to the lead in the batteries.

Therefore, the specification is for the procurement and use of sealed batteries which should not leak any substances. With regards disposal, the recommendation is for the supplier of the batteries to be required to collect all disused batteries from all households, and to be responsible for their storage, recycling and otherwise disposal, either nationally or for re-export to other countries who have capacity to manage the safe disposal of these batteries to acceptable international standard.

Therefore, the bidding documents for the procurement of the SHS will be revised to include the following:

- Potential suppliers will submit a **Battery Disposal Management Plan** (BDMP) with their bids which will be reviewed by the REF.
- The REF will include in its evaluation criteria, the submission of an acceptable disposal BDMP.
- The Consultant will assist the REF in reviewing these BDMP.
- The supplier will also be required to provide training material in the form of easily readable leaflets in local languages on the risks and safe use, storage and handling of these batteries.
- The REF will monitor implementation of these plans and will pose serious punitive measures on the supplier(s) for any violations of these plans, which will
include being responsible for the health management of any person or persons exposed to these risks as a result of negligence on the part of the supplier in implementing their BDMP.

- The Consultant is to assist the REF in preparing the bid documents to include these requirements.

The exclusion of indigenous ethnic communities as recipients of SHSs is a potential adverse project impact. Thus in the preparation of EMDPs for SHSs, the Consultants should focus on ensuring that minorities access the same benefits as the majority population with respect to the SHS (see format from section 12.0). The consultants will clarify the approach regarding the selection of beneficiaries which gives equal access to minorities; develop clear monitoring measures to enable an assessment of whether ethnic minorities are benefiting equitably.