



EXECUTIVE SUMMARY

1.0 PROJECT BACKGROUND

Over the years a large number of dams have been built all over India for development of water resources for irrigation, water supply, power generation and other benefits. Many of these dams are in urgent need of strengthening and rehabilitation to ensure their safety and to improve their performance. With this in view, Dam Safety Assurance and Rehabilitation Project (DSARP) was undertaken by the Central Water Commission (CWC) with the World Bank (WB) assistance in 1991. There were four participating States, namely, Orissa, Rajasthan, Madhya Pradesh and Tamil Nadu. The objectives of DSARP were to:

- a) Strengthen the institutional framework for Dam Safety Assurance
- b) Provide basic safety facilities and take up remedial works for upgradation of selected dams.

The project ended in 1999, but in view of the benefits obtained, it was decided to extend the dam safety activities to other States having significant number of major dams. DSARP Phase-II was thus conceived which included the States of Andhra Pradesh, Bihar, Gujarat, Karnataka, Kerala, Maharashtra and Uttar Pradesh. The DSARP Phase-II was later revised and updated as Dam Rehabilitation and Improvement Project (DRIP). The project development objective is to improve the safety and operational performance of selected existing dams. The proposed project deals with rehabilitation and modernization of existing dams. The purpose of the works is to prevent that the dams will operate under unsafe conditions due to prevailing safety issues. The project is now expected to be implemented in the following five states: Chhatisgarh, Kerala, Madhya Pradesh, Orissa, and Tamil Nadu

A good number of dams, referred to as sub-projects, have been identified by the States for rehabilitation and upgradation under the DRIP. While reviewing the rehabilitation activities to be undertaken in each of the sub-projects, it was observed that a number of them could have potential environmental / social impacts which need to be taken care of during implementation of such activities. Hence, CWC, in consultation with the World Bank, decided to undertake environmental and social



assessment of the sub-projects under consideration, in accordance with the relevant national and World Bank policies / guidelines.

Since majority of the activities were found to be common among the sub-projects, it was further decided to undertake environmental and social assessment of the activities in ten representative sub-projects to identify the potential impacts and their mitigation measures and, based on this exercise, to develop an environmental and social management framework (ESMF). The framework will indicate the impacts of each activity, the required mitigation measures and the responsible entities for implementation, supervision and monitoring of the mitigation measures. It will also categorize the impacts in terms of low, medium and high. The ESMF will then be used by the concerned officials for screening of the sub-projects and for implementation, supervision and monitoring of the mitigation measures at appropriate levels.

The ten representative sub-projects were selected from the States of Gujarat, Madhya Pradesh, Maharashtra and West Bengal. Environmental and social assessment of these sub-projects was carried out and an ESMF was developed, in accordance with the scope of the study.

1.2 Scope of the Study

The scope of the study required the following key issues to be covered:

1. Review of the activities in the selected sub projects
2. Review of Policy and Institutional Framework
3. Environmental and Social Assessment of the selected sub projects
4. Public Consultation
5. Scoping and screening of impacts
6. Development of an Environmental and Social Management framework.

2.0 POLICY AND INSTITUTIONAL FRAMEWORK

Policy and institutional framework of the Govt. of India as well as relevant safeguard policies of the World Bank with regard to environmental and social management of developmental projects were reviewed in the context of this study.



The Government of India by specific legislations, regulates the environmental management of projects through the following Ministries / Statutory Bodies.

- The Ministry of Environment & Forests (MOEF)
- Central Pollution Control Board (CPCB)
- State Pollution Control Boards (SPCBs)
- Ministry / Department of Environment in the States

The relevant policies / acts / notifications in this regard are:

- I. Environment Protection Act, 1986
- II. The Forest Conservation Act, 1980
- III. Water (Prevention and Control of Pollution) Act, 1974
- IV. The Air (Prevention and Control of Pollution) Act, 1981
- V. The National Rehabilitation and Resettlement Policy, 2007
- VI. Environmental Impact Assessment Notification, 2006

The safeguard policies of the World Bank are given below:

OP / BP 4.01: Environmental Assessment: The objective of this policy is to ensure that Bank financed projects are environmentally sound and sustainable

OP/BP 4.04: Natural Habitats: The policy recognizes that the conservation of natural habitats is essential for long-term sustainable development. The Bank, therefore, supports the protection, maintenance and rehabilitation of natural habitats in projects funded by it. The Bank supports and expects the Borrowers to apply a precautionary approach to natural resources management to ensure environmentally sustainable development.

OP 4.36: Forestry: This policy focuses on the management, conservation, and sustainable development of forest ecosystems and resources. It applies to projects which may have impacts on

- (a) The health and quality of forests;
- (b) The rights and welfare of people and their level of dependence upon forests. The Bank does not support significant conversion or degradation of critical forest areas / natural habitats.



OP 4.09: Pest Management: The Policy encourages promotion and use of biological or natural pest control methods and reduced dependence on chemical pesticides.

OP/BP 4.12: Involuntary Resettlement: The objective of this policy is to avoid or minimize involuntary resettlement, exploring all viable alternatives. Furthermore, it intends to assist displaced persons in improving their living standards; to encourage community participation in planning and implementation of resettlement; and to provide assistance to affected people, regardless of their legal status on the title of land.

OP 4.10: Indigenous People: This policy aims to protect the dignity, right and cultural uniqueness of indigenous people; to ensure that they do not suffer due to development; and that they receive social and economic benefits of development.

OP N 11.03: Cultural Property: The objective is to ensure preservation of cultural property in the project area. This includes preservation of archeological remains and unique environmental features.

OP/BP 4.37: Safety of Dams: The policy requires that adequate measures are undertaken to ensure the safety of dams during its life cycle, both for new dams and dams taken up for rehabilitation and up-gradation.

OP/BP 7.50: Projects on International Waters: This policy is applicable in case of dams on rivers with basins falling in more than one country.

OP/BP 7.60: Projects in Disputed Areas: This policy is applicable where projects may affect relations between neighboring countries due to their location / operations.

3.0 ENVIRONMENTAL AND SOCIAL ASSESSMENT

The activities proposed in each of the ten representative sub-projects were studied and reviewed. A baseline survey was then carried out at each of the sub-projects to establish the existing environmental and social status. This included the study of physical, biological and socio-economic environment of the sub-projects and their surroundings, collection and study of secondary data, such as, meteorology, geology,



topography, flora & fauna, as well as, consultations with local communities and officials of Water Resources Department, Dam Safety Organisations, Irrigation, Fishery, Tourism and Power Departments of the concerned States. Details of consultations are discussed separately in the subsequent section.

Environmental and social assessments of the sub-projects were then carried out for potential impacts and mitigation measures.

4.0 Stakeholders and Public Consultation

The process of consultation involved formal and informal discussion including individual interviews, and meetings with local villagers including women and other weaker sections of the communities, as well as, concerned officials of the following government departments:

- Central Water Commission
- State Water Resources Department
- Agriculture Department
- Hydro Power Development Agencies
- Municipal Development Board
- Public Health Department
- State Forest Department
- Fishery Department
- Tourism Department

4.1 Issues Discussed:

A wide range of issues were discussed with various stakeholders which might have environmental / social concern. These are listed below.

- Intensity of rainfall and inflow from the upstream
- Downstream flooding problem due to dam water release.
- Structural aspects of dams.
- Water Quality and Siltation Problem
- Water distribution and canal related problems
- Local issues



- Tourism potential
- Hydro power generation
- Land use pattern
- Catchment Area Treatment
- Rainfall monitoring and Alarm system
- Environmentally sensitive areas in the vicinity
- Fishing activity within the reservoir

4.2 Major Findings and Recommendations

- The Alarm system to warn the local people during emergency water release need improvement. The system relies on mobile phone service which depends on the efficiency of such service providers.
- Adequate rainfall monitoring station be installed to assess the inflow from upstream in advance.
- Promotion of fishing activities should be taken up within the reservoirs. A part of the revenue should go to the Water Resource Dept. towards maintenance of the dams.
- There is good potential for tourism development with economic benefits for the locals. Development of suitable infrastructure is required for this purpose.
- Siltation rate is quite high in some places affecting the storage capacity and water quality of the reservoir.
- Catchment area treatment may be prioritized. Better coordination between the Forest Department and Irrigation Department may be ensured.
- There are some major structural problem in some of the dams. Extension of guidewall and increase in the height of sill is required to minimize flooding effect in the immediate downstream and to protect the scouring of the stilling basin.
- Canal systems need to be strengthened for better water distribution system and to minimize water loss.
- Hydropower should be developed where potential exists.
- Leakages in masonry work and choking of drains are major problems.



4.3 Assessment of key environmental and social issues:

A few points that were identified during the environmental and social assessment of the sample of dams are summarized in more detail.

Changes in water allocation upstream and downstream of project dams as a result of the project activities are not expected. The configuration of the dams will not change (no change in dam height, spillway crest level, etc.). Almost all dams do fill up now and spill, and this will continue after the project, but with a safer dam. As there are annual flood events there are limited opportunities to encroach on silted areas within the reservoir. Desilting of reservoir areas will not be a major activity under the project. There are only requests for possible desilting of a few State Electricity Board dams, and these are in remote areas where there is no encroachment.

In the unlikely event that the remedial work on the dam requires land acquisition or resettlement, OP 4.12 on Involuntary Resettlement has been triggered. The ESMF already details the process to be followed for the preparation of a Resettlement Action Plan (RAP) in the event this may be required.

There will be no change in reservoir volume for those dams that do spill already now. For the dams where the reservoir area is at the moment kept below full supply level for safety reasons, the rehabilitation works will allow a complete filling up afterwards, giving a positive impact (more water availability). Negative changes in overall water regime are therefore not expected. O&M manuals will be updated and the water delivery regime will be included.

OP 4.10 on Indigenous Peoples has been triggered to address the eventuality that any sub-project dam is in a tribal area and the DRIP activity affects tribal populations. The ESMF already provides the procedure for preparation of an Indigenous People's Development Plan following all requirements of OP 4.10 that will include a process map for implementation which includes free, prior, and informed consultations with affected communities leading to broad-base community support for the intervention. Significant impact on livelihood systems as a result of the project interventions is not expected, but as needed this will be covered in the Plan.

Although catchment rehabilitation was identified as an issue for some dams, addressing catchment management issues in a holistic way will not be carried out



under the project, as it will involve many institutions, stakeholders, and a set of complex socio-economic issues. The proposed project interventions at the dams do not have any negative impact on the catchment areas, so it will not worsen the situation. If for the sustainability of rehabilitation and improvement of a dam, some catchment area treatment is seen as essential it can become part of the sub-project interventions.

5.1 Identification of Activities

Based on the analysis of the sub-projects, activities have been identified where environmental/social impacts need to be addressed. The activities taken into consideration are:

Activities identified for DRIP

1. Reservoir Desiltation,
2. Tourism Development,
3. Approach road, dam crest roads, etc. construction / improvement,
4. Hydropower Generation,
5. Standby Generator,
6. River Regradation,
7. Flood Protection Network,
8. Wind Mill & Solar Power,
9. Treatment of leakage through masonry and concrete dams and reduction of seepage through earth dams and their foundations,
10. Improving Dam Drainage
- 11 Structural strengthening of dams to withstand higher earthquake loads,
12. Remodeling earth dams to safe, stable cross sections,
13. Improving toe drain and seepage measuring devices,
14. Improving ability to withstand higher floods including additional flood handling facilities, if needed,
15. Repairs to damaged spillways, stilling basins and downstream channels,
16. Improving dam safety instrumentation,
17. Improving communications – real-time as much as possible – between dams, upstream rain/river flow gauging stations and with other dams, control offices and civil authorities in flood plains downstream of the dam,
18. Flood marking,
19. Low voltage electrical supplies in inspection and drainage galleries
20. Improving lighting for external areas of dams,
21. Inspection launches provision,
22. Rehabilitation / Improvement of Spillway, head regulator and draw-off gates and their operating mechanisms,
23. Repair / Modification of Spillway Gates,
24. Cleaning of foundation drain & porous drain,
25. Repair and cleaning of irrigation outlets



Construction phase interventions, such as improvement of access roads, labor camps, silt disposal, and other ancillary temporary infrastructure may produce impacts on the communities in proximity. The ESMF does provide for addressing construction phase interventions, including how to deal with labor camps. The template discussed below will describe any major issues related to construction phase interventions that are identified at the investigation and pre-design phase. For example, in the rare instance there will be reservoir desilting, the design will have to determine the amount of silt and will have to prepare a specific plan where the silt will be desposited. The ESMF suffices to identify this as an environmental issue to be addressed during design and construction.

There may be some dams which are near protected areas. As a rule, activities inside protected areas, such as borrow pits and building access roads, will not be allowed. Construction management plans will take into account the protected areas. If indeed the rehabilitation and improvement of a specific dam is in the vicinity of a protected area, as identified by the template, it will be ensured that a (partial) EA/EMP will be prepared.

There are readily available, well-developed environmental specifications and it will be ensured that such specifications will indeed be included in the technical specifications of each tender document. The contractor will have to factor costs related to the implementation of environmental mitigation aspects in his bid. Site engineers will be instructed to supervise the compliance with the technical specifications, including the environmental clauses. As part of the third-party construction supervision and quality control, the Consultant will ensure compliance as well.

For some dams the water levels in the reservoir will have to be brought down to facilitate repairs of the upstream face or carry out other works, which may temporarily disrupt release schedules. This is an aspect that will be taken into account during the design phase of the project. The technical guidance is that all alternative technologically and financially viable options which do not require or reduce reservoir draw-down will be taken into account. If it is unavoidable, the needed works will be planned during the period when the reservoir is at its lowest level, which is typically after the Rabi irrigation season and before the monsoons. The disruption to the water users will thus be minimal. In the worst case, the project will be ready with a



communication strategy to inform the water users about temporary changes in water supply.

5.2 Scoping

In order to develop the ESMF for the identified activities, a scoping exercise was carried out to identify the components involved for execution of the activities. The components here signify the operational requirements for implementations of an activity in terms of manpower, machinery, materials (e.g. borrow/quarry materials etc) which are likely to cause environmental / social impacts. The components thus identified are listed below:

| Components Identified |
|---|
| Acquisition of forest land, if any |
| Borrow materials/ area |
| Quarry materials / area |
| Blasting |
| Dredging/Desiltation |
| Resettlement and Rehabilitation (anticipated in rare cases) |
| Labour Camps |
| Heavy machinery |
| Hot mix plant |
| Concrete mixer and heavy pumps |
| Material handling and storage |
| Temporary land acquisition |
| Tree felling/ vegetation clearance |
| Haulage of machinery |
| Debris Disposal |
| Transport of materials |
| Small tools and pumps |
| Sheds to keep machines and tools |

5.3 Categorisation of Components

The components were categorized as A, B and C based on extent of adverse impacts

| Category A (major impact) | Category B (Moderate impacts) | Category C (Negligible impact) |
|--------------------------------------|--|---|
| Acquisition of forest land | Heavy machinery | Small tools and |



| Category A (major impact) | Category B (Moderate impacts) | Category C (Negligible impact) |
|---|------------------------------------|------------------------------------|
| | | pumps |
| Borrow materials/ area | Hot mix plant | Sheds to keep machines and tools |
| Quarry materials / area | Concrete mixture and heavy pumps | |
| Blasting | Material handling and storage | |
| Dredging/Desilting of reservoir | Temporary land acquisition | |
| Resettlement And Rehabilitation (anticipated in rare cases) | Tree felling/ vegetation clearance | |
| | Haulage of machinery | |
| | Debris Disposal | |
| | Transport of materials | |
| | Labour Camps | |

5.4 Screening

A Screening exercise was then carried out to delineate the potential environmental and social impacts due to the components identified.

6.0 ANALYSIS OF ALTERNATIVES

An analysis was carried out for the sub-project activities to develop alternative scenarios which included no-project alternatives, no-component alternatives and with-component alternatives. The preferred alternative suggested is with-component alternative.

7.0 ESMF

The ESMF is the instrument that provides the necessary guidance to identify salient environmental and social issues early on, prepare, as needed, remedies and plans to address these issues, and monitor implementation. Keeping in view the specific requirements of ESMF, five forms have been developed. These forms will serve as reference material for use by the field officials/engineers to enable them to develop and impact sub-project specific ESMF. The forms are briefly described below.

The 25 sub-project level activities identified for the development of the ESMF have been given in **Form SC-1** for the purpose of identifying the activities relevant to a specific sub-project and screening out the other activities. The responsible entity at the dam level will carry out this task.



To identify the potential environmental / social impacts of an activity, the tasks and facilities required to be performed and provided for the activity are needed to be identified. These have been termed as components of an activity. A list of all possible components have been prepared and given in **Form SC-2**. For each activity, the components involved can be identified by dam level officials.

Form SC-3 provides the identified sub-project activities in the first column, the components involved in the second column and potential impacts in the third column. Last two columns refer to implementation phase (I) and post-implementation phase (P).

Based on potential environmental and social impacts associated with each component, these have been categorized as A, B and C and are given in **Form SC-4**.

Category - A Components have major environmental / social impacts and require specific environment management plan (EMP) for implementation of mitigation measures. This EMP is to be incorporated in the bid document for the contractor / implementing agency to follow during implementation, as well as, post-implementation.

Category - B Components have moderate environmental / social impacts and certain precautionary measures have to be followed by the contractor and the project authorities to minimize impacts during implementation as well as post-implementation.

Category - C Components have negligible or nil environmental / social impacts and as such, no mitigation measures are proposed for these activities.

Form SC-5 has been developed to identify mitigation measures for each type of potential environmental and social impacts. For ease of understanding and use, the components identified are given in the first column, corresponding potential impacts are given in the second column and corresponding mitigation measures are provided in the third column. The remaining three columns indicate the entities responsible for execution, supervision and monitoring of the mitigation measures, respectively.



7.1 APPLICATION OF ESMF

The ESMF may be used for sub-projects under the DRIP at the planning, implementation and post implementation phases to identify the environmental and social concerns, as well as, the opportunities to be addressed, so that these could be integrated in the relevant project documents.

The organizational structure for DRIP consists of a Project Management Unit (PMU) at the Central level (at the Central Water Commission (CWC)), with one State level PMU for each of the 5 participating States. Each of these PMUs will include qualified Environmental and Social Development Specialists. The CPMU will be supported by a multi-disciplinary management and engineering consultant team (the Consultant) that will assist CWC with the overall implementation of the project. The Consultant's team will include environmental and social specialists. The terms of reference include tasks related to environmental and social compliance. Some of the relevant tasks of the Consultant include: provide formal training to concerned staff at state, and central level to ensure that there is full awareness about environmental and social issues and the implementation of the ESMF; provide guidance and support to collect sufficient data at the investigation stage to determine the environmental and social impacts, if any, including whether stand-alone Environmental Assessments (EA) and Environmental Management Plans (EMP) are needed based on the outline provided in the ESMF; set up and monitor a reporting system that will show in a clear and transparent way whether there are any social and environmental issues related to the rehabilitation of the dams and the mitigation actions; provide guidance and support to the implementation of adequate monitoring of social and environmental parameters; and as part of the third-party construction supervision efforts, ensure that actions agreed to minimize environmental impact are being implemented.

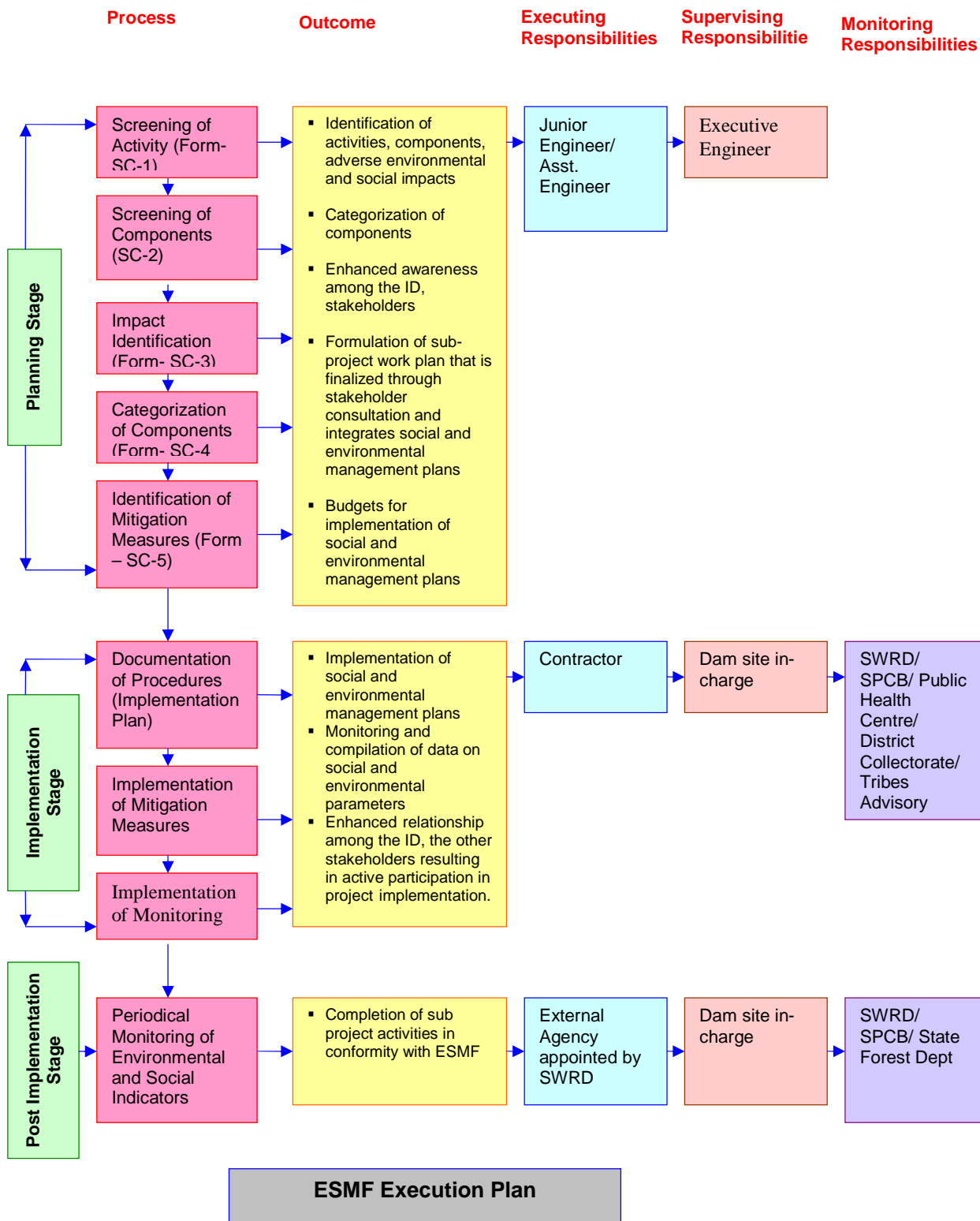
A template will be used that will require the concerned State level PMUs during the investigation and preliminary design stage for each dam to provide detailed information on technical, environmental, social, and all implementation-related aspects of each dam. The State level PMU will for each sub-project dam incorporate in the template the essential elements from the environmental and social screening templates prepared as part of the ESMF (refer to Forms above). The Central PMU, assisted by the Consultant, will carry out a first level screening of each template. The Consultant will develop and maintain a web-based MIS that will capture the information from the



templates. The Bank Task Team will receive and review each of the templates as well. Based on the review of the templates, a final categorization of each of the sub-project dams will be made. Those that have no major environmental or social issues can have the designs finalized and be tendered. Only the few where there may be major environmental or social issues will require the preparation of a site specific EA/EMP. This template and the MIS will allow an early identification of those dams where major issues can be expected. There will then be additional supervision efforts for these dams.

Schematic diagram for Execution of ESMF is given below.

It may be mentioned here that though the sub-project activities for the development of this ESMF have been identified based on the analysis of such activities in a large number of dams proposed to be taken up for rehabilitation under the DRIP, **this is a live document which can be improved upon at the sub-project level by the concerned authorities, as and when the need arises.**



Note: At central level an experienced environmental / social consultant may be engaged for supervision and monitoring of ESMF implementation in the state on behalf of CWC



In rare cases, development of a resettlement action plan may be called for, including relocation of cultural / common properties of the affected population. Similarly, tribal development plan may have to be prepared if a substantial section of the affected population are tribals.

7.2 Monitoring and Evaluation Framework

Monitoring and evaluation is primarily required to ensure proper and timely implementation of environmental and social mitigation measures identified in the planning stage, based on the ESMF. Monitoring at regular intervals during implementation and for a specified period in the post implementation stages is necessary to identify and implement any change / improvement needed in the execution of the activity or in the mitigation measures.

A monitoring and evaluation cell may be created at State level under the supervision of an official familiar with environmental and social issues of the sub-projects. He may be given suitable training if needed. In specific situations, one may consider appointing external agencies to carry out the monitoring and evaluation activities and report to the supervising official. The indicators to be monitored can be framed from the ESMF taking into consideration the activities involved.

The feedback received from monitoring and evaluation cell will be discussed with the implementing officials and the contractor and corrective actions will be taken, where necessary.

7.2.1 Monitoring Budget

A monitoring budget has been drawn up considering various environmental and social components. This provides cost for different mitigation measures of likely environmental/social impacts at sub-project level. Cost for environmental enhancement measures and monitoring has also been included. It also gives cost for plantation, enhancement of sites, and cost of monitoring.

7.3 Training & Capacity Building

The key to institutional reforms would be well-trained and motivated human resources. Competence levels of the departmental officials and their ability must be assessed and training in new skills provided. Cultural sensitivity, group dynamics, conflict resolution,



leadership and ability to work with user population are as important as the engineering skills which are already in place. This will require the co-option into water resources department of social, gender and environmental subject matter specialists. This would also be an appropriate opportunity for assessing the capabilities of state training institutions, and enhance them if necessary. Enhanced training would also be required for local tribal population and women groups etc. The need and desirability of private sector participation should be assessed. The need for training equipment, computers, and software, training aids must be assessed, and procurement procedures should be initiated.

7.4 Institutional arrangement

Training and Capacity Building Strategy will form an integral part of the sub-project Plan and its implementation will be synchronized with other project interventions at different level. The responsibility of approving Training and Capacity Building Strategy as part of sub-project Plan will be with the PMU. The PMU will ensure that Training and Capacity Building Strategy conform to the agreed strategy of the project.

Inter-sectoral coordination will be ensured at the Government (PMU), IDC and Project level through PMU. At the PMU level, a Project Steering Committee chaired by the Secretary and comprising of Chief Engineers of various IDCs and Project Divisions will provide inter-departmental coordination and strategic directions, decisions and support with a view to ensure timely and successful implementation of all project activities

Training, awareness-raising, and capacity building strategies have been planned and factored into the project budget. The Central Water Commission will provide the necessary centralized support and facilities for the training and capacity building for different state level officers.

8.0 ENVIRONMENT AND SOCIAL MANAGEMENT PLAN

One of the requirement of the present study was to develop a sample environmental and social management plan (ESMP) to serve as a guide for preparation of a project specific ESMP. The sample ESMP is placed at chapter 8 in this report. It covers various aspects to be considered while preparing an ESMP, such as, management of dust and emissions, borrow and quarry areas, solid waste, labour camps, tribal



development, resettlement and rehabilitation. The ESMP also details monitoring requirements, institutional framework, training and capacity building aspects.