

## **ENVIRONMENTAL ASSESSMENT AND REVIEW PROCEDURES AND ARRANGEMENTS**

### **A. Introduction**

1. These procedures are prepared specifically for sub-projects of the Community-managed Irrigated Agriculture Sector Project (the Project). They are intended to provide for effective integration of environmental assessment and environmental management planning into the sub-project preparation process, in accordance with the laws of Nepal, and conforms to the requirements of the ADB.

### **B. Overview of Subprojects**

2. Under the Project 250 subprojects will be implemented in the 35 districts of the central and eastern regions to rehabilitate and improve the existing farmer-managed irrigation systems (FMISs). The sub-projects will comprise (i) participatory planning and beneficiary mobilization, (ii) improvements to irrigation and associated infrastructure, (iii) agriculture and social development support, and (iv) regular monitoring and support. An implementation procedure has been designed for effective sequencing of these components. It comprises (i) formulation of irrigated agriculture development strategy; (ii) information campaign; (iii) subproject screening/identification survey; and (iv) preparation of subproject implementation plan (SIP) through feasibility studies; (v) WUA beneficiary mobilization; (vi) signing a memorandum of agreement (MOA) by all concerned parties; (vi) preparation of detailed survey and design; (vii) preparation and implementation of resettlement plan; (viii) tendering and construction; (ix) agriculture and social development support; (x) completion and support to WUA in O&M; and (xi) monitoring.

3. The first component, participatory planning and beneficiary mobilization, involves the identification of viable subprojects and preparation of comprehensive subproject implementation plans (SIPs) that spells out specific action plans and programs for water user association (WUA) development, irrigation infrastructure, and agriculture and social development for each subproject, to be prepared through a genuine participatory approach. Along with this process, the WUA will receive support to be empowered to become community organizations capable of mobilizing resources for subproject implementation and self-sustained O&M. This will occur on the basis of a WUA institutional development plan specified in SIP covering membership enrollment, formal registration and formation of executive structure and operational rules, management of O&M and formation of agreements on land arrangements.

4. The second component, improvements to irrigation and associated infrastructure, consists of improvements to FMISs in terms of (i) water availability throughout the year, (ii) increases in their effective command area, and (iii) reduced susceptibility to damage from natural occurrences such as floods and landslides. In accordance with the subproject implementation procedures, these improvements will take place following thorough planning and feasibility study, and the signing of a Memorandum of Agreement with the concerned parties. The technologies that will be applied will generally be confined to surface water collection and harvesting, storage and distribution. However, groundwater development and the use of tubewells and pumps may be considered on a project-by-project basis if it can be shown that this is the most appropriate technology and where there are strong extenuating circumstances regarding poverty alleviation.

5. Project sizes to be considered under this component will be limited to less than 1000 ha (in command area in the terai) and be no smaller than 25 ha (in all areas). They will be farmer-owned and managed and will not have received previous external assistance. Smaller schemes less than 25 ha may be considered under special circumstances. New projects, or those that have had previous assistance, may be considered only if there are exceptionally high additional benefits to be gained in terms of poverty alleviation. This component will address irrigation improvement requirements in all 35 districts and in the regions of the terai, the churia and the hills. A non-conventional irrigation improvement sub-component will be undertaken on a pilot basis that will focus on those mountain, hill and terai areas where conventional surface irrigation is not appropriate and where there are significant poverty issues. This will include new technologies currently being applied in Nepal (e.g. micro-irrigation) that are appropriate for areas with limited water availability, and facilitation and support for small low lift pumping in the terai.

6. The third component, agriculture and social development support, will establish more intensive and diversified agriculture production systems and all-inclusive socio-economic development in the subproject areas. In addition to intensified production it will promote (i) adoption of high-yielding and improved varieties of crops; (ii) diversification of cropping patterns; (iii) integrated pest management (IPM); (iv) improved on-farm water management as a basis of these agriculture practices; and (v) cropping and irrigation calendar management to save time and water.

7. The fourth component, regular monitoring and support, will operate institutional, technical, social, and financial audit of the completed FMIS schemes including those assisted under previous projects.

### **C. Environmental Assessment and Review Procedures in Nepal**

8. Environmental Assessment is required under the Environment Protection Act (EPA) of 1997. Assessment and reporting requirements are set out under the Environmental Protection Rules of 1997, as amended in 1999.

9. Section 3 of the EPA stipulates the environmental assessment requirements for irrigation schemes. Initial environmental examinations (IEEs) are required for (i) new systems with command areas of between 25 and 2000ha in the terai, between 15 and 500 ha in hill valleys and between 10 and 200ha on steeper hill and mountain areas and (ii) schemes to be rehabilitated with command areas greater than 500ha for the terai, 200ha for hill valleys and 100ha for steeper hill and mountain areas. Environmental Impact Assessments are required for new irrigation schemes with command areas greater than 2,000ha in the terai, 500ha in hill valleys, 200ha on steeper hill and mountain areas, which are outside the scope of the Project.

10. Responsibility for preparation of IEEs and obtaining approvals rests with the project proponent. For subprojects this is taken to be the Department of Irrigation (DOI). There are several key parties involved in the environmental assessment of irrigation projects. First of all, the project *proponent* in the case of the Project is the DOI. Supervision of the IEE process, and the granting of approvals, is the responsibility of the *concerned agency*, which is taken to be the Ministry of Water Resources (MOWR). The Environment Branch of the DOI is responsible for liaison with this office. The final authority is the Ministry of Population and Environment. However, in the case of IEE's, the concerned agency has the approval authority.

11. The following procedures are stipulated under the EPA for IEE's, that a work schedule, incorporating Terms of Reference, is to be prepared for the IEE for the project in accordance with Schedule 3 of the Environmental Protection Rules. Firstly, under Rule 5 of the Environmental Protection Rules this must be approved by the concerned agency, which is MOWR. Secondly, investigations are to proceed according to the approved work schedule and these are summarized in a report that must present key details of the project and predictions on environmental impact, according to Schedule 5 of the Environmental Protection Rules. Finally, the report must be approved by the concerned agency, the MOWR.

12. Specific guidance on environmental assessment is provided in the National EIA Guidelines, 1993. Separate guidelines, based on these, have since been prepared for the forestry and industry sectors. The Ministry of Physical Planning and Works has issued Public Works Directive which give detailed generic guidelines for both IEE and EIA. The Public Works Directives are issued under powers conferred on the Ministry of Physical Planning and Works by Rule 62 of the Financial Administration Regulations (1999). The Public Works Directives form a comprehensive amalgamation of the requirements of the Environment Protection Act, the National EIA Guidelines, and the ADB guidelines.

#### **D. Specific Procedures to be used for Subprojects under the Sector Loan**

##### **1. Responsibilities and Authorities**

13. In accordance with Nepalese law and ADB requirements, the IEEs will be prepared for all subprojects, and identified mitigation measures and environmental monitoring plan will be implemented during the subproject implementation stage. At the DOI headquarters level, a central project management office (CPMO) will be set up with class-I engineer as full time project director, and will be responsible for overall environmental management, under technical support and guidance from Environmental Section in SID. At the regional level, regional project support unit (RPSU) will be established with director of the Regional Irrigation Directorate as project manager of each region and will be responsible for day-to-day implementation of the Project. RPSU will have an assigned staff to manage environmental activities with the assistance of the consultants. At the field level, subproject management unit (SMU) will be established in each district headed by the chief of the irrigation development division/ sub-division (IDD/IDSD), which will undertake field operations including environmental planning and monitoring under supervision by RPSU. Specific institutional responsibilities and authorities during the subproject implementation cycle are stipulated as below.

**Table 1. Institutional Responsibilities for Environmental Management**

<b>Subproject Stage</b>	<b>Responsible Organization</b>	<b>Responsibilities</b>
Overall	ISPM consultants	Support capacity development of environmental planning, monitoring, and management
	EB in SWD	Guidance for environmental planning, monitoring, and mitigation
	MEQCB in PDMED	Management of monitoring and evaluation data
	CPMO (with ISPM consultants)	Overall review and monitoring of environmental management activities of the project, for incorporation in the regular project progress reports
Screening	RPSU/SMU	Screen the project requests in light of environmental and other criteria.
Planning	RPSU/SMU/firms	Prepare IEE (included in SIP), minimize avoidable losses, incorporate mitigation measures, and prepare EMP

Subproject Stage	Responsible Organization	Responsibilities
	CPMO-EB in SWD	Endorse IEE and SIP
	Subproject Appraisal Subcommittee	Approve IEE and SIP
	Ministry of Water Resources	Approve IEE
WUA formation	RPSU/SMU/NGOs/ Cos	Strengthen WUA including monitoring capacities
Detailed Design	RPSU/SMU/ firms	Assist preparing RP, incorporate EMP into engineering design and specifications
	RPSU/SMU/NGOs	Prepare and implement RP
	CPMO-DB in PDMED	Approve detailed design
Construction	Contractor	Implement required environmental measures
	RPSU/SMU/firms	Supervise contractor implementation of environmental measures
Agriculture and social support	RPSU/SMU/firms/ NGOs	Implement specific environmental mitigation measures incorporated in the agriculture and social development programs
Operational	DOI	Provide budget to undertake annual monitoring and audit
	RPSU/SMU/NGOs (during Project)	Carry out annual performance audit of completed schemes. Support additional mitigation measures as necessary
	RID/IDD/IDSD/DDC/ DADO (after Project)	Same as above.
	WUAs	Monitor agriculture practice and impacts and report them to SMU

DB=Design Branch; EB=Environmental Branch; MEQCB=Monitoring, Evaluation, and Quality Control Branch; PDMED=Planning, Design, Monitoring and Evaluation Division; SWD=Surface Water Division

14. IEEs will be prepared by private firms that will be engaged by the CPMO or RPSU to undertake feasibility studies and prepare SIP, under the supervision of the SMU. RPSU will be responsible for reviewing IEEs for adequacy and submitting to Environmental Branch in the Surface Water Irrigation Division (SWID) of DOI through CPMO, and then to the environmental section of MOWR for their endorsement. Then, the endorsed IEEs, combined with feasibility studies and SIP will be placed for approval by the central Subproject Appraisal Sub-committee (of the Project Steering Committee), chaired by the Director General of the DOI and comprising staff from DOI, MOWR, DOA and other concerned agencies. Finally, the IEEs will be sent to MOWR for final approval.

15. Initially, the drafts of the feasibility studies and IEEs shall be submitted to ADB for concurrence until it is deemed that sufficient mechanisms have been established to ensure quality. Nevertheless, for schemes larger than 1,000ha in command area, the feasibility studies and IEEs will be submitted to ADB for concurrence.

## 2. Environmental Criteria of Subproject Selection/ Identification

16. The following environmental criteria for subproject selection will apply during the implementation of the Project: (i) the subproject must have reliable water availability for the proposed investment or there will be no negative impact on other users of the same source of on the ecosystems downstream, which will have to be confirmed through a water resources assessment and consultation with downstream water users, in particular in case that water

intake is expected to increase in association with expansion of the command area for any cropping seasons; (ii) the source water must be of adequate quality, where groundwater is to be used arsenic levels must be below 100 micrograms per liter; (iii) subprojects should avoid the areas where main facilities are located in the area prone to frequent land slide that requires high O&M costs and cannot ensure reliable irrigation water supply; (iv) subprojects should avoid areas where their main facilities are located in the area prone to riverbank erosion that threatens affordable O&M by WUAs; (v) the subproject area has soils suitable to surface irrigation and will not lead to drainage congestion, salinity intrusion, and soil erosion caused by irrigation; (vi) the subproject should not in principle exceed 1,000ha in the tarai, 500ha in the hills, and 200ha in the mountains or steep hill sites; and (vii) the subproject will cause no direct or indirect threat to ecologically sensitive areas such as national parks, wildlife sanctuaries or wetlands of international significance, or areas of high historical, archeological, cultural or aesthetic value. These will ensure that subprojects selected under the Project will have no major negative environmental impacts.

### **3. Procedures for Environmental Assessment of Subprojects at Appraisal**

#### **a. Environmental Classification**

17. Subprojects may entail negative environmental impacts and are therefore classified as category B according to the ADB's environmental project classification criteria. Accordingly, all subprojects to be proposed for the Project will have to undertake IEEs during the planning stage. Subprojects for which IEEs have identified significant social and environmental impacts will not be selected for implementation.

#### **b. Preparation of Initial Environmental Examinations**

18. **Overview of the Process.** The IEE process involves technical and non-technical judgement on a wide range of issues and is carried out as part of the feasibility study process and therefore should involve the entire feasibility study team, coordinated by a nominated individual team member. The process involves (i) scoping of the IEE process and preparation of a work schedule by CPMO, and (ii) approval of the work schedule by MOWR. The ISPM consultants will assist the process.

19. **Scoping.** Environmental assessment commences when the basic features of the project have been identified, but before final decisions have been taken. Information required includes (i) an understanding of the community mobilization and agriculture and social development support plans for each subproject, (ii) basic plans to improve diversion structure and distribution systems (iii) location of the improvements, (iv) materials to be used and their source, (v) overall cost, and (vi) extent of labor and machinery that needs to be brought to the site for construction. This first step in the IEE, scoping, is a planning exercise to determine the requirements for an adequate and effective IEE. The outputs of scoping are (i) tentative list of the likely environmental impacts, (ii) statement of the investigations that are necessary to determine the extent of these impacts and examine mitigation options, and (iii) an agreed work schedule with terms of reference of the IEE.

20. Using an appropriate checklist given in Table 2, the team identifies likely impacts and decides upon the scope and methodology for the IEE.

**Table 2. Checklist of likely environmental impacts of the Project schemes**

<p><b>1. Problems due to Project Location</b></p> <ul style="list-style-type: none"> <li>• Water resources conflicts including impacts on downstream water use and ecosystems</li> <li>• Downstream water quality problems</li> <li>• Encroachment into areas of conservation</li> <li>• Impediments to movements of wildlife, livestock and people</li> <li>• Encroachment on historical and cultural sites</li> </ul> <p><b>2. Problems related to Project Design</b></p> <ul style="list-style-type: none"> <li>• Displacement of people and property</li> <li>• Watershed Erosion</li> <li>• Suitability of natural water for irrigation</li> <li>• Over-pumping of groundwater</li> <li>• Adequacy of drainage planning</li> <li>• Drainage and flooding problems</li> <li>• Land tenure problems</li> <li>• Farmer credit limitations</li> <li>• Feasibility of cooperatives</li> <li>• Feasibility of water user association</li> <li>• Disruption of existing farmer cooperative systems</li> <li>• Use of chemicals in agriculture and horticulture</li> <li>• Selection of pesticides</li> <li>• Land use conflicts</li> </ul>	<ul style="list-style-type: none"> <li>• Inadequacies in water distribution</li> <li>• Canal management</li> <li>• Passageways</li> <li>• Scouring hazards</li> </ul> <p><b>3. Problems Related to Construction Stage</b></p> <ul style="list-style-type: none"> <li>• Erosion Control</li> <li>• Other construction stage hazards</li> </ul> <p><b>4. Problems Resulting from Project Operations</b></p> <ul style="list-style-type: none"> <li>• O&amp;M capacities and arrangements</li> <li>• Adverse Soil Modifications</li> <li>• Changes in groundwater hydrology</li> <li>• Water-borne diseases</li> <li>• Hazards associated with the use of toxic chemicals</li> <li>• Hazards associated with the use of mineral fertilizer</li> <li>• Impacts on water use for domestic consumption or aquaculture</li> </ul> <p><b>5. Realization of Enhancement Potentials</b></p> <ul style="list-style-type: none"> <li>• Community water supply in command area</li> <li>• Aquaculture in command area</li> </ul>
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21. The preliminary identification of likely environmental impacts is the basis of identifying the information needs for the IEE. Much of the information required for the IEE will be collected as part of the normal feasibility study process, but some additional investigations such as community consultations and water testing, outlined below, may also be required. On determining the likely investigation tasks a work schedule is prepared for approval. The approving authority should be the RID/RPSU. An outline of a work schedule given in Table 3. The work schedule should be brief and explicit, typically, one or two pages in length.

**Table 3: Outline of a work schedule to be submitted for approval**

<p><b>A. General</b> Name and location of the scheme under consideration, current status of the feasibility study</p> <p><b>B. Policies and Laws under consideration.</b> These will usually include some or all of the following:</p> <ul style="list-style-type: none"> <li>• The Environmental Protection Act, 1997 and Environmental Protections, 1999 (Amended): Under which the EIA is required</li> <li>• The Water Resources Act, 1992 and the Irrigation Rules 2000 (Amended): If issues of water resource allocation issues are involved</li> <li>• The Forest Act, 1993, if encroachment on forest areas is involved</li> <li>• The Land Acquisition Act, 1978, if resettlement or the acquisition of property is involved</li> <li>• The Aquatic Life Protection Act, 1961, if there are threats to aquatic life</li> <li>• The Soil and Water Conservation Act, 1982, if there are watershed management issues involved</li> </ul> <p><b>C. Impacts that are likely to involve special consideration.</b> See Table 2 for specifics. These may include some of the following:</p> <ul style="list-style-type: none"> <li>• Potential of the scheme to affect the downstream water availability and ecosystems.</li> <li>• Potential of the scheme to induce land instability (hill and mountain sub-projects)</li> <li>• Possible stimulation of conversion of forest land to irrigated agricultural land (hill and mountain sub-projects)</li> </ul>
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- Risks associated with intensified agriculture including the use of mineral fertilizers
- Risks associated with proximity to pollution industry (mainly terai sub-projects)

#### **D. Description of the scheme**

Referring to the feasibility study, basic features of the scheme (physical works, materials to be used, any special construction issues, key alternatives under consideration).

#### **E Implementation Schedule**

For the remainder of the feasibility study and the sub-project preparation process, as well as for sub-project implementation.

22. **Assessment Methods.** The actual methodology used for IEEs will vary according to the nature of the subproject. Consideration and assessment of environmental impacts should include the participatory planning and beneficiary mobilization and the agriculture and social development support component for each subproject, as well as physical improvements to infrastructure. As assessment takes place, potential mitigation measures will also be identified. In each case, care should be taken to ensure that mitigation measures are feasible and affordable. This calls for careful judgment, and underlines the need for engineers to be involved in the assessment process. An outline of the activities that might form part of IEE preparation are outlined below:

- (i) Desk Study: This consists of gathering and reviewing information such as maps, reports, publications and gathering information relevant to the project from them. Much of the information, particularly relating to the climate and physical features of the scheme, will be being gathered as part of the engineering feasibility study for the project. Some likely additional sources of information for desk study include the water resource availability mapping that is to be prepared during the initial months of the project, topographical maps, geological maps, reports from other projects in the area and statistical data for the area.<sup>1</sup>
- (ii) Consultations: Much of the information required for IEEs can be obtained from villagers in the project area itself, and from resource persons who include local officials and specialists, from the staff of other projects in the area, and from various experts on the matters under investigation. Consultations with villagers are essential for the IEE process, partly because they have unequalled knowledge of the local area, and also because they are the primary stakeholders in the subprojects themselves. The sort of information that local people can provide includes (i) likely dangers of inducing slope failure (ii) presence of wild or endangered animals and of fish (iii) presence of temples or other sites of religious or cultural importance in the area (iv) types of forest in and around the area (v) general information on their quality of life and (vi) changes that people are likely to make to their farming methods when a more reliable source of irrigation water becomes available.
- (iii) Villagers can be consulted by means of semi-formal discussions in the study area, and through the use of questionnaires. Questionnaires will be used during the feasibility study to gather important socio-economic information and some questions relating to environmental matters such as those listed above can be included in this

<sup>1</sup> As to subprojects where water resources availability may be a potential concern such as those in the terai, the study should include the analysis of the incremental water diversion (that is post-project diversion minus current diversion) on a time series basis, and its impacts on the downstream water users. The key parameters should be confirmed at the field level. As a condition to submit feasibility study reports to the approval authority, the impacts and mitigation measures should also be consulted and agreed with the concerned downstream users.

questionnaire. Questions should be specific, and phrased in terms that villagers use and understand.

- (iv) Resource persons include staff local government offices, such as the district forest office and district water supply office, staff working on related projects in the area, and local NGOs. Such agencies may be able to provide a range of useful information including (i) information on current or future drinking water supply projects operating in the area (ii) information on forest resources and levels of community involvement in their management (iii) technical information relating to climate, soils, topography and other parameters and (iv) lessons learned on other projects in the area.
- (v) Field Visits: Field visits are essential in order to acquire a basic understanding of the subproject site. They also provide the opportunity to undertake consultations and collect samples. Field visits should include at least an inspection of the headworks and some of the distribution network including existing canals and proposed extensions, as well as discussions with villagers.
- (vi) Water testing: Special tests may be necessary in certain instances, for example where water pollution issues need to be investigated. For example, some schemes may be close to factories that pollute the source river. When groundwater is used, there may be concerns over the incidence of arsenic. Samples should be collected in the field and brought to an accredited laboratory for testing.
- (vii) Geotechnical investigations and soil tests: In the hill and mountain regions, slope stability will often be an issue. If there is a risk of irrigation canals causing slope failures through undercutting, rupture and release of water or any other mechanism, the impacts on the environment can be very significant. In schemes in the hills, special investigations may be necessary to assess these risks. Geotechnical investigations will normally be required as part of the engineering feasibility study, it is important that these extend to an assessment is made of geotechnical risks, through site investigations by specialists and/or soil strength testing.

23. **Consideration of Alternatives.** Key alternatives include different headwork options, water source options and canal alignment options as well as the option of doing nothing. Each alternative may have significant implications for the environment, though the assessment of impacts will have been based on the chosen alternatives for the scheme. The environmental implications of different alternatives should however be briefly described, as this will help the decision making process if any changes are to be made to the design of the scheme. In addition, the final decision to go ahead with the scheme or reject it is helped by a description of the environmental consequences of the “do nothing” option. Often, the “do nothing” option will actually be more environmentally damaging than the proposed sub-project. For example many of the sub-projects will involve rehabilitating and improving existing schemes that cause water to concentrate in slopes that are prone to failure, causing landslips. The proposed scheme may correct this problem, and therefore itself be more environmentally beneficial than the “do nothing” option.

24. **Mitigation Measures.** Consideration of mitigation measures involves both identifying appropriate measures and making sure that they will be incorporated into contract documentation for the subproject. In this regard, care must be taken to ensure that appropriate specifications are available to the drafters of project contracts, and that reliable quantity

estimates are included. In many cases, mitigation measures will consist of slope protection methods (such as wall construction, or bio-engineering measures), the adoption of the principles of “best practice”, and other measures that are well known and used in construction in various sectors in Nepal. Appropriate specifications will therefore be available in standard reference documents. Where this applies, specific references should be made. In some cases, specifications may be available from handbooks and guidebooks prepared for other sectors, for example the Reference Manual for Roadside Bio-engineering produced for the roads sector, and available from the Geo-Environmental Unit of the Department of Roads. Drawings, quantity estimates and drafts of specifications should be attached to IEE reports to facilitate their incorporation into contract documentation, citing sources where appropriate. Table 4 below provides a non-exhaustive list of mitigation measures that may be applied to the environmental issues that are likely to be encountered on subprojects.

**Table 4: List of possible mitigation measures for issues likely to arise with Subprojects**

Potential Effect	Mitigation Measure(s)	Agencies responsible for planning and monitoring
<b>Environmental impacts related to project location</b>		
Effects on downstream water use including reduced water availability to users and concentration of pollutants	Mapping water resource availability over the project area (excluding areas of known water deficit)	DOI/CPMO
	Reconfirmation of adequate water availability (to exclude schemes with inadequate sources) in consultation with downstream users	SMU/consultants engaged for SIP preparation/RPSU
	Provision in scheme design for use of any availability supplementary water sources e.g. groundwater	SMU/consultants engaged for SIP preparation/RPSU
	Training and support to WUAs in coordination of water use and practice of rotational water intake	SMU/NGOs engaged for beneficiary mobilization and social development support
Water resource conflicts where increased abstraction exacerbates existing shortages	Water resource assessment as above	DOI/CPMO, SMU/consultants engaged for SIP preparation/RPSU
	Reviewing scope for supplementary or alternative water sources during feasibility study and incorporation into design if feasible	SMU/consultants engaged for SIP preparation/RPSU
Cumulative effects should more than one scheme in any one basin receive support under the project	Water resource assessment as above, assessing extent of cumulative water extraction and drainage effects	DOI/CPMO, SMU/consultants engaged for SIP preparation/RPSU
Restrictions on movement of people and animals	Provision of adequate super-passages and culvert crossings in the design	SMU/consultants engaged for SIP preparation/RPSU
<b>Environmental impacts related to project design</b>		
Effects on land or property	Application of resettlement framework, prepared during PPTA	CPMO/DOI
Watershed erosion and scour on hill schemes	Use of low cost bio-engineering techniques	SMU/consultants engaged for SIP preparation/RPSU
In the case of larger schemes, soil salinization and changes in water table levels	Appropriate design measures such as provision of groundwater drains	SMU/consultants engaged for SIP preparation/RPSU
Arsenic poisoning	Exclusion criterion for schemes using groundwater where the source is found to	SMU/consultants engaged for SIP preparation/RPSU

Potential Effect	Mitigation Measure(s)	Agencies responsible for planning and monitoring
	contain excessive levels of arsenic	
Structures and facilities that are difficult to operate by WUAs	Preparation of design standards that encourage user-friendly design measures	DOI/CPMO
	Consideration of feasibility of operation in design/adherence to standards	SMU/consultants engaged for SIP preparation/RPSU
<b>Environmental impacts related to construction</b>		
Temporary increases in silt runoff/induced erosion	Provision in standard contract documentation for adequate supervision of operations and adherence to them by contractors; confining of operations to the dry season, use of silt traps, careful deposition of spoil arisings using reinforcement if necessary	DOI/CMPO – preparation of standard contract documentation
	Incorporation of the above measures into BoQs for subproject contract documentation	SMU/consultants engaged for SIP preparation/RPSU
	Supervision of Contractors	SMU
Temporary closure of irrigation systems	Participation by users and information to them	SMU/Contractors/WUAs
	Use of flexible hosing and/or diversion canals	DOI/CPMO for inclusion into standard contract documentation SMU/consultants for incorporation into BoQ SMU for contractor supervision
Dust generation	Appropriate timing of operations wetting of surfaces and notice to/involvement of public	As above
Noise generation	Appropriate timing of operations and notice to/involvement of public	As above
Land use conflict for construction facilities/ work camps/plant parking sites	Negotiation with landowners and compensation to them, in accordance with the resettlement framework as appropriate	As above
<b>Environmental impacts related to operation</b>		
Soil modifications as a result of intensified agriculture	Encouragement of (i) continued use of traditional terrace construction and management of water flows (ii) the use of deep rooting grasses and shrubs to further strengthen bunds and terrace walls, (iii) promotion of continued use of organic based practices	SMUs/DADO/NGOs engaged for the component
Soil and water contamination due to increased use of agrochemicals including fertilizer and pesticides	Agriculture extension to include (i) optimum, informed use of mineral fertilizers, (ii) promotion of integrated pest management, (iii) emphatic discouragement of the use of persistent pesticides	SMUs/DADO/NGOs engaged for the component
Biodiversity concerns associated with introduced plant species and varieties, reduced diversity of cropping and land use changes from tree cover to agriculture	(i) awareness raising on bio-diversity issues, (ii) promotion of diversity in farming practices and local landscape (iii) promoting planting of multipurpose trees	SMUs/DADO/NGOs engaged for the component
Increases in incidence of waterborne diseases,	Promotion of improved O&M of the schemes by WUAs	SMUs/ NGOs engaged for the component

Potential Effect	Mitigation Measure(s)	Agencies responsible for planning and monitoring
particularly due to increases in water logging	Awareness raising on hazards posed by poor sanitation, water logging and use of untreated water for drinking	SMUs/ NGOs engaged for the component
	Provision for adequate drainage in the scheme design	DOI/CPMO for inclusion into standard contract documentation SMU/consultants for incorporation into BoQ

25. **Design of Monitoring Systems.** The IEE must identify monitoring requirements for potential environmental effects over which uncertainty remains. Responsibilities for both undertaking the monitoring and acting on it must be clearly so that these can be incorporated into contract documents and other agreements relating to the project.

26. **IEE Reporting.** The findings of the IEE process should appear within the feasibility study report for the sub-project or micro project. A structure for the IEE section of the feasibility study report is given in Table 6.

**Table 5: Outline of an IEE report**

<p><b>A. Category</b> Statement of the type of project, referring to schedules 1 and 2 of the Environmental Protection Rules</p> <p><b>B. Description of the Environment</b>  <b>Physical Resources</b>            a) Climate Reference to sections in the feasibility study that give data on temperature, rainfall and humidity            b) Topography Reference to sections in the feasibility study that describe the topography of the command area and its surrounds. Brief highlighting of any issues of environmental significance.            c) Geology and Soils Reference to sections in the feasibility study that describe geology and soils in the command area. Brief highlighting of any issues of environmental significance.            d) Water Resources Reference to sections in the feasibility study that describe groundwater and surface water resources and associated issues. Brief highlighting of any issues of environmental significance.</p> <p><b>Ecological Resources</b>            a) Trees and Forests Description of condition of forests and trees occurring in and around the command area            b) Protected Areas and Wildlife Location of any protected areas in the vicinity of the command area.            c) Human and Economic Development Summary of Socio-economic features of environmental significance.            d) Quality of Life values Brief summary of the living situation for the people in and around the command area, mentioning any pertinent issues such as health issues, aesthetic issues, religious issues and description of any temples in or around the command area, population density, incidence of crime, tendencies for in and out migration, and any other issues pertinent to the quality of life.</p> <p><b>C. Screening of Potential Environmental Impacts</b> This should consist of a description of the main environmental risks and ways in which the environment can be enhanced by the sub-project, according to the following sub-headings. Predictions of environmental affects should consider both construction and agricultural extension components of each sub-project:</p>
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**Environmental Problems due to Project Location**

- a) Encroachment into Areas of Conservation Significance
- b) Impediments to Movements of Wildlife, Livestock and People
- c) Encroachment on Historical and Cultural Sites
- d) Water Resource Conflicts
- e) Flooding and Drainage Hazards
- f) Displacement of People and Property

**Environmental Problems related to Project Design**

- a) Watershed Erosion
- b) Downstream Water Quality Problems
- c) Suitability of Natural Water for Irrigation
- d) Overpumping of Groundwater
- e) Adequacy of Drainage Planning
- f) Land Tenure Problems
- g) Farmer Credit Limitations
- h) Feasibility of Cooperatives
- i) Feasibility of Water User Association
- j) Disruption of Existing Farmer Cooperative Systems
- k) Use of Chemicals in Agriculture and Horticulture
- l) Selection of Pesticides
- m) Land Use Conflicts
- n) Inadequacies in Water Distribution
- o) Canal Management
- p) Passageways
- q) Scouring Hazards

**Environmental Problems Related to Construction Stage**

- a) Erosion Control
- b) Other construction stage hazards

**Environmental Problems Resulting from Project Operations**

- a) O&M capacities and arrangements
- b) Adverse Soil Modifications
- c) Changes in groundwater hydrology
- d) Water-borne diseases
- e) Hazards associated with the use of toxic chemicals
- f) Hazards associated with the use of mineral fertilizer
- g) Impacts on water use for domestic consumption or aquaculture

**Realization of Enhancement Potentials**

- a) Community water supply in command area
- b) Aquaculture in command area

**D. Analysis of Alternatives****E. Mitigation Measures**

This section should include detail on the required mitigation measures. A high level of detail should be included here, to facilitate the incorporation of mitigation measures into contract documents for the sub-projects. For each measure, the following details should be given:

- Overall description including location(s) where the measure is to be applied
- Specifications, reference to appropriate clauses in standard specifications
- Quantities involved in each (materials, manpower, machinery time as required)

**F. Monitoring Requirements**

State which impacts need to be monitored, how monitoring is to be done, and what the indicators are.

**G. Institutional Arrangements**

Confirm which parties are responsible for ensuring that mitigation measures are enacted, and that monitoring is carried out.

**H. Findings and Recommendations**

Brief summary of the most important environmental considerations of the sub-project.

**I. Conclusion**

Brief statement. Normally, the conclusions will be one of the following:

- No environmental concerns relating to the sub-project
- No environmental concerns relating to the sub-project provided specified mitigation and monitoring measures are incorporated into contract documentation of the sub-project and enacted.
- Significant environmental concerns about the sub-project. The sub-project should not be approved, or an EIA must be carried out.

**c. Requirements for Public Consultation and Information Disclosure**

27. The approach adopted for the Project ensures that all subprojects are community driven. Accordingly, design and implementation involves the groups potentially affected by the schemes, ensuring a very high level of public awareness and involvement at each stage. Procedures for public consultation and disclosure are incorporated in subproject implementation guidelines prepared for the project. The main elements incorporated into the process of the Project include (i) understanding the project during the planning phase, (ii) physical and financial contributions during the construction phase, and (iii) taking ownership for operation, maintenance and management of the irrigation systems after construction.

28. Steps involved in public participation are outlined in subproject implementation guidelines and include (i) initial confirmation of genuine sub-project demand, (ii) participatory, comprehensive and accurate sub-project preparation, (iii) strong WUA organizations, (iv) committed participation of the WUA in sub-project implementation, (v) effective and transparent communication between supporting agencies and WUAs, and (vi) efficient use of financial resources.

**4. Monitoring Environmental Performance**

29. The Environmental Monitoring Plans (EMP) for each subproject will be prepared in the context of individual IEEs stipulating the possible environmental issues, mitigation measures, and monitoring and mitigation responsibilities in line with the Table 4 above, and will be further refined during the detailed design stage. Environmental monitoring will be integrated into the Project performance monitoring and evaluation (PPME) system. Essentially, it will be put into operation through data collection at subproject level by SMU with the engagement of private firms as necessary and/or WUA, monitored and supervised by RPSU through regular management review and field confirmation, and processing and analysis by Monitoring and Evaluation Branch of DOI in coordination with DOA. Environmental data will be shared with Environment Division. Monitoring costs have been incorporated into the design of the PPME system for the project. The findings of the monitoring activities will be incorporated in the regular PPME reports prepared by CPMO with the assistance of the consultants engaged under institutional strengthening and project management, and submitted to ADB.

30. Monitoring is necessary in respect of (i) water resources quantity and quality; (ii) any evidence of water resources dispute among users or environmental degradation; (iii) progress and status on resettlement activities; (iv) environmental indicators related to design and construction; (v) agricultural impacts such as input use (seeds, fertilizer, and pesticides) and outputs; and (vi) maintenance requirements and status of the subprojects including conditions of riverbank, structures, canals, and adjacent slopes.

31. For schemes located in the terai or in other locations close to or potentially close to polluting industries, water quality requires monitoring. The following parameters should be monitored on a quarterly basis, sampling at sources and at further points along the length of the principal canals: Chemical Oxygen Demand (COD), Biological Oxygen Demand (BOC), pH, Presence of Chromium, Presence of Lead, and Presence of Arsenic. In cases where conjunctive use of surface water and groundwater is promoted, the output rate from a sample of source wells should be monitored during each dry season to detect any trends in availability. The outputs should be monitored three times each dry season, at regularly spaced intervals.

## **5. Environmental Review and Reporting Requirements**

32. During the Project implementation period, CPMO on the basis of the information submitted from RPSU will regularly review and report the status of environmental management and monitoring in the Project, covering (i) compliance with environmental screening; (ii) compliance with requirements in IEE preparation; and (iii) environmental monitoring by the concerned institutions. These will be included in the regular project progress report. Prior to the midterm review, the ISPM consultants will undertake a more detailed review on project environmental performance, and identify any measures that need to be addressed during the ADB midterm review mission.

### **E. Confirmation**

33. These procedures cover the responsibilities, process and resources required for IEE preparation in respect of sub-projects for infrastructure improvement under the sector loan. The procedures satisfy the general objectives of IEEs under ADB requirements, and the requirements of the laws of Nepal. Studies undertaken during the PPTA have confirmed that sub-projects are classified under category B, for which IEEs must be prepared. Sub-project exclusion criteria eliminate sub-projects that require EIAs.

### **F. Staffing Requirements and Budget**

34. DOI staff at district, regional and central levels are required to undertake (i) environmental screening at subproject identification stage; (ii) preparation of IEEs at subproject appraisal stage; and (iii) environmental monitoring and mitigation during subproject implementation and operational stage. At appraisal, IEEs will be done with the engagement of private firms in the context of subproject feasibility studies under field supervision of SMU and overall supervision of RPSU, which will also be assisted by the ISPM environmental specialist in particular during the initial period for necessary capacity strengthening activities. Environmental monitoring and mitigation will be undertaken by the responsible organizations designated in the subproject EMPs in line with the responsibility matrix shown in Table 3. All staffing levels and costs have been incorporated into plans for implementation arrangements and the project budget.