

28. Guide to Environmental Assessment in Nepal Sector

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28. Guide to Environmental Assessment in Nepal

28.1 Concept of Environment

28.1.1 Introduction

The term “environment” is an all-encompassing one, which means essentially everything around us including the conditions under which we live. It can be defined to include the following three components.

Bio-physical

- land, water and air, including all layers of the atmosphere
- all organic and inorganic matter and living organisms, and
- the interacting natural systems (ecosystems) that include these components.

Socio-economic and cultural

- the social, economic and cultural conditions that affect the lives of people and communities

Built environment

- any building or structure or things made by the people

The World Bank (1994) defines the environment as “the natural and social conditions surrounding all mankind including the future generation”, thus encompassing all of these aspects.

All of these aspects are inextricably linked together; humans and their environment are interdependent and interactive. We live within our environment, we shape our environment, we depend upon our environment to support us, and we are shaped by our environment.

Human society receives numerous benefits and services from the bio-physical environment. These fall into four categories:

- life support functions,
- socio-cultural functions,
- productive functions, and
- sink functions.

All of these functions provide benefits to humans, either directly or indirectly. An ecosystem may, for example, provide water storage, habitat for plants and animals, natural recycling of wastes and flood control. A healthy ecosystem may function as a cultural resource, providing opportunities for non-consumptive uses such as trekking, and for religious or spiritual uses. The same ecosystem may be a source of raw materials and renewable resources such as timber, wild game animals and plant species. Society derives value from the continued supply of all of these benefits. Alteration of the ecosystem or other changes induced by development projects may remove or interrupt the ability of the system to continue to support the functions on which these benefits depend.

Confronted with a number of environmental problems and issues, society has developed number of tools to actively manage our environment. When applied in a comprehensive fashion, these tools form an environmental management framework which allows a society to address environmental concerns. For many countries, the tool known as Environmental Impact Assessment, or EIA, is seen as the central tool for managing environmental impacts.

28.1.2 Environmental Impact Assessment

The objective of environmental assessment is to protect our Environment in order to have;

- resources (renewable and non-renewable) on which to base a sustainable economic structure,
- safe and healthy living conditions for a high quality of life, and
- a sustainable and nurturing socio-cultural structure.

This can be done through:

- planning development and economic activities,
- conservation and protection of the biophysical environment, and
- maintenance of environmental health.

Environmental Impact Assessment (EIA) is one of the major instruments integrated with a goal of making economic development project, environmentally sound and sustainable. The use of EIA began in 1970 in USA and spread rapidly throughout the world particularly after the UN Earth Summit held in 1992. To enable such issues to be taken into account in decision making it was necessary to introduce a systematic procedure of EIA. Therefore, to date many of the countries of world have a legal and institutionalized system of EIA.

EIA has been defined in various ways by many national and international authors and institutions. The International Association for Impact Assessment (IAIA) provides one of the simplest but most complete definitions of EIA as: *“the systematic process of identifying the future consequences of a current or proposed action”*.

An application of EIA is based upon the certain values and principles for an effective implementation at the project level. There are following three core values:

- sustainability – the EIA process will result in environmental safeguards,
- integrity – the EIA process will confirm to agreed standards, and
- utility – the EIA process will provide balance, credible information for decision making.

28.1.3 The Application of EIA

EIA is considered as a project management tool for collecting and analyzing information on the environmental effects of a particular project. As such, it is used to:

- identify the potential environmental impacts,
- examine the significance of environmental implications ,
- assess whether impacts can be mitigated,
- recommends preventive and corrective mitigating measures,
- inform decision makers and concerned parties about environmental implications, and
- advise whether development should go ahead.

EIA is combination of both art and science. Management aspect in EIA is an art, whereas the technical analysis is based on the scientific principles.

EIA has been considered as a central management tool for achieving sustainable development supporting the notions of the Brundtland Commission (1987), which defined sustainable development as *“development, which meets the needs of the present generation without compromising the ability of fulfilling the needs for future generations.”*

28.1.4 The EIA Process

In EIA systems. there are number of sequence of activities to be implemented in project in logical order and are termed as EIA processes.

EIA Process in sequences of Application

- **Project Screening:** determines whether the project needs an EIA,
- **Scoping:** identifies significant impact, provides project alternatives and a basis for developing terms of reference,
- **Project Description and Consideration of Alternatives:** seeks to describe all reasonable alternatives, including the preferred and “no action” options (project location, scale, process, layout, and operating conditions),
- **Prediction of Impacts:** predicts impacts (as far as possible, quantitatively) in terms of characteristics such as magnitude, extent and duration,
- **Evaluation of Impacts:** the significance of predicted impacts,
- **Mitigation Measures:** measures to avoid, reduce and minimize adverse impacts and to enhance beneficial impacts,
- **Stakeholders Involvement:** occurs at various stages in the EIA process to ensure quality, comprehensiveness and effectiveness of EIA, and to ensure that stakeholders view are adequately addressed in the decision-making process,
- **Monitoring and Auditing Measures:** impacts which should be monitor are identified and auditing requirements are specified,
- **EIA Report:** summarizes all the information obtained, analyzed, interpreted and compiled in a report form. The report should contain a non-technical summary, including methods used, results, interpretation and conclusions,
- **Review:** EIA report submitted in order to assess whether or not all the possible issues have been adequately addressed and to facilitate the decision making process, and
- **Decision making:** Determines whether or not the project should proceed with the help of information and conclusion given in EIA reports.

28.2 Environmental Impact Assessment, Project Cycle and Project Management

28.2.1 Introduction

There are two aspects in project management.

- consideration of how EIA is linked to the main stages of the project cycle, and
- integration of important issues in the management of EIA studies.

Administrative procedure requires the preparation of an EIA report, which should be available to the decision makers and to the other interested parties before the implementation of the project. But the work of EIA should be accurate enough to provide information to facilitate the authorization purposes. The EIA reports produced at the later stage of project cycle reduces the project option/alternative and simply act as a justification for the project authorization. Therefore, to meet objective EIA should be initiated in the beginning of the project cycle, and should continue throughout the life of a project in a 'proactive mode'.

The relevant EIA activities for each stage in the project cycle, are described in Figure 2 and Annex 2.

28.2.2 Project Concept/Identification

At the initial stage of the project planning, detailed information on the project will not be available, but the basic nature of the project will be known. At this stage, the project may be subject to "screening" to decide whether a full and comprehensive EIA report must be prepared. In Nepal, projects required to be considered for an EIA and IEE are listed in the schedules 1 and 2 of Environmental Protection Regulation (EPR, 2055).

EIA work begins with screening. If screening recommends that an EIA report is required, then the initial study will begin. At this early stage, environmental overview/reconnaissance can indicate, whether any of the alternatives proposed are environmentally "disastrous". These can be eliminated from further consideration, and new alternatives can be identified. Major benefits of a "quick and dirty" overview are as follows;

- identification of "viable" alternatives (from an environmental viewpoint), and
- provision of an early indication of likely significant impacts.

28.2.3 Pre-feasibility

A series of investigation takes place during pre-feasibility stage. Existing basic information and additional information from the fields are collected and technical, economical and cost-benefit assessments are carried out in the course of pre-feasibility study. On the environmental side scoping is often carried out as an integral part of pre-feasibility study in order to ascertain;

- issues/impacts to be investigated,
- EIA study schedule,
- consultation to be undertaken,
- methods and techniques to be used,
- the form/content of EIA report, and
- preparation TOR for EIA study.

28.2.4 Feasibility study

The feasibility study provides a basis for the approval of a project. The feasibility study of the proposed project should address the following components;

- technical feasibility which includes, alternatives, preliminary design and specification, materials, cost estimate of construction, operation and maintenance,
- financial feasibility includes, analysis of revenues and direct cost,
- economic feasibility includes cost-benefit analysis,
- institutional sustainability; includes involvement, training, strengthening and capacity building of agency which will operate and own, and
- consideration of environmental and social implication of project implementation, includes, Environmental and Social Impact Assessment (EIA) study which comprises;
 - identification, prediction and assessment of anticipated impacts,
 - evaluation of significant impacts, and alternatives,
 - mitigation measures and estimated cost,
 - monitoring and auditing plan and the cost associated with them, and
 - preparation environmental Management Action Plan (EMAP)

28.2.5 Project Appraisal and Decision

During the project appraisal, a decision is made by the proponent or by the government agency, and in some case, by the lending agencies, as to whether the project is viable. At this stage, EIA results should be put into consideration with feasibility study. An application for authorization(s) should be made by the project proponent to a local/central government agency. This decision made by the authorizing agency is the final and determines whether a project is to be implemented. The EIA report plays an important role in this decision making process.

28.2.6 Project Implementation (PIP)

Prior to the project construction, project implementation plan - a guiding document should be prepared. PIP includes the arrangement for consultants, contractors, finance, reporting,

monitoring and evaluation for the construction of project. At the same time, in environmental and social aspects, a Environmental and Social Management Action Plan (EMAP) should be prepared. EMAP basically contains

- all environmental actions to be undertaken in the process of project construction, operation and maintenance,
- specific actions to be undertaken to reduce the anticipated impacts,
- monitoring parameters, schedules, indicators, methods and reporting, and
- cost consideration of all action including monitoring and auditing.

28.2.7 Engineering design/cost estimate/contract package

Engineering Design includes, final design, drawings, specification cost estimate, contract package and bidding documents for the construction and operation of the project. Environmental and social requirements mentioned in EMAP, should be incorporated in final design of the project. All environmental and social actions to be considered in the project implementation should be clearly integrated in project design specification and in Bill of Quantities (BOQ). The cost consideration for each and every activities of Environmental and Social consideration as estimated by EMAP must be integrated in Engineering cost estimate.

All the conditions and actions related to environmental and social aspects should be clearly mention in contract package. It may not be feasible to undertake all the diverse work of a project by a single contractor and it may be necessary to develop a different packages but the package relating to environmental and social actions, should be treated as the integral part of construction contract package. The EMAP requirements should be an integral component of bidding document.

28.2.8 EMAP Implementation and Monitoring

Specified project staffs for Monitoring of EMAP implementation should be made available. During project design. Construction and operation, the monitoring of EMAP implementation should be carried in order to assess, whether or not;

- the conditions required by EMAP have been integrated into engineering design and specification,
- the cost estimated to implement EMAP has been included in engineering cost estimate,
- all the items of Environment and Social enhancement and protection activities as presented in EMAP have been included in BOQ,
- all the specified items of EMAP are integrated into contract package and bidding document,
- the project contractor has complied the EMAP requirements,
- some new environmental and social impacts have emerged in the process of project implementation, and
- EMAP are adequate to control the impacts.

The Environmental Audit has to be undertaken after two years of operation of project.

28.3 Environmental Screening

28.3.1 Introduction

Many projects are considered by the public and private agencies every year. Environmental impact Assessment (EIA) should be applied to those actions, which may have significant effect on the environment. It is therefore, important to establish mechanisms by identifying projects which requires EIA, and this process of selection of project is referred as "Screening".

28.3.2 Screening Criteria

The following criteria are used to determine the projects that are requiring an EIA.

Threshold criteria

This method of screening establishes the thresholds for key features of a project, or an environmental parameter which exceeded the thresholds, would require an EIA. Such thresholds can range from environmental factors such as the size of agricultural land used for a development project, location, cost, outputs, infrastructure demands, national standards for air, water and noise.

General guidance for site threshold in which an EIA is usually required is given below:

- if the land requirement for the project is large in comparison to the scale of the surrounding environment,
- the area affected is of more than local importance or of a large number of people in the project area could be adversely affected, and
- if the project is highly visible and disrupts aesthetic values.

Capital investment or project cost may also be used as financial threshold. This threshold is an indicator of whether a project may be characterized by the following elements:

- occupation of large land area or involving high valued land,
- dislocation of large number of people, and
- large sized project requiring costly machinery or processing plant.

Project Type Criteria

To further assist in the initial screening decision, development projects can be divided into three broad categories as indicated in the following schedules, reflecting various degrees of potential impact on the environment. These schedules are determined on the basis of past experience with similar forms of development.

Schedule 1

Proposal likely to have significant but easily identifiable adverse impacts on the environment and for which mitigation measures can be readily prescribed. Such project requires Initial Environmental Examination (IEE) report (Schedule 1 of EPR 2055).

Schedule 2

Proposals which are likely to have significant adverse impact on the environment requires an environmental impact assessment report to be prepared (schedule 2, of EPR, 2055).

Schedule 3

Sensitive Area Criteria

Proposals of projects which are to be located within or near environmentally sensitive areas, are required to have an environmental impact assessment report prepared unless exempted by the Act. These areas include the following categories:

- areas of unique historic, cultural, archaeological, scientific or geological interest/wetlands,
- ecological fragile areas,
- national parks, wildlife sanctuaries and protected areas,
- wilderness areas containing rare or endangered species of animals or plants and their habitat,
- semi-arid, alpine or tundra areas,
- flood or other hazard zones,

- residential, school, and hospital areas,
- major sources of public water supply,

28.3.3 Initial Environmental Examination (IEE)

Projects in which the requirement for an EIA needs to be ascertained, should be subjected to an Initial Environmental Examination (IEE). IEE is carried out to determine whether potentially adverse environmental effects are significant or whether mitigation measures can be adopted to reduce or eliminate these adverse effects. IEE requires more in-depth analysis than applied in the screening procedure. Consequently, an IEE involves more time and resources. IEE also requires expert advice and technical input from environmental specialists so that potential environmental problems can be clearly defined. When an IEE is able to provide a definite solution to environmental problems, an EIA is not necessary.

To prepare an IEE, it is necessary to initially make a checklist that briefly describes the project activities to be implemented and natural resources to be affected.

Typical activities such as site of the project, resource demand, waste production and regulation, policies and guidelines are required to be included in IEE process. For any particular project, only a few of these may be significant and therefore the first step is to narrow the list of activities likely to produce significant effects on the environment. The interaction matrix shown in (Annex 3) illustrates the process of identifying significant impacts. The horizontal column in the matrix describes the proposed project activities, and the vertical column lists the environmental parameters that might be affected. The response of each environmental parameter to each project action is represented by an interaction cell and should be checked by a rating number ranging from 1 to 3, 1 represent no significant impact, 2 moderate impact and 3 major impact.

28.4 Environmental Scoping

28.4.1 Introduction

The next important step following the screening procedure is to determine what should be the coverage or scope of the EIA study for a project proposal as having potentially significant environmental impacts. This activity is referred to as "Scoping". Scoping helps in developing and selecting alternatives to the proposed action and in identifying the issues to be considered in an EIA. It is also a procedure designed to establish a terms of reference (TOR) for an EIA.

28.4.2 Aim of Scoping

Scoping is required to ensure the following:

- identify concerns and issues for consideration in an EIA,
- ensure a relevant EIA,
- enable those responsible for an EIA study to properly brief the study team on the alternatives and on impacts to be considered at different levels of analysis,
- determine the assessment methods to be used,
- identify all affected interests,
- provide an opportunity for public involvement in determining the factors to be assessed, and facilitate early agreement on contentious issues,
- save time and money, and
- establish terms of reference (TOR) for EIA study.

Scoping is not an isolated exercise. It may continue well into the project planning and design phase, depending on new issues may arise for consideration.

28.4.3 Method of Scoping

The approach and techniques used in scoping are commonly a part of any decision-making process. Issues are identified, evaluated, and organized for presentation to decision-makers. The basic components of a scoping exercise are as follows:

- making a plan for public involvement,
- assembling relevant existing information,
- distribution of information to affected interests,
- identifying major issues of public concern,
- evaluating the significance of issues on the basis of available information,
- establishing priorities for environmental assessment, and
- developing a strategy for addressing priority issues.

28.4.4 Agencies Responsible for Scoping

Responsibility for scoping may rest with the authorizing agency; alternatively, the authorizing agency should provide guidelines for this activity to the project proponent, who may be another government agency or a private developer. Sectoral agencies of the government should also be involved in the EIA scoping exercise (e.g., Agriculture, Forests, Livestock, Water Resources, Health) as well as relevant donor agencies. At the community level, key local persons, leaders, and special interest groups such as teachers, women, students and farmers should also be involved in EIA scoping. This involvement will encourage their participation in the EIA process, and in the implementation of EIA of the proposed project including environmental monitoring and evaluation. EIA scoping should be an open and participatory exercise. It should involve review agencies and sectoral representatives and should allow public participation.

28.4.5 Time for Conducting Scoping

Scoping should be carried out at an early stage of project planning, followed by the completion of the screening process. The process of scoping is best initiated at the pre-feasibility stage of the project cycle. Terms of reference (TOR) for an EIA study is usually prepared on the basis of scoping results.

28.5 Terms of reference (TOR) for EIA Study

28.5.1 The Need for TOR

If the screening exercise indicates the need for an EIA for a particular project, a TOR is prepared to provide specific guidelines for the full-scale EIA study. TOR preparation assists in:

- systematising the working procedure,
- delineating the specific activities to be implemented,
- fitting the EIA study into the context of existing policies, rules and administrative procedures,
- accomplishing the work within a specified time frame,
- giving emphasis to the most important elements for study, and
- providing technical guidance in delineating the specific environmental aspects for study.

28.5.2 Suggested Format for TOR

a. Introduction

- purpose of terms of reference, and
- responsible party for preparing the EIA report.

b. EIA guidelines

General guides to be followed should be provided, together with the procedure to be used in preparing the EIA report.

c. Background Information

- general background studies and relevant reports should be described,
- specific background studies and reports related to the project and location should be listed or described,
- relevant policy and legislation should be mentioned, and
- the relevance to local planning perspectives should be discussed.

d. Specific EIA guidance

- the environmental components which need detailed or further study should be listed. The indicators of each listed component to be measured or assessed might be specified,
- action required to minimise possible adverse impact (relocation, increased taxes, compensation, etc.),
- cost- benefit analysis of project in terms of its environmental implications.
- EIA reports should propose a monitoring programme for assessing the actual impacts during the project operation and beyond,

e. The following tasks should be mentioned in the EIA study proposal:

- work tasks: each specific task to be done should be sufficiently described,
- study schedule: the proposed plan for carrying out the EIA study should be indicated,
- review sessions: periodic reviews of the work might be needed during study,
- study team: expertise and specialists needed for the proposed project, and
- study team should be described.

f. Conclusion on whether the project should be implemented or whether it poses an unacceptable risk.

g. Time constraints

- the time required for the EIA report to be completed should be specified (e.g. within 3 to 12 months).
- a description of EIA tasks and completion dates should be stated.

h. Budget

The estimated budget allocation for the EIA study and report preparation should be given.

i. EIA report format

j. Other relevant Information

Reference list

Annexes, Maps, Photographs, Figures, Tables, Chart Drawings, Checklist, etc.

(Schedule 3 EPR, 2055)

28.6 Baseline Data Collection

28.6.1 Introduction

Baseline information is important reference point for conducting EIA. The term "baseline" refers to the collection of background information on the biophysical, social and economic settings of a proposed project area. Normally, information is obtained from secondary sources when there exists a facility of database, or the acquisition of new information through field samplings. The task of collecting baseline data starts right from the period of project inception, however a majority of this task may be undertaken during scoping.

Baseline data are collected for two main purposes:

- to provide a description of the status and trends of environmental factors (e.g., air pollutant concentrations) against which predicted changes can be compared and evaluated in terms of importance, and
- to provide a means of detecting actual change by monitoring once a project has been initiated.

28.6.2 Environmental Setting

The description of the environmental setting includes the characteristics of the area in which the proposed action would occur. Project area is defined as the area within which all effects, impacts, features and potential compensation efforts would occur. The levels of details of the description of the study area should be sufficient to convey to readers or reviewers the precise nature of the natural and human resources, potentially affected by the proposed action and alternatives.

The following are the major environmental parameters of the proposed project area for which the existing baseline information required to be assessed:

- **geology:** geological provinces, bedrock formations, history of geological stability or instability,
- **topography:** general topography of region, specific topography of project area,
- **soils:** soil mapping, soil series properties, constraints to development,
- **groundwater resources:** nature of water-bearing formations, recharge rates, sustainable safe yields, locations and depths of existing wells etc.,
- **sound Levels:** existing sound levels, sources of sound,
- **surface Water Resources:** drainage basin and sub-basin, named and unnamed water bodies and water courses, regulatory, classification of water bodies, flow regimes, water quality data and evaluation, identification of existing permitted discharges to surface water,
- **terrestrial Communities (botanical and zoological):** spatial arrangement of vegetative community types, species, abundance listings, wildlife species, abundance listing, records of threatened and endangered plant and animal species,
- **aquatic Communities:** nature of aquatic habitats species abundance listings for aquatic macro invertebrate and fish communities, ecological indexing of community data,
- **environmentally Sensitive Area:** identification of wetlands, floodplains, steep slopes, stands of mature vegetation, aquifer recharge areas, areas of high water table, areas of rock outcrops, prime agricultural mines,
- **land Use:** - existing patterns of land use in region, regional planning for future use, zoning,
- **demography:** estimated population, recent trends and projections for future population,
- **socio-economic:** economic and social structure of communities, tax rates, characteristic types of development,

- **infrastructure Services:** nature and scope of human services such as police and fire protection, hospital, schools, utilities,
- **transportation:** layout and function of existing roadways, airports; existing and projected capacities and demands.
- **cultural Resources:** location and characterisation of identified cultural resources (archaeological, historical, cultural, landmark), potential for unidentified resources to be present in project area, and
- **project Economics:** comparative analysis of proposed alternatives with cost-effective and cost/benefit criteria, or other methods.

The levels of detail description of the environmental setting will vary with the nature of the proposed action and affected resources. When an action (and its anticipated effects) is a 'point' and essentially confined to a particular piece of property then it is generally appropriate to describe all natural and man-made features of the property and the vicinity. This approach would be appropriate for the EIA of a moderate-size industrial/commercial facility or for a residential development. When an action is a 'band' such as a transmission line, pipeline, or canal, the discussion of existing environments may necessarily be less detailed and in certain categories only.

EIA is often conducted under severe time constraints. In most cases, two to three months are allocated for EIA study. Sometimes, it may go up to six months. EIA practitioners often tend to take up, the majority of time for collecting baseline information and in the end, the volume of baseline data becomes so large that it becomes difficult to handle properly, and it may be irrelevant in the preparation of EIA.

It is often forgotten why the baseline information is collected, where to incorporate them and what level of understanding is required. Sometimes, it becomes too superficial, while in other cases it goes deeper, and at the end much of the investment on time and money are being wasted.

Collection of baseline data should be designed to satisfy information requirements and should be relevant to EIA analysis. Only baseline data needed to assist prediction of the impacts contained in the TOR should be collected. Intensive and focused efforts to collect baseline data must be directed by the requirements of the TOR.

28.7 Policies, Laws, Guidelines, Standards and International Obligations Related to EIA Implementation

28.7.1 Introduction

Recognizing the importance of an application of Environmental Impact Assessment for making development proposals sustainable and environment-friendly, most of the developing countries including Nepal have integrated EIA in policy framework, enacted legislation and prepared environmental assessment guidelines.

28.7.2 EIA Related Policies

National Level Policies

In the planning history of Nepal, the Sixth Plan (1980-'85), for the first time, recognized the need for EIA integration for major infrastructure projects. The government of Nepal enunciated environment conservation related policies in the Seventh Plan (1985-90). In order to enforce this policy, *a series of guidelines were developed incorporating the elements of environmental factors right from the project formulation stage of development plans.*

EIA was one of the major components in National Conservation Strategy (NCS) and the Master Plan for Forestry Sector (MPFS) for implementation. The NCS also emphasized the need to internalize the EIA system into Nepal's resource management and development planning.

Nepal's Eighth Plan, formulated after the participation in the Rio Earth Summit in 1992, was an important policy document. The Eighth Plan period (1992-1997) has made contribution in institutionalizing EIA system in Nepal's development planning and administration. During this period, government of Nepal adopted and implemented the National EIA Guidelines, 1993, and two separate EIA Guidelines for Forestry and Industry sector in 1995 through administrative decisions, and also continued the preparation of the sectoral EIA guidelines. During the Plan period, the Environment Protection Act, 1996 and the Environment Protection Rules, 1997 were enacted and enforced.

The current Ninth Plan (1997-2002) has adopted a policy of participatory EIA system and it emphasizes to make necessary procedures for the involvement of local bodies, communities, private sector, NGOs and government agencies. The plan has also focussed the need for conducting EIA study in order to protect biodiversity conservation while implementing development projects in remote area.

Sectoral Policies

Besides these national level policies, sectoral development policies have also emphasized the need of environmental management, including the adoption of EIA process. The Hydropower Development Policy (1992), The Irrigation Policy, 1993 (revision 1997), Policy Document on EIA in Road Sector of Nepal (2000) formulated Geo-Environmental unit, Department of Road, all have substantial section on EIA. Similarly the sectoral policies of forests, industry, tourism, solid waste management and road development policy have accorded high priority to integrate environmental aspects in the respective development projects and programs.

28.7.3 EIA Related Laws

Nepal has enacted a number of regulatory measures for the consideration of the environmental aspects in development project and program. Various sectoral Acts contain "loose" provisions and provide opportunities to frame rules and by-laws to consider an integration of environment at the project level.

Environment Protection Laws/ Regulation

In the process of internalizing the Environmental Assessment System in development proposals, government of Nepal enacted the *Environment Protection Act (EPA)* 1996 and the *Environment Protection Rules (EPR)*, 1997, which makes the integration of IEE and EIA legally binding to the prescribed projects. Proposals requiring IEE and EIA study have been included in Schedules 1 and 2 of the EPR, 1997 (amendment 1999). The EPA and EPR have been enforced since 24 and 26 June 1997 respectively in Nepal.

Ministry of Population and Environment (MOPE) has published an additional notice in the Nepal Gazette, on 23 August 1999, stating that the proposals which are not listed in Schedules 1 and worth of investment of over Rs. 10 million to 100 million may require IEE study, and those which are not listed in Schedule 2 and worth of investment of over Rs. 100 million should undergo an EIA process (Annex 4).

28.7.4 EIA Guidelines

The National EIA Guidelines for Nepal was drafted, tested and finalized through a participatory approach and within two years of continued efforts the government of Nepal endorsed the guidelines on 27 September 1992 through an administrative decision (Cabinet decision) and gazetted it on 19 July 1993. Although National EIA guidelines is a procedural guidelines, it substantially encouraged the proponent to prepare an EIA report of the prescribed development projects and programs and it served the primary source of integrating environmental aspects in major development projects.

Within the broad framework of the National EIA guidelines, two separate EIA guidelines of Forestry and Industry Sector were prepared and the government endorsed them in 1995. These two guidelines primarily differ on schedules, which include projects and programs requiring environmental assessment.

28.7.5 Standards

The environmental law empowers the government to issue any kinds of standards to promoting environmental management in Nepal. MOPE should develop and implement ambient environmental quality standards and the concerned agencies should implement emission or effluent standards. No ambient standards have been developed so far and efforts are underway to develop other categories of standards. Currently, two types of environmental standards are under implementation. They are grouped into legally binding and voluntary standards.

Discharge Standards

- effluent standards,
- vehicle emission standard, and
- pesticide residues.

The standard on carbon monoxide (CO) and cartridge smoke unit (H.S.U.) are legally binding and was issued in accordance with the provisions of the Vehicle and Transport Management Act, 2049 (1992) on 28 Paush 2054. The standard for CO and HSU is as follows.

a. Petrol Operated Vehicles:

- a. CO - maximum 4.5 per cent (by volume) for four wheelers produced till 1980.
- b. CO - maximum 3.0 per cent (by volume) for vehicles produced after 1981.
- c. CO - maximum 4.5 per cent (by volume) for three wheelers produced till 1991
- d. CO - maximum 4.5 per cent (by volume) for all two wheelers

b. Diesel Operated Vehicles:

- a. Smoke density - 75 H.S.U. for all diesels operated vehicles produced till 1994
- b. Smoke density - 65 H.S.U. for all diesels operated vehicles produced after 1995

These standards were enforced since Shrawan 1, 2055 for two wheelers, and since Magh 1, 2054 for all other vehicles.

28.7.6 Meeting the International Obligations

Nepal has been a Party to 16 environment related international legal instruments, the treaties, conventions and agreements. Furthermore, Nepal has signed other four conventions and treaties, which Nepal should implement, based on moral obligation but not on legal ground. In view of the EIA requirements on international legal instruments, the Convention on Biological Diversity (CBD) is more important. This Convention obliges the Party countries to

- introduce appropriate procedures for EIA,
- introduce appropriate arrangements to conduct EIA,
- promote and exchange information with other states,
- notify immediately the potential affected states in danger of biodiversity,
- promote national arrangement for emergency response on conservation, and
- examine restoration and compensation for damage to biodiversity.

Nepal signed this Convention on Biodiversity on 12 June 1992 during the Earth Summit at Rio and Nepal ratified this Convention and deposited its instrument of ratification on 23 November 1993 and became a Party since 21 February 1994. Other Conventions to which Nepal is a Party do not specifically mention about EIA requirements.

Besides the international legally binding instruments, there are other instruments such as Stockholm declaration, Rio declaration and also Agenda 21 – a blue print of action – for the 21st century, which obliges the UN member states to adopt necessary measures on EIA application

so as to minimize potential environmental impacts and augment beneficial environmental impacts. The Stockholm and Rio Declarations also encourage the UN member States to integrate EIA process in the overall decision-making, planning and implementation of the development projects and programs.

28.8 Identification of Environmental Impacts: Concepts and Methods

28.8.1 Introductory Concepts

Any economic development project, whether its simple and small or large and complex, it has some environmental implications. The environmental implications may be beneficial or adverse, but the main objective of impact identification is to specify areas that are likely to be affected by the implementation of a project. Environmental impact, by definition, implies an alternation of environmental conditions or creation of a new set of adverse or beneficial environmental consequences caused by the action under consideration. Impact identification starts at the early stage of scoping when data on both the project and surrounding environment are made available.

28.8.2 Type of Impacts and their Consideration

28.8.2.1 Bio-Physical Impacts

Impacts in this category relate to effects on biological resources such as vegetation, wildlife, crops, and aquatic life. Impacts affecting soil and land forms, or creation of a propensity for soil erosion, floods and sedimentation, would be considered as physical impacts. Chemical impacts relate to project activities that cause a chemical change in air/water/soil quality. Smoke emitted from a brick factory, for example, may change the amount of sulphur dioxide (SO₂) content of ambient air, while untreated effluent discharged directly into a river by a paper factory may change the chemical characteristics of the river.

The biological component covers all elements, including different forms of plant life, structures, functions and their interaction with other components of an ecosystem. Another component of a biological system is the animal life, which ranges from microscopic protozoans to large animals such as elephants occupying different niches in trophic-dynamic systems.

In the conclusion, in the process of planning of a economic development project, the consideration of following four major points should be made to avoid or minimize the adverse impacts of biophysical components;

- the project activities, which may affect the bio-physical component of the project area, should be carefully analysed and the measures to be adopted to avoid any adverse impacts, should be implemented,
- the composition, structure, and abundances of flora, is the habitat for keystone animals, may also contain economic plants, endangered, rare, endemic and threatened species. It may also constitute a primary components of biodiversity, which should be protected and conserved from the damage likely to take place in the implementation of project activities,
- keystone animals constitute unimportant role in food-chain, and may be endangered, rare, threatened, and endemic species, which form an important component of biodiversity, should not be affected by the project activities. Measures to protect such animals and their habitat from any adverse impacts should be included in the development activity package, and
- any activities, which affects bio/geo-chemical cycle within an ecosystem should be carefully analysed and efforts should be made to minimise the impacts through the implementation of appropriate measures.

28.8.2.2 Social Impact

A study of socio-economic impacts would examine project action that alters the existing social condition of communities within or around the project location. Socio-economic impacts may prove either adverse or beneficial.

Social impacts can be subdivided into the following:

- **demographic impacts** - such as displacement and relocation effects; and changes in population characteristics,
- **socio-economic impacts** - including income and income multiplier effects, employment rates and patterns, prices of local goods and services, and taxation effects,
- **cultural impacts** - traditional patterns of life and work, family structures and authority, religious and tribal factors, archaeological features, social networks and community cohesion,
- **institutional impacts** - including demands on the government and social service, NGOs housing, schools, criminal justice, health, welfare and recreation, and
- **gender impacts** - the implications of development projects on the roles of women in society, income-generating opportunities, access to resources, employment opportunities and equity.

The first step in social impact analysis is the identification of social communities such as:

- ethnic/tribal group,
- occupational groups,
- socio-economic status, and
- age and gender.

The analysis also include the refinement of the actual capacity of the people, to make the major decision, regarding the uses of biophysical resources, upon which they depend for livelihood. The distribution of production is also another important aspects to be analysed. Identification and analysis has to be made on:

- the existing local institutions and their systems of operation, for bio-physical resource utilization
- conflict resolutions,
- authority and leadership structures,
- representation of social communities,
- dominance, and
- their capability of handling the issues.

Information on resource availability and utilization, impact of inadequate compensation, and traditional system of resource use if disrupted, then the process of EIA is extremely useful for formulating environmental mitigation strategy.

Two important aspects have been recommended while considering social aspects in EIA:

- it is always advisable to avoid involuntary resettlement, mostly in cases where vulnerable groups of people are involved, and
- in cases, where projects require land acquisition from indigenous territories, the people affected should be compensated adequately so that their standard of living is improved or, at the least, is at the similar level.

28.8.2.3 Cultural Impacts

Project impacts on cultural heritage should be considered. Areas of study should include historic sites, religious shrines or areas, or traditional practices that may be affected.

Cultural resources refer to archaeological, historical, religious, cultural and aesthetic values. Cultural resources are part of the resource base, it is therefore important that the development options, under consideration are screened for potential impact on cultural properties. In the process of conducting EIA, it is essential; to check; whether or not the area contains UNESCO World Heritage Sites, which now number over 300 sites recognised as having outstanding universal value. The national inventories of cultural resources, which can provide important data along with the agencies like museums, universities, departments of archaeology, and other relevant agencies should be consulted.

If in the project site, there are some buried materials of archaeological/ historical value, discovered within three meters under the earth's surface, they are called "Archaeological Chance Finds", and the construction contractor should comply with the following rules and national archaeological laws:

- notify relevant departments of such findings,
- request a site inspection,
- completely halt work until inspection results are received, and
- decide whether or not to proceed with further work.

28.8.2.4 Health Impact

Traditionally, health issues have been given little attention in EIAs. Even when social impacts were being investigated, the effects of a proposal on individual mental and physiological well-being (health status and trends) were often omitted or treated in an unsatisfactory manner. The World Health Organization (WHO) defines health as a state of social and individual well-being and not just the absence of disease. If this view is accepted, then the links between health and social impacts are apparent. Often, not always, health impacts depend on environmental impacts, such change in habitat causing increased in vector or the likelihood of contact between the vectors and humans. The direct relationship between biophysical change, and incidence of disease may be one of the important reasons. A common example is an increased incidence of sexually transmitted disease resulting from the influx of a large construction labour force.

The following are reasons why the consideration of health impact assessment, should be integrated into the EIA process.

- prevention is better than cure, as with other forms of assessment,
- it is specified in many forms of impact assessment legislation,
- environmental degradation is linked with health impacts,
- environmental, social and health outcomes can be improved,
- systematic consideration of health issues improves the legitimacy of the decisions made and the process through they are taken, and
- human health issues often prompt a public response and their involvement.

28.8.2.5 Economic Impact

The focus in economic impact assessment is the estimation of the change in economic variable caused by:

- project construction and operation
- workforce requirement and the income earned by workers,
- materials and other inputs for the project, and

- capital investment.

It is essential to estimate the size of labourforce, skilled manpower requirement and the duration of their involvement. Requirement of manpower varies at different stages of project implementation; for example, the need for labour peaks at the mid point of construction and then declines gradually. An estimation of capital expenditure on local materials, and services is also required for economic evaluation.

A thorough analysis of the labourforce and the local economy requires information on:

- the categories of labour available,
- the categories of labour that are highly demanded and employed, not employed and partly employed,
- estimation of unemployed labour; proportion of female looking for employment, and
- the number and type of employment likely to be generated by project implementation.

These data can be manipulated for analysing and predicting economic impacts. The money, that comes into the area in the form of wages is the Initial Income Injection (III) into the local economy. Some part of such money will be spent on buying goods and services, helping to improve the economy of those who sell goods and services. In this way a flow of money in the project area is being maintained with certain changes in the economy at each stage. Thus, the value of economic multiplier will be high. In some cases, the income earned by labours will be remitted outside the project area to their families; in such cases, the value of multiplier would be low. This is the reason why the emphasis on the employment of local people is desirable rather than employing people from outside of the project area.

28.8.2.6 Risk and Uncertainty in EIA

EIA deals with future events and, thus, has to cope with the issue of predicting events whose livelihood of occurrence is not known precisely or accurately. Until recently, this issue was usually handled by ignoring it. EIA reports used words such as "will" and "might" to indicate in a qualitative manner the likelihood or probability of events occurring. It was left to the decision makers and the public to interpret the meaning and significance of such qualitative expressions.

It is useful to define the term "hazard" at this point because it is used commonly in EIA and project appraisal. A hazard can be defined as the inherent or intrinsic property of a system (which can be an operating factor, or a mode of transport) to cause damage. The livelihood of that damage or harm occurring is termed the "risk". Risk- assessment is the scientific process of assessing the probability of an adverse effect of defined characteristics caused by a hazardous event occurring (for example, the explosion or release of a toxic gas occurring at a chemical installation). Risk assessment answers two basic questions:

- how likely is an event to occur?
- how harmful can it be in terms of deaths, injuries and property and ecosystem damage?

Risk assessments have been undertaken, traditionally, for proposed hazardous facilities such as nuclear power stations, pipelines transporting flammable materials, and installations, which use or produce hazardous materials. In the past, these have been undertaken separately from EIA often because there were no EIA requirements but even when EIA requirements existed. Basically, risk, assessment is based on engineering systems, their potential malfunction and relating the consequences of such an event to human health (mortality and morbidity) and structural damage to buildings.

There are three distinct stages in a probabilistic risk assessment:

- identification of hazards,
- identification of initiating events that might lead, to various hazards, and
- pathways or scenarios, to a hazardous.

28.8.3 Categorization of the Impacts

The types of impact should be categorised as direct, indirect and/or cumulative as indicated in the following descriptions:

- a. **Direct Impacts:** direct impact refers to an alteration of the existing environmental condition as a direct consequence of project activity. Construction of an irrigation diversion weir on a stream bank, for example, may have a direct impact on the aquatic ecosystem and stream valley vegetation and also directly cause erosion,
- b. **Indirect Impacts:** indirect impact results when one component of the environment produces repercussions for other related components. A direct impact can have far reaching effects, producing numerous indirect impacts, depending on the structure and function of the system which is being stressed by development activities, and
- c. **Cumulative Impacts:** while an environmental impact produced by a single activity may not be significant, a series of types of impacts created by more than one project, or by the combined effects of several impacts from the same project, may be cumulative. Consequently, an ecosystem may be dramatically affected through cumulative impacts. It is necessary to consider the cumulative impact of all projects that share mutual resources or affect the same area (Annex 5).

28.8.4 Impact Identification Methods

In the history of EIA, an enormous variety of methods have been devised to help undertake EIAs and prepare EIA reports. These EIA methods are structured, formal frameworks, which allow impact data to be identified, manipulated and presented. Irrespective of particular methods employed at various stages, the overall approach to EIA should be based on fairness, openness, cost-effectiveness and efficiency. The methods should be:

- **Comprehensive:** recognized that EIA is multi-disciplinary subject,
- **Selective:** pinpoint the significant impact and eliminate non-significant issues that would dissipate the efforts and confuse the decision making process,
- **Comparative:** determine the environmental changes resulting from the project as distinct from changes that would otherwise occur under existing biophysical and social condition, and
- **Objective:** provide unbiased measurement and prediction, free from political and external influences.

The EIA methods are broadly divided into two main categories. They are:

- identifying impacts; and
- presenting the results of the study in the EIA report.

A variety of assessment tools are available for use by EIA practitioner. The successful utilization of any of these tools depends upon the nature of the project. Some of the tools include;

Checklists

As one of the first EIA methods, checklists are still in use, though, in many different forms. Usually, checklists consist of list of environmental factors, which may be affected by project activities. Checklists can range from simple lists of items to more complex variations, which incorporate guidance on the scaling and weighting of impacts. Broadly, there are different types of checklists frequently used in impact identification, and some of them are briefly, described below:

- a. **Simple checklists:** checklist containing a list of environmental factors and are very simple to use. The simple checklist focus attention only on those factors, which have to be considered for EIA analysis (Annex 5).
- b. **Questionnaire checklist:** this methods includes a set of questions to be answered. The questions are listed under generic categories such as "terrestrial ecosystem" and "disease vectors". Those assessing impacts must attempt to answer the questions in all categories.

There can be three answers, depending on how much is known about the particular impact under consideration (Annex 7 and 8).

- c. **Simple Matrix:** the simple matrix refers to a display of project actions or activities along with one axis, with appropriate environmental factors listed along with the other axis of the matrix. When a given action or activity is anticipated to cause a change in an environmental factor, this is noted at the intersection point in the matrix and can be further described in terms of magnitude and important considerations.
- d. **Leopold Matrix (LM):** this matrix method was developed by Leopold et al. (1971), and it has been used for the identification of impacts. It involves the use of a matrix with 100 specified actions and 88 environmental items. In constructing the matrix, each action and its potentiality for creating an impact on each environmental item must be considered. Where an impact is anticipated, the matrix is marked with a diagonal line in the interaction box. The second step in using the Leopold Matrix is to describe the interaction in terms of its magnitude (M) in the upper section and importance (I) in the lower section of each box.
- e. **Networks:** Networks are an extension of information presented in matrices. A network diagram visually illustrates the linkages of different components of impacts and ecosystems. The networks are the better ways of presenting cases and effect relationship. Network recognizes a series of impact that may be triggered by single project action and identifies the second and third-orders effects (Annex 9).
- f. **Geographic Information Systems (GIS):** in the strictest sense any organized system for the management and manipulation of spatial information may be regarded as constituting a GIS. However, it is generally accepted that the term GIS refers to a computer-based system incorporating the collection, storage, retrieval at will, transformation and display of spatial data.

In general, geographic information systems (GIS)

- have the potential for storing and accessing very large data sets,
 - can consolidate data from many different sources for use in geographic analysis,
 - are very efficient at performing multiple map of overlays, incorporating logic statements as well as mathematical manipulation,
 - can generate descriptive statistics regarding the distribution of spatial phenomena,
 - allow a number of different scenarios to be investigated quickly and efficiently by varying input parameters for successive analysis runs, and
 - can generate maps for output to hard copy as well as display map information on screen.
- g. **Task Specific Computer Model:** when future prediction is involved, computer model designed for specific purpose is being utilized in EIA analysis. Such model often incorporates mathematical representation of key process and interactions. These models are used to predict the changes of resources to be affected over a period of time. Such modellings are only effective, when environmental factors are quantifiable.

28.8.5 Impact Prediction

Prediction should be based on the available environmental baseline of the project data. Such predictions are described in quantitative or qualitative terms. The predictions made, at least should indicate the following:

- determine the initial reference of baseline condition,
- estimate the future state with the proposed action, and
- estimate the future state without the proposed action.

Impact Prediction should be focused into the following consideration,

Magnitude of Impact: this is defined by the severity of each potential impact and indicates whether the impact is irreversible or, reversible and estimated potential rate of recovery. The magnitude of an impact can not be considered high if a major adverse impact can be mitigated.

In prediction of impact, the magnitude is often expressed as high (H), medium (M) and low (L).

Extent of Impact: the spatial extent or the zone of influence of the impact should always be determined. An impact can be site-specific or limited to the project area (SP); a locally occurring impact within the watershed of the proposed project (L); a regional impact that may extend beyond the watershed (R); and a national impact affecting resources on a national scale (N).

Duration of Impact: environmental impacts have a temporal dimension and need to be considered in an EIA. Impacts arising at different phases of the project cycle may need to be considered. An impact that generally lasts for only three to nine years after project completion may be classified short-term (St). An impact which continues for 10 to 20 years may be defined as medium-term (Mt), and impacts that last beyond 20 years are considered long-term (Lt). The type of impacts produced during the construction phase are of generally of short-termed.

28.9 Mitigation Measures

28.9.1 Introduction

Mitigation measures are actions which reduce, avoid or offset the potential adverse environmental consequence of development activities. The objective of mitigation measures is to maximise project benefits and minimise undesirable impacts. Although a wide range of mitigation measures may be proposed, the following are relevant to most development projects.

28.9.2 Consideration of Alternatives

Considering of alternatives to a proposed project is one of the key functions of an EIA, which involves an examination of alternative ways of achieving the objectives of a proposed project. The aim is to arrive at a development option which maximises the benefits while minimising unwanted impacts. Important aspects of development proposals for which alternatives need to be considered include:

- scale,
- technology,
- location,
- fuel ,
- mitigation measures,
- raw materials,
- design,
- time schedule, and
- economic factors.

A comparison of adverse impacts against advantages should also include in considering the alternative while designing the project. However, adaptation of any alternative should not substantially alter the objectives of a proposed project if it is determined that the project should proceed.

28.9.3 Compensatory Measures

Compensatory measures are actions which compensate for adverse impacts that are unavoidable. Possible compensatory measures include:

- restoration of damaged resources,
- rehabilitating displaced settlements, and

- compensation to affected persons.

28.9.4 Corrective Measures

Corrective measures may be adopted to reduce adverse impacts to acceptable levels. The following are examples of the types of corrective measures that can be used:

- installation of pollution control devices,
- construction of a wastewater treatment plant, and
- construction of a fish ladder (in dams, weirs).

28.9.5 Preventive Measures

Potential adverse impact may be reduced or eliminated before its occurrence by introducing preventive measure. Examples of preventative measures include:

- implementation of a health education programme
- initiation of a public awareness programme

28.9.6 Implementation of Mitigation Measures

Implementation of mitigation measures requires funding which should be estimated and included in the EIA report. All proposed mitigation measures should be integrated in the project design so that these measures may automatically form part of the construction and operational phases of the project. This is a cost effective approach rather than adding mitigating measures to an existing project.

28.10 Public Consultation and Participation

28.10.1 Introduction

The involvement of the public is a vital component in successful EIA system and specific EIA study. Different terms have been used to describe this aspect of EIA, for example, consultation and participation.

Who is the public ? Generally, this phrase refers to the following:

- local people (individual) and communities (for example, villagers) are likely to be affected by a project;
- project beneficiaries (may not be local)
- NGOs active in the local area or with an interest on natural resources/social welfare; and the interested "public" in the country of any external financing agency.

Individuals, groups or organisations or representation, should be involved in EIA. Often, EIAs provide opportunities of being involved, for example, the research scientists, who may be the experts on aspects of the concerning locality. In total, they are often referred to as "stakeholders".

There are basically two approaches for making public involvement in EIA:

- information dissemination, wherein the proponent provides information on a proposal, to the stakeholders, and
- flow of information is 'one-way' and getting responses from the stakeholders.

However during consultations there are opportunities for the stakeholders to express their views on issues, related to the proposal. The proponent and/ authorizing agency are also involved in participation. As the term indicates, the participation requires shared involvements and responsibilities. Basically, it implies an element of joint analysis and control over decisions and their implementations.

In participatory decision making, there is no single source of ultimate control or authority. The participating parties must discuss and reach a decision by means of an agreed process, for example, through the process of mediation and consensus-building.

28.10.2 Need for Stakeholder Involvement

Experience has shown that the following are the benefits of stakeholder involvement in EIA process.

- improved understanding of the potential impacts of the proposed projects,
- identification of alternative sites and designs and mitigation measures,
- clarification of values and trade-off associated with different alternatives,
- identification of issues (and possible forum to resolve them),
- establishment of transparent procedures for implementing proposed projects, and
- creation of accountability and a sense of local ownership during project implementation.

28.10.3 Approaches to Stakeholder Involvement

It is very important that a plan for stakeholder involvement is prepared before EIA work begins. It is essential to have such a plan, because there is a tendency of EIA practitioners to focus their attention on the technical aspects of the EIA work only. This will occur even if an anthropologist or rural sociologist has been included in the team, as often, such experts are marginalised in large teams of engineers, planners or environmental scientists.

There are numerous methods which can be utilized to involve stakeholders, especially the public, in EIA process.

- **public Meetings:** these are "open" with no restriction as to who may attend
- **advisory Panels;** group of individuals chosen to represent stakeholders, and meet periodically to assess work done/results obtained and to advise on future works,
- **public Information Centre:** a man made facility, in an accessible location, which contains an information and display on the project and the study. Members of the public can visit and obtain information and make their concerns and views,
- **interviews:** structured series of open-ended interviews with selected community representatives to obtain information/ concerns/ views.
- **questionnaires:** a written, structured series of questions issued to local people to assemble; concerns/views/ideas,
- **participatory Appraisal Techniques:** a systematic approach to appraisal based on group inquiry and analysis with multiple and varied inputs. The process may be assisted, but not controlled or directed, by external specialists.

The main challenge is to identify and involve those individuals and groups that are likely to be affected. Therefore, representative of the following groups are necessary:

- **traditional authorities:** such as village headman, tribal elders, and religious leader,
- **voluntary organisations:** such as local community development or users' groups, kinship societies, recreational groups, neighbourhood associations, labour unions, gender groups, ethnic organisations, and co-operatives, and
- **private sector representatives:** such as private business interest groups, trade associations, or professional societies.

28.10.4 Stages of Stakeholder Involvement

The stages at which involvement may occur are during:

- scoping and in the preparation of TOR for an EIA,

- project appraisal (while conducting EIA/feasibility studies) either at release of the preliminary/interim EIA report or the draft or final EIA report,
- project implementation (application of EIA recommendations), and
- project evaluation.

28.11 Environmental Monitoring

28.11.1 Monitoring

Monitoring is defined as an “action-oriented” activity and designed to determine the extent to which environmental regulation is working.

Environmental monitoring is one of the most important components of an EIA which is essential for:

- ensuring that impacts do not exceed the legal standards,
- checking the implementation of mitigation measures in the manner described in the EIA report, and
- providing early warning of potential environmental damages.

28.11.2 Principles of Monitoring

Certain principles of EIA monitoring should not be overlooked. If the EIA monitoring process is to generate meaningful information and improve implementation of mitigation measures, it must accomplish the following:

- determine the indicators to be used in monitoring activities,
- collection of meaningful and relevant information,
- application of measurable criteria in relation to chosen indicators,
- reviewing of objective judgments on the information collected,
- draw tangible conclusions based on the processing of information,
- making rational decision based on the conclusion drawn, and
- recommendation of improved mitigation measures to be undertaken.

28.11.3 Types of Monitoring

Various types of monitoring activity are currently in practice, and each has some degree of relevance to an EIA study. The main types are briefly described below:

Baseline Monitoring; a survey should be conducted on basic environmental parameters in the area surrounding the proposed project before construction begins (pre-audit study). Subsequent monitoring can assess the changes in those parameters over time against the baseline.

Impact Monitoring; the biophysical and socio-economical (including public health) parameters within the project area, must be measured during the project construction and operational phases in order to detect environmental changes, which may have occurred as a result of project implementation.

Compliance Monitoring; this form of monitoring employs a periodic sampling method, or continuous recording of specific environmental quality indicators or pollution levels to ensure project compliance with recommended environmental protection standards.

Monitoring should be regular and performed over a long period of duration. Interruptions in monitoring may result in generating insufficient data to draw accurate conclusion concerning project impact.

28.11.4 Development of Monitoring Indicators

For each of the impacts and corresponding mitigation measures indicators to be measured during project construction should be developed. The indicator selected should reflect the condition of that particular component upon the measurement. As for example, if the number of the fish species have decreased after the construction of project, it is an indication of deterioration of river habitat.

28.11.5 Institutional Aspect

Institutional factors determining the effectiveness of monitoring should not be underestimated. There needs to be a firm institutional commitment by the agencies responsible for the monitoring process, particularly in regard to the following:

- willingness on the part of the institutions involved and organizational personnel to support the monitoring process with the necessary level of resources and authority,
- maintaining continuity in the monitoring programme,
- technical capabilities of the personnel involved must be developed,
- integrity or honesty of the process must be maintained,
- decisions must be taken based on a thorough review of results,
- monitoring information must be made available to all agencies concerned, and
- necessary institutional reforms need to be made within the planning and implementation agencies.

EIA monitoring responsibility should be given to monitoring section within the planning divisions of concerned ministries.

The costs involved in EIA monitoring should be borne by the project proponent.

28.12 Environmental Auditing

28.12.1 Introduction

The terms “audit” is usually associated with the finance and accounting. Auditing refers to the examination and assessment of a certain type of performance. In the case of an EIA, an audit assess the actual environmental impact, the accuracy of prediction, the effectiveness of environmental impact mitigation and enhancement measures, and the functioning of monitoring mechanisms. The audit should be undertaken upon a project run in operation, for some time, and is usually performed once or twice in the entire project cycle.

28.12.2 Types of Audit

The following types of audit that are recommended to be implemented in different phases of the EIA process:

Decision Point Audit; examines the effectiveness of EIA as a decision-making tool,

Implementation Audit; ensures that approved conditions have been met,

Performance Audit; examines the responses of agencies concerned with project management,

Project Impact Audit; examines environmental changes arising from project implementation,

Predictive Technique Audit; examines the accuracy and utility of predictive techniques by comparing actual against predicted environmental effects, and

EIA Procedures Audit; critically examines the methods and approach adopted during the EIA study.

Not all the audit types mentioned above are required to be implemented in EIA process. However, at the project approval stage, both project proponent and authorizing agency should considered whether an application of a particular audit technique is likely to result in new

information or an improvement in management practices. Particular attention should be given to project cost-effectiveness of any proposed audit and to technical difficulties likely to be encountered.

Since the EIA concept is a relatively recent, the use of environmental audits will play a significant role in evolving a systematic approach of the application of EIA. Environmental auditing should compare monitoring results with information generated during the pre-project period. Comparisons can be made with similar projects or against standard norms. Relating actual impacts with predicted impacts, help in evaluating the accuracy and adequacy of EIA predictions.

28.12.3 Time frame for the application of Audit

The audit should be carried out by the agency, which approves the project, with assistance from other relevant organizations, if required. The auditing should be scheduled immediately after completion of project construction or when considered necessary. In Nepal the responsibility of audit goes to Ministry of Population and Environment (MOPE), however, in collaboration with concerned agencies and project proponent. The audit is a crucial stages of project implementation, that may indicate the need to improve the project implementation in order to reduce or prevent the unwanted consequences.

28.12.4 Environmental Auditing Plan

Environmental Audit should be carried out upon the completion of project construction and after 2 years of project operation in order to obtain information on:

- the condition of natural/social/economical resources prior to project implementation after the project construction is completed,
- whether or not, all the mitigation measures implemented are effective to control adverse impact, or enhance beneficial impacts,
- whether or not mitigation measures implemented are effective to control adverse impact, or enhance beneficial impact,
- whether or not all degraded landscape due to project implementation have been restored into original condition,
- what are the impacts of boom-bust scenario among the workforce involved in project implementation and the local economy, and
- the effect on the local economy of project implementation.

28.13 Agencies Responsible for EIA Implementation

28.13.1 Introduction

A number of governmental, semi-governmental, NGOs and private sector institutions are involved in the implementation of EIA. Their roles and responsibilities are given below with reference to Nepal.

28.13.1.1 Parliament

The Parliament is the highest legislative body. In relation to EIA implementation it has:

- power and responsibility to discuss environmental policy in general, and EIA in particular,
- to discuss reject or approve legislation concerning EIA mandates, and
- to pass resolution for making national policy commitment to implement EIA of development project.

The parliament it provides suggestions to make government policies and activities effective, through the ministry level Task Force of Legislatures, provide input in law-making (new laws and

amendment), budget speech, ratification of treaties and affiliation with international institutions in the domain of natural resources and environmental management.

28.13.1.2 Parliamentary Committee on Environmental Management (PCEM)

PCEM is a multi-party committee, chaired by the senior member of the parliament of ruling party and it has following functions:

- settling of the environmental disputes at the political level,
- has the power and responsibility for review, and monitoring
- discuss and suggest necessary changes in the environment related bills prior to the submission in the House of Representatives,
- also acts as the watch dog on the activities and performance of the Environmental related ministries
- PCEM can investigate and evaluate the policies programme of environment related activities and recommend to take necessary actions.

28.13.1.3 The Cabinet

The cabinet is the highest executive body in the country. The roles of the Cabinet in regards to environmental matters are:

- discuss and approve the legislation proposals related to environment to be tabbed to the Parliament,
- approves the rules and regulation related to environment, submitted by sector-specific ministries,
- discuss the environmental issues of national importance and give necessary instruction to the concerned ministries for implementation, and
- leading Ministry with EIA responsibility (MOPE) is answerable to the cabinet for their performances.

28.13.1.4 National Planning Commission (NPC)

NPC is the principle Policy advisory body of the government. It has mandate to prepare overall development plans and strategy for environmental protection. Further, it has following functions:

- bring an inter-sectoral coordination (horizontal coordination)
- integrate environmental concerns into development process,
- acts as coordinator, mediator, arbitrator in competing issues of the line ministries

NPC is answerable to the Prime Minister and Environmental Protection Council.

28.13.1.5 Environmental Protection Council (EPC)

The EPC was founded by executive decision in 1992 and is under the chairmanship of the Prime Minister. It is not a statutory body. Ten out of the total membership consists of ministers. Only the Chief secretary of HMG/N is an ex-officio member.

The Minister of Population and Environment is the Vice-Chairman of the EPC and the Secretary of the Ministry is also the ex-officio Member-Secretary. The EPC is ideally suited to achieve the highest level multi-sectoral political commitment on environment policy and programs. It is a good forum for policy review, political consensus and multi-sectoral commitment. However, at the moment, it is not active in Nepal.

28.13.1.6 Ministry of Population and Environment (MOPE)

The establishment of the ministry of Population and Environment (MOPE) was announced on September 22, 1995. MOPE's mandate to be primarily responsible for formulating and implementing policies, plans and programs; preparing Acts, Regulations and Guidelines and enforcing them, conducting surveys, studies and research; disseminating information and carrying out publicity; monitoring and evaluating programs; developing human resources- and acting as a national and international focal point in the domain of environment.

The Ministry as the lead agency for environment has the responsibility to formulate a legislative framework for EIA enforcement in Nepal. It has the responsibility to work out policy, legislation, administrative procedures and sector-specific technical guidelines in coordination with concerned line ministries. MOPE has a very important role in promoting the EIA process by helping the sectoral ministries to develop their own guidelines and training their manpower. Ministry of Environment is answerable to cabinet, parliament and Parliamentary Committee, and to the people at the large.

28.13.1.7 Ministries and Associated Departments / Agencies

Nine Ministries and their Departments (or equivalent) are directly involved in EIA process in Nepal.

Ministries and Departments with EIA Responsibilities

Ministry	Department
Agriculture	• Agriculture • Livestock • Cooperatives
Physical Planning and Public Works	• Housing and Urban development • Building • Water Supply and Sewerage • Nepal Water Supply Cooperation • Road • Transport Planning
Industry	• Industry • National Bureau of Standards, Weights and Measures • Cottage and Small Industry • Mines and Geology
Forestry and Soil Conservation	• Soil Conservation • Forests • National Parks and Wildlife Conservation
Tourism and Civil Aviation	• Civil Aviation • Tourism
Health	• Department of Health
Water Resources	• Irrigation • Hydrology and Metrology • Nepal Electric Authority • Water and Energy Commission Secretariat • Department of Electricity Development

Three ministries in Nepal currently have a separate Environmental Section within the organization. The Environmental Sections in the Ministry of Industry, Geo-Environmental Section of Department of Roads are attached to their Planning Divisions, but the Ministry of Physical Planning Public Works and the Ministry of Forests and Soil Conservation have separate units for Planning and Environment, each attached to different divisions headed by respective Joint Secretaries. The rest of the ministries have assigned the environmental responsibilities to

their Planning Division or to a section attached to the Planning Division. Exceptions are the Ministry of Water Resources (MOWR) and the Ministry of Tourism and Civil Aviation. The Water and Energy Commission Secretariat (WECS) as an advisory body of MOWR, is responsible for environmental responsibilities. However, the Nepal Electricity Authority has an active Environment Division in its Engineering Directorate, which is involved in doing EIA, and the Department of Electricity Development also has EIA responsibilities. Mountaineering Section of Ministry of Tourism is currently handling environmental issues relating to mountaineering but not attached to the Planning Division of the Ministry.

Most of the Environmental Sections within the departments are:

- very new
- have limited capacity to handle IEE/EIA,
- lack of knowledge and training in EIA, and
- lack of resources and incentives.

28.13.1.8 Final Approval of EIA by Ministry of Population and Environment

The concerned Ministry submits Scoping, TOR and EIA reports of the projects with the comments to Ministry of Population and Environment for final approval. The Ministry of Environment constitutes a review committee with the representation from concerned Ministries, project proponent and EIA expert. Upon the review of documents submitted, the Ministry provides the decision on:

- approved without conditions,
- approval with condition, and
- disapproval and send back to concerned ministry with instruction for improvement. (Fig 1.)

28.13.1.9 Local Governments

Local governments are autonomous institutions with environmental responsibilities at the local level. They are basically development agencies with socioeconomic responsibilities to the community. The recent decentralization Act (District Development Committee, Municipality or Village Development Committee) has empowered the local institution for planning and implementing their own projects and integration of EIA at the local levels. These institutions have authority for development control. However, these institutions are:

- weak in terms of trained human and financial resources,
- limited capacity of project planning, and implementation,
- limited capacity of environmental integration in the project, and
- need to be strengthened in terms of financial, trained human resources in environmental sector.

These institutions are directly answerable to the people, Ministry of Local Development, and to the cabinet.

28.13.1.10 District Level Line Agencies

District level line agencies of the government have a dual responsibility for technical support to the District Development Committees and for executing centrally approved development projects. These line agencies also play a role in developing project plans and proposals, and therefore need to know how to incorporate EIA as an integral part of their work.

28.13.1.11 NGOS/Private Sector

NGOs and private sector institutions have the roles of promoting EIA awareness, providing consultancy services for preparing EIA documents, EIA monitoring and EIA audit. With the

introduction of privatization and the liberalization policy in Nepal, the role of government is being minimized day by day. Many private companies and foreign investors are interested in launching heavy industries, hydro-projects and road networks and so on. These developers would require the services of competent and trained manpower in the private sector to prepare EIA, documents and obtain permits or licenses for their projects. Development of trained human resources to be used in private sector for effective EIA is another challenge.

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Annexes 2: Project Cycle and Relevant EIA Activities

Stages in Project Cycle	Recommended EIA Activities
1. PROJECT CONCEPT /IDENTIFICATION • identification of project • detail design not available • basic nature of project known	Screening - to decide what sort of environment study is necessary; full EIA, IEE Approve, and Reject. (sensitive area, threshold, size criteria) • choose environmental viable alternatives • indications of key impacts for further study.
2. PRE-FEASIBILITY • preliminary comparison of alternatives and selection of viable ones for future investigation/ evaluation	Scoping - identification of issues/impacts for investigation, formulation of TOR for EIA, decision is made on, • impacts to be investigated • EIA work schedules • consultation to be undertaken • methods/techniques to be used • form/content of EIA report
3. FEASIBILITY STUDY • economic and technical comparison of the alternatives • detail engineering design and construction details of the selected alternative	Majority of EIA study work • identification, prediction and assessment of impacts and their significance • identification and design of mitigation measures • development of monitoring plan
4. Project Appraisal and decision before implementation of a project, it is reviewed in light of the feasibility study and EIA study findings. Decision is to be made as to whether the project be implemented (go-ahead).	
5. PROJECT IMPLEMENTATION PLAN • consultant • contractor, finance and reporting and evaluation	Preparation of Environmental Management Action Plan (EMAP)
6. ENGINEERING DESIGN, COST ESTIMATE, CONTACT PACKAGE AND BIDDING DOCUMENT	Integration EMAP requirement in (i) design (ii) cost estimate (iii) contractor package (iv) BOQ (v) tender document
7. MONITORING AND AUDITING	EMAP Compliance

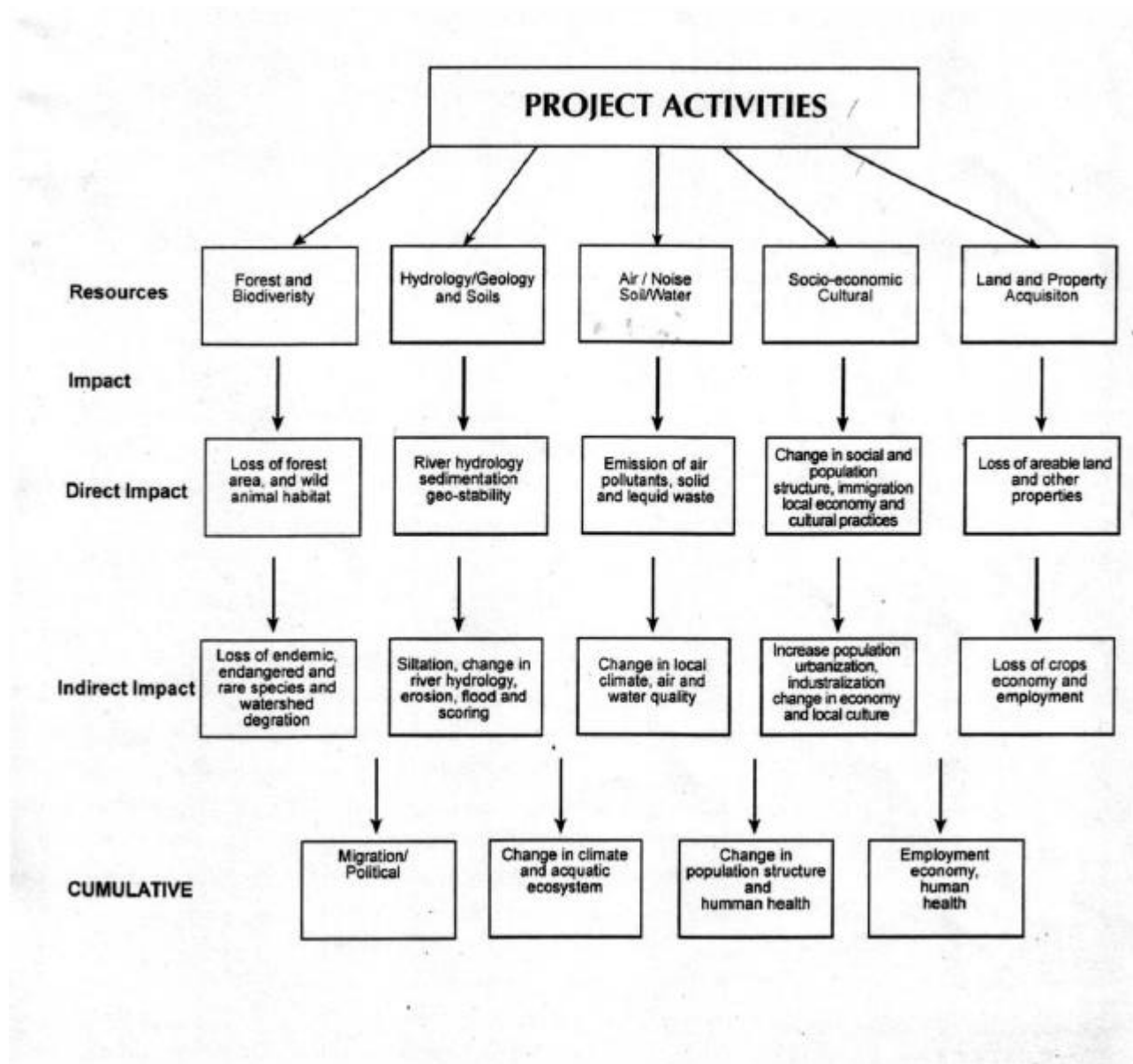
Annex 3: Checklist of Environmental Parameter to be used in IEE

Check-List of Environmental Parameters for IEE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
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Annex 4: Highlights of the Environment Protection Act, 1996 and Its Rule, 1997

Sections / Rules	Major Highlights of Environment Protection Act, 1996
Section 3	The Proponent should carry out IEE/EIA of the prescribed proposals.
Section 4	No one should implement the proposals requiring IEE or EIA without approval.
Section 5	The proponent should submit the IEE/EIA reports for approval by the concerned agency for approval process.
Section 6	Upon receipt of such proposal, the concerned agency should approve the IEE report and forward the EIA report to MOPE for approval process. MOPE should approve the EIA report after public notice is over. MOPE can form a committee to seek suggestions over EIA reports.
Section 17	If any person ask for compensation, the proponent is liable to compensate for the loss or effects as prescribed.
Section 18	In case the proposal requiring environmental assessments is implemented without necessary approval or violates the conditions of approval, the prescribed authority may close down such activity immediately and may punish up to Rs. 1,00,000/.
Section 19	A person who is not satisfied with the decision of the prescribed authority may appeal to the concerned Appellate Court within 35 days from the date of decision or order.
Section 23	Government may frame and implement necessary guidelines, including EIA guidelines.
Section 24	Government may frame necessary rules, including conduction of IEE or EIA, standards etc.
Environment Protection Rules, 1997 (amendment 5 April 1999)	
Rule 3	The proponent is required to prepare IEE and EIA report as per Schedules 1 and 2 respectively.
Rule 4	Before preparing an EIA report, the proponent should publish a 15-days public notice to provide the stakeholders to offer their opinions and concerns in writing on the proposal. The proponent should prepare and submit the scoping report to the concerned agency and forward to MOPE for approval and MOPE should determine the scope of the EIA study as submitted or amended.
Rule 5	In case of IEE report, the proponent should prepare and submit the TOR and get approval of TOR from concerned agency while in case of EIA report, the proponent should prepare and submit the TOR to the concerned agency, which should forward to MOPE for necessary approval.
Rule 6	In case, the approving agency of IEE report finds appropriate to carry out EIA, the proponent should fulfil all the formalities of the EIA process.
Rule 7	The proponent should prepare IEE and EIA report in the format as indicated in Schedule 5 of the EPR, 1997. In case of IEE report, the proponent should notice the concerned VDC, municipality, DDC, school, health posts and hospital to offer their opinions and suggestions in writing before the finalization of the IEE report. However, the proponent should conduct a public hearing in the project site about the EIA report.
Rules 8 and 9 have been repealed by the First Amendment (April 1999)	
Rule 10	The proponent should submit 15 copies of the IEE/EIA report along with the recommendation of the concerned VDC or municipality to the concerned agency for approval.
Rule 11	The concerned agency, after investigation, should approve the IEE report within 21 days from the date of its receipt, and forward the 10 copies of the EIA report with its suggestion to MOPE within 21 days from the date of receipt. Upon receipt of the EIA report, MOPE should issue a 30-days public notice in the daily newspaper to offer written comments of the stakeholders. MOPE also may seek the suggestions of the committee, if formed for this purpose, and should approve the EIA report within 60 days from the date of receipt or within 90 days in case of special reason.
Rule 12	The proponent should implement EIA and other conditions given during the approval process.
Rule 13	The concerned agency (ministry) is made responsible for environmental monitoring and evaluation activities, and issue necessary directives to the proponent to implement environmental protection measures.
Rule 14	MOPE is responsible to prepare the environmental auditing report after two years of the commencement of the service by the proposal.
Rule 45-47	Anyone wishing to receive compensation may file the application to the Chief District Officer (CDO) and should forward the file to the concerned agency in case the evaluation of effects/loss. Once the loss of evaluated, the CDO should determine the amount of compensation within 60 days of receipt of application. The proponent should pay the compensation amount within 30 days of decision. In case the proponent (individual, institution or proponent) fails to pay within the time limit, the victim may submit an application, and the CDO shall auction the property of the proponent and pay the amount of compensation as determined.

Annex 5: Categorization of Impacts as Illustrated by the Effect of Road Construction in Nepal



Annex 6: Typical Project Checklist by Impact Area

Potential Impact Area	Construction Phase			Operation Phase		
A. LAND TRANSFORMATION AND CONSTRUCTION	Adverse Effect	No Effect	Beneficial Effect	Adverse Effect	No Effect	Beneficial Effect
a. Compaction and setting						
b. Erosion						
c. Ground cover						
d. Deposition (sedimentation, precipitation)						
e. Stability (Slides)						
f. Stress-strain (earthquakes)						
g. Floods						
h. Waste control						
i. Drilling and blasting						
j. Operational failure						
B. LAND USE						
a. Open space						
b. Recreational						
c. Agriculture						
d. Residential						
e. Commercial						
f. Industry						
C. WATER RESOURCES						
a. Oxides (Sulphur, carbon, nitrogen)						
b. Particulate matter						
c. Chemicals						
d. Odours						
e. Gases						
E. PUBLIC SERVICES SYSTEM						
a. Schools						
b. Police						
c. Fire protection						
d. Water and Power system						
e. Sewerage system						
f. Refuse disposal						
F. BIOLOGICAL CONDITIONS						
a. Wildlife						
b. Trees, shrubs						
c. Grasses						
G. TRANSPORTATION SYSTEM						
a. Automobile						
b. Trucking						
c. Safety						
d. Movement						
H. NOISE AND VIBRATION						
a. On-site						
b. Off-site						
I. Aesthetic						
a. Scenery						
b. Structure						
J. COMMUNITY STRUCTURE						
a. Relocation						
b. Mobility						
c. Services						
d. Recreation						
e. Employment						
f. Housing						
K. OTHER (List as appropriate)						

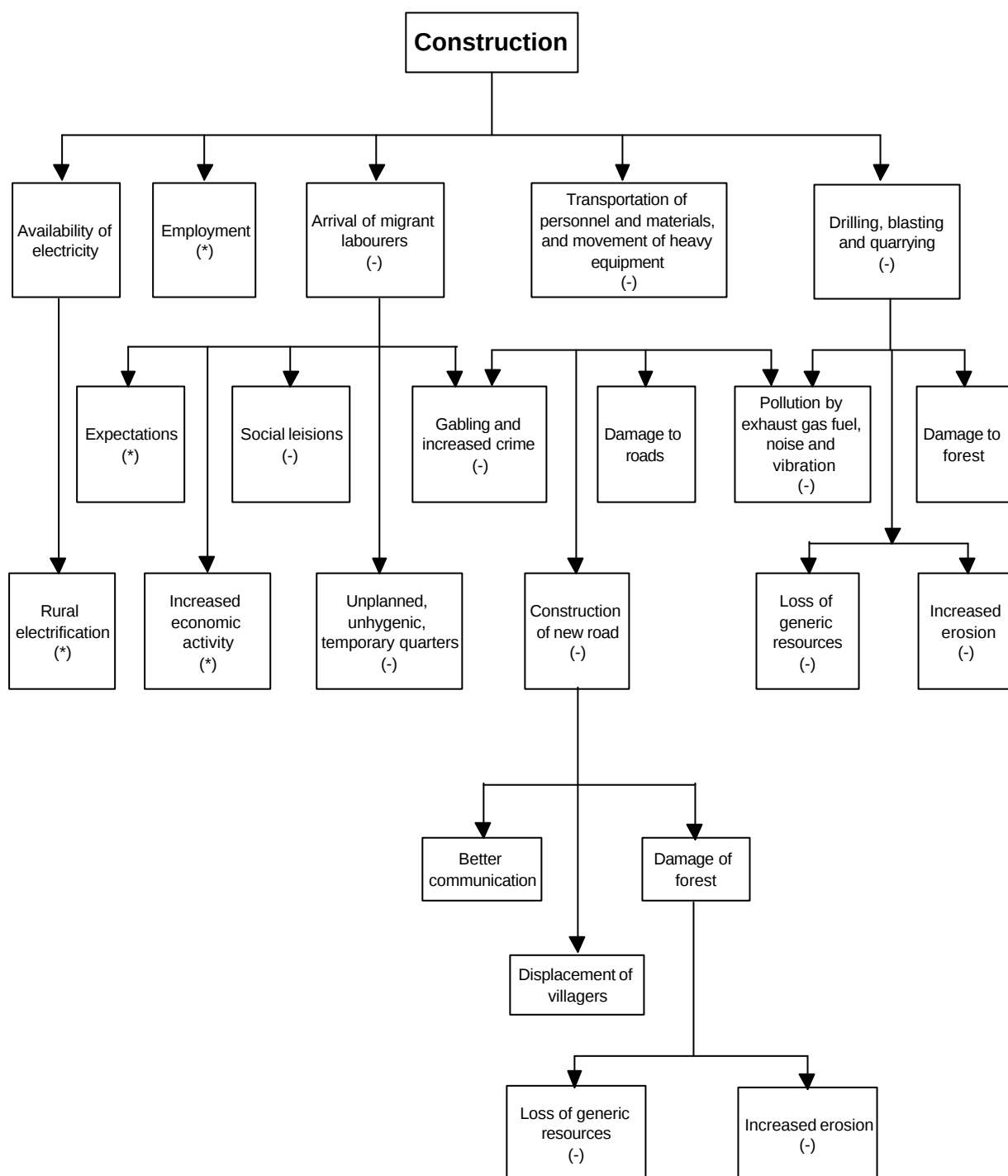
Annex 7 : Example of a Questionnaire Checklist

Terrestrial Ecosystems				
a)	Are there any terrestrial ecosystems of the following types which, by nature of their size, abundance or type, could be classified as significant or unique?			
	Forest?	Yes	No	Unk.
	Savanna?	Yes	No	Unk.
	Grassland?	Yes	No	Unk.
	Dessert?	Yes	No	Unk.
b)	Are these ecosystems:			
	Pristine?	Yes	No	Unk.
	Moderately degraded?		Yes	No
	Severely degraded?		Yes	No
c)	Are there present trends towards alteration of these ecosystems through cutting, burning, etc. to produce agricultural, industrial or urban land?		Yes	No
d)	Does the local population use these ecosystems to obtain non-domesticated:			
	Food plants?		Yes	No
	Medicinal plants?	Yes	No	Unk.
	Wood products?	Yes	No	Unk.
	Fibre?		Yes	No
	Fur?		Yes	No
	Food animals"		Yes	No
e)	Will the project require clearing or alternation of:			
	Small areas of land in these ecosystem?	Yes	No	Unk-
	Moderate areas of land?	Yes	No	Unk
	Large areas of land?		Yes	No
f)	Does the project rely on any raw materials (eg. wood, fibre) from the ecosystem?		Yes	No
g)	Will the project decrease use of products from these ecosystems by producing or providing substitute materials?		Yes	No
h)	Will the project cause increased population growth in the area, bringing about increased stress on these ecosystems?		Yes	No

Annex 8: Part of a Questionnaire Checklist

a)	Are there known disease problems in the project area transmitted through vector species, such as mosquitoes, flies, snails, etc.?	Yes	No	Unknown
b)	Are these vector species associated with:			
	* aquatic habitats?	Yes	No	Unknown
	* forest habitats?	Yes	No	Unknown
	* agricultural habitats?	Yes	No	Unknown
c)	Will the project provide opportunities for vector Control through improved standards of living ?	Yes	No	Unknown
Estimated impact on disease vectors?				
highly adverse	←	insignificant	→	highly beneficial.

Annex 9: Example of an Impact Network for Construction Period of a Dam



(*) benefit
(-) cost

