PREPARATION OF ENVIRONMENTAL GUIDELINES FOR DEVELOPMENT ACTIVITIES IN PROTECTED AREAS

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ENVIRONMENTAL GUIDELINES FOR DEVELOPMENT ACTIVITIES IN THE PROTECTED AREAS

EXECUTIVE SUMMARY

To enable the Parties to the Convention on Biological Diversity (CBD[1]) to effectively conserve biodiversity and implement the provisions of the Convention, international guidelines have been developed on biodiversity-inclusive Environmental Impact Assessment (EIA). Nepal has initiated efforts to integrate biodiversity into impact assessment, and it is felt that there is an urgent need to develop national guidelines to provide guidance to project developers, professionals, practitioners and decision-makers for the *ex ante* consideration of biodiversity during the preparation and approval of Environmental Assessment (EA) reports. In recognition of this IUCN Nepal has prepared these guidelines with the support of the *Capacity Building in Biodiversity and Impact Assessment* (CBBIA) *Project*, an undertaking of the International Association for Impact Assessment (IAIA) and funded by the Government of The Netherlands.

The aim of these guidelines is to provide a basis for the integration of biodiversity concerns into EIAs of developments that are planned in protected areas. Consideration of biodiversity within EIAs is a recent phenomenon although biodiversity and EIA policies have existed in Nepal since the 1980s. The legal system regulating biodiversity and impact assessment in Nepal is well established but the implementation of biodiversity conservation requirements is often weak due to a lack of proper monitoring and the limited capacities of stakeholders. EA processes are often interpreted differently by proponents and protected area authorities, causing mistrust, project delays and adverse impacts on biodiversity.

These guidelines indicate potential impacts of different development activities on biodiversity in protected areas. It outlines key aspects of the EA process and identifies ways to incorporate biodiversity concerns. It also provides guidance on the methods for collection of baseline data, identification, prediction and evaluation of significant impacts, and approaches to selecting mitigation measures. An example is provided of the potential impacts of a development project on physical, biological, socio-economic and cultural aspects of a protected area, together with corresponding possible mitigation measures. Guidance is provided for the implementation of mitigation measures and environmental monitoring. Monitoring indicators and procedures have also been included in the guidelines to help select indicators and methods for monitoring physical, biological, socio-economic and cultural aspects of the environment. The guidelines include a basis for project auditing, which includes parameters, indicators, location of, and methods for auditing.

Public participation is a key aspect of biodiversity conservation and EA. The guidelines therefore include approaches to public consultation. A framework is provided to help project developers and decision-makers ensure public involvement during the preparation and approval of EA reports and their implementation. The major activities that should be performed during public participation are described for different stages of the project, such as the pre-feasibility and feasibility studies, detailed design and approval stages.

The guidelines also recommend important future actions such as consolidating and linking biodiversity in protected area processes, encouraging authorities to institutionalize biodiversity concerns in EA processes, awareness raising amongst key stakeholders, improving understanding between proponents and PA authorities and incorporating contemporary conservation issues into future revisions of EA regimes.

[1] See Appendix 1 for a full list of acronyms.

1 INTRODUCTION

1.1 BACKGROUND

Nepal has a number of facilitating policies to conserve biodiversity through EIA process. However, these policies tend to be sectoral in nature and do not integrate biodiversity conservation and EIA in the same policy document (See Appendix 2). In order to mainstream biodiversity into impact assessment, the then His Majesty's Government of Nepal (HMGN) made a policy decision in June 2003 indicating important aspects that need to be addressed in EIA reports (Uprety, 2003). These include:

- Identification of biodiversity rich areas.
- Number and extent of distribution of legally protected, endemic, rare and threatened species.
- Migratory species and area required by such species.
- Species having social, cultural and scientific importance.
- Species having medicinal properties, agricultural and economic value.
- Wild relatives of domesticated species.
- Possible loss of biomass in the project area.
- Number and species found in the specified area including total forest area in the project.
- Area covered by natural forests and plantation including composition of species.

This provision is, in general, included in the EIA Terms of Reference and requires an avoidance-minimisation-compensation approach and adoption of a "no net loss" principle and/or creation of new habitats to the extent possible. The initiative provides a basis for the collection of project-specific data and information on biodiversity and the assessment of impacts. Furthermore, it provides opportunities to include mitigation measures and monitoring requirements in the EIA report.

In Nepal, efforts are also underway to evaluate the impacts of project activities on biodiversity. The following criteria are generally considered for impact evaluation:

- Loss of rare, endangered and/or endemic species.
- Extent of habitat destruction, depletion or fragmentation.
- Reduction in species diversity.
- Loss of critical or productive habitats.

These initiatives are on a species level and in some cases, ecosystem diversity has been considered. This is in line with CBD Article 14 and IAIA principles on biodiversity and impact assessment. These are the building blocks for mainstreaming biodiversity into the EA process.

Similarly, Nepal has enforced several legislative instruments that focus on biodiversity but seldom recognises the importance of integration of biodiversity conservation into EIA. For example, the National Parks and Wildlife Conservation Act (NPWCA), 1973 and Forest Act, 1993 are the primary legislation for the conservation of wild biodiversity. Section 68 of the Forest Act, 1993 provides provisions that the forest area could be provided only for the national priority projects if there is no other options than using the forest areas, and the impact is not significant.

The Government of Nepal has enforced the Environment Protection Act (EPA), 1996 and Environmental Protection Rules (EPR), 1997. The law supports conservation and natural resource management through a project-level environmental assessment (EA) process. This is the only legislation in Nepal which defines biodiversity as 'ecosystem diversity, species diversity and genetic diversity'. The EPA and EPR require the approval of an Initial Environmental Examination (IEE) and EIA report of the prescribed development projects before their implementation. The EPR lists over 200 types of project that require EA in various sectors such as forestry, industry and mining, water resources (hydropower, irrigation, and drinking water), roads, waste management and agriculture. The environmental law used criteria relating to the (i) thresholds, (ii) investments, (iii) sensitive areas and (iv) general issues to identify proposals that require an IEE or EIA. The proposals that are not prescribed in the EPR and which invest from 10 to 100-million Nepalese Rupees[2] (NRs) require an IEE, whilst those which invest over 100 million NRs require an EIA. In addition, the law provides for Strategic Environmental Assessment (SEA) of plans and programmes[3]. However, there is neither a clear description of SEA policy nor the process required to conduct and approve it. In view of the importance and urgency of conserving biodiversity, it is also essential that guidelines are in place for development of environmentally sound development activities to contribute to achieve the objectives of natural resource conservation and sustainable development.

In this context, IUCN Nepal has facilitated integration of conservation and development issues in Nepal's development strategies. It worked closely with the National Planning Commission (NPC) to prepare a National Conservation Strategy (NCS) in mid-1980s, assisted in establishing an EIA system and processes during the implementation of the NCS Implementation Project. IUCN has also contributed to the preparation of the Nepal Environment Policy and Action Plan (NEPAP). IUCN Nepal has actively collaborated with the Government of Nepal to prepare the National EIA Guidelines, and separate EIA guidelines for forestry and industry sectors in early 1990s. The Government endorsed the National EIA Guidelines in 1993 and other two EIA Guidelines in 1995 to mainstreaming EIA process in planning and development administration in Nepal prior to enactment of EPA, 1996 and EPR, 1997. The list of projects requiring the level of EA as listed in draft EIA guidelines of tourism, water resources, road, and mining sectors were later incorporated in the EPR, 1997. It hosted the Regional Environmental Assessment Program which further strengthened capacity of EIA implementation in South Asia and contributed to consider the incorporation of biodiversity aspects in EIAs.

IUCN Nepal's close working relationship with the Government on biodiversity conservation and promotion of sustainable use of natural resources has provided opportunities to prepare environmental guidelines and encourage their adoption by the government. In this regard, the Ministry of Local Development (MoLD) in collaboration with IUCN Nepal prepared environmental guidelines for rural infrastructure projects, which defined practices and methods for mitigating potentially adverse impacts. This current guidance for development activities in protected areas was prepared to further support such initiatives.

1.2 GOAL, OBJECTIVES AND SCOPE OF THIS GUIDANCE

The overall goal of the project was to provide environmental guidelines for development activities in protected areas.

The specific objectives of the guidelines are to ensure that:

[2] As of 6 May 2006 1 US$ = NRs 72.7

[3] The Environment Protection Act, 1996 defines "proposal" *as a proposal prepared in regard to the carrying out of such development work, physical activity that may bring about change in the existing environmental conditions of any plan, project or program which changes the land uses*.

- Development activities in protected areas are socio-culturally acceptable, economically feasible and environmentally benign.
- Assessments of proposed development activities enable stakeholder participation in the determination of impacts and identification of potential mitigation measures.
- Park-people conflicts are considered while defining codes of conduct for the proposed and ongoing development activities.
- Tourism activities in protected areas do not jeopardize conservation issues and at the same time maintain the welfare of the local people who have traditionally benefited from the protected area.

These guidelines are targeted at activities relating to:

- Infrastructure development such as roads, community service buildings, hydropower projects, transmission lines and irrigation projects.
- Development of tourism promotion services and related infrastructure.
- Enhancement of existing infrastructure.

The above mentioned activities have been targeted to fulfil the needs of local people and the existing natural environment in protected areas.

1.3 METHODOLOGY

The preparation of these guidelines has involved a literature review and external review of drafts. The literature review included an examination of:

- Policy and legislative frameworks for protected areas and EA issues, including norms and standards for EIAs in Nepal.
- Conservation and sustainable development issues relating to impact assessment of development activities in protected areas.
- Biodiversity issues in and within the vicinity of protected areas, including biological corridors and bottlenecks, Buffer Zones, and tourism and stakeholder issues relating to environmentally safe development practices.
- IUCN's *'Guidelines for Protected Areas Management Categories'* published in 1994 to delineate specific guidelines for correlating impacts of development activities; and
- *'Principles of EIA Best Practices'* published by IAIA in cooperation with Institute of Environmental Assessment.

The methods followed while preparing the guidelines were as follows:

- Study/review of existing guidelines.
- Identification of gaps in current legislation and procedures for addressing biodiversity issues.
- Preparation of draft guidelines and distribution to experts for review.
- Finalization of the guidelines with the integration of reviewers' comments.

1.4 THE TARGET GROUP FOR THE GUIDELINES

The primary target group for the guidelines are development organisations, project developers/proponents, Village Development Committees (VDCs), municipalities, District Development Committees (DDCs), relevant government agencies and businesses involved in designing, approving and implementing development activities including tourism

infrastructures in PAs. The guidelines may also be useful to researchers developing additional methods for impact assessment.

2 PROTECTED AREAS IN NEPAL

2.1 BACKGROUND

In 1970, a major development took place when His Late Majesty King Mahendra approved in principle the establishment of then Royal Chitwan National Park (RCNP) and Langtang National Park, which effectively launched the conservation movement in Nepal (HMG/IUCN, 1988). The 1973 NPWCA further developed legislative measures for protected areas and biodiversity conservation. Since then, Nepal has established an extensive network of protected areas and developed several policies for the purpose of conserving Nepal's rich but diminishing natural resources and biodiversity.

Protected areas in Nepal comprise nine National Parks (IUCN category 2), three Wildlife Reserves (IUCN category IV), one Hunting Reserve (IUCN category VI), and three Conservation Areas (IUCN category VI) (see Table 2.1). National Parks and Wildlife Reserves generally have restrictions on access, infrastructure development, collection and transportation of biological and non-biological resources, diversion of water courses, and any other actions that negatively impact forests and wildlife. However, park authorities allow the holders of traditional rights to use trails and roads that pass through protected areas. Park authorities can also issue licences for the development of tourist facilities.

Table 2.1: List of protected areas of Nepal

SN	Categories of protected areas	Year of Declaration	Area (km^2)	Physiographic zone	Conservation of
National Parks					
1.1	Chitwan National Park (WHS, 1984)	1973	932	Terai-Siwalik	Rhinoceros, elephant, tiger, bison etc.
1.2	Langtang National Park	1976	1710	High mountain	Musk deer and red panda
1.3	Sagarmatha National Park (WHS 1979)	1976	1148	High mountain	Musk deer, red panda, beer, snow leopard etc.
1.4	Rara National Park	1976	106	High mountain	Musk deer, red panda, and high altitude lake
1.5	Bardia National Park	1976 (area extended in 1988)	968	Terai	Elephant, tiger, rhinoceros (translocated from Chitwan National Park), etc.
1.6	Khaptad National Park	1984	225	Middle mountain	Wild goat, blue sheep and spiritual site
1.7	Shey Phoksundo National Park	1984	3555	High mountain	Wild goat, blue sheep, musk deer, lake
1.8	Shivapuri Watershed and Wildlife Reserve (Renamed as Shivapuri National Park in 2002)	1984	144	Mid-hills	Watershed of Kathmandu

1.9	Makalu Barun National Park	1991	1500	High mountain	High altitude endangered plants
Wildlife Reserves					
2.1	Koshi Tappu Wildlife Reserve (Ramsar Site, 1987)	1976	175	Terai	Wild buffalo and migratory birds
2.2	Suklaphanta Wildlife Reserve	1976	305	Terai	Swamp deer, rhinoceros (translocated from Chitwan National Park), tiger
2.3	Parsa Wildlife Reserve	1984	499	Terai-Siwalik	Tiger, deer, antelopes, bison etc.
Conservation Areas					
3.1	Annapurna Conservation Area	1992	7629	Middle mountain	Endemic plants and animals
3.2	Kanchenjunga Conservation Area	1997	2035	Middle mountain	Endemic plants and animals
3.3	Manaslu Conservation Area	1998	1663	High mountain	Endemic plants and animals
Hunting Reserve					
4.1	Dhorpatan Hunting Reserve	1987	1325	Middle mountain	Blue sheep
Buffer Zones					
5.1	Chitwan Buffer Zone	1996	750	Terai-Siwalik	Aimed at expanding biodiversity conservation and community development to reduce pressure on national parks and wildlife reserves. Also aimed at bringing the local people in the mainstream of biodiversity conservation.
5.2	Langtang Buffer Zone	1997	420	High mountain	
5.3	Bardia Buffer Zone	1997	328	Terai	
5.4	Makalu Barun Buffer Zone	1998	830	High mountain	
5.5	Shey Phoksundo Buffer Zone	1999	1349	High mountain	
5.6	Sagarmatha Buffer Zone	2002	175	High mountain	
5.7	Suklaphanta Buffer Zone	2004	244	Terai	
5.8	Koshi Tappu Buffer Zone	2004	173	Terai	
5.9	Parsa Buffer Zone	2005	298	Terai	
			4666		
	Total Area (km^2)		28,585	19.4 percent of the total area of the country	

Source: MFSC, 2005 and IUCN Nepal, 2005

Among the protected areas, Chitwan National Park (CNP) and Sagarmatha National Park are listed as World Heritage Sites (WHS) by the United Nations Educational, Scientific, and Cultural Organization (UNESCO). Similarly, Koshi Tappu Wildlife Reserve and its Buffer Zone has been listed as a Ramsar Site under the Ramsar Convention. Bishazariya Tal which is within the Buffer Zone of the CNP is also listed as Ramsar Site in 2003. In addition to their ecological and cultural importance, the protected areas hold crucial biodiversity and economic resources for the country. The two World Heritage Sites and two other protected areas, Langtang National Park and Annapurna Conservation Area, earn a substantial amount of revenue from tourism which is also shared with local communities for development.

2.2 BUFFER ZONES IN NATIONAL PARKS AND WILDLIFE RESERVES

Nepal has made considerable progress in involving local people in protected area conservation and management. However, the conservation and sustainable use of natural resources remains a considerable challenge. The areas within protected areas have been used for a variety of purposes by resident communities throughout history. Their livelihoods depend upon resources provided by the areas they live in. However, the rate of depletion of natural resources has led to difficulties with sustaining their livelihoods; hence the need for Buffer Zones has become important. Although legislation has provided much needed protection for protected areas, local communities have been under pressure from limits placed on the use of natural resources. Such pressures led to a shift in management of protected areas, which paved the way for the creation of Buffer Zones around the National Parks and Wildlife Reserves.

Traditionally, Buffer Zones are protective zones where land use is partially restricted (MacKinnon *et al.,* 1986). In Nepal, however, Buffer Zones have been deliberately developed to focus on the special needs of local communities who are likely to be adversely affected by conservation measures (Sharma, 1999). These zones have been developed with the purpose of increasing their agricultural and forestry productivity, while the areas within National Parks and Wildlife Reserves remain intact and managed for biodiversity conservation. Currently, there are Buffer Zones in the periphery of nine National Parks and Wildlife Reserves (Table 2.1) which enable local communities to develop and use the natural resources of the area without disturbing the core of the protected area.

2.3 LEGISLATIONS GOVERNING PROTECTED AREAS

In Nepal, environmental concerns from development activities have been recognised in the country's periodic plans. The Government's commitments on biodiversity conservation are clearly reflected from the First Plan (1957-1962) to the Tenth Plan (2002-2007). EIA policies have been included from the Sixth Plan (1980-1985) onwards (Appendix 2). However, the conservation objectives have not been fulfilled due to inadequate implementation mechanisms, institutions and trained personnel to undertake conservation activities.

The commitment towards biodiversity and environmental conservation *vis a vis* development is also clearly reflected in the Constitution of Nepal. One of the State policies in the 1990 Constitution is to protect the environment from further damage due to development activities. The policy further states that "the State shall also make arrangements for the special protection of the rare wildlife, the forests and the vegetation" (HMGN, 1990). The Constitution clearly provides a mandate for a proactive role towards conservation and management of the environment and biodiversity.

With the enactment of the 1973 NPWCA conservation efforts in Nepal began to take legal shape. The Act provides legal provisions for the establishment of protected areas for protecting sensitive areas and the diversity in them. The Act also prohibits certain actions and activities within National Parks and Wildlife Reserves, including wildlife hunting and

disturbance, construction of houses and sheds, cultivation, grazing, felling of trees and vegetation and extraction of minerals. It also prohibits the diversion of water from rivers and streams and the use of harmful substances in National Parks and Wildlife Reserves. The Act, however, allows for the operation of hotels, lodges, public transport services, and other similar services/facilities, by the government or other parties, through contractual arrangements according to prescribed procedures (HMGN, 1973). The 1974 National Parks and Wildlife Conservation Rules further deals with procedures for operation of services and facilities inside protected areas. Under the regulations construction activities related to the operation of services and facilities also require proper planning and approval from the Government before they can start.

The 1973 NPWCA also includes provisions for the establishment of Conservation Areas and Buffer Zones. Conservation Areas are managed by the government and the non-governmental organisations. To facilitate the functioning of Buffer Zones, the Government has implemented separate Conservation Area Management Rules, 1996 and Buffer Zone Management Rules and Guidelines in 1996 and 1999 respectively. The rules and guidelines have been promulgated under the NPWCA, in order to design programmes that are compatible with National Park and Wildlife Reserve management and also to facilitate public participation in the conservation, design and management of Buffer Zones. The 1999 guidelines promote the selection of projects in the Buffer Zones that meet the requirements of local people and at the same time give priority to natural resource conservation. The guidelines also include a section for operation of services, which may be operated in accordance with the Buffer Zone Management Rules, 1996. The guidelines direct the operation of services according to the approved management plan. The warden is also authorized to develop and enforce codes of conduct with the approval of the Ministry of Forests and Soil Conservation. The guidelines also require consultation with user committees prior to the granting of permits for the operation of services in the Buffer Zones. The guidelines specifically require an Initial Environmental Examination (IEE) or EIA for tourism in the Buffer Zone .

2.4 THE NEED FOR GUIDELINES ON DEVELOPMENT ACTIVITIES IN PROTECTED AREAS

In Nepal, conservation and sustainable use of natural resources are major challenges even within protected areas. Activities mostly impacting upon protected areas are tourism infrastructures such as road and trail networks, and the use of resources for construction and operation of those services. There already exist a number of establishments in National Parks and Wildlife Reserves for promoting tourism and recreational activities. There are also sections of national highways that are routed through such areas. Moreover, there is a need for guidelines to address impacts from increasing development activities in protected areas, people-park conflicts, establishment of Buffer Zones and the Government's recent policy decisions to promote captive breeding of certain wildlife and also to lease out selected protected areas to non-governmental entities for management.

Table 2.2, developed through expert consultation, highlights some activities that the preparation of guidelines may address with respect to biodiversity conservation and local community needs within protected areas.

In other National Parks and Wildlife Reserves, development activities are increasing. For example, the multi-branched Mahakali Irrigation Project will have impacts on Suklaphanta Wildlife Reserve. Langtang National Park has high potential for hydroelectricity generation. Two hydroelectricity projects have prepared EIA reports and are awaiting decisions. There are additional opportunities for other hydropower projects as well. Similarly, the upgrading of the Trishuli-Syabrubeshi road to a metalled road may have impacts on the park.

Table 2.2: Activities in and around protected areas and their threats

Protected area	Activities in protected areas	Threats from activities
Makalu Barun National Park and Conservation Area	The areas in and around the Park have hydropower potential. The power project components such as reservoirs and access roads require considerable land areas and provide easy access for entrepreneurs, immigrants and tourists.	Higher pressures on natural resources. Frequent movement of people in and around the Park. Increased possibility of wildlife poaching and encroachment to land
Sagarmatha National Park	The major activities are associated with tourism services. These activities promote development of roads, trails, hotels and lodges, airports and rangelands.	Heavy tourism pressure and mountaineering expeditions have increased the use of natural resources in spite of alternative energy provisions Problems with waste disposal due to tourism service industry are emerging Increased possibility of wildlife poaching
Chitwan National Park	Increasing grazing in the park and increasing numbers of tourists. Another major activity going on close to the park is the operation of a large paper factory. The effluent from the mill has high levels of BOD[4], suspended solids, silica and sodium elements which are discharged into the Narayani river, which flows through the park, without prior treatment. Construction of public road in the park to link settlements outside the park, and a plan to construct transmission lines through the park	Increase in number of tourist service industry is a threat to the natural harmony of the park. Adverse effects from the mill effluent on aquatic flora, fauna and invertebrates due to degradation of the habitat of aquatic species and food chain Possibility of Rhino and Tiger poaching Habitat modification from grassland to woody vegetation due to strict management prescriptions Emergence of invasive species
Bardia National Park	The section of East-West Highway passes through the Park. There are irrigation canals, existing and planned Development of hotels and entrepreneurs outside the park boundary	The highway hinders movement of wildlife in and around the park exerting disturbances in the natural harmony of the park, and may encourage poaching and deforestation. The irrigation canals restrict traditional movements of fauna. Disposal of non-biodegradable wastes

[4] Biological Oxygen Demand

Protected area	Activities in protected areas	Threats from activities
Annapurna Conservation Area	The activities are mainly cultivation on marginal land, persistent hunting of declining populations of mammals and birds, over-use of existing forest and grassland resources and tourism services. Most favoured trekking route with high number of tourists	Soil erosion and deforestation. The tourism industry further increases pressures on natural resources in spite of promotion of alternative energy

Source: Developed through expert consultation

3 PROJECT DEVELOPMENT AND IDENTIFICATION OF IMPACTS

3.1 IDENTIFICATION OF PROJECT DEVELOPMENT NEEDS

Protected areas in Nepal hold rich natural resources, biodiversity and cultural diversity. They, therefore, attract the attention of government policies and programmes. At the same time the strict rules and guidelines for activities within and outside the protected areas reflect their benefits to local communities. It is, therefore, essential that projects developed in such areas do not undermine both components - local community development and conservation efforts.

The needs of beneficiaries from a project may be identified in many ways, including consultations with:

- Communities in Buffer Zones.
- Entrepreneurs, non-government organisations (NGOs) and community-based organisations (CBOs).
- Local bodies such as Village Development Committees (VDCs), District Development Committees (DDCs) and other governmental agencies at district level.
- Various protected area resource and infrastructure user groups.
- Central government and planning bodies.

The important issue here is that, once a project is conceived, research and study should be conducted to prioritize the needs for conservation and other benefits.

When project needs have been confirmed, it is essential to visit the project site to assess their suitability. Such visits would also support the project design phase. Although maps or aerial photographs of protected areas may provide overviews, a site visit is essential to develop a full understanding of the project area. More specifically, the visit may be used to:

- Gather pertinent plans, update maps and reference material, which may help in the location of existing project area features.
- Take notes, photographs and/or videotape of the project area to identify key project issues.

3.2 PROJECT SCREENING AND THE NEED FOR ENVIRONMENTAL ASSESSMENT

The requirement for an IEE or EIA is determined through a simple screening procedure on the basis of Schedules as mentioned in the 1997 EPR. Schedules 1 and 2 of the EPR provide a simple check list for project proposals that require an IEE and EIA respectively.

Proposals that are not included in Schedule 2 also require an EIA if the project cost is higher than 100-million NRs. Similarly, projects that are not included in Schedule 1 but cost 10-100 million NRs are required to go through an IEE process.

Notwithstanding the project size or category, the EPR specifically requires (under Schedule 2 Clause K) an EIA for any development proposal that is to be implemented in a National Park, Wildlife Reserve or Conservation Area.

3.3 THE NEED FOR IMPACT IDENTIFICATION

A development activity is bound to have certain impacts, which may be positive or negative. It is, therefore, essential that potential changes that may result from proposed activities are identified so that the adverse impacts are mitigated as much as possible. It is also essential that baseline data collection should precede impact identification, (as set out in Section 4.4). The identification of impacts also aids in formulating mitigation measures and enhancing beneficial impacts. Moreover, impact identification should start at the initial stage of project development such that impacts are predicted in advance and can be addressed accordingly.

3.4 BASELINE DATA COLLECTION

The term "baseline" refers to the collection of background information on the physical, biological, and socio-economic character of the project area including social and cultural practices. It is very important that detailed baseline information is collected while planning and developing activities such that impacts may be evaluated in terms of benefits and adverse impacts. Baseline data are collected for two main purposes (Khadka, 2004):

- To provide a description of the status and trends of environmental components (or features) against which predicted changes can be compared and evaluated in terms of importance.
- To provide a means of detecting actual change by monitoring once a project has been initiated.

Baseline data should, therefore, be collected on the physical, biological, and socio-economic environment and cultural aspects of the project area before the start of the development of any proposal. It is important that, as well as describing the area directly impacted by the project (i.e. its 'footprint'), baseline data are collected for other areas that may be potentially impacted by the project, e.g. downstream of a dam.

Sources of baseline information may include secondary sources, such as various government records and surveys (e.g. project area profiles, relevant maps and aerial photographs of the project area, air and water quality monitoring station reports and records from project area government service offices) and private databases etc. However, it is essential to conduct site surveys to validate secondary data sources and at the same time to fill data gaps. Emphasis should be given to identifying and surveying important indicator species, e.g. of birds, butterflies, orchids, bees etc. It is equally important to document non-timber forest products (NTFPs) of the project area that are locally used.

Relevant primary data may include air, water and soil quality, noise levels, vegetation cover, forest species inventories, tree measurements, animal population estimates, data obtained from socio-economic surveys and lists of cultural resources, including archaeological and historical sites (Uprety, 2003). Such primary information may be collected by field surveys or measurements, laboratory analysis of samples, and through discussions with relevant project stakeholders and authorities in the project area.

Table 3.1 provides some guidance, developed through consultations, on the collection of baseline data for identified projects. In addition to the information sources listed in the table local inhabitants should be consulted to verify biological and socio-economic information.

Table 3.1: Indicative methods for baseline data collection

SN	Parameter	Probable data source	Methods
Physical environment			
1	Topography and geology	Available maps preferably with land use delineation Satellite images, aerial photos New baseline photographs	Record project area in the topographical map Develop site-specific project map The maps should include delineated areas of landslides, potential landslides, settlements, water bodies, cultivation and sensitive sites, biodiversity-rich areas, and major habitats and biological corridors Determine soil characteristics through sampling and laboratory analysis Determine watershed condition such as drainage area, groundwater and its vulnerabilities Identify seismic zones
2	Air and water quality and noise levels	Sample measurements within project area	Determine air (Total Suspended Solids (TSP), PM_{10}, NO_x, SO_2), water (pH, BOD, COD, Turbidity) quality and noise levels in the project area and areas potentially impacted
Biological environment			
3	Terrestrial flora	Sampling, inventory, and review of existing literature Enumerated species from the National Herbarium of the Department of Plant Resources and Academic Institutions	Determine vegetation communities and species present from direct surveys and analysis of records Use appropriate sampling sizes to take stock of forest and shrub areas Conduct inventory of vegetation that may be potentially lost as a result of site-clearance (unavoidable loss) Use checklists and/or questionnaires or conduct discussion programmes to collect indigenous knowledge on the use of various species of plants
4	Terrestrial fauna	Sampling and review of existing literature. Natural History Museum	Review literature specific to project area. Carry out surveys to establish which important species are present in the project area (e.g. threatened or endemic mammals and birds) Follow various methods of capture and release to estimate population of mammalian species
5	Aquatic flora and fauna	Sampling and review of existing literature	Review literature specific to project area Carry out surveys to establish which important species are present in the project area Consult with fishing communities on the status of

SN	Parameter	Probable data source	Methods
			fish stocks
6	Agricultural biodiversity	List of crops, fruits, vegetables, livestock rearing	Review and update agricultural and livestock baseline data on indigenous crops, fruits, vegetables, cattle, poultry, pigs, goats etc.
Socio-economic environment			
7	Public health and safety	Sampling, record of the health post/hospital and review of existing literature	Observe and gather information relative to disease, sanitation; use focus group discussions
8	Economy	Sampling and review of existing literature	Questionnaires covering occupations, settlements, industry, forest and agro products, livestock, fisheries, markets, land tenure and tourism
9	Local Institutions	Interviews with officials of identified institutions	Checklists covering areas of work undertaken by local institutions such as local bodies, security, health and education, NGOs, CBOs and local knowledgeable persons
10	Demography	Sampling and review of existing literature	Questionnaire to determine population demographics including birth/death rates, density, distribution, migration Document ethnic minority and their indigenous knowledge systems
11	Social service facilities	Local people and review of records	Checklists, observation, and focus group discussions on health services, education, drinking water and sanitation
12	Infrastructures	Local people	Checklists, observation, and focus group discussions on roads, irrigation, electricity etc. Consultations with service providers

Source: Developed through expert consultation

3.5 IMPACTS OF PROJECT ACTIVITIES

Project activities may impact upon physical, biological, socio-economic and cultural aspects of the environment in the project area. These impacts may be:

- Direct.
- Indirect.
- Cumulative.

Direct impacts of a project activity are the result of changes in environmental conditions within the project area (i.e. footprint). Direct impacts can sometimes be reduced (e.g. by reducing the size of the project's footprint) but can't generally be totally avoided. Indirect impacts are brought about by project activities that have environmental effects outside the specific project area (e.g. the loss of fish downstream of a project as a result of water pollution). In some cases there may be activities, which individually have insignificant impacts, but when combined together produce far more significant impacts. The combined impacts of such activities constitute cumulative impacts.

Environmental impacts may be significant or insignificant, reversible or irreversible, and permanent or temporary in nature.

3.5.1 Methods of impact identification

Methods for impact identification may vary depending on the nature of development activities being considered. These methods may be adapted according to requirements and expert judgement. The following methods may be adapted for impact identification and comparison.

Checklist

This method starts with the preparation of a list of environmental, social and economic factors, which may be affected by the project. One of the most effective and widely used methods combines a checklist and threshold assessment. Any impact that exceeds the threshold of concern is considered to be significant. The threshold values are generally available as standards for the resources concerned (Uprety, 2003). A simple checklist is basically a summary of the range of environmental impacts and should start with listing potential impact areas. The next step is to assess the character and nature of the impacts. This should usually be accomplished by using descriptive terms such as adverse or beneficial, short-term or long-term, insignificant or significant impact (Uprety, 2003). The following questions may help identify potential impact areas and species that should be addressed by the impact assessment.

- Will the project be implemented in the forest area? Yes No
- Is the forest pristine/mature and rich in biodiversity? Yes No
- Are there rare, endemic or endangered species? Yes No
- Are there economically important NTFPs? Yes No

Matrix

A two-dimensional matrix is developed by combining a checklist of development actions with a checklist of environmental components and this can be used to identify potential impacts (Uprety, 2003). The likelihood of impacts from each development component on each environmental component is marked in an interaction cell with a predetermined sign. At this stage of identification the type of impact is not categorised as direct or indirect, but the completed matrix indicates impacts that require further study.

Matrices can also provide further details of impacts on those resources likely to be affected by project activities. For each resource or feature they can identify potential impact areas, predict impact severity, specify corresponding mitigation measures, and help identify agencies responsible for implementing mitigation measures.

A hypothetical example of a simple impact matrix is given in Table 3.2, which also lists corresponding mitigation measures (see Section 4 for information on mitigation approaches). This type of matrix is simple, covers all aspects and provides an overview of impacts which can provide easy and clear guidance for decision-makers.

Table 3.2: An example of simple matrix for presentation of impacts from a road project

Activity	Likely impacts	Environmental impacts				Mitigation measures	Responsibility
		Nature	*Magnitude*	*Extent*	*Duration*		
Site Clearance	Loss of vegetation	Direct	High	Site-specific	Short-term	Compensate for the loss of forests	Proponent in collaboration with forestry organisation
	Fragmentation of habitat	Direct	Medium	Local	Long-term	Create a new habitat and release species	Proponent
Workers mobilisation	Demand for firewood and possible collection from nearby forests	Indirect	Medium	Local	Short-term	Provide kerosene or LPG for cooking purpose along with cooking devices Regulate the activities of workers in forests	Proponent District Forest Office
	Illegal collection of biological/ biodiversity products from nearby forests by the workers' dependants	Indirect	Medium	Local	Short-term	Regulate the activities of workers' dependants and if found involved in collection and selling of biodiversity products, penalise and even expel from job	Proponent

Note: Construction related impacts are considered to be short-term duration and predicted impacts are considered to be indirect.

Overlays

This method provides information on spatial aspects of impacts of actions. A map of project activities can be placed over an updated base map and potential changes of the project activities on the environmental resources identified. This can help identify options for alternatives or alternative routes, which may for example avoid biodiversity-rich areas. Geographical Information Systems (GIS) are particularly useful for analysing the spatial aspects of potential impacts because they provide many possibilities for superimposing map-based data.

Networks

Network methods can be used to establish the cause-effect relationships of actions and impacts. They can then be used to identify second and third order impacts resulting from primary impacts. For example, loss of forest vegetation is a primary impact that could induce soil erosion (a secondary impact) which may in turn lead to third order impacts such as flooding, due to river sedimentation, and/or degradation of fish habitats.

Several scientific and social methods are available for identification, prediction and evaluation of impacts.

3.5.2 Identification of project impacts

It is essential that a proper analysis is carried out of potential impacts during project development so that the implemented project has far reaching benefits and does not undermine conservation of protected areas. Therefore, identification of project impacts plays a vital role in the development of mitigation measures. The following project activities outlined in Table 3.3 should be considered when identifying project impacts on the physical, biological and socio-economic environment.

In any impact analysis a clear linkage should be developed between the baseline condition of important features or resources and potential impacts. It should also be remembered that impacts may be beneficial (i.e. positive) as well as detrimental (negative), depending on conservation objectives. For example, the 750 MW West Seti Hydroelectricity Project will have direct impacts on vegetation, but at the same time it will create 1,989 ha of open water reservoir habitat which may benefit 47 bird species and lentic fish (SMEC, 2000).

Table 3.3: Identification of project impacts

Project activity	Feature	Possible impact	Impact checklists
Opening of trail	**Physical environment**		
Earthworks such as cut and fill	Land use pattern at project site Create photographic evidences	Loss of agricultural and forest area	Determination of loss of land used for agriculture or household Quantification of loss of community and other forests/wildlife habitats
Removal of vegetation for project components	Topography and geology of project area	Slope instability resulting in landslides and erosion	Identification of number and size of landslides at the project area Determination of possible soil erosion and landslides initiated by clearance of

Project activity	Feature	Possible impact	Impact checklists
			vegetation
Operation of quarries and borrow pits for project development	Water bodies near project	Sedimentation in streams and siltation at agricultural land	Identification of turbidity of the streams and soil condition of adjoining agriculture land of project area
Stockpiling of construction materials	Natural drainage pattern	Disturbance to natural drainage	Identification of possible drainage problems due to construction activities
Use of forest and agricultural products of project area	Water bodies and their quality downstream of project area	Short-term contamination of water bodies due to polluted run-off	Determination of water quality of downstream water bodies
Acquisition of land and property	Area and type of land occupied or rented	Temporary loss of land	Identification of location of work camp in the project area
Work camp operation during project activities	Downstream water bodies and their quality	Contamination of water	Determination of runoff to nearby water bodies and sanitary condition Assessment of waste disposal site and waste disposal system
	Biological environment		
Establishment of right of way	Type, area, condition and value of vegetation at project site	Loss of vegetation cover	Quantification of vegetation to be extracted during project development
	Location/vegetation type	Disturbance to vegetation due to site clearance	Quantification of area of vegetation to be disturbed for establishment of work camp
	Locally found wildlife including endangered species	Possibility of illegal hunting/trapping/fishing Fragmentation of mammal habitats	Assessment of possible illegal hunting, trapping of wildlife by workforce of the project
		Disturbance to wildlife	Quantification and identification of any disturbance to wildlife population
Water diversion	Area of dewatered zone	Loss in amount of fish production Loss of planktons and impact on food chain	Availability of endangered aquatic flora and fauna including fish species Identification of change in aquatic ecosystem

Project activity	Feature	Possible impact	Impact checklists
	Socio-economic and cultural environment		
Forest clearance	Existing Community Forest User Groups (CFUG) and BZFUGs nearby project components	CFUG affected due to acquisition of their forest land	Identification and quantification of community forests land and its resources to be used for project development Determination of effects on local livelihoods due to use of forest resources
Mobilisation of work force	Flow of migrants to project area for work and livelihood opportunities	Conflict for the use of forestry resources between locals and migrants	Assessment of requirement of number of work force for project activities Assessment of requirement of local resources to sustain work force
	Migration pattern in the project area	In-migration affecting local social and economic conditions Less employment opportunity to locals	Assessment of requirement of local resources to sustain work force Assessment of requirement of number of work force for project activities Identification of existing occupation of local people and availability of skilled and unskilled labourers
Project activity in the agriculture land	Existing cropping pattern and agricultural practices	Disturbance to agricultural production Change in land use pattern	Identification of current project area practice and assess predicted changes against project activities
Demolition of public service facilities	Existing public service facilities such as water supply, security	Disturbance, demolition of water supply infrastructure Local public infrastructure unable to cope with increased population Increased pressure on security agencies to maintain law and order	Identification of current public service facilities against project activity changes Assessment of requirement of facilities when project activities are undertaken
Establishment of workers camp	Existing medical facilities/prevailing workers' health	Possibility of introduction of new communicable diseases	Identification of existing medical facilities Assessment of possible requirement of facilities when project activities are

Project activity	Feature	Possible impact	Impact checklists
			undertaken Assessment of requirement of number of work force for project activities
Site clearance	Existing important sites in the area Heritage site	Disturbance to site of historical/cultural/architectural/archaeological importance	Identification of current sites, project area practice and assess predicted changes against project activities

Source: Developed through expert consultation

3.5.3 Magnitude, extent and duration

In the process of impact identification, categorisation of impacts in terms of their magnitude, extent and duration is very important. Within the categories of impacts, they may be further compared in terms of high, moderate or minor magnitude, trans-boundary, national, regional, local or site-specific, and long-term, medium-term or short-term duration.

Simple steps are suggested in Table 3.4 below for the categorisation and ranking of impacts of project activities in protected areas.

Table 3.4: Impact categorisation and ranking

Impact category	Important characteristics of project activities that determine impact categories	Ranking of impact category
Magnitude	Severity in relation to the loss of biodiversity of project activity Reversibility of project impacts Sustainability of resource use	High/Major Moderate Minor
Extent	Area impacted by project activity, e.g.: Impact crossing the national border Impact having national significance Impact that occur within a designated geographical area (valley, watershed basin etc.) Impact having spatial distribution over a few km from the project site Impact occurring within the specified project area	 Trans-boundary National Regional Local Site-specific
Duration	Project activity in terms of temporal or permanent effects such as short, medium or long-term.	Long-term Medium-term Short-term

Source: Developed through expert consultation

Note: Assessments of magnitude, extent and duration should take into consideration the nature and location of the project and its particular activities. In general, construction-related impacts are normally considered as short-term and operation-related impacts as long-term.

For the evaluation of impacts, the proponent should consider: (i) national policies, laws, local customs and religious beliefs, (ii) defined environmental standards (e.g. Appendix 3), (iii) the value of impacted resources (Uprety, 2003). It is therefore important to know how local people and other stakeholders value the resources that might be affected by the project activities. For example, a hydropower project was not able to remove two large trees at a tunnel work site because of strong resistance from the local people, who had strong cultural attachments to the trees. The project therefore found an alternative way to complete the tunnel work without harming the trees. This example indicates that biological resources sometimes have much higher values than may be apparent.

Evaluation of the importance of biodiversity in impact assessment should use quantitative data when these are available. However, any evaluation of impacts should recognise that the value of the biodiversity affected by a project activity will depend upon its location and its uses and thus the perception of different stakeholders.

4 IDENTIFICATION OF MITIGATION MEASURES

4.1 THE NEED FOR IMPACT MITIGATION MEASURES

Mitigation measures aim to reduce or offset (i.e. compensate for) adverse impacts to an acceptable level. In order to minimize negative impacts, mitigation measures need to be well-planned and adequately implemented. Priority should be given to following an avoidance-minimisation-compensation approach. This means that attempts should be firstly made to prevent adverse impacts. Then, if this is not possible measures should be taken to reduce impacts to an acceptable level. If this cannot be achieved, compensation should be provided for the lost resources (e.g. by restoring or creating alternative areas of habitat). It is particularly important to adopt this mitigation approach for projects in and around protected areas because of their high conservation values. Proper identification of impacts and mitigation measures can also decrease biodiversity related business risks and increase the likelihood of project approval and success in the long-run.

4.2 MITIGATION APPROACHES

Mitigation measures should be developed to ensure that development activities are viable and sustainable. Such measures should be practical, locally suitable, socially acceptable, and easy to implement. At the same time the mitigation measures need to be cost-effective so that they are implemented adequately. Some examples of simple but effective approaches to mitigation measures is given in Table 4.1.

Table 4.1: Approach to mitigation measures

Mitigation Measure	Example of approaches
1. Preventive Measures	Realignment of proposed road to avoid valuable forest area Relocation of project activities from biodiversity rich and/or sensitive areas
2. Corrective Measures	Installation of air and noise pollution control devices Discharge of 'only' treated effluents into water bodies or land by complying with the standards Selective felling of trees or leaving adequate source trees to promote regeneration
3. Compensatory Measures	Restoration of damaged natural resources, including specific consideration to maintain biodiversity Creation of similar habitats for important biodiversity where possible Resettlement or rehabilitation of displaced settlements. Relief and compensation to affected persons.

Source: Revised from National Conservation Strategy Implementation Project, 1994; Uprety, 2003; and MFSC's Policy Decision, 2003.

4.3 IDENTIFICATION OF APPROPRIATE MITIGATION MEASURE

Designs that include best practice physical and biological engineering measures, social concerns and involvement of the beneficiaries are most likely to incorporate appropriate mitigation measures. Therefore, the needs of all people affected by the project, including protected area representatives, Buffer Zone communities, VDC representatives and project beneficiaries, should be considered when identifying mitigation measures. Some examples of possible mitigation measures for various impacts are given in Table 4.2. The mitigation measures have been identified in terms of broad categories of possible project impacts. A more specific example of impacts and mitigation measures is given for a hydroelectricity project in Appendix 4.

Table 4.2: Examples of potential mitigation measures for project Impacts

Broad category	Potential impact[5]	Mitigation measure
Slope stability	Landslides or other forms of mass instability on the slopes	Geological/geomorphological studies conducted to investigate and recommend best available options Civil engineering structures and bio-engineering measures used Measures taken to avoid undercutting of slope toes Quarrying prohibited in river beds, where flood discharge is significant
	Development of erosion or gulling	Check dams and bio-engineering measures used as necessary
	Road crosses major areas of deep-seated instability	Width and surfacing including bio-engineering treatments (relaxed for short lengths, as required)
Spoil disposal	High volume of wastes/spoils	Minimize spoil by balancing cut and fill wherever possible
	Spoil tipped away from designated areas	Safe tipping areas identified and enforced
	Spoil failing or being washed on to farmland	Spoil traps constructed
Water management	Scour and erosion below unprotected drainage out falls	Mattresses, check dams and other protection measures constructed as necessary Cascades constructed, to be as long as necessary
	Disruption of drinking or irrigation water	Measures to resolve these problems incorporated into project works, or compensation paid
Land use	Houses need to be removed	Compensation
	Loss of agricultural land	Restoration or compensation
	Loss of forest lands, grasslands and wetlands	Restoration or compensation Forest User Groups compensated for trees and products lost Check impacts are limited to compensated trees and resources/products

[5] The engineering practices to complement mitigation measures may as well be referred from: HMGN. 2000. *Environmental Guidelines Prepared for Small Rural Infrastructure Projects*. Ministry of Local Development, HMGN, Kathmandu.

Broad category	Potential impact[5]	Mitigation measure
Plants and wildlife	Large numbers of trees being removed Pressure on forests resource use	Replace felled trees, using the same species if appropriate Avoid felling seed-bearing trees Trees planted wherever land is available Rehabilitate epiphytic plants like orchids Regulate firewood collection Raise awareness of protected species and enforce legislation
	Disturbance to wildlife	Realignment or relocation of the project Habitats re-created on marginal roadside land Provide escape ways Monitor and regulate vehicular traffic hazards
	Disruption of movement of wildlife Invasion of alien species	Restrict project activities and movement of people during critical times such as breeding periods Avoid use of alien species and accidental introduction of alien species
Quarries and borrow pits	Pollution & disturbance	Construct bunds to screen noise and dust Enforce access restrictions
	Safety risks from abandoned quarries or borrow pits	Quarries made safe by re-grading slopes and installing structures as necessary
	Land seriously disturbed or lost from production	Quarry and borrow areas restored to appropriate habitats using bio-engineering techniques
	Quarries continue to be used by unauthorized persons	Unauthorized quarrying stopped, where necessary by working with the Districts Development Committee
Stone crushing & asphalt plants	Dust and noise pollution	Plants re-sited or compensation arranged if pollution is caused Large earth bunds constructed and vegetation used to screen hazards
Hazardous materials	Spills, leaks or injuries from any type of hazardous material (e.g. bitumen, cement, paint, explosives, fuels, lubricants)	Checks to ensure that storage is acceptable and that there are no losses or leaks Checks to ensure that protective clothing and safety measures are used
Camp operation	Pollution from work and labour camps	Checks to ensure that camps are not polluting neighbouring areas, especially from sewerage and rubbish disposal

Broad category	Potential impact[5]	Mitigation measure
	Labourers cut trees for firewood	Kerosene stoves and kerosene provided to labourers
	Land remains damaged after construction	Checks to ensure camp areas are fully restored, including re-top soiling and tree planting if appropriate
Dust and noise	Dust generated from construction works	Vehicle speed controlled using speed bumps. If water is available, the road surface can be sprayed on a frequent schedule
	Dust from a road with an earth or gravel surface	Permanent speed bumps installed in villages and bazaars to reduce traffic speeds in inhabited areas Bitumen surface constructed in bazaars, with speed controls Dense vegetation screens planted on roadside
	Noise from large work sites	Large earth bunds constructed and vegetated to reduce noise Work scheduled to minimize disturbance
Social issues	Positive impact of road confined to wealthier sections of society	Development impacts encouraged to integrate activities beneficial to poor and excluded sections of society
	Local people excluded from project activities	Designs incorporating methods within the skills of local people Contractors encouraged to use local labour whenever possible
	Significant disparities in levels of compensation	Compensation levels rationalized to ensure reasonable parity
	Disruption of social harmony Spread of contagious diseases	Encourage immigrant workers to abide local customs and culture Educate workers and locals about the contagious diseases such as HIV Aids

Source: Developed through expert consultation

4.4 IMPLEMENTATION OF MITIGATION MEASURES

Proposed mitigation measures are only effective if properly implemented. Unfortunately, it is common for mitigation measures to be proposed but not implemented as a result of weak project monitoring systems.

An effective way to ensure that mitigation measures are implemented is to include them in project design and tender documents. Tender documents should clearly indicate that the construction works are deemed complete only when the prescribed mitigation measures are in place. Tender instructions to bidders should explicitly describe the mitigation measures to be taken. Such instructions should also require bidders to indicate the costs of the mitigation measures, which otherwise might be lost in an attempt to be more competitive. Using this approach, mitigation measures become part of the project construction and operation

phases. By including mitigation measures in the contract or in specific items in the Bill of Quantities, monitoring and supervision of mitigation implementation can be covered under the normal engineering supervision provisions of the contract. The responsibility for mitigation measures lies with the project proponent, although they may be implemented by contractors and/or supervisory consultants.

Table 4.3 suggests project phases and parties that should take responsibility for the implementation of mitigation measures. For each project activity the contractor shall comply with the clause pertaining to mitigation in the contract.

Table 4.3: Implementation Responsibility for Mitigation Measures

Mitigation activity	Implementation responsibility		
	Project design	**Bill of Quantity**	**Monitoring**
Slope stability	Specify bio-engineering and relevant techniques	Identify stabilization area Provide list of vegetation to be planted Area coverage	Adequacy, quality of vegetation Survival rate of plants
Spoil disposal	Identify mass balance techniques Safe tipping areas identified and enforced Design spoil traps	Quantify disposal and extraction volume	Presence of scouring, erosion, damage to property, water supply disruption Complaints from local people
Water management	Design safe discharge drainage and techniques (check dam) to natural water course	Physical works for safe discharge drainage listed	Evidence of fresh surface erosion, presence of gullies, increase in water turbidity, loss of agriculture forest land Slope condition Indigenous fish resources Public complaints
Land use	Explore use of marginal land Check impacts are limited to compensated trees and products		Quantify actual land use pattern for construction and other activities Public complaints
Plants and wildlife	Consider construction least affecting forests and productive plots		Check habitats re-created on marginal roadside land
Quarries and borrow pits	Design bunds to screen noise and dust Design re-grading slopes Use bio-engineering techniques for	Quantify restoration costs and present technical specifications	Check for water ponding, formation of gullies, water turbidity Check unauthorized quarrying activities

Mitigation activity	Implementation responsibility		
	Project design	Bill of Quantity	Monitoring
	rehabilitation		
Stone crushing and asphalt plants	-	Amount to be included in contractor's own expense	Dust control equipment being utilized Public complaints
Hazardous materials	Specify storage facilities for explosives and toxic materials	Amount to be included in contractor's own expense through rate for supplying materials	Checks to ensure that storage is good and that there are no losses or leaks Checks to ensure that protective clothing and safety measures are used
Camp operation	Identify camping grounds	Amount to be included in contractor's own expense through work camp item expense	Latrine construction and effective waste disposal Check disruption in water supply Plantation, rehabilitation of site Supply of alternate fuels
Dust and noise	Indicate use of safe pollution level equipment	Specify buffer area requirements Amount to be included in contractor's own expense through work camp item expense	Air pollution control equipment Dust deposition on crops and vegetation Survival rate of plants Public complaints
Social issues	Incorporate socially acceptable design specifications	-	Check issues pertaining to social concern

Source: Developed through expert consultation process

5 PROJECT ACTIVITY MONITORING AND AUDITING

5.1 THE NEED FOR MONITORING

A problem with many development activities in Nepal is a lack of monitoring of project activities, both during construction and operation phases. This is exacerbated by poor baseline data, impact prediction and mitigation measures. Therefore, it is essential that adequate baseline information is collected and project impacts and possible mitigation measures clearly and carefully identified. Monitoring is necessary to ensure that impacts do not exceed legal standards, to check the implementation of mitigation measures proposed in the EIA report and to providing early warning of potential damage (NCS Implementation Project, 1994).

5.2 TYPES OF MONITORING

Three types of monitoring should be identified in the EIA report. If the project is to be implemented immediately after the approval of the EIA report, there is no need to conduct baseline monitoring with the understanding that there will be no substantial change in the baseline conditions of the project area. Compliance and impact monitoring should be designed for both construction and operational stages of the project.

5.2.1 Baseline monitoring

The baseline monitoring should be undertaken prior to initiation of construction of project components to describe and quantify the environmental and socio-economic conditions at the project area and areas of potential impact before project implementation. Such monitoring would help identify changes in the parameters identified once the project has started.

5.2.2 Compliance monitoring

Compliance monitoring is undertaken to ensure that project activities are being implemented in accordance with agreed project designs, permits, environmental standards and other regulations and contracts. It should employ periodic sampling or continuous recording of specific environmental quality indicators. Compliance monitoring does not assess the effectiveness of the mitigation measures and benefit augmentation measures. It only indicates whether the recommended measures are implemented or not.

Specifically, the recommendations suggested in the EIA report of the project should be adhered to, which also forms the basis for identifying indicators for monitoring purposes.

A monitoring framework for development activities is proposed in Table 5.1. This framework may help project developers ensure that project construction and operation phases are well prepared to respond to the results of monitoring.

5.2.3 Impact monitoring

Impact monitoring is concerned with monitoring impacts which result from the implementation of the project and its mitigation measures. The construction of project components is bound to impart certain impacts which need to be monitored so that changes are identified and corrective measures are implemented accordingly.

Table 5.1: Monitoring framework for development activities in and around protected areas

Impacts on categorised activity	Monitoring indicator	Monitoring methods	Monitoring period / responsible party
Physical environment			
Topography and geology	Cases of erosion, sedimentation State of marginal land area Change in land-use Photographic evidences based on pro-project programs	Inspection of site clearance practices, top soil storage sites Disposal of excavated materials and other construction wastes Plotting on maps, comparison with previous maps, observations	During quarry operation or bi-weekly by DDC Environmental Unit, project, local, NGOs, contractor

Impacts on categorised activity	Monitoring indicator	Monitoring methods	Monitoring period / responsible party
	and post project photographs		
Air & water quality; noise levels	Total Suspended Solid (TSP) in air Water temperature, pH, Dissolved Oxygen (DO) Intensity of noise	Observation of construction practices and discussion with residents and workers Use field kit/visual observation	Periodically by DDC Environmental Unit, project, local NGOs, contractor Weekly or when construction taking place near water body
Biological environment			
Aquatic fauna	Fish and other species population	Observation and sample surveys of water bodies Discussion with local inhabitants on population changes of specific aquatic species Document and analyse knowledge of specific ethnic or professional groups	During construction and operation period by relevant authority, project contractor, local institutions
Aquatic flora	State of aquatic floral distribution	Observation and sample surveys of water bodies Discussion with local inhabitants on changes of floral distribution and uses	During construction and operation period by relevant authority, project contractor, local institutions
Terrestrial flora	State of forest species, community forest species, biomass including NTFPs	Observation and sample surveys of important habitats and species Discussion with local inhabitants on changes of floral distribution and uses Construction of barriers to control access to forest areas	During construction and operation period by relevant authority, project contractor, local institutions
Terrestrial fauna	State of wildlife species	Observation and sample surveys of important habitats and species Discussion with local inhabitants on changes of faunal distribution, uses	During construction and operation period by relevant authority, project contractor, local institutions
Socio-economic environment			
Public Health and Safety	Sanitation and health Situation of law and order	Check cases of diseases Observe sanitation condition	During construction and operation period by relevant health authority, project

Impacts on categorised activity	Monitoring indicator	Monitoring methods	Monitoring period / responsible party
	order	Check police records	contractor, local institutions
Economy	State of employment, settlement, migration pattern, market, land tenure Development of new or expansion of old settlements along project components	Site observation, checking of attendance record, interaction with labourers, local resource/infrastructure user committees, contractors, wage payment records	
Local Institution and Infrastructure	State of institutions of security, health care, education, local government, NGOs, CBOs Services of local infrastructure such as road, water supply, electricity State of culturally sensitive spots	Observation and assessment of local institutions Discussions with local people to assess changes in quality of services Protection of culturally sensitive spots	During construction and operation period by relevant health authority, project contractor, local institutions
Demography	Changes in population structure, migration pattern Migration to the road side/displacement of local people		
General Monitoring			
Integration of local people's environmental concerns	Local people's concerns integrated	Review of study and design reports, discussion with local residents, representatives, and designers	During the study and design process/Prior to approval by relevant authority, project, local stakeholders
Preparation of environmental brief and baseline status of the corridor	Biodiversity corridor studied	Review of discussions with sectoral agencies and knowledgeable persons	Prior to finalizing location and design/authority, project, local stakeholders
Incorporation of mitigation measures into the overall design	Mitigation measures integrated into design	Review detail design/drawings of the project	During project approval/relevant authority, project, contractor, local stakeholders
Incorporation	Codes of conduct	Review detail design/drawings	Prior to project

Impacts on categorised activity	Monitoring indicator	Monitoring methods	Monitoring period / responsible party
of environmental codes of conduct	integrated	of the project	approval/relevant authority, project, contractor, local stakeholders
Care for vegetation in the right-of-way (RoW) and immediate vicinity	RoW vegetation conserved	Inspection of site clearance activities	Bi-Weekly during construction/Relevant authority, project, contractor, local stakeholders
Condition of environmental mitigation measures used in the road	Mitigation measures implemented	Inspection of such measures and discussion with maintenance workers	Annually. DDC Environmental Unit, local NGOs, local people

Source: Developed through expert consultation

Depending upon the nature of the project, the monitoring plan should cover the project's pre-construction, construction and operational stages. The pre-construction stage monitoring is mostly related to site-clearance and compensation. It is also essential to specify the location of monitoring sites, which should include control sites for comparison with sites within the project impact area. The proposed monitoring parameters and indicators should be clearly linked with the proposed mitigation measures.

In accordance with Nepal's EIA legislation, monitoring responsibilities lie with the concerned ministries. The environmental monitoring responsibility for water resources projects lies with the Ministry of Water Resources, whilst the Ministry of Physical Planning and Works is responsible for road projects. However, the Ministry of Environment, Science and Technology may also monitor as and when necessary.

In order to ensure that monitoring is carried out, EIA reports should clearly indicate who is responsible for monitoring and which agencies should be consulted. This provides opportunities for the involvement of the protected area authority and other institutions that have mandates for biodiversity conservation. The Department of National Parks and Wildlife Conservation, and concerned wardens should be directly involved in monitoring of projects that will be implemented in and around the protected areas. The Department of Forests and its District Forest Offices will have important roles in biodiversity monitoring of projects outside protected areas. Similarly, the District Agriculture Offices should be involved in agro-biodiversity monitoring. To facilitate the organisation of monitoring a joint monitoring team including the proponent, agencies that have mandates for biodiversity conservation and representatives of affected communities should be formed.

5.3 PROJECT AUDITING

Projects should be audited when they have been completed and in operation for an appropriate time. The purpose of auditing is to establish and assess actual project impacts, the accuracy of impact prediction, the effectiveness of suggested mitigation measures and the functioning of monitoring mechanisms. According to the 1997 EPR, which requires EIA for any development projects in the protected areas, auditing is required after two-years

project operation. The Ministry of Environment, Science and Environment (MoEST)[6], which also bears responsibility for approving EIA reports, has the legal responsibility to carry out environmental auditing. Various types of environmental auditing are generally conducted. In Nepal, performance audits and/or project impact audits are the starting point.

Since the MoEST undertakes auditing of the implemented project, the framework outlined in Table 5.2 is suggested, which incorporates the categories that are usually audited.

Table 5.2: A proposed auditing framework

Parameter	Indicator	Location	Method	Source
Physical environment				
Topography and geology	Erosion, sedimentation Marginal land area Change in land use	Project site	Inspection	Observation
Air & water quality; noise levels	TSP Water temperature, pH, Dissolved Oxygen (DO), BOD, COD Intensity of Noise	Project site and nearby areas	Inspection Field analysis kit of parameters Photography documentation	Direct observation and equipment records
Biological environment				
Aquatic fauna	Fish and other species population	Project site and nearby areas	Visual observation and counting/ sampling	Observation and information from local people and authority
Aquatic flora	Aquatic floral distribution	Project site and nearby areas	Visual observation and counting/ sampling	Observation and information from local people and authority
Terrestrial flora	Forest species, community forest species, biomass	Project site and nearby areas	Visual observation and counting/ sampling	Observation and information from local people and authority
Terrestrial fauna	Wildlife species	Project site and nearby areas	Visual observation	Observation and information from local people and authority
Socio-Economic Component				
Public health and safety	Sanitation and health Situation of law and order	Project and nearby area	Inspection of records of diseases Assessment of overall security of project area	Appropriate records from relevant health and security agencies
Economy	State of employment, settlement, migration pattern, market, land tenure Development of new or expansion of old settlements along project	Project and nearby area	Observation of project area	

[6] The then Ministry of Population and Environment (MoPE) was dissolved on 23st March, 2005, and its environment portfolio was given to the Ministry of Science and Technology, thus renaming as the Ministry of Environment, Science and Technology (MoEST), and amending the HMG Business Allocation Rules.

Parameter	Indicator	Location	Method	Source
	components			
Local institution and infrastructure	State of institutions of security, health care, education, local government, NGOs, CBOs Services of local infrastructure such as road, water supply, electricity State of culturally sensitive spots	Project area	Inspection of local institutions and physical state of infrastructures	Observation and information from local people and authority
Demography	Population structure, migration pattern Migration to vicinity of project components Displacement of local people	Project area	Project area observation	Observation and information from local people and authority

Source: Developed through expert consultation

6 PUBLIC CONSULTATION PROCESSES

6.1 THE NEED FOR PUBLIC CONSULTATIONS AND HEARINGS

Experience over the years has shown that participation of local stakeholders in project development is essential to prevent misunderstandings and subsequent problems. Consultations should attempt to gain the participation and acceptance of the project by all stakeholders, as this will help to sustain the project in the long-term. Public consultation is also required to ensure that project impacts and required mitigation measures are effectively identified and integrated. If the end result of public consultation is a sense of ownership of the project amongst stakeholders, then this is itself very useful.

6.2 APPROACHES TO PUBLIC CONSULTATION

In general, project developers and consultants now recognize the need for public participation and acceptance for the successful implementation and sustainability of projects. To this effect, there are a number of techniques to consult the public. In Nepal a public hearing must be carried out at the project site after the preparation of the draft EIA report. Local people and stakeholders are informed of the public hearing by public notices and they are given opportunity to raise their concerns and issues. The proponent must submit proof that such public hearings have taken place before they can obtain project approval. For some recent projects, audio-visual recordings have been used to inform decision-makers of the outcomes of the public hearing.

As described above, wider participation in the project planning and development process, beyond obligatory hearings, may be useful to entail local ownership of the project. Useful participation techniques[7] may include:

- Public meetings: ‘open’ meetings with no restriction on attendance.
- Door to door visits to inform stakeholders of the project and help them understand it.

[7] Based on: DoLID. 1998. *Proposed Social and Environmental Monitoring and Evaluation Systems for Agricultural Roads.* NEP/96/ADB/TA No 1556, DoLID, Nepal.

- Advisory panels: groups of individuals chosen to represent the public, which meet periodically to assess projects, and to advise on future project planning.
- Open displays: manned facilities, in a locally accessible location, which contain information displays regarding the project components, which members of the public can visit to obtain information and make their concerns and views known.
- Interviews: structured series of open-ended interviews with selected community representatives to obtain information, concerns and views.
- Questionnaires: written, structured series of questions issued to a sample of local people to identify their concerns, views and opinions.
- Participatory techniques: systematic approaches to appraisal based on group inquiry and analysis acquiring multiple and varied inputs. They may be assisted, but not controlled or directed, by external specialists.

A proposed framework for a public consultation process during project development is outlined in Table 6.1. It identifies different phases and the activities that go into each phase that support public participation and gain their understanding towards the project. These activities should be linked with environmental assessment requirements for each project under EPA, 1997 and EPR, 1997.

Table 6.1: Project phase activities in support of public participation

Responsible party	Activity	Evidence of participation	Remark
Project pre-feasibility study			
Proponent	Dissemination of information regarding project type to the local community Perform environmental and social screening	Collection of letters from the local authorities regarding public consultation	Record any positive or negative issues
Local bodies	Assist local people with compiling their inputs regarding the project Ensure awareness of people regarding the project	Record minutes of consultations	Record any positive or negative issues, which need immediate attention by the parties concerned
Proponent	Appraise project consultants and contractors regarding local environmental and social issues	Record evidence of participation and communication with project officials	Record any positive or negative issues, which need immediate attention by the parties concerned
Feasibility study			
Proponent	Disclose project components to the local communities Disclose beneficial and negative impacts to the local communities due to implementation of the project	Collection of minutes of discussion meetings regarding different aspects of project components	Identification of project impacts Presentation of project information such that local community understand them
Local Bodies	Clearly mention the areas of impacts	As above	Possibly liaise between project and local

Responsible party	Activity	Evidence of participation	Remark
	impacts Identify communities under influence of direct and indirect impacts Help local communities to understand public participation legal procedures		community Initiation of participatory planning
Local Communities	Weigh carefully development alternatives Understand major issues related to the project Communicate with individuals of the communities to ensure wider participation Timely response to legal procedures of public participation	Record evidence of participation and communication with project officials and community members	Make sure that community members understand and realize project impacts
Detailed design stage of project			
Proponent	Dissemination of information regarding project design and its components Ensure inclusion of public concern into project design Adhere to legal requirements of public consultation	Collection of minutes of discussion meetings held for different aspects of project components	Ensure inclusion of monitoring and evaluation activities, and impact mitigation measures
Local Bodies	Communicate with project regarding project labor and social service requirements, and conflict resolution	As above	Relevant decision-making authorities, information sharing and their participation
Local Communities	Participation in public meetings and hearings Consult project officials regarding project implications Keep track of design components of the project Timely respond to legal requirements	Record evidence of participation and communication by project officials and community members	Ensure local communities understand design components of the project
Project approval			
Proponent	Provide necessary information to the authorities and community for approval procedures	Information provided	Ensure exchange of relevant information and do not mislead authorities and communities

Responsible party	Activity	Evidence of participation	Remark
Local Bodies	Understand project components and its impacts, ensure inclusion of community concerns prior to recommending project implementation to concerned authority	Keep records of information provided	Impartial recommendation to approving agencies required with respect to public concerns
Local Communities	Participation in public meetings and hearings, and enable community consultation Enabling and encouraging sense of public ownership of the project	Keeping records and track of information provided	Monitoring of approval procedures
Project construction			
Proponent	Timely appraisal of local communities and authorities on project progress Make sure that environmental damages are avoided or mitigated Make sure that beneficial impacts are enhanced Keep track of direct and indirect project impacts Maintenance of project standards	Recording of persons/contractors responsible for construction and implementation	Monitor implementation of all the project components
Local Bodies	Monitoring of project activities Facilitate resolution of conflicts Monitoring of project affected people Monitoring of indirect and direct project impacts	As above	Make sure that project components are not overlooked
Local Communities	Understand and consult project officials regarding project components being constructed Monitor implementation of project mitigation and other measures	As above	Realization of project necessity and ownership
Post-construction			
Proponent	Observe maintenance and compliance standards Preparation of monitoring reports	Record names of persons/authorities/community members responsible for monitoring activities	Disseminate information on project objectives
Local Bodies	Facilitate assessment of project operation	Keeping track of responsible parties for operation of the	Recording of any discrepancies in the project implementation

Responsible party	Activity	Evidence of participation	Remark
	Observe direct and indirect impacts of project on community livelihoods	project	project implementation
Local Communities	Interest and ownership of the implemented project Enable all community members to benefit from the project	Do	Participation in monitoring activities Ensure that monitoring is established

Source: Developed through expert consultation

In Nepal, public hearings are generally practiced as follows:

- After the preparation of the draft EIA report, the proponent publishes the public notice inviting the local people and stakeholders to participate in the public hearing.
- Similar public notices are placed in the offices of the concerned VDCs or municipality, as well as in health posts and schools to let the people know about the venue and time of public hearing.
- An invitation letter is also sent to the concerned institutions including the Ministry of Environment, Science and Technology and other concerned ministries (related to the project) to send their representative to attend the public hearing.
- The project proponent or the Team Leader of the EIA study team describes the project and its potentially significant environmental impacts. The representatives of the concerned institutions are also invited to present their observations and remarks. Participants ask the questions and the proponent and/or the study team member responses on them.
- The proponent finalises the EIA report taking into account the appropriate concerns raised by stakeholders.

The proponents then submit proof of the public hearing along with the EIA report for approval.

7 CONCLUSIONS AND RECOMMENDATIONS

7.1 CONCLUSION

The incorporation of biodiversity concerns in EA is a recent phenomenon in Nepal despite the existence of separate policies on biodiversity and EIA since the 1980s. However, although the legal system on biodiversity and impact assessment is well established, implementation of conservation measures is often weak due to inadequate monitoring and the limited capacities of stakeholders. Misunderstandings and mistrust between protected area authorities and project proponents has increased because of differences in interpretation of EA processes and weak compliance with recommendations in EA reports.

These guidelines aim to help those involved in the preparation, review and approval of EAs with the identification and prediction of project impacts on biodiversity. They follow the basic process of EIA and accommodate concerns as reflected in the COP decisions of the CBD. The guidelines also provide examples of approaches to identifying impacts, selecting mitigation measures, monitoring and auditing, and public participation.

7.2 RECOMMENDATIONS FOR FURTHER ACTION

The following recommendations are made to encourage further integration of bio-diversity concerns into EA processes in Nepal.

1. There is a need for consolidation and linking of biodiversity and EA in such a way that biodiversity is an integral part of a EA report. This would help translate segregated policies into simplified implementation practices.
2. More needs to be done in influencing authorities to institutionalize integration of biodiversity concerns into EIA decision-making processes, from the initial TOR to final report and follow on stages.
3. Greater awareness is required amongst project proponents, EA report authors and reviewers and decision-makers of the importance of biodiversity (including its functions and values), and the use of these guidelines on biodiversity assessment in EA.
4. Conflicts between project proponents and protected area authorities need to be reduced. This may be facilitated by giving protected area authorities a direct role in compliance and impact monitoring, and including such a role in future amendments of EIA regulations.
5. Biodiversity is facing acute pressures and conservation needs change frequently. Therefore, there is a need for an institutional mechanism that enables EA guidance to be updated in accordance with changing biodiversity concerns and objectives.

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APPENDIX 1: ACRONYMS

As	- Arsenic
BD	- Biological Diversity
BOD	- Biological Oxygen Demand
BZFUG	- Buffer Zones Forest User Groups
CBBIA	- Capacity Building in Biodiversity and Impact Assessment
CBD	- Convention on Biological Diversity
CBO	- Community Based Organisation
Cd	- Cadmium
CFUG	- Community Forest User Groups
CITES	- Convention on International Trade in Endangered Species of Wild Flora and Fauna
Cl	- Chloride
CN	- Cyanides
COD	- Chemical Oxygen Demand
COP	- Conference of Parties
Cr	- Hexavalent chromium
Cu	- Copper
DDC	- District Development Committee
DO	- Dissolved Oxygen
EA	- Environmental Assessment
EIA	- Environmental Impact Assessment
EPA	- Environmental Protection Act
EPR	- Environmental Protection Rules
F	- Fluorides
GIS	- Geographical Information System
ha	- Hectare
Hg	- Mercury
HMGN	- His Majesty's Government of Nepal (as referred to at the time)
IAIA	- International Association for Impact Assessment
IEE	- Initial Environmental Examination
IUCN	- The World Conservation Union
km	- Kilometer
LPG	- Liquified Petroleum Gas
MFSC	- Ministry of Forests and Soil Conservation
MoEST	- Ministry of Environment, Science and Technology

MoLD	- Ministry of Local Development
MoPE	- The Ministry of Population and Environment
NCS	- National Conservation Strategy
NCSIP	- Nepal Conservation Strategy Implementation Plan
NEP	- Nepal
NEPAP	- National Environment Policy and Action Plans
NGO	- Non Government Organisation
Ni	- Nickel
NP	- National Park
NPC	- National Planning Commission
NPWCA	- The National Parks and Wildlife Conservation Act
NRs	- Nepali Rupees
NTFP	- Non-timber Forest Products
Pb	- Lead
RoW	- Right-of-way
S	- Sulphides
Se	- Selenium
SEA	- Strategic Environmental Assessment
SMEC	- Snowy Mountains Engineering Corporation International Pvt. Ltd.
SO_4	- Sulphates
TDS	- Total Dissolved Substance
TOR	- Terms of Reference
TSP	- Total Suspended Particles
UNESCO	- United Nations Educational, Scientific, and Cultural Organization
VDC	- Village Development Committee
WHS	- The World Heritage Site
Zn	- Zinc

APPENDIX 2: CONSIDERATION OF POLICIES AND STRATEGIES ON BIODIVERSITY AND EIA (1980-2005)

SN	Policies and Strategies	Provisions on		Remark
		BD	EIA	
1	Sixth Plan (1980-1985)	√	√	
2	Seventh Plan (1985-1990)	√	√	
3	National Conservation Strategy, 1988	√	√	
4	Master Plan for Forestry Sector, 1989	√	√	
5	Forest Policy, 1990 and 2000	√		
6	Eighth Plan (1992-'97)	√	√	Development of EIA guidelines and enactment of EPA, 1996 and EPR, 1997
7	Industrial Enterprises Policy, 1992		√	
8	Hydropower Policy, 1992		√	
9	Nepal Environmental Policy and Action Plan, 1993	√	√	
10	Tourism Policy, 1995		√	
11	Solid Waste Management Policy, 1996		√	
12	Irrigation Policy, 1993 (revised 1997)		√	
13	Ninth Plan (1997-2002)	√	√	Continuation on species conservation and EIA strengthening
14	Public Infrastructure (Built, Operate and Transfer) Policy, 2000		√	
15	Hydropower Development Policy, 2001	√	√	Release 10% water to maintain downstream ecosystem
16	Water Resources Strategy, 2002	√	√	Provision for watershed management including BD
17	Nepal Biodiversity Strategy, 2002	√	√	
18	Tenth Plan (2002-2007)	√	√	SEA introduced, policy decisions to integrate biodiversity into EA
19	National Wetland Policy, 2003	√	√	
20	Irrigation Policy, 2003		√	
21	Sustainable Development Agenda for Nepal, 2003	√	√	
22	Domesticated Elephant Management Policy, 2003	√		
23	Handover of the Management of National Parks, Wildlife Reserves and Conservation Areas to Non-governmental Organizations or Other Organizations, 2003	√		
24	Working Policy on Wildlife Farming, Breeding and Research, 2003	√		
25	National Agriculture Development Policy, 2004	√		
26	Herbs and Non-Timber Forest Products Development Policy, 2004	√		

Source: Revised from Uprety, 2004

APPENDIX 3: GENERIC STANDARDS: TOLERANCE LIMITS FOR INDUSTRIAL (WASTEWATERS) EFFLUENTS DISCHARGED INTO INLAND SURFACE WATERS AND PUBLIC SEWERS

SN	Parameters	Tolerance Limit		
		Industrial waste into Inland Surface Waters*	**Wastewater into Inland Surface Waters from CWTP***	**Industrial Effluents into Public Sewers***
1	TSS, mg/L	30-200	50	600
2	Particle size of TSS	Shall pass 850-micron Sieve	Shall pass 850-micron Sieve	
3	pH Value	5.5 to 9.0	5.5 to 9.0	5.5 to 9.0
4	Temperature ^0C[1]	< 40	< 40	45
5	TDS, mg/L, max			2100
6	Colour and Odour			
7	BOD for 5 days at 20 degree C, mg/L, Max	30-100	50	400
8	Oils and grease, mg/L, Max	10	10	50
9	Phenolic compounds, mg/L, Max	1.0	1.0	10
10	Cyanides (as CN), mg/L, Max	0.2	0.2	2
11	Sulphides (as S), mg/L, Max Sulphates (SO_4), mg/L, Max	2.0	2.0	2.0 500
12	Radioactive materials: a. Alpha emitters, c/ml, Max b. Beta emitters, c/ml, Max	 10^{-7} 10^{-8}	 10^{-7} 10^{-8}	
13	Insecticides	Absent	Absent	Absent
14	Total residual chlorine, mg/L	1	1	1000 as chlorides
15	Fluorides (as F), mg/L, Max	2.0	2.0	10
16	Arsenic (as As), mg/L, Max	0.2	0.2	1.0
17	Cadmium (as, Cd), mg/L, Max	2.0	2.0	2.0
18	Hexavalent chromium (as Cr), mg/L, Max	0.1	0.1	2.0
19	Copper (as Cu), mg/L, Max	3.0	3.0	3.0
20	Lead (as Pb), mg/L, Max	0.1	0.1	0.1
21	Mercury (as Hg), mg/L, Max	0.01	0.01	0.01
22	Nickel (as Ni), mg/L, Max	3.0	3.0	3.0

[1] Shall not exceed 40^0 C in any section within 15 m down-stream from the effluent outlet.

23	Selenium (as Se), mg/L, Max	0.05	0.05	0.05
24	Zinc (as Zn), mg/L, Max	5	5	5
25	Sodium, %, max.			
26	Ammonical nitrogen, mg/L, Max	50	50	50
27	COD, mg/L, Max	250	250	1000
28	Silver, mg/L, Max	0.1	0.1	0.1
29	Mineral Oils, mg/L, Max			10
30	Inhibition of nitrification test at 200ml/l			< 50%

Note: CWTP = Combined Waste Water Treatment Plant

Under enforcement since B.S. 2058/1/17 (30 April 2001)

* Under enforcement since B.S. 2060/3/9 (23 June 2003)

Industry-specific tolerance limits for industrial effluents discharged into inland surface waters

SN	Parameters	Generic	Leather	Wool Processing	Fermentation	Vegetable Ghee and Oil	Paper and Pulp
1	TSS, mg/L	30-200	100	100			
2	Particle size of TSS	Shall pass 850-micron Sieve			100		100
3	pH Value	5.5 to 9.0	6.0-9.0	5.5-9.0	5.5-9.0	6-9	5.5-9
4	Temperature ^0C[1]	< 40		40			
5	TDS, mg/L, max		2100				
6	Colour and Odour		Absent*				
7	BOD for 5 days at 20 degree C, mg/L	30-100	100	100	60	100	100
8	Oils and grease, mg/L, Max	10		10		10	
9	Phenolic compounds, mg/L, Max	1.0		5 (as C_6H_5OH			
10	Cyanides (as CN), mg/L, Max	0.2					
11	Sulphides (as S), mg/L, Max	2.0	2.0	2.0			
12	Insecticides	Absent					
13	Total residual chlorine, mg/L	1	600 max.				
14	Hexavalent chromium (as Cr), mg/L, Max	0.1	0.1 Total 2.0	Total 2.0			
15	Nickel (as Ni), mg/L, Max	3.0				3	
16	Sodium, %, max.		60				

[1] Shall not exceed 40^0 C in any section within 15 m down-stream from the effluent outlet.

17	COD, mg/L, Max	250	250	250		250	

Note: TSS indicates Total Suspended Solids; BOD = Biological Oxygen Demand

COD = Chemical Oxygen Demand

* No standards for colour

Under enforcement since B.S. 2058/1/17 (30 April 2001)

Tolerance limits for industrial effluents discharged into inland surface waters

SN	Characteristics	Dairy	Sugar	Cotton Textile	Soap
1.	pH	5.5-8.5	5.5-8.5	6.0-9.0	6.0-9.0
2.	TSS mg/litre, Max	150	100	150	200
3.	BOD (5 days at 20^0 C) mg/litre, Max	100	100	100	100
4.	Oil and Grease, mg/litre, Max	10	-	-	10
5.	COD, mg/litre, Max	250	250	250	250
6.	Phenolic Compound mg/litre, Max				1

Under enforcement since 2060/3/9 (23 June 2003)

Note: In accordance with Rules 15 of the Environment Protection Rules 1997, the following sampling and analysing methods should be employed for parameters of the industrial effluents.

Part I: Sampling Methods

	Prescribed ISO Standard Numbers
Guidance on the design of sampling programs	5667 (1)
Guidance on sampling techniques	5667 (2)
Guidance on the preservation and handling of samples	5667 (3)
Guidance on sampling of wastewaters	5667 (10)

Part II: Analysing

Parameters	Prescribed ISO Standard Numbers
Total Suspended solids, mg/L, Max	11923
pH	10523
Biochemical oxygen demand (BOD) for 5 days at 20 degree C, mg/L, Max	5815
Oils and grease, mg/L, Max	9377 (1,2,4)
Phenolic compounds, mg/L, Max	14402 / 6439
Cyanides (as CN), mg/L, Max	6703 (1)
Sulphides (as S), mg/L, Max	10530
Chloride (Cl), mg/L, Max	10304 (2) / 9297
Insecticides	6468

Sulphates (SO_4), mg/L, Max	10304 (2)
Fluorides (as F), mg/L, Max	10304 (1)
Arsenic (as As), mg/L, Max	11885/11969/6595
Cadmium (as, Cd), mg/L, Max	5961/8288
Total Chromium, mg/L, Max	9174/11083
Copper (as Cu), mg/L, Max	8288/11885
Lead (as Pb), mg/L, Max	8288/11885
Mercury (as Hg), mg/L, Max	5666
Nickel (as Ni), mg/L, Max	8288 /11885
Selenium (as Se), mg/L, Max	9965/11885
Zinc (as Zn), mg/L, Max	8288/11885
Ammonical nitrogen, mg/L, Max	11905 (1)/5664
Chemical Oxygen Demand, mg/L, Max	ISO/DIS 15705 / 6060
Silver, mg/L, Max	11885
Mineral Oils, mg/L, Max	9377 (1,2,4)
Inhibition of nitrification test*	9509

* **Note on Nitrification Test**: A nitrification test can be conducted to supplement analysing of the wastewater for various parameters. The test gives information on the general characteristics of the wastewater in relation to the possible effects of the wastewater on the biological processes that takes place in the wastewater treatment plant.

The nitrification test provides data on the inhibitory effect of a sample of the wastewater on a specified population of nitrification bacteria. The inhibitory effect of the wastewater on the nitrification processes should be less than 50% in 200 ml/l solution of the wastewater.

The test is described in the ISO 9509:1989 standard. However this standard do not take a possible loss of Nitrate during the test into account. In addition the specified minimum oxygen concentration of 2 mg/l is similarly too low, as the nitrification process will be substantially inhibited at such a concentration of oxygen.

It is recommended to use an oxygen concentration of at least 6 mg/l during the test and to analyse for ammonium-N, nitrate and nitrite-N of the industrial wastewater.

APPENDIX 4: BASELINE CONDITION AND IMPACTS WITH CORRESPONDING MITIGATION MEASURES ON BIODIVERSITY

(West Seti Hydroelectric Project)

BD	Baseline Condition	Likely Impacts	Mitigation Measures	Implementation Responsibility	Remark
Vegetation (forests and Flora)	• 2,325 ha of land area to be acquired permanently (805 ha of forests, 169 ha of shrublands, 246 ha of grasslands and 409 ha of riverine features) • Distribution of *Dalbergia latifolia* thin, and limited distribution of *Lilium wallichiana, Pistacia chinensis* and *Wallichia densiflora* to West Nepal • 4 legally protected species and 1 species included in CITES Appendices II	• Inundation of 1,090 ha of vegetation (912 ha of forests, 178 ha of shrublands) and also inundation of 241 ha of grassland, and clearance of 110 ha of forests along the transmission line • Extraction of 2,397 m^3 of firewood, and 44,122 m^3 timber due to site clearance • Removal of forests of *Aegle marmelos, Acacia spp*., and *Bassia spp*., and scrubland of *Lantana camara* • Impact on 4 legally protected and 1 plant species included in the CITES Appendices II	• Minimise the number, length and width of project roads • Minimize size of permanent ancillary sites by efficient site planning • Plantation an propagation of spp. having conservation significance • Provide alternative fuels at camp	• Construction contractor	• Forest might be provided on lease with annual payment provisions based on Forest Act, 1993 and Forest Rules, 1995
	• 11 vegetation types recorded in project area with 12 plant species of conservation significance and 64 species with medicinal properties	• Degradation of vegetation within ROI (5 km on either side of main construction sites and riparian section of the Seti River)	• Sting cables along the transmission line by helicopter where economically feasible • Prohibit harvesting or trading of vegetation • Support to community forests in ROI • Provide electricity to riparian village areas	• Project developer	• Avoidance-minimisation-compensation approach not followed
	• Annual consumption of 323kg of wild vegetables, 72 kg of wild fruits, 9 MT of firewood, 1m^3 of timber, 65 kg of medicinal plants, and 323 kg of spice having plants	• Possible illegal collection of forest products		• Project developer	• No compensation to State-owned forests and wild plants
Wild Fauna	• 11 species of mammals and occurrence of Goral and Wild Pig uncommon	• Loss of habitat due to habitat inundation			• No measure proposed for wild mammals, and birds • No data on agro-biodiversity
	• 140 species of birds recorded with 1 rare species (Yellow Cheeked Tit) and 10 species having internationally significant population	• Inundation of habitat of Yellow Cheeked Tit • Loss of 1,566 ha of high value and 919 ha of low value habitat			

	• 29 migratory and 44 bird species associate with water bodies	• Creation of reservoir habitat to 47 avian species (beneficial impacts) and reservoir as a resting area for long-distance migratory birds			
	• High number of bird species in highly disturbed forests and very low number in regeneration forests				• No measures recommended
	• 34 herpetofauna species reported with 2 endemic species, and no legally protected species recorded				• No measures proposed
Aquatic Plants and Animals	• 5 species of phytoplankton, and 5 species of zooplanktons reported in the Seti River and tributaries	• Loss of 53.1 km long riverine habitat due to inundation • Alteration of hydrological and riverine habitat (57 km of Seti River)	• Undertake Otter research, and develop and implement conservation management strategy • Monitor riparian release and discharge from tailrace • Establish a fish hatchery, and regularly stock the reservoir and water downstream of tailrace with fish fry • Monitor impact on aquatic ecology in first 5 years of project operation	Project Developer	• Fish ladder, hydraulic lift and trapping and hauling not found appropriate
	• 13 fish species recorded and asla being the dominant fish	• Prevention of fish migration		Operation Contractor	
	• 6 species residential, 7species migratory and 2 species considered as rare fishes	• Creation of 1989 ha of lake habitat suitable for lentic fish species (beneficial impacts)		Project Developer	
	• Ongoing fishing activities using cast nets and hooks, and average fish catch from 20 to 25 kg/day in general and up to 50 kg/day during March to May, and 1 to5 kg/day in other months			Operation Contractor	

Source: Uprety, B.K. (2006). *Biodiversity Considerations in the Mega-Hydroelectricity Project in Nepal***.** Presented on the *26th Annual Conference of IAIA on Power, Poverty and Sustainability*: The Role of Impact Assessment. 23-26 May 2006, Stavanger, Norway