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Nepal Environmental Policy and Action Plan

Integrating environment and development

His Majesty's Government of Nepal
Environment Protection Council
August 1993

The Prime Minister

Foreword

Nepal currently faces a number of serious environmental challenges. The Nepal Environmental Policy and Action Plan (NEPAP) has been prepared to address these challenges It represents HMG's firm commitment to continuing efforts to integrate environmental concerns with development objectives, and to address environmental problems.

A number of important measures have already been taken to tackle some of these problems. The endorsement of the *National Conservation Strategy* in 1988 and the follow-up NPC/IUCN NCS Implementation Project have provided a basis for much of the NEPAP work. More recently, the establishment of the Environment Protection Council in October 1992 was an important step towards integrating environmental concerns into the development process. At the local level, the process of decentralisation is giving greater responsibility to village- and district-level agencies and the private sector, including non-governmental organisations, to manage resources.

The NEPAP builds on these initiatives: it identifies major environmental problems facing Nepal, briefly reviews the causes and consequences of these problems, and recommends practical policy guidelines and actions to address them.

Last year's United Nations Conference on Environment and Development adopted *Agenda 21*, which is a comprehensive programme of action to develop a global partnership for sustainable development. The NEPAP has also been prepared in response to *Agenda 21* and is an important step towards its implementation in Nepal.

Beyond this present document, there is definite a need to develop detailed sectoral action programmes, and I would like to encourage all relevant agencies--government ministries and departments, NGOs, the private sector and the donor community--to cooperate and provide assistance to the practical task of dealing with Nepal's environmental problems.

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Preface

The Nepal Environmental Policy and Action Plan (NEPAP) has been prepared as part of His Majesty's Government of Nepal's continuing efforts to incorporate environmental concerns into the country's development process.

A number of reports produced over the last five years on the state of Nepal's environment have suggested methods of addressing environmental problems. HMG regards the NEPAP as a significant step forward in further defining its environmental strategy. It builds on the issues raised and actions proposed in earlier reports and aims to develop a coherent strategy to deal with Nepal's environmental problems. The NEPAP analyses the country's environmental issues in a multi-sectoral framework and sets forth a strategy for maintaining the country's natural environment, the health and safety of its population and its cultural heritage as economic development occurs.

A thirteen-member multisectoral and multidisciplinary Task Force was constituted for the preparation of NEPAP. A National Steering Committee consisting HMG Secretaries from related Ministries and NGO representatives as members was set up under the chairmanship of the Member of the National Planning Commission for Environment. The Steering Committee guided the Task Force in the preparation of NEPAP.

An earlier draft of this document was extensively discussed at a national workshop held in April 1993. The workshop was participated by members of Environment Protection Council, senior officials of relevant HMG Ministries, individual experts, NGOs and representatives of various donor agencies. Revised drafts were then circulated among the above agencies and individuals for further comments and suggestions. Attempts have been made to incorporate all relevant suggestions that were received.

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Abbreviations

ADB	Asian Development Bank
AIC	Agricultural Inputs Corporation
BSM	Bureau of Standards and Metrology
CECI	Canadian Centre for International Studies and Cooperation
CFRL	Central Food Research Laboratory
CITES	Convention on International Trade in Endangered Species of Wild Flora and Fauna
DDC	District Development Committee
DFO	District Forest Office
DHUD	Department of Housing and Urban Development
DNPWC	Department of National Parks and Wildlife Conservation
DOA	Department of Archaeology
DOAD	Department of Agricultural Development
DOB	Department of Botany
DOF	Department of Forests
DOI	Department of Immigration/Irrigation
DOR	Department of Roads
DOT	Department of Tourism
DSC	Department of Soil Conservation
DWSS	Department of Water Supply and Sanitation
EFYP	Eighth Five-Year Plan (HMG 1992a)
EIA	Environmental Impact Assessment
EPC	Environment Protection Council
FINNIDA	Finnish International Development Agency
FP/MCH	Family Planning/Maternal and Child Health Care
GDP	Gross domestic product
GLD	Guided Land Development
HDC	Hydropower Development Centre
HMG	His Majesty's Government of Nepal
HYV	High-yielding variety
ICIMOD	International Centre for Integrated Mountain Development
IEC	Information, Education and Communication
IEE	Initial environmental examination
IUCN	International Union for the Conservation of Nature and Natural Resources or The World Conservation Union
JTA	Junior Technical Assistant
KMTNC	King Mahendra Trust for Nature Conservation
LPG	Liquefied petroleum gas
M&E	Monitoring and Evaluation
MCI	Ministry of Communication and Information

MECSW	Ministry of Education, Culture and Social Welfare
MFSC	Ministry of Forest and Soil Conservation
MHPP	Ministry of Housing and Physical Planning
MLD	Ministry of Local Development
MLJPA	Ministry of Law, Justice and Parliamentary Affairs
MOA	Ministry of Agriculture
MOF	Ministry of Finance
MOH	Ministry of Health
MOI	Ministry of Industry
MOS	Ministry of Supplies
MPFS	Master Plan for the Forestry Sector
MTCA	Ministry of Tourism and Civil Aviation
MWR	Ministry of Water Resources
MWT	Ministry of Works and Transport
NARC	National Agricultural Research Council/Centre
NCA	Net command area
NCS	National Conservation Strategy
NWSC	Nepal Water Supply Corporation
NEA	Nepal Electricity Authority
NEPAP	Nepal Environmental Policy and Action Plan
NGO	Non-governmental organisation
NMA	Nepal Mountaineering Association
NPC	National Planning Commission
NRs	Nepali rupees
O&M	Operation and maintenance
POL	Petroleum, oil and lubricants
RNA	Royal Nepal Army
TDC	Town Development Committee
TU	Tribhuvan University, Kathmandu
UEMC	Urban Environment Management Committee
UNCED	United Nations Conference on Environment and Development
UNDP	United Nations Development Programme
USAID	United States Agency for International Development
VDC	Village Development Committee
WECS	Water and Energy Commission Secretariat
WHO	World Health Organisation
WDD	Women's Development Division

Summary

1Under the auspices of the National Planning Commission, the **Nepal Environmental Policy and Action Plan** (NEPAP) has been prepared. The NEPAP is part of HMG's continuing efforts to incorporate environmental concerns into the country's development process. The document builds on the substantial amount of work that has already been undertaken on analysing the country's environmental issues. It reviews current government policy on the environment; formulates new policy, where it is needed; and suggests an action agenda to address environmental problems.

The NEPAP has also been prepared in response to the growing global awareness about the importance of maintaining a balance between economic development and environmental conservation, which culminated in the United Nations Conference on Environment and Development in 1992.

HMG'S ENVIRONMENTAL POLICY

There are five main aims of HMG's environmental policy:

- To manage efficiently and sustainably natural and physical resources
- To balance development efforts and environmental conservation for sustainable fulfillment of the basic needs of the people
- To safeguard national heritage
- To mitigate the adverse environmental impacts of development projects and human actions
- To integrate environment and development through appropriate institutions, adequate legislation and economic incentives, and sufficient public resources.

The NEPAP is organised around these five policy objectives. The document is divided into the following five chapters :

1. Sustainable Management of Natural Resources

The proper management of Nepal's land, forest and water resources is essential to guarantee and enhance the continued productivity of the country's agriculture, on which the vast majority of the population depend.

Land Management

Sustained growth in the agricultural sector is critical for feeding the growing number of people in Nepal, and for generating a sufficient surplus to support other economic sectors, such as manufacturing. However, growth in the agricultural sector has been stagnant. One of the principal reasons for this low growth in agriculture is low crop yields that are, in turn, affected by deteriorating soil fertility and quality of agricultural land.

Appropriate policies therefore need to be pursued to improve soil fertility and to raise agricultural productivity. Proper soil fertility management through optimal utilisation of locally available biomass, rehabilitation of lower potential agricultural lands, adoption of environmentally compatible farming practices, and a reorientation of research and extension to reflect greater responsiveness to the local needs and to sustainable production and consumption alternatives, as well as improved management of livestock and rangelands are some of the key policies.

Forest and Rangeland Management

Deforestation and forest degradation have seriously reduced the availability of timber, fuelwood, leaf litter, fodder and forage. This has not only depressed the incomes of those who traditionally depend on the direct extraction and utilisation of these products, but has also contributed to soil erosion and fertility loss, damaged ecosystems, degraded watersheds and other adverse environmental effects.

Proposed policies to improve the management of forests and rangelands include adoption of a national land use plan based on appropriate resource use in different agro-ecological zones, formulation of a national energy policy that emphasises increased energy use efficiency and development of alternative sources, better integration of related sectors such as agriculture, livestock and soil conservation, and greater participation of local communities and the private sector in the management of forests and rangelands.

Implementation of the above policies will be made effective through a number of actions, including: simplification of the rules governing the allocation of forests for private, leasehold and community management; promotion of agroforestry, silvi-pastoral and rangeland management systems to expand income and employment opportunities; adoption of a long-term land use plan and a system of zoning to better manage natural resources; institutionalisation of necessary legal reforms; and forestry research and extension geared to increased community participation.

Water Resource Management

Nepal's vast water resource potential remains largely untapped, particularly for energy generation. Yet erosion and sedimentation have emerged as serious problems in many watershed areas. Watersheds, which comprise over two-thirds of the country's land area, have experienced degradation due primarily to inappropriate farming practices and devegetation.

Protection of Nepal's watersheds is essential to prevent further degradation from human-induced actions. In this regard, low-cost vegetative and cultural measures, that recognise the needs of farmers, have a better chance of success in preventing erosion and conserving soil than high-cost civil works programmes where the farmer has little involvement.

2. Population, Health and Poverty

The proper management of land, forests and water is essential to provide the basic food, fodder and fuel requirements of the Nepali people. However, with almost half the population living in poverty, there is also a need to improve the health status of the population by providing adequate supplies of clean water, improved sanitation and by satisfying the unmet demand for family planning services.

Population

The large size of Nepal's population relative to the resource base, and its high growth rate are at the root of many environmental problems in Nepal. The agricultural land base in some areas is reaching to the saturation point, and the labour force is expanding faster than off-farm jobs. As a consequence, poverty is increasing. Measures to curb population growth are therefore critical to the success of any development and environmental programme.

The main aim of HMG's population strategy is to reduce the rate of population growth through a decrease in the fertility rate. There is considerable evidence that the demand for family planning services is not being adequately met. Primary health care services are also not reaching those who most need them resulting in high rates of infant and maternal mortality.

Through a series of programmes aimed at improving the delivery of family planning and maternal and child health care services, accompanied by a targeted information, education and communication campaign, it is hoped the population growth rate will be reduced. These direct measures will be complemented by measures to enhance the status of women, for example through encouraging greater enrollment of girls in school and adult literacy programmes.

Health and Sanitation

The health status of the population in Nepal is generally poor. The lack of potable water and sanitation, safe food supplies and medical facilities are major contributing factors to the poor state of health. The lack of clean water in particular is imposing a high cost on the economy in terms of its impact on human health and productivity. The country's rapidly growing population is also placing a stress on available water resources.

A number of policy initiatives are required to correct the problems associated with water supply and sanitation. These include decentralisation of drinking water supply and sanitation activities to local bodies and the private sector,

maintenance of safe standards in drinking water supplies, increased investment in sanitation, rationalisation of water tariffs, and reform of the legal, regulatory and institutional arrangements.

Recommended actions in this regard are: instituting a system of regular monitoring of water pollution at the main sources for urban areas, overhauling the existing water distribution system in partnership with the private sector, adoption of a water tariff structure based on the costs of supply, increased investment in sanitation, and involving local communities and the private sector in the maintenance and management of water supply schemes.

Poverty Alleviation

Almost half of Nepal's population lives below the poverty line. It is hoped that many of the strategies aimed at improving natural resource management and providing basic health care services will benefit the poor. However, there is also a need for programmes to be targeted directly at the poor.

HMG's poverty alleviation policy emphasises the need for increased off-farm employment, a proper spatial balance in the implementation of development programmes, and increased female education. These policies need to be backed up by the provision of environmentally-sound infrastructure projects guided by economic benefits, the creation of environment conducive to sending girls to school, and measures promoting the birth spacing and discouraging early marriage.

3. Safeguarding National Heritage

Nepal is well known for its natural and cultural heritage. In recent years, however, these resources have been degraded. Conflicts have arisen between local residents and authorities in areas surrounding some of the designated protected areas and national parks. Areas adjacent to cultural and historical monuments and religious shrines have been threatened by a continual process of encroachment, poor maintenance and sanitary degradation. Areas along the most popular trekking and mountaineering routes are being threatened by growing congestion, accumulation of solid wastes and deforestation.

Policy interventions and action plans are urgently needed in the areas of preserving biodiversity inside as well as outside the protected areas, improving the relationship between the local communities and park management, demarcating the core areas inside parks for strict conservation and buffer areas for sustainable resource management, promoting tourism in conformity with resource conservation and environmental protection, and involving local bodies and private organisations in the preservation and maintenance of natural and cultural heritage resources.

HMG has already taken action to deal with some of these issues. Recently approved legislation permits some revenue-sharing and encourages a greater degree of local participation.

4. Mitigating Adverse Environmental Impacts

The impacts of urbanisation and industrialisation are beginning to cause serious environmental problems in some areas of Nepal. Also, many development projects, particularly large infrastructure projects, can have adverse environmental impacts. Steps must be taken to foresee and correct these environmental issues before they inflict high costs on Nepal's people and its economy.

Urban And Industrial Development

Environmental conditions have deteriorated rapidly in the Kathmandu Valley and some other towns, particularly in the *terai*. Rapidly expanding, unplanned urban settlements have generated a range of environmental problems affecting human health and welfare. Air and water pollution has worsened due to inadequate sewerage, improper disposal of solid wastes, industrial effluents and discharges, and emissions from motor vehicles. The provision of infrastructure and utility services has been inadequate, exacerbating the situation further.

The current trend of urban sprawl and industrial expansion in and around densely populated areas is unsustainable and poses a serious threat to a clean environment. Policies and actions to remedy the environmental problems associated with urban growth and industrial development, and to prevent similar consequences from happening in future include defining and implementing appropriate zoning regulations, setting of standards for air and water pollution and their enforcement through a carefully designed package of incentives and regulation, and the clear designation of responsible institutions for providing infrastructure and utility services.

Local bodies and the private sector will have to be involved to a much greater extent in the provision and maintenance of infrastructure services. Capacities of local bodies and the private sector will have to be enhanced. In view of the particular issues affecting urban and industrial expansion in the Kathmandu Valley, a separate action plan needs to be developed and implemented for this area.

Infrastructure Development

Roads, irrigation, hydroelectric and other infrastructure projects have the potential for imposing significant environmental costs if they are not properly designed and implemented. For example, irrigation systems have suffered from problems of poor design and construction, and inadequate maintenance and management, creating a series of environmental problems, including insufficient surface drainage that causes waterlogging. Improper design and construction of roads can lead to landslides, and many of Nepal's existing hydroelectric projects suffer from high rates of sedimentation, resulting from inadequate attention being paid to protecting upstream watersheds.

Measures to mitigate these problems will vary considerably. The use of Environmental Impact Assessment (EIA) is a recent innovation that can help identify adverse environmental impacts and propose remedial actions. HMG has adopted the principle of making EIA obligatory for certain types of projects.

Greater involvement of local people is a prerequisite for improving design and implementation. For example, in the case of irrigation, HMG is committed to hand over the responsibility for the operation and management of small- and medium-sized irrigation schemes to user groups. It is recognised that direct government involvement is best restricted to provide technical assistance and training rather than to attempt to provide the entire irrigation service.

5. Legislation, Institutions, Education and Public Resources

Environmental issues are varied and complex. It is not possible to address all issues and to solve all problems at the same time. Resources are scarce and institutional capacities are limited. To implement the policies and actions outlined in the NEPAP effectively, a series of supportive measures are needed in the areas of institution building, economic policy, legal and regulatory provisions, and public resource allocation.

There is a wide range of institutional arrangements available for improving environmental management. In keeping with the importance attached to the process of decentralisation by HMG, the NEPAP supports giving a greater role to local agencies, including user groups and non-governmental organisations, as well as to the private sectors.

Public-sector agencies at various levels will play a critical role in the process of decentralised decision-making, serving as the promoter, facilitator and guarantor of enabling mechanisms for local bodies. Village- and local-level groups will be made the principal vehicle to plan, implement and monitor local-level development and environmental activities. NGOs will be encouraged to play an active role in this process.

In some sectors there is a need to enact basic legislation. In others there is a greater need for developing mechanisms to implement existing laws. Economic incentives, rather than centralised regulation, often offer an opportunity to encourage environmentally friendly actions and discourage environmentally damaging ones in a cost-effective manner.

Current efforts to reform the public resource management system will be continued, with a greater emphasis being placed on project quality and the development of mechanisms to enable local-level organisations to mobilise and command greater access to resources. Adequate funds will be made available for undertaking necessary mitigatory measures against environmentally damaging impacts.

Future Prospects

The NEPAP represents another step in a continuing process to integrate environmental concerns into the development process. It emphasizes the need to develop appropriate policies and recommends a set of actions to achieve these policies. However, in order to implement the recommended actions, it is needed to develop more detailed sector-specific programmes and projects.

With the assistance of relevant line ministries, other government agencies and the donor community, HMG is now moving to the next phase to prepare a time-bound, fully-costed, prioritised implementation plan.

Environmental Policies and Action Plans presented in each chapter are summarised below :

Policies	Recommended Actions	Institutional Responsibility	Time Frame
Land Management			
Improve soil fertility management by increasing supplies of farmyard manure and reducing the stock density of livestock on arable land	Encourage planting of trees, shrubs and grasses on private land to provide an additional source of fodder for livestock	DOAD	Continuous
	Where appropriate, encourage stall-feeding of livestock using fodder from trees on private land	DOAD, NARC	Continuous
	Promote low-cost, vegetative and cultural soil conservation measures to reduce soil erosion	DSC, DOAD, NARC	Continuous
Promote policies to directly increase soil fertility	Encourage modification of farming systems to include nitrogen-fixing species to enhance nutrient cycling	MOA, NARC	Short-term, continuous
	Remove constraints to greater private sector involvement in the purchase and distribution of chemical fertilizers to improve their availability	DOAD, NPC	Immediate
	Develop recommended fertilizer applications, including the use of agricultural lime on acidic soils, based on particular agro-ecological conditions	DOAD, NARC	Short-term
Develop an extension system capable of responding to farmers' needs	Improve participation in agricultural extension through the use of the "group approach"	DOAD	Short-term, continuous
	Finalise arrangements for pilot scheme for contracting-out extension services to the private sector	MOA, NPC	Immediate
Provide technical information relevant to the needs of farmers	Promote the use of adaptive research techniques on farms as a method of rapidly disseminating information	DOAD, NARC	Short-term, continuous
Forest and Rangeland Management			
Improve forest management by implementing the findings of the MPFS	Finalise the by-laws for the implementation of the Forest Act 1993, ensuring they are consistent with HMG forest policies stated in the MPFS and EFYP	MFSC	Immediate

Encourage community participation in forest management	Continue to promote community forestry schemes in the hills	MFSC	Immediate, continuous
Improve rangeland management	Undertake strategic assessments of Nepal's rangelands to improve knowledge base	MFSC, MOA	Immediate, continuous
	Clarify institutional responsibilities for rangeland management	MFSC, MOA	Immediate
Encourage greater private sector involvement in managing national forests	Develop an appropriate system of incentives and regulations governing private sector management of forests	MFSC	Immediate
	Review the present system of open-ended subsidies provided for the purchase of wood by the District Forest Products Supply Boards, which prevents the proper valuation of forests and undermines private sector involvement	MFSC	Short-term
Reorient forestry research	Develop programmes to provide information (including utilisation of so far unused or lesser known forest species) for users' groups, forest industries and private individuals	MFSC	Short-term
Raise awareness of the importance of forest conservation	Develop forest extension agents' role based on promotion and persuasion rather than enforcement and coercion	MFSC	Short-term
Improve the basis on which land use is decided	Adopt a national land use policy classifying areas by their suitability for alternative uses	NPC, MFSC, MOA	Long-term
Minimise adverse environmental impacts of forest-related projects	Finalise EIA guidelines for the forestry sector	NPC, MFSC	Short-term
Promote research and development of alternative energy sources to reduce dependence on biomass sources	Finalise the energy sector strategy study and incorporate alternative energy development and promotion as an integral part of this strategy	NPC, WECS	Short-term

Water Resource Management

Encourage watershed protection measures to reduce soil erosion and downstream sedimentation	Reassess the efficiency and cost-effectiveness of structural techniques for watershed protection, especially river training schemes	MWR, DSC	Immediate
	Promote low-cost vegetative and cultural techniques for watershed protection based on farmer participation	MWR, DSC	Short-term, continuous

	Integrate programmes for soil fertility and forest management with watershed protection measures	DSC, DOAD, MFSC	Short-term
Ensure major watersheds are adequately protected	Develop management plans for Nepal's key watersheds	MWR, DSC	Short-term

Population

Improve delivery of FP/MCH services to lower fertility rates	Recruit additional local female MCH workers from programme areas	MOH	Immediate, continuous
	Prepare a revised plan for outreach supervision service	MOH	Short-term
	Expand the range and availability of FP methods	MOH	Immediate
	Investigate the potential for private sector (including NGOs) involvement in service delivery	MOH, NPC	Short-term
Raise awareness with regard to range and availability of FP products and the importance of population control	Use a variety of techniques to develop an effective information, education and communication campaign	MOH, MCI, NPC, NGOs	Continuous
Improve institutional arrangements for developing population policies	Strengthen the Population Division in NPC to enable it take a central role in advising the National Committee for Population, and in developing population policies	NPC	Immediate
Improve the socio-economic status of women	Promote adult literacy and education programmes, increase the school enrollment rate for girls, establish skill training programme, extend income generation activities and loan schemes, and make appropriate legal provisions.	NPC, MOH, , MECSW, MLD, MOA	Immediate, continuous

Health and Sanitation

Improve coverage and delivery of urban water supplies	Separate service provision from utility regulation	DWSS, NWSC, NPC	Short-term
	Avoid direct service provision by government agencies	DWSS	Short-term
	Set appropriate level of tariffs based on cost of supply	NWSC, NPC	Immediate
	Investigate options for greater private sector involvement	NPC	Short-term

Improve coverage and delivery of rural water supplies	Encourage greater community involvement, especially of women	NGOs, DWSS	Short-term
	Combine programmes to protect watersheds with water supply projects	DWSS, DSC	Short-term
Revise institutional arrangements to shift the focus of government agencies from direct service provision to facilitating service delivery	Central government agencies will concentrate on policy making, M&E, establishing an institutional framework, overseeing government agencies and donor coordination	NPC	Immediate
Raise demand for sanitation	Develop programmes to educate people about the importance of sanitation, personal hygiene and health	MOH	Short-term
Increase sanitation coverage by providing services that people want and are willing to pay for	Conduct studies to ascertain the type of sanitary service people are willing to pay for	NPC	Short-term
	Develop clearer institutional responsibilities concerning all aspects of sanitation	DWSS, NWSC, DOR, MLD, MOH, municipalities, NPC	Immediate, continuous
Improve efficiency of water allocation among competing needs	Define the basis of allocating water rights and enact necessary legislation	MWR, MHPP, MOA	Short-term
Improve quality of drinking water	Develop drinking water quality surveillance and drinking water standards.	MOH, MHPP	Immediate
	Promote on-site low-cost sanitation options	DWSS	Short-term
Improved food safety and pesticide control	Adopt appropriate standards for toxic contaminants of food and strengthen surveillance and monitoring capability	MOA, MOH	Short-term, Continuous

Poverty Alleviation

Reduce rapid rate of population growth.	[See Action Plan for Population]		
Increase agricultural productivity	[See Action Plans on Land, Forest and Rangeland, and Water Resource Management]		
Expand off-farm employment opportunities	Design environmentally appropriate infrastructure projects utilising unemployed skill of the poor	All relevant development agencies	Short-term, continuous
Develop measures to provide direct relief to the poor	Prepare various targeted interventions to assist the poor with social services and income-generating opportunities	NPC	Longer-term

Biodiversity Conservation

Strengthen the capacity of DNPWC to act as the main institution responsible for protected areas	Reassess the role of the army as park protectors to minimise "people-park" conflicts ; develop an alternative protection force	DNPWC, RNA	Immediate
	Commission a study to resolve the problems of overlapping jurisdiction in protected areas and to recommend a simplified procedure for handling various activities affecting protected area management	DNPWC, MTCA, DOT	Short-term
Ensure adequate representation of Nepal's major ecosystems in the protected area system	Review the representativeness of the existing protected area system	NPC, MFSC, MOA	Immediate
Involve local people directly in the management of parks	Develop mechanisms for benefit-sharing with people whose livelihoods are adversely affected by parks	DNPWC	Short-term
	Effectively harness the efforts of NGOs to test and develop appropriate models of park management	DNPWC, NGOs	Short-term, continuous
	Set up a Task Force to prepare guidelines for the development of management plans	DNPWC, NGOs	Immediate
	Enact and enforce necessary legal and regulatory measures to implement major international treaties and conventions, as well as to control illegal wildlife trade within the country	MFSC	Short-term
Preserve endemic and endangered species and their habitats	Promote tourism in protected areas, consistent with conservation objectives	MFSC, MTCA	Short-term
	Identify, and take actions to protect, marshes, wetlands and water bodies significant to biodiversity conservation	MFSC, MWR, NEA	Short-term
	Develop management plans to conserve biodiversity, while providing for people's basic needs	DNPWC, NGOs	Immediate, continuous
	Mount a study to assess the status of biological diversity of endemic plants and animals, both terrestrial and aquatic, occurring outside protected areas in farmlands, pastures, rangelands, forests, rivers, lakes and ponds	MFSC, MOA, NARC	Immediate
Promote private and public institutions for biological resource inventory and conservation	Collate and disseminate data on biodiversity from various, existing databases, and establish a national biodiversity database	DNPWC, MFSC, NARC, DOB, TU, NGOs	Short-term

	Identify and strengthen institutions responsible for research, education and training in biological resource management	DNPWC, TU, NGOs	Short-term

Cultural Heritage

Review the institutional arrangements governing the protection of cultural heritage sites	Prepare a detailed strategy document for cultural heritage preservation	DOA	Short-term
	Develop or revitalise Heritage Conservation Action Plans	DOA	Immediate, short-term
	Assess the effectiveness of the *Guthi Sansthan* in providing resources for preserving cultural sites, and investigate possible alternative institutional arrangements	DOA, MECSW, NPC	Short-term
	(Note: Suspend transfer of *guthi* lands to private individuals until after this review)		Immediate
Improve the level of knowledge concerning the status of cultural resources	Develop a priority listing of heritage sites in need of preservation and/or restoration	DOA, NPC	Short-term, continuous
Investigate mechanisms for raising additional revenue to fund preservation work	Commission a study to identify possible options	DOA, DOT, NPC	Short-term

Tourism

Improve institutional arrangements in the tourism sector	Establish a Task Force to assess ways to improve the current system of issuing permits and revenue sharing	MTCA, DOI, NMA, DNPWC, NGOs	Immediate
Raise awareness concerning the importance of environmental preservation	Ensure fuelwood is not used by trekkers and trekking companies; promote the use of biodegradable materials; encourage effective waste management systems in national parks	MTCA, NGOs, DNPWC	Short-term, continuous
Finalise preparation of a Tourism Policy	Determine appropriate mix of high- and low-budget travellers, and identify suitable strategies to achieve this mix	MTCA	Short-term
	Identify a mechanism for assessing appropriate tourist fees for national parks, trekking and mountaineering	MTCA, DOI, NMA, DNPWC, NGOs	Short-term
	Determine the basis upon which new areas will be opened up for tourist travel	MTCA, DNPWC	Short-term

	Develop environmental management plans for tourist routes and destinations, both presently used and those to be opened up in future	MTCA, DNPWC	Short-term
	Encourage the role of the private sector in identifying, developing and marketing new products and activities in new areas	MTCA	Short-term

Urban and Industrial Development

Transform present informal system of urban land development into a more formal one	Review the present system of urban land regulations, in order to remove constraints to efficient land development, while formulating enforceable building standards	Municipalities, MHPP	Immediate
	Directly involve local communities in land development plans	Municipalities	Immediate, continuous
	Further develop the use of Guided Land Development as a tool for more efficient land use planning	Municipalities, DHUD	Short-term
	Encourage industrial enterprises to relocate away from centres of population to special industrial districts	MOI, municipalities	Short-term
Reduce the level of indoor smoke pollution	Revitalise smokeless *chulo* programme and inform people of the health risks associated with exposure to smoke	MECSW, MOH, MWR, MFSC, MLD	Short-term
Promote greater fuel efficiency as a way of reducing emissions of air pollutants	Implement proposed pilot projects to improve industrial boiler efficiency, and introduce "cleaner" brick kiln technology	MOI	Short-term
Reduce the level of industrial pollution	Finalise preparation of industrial sector EIA guidelines for HMG endorsement	MOI, NPC	Immediate
	Develop pollution control management plans for industrial areas	MOI	Short-term
	Investigate the possibility of minimal taxes on the most pollution-prone industries	MOI, NPC	Longer-term
Reduce the level of vehicular air pollution	Review tariff structure for imported vehicles	MOF, NPC, MWT	Immediate
	Continue to review pricing policies for petroleum products; assess the desirability of privatising the purchase and distribution of petroleum products	MOF, MOS, NPC	Short-term
	Investigate mechanisms for setting up regular pollution testing of vehicles	MWT, NPC	Longer-term
Improve data availability on air pollution	Set up air and water pollution monitoring stations	MOI, MHPP, MWR, NPC	Short-term

Develop realistic air and water quality standards, and institutional mechanisms for enforcing them	Assess the relevance of standards from neighbouring countries as an initial basis for standards in Nepal; use experience of more industrialised countries as a guide for appropriate institutional arrangements	BSM, MOI, NPC, MHPP	Immediate
Foster and improve functional coordination among government agencies, non-governmental organisations, private sector and donors involved in urban development and environmental protection	Prepare a comprehensive urban environment management programme focusing on practical policies, strategies and actions	UEMC, MHPP	Immediate
	Prepare and implement an Environmental Action Plan for the Kathmandu Valley addressing the growing problem of degradation	MHPP, Municipalities, NPC	Immediate

Infrastructure Development

Ensure adequate surface drainage on irrigation projects	Educate farmers on the importance of surface drainage; include drainage as an element in the design of projects	DOI	Immediate, continuous
Develop groundwater resources in the Terai as a source of irrigation water	Ensure groundwater extractions are not excessive through monitoring and enforcement of the current system of permits	DOI	Short-term, continuous
Improve management of irrigation schemes to maximise productivity gains	Transfer management responsibilities from government line agencies to farmers and water users' groups	DOI	Immediate, continuous
	users' groups should develop rules governing the operation of irrigation systems	DOI	Short-term
Encourage conservation of scarce irrigation resources	Use fees and labour to cover at least O&M costs and promote conservation by making farmers aware of the costs involved	DOI	Short-term
Ensure the use of EIA for irrigation projects with significant environmental impacts	Finalise draft EIA guidelines for water resources	MWR, NPC	Immediate
Promote the use of environmentally friendly road construction methods	Investigate the potential for more widespread use of the "green roads" approach	DOR	Short-term
Improve the capacity of DOR to undertake environmental assessments of road projects	Strengthen the Environmental Management Unit in DOR to enable it to monitor road contractors to ensure that necessary environmental mitigation measures are implemented	DOR	Immediate
	Develop EIA sector guidelines for road construction	DOR, NPC, MWR	Short-term
Minimise environmental impact of hydroelectric projects	Ensure the use of EIA when designing a hydroelectric project	MWR, WECS, NEA, HDC, NPC	Short-term, continuous

	Where economically feasible, encourage the construction of mini- and micro-hydroelectric projects at sites with minimum geological risk	MWR, NEA, HDC	Continuous

Legislation, Regulation and Economic Incentives

Tighten loopholes in existing environmental legislation	Complete preparation of comprehensive environmental protection law	NPC, MLJPA	Immediate
Enable HMG to meet its obligations as signatory to various international conventions	Amend existing legislation, or enact new laws, for implementing international conventions	NPC, MLJPA	Short-term
Ensure all regulations are accompanied by appropriate mechanisms for enforcement	Develop institutional mechanisms to implement regulations effectively, and ensure all regulations specify the institution responsible for implementation	NPC, MLJPA	Continuous
	Involve local people in decision-making to reduce the need for regulations	All ministries	Continuous
Ensure sufficient consideration is given to integrating environmental considerations with development objectives	Complete sectoral EIA guidelines to ensure relevant projects receive adequate environmental scrutiny	NPC, concerned sector	Immediate
	Complete sectoral environmental planning guidelines and develop local- and national-level planning manuals for better integration of environmental concerns in development plans	NPC, MLD and concerned sectors	
Expand use of economic incentives to encourage more environmentally benign activities	Review environmental impact of current pricing policies on fertilizers and petroleum products to ensure they are not having a negative economic impact by encouraging pollution, rather than discouraging it	NPC	Short-term
	Investigate options for developing taxes to discourage pollution	NPC	Longer-term
Provide legal measures to prevent and control air and water pollution	Develop pollution prevention and control legislation	NPC,/MHPP	Short-term
Ensure strict product and service liability with respect to those products and services which are hazardous to public health and significantly degrade natural resource base	Enact strict product and service liability legislation	NPC/MOS	Short-term
Ensure effective implementation of Pesticides Act, 1991	Prepare pesticides regulations, guidelines and manuals	NPC, MOA, MOH	Immediate

Institutional Development

Entrust responsibility of local-level decision-making to local-level institutions	Improve human resource and institutional base to enable local-level institutions to carry out their responsibilities	MLD	Immediate, continuous
	Promote formulation of new user groups; support existing ones	MLD	Immediate, continuous
	Develop appropriate local government and user group accounting and audit systems	MLD	Short-term
	Continue with progressive devolution of sectoral budgets	MOF, MLD	Continuous
	Review and revise provisions for raising local revenues	MLD	Short-term
	Develop rules governing the functional linkages between local-level institutions	MLD	Immediate
Reduce constraints facing NGOs to promote community-based development	Build local financial and project planning and monitoring systems that are simple enough to ensure local transparency, while enabling a sufficient level of detail to ensure efficient management and cost control	MOF, MLD	Short-term, continuous
Improve capacity of HMG agencies to carry out their responsibilities effectively	Continue with on-going public sector reform programme	MOF, NPC	Continuous
	Appoint staff on the basis of ability and merit	All ministries	Continuous
	Use short-term technical assistance to fill skill gaps	All ministries	Continuous
	Reduce the turnover of senior staff	All ministries	Continuous
	Develop institutional arrangements for the relationship between the proposed environmental units and line agencies	All relevant ministries	Short-term
	Strengthen capacity of EPC Secretariat to act as an advisory body to the EPC	NPC	Immediate
	Assess the need for establishing a broader environmental protection agency to advise the EPC	NPC	Longer-term

Environmental Education

Incorporate environmental concerns in all formal education programmes	Integrate environmental concerns in the primary education curriculum and textbooks being revised now	MECSW	Immediate, continuous

Institutional Development

Entrust responsibility of local-level decision-making to local-level institutions	Improve human resource and institutional base to enable local-level institutions to carry out their responsibilities	MLD	Immediate, continuous
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	Reduce the turnover of senior staff	All ministries	Continuous
	Develop institutional arrangements for the relationship between the proposed environmental units and line agencies	All relevant ministries	Short-term
	Strengthen capacity of EPC Secretariat to act as an advisory body to the EPC	NPC	Immediate
	Assess the need for establishing a broader environmental protection agency to advise the EPC	NPC	Longer-term

Environmental Education

Incorporate environmental concerns in all formal education programmes	Integrate environmental concerns in the primary education curriculum and textbooks being revised now	MECSW	Immediate, continuous

	Infuse environmental concerns in existing courses or introduce new courses at secondary, higher secondary and tertiary levels	MECSW, TU	Immediate, continuous
Incorporate environmental concerns in nonformal education and training programmes	Infuse environmental concerns in training programmes run by governmental and non-governmental agencies	Training centres/units of all Ministries, NGOs	Immediate, continuous
	Design and implement short-term orientation/training programmes to convey important environmental messages to specific target groups in urban and rural areas	All relevant government agencies, NGOs	Continuous
	Incorporate environmental concerns in communication, media and other informal educational channels and communicate environmental messages through such mass media as magazines, newsletters, newspapers, radio and television	All relevant government agencies, NGOs, mass media	Continuous

Public Resource Management

Review current levels of government expenditure to ensure resources are directed to priority areas	Continue with ongoing public resource management review	MOF, NPC	Continuous
Review government expenditures to ensure sufficient resource allocation for environmental protection	Where appropriate, ensure sectoral resource allocations follow endorsed Master Plans, e.g., forestry	MOF, NPC	Immediate, continuous
	Review impact of current public expenditure policies to ensure they are not having a perverse impact by encouraging pollution, rather than discouraging it, e.g., fertilizers, petroleum products	MOF, NPC	Immediate
Develop a monitorable, fully costed, prioritised, time-bound action plan for the environment	Institute follow-on phase of the NEPAP process to identify priorities and develop a sectoral investment programme	NPC	Short-term

Introduction

1. Nepal is facing a number of serious environmental challenges. In a country where half the population live under the poverty line, a lack of economic and technical alternatives means that people face a limited set of choices in determining their own development strategies. A rapidly growing population is exerting increasing pressure on a limited resource base, depleting and degrading natural resources. New environmental problems are also emerging. The adverse environmental impacts of urban and industrial development require mitigation. Government institutions have often proved ineffective as managers of scarce natural and financial resources, and institutional changes are currently being implemented to encourage a greater level of popular participation in environmental management.

2. **National context.** There is a growing awareness among policy-makers and the public about the detrimental effects of environmental degradation in Nepal. In response, some measures have been initiated to tackle environmental problems, including the adoption of the *National Conservation Strategy* (HMG/IUCN 1988), the implementation of a series of national, sectoral and subsectoral plans and projects, and the creation of a number of conservation related institutions. These measures include, the *Eighth Five-Year Plan* (HMG 1992a); master plans for the forestry, irrigation, livestock and horticulture sectors; the *National Environmental Impact Assessment Guidelines*; the establishment of additional protected areas and national parks; and the creation of the national Environment Protection Council. A large number of NGOs have also emerged with the mandate of increasing public awareness about environmental issues and lobbying for mitigatory and protective actions.

3. HMG has expressed a strong commitment to dealing with environment-related matters in the development process . However, past efforts have often failed to curb and reverse the high rate of natural resource depletion and environmental degradation. Recent government policies supporting economic liberalisation, decentralisation, and increased community and private sector participation have opened up opportunities for improved resource management and environmental protection. These need to be carefully directed towards a better stewardship of the country's threatened natural resource base, fragile ecosystem and worsening environment.

4. **International context.** *Agenda 21*, which was adopted by the United Nations Conference on Environment and Development held in Rio de Janeiro in 1992, outlines strategies to halt and reverse the effects of environmental degradation "in the context of increased national and international efforts to promote sustainable and environmentally sound development in all countries". It provides a comprehensive programme of action to be implemented by governments, development agencies, United Nations organisations and independent sector groups in every area where human activity affects the environment. It pro-

vides a framework for global partnership for sustainable development.

5. *Agenda 21* recommends a wide range of policy strategies and actions encompassing major environment-related issues that member countries need to address from the national and international perspective. The NEPAP seeks to address issues raised in *Agenda 21* that are of particular relevance to Nepal. They include:

(i) Alleviation of poverty through the adoption of appropriate policies on food security, population, health care, education, rights of women, and the role of youth, indigenous people and local communities;

(ii) Greater emphasis on demographic dynamics and sustainability by fully integrating population concerns into national planning, policy and decision-making;

(iii) Sustainable use and management of land resources, arresting the rate of deforestation, halting the spread of deserts, and protection of mountain ecosystems;

(iv) Protection and promotion of human health through the provision of safe water, food supplies, sanitation, nutrition, health education, immunisation and essential drugs, reduction in health risks from environmental pollution, and protection of vulnerable groups such as infants, women, indigenous peoples and the very poor;

(v) Promotion of sustainable human settlements by providing adequate shelter, improved management of urban settlements, sustainable land use planning and management, environmentally-sound infrastructure facilities, energy-efficient technology and sustainable transport systems, safety measure against natural disasters, and sustainable construction activities;

(vi) Full integration of environmental and developmental issues in governmental decision-making on economic, social, fiscal, energy, agricultural, transportation, trade and other policies, emphasizing broader public participation in the process;

(vii) Protection of the atmosphere through better understanding of climate changes, reduction in air pollution, and transition to viable, environmentally sound and sustainable energy sources;

(viii) Sustaining biological diversity, and implementing environmentally sound management of biotechnology;

(ix) Promoting hazardous and solid waste management and safe use of toxic chemicals;

(x) Action for women to guarantee their full and equal participation in all development and particularly environmental management, and involvement of social groups such as youth, indigenous people, non-governmental organisations, local authorities, workers and trade unions, business and industry, scientific and technological community, and farmers;

(xi) Identification of financial resources and mobilisation mechanisms;

(xii) Building national capacity and strengthening institutional capacity for sustainable development;

(xiii) Improving legal instruments and mechanisms and strengthening the database for sustainable development.

6. Despite its comprehensive coverage, the NEPAP remains a selective document which identifies the most pressing environmental issues facing the country and recommends high-priority actions. Because of its selective nature, some of the above-listed topics and others mentioned in *Agenda 21* may not have been adequately addressed in this document. It is hoped that the policies and actions recommended in this report will guide the government, community organisations, NGOs and the private sector in a mutual endeavour to achieve the twin goals of sustainable development and environmental protection.

ENVIRONMENTAL POLICY

7. HMG's policy on the environment has been broadly stated in a number of recent documents. The EFYP, for example, endorses moves toward greater direct participation by people in the management of natural resources and in the implementation of environment programmes. It argues for the incorporation of preventative and mitigatory measures beginning in the planning stage of development projects, and for the development of a comprehensive legal framework to consistently integrate environmental concerns into the development process. A series of studies on air, water, noise and land pollution are also proposed to assist in the development of appropriate pollution standards and guidelines. Preservation and promotion of Nepal's natural and cultural heritage is stressed, as is the need for expanded environmental education to raise public awareness concerning environmental problems.

8. The HMG's Environmental Protection Council has identified the following aims and policies of environmental protection in Nepal :

(i) To efficiently manage natural and physical resources;

(ii) To balance and coordinate developmental efforts and environmental conservation in order to meet the basic needs of the Nepalese people in a sustainable manner;

(iii) To manage, develop, and conserve natural, cultural, physical, and heritage resources, keeping in view the social, economic, and cultural needs and potentialities of the present and future generations;

(iv) To identify and mitigate to the greatest extent possible the adverse environmental impacts caused, or likely to be caused, by human action and development projects;

(v) To utilise, manage, develop, conserve, and recycle natural and physical resources in a manner that is not detrimental to their ability to yield long-term benefits;

(vi) To formulate and implement special protection and conservation policies and plans to safeguard important national heritage resources such as rare wildlife species, plants, biodiversity, genetic pools, environmentally sensitive areas, and manmade heritage sites of aesthetic and cultural significance;

(vii) To formulate acts and laws pertaining to various environmental issues as the need arises and to carry out timely reform of existing legislation; and

(viii) To develop institutions for the effective implementation of environmental laws and policies.

The basic structure of the NEPAP has been developed around these objectives.

SCOPE AND COVERAGE

9. Environmental issues cut across all sectors of the economy. The scope of the NEPAP is therefore wide. It discusses issues as diverse as the need for appropriate building standards to encourage more orderly urban development, and the need to promote much greater participation of users in the management of scarce natural resources. At the same time, the report tries to be selective, focusing on issues and recommendations that deserve priority attention. In this relatively short document, however, it is not possible to deal with all these issues at a sufficient level of detail to enable a thorough analysis of the problems. Numerous existing reports and papers analyse environmental issues in the various sectors, and interested readers are directed to the list of environmental reports given at the end of the document for further details. The NEPAP seeks to synthesise this material and to present the major analytical issues confronting environmental policy-makers.

10. No new research has been undertaken for the NEPAP. Instead, it draws on the existing pool of information and experiences available within the

country. Where further study is needed, the NEPAP notes this and makes suggestions for the implementation of the research.

ENVIRONMENTAL PRIORITIES

11. One of the primary aims of the NEPAP is to develop a prioritised strategy for dealing with environmental issues. One method for identifying priorities might be based on an analysis of the economic costs and benefits associated with various policies. It would then be possible to rank the policies and implement those with the highest environmental pay-off first. Unfortunately, there are few such analytical studies and none that look at all of Nepal's environmental issues in a holistic manner. It has not been possible, therefore, to rank environmental problems according to their severity. However, for each environmental problem considered, a priority set of actions is given which are essential for HMG to initiate immediately or, if work is already ongoing, to ensure that implementation is completed.

ORGANISATION OF THE REPORT

12. The NEPAP is organised into five main sections. Section I deals with pressing issues related to natural resource management and advocates the need for greater participation by local resource users in the management of land, forests and water. Section II emphasizes the critical importance of reducing the population growth rate to reduce pressures on natural resources. Improving the provision of drinking water and sanitation as essential elements for healthy living is also vital. Section III recognises the important contributions heritage resources make to Nepal's natural beauty, and stresses the need to maintain these resources to ensure the sustainability of ecosystems and cultural diversity, and to maximise tourist revenues. Section IV addresses a range of environmental issues associated with social and economic development, such as urbanisation, industrialisation and infrastructure projects, which can have a destructive impact on the environment if not properly managed. Finally, Section V highlights the need for appropriate legislation and regulation to assist in improving environmental management. It emphasizes the importance of institutions capable of implementing environmental policy, the need for incorporating environmental subjects in formal and nonformal education programmes in order to raise general awareness regarding the environment, and the need to improve public resource management in order to increase financial allocations for environment-related programmes and projects.

13. **Action Plans.** Each sub-section concludes with an Action Plan outlining the main policies and recommended actions for that sector. The plan also identifies which institution has the main responsibility for implementing each of the recommended actions. Where an action is clearly the responsibility of a single sectoral agency, only one institution is identified; however, where it is anticipated that inter-sectoral coordination will be required, a number of institutions are listed. Most of the agencies identified are government ministries or departments. This does not imply that they are the only relevant executing agencies, but they are considered responsible for monitoring implementation of the recommended actions. The approximate time frame for achieving the actions is also given: immediate and continuous are self-explanatory categories; short-term is considered to be within the next one to three years; longer-term is anything beyond that.

THE FUTURE

14. This report represents a further refinement of HMG's environmental policy. It presents a range of actions addressing environmental problems in Nepal. However, it is beyond the scope of this report to present detailed sectoral plans for implementing the recommended actions. It is anticipated that a follow-up programme to this current work will lead to the development of a monitorable, fully costed, prioritised, time-bound action plan for the environment. The preparation of this plan will require extensive discussions with government ministries, NGOs, the donor community and the private sector.

1 Sustainable management of natural resources

15. Nepal's environmental problems encompass a range of issues that are complex and interrelated. The direct and indirect effects of these problems are reflected in the reduced productive capacity of the natural resource base, lower outputs and income for the majority of the people and a worsening trend in human health, all leading to a high rate of impoverishment.

LAND MANAGEMENT

16. Proper management of Nepal's land resources is critical if a sustained increase in agricultural productivity is to be achieved. Improved agricultural output is the key, at least in the short run, to improving prospects for economic growth and poverty alleviation.

17. Soil fertility is a crucial element in determining the productivity of the land. Evidence suggests that soil fertility is declining in many parts of Nepal, and this has had a negative impact on the yield of key crops. Changes in farming practices are needed to reverse this trend, as are improvements in the institutional arrangements for agricultural research and extension.

Soil Fertility Management

18. HMG's main policy objective with regard to agriculture is to increase productivity. Declining soil fertility, however, presents a serious constraint to realising this goal. Soil degradation is taking place as a direct result of agriculture and forestry production systems that are becoming increasingly marginalised. The main causes of this process of degradation are an insufficiency of farmyard manure—the primary source of fertilizing material for most farmers—and a high stock density of livestock on grazing sites, which compacts soil and encourages erosion.

19. The capacity of forests and rangelands to continue to regenerate and produce needed products is adversely affected when soil fertility declines. Trees do not grow as fast, less leaf litter is produced, grass cover decreases and rangeland vegetation declines, making soils more susceptible to erosion.

20. The net effect of these problems has been: reduced agricultural production and yields; lost income for households engaged in agricultural and forestry production enterprises, particularly low-income groups of small farmers, the landless, and other vulnerable classes; declining availability of food and other products; and a greater risk of natural disasters such as landslides.

21. Solutions to these problems lie in improving soil fertility management practices through the development of a productive, profitable and sustainable agricultural system. Measures to improve soil fertility must focus on providing incentives for farmers to undertake actions that they perceive are in their best interests. Attempts to impose external solutions that farmers do not perceive to be in their interest, however well-

intentioned, are likely to fail.

22. **Status of soil fertility.** Productive soils are needed to sustain all aspects of the rural economy in Nepal. The productivity of agriculture, forestry and livestock all depend on the adequate fertility of soils. Current indications suggest that soil fertility is declining in many parts of Nepal, threatening the livelihood of rural people.

23. On agricultural land, yields of many crops have declined[1] in the Mountains and the Hills, though they have increased in the Terai (Table 1.1). The overall rate of growth in yields has not kept up with the rate of population growth, resulting in reduced food supplies in some areas and causing nutritional deficiencies. Yields of a few cash crops, such as oilseed, potato and sugarcane have, however, shown a general increase, due either to the wider adoption of HYV seed-fertilizer technology or to better husbandry practices.

24. **Causes of soil fertility loss.** Intensified agriculture, which is being brought about largely through the provision of irrigation water, enables farmers to grow two or three crops a year where previously under rainfed conditions only one was possible. However, to realise potential yield increases, larger applications of fertilizing material are required on irrigated land. Farmyard manure, which comprises any combination of livestock manure, animal bedding, agricultural crop residues, ash and domestic refuse, is the main source of fertilizing material in Nepal. In the short run, these supplies of manure are fixed. With competing uses but fixed supplies, farmers are faced with a choice of where to put their manure and not surprisingly are choosing the more productive, profitable irrigated lands. The result has been a diversion of manure away from rainfed to irrigated lands, and a rapid decline in the soil fertility of rainfed lands.

25. Farming practices are often based on cropping systems exhibiting inadequate nutrient cycling. With the exception of some leguminous crops, most cropping patterns in Nepal are dominated by cereal crops which remove a significant amount of nutrients from the soil. To maintain soil fertility nutrients must be returned to the soil through the application of fertilizing material. However, with less farmyard manure being available for rainfed upland areas, applications of manure are inadequate and yields can decline rapidly.

26. In areas where inorganic fertilizers are available, there is the potential to replace some of the lost nutrients. However, little attention has been paid to educating farmers on the appropriate level and mix of nutrient applications and the result has been that a short-term increase in agricultural productivity achieved through higher use of chemical fertilizers is undermining the longer term fertility of the soil. Some agricultural trials have shown declining yields after just ten years of intensive application of an inappropriate fertilizer mix. In other areas, untimely and intermittent deliveries from the AIC has meant that farmers who would like to use fertilizers to improve soil fertility are unable to do so.

27. Hill soils are inherently acidic in nature. Soil acidity levels in several hill districts have been

Table 1.1
Average Annual Growth Rate (%) in Yields of Selected Crops by Ecological Zone, 1975/6-1990/1

Crop	Mountains	Hills	Terai	Nepal
Rice	-0.6	-0.8	2.1	1.5
Maize	-1.2	-1.0	1.0	-0.6
Wheat	0.4	0.0	2.5	1.4
Potato	2.8	2.1	4.4	2.8

Source: Ministry of Agriculture

reported as high, adversely affecting crop yields. HMG has a programme to promote lime application to ameliorate soil acidity, but due to delivery constraints and inadequate extension, the adoption rate is quite low in relation to the severity of the problem.

28. In some areas these problems have been accompanied by shortages of available cultivable land leading farmers to encroach onto marginal and forested land. The result has been cultivation of land lacking have the inherent capacity to sustain intensive agriculture. Soils become quickly depleted when left to the elements and serious erosion can result.

29. Farmers have traditionally supplemented soil fertility through practices such as green manuring and *in-situ* manuring. However, these practices have become less common due to the reduced availability of vegetation, restricted wintering of livestock and the scarcity of labour.

30. If soil fertility declines sufficiently, it becomes unprofitable for the farmer to cultivate the land and it is abandoned, albeit often only temporarily. Carson (1992) has estimated that between 10 and 20 percent of rainfed cultivated lands in Nepal are not being cultivated because of shortages of fertilizing material.

31. **Livestock management.** A crucial element in the soil fertility system is the rearing of livestock. As with other elements in the Nepali farming system, livestock have multiple uses: as the providers of draught power, as producers of meat, milk, butter and other marketable products and as the principle source of animal wastes essential for farmyard manure.

32. Just as livestock are central elements in farm production systems, so too are they central to the process of declining soil fertility outlined above. At lower elevations, especially during the monsoon, free-grazing livestock trampling the land cause soil compaction resulting in increased soil erosion. Free-grazing livestock also consume fodder plants. With low livestock densities this would not be a problem, but with current high densities—Nepal has the highest livestock density per hectare of cultivated land in Asia—insufficient time is permitted for fodder regeneration. The result is the marginalisation of both agricultural and forestry lands as the stock of good fodder plants declines.

33. Communal grazing lands are particularly affected. Poor farmers do not have sufficient land to graze their livestock and so must exploit communal areas. With no clear ownership rights on communal areas, it is difficult to control access and hard to motivate individuals to spend precious labour time improving the fertility of these lands only to see someone else's livestock undoing all the good work. The result can be serious land degradation. Farmers working on their own private grazing lands where ownership rights are clearer (though often not unambiguous) can see the benefit of their work and are thus much more likely to perceive the beneficial effects of improving soil fertility.

34. **Enhancing soil fertility.** Given the diverse causes of soil fertility loss there is a need for an equally diverse package of solutions suited to the observed agricultural, forestry and livestock practices different areas. Some general solutions are suggested here, but these will need to be appropriately tailored to the specific agro-ecological conditions prevailing in a particular area[2].

35. The greatest priority is a reduction in the number of free-grazing livestock on grazing lands in order to reduce stock density. To achieve this, the present trend toward stall-feeding needs to be encouraged. This in turn depends on increasing supplies of high-quality fodder. In the short run, as public grazing lands represent the only source of forage for many poor farmers, it will be impractical for these farmers to remove their livestock. Where farmers have their own grazing lands, however, there is considerable opportunity for them to improve fertility and to use these lands as a source of high-quality fodder for their livestock. By doing so they will reduce pressure on communal lands and indirectly encourage their regeneration. Planting fodder species on marginalised land not

only provides the necessary supplies for stall-feeding but can also contribute directly to improving soil fertility if nitrogen-fixing species are selected.

36. Cropping patterns are best modified through demonstration and education. In many cases, Nepali farmers are unaware of the beneficial effects on the soil of planting leguminous crops. Extension agents should strive to convey this information to farmers. When farmers include a nitrogen-fixing crop in the rotation and soil fertility improves, nearby farmers are likely to adopt similar strategies if feasible.

37. Where farmers are cultivating marginal lands, the focus should be on enhancing soil fertility rather than the forced removal of farmers. Soil conservation techniques that emphasize improved vegetative and cultural practices are likely to be accepted by farmers if they are profitable. Planting of multipurpose trees, green-manure shrubs, grasses and other protective vegetation on terrace edges and risers, and minimum tillage practices will be adopted if farm productivity is increased and farmers realise greater returns from their scarce resources of land, labour and capital.

38. In areas where fertilizers are used, programmes need to be developed to educate farmers as to the importance of maintaining a balanced soil fertility management system, based on the use of manure and other organic materials and biofertilizers, coupled with judicious applications of fertilizers (not only nitrogenous ones) together with strictly controlled applications of pesticides. Research stations in different agro-ecological zones should develop appropriate but flexible application guidelines providing the farmer with a choice of combinations and techniques. With the recent emphasis on integrated pest management and other environmentally friendly farming techniques, research stations need to be more innovative and farmer-oriented.

Agricultural Research and Extension

39. Nepal's public sector support to agricultural development has suffered from frequent reorganisation of agencies and the past failure to design needs-based, farmer-oriented institutional arrangements.

40. **Institutional arrangements.** The institutional responsibility for research and extension related to agriculture is spread over a number of agencies. Each of these agencies operates under its own organisational setup and orientation and coordination among them is weak or nonexistent.

41. Research into field crops, horticulture, livestock and fisheries, as well as technical disciplinary areas, is carried out by the National Agricultural Research Centre of the National Agricultural Research Council of the MOA. Research on pasture and forage is the responsibility of NARC, while public rangelands fall under the control of MFSC.

42. The Central Food Research Laboratory is responsible for food processing and food technology-related studies, while the Dairy Development Board is charged with dairy-related studies. Two institutes at Tribhuvan University also conduct various studies on agriculture and forestry-related areas, mostly along academic lines. Surveys and studies on farm management, marketing and prices, and agricultural statistics were conducted by the former Department of Food and Agricultural Marketing Services. These functions have now been reassigned either to the Ministry of Agriculture itself or to the Department of Agricultural Development. There is no agency responsible for policy-related research.

43. Extension services have been similarly fragmented. Various experiments were made in the past to provide better agricultural extension services in potential production areas through "block" and "pocket" production programmes. At least three Departments under the MOA provided separate extension services in their respective areas, namely Agriculture, Livestock Development and Horticulture. In 1992, these Departments,

along with CFRL, were merged to constitute the present Department of Agricultural Development. This reorganization aims at integrating various related activities, and providing production support and extension services to farmers and rural communities under one roof.

44. **Research needs**. There is little detailed knowledge about soil conditions and the resulting constraints on extension recommendations. The diversity of farming systems and agronomic and ecological conditions requires a differentiated research approach to identify suitable methods of soil fertility enhancement, and conservation and rehabilitation of the lower potential lands. Mountain agriculture is not capable of supporting the same level of productive intensity as is possible in certain areas of the Hills and the Terai. Crop-dominated mountain agriculture will remain essentially subsistence-based. However, the selective development of more diverse farming systems based on livestock, horticulture, fruit trees, and other agro-forestry approaches needs to be encouraged. Adequate availability of inputs such as fertilizer and irrigation are critical considerations in implementing these systems, as are markets and access to them, though drying fruit and vegetables may provide an alternative for areas too remote to permit the timely delivery of perishable products.

45. In Hill regions where intensive agriculture is being practiced the research focus should be to develop appropriate technology for improving soil fertility management, recommended fertilizer and pesticide applications, and the development of crop and animal varieties suited to the specific region. (See para 340 and 341 for provisions relating to use and regulation of pesticides).

46. The Terai provides the greatest opportunity for substantial increases in agricultural productivity. Research needs to focus on productivity-enhancing technologies. One of the most promising of these is the development of irrigation systems based on privately owned shallow tubewells, accompanied by increased, but appropriate use of chemical fertilizers.

47. **Reforming research and extension services**. To achieve increased agricultural productivity, a significant effort on the part of agricultural research and extension services will be required. The focus of research needs to become the provision of information that relevant to farmers in meeting their twin goals of improved productivity and greater profitability, without degrading the natural resource base. Only through a more productive, profitable agriculture will Nepal be able to realise significant economic growth in the short- to medium-term.

48. Several approaches have been tried in Nepal with respect to agricultural extension, though the focus has always been "top-down". In the past, the concern of research stations has been to achieve annual targets set by central ministries, mostly in terms of meeting goals for the area under various crops. Extension agents mirroring this concern have provided information that is typically irrelevant in terms of farmers' own priorities, and have sometimes unwittingly worsened soil fertility by recommending crops be grown in inappropriate areas.

49. Except in selected high potential areas with better irrigation and purchased input delivery facilities the vast network of extension service has been ineffective. The system has been inadequate to provide farmers with the support needed to encourage productivity growth. This problem is particularly acute in the areas of agriculture, forestry, and livestock. While the government structure has two different ministries (Agriculture and Forestry) to deal with these areas, farmers confront issues related to all three simultaneously. Although some separation of responsibilities at the central level is desirable, inadequate dialogue between the ministries and their various departments results in farmers being given contradictory and irrelevant advice[3]. Lack of motivation and faulty planning, especially at the district level where projects are often developed without sufficient reference to beneficiary farmers, have also been major problems. A comprehensive environmental planning and its implementation at village and district levels incorporating multi-

dimensional approach in natural resource management will encourage sustainable production.

50. HMG has begun to address these issues. With regard to research services, a system of adaptive research is being encouraged to provide recommendations to location-specific problems. Some initiatives have been taken to improve the technology generation process by shifting emphasis away from research stations to farmers' own fields and to recognise the importance of clientele participation in the process. For extension services, a "group approach" concept is being introduced. The so-called "Farmer-Centred Farming System" approach uses extension agents as facilitators among a group of farmers, helping the farmers to identify common problems and actively participating in developing solutions *with* farmers, rather than *for* them.

51. HMG is also investigating the possibility of contracting out extension services to the private sector. Five districts, one from each development region, will be selected as part of a pilot project. Details of the experiment are still being developed, but this approach may suggest a new method for delivering extension services more effectively.

FOREST AND RANGELAND MANAGEMENT

52. Forest and rangeland resources in Nepal play an important role in national development as well as the socio-economic condition of rural people. However, deforestation and forest degradation have seriously reduced the availability of forest

ACTION PLAN FOR LAND MANAGEMENT

Policies	Recommended Actions	Institutional Responsibility	Time Frame
Improve soil fertility management by increasing supplies of farmyard manure and reducing the stock density of livestock on arable land	Encourage planting of trees, shrubs and grasses on private land to provide an additional source of fodder for livestock	DOAD	Continuous
	Where appropriate, encourage stall-feeding of livestock using fodder from trees on private land	DOAD, NARC	Continuous
	Promote low-cost, vegetative and cultural soil conservation measures to reduce soil erosion	DSC, DOAD, NARC	Continuous
Promote policies to directly increase soil fertility	Encourage modification of farming systems to include nitrogen-fixing species to enhance nutrient cycling	MOA, NARC	Short-term, continuous
	Remove constraints to greater private sector involvement in the purchase and distribution of chemical fertilizers to improve their availability	DOAD, NPC	Immediate
	Develop recommended fertilizer applications, including the use of agricultural lime on acidic soils, based on particular agro-ecological conditions	DOAD, NARC	Short-term
Develop an extension system capable of responding to farmers' needs	Improve participation in agricultural extension through the use of the "group approach"	DOAD	Short-term, continuous
	Finalise arrangements for pilot scheme for contracting-out extension services to the private sector	MOA, NPC	Immediate
	Promote the use of adaptive research techniques on farms as a method of rapidly disseminating information	DOAD, NARC	Short-term, continuous

products, which has adversely affected much of the country's natural resource base. Although the causes of deforestation are complex and interrelated, there is a growing consensus that any solution to these problems needs to be based on improving systems of forest management.

53. Fodder from forest land provides more than 40 percent of livestock nutrition. Forest litter and dung are relied upon to enrich farm soils. Fuelwood from forests, shrublands, and land adjoining farms provides 75 percent of total energy needs. Forest watersheds are the main source of water for energy, irrigation and domestic use. The protected area network established in natural forests acts to preserve biodiversity and maintain the genetic stock. In addition, forests also provide employment opportunities for the rural poor, and forested areas provide the basis for some of Nepal's tourist industry.

54. Reduced availability of timber, wood, fuelwood, leaf litter, fodder and forage has not only depressed the incomes and productivity of those who traditionally depend on the direct extraction and utilisation of these products, but also has resulted in erosion, soil fertility loss, damaged ecosystems, reduced biodiversity, degraded watersheds, and disfigured landscapes.

Status of Forest and Rangeland Resources

55. Nepal has around 5.5 million hectares of forests (representing about 37 percent of a total land area of 15 million hectares), 0.7 million hectares of shrubland, 1.7 million hectares of grassland and 1.0 million hectares of noncultivated inclusions, mostly under private management (Table 1.2 Chart 1.1 and 1.2). Past statistics indicate that the annual rate of deforestation between the period 1964-1986 was 0.4 percent. This information, however, is based on the net area cleared and does not fully represent the actual state of natural forests. Many areas considered by the MFSC as forested land, for example, may contain only a handful of trees per hectare.

56. Only 15 percent of the forest land has a crown cover of more than 70 percent, and only one percent carries predominantly young regeneration or pole-sized trees. Moreover, uncontrolled grazing practices and frequent fires pose further threats to regeneration, undermining the future status of forest areas. To date, reforestation programmes have been on a small scale: only about 99 thousand hectares including government, community, private and leasehold plantations were planted between 1985 and 1992. The average rate of reforestation has not exceeded 15 thousand hectares per year, and during the EFYP period

TABLE 1.2: LAND USE BY PHYSIOGRAPHIC ZONE, 1985/86, IN THOUSAND HECTARES

Region	Forest	Shrubland and Degraded Forest	Grassland	Uncultivated inclusions	Farmland	Other Lands	Total
Mountains	1,794	243	1,393	149	252	2,479	6,310
Hills	1,811	404	278	667	1,223	59	4,442
Siwaliks	1,438	29	16	59	269	75	1,886
Terai	475	30	58	123	1,308	116	2,110
Nepal	5,518	706	1,745	998	3,052	2,729	14,748

Source: HMG/ADB/FINNIDA. 1988. Master Plan for the Forestry Sector Nepal (Kathmandu)

Chart 1.1
Land-use in Nepal, 1985/86, in percent

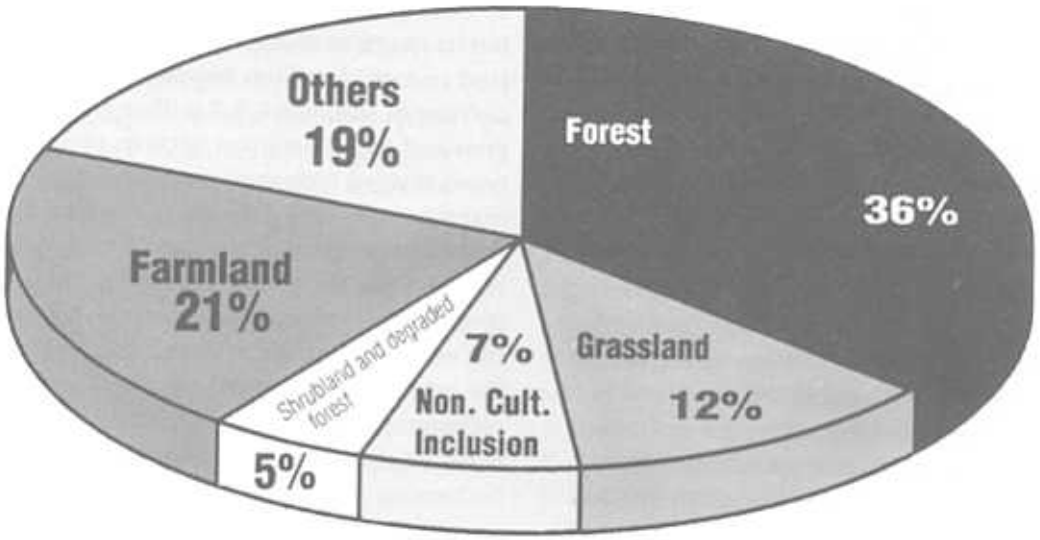
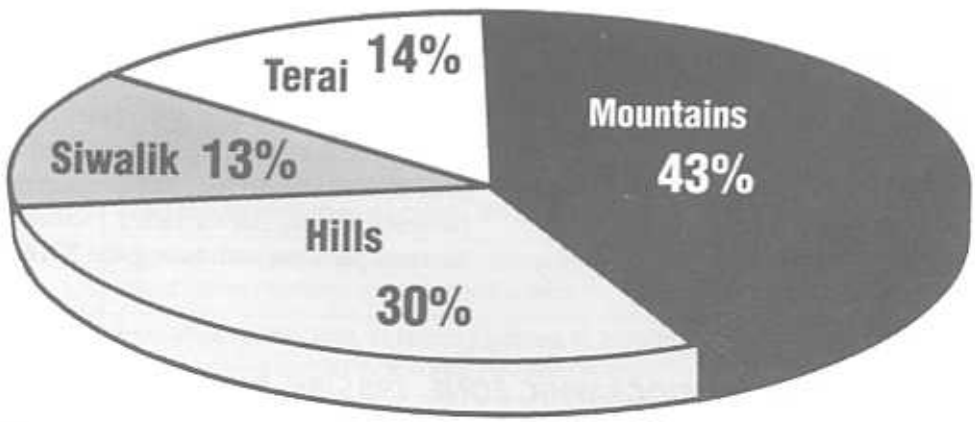


Chart 1.2
Land-use by Physiographic Zone, in percent



reforestation is not expected to be greater than 20 thousand hectares per year, which is considerably less than the area lost each year.

57. Nepal's rangelands, comprising grasslands, forests and shrublands, play an important role in the country's agricultural farming systems. They are diverse in character, ranging from subtropical savannas to temperate grasslands and alpine meadows, and a cold, arid steppe north of the main Himalayan range. Estimates of Nepal's total grazing area usually only refer to grassland areas, ignoring grazing areas in forests and shrublands, which provide significant forage supplies for livestock. Grasslands alone are estimated to cover about 1.7 million hectares, or 12 percent of total land area.

58. **Forest loss.** It is possible to distinguish be-

tween two processes that are having an adverse impact on forests and rangelands—deforestation and forest degradation. It is important to do so as their causes and effects, and therefore their solutions, are different. Deforestation is the permanent removal of trees from forested areas. Degradation, on the other hand, involves a process of continued removal of forest products in excess of the forest's ability to regenerate. If this process continues unchecked, once densely forested areas can become wasteland. Each of these processes is discussed below.

59. Nearly all of the deforestation is taking place in the Terai. Forests continue to be converted for agricultural use. The process of migration from the Hills and Mountains that began in the 1950s, following the eradication of malaria in the Terai, is continuing. This growing population places a strain on the existing agricultural land base and leads to encroachment onto forested lands in the search for more cultivable land.

60. Migration from the Hills and Mountains to the Terai is likely to continue as new infrastructure opens up previously inaccessible areas, and as the disparity between incomes in upland and lowland regions continues to increase. Pressures to convert still more of the remaining Terai forests are difficult to avoid unless the increasing labour force in the hills is retained through the creation of additional income-generating opportunities. Given the good quality of soils existing in some forested areas, and providing that efforts continue to develop and manage forested areas outside the Terai, conversion of suitable forested areas may be a reasonable strategy, if it is based on an assessment of the best economic use, taking into account all potential environmental costs and benefits. Further forest conversion will only serve to increase the need to improve forest management and enhance forest productivity.

61. The real challenge is to ensure proper management of this process. At present, forests are being cleared for intensive agriculture with no reference to the suitability of the soils beneath them. Part of the solution lies in continuing to implement new forest management strategies that emphasise the need for much greater involvement of communities and private agents. This is discussed in more detail below. However, developing a long-term land use plan is also important as a means of properly managing the overall development of the Terai. Information from the vast array of government- and donor-funded projects needs to be pooled, and a zoning system of the Terai and the Hills needs to be developed that identifies areas that are definitely unsuitable for conversion, those that are probably suitable, and those areas that may be suitable but for which further research is needed.

62. The process of degradation is far more widespread throughout Nepal. Primary causes are rapidly increasing human population and its demand for fuelwood, timber, leaf litter and other forest products, and the demand of a large number of livestock for pasture and rangeland. The need for improved livestock management and better cropping practices by farmers as strategies to deal with these problems has been discussed in the Section on Land Management. The section below focuses on the need to improve forest management, not just by farmers, but also by government agencies and private enterprises.

Forest Management

63. Past efforts at forest management were heavily centralised and overly bureaucratic. Undue emphasis was placed on protection and conservation, while little attention was paid to managing forests. This approach has led people to regard the government forest services as adversaries rather than partners. In turn, government forest workers tend to perceive the actions of local people as posing a threat to forests; they therefore see their role as protectors of the forests whose main aim is to keep villagers out. Such an approach has failed in its attempts to protect forests, as the government does not have the manpower necessary to patrol all of Nepal's forests. In fact, it is likely that this approach has encouraged encroachment: as individuals had no involvement in the management of government-owned forests, they tended to regard

them as free resources available at minimum risk.

64. A similarly narrow approach was taken with regard to conservation, where the emphasis was on maintaining and planting trees. Forest management thus had a very restricted purpose: to prevent access to forests by local people and to maintain and increase the stock of trees. There has, however, been a recent realisation that this approach to forest management has failed. The Master Plan for the Forestry Sector (HMG/ADB/FINNIDA 1988), endorsed by HMG in 1989, presents a comprehensive strategy for forestry in Nepal. The approach focuses on establishing procedures to enable a hand over of forests to user groups and the private sector, based on a partnership between the MFSC and local forest users that encourages management of all aspects of forests—not just trees, but shrubs, grasses, and medicinal and other plants.

65. Although the Forest Act of 1961 made provisions for classifying existing natural forests into community, leasehold and national forests for the purpose of enhancing private sector participation in forestry development, it was only in 1978 that the rules governing community and leasehold forests, and in 1983 that the rules governing private forests, came into use. Drawing on this legislation, the MPFS proposed two primary development programmes to implement sound management practices effectively: the Community and Private Forestry Programme, and the National and Leasehold Forestry Programme. However, a review of the MPFS implementation so far, as well as the continued deterioration of the country's forests, suggests that immediate reforms are needed in some policies and actions to support effective forest management.

66. The Forest Act of 1993 tries to alleviate many of the contradictions and restrictions posed by past legislation that have prevented a rapid hand over of national forests to community management by user groups and other private enterprises. Work is currently progressing on drafting the by-laws that will specify how the elements of the law are to be implemented in practice. A Task Force within the MFSC has prepared a draft set of by-laws that are presently being reviewed by other relevant ministries and donor agencies.

67. HMG's current policy is to promote community forestry in the Hills, where forests form an integral part of farming systems and are often of high environmental value in terms of stabilising soils and protecting watersheds. However, in the Terai, due to the large commercial potential, forests will be managed for production either through leasehold arrangements with the private sector or as national forests managed by MFSC. However, although recent legislation mentions leasehold forestry as an alternative to government management, there are concerns that an effective system of control governing the rights and responsibilities of potential leasehold concessionaires has not yet been fully developed. Most large forests in the Terai are therefore likely to remain under government management until an appropriate system is finalised.

68. There are in addition a number of other issues in the draft by-laws that need further clarification. At present the distribution and price of forest products are controlled by HMG. Wood products are allocated according to the request of the District Forest Products Supply Board, and prices and subsidies for different categories of users are determined by HMG. Furthermore, the Timber Corporation of Nepal has a monopoly to purchase wood from state forest and plantations at fixed and subsidised prices. This tight control is meant to ensure that basic needs for wood products are met; however, current subsidies are open-ended, leading to a potential undervaluation of forest products, resulting in further resource degradation and market imperfections.

69. Developing a free market-based distribution and pricing system is essential in encouraging further private sector involvement. Also, open-ended subsidies are draining scarce public resources. Alternative mechanisms for making forest products available at affordable prices need to be investigated. One alternative would be for HMG to allocate directly budgeted funds to the District

Forest Products Supply Boards for the procurement of wood at free market prices, in a similar fashion to budgetary allocations for other sectors. Subsidies would cease to be open-ended, and their true cost would become more transparent.

70. **Special cases of the Siwalik hills and the western Terai.** The Siwalik range occupying 12.8% of the total area is highly susceptible to soil erosion, and its watershed condition is already considered poor. About one-third of the zone is experiencing diminished productivity and disturbances in the soil mantle and channels; about two percent is suffering from advanced erosion. This high-risk area should be managed as a Protected Forest Area and put under effective conservation. A management plan should be prepared to restrict activities that reduce vegetative cover.

71. Although the Forest Act of 2049 provides a legal basis for declaring the Siwaliks a protected area, appropriate management systems still need to be developed. The Churia Forest Development Project is an ongoing exercise to prepare a conservation-oriented project for the eastern Siwaliks. This project is expected to address the problems associated with the protection of Siwalik hills, including the needs of local communities, in three districts in the eastern development region. It will be implemented by the Department of Forests. On the basis of its experience similar programmes could be developed for the remaining Siwalik districts.

72. Although it still accounts for less than four percent of Nepal's total population, the population of the far-western Terai more than tripled between 1971 and 1991, experiencing an average annual rate of growth of almost seven percent, by far the highest of Nepal's 15 eco-development zones. Completion of the East-West Highway in the western Terai will increase population pressures in that area in the near future. At the same time, estimates from the MPFS show that forested lands and plantations in the Far-Western Development Region account for over 50 percent of land area, the highest proportion of the five development regions. The rapid growth in the area's population will undoubtedly place considerable strain on these forest resources.

73. The challenge is to use a number of different strategies to manage and influence the migration and inevitable forest conversion that will take place. One previously mentioned strategy is the rapid development of a land use plan for the Terai and the Hills to identify forested areas that might be suitable for agriculture and those where cultivation should be avoided. Without such a plan there will be greater risk of encroachment on the remaining forests and protected areas. With its relatively small land area, the Far-Western Terai is suitable for land use plan development and testing. Information from this plan could be used to guide the provision of infrastructure services to the area, which are likely to have a considerable impact on the rate of migration and forest conversion.

74. There is already evidence that forest conversion is taking place in an unplanned and unsustainable manner. Cadastral survey work is taking place in the Far-Western Terai and as only cleared land can have title deeds issued there is considerable incentive for farmers to clear forested and other land, even though they may have no intention of cultivating it. The results of the cadastral survey could prove useful in developing a land use plan; however, it is important to develop the plan before land is finally deeded. This will give government and the local people the option of preserving and protecting areas unsuitable for cultivation, while giving people the opportunity to develop land with high productive potential for which the government might agree to encourage the provision of necessary infrastructure and inputs.

75. **Monitoring and evaluation.** The MPFS highlights the importance of monitoring plan implementation and refining programmes according to experience. The need for adequate monitoring and evaluation will require the MFSC to develop and institutionalise a comprehensive system in every tier of its vertical hierarchy.

76. The problem of environmental degradation has received growing concern at the highest level, resulting in the formation of the Environment Protection Council (EPC) under the chairmanship of the Prime Minister. It is essential to strengthen the capacity of the line ministries concerned with development, for example, the Environment Section of the MFSC, which must be made capable of carrying out intra- as well as inter-ministerial coordination in matters affecting forests. It also must make available results of M&E work to inform discussion and shape policies.

77. **Environmental impact assessment.** In general, forestry sector development projects and programmes are developed to alleviate environmental problems. However, activities which influence land use change, promote extensive monoculture plantations of exotic or indigenous species, or use modern technologies releasing toxic chemicals or hazardous wastes into the environment should follow a systematic process of EIA before approval. In this regard, the MFSC in collaboration with the NPC has recently completed draft guidelines for EIA in the forestry sector. These guidelines are expected to be finalised shortly and institutionalised in the MFSC as a mandatory instrument for decision-making.

78. As development projects in other sectors can contribute directly to deforestation, it is necessary to institutionalise a EIA system for other sectors as well. The forestry sector draft EIA guidelines identify critical areas of forestry concern that should be considered by other ministries during the feasibility study phase of their sectoral development projects.

Rangeland Management

79. Relatively little is known about the biological, agronomic and socio-economic characteristics of Nepal's rangelands. There is a general perception that rangelands are overgrazed and that modern techniques are needed to improve conditions. However, the "improved" grazing systems that are often prescribed by livestock planners ignore the complexity of rangeland systems. Detailed assessments of rangeland resources in Nepal have not yet been undertaken, and there is a lack of quantitative data to support widespread claims of overgrazing and degradation. Even where overgrazing has taken place, it is still not known to what extent range condition has declined.

80. Management responsibility for rangelands is unclear. The ownership of these lands rests with MFSC, while their utilisation by farmers implicitly leaves the responsibility to the MOA and local communities. In addition, a substantial proportion of northern rangelands is located within national parks and so comes under the direct jurisdiction of the DNPWC. The MOA and MFSC should jointly address this issue and develop appropriate management strategies in consultation with users' groups.

81. As with strategies for forest management, range-livestock strategies for pastoral areas need to be multisectoral to reflect the multiple uses of these areas, and must focus on private institutions—for example, farmer groups or pastoral associations—as the basis for improving production systems. Greater emphasis should be placed on designing appropriate incentives and regulations for pastoralists to invest in range development and sustainable livestock management practices.

Forestry Research and Extension

82. Forestry research in the past has tended to directly support the needs of foresters who emphasised commercial forestry, and has been mainly confined to the physical-biological aspects of conservation and silvicultural practices. It has yet to adapt itself to address the more pressing issues of alternative modes of participatory management, sustainable resource use and alternative means of meeting the resource needs of rural communities. This issue has been dealt with in detail by the MPFS, identifies socio-economic considerations and the management of natural forests as two areas which neglected by earlier forestry research and in need of priority attention. Research on issues related to rangelands has been almost entirely neglected.

83. Forestry research needs to focus on maximising the economic return from land resources. For example, intercropping of agricultural crops with trees has proved effective in large-scale plantations as a mechanism to reduce the cost of plantation establishment. Similarly, multiple-use forestry in the Hills and multi-purpose tree species in private forests and marginal lands could enhance both the productivity of land and the income of private landowners. Therefore, it would be desirable to immediately adopt, where appropriate, agro-forestry systems incorporating food and cash crops during the initial establishment period of new plantations in the Terai, as successfully demonstrated by the Sagarnath Forestry Development Project. Silvi-pasture in the mid-Hills forestry management system should be encouraged, and agro-silvi-pasture or multiple forestry practices in all private forest lands as well as in marginal agricultural lands should be promoted. The distinguishing feature of these new approaches is a recognition that forests contain not only trees but shrubs, grasses and other products, all of which are important to maintaining people's livelihoods.

84. As the country is encouraging private sector participation in forestry development, the new thrust of forestry research should be to support local users' groups, forest industries and private individuals in their efforts at natural forest management, plantation establishment, forest utilisation and new product development at low cost. This has become essential, as growing urban markets have placed additional pressures on remaining forests to supply an increasing quantity of wood and timber. Current forest products utilisation practices do not make full use of all available tree species in natural forests. Direct support is required from forestry research to develop new products from tree species that are so far underutilised or unrecognised as having economic benefits.

85. The present forestry research institution is weak in capacity and cannot fully cover the nationwide programme of community forestry at the user-group level. Therefore, the issues of equitable benefit-sharing and local income and employment generation through small-scale, local forest-based industries—two vital elements in the sustainable development of community forestry—have not yet been addressed by forestry research.

86. Future forestry research must realign its activities and enhance its capacity. Some related activities have been included in the Nepal-Australia Community Forestry Project in recent years, and based upon their success a much expanded programme may be possible in the future. This would require close cooperation between the project and the Forest Survey and Research Centre of the MFSC.

87. Forestry extension and conservation education should be viewed as essential components of an awareness-raising programme for forestry development. This programme would need to stress the importance of forest conservation in environmental protection. An effective extension programme could be an invaluable tool for promoting people's participation in forestry development.

88. Policy statements in both the EFYP and the MPFS place high importance on public participation. To achieve this objective through implementation of the private forestry, leasehold forestry and community forestry programmes (in addition to the national forestry development programme) requires enhancing forestry staff's knowledge of appropriate forestry techniques, and improving communication with local people.

89. Forest extension is in its infancy and has a long way to go in defining a new role for forestry staff based on promotion and persuasion rather than enforcement and coercion. The present terms of reference of forestry staff do not include specific reference to their role as extension workers. For staff to be effective agents of participatory development, their knowledge of social science and communication skills needs to be enhanced. Also, as the country is pursuing a decentralized planning and implementation strategy based on the devolution of authority to local governments and people's representatives, forestry staff should be

ACTION PLAN FOR FOREST AND RANGELAND MANAGEMENT

Policies	Recommended Actions	Institutional Responsibility	Time Frame
Improve forest management by implementing the findings of the MPFS	Finalise the by-laws for the implementation of the Forest Act 1993, ensuring they are consistent with HMG forest policies stated in the MPFS and EFYP	MFSC	Immediate
Encourage community participation in forest management	Continue to promote community forestry schemes in the hills	MFSC	Immediate, continuous
Improve rangeland management	Undertake strategic assessments of Nepal's rangelands to improve knowledge base	MFSC, MOA	Immediate, continuous
	Clarify institutional responsibilities for rangeland management	MFSC, MOA	Immediate
Encourage greater private sector involvement in managing national forests	Develop an appropriate system of incentives and regulations governing private sector management of forests	MFSC	Immediate
	Review the present system of open-ended subsidies provided for the purchase of wood by the District Forest Products Supply Boards, which prevents the proper valuation of forests and undermines private sector involvement	MFSC	Short-term
Reorient forestry research	Develop programmes to provide information (including utilisation of so far unused or lesser known forest species) for users' groups, forest industries and private individuals	MFSC	Short-term
Raise awareness of the importance of forest conservation	Develop forest extension agents' role based on promotion and persuasion rather than enforcement and coercion	MFSC	Short-term
Improve the basis on which land use is decided	Adopt a national land use policy classifying areas by their suitability for alternative uses	NPC, MFSC, MOA	Long-term
Minimise adverse environmental impacts of forest-related projects	Finalise EIA guidelines for the forestry sector	NPC, MFSC	Short-term
Promote research and development of alternative energy sources to reduce dependence on biomass sources	Finalise the energy sector strategy study and incorporate alternative energy development and promotion as an integral part of this strategy	NPC, WECS	Short-term

made fully aware of their role in local-level forestry development and environmental protection.

90. Apart from forestry development programmes, soil conservation and watershed management programmes also rely heavily on people's participation. Therefore, all programmes aimed at increasing awareness should integrate both extension and education and should be implemented in close coordination with the concerned agencies.

WATER RESOURCE MANAGEMENT

91. In relation to its size, Nepal has abundant water resources[4]. Its rugged topography creates great potential for putting these resources to economically productive uses, such as hydroelectric power generation and irrigation. Despite these considerable resources, the country presently faces an acute shortage of electricity, many watersheds are in poor condition and some irrigation projects are displaying serious environmental problems associated with faulty design and management.

Watershed Protection

92. Over two-thirds of Nepal's land area falls under the watersheds of major river systems and their tributaries. Deforestation, poor management of natural resources and improper farming practices in watersheds accelerate soil erosion, adversely affecting yields on agricultural land, and increasing the downstream sedimentation of dams, reservoirs and irrigation systems, as well as threatening people's lives and property. Some of these problems can be solved by physical actions, while others require policy reform and research. Still others are problems relating to geology and climate and require continued adaptation and accommodation.

93. Environmental problems that contribute to watershed degradation such as inappropriate farming practices and deforestation have been discussed in detail earlier in this section. Here, the focus is on strategies and methods to combat the negative impacts of these problems.

94. Appropriate strategies for upland areas require greater emphasis on generating site-specific recommendations. These should focus particularly on improving the productivity of rainfed agriculture through low-cost methods of soil and moisture conservation. Appropriate recommendations developed through research and the involvement of local farmers demonstrate that it is possible to find low-cost soil conservation techniques that are in the farmer's economic interest and have wider environmental benefits. A regular mechanism is required to continually monitor water resources development and management, water source and water quality, and impacts of climatic change on water resources.

95. **Structural techniques for soil conservation.** Indigenous structural techniques in the Hills and Mountains are based around terracing. Recent research has added little as to how modifications or extensions of this technology might assist soil conservation. Attempts to modify outward-sloping terraces that allow high run-off but minimal surface erosion by introducing back-sloping terraces have often resulted in the collapse of the new terrace due to a high concentration of water. It must be recognised that the costs of establishing and maintaining terraces are high, and efforts to introduce terracing in areas of labour shortage are likely to fail. If terraces are not adequately maintained, structural failure can take place, leading to even worse erosion.

96. A popular method in Nepal for trying to cope with the downstream effects of high water-flow is river training, which makes use of low-cost, locally available materials and provide employment for the poor. In terms of the stated aim of ameliorating the negative effects of flooding and riverbank erosion such programmes appear technically feasible, but the financial costs are high. Resources might be better spent on educating farmers about farming practices and river bank afforestation, which may contribute to lessening erosion both upstream and downstream, though no detailed economic analysis of the river training programme has been carried out to date.

97. **Vegetative and cultural techniques for soil conservation.** Low-cost alternatives to structural treatments include vegetative and cultural practices that promote contour cultivation, reduced tillage, the addition of new crops and changes in timing or cropping patterns. Vegetative practices have been shown to be highly effective in minimising erosion by reducing the impact of raindrops as they strike the soil; mulches, agroforestry techniques and permanent cover crops are also effective. Plants can also be used to form a physical barrier to slow runoff and arrest already moving soil. Suitable species have already been identified in Nepal, but more needs to be done to encourage their adoption. This suggestion reinforces the recommendations made earlier concerning the importance of planting high-quality, nitrogen-fixing forage crops to enhance soil fertility.

98. Institutionally, there is a need to develop much closer cooperation between the various government agencies involved. Although there is a separate Department of Soil Conservation within the MFSC, most of its work has concentrated on larger-scale projects. Few efforts have been made to integrate low-cost soil conservation practices into farming systems, as agricultural extension agents do not consider it part of their job. Some donor-funded projects have had success in this area, however.

Management of Key Watersheds

99. Water resource development projects such as those on the Kulekhani and Marsyangdi rivers have contributed to existing irrigation and or power generation systems; however, they are suffering from sedimentation associated with upstream soil erosion. One management strategy might be to declare these watersheds Protected Watershed Areas, under the provision of the Soil and Watershed Conservation Act (1982), and to develop specific management plans for their rehabilitation. Watersheds of other major river systems where feasibility studies already show potential for large-scale power generation and/or irrigation, such as the Arun, Kali Gandaki, Mahakali and Karnali rivers, could similarly be protected and developed under long-term Watershed Management Plans.

100. Since declaration of any watershed as a protected watershed area affects both people and land use practices, it is essential to involve all those concerned in such a decision. Furthermore, the watershed management plan preparatory process should precede the official declaration decision. It should properly assess the effects of such a decision and include compensatory mechanisms to induce land use changes through a participatory approach. Without such an approach, no watershed management plan can be effectively implemented.

101. In addition, the three approaches recommended by the MPFS for soil conservation and watershed management—preventive measures, rehabilitative measures, and conservation education and extension—should be pursued. Preventive measures would be most appropriate to bring about a long-term solution to watershed degradation. Rehabilitative measures should be implemented in appropriate watershed areas to reduce the danger to human life and property, and the damage to infrastructures and other valuable resources. Conservation education and extension is essential for the successful implementation of other measures such as the control of forest fires and open grazing. Since this increases people's awareness and encourages their active participation, these programmes should be promoted on a nationwide basis. Activities for soil conservation and watershed management would be implemented by DSC in close cooperation and coordination with concerned departments and ministries and local users' groups.

102. Apart from conservation issues, optimum utilisation of water resources is essential to minimise the damages caused by frequent floods, provide year-round water for irrigation, and substitute electricity for fuelwood and fossil fuel energy. This should be achieved through the construction of multipurpose projects in feasible areas.

ACTION PLAN FOR WATER RESOURCE MANAGEMENT

Policies	Recommended Actions	Institutional Responsibility	Time frame
Encourage watershed protection measures to reduce soil erosion and downstream sedimentation	Reassess the efficiency and cost-effectiveness of structural techniques for watershed protection, especially river training schemes	MWR, DSC	Immediate
	Promote low-cost vegetative and cultural techniques for watershed protection based on farmer participation	MWR, DSC	Short-term, continuous
	Integrate programmes for soil fertility and forest management with watershed protection measures	DSC, DOAD, MFSC	Short-term
Ensure major watersheds are adequately protected	Develop management plans for Nepal's key watersheds	MWR, DSC	Short-term

Notes

[1] It seems likely that the current statistical validity of yield data of Nepal's major crops is weak—a matter that requires urgent attention. For example, no attempt was made to back-date the improvement in cropped area data provided by cadastral surveys. Estimates prior to cadastral surveys often significantly underestimated cropped areas. When the new data are included with no attempt to correct for this error, the result is an apparent decline in yields. Steps are being taken to correct this, but greater importance needs to be attached to providing such basic information.

[2] Carson (1992) has suggested a simple methodology for classifying agro-ecological zones in order to provide an initial starting-point for building a more detailed database on which recommendations to farmers could be based.

[3] A comment from a farmer quoted in a government report is illuminating: "A JTA comes and tells us to grow new crops, new seeds, use fertilizer and insecticide and not to plant trees around the homestead that could have a shading effect on growing crops; a ranger comes and tells us to grow grasses on terrace risers, gullies, plant trees on bunds of upland areas for fuel and fodder, decrease the cattle population and have less grazing on forest cover, and tells us to plant more trees on abandoned terraces and around the homestead, not to graze in the forest. The livestock staff come and tell us to improve animals, increase goat and buffalo population and plant grasses and fodder trees on unproductive upland. The family planning people tell us to decrease the population. We do not know what to do, what to accept or reject, their sayings are often contradictory and we have not been able to decide on what to do." (Shah, 1980)

[4] The availability of water in Nepal is about 150 billion cubic metres per year, which could irrigate 8-10 million hectares of land and produce some 27 thousand megawatts of hydro-power. Groundwater irrigation is possible on 350,000 hectares of land, with an additional 150 thousand hectares being suitable for conjunctive use. However, 90 percent of the surface water is concentrated in four major river basins, and 70-80 percent is available on average only between June and September. There are thus major technical problems associated with exploiting these water resources.

2 Population, Health and Poverty

103. Improved management of land, forests and water resources is essential in meeting the basic food, fodder and fuel requirements of people in Nepal. However, with almost half of the population living below the poverty line, there is also a need to improve health status by providing adequate supplies of clean water, improved sanitation, and by satisfying the significant unmet demand for family planning services. Population and environment are closely interlinked. The health status of people is determined by a range of factors such as safe drinking water, clean air, safe use of chemicals in industry and agriculture, and proper waste management including hazardous wastes from hospitals.

POPULATION

104. The current size of Nepal's population and its growth rate are high relative to the availability of land and other natural resources, and present a major environmental challenge. Policies aimed at curbing population growth directly impact the demand for products and services derived from natural systems, or are closely related to environmental problems. Appropriate population control strategies are an essential prerequisite for realising the benefits of other actions suggested in this report. Without a concerted, committed effort to curb the population growth rate, all other environmental policies will be severely undermined.

Population Growth and Pressure on Available Resources

105. Nepal's population was about 19 million people in 1990, more than one-and-a-half times its size in 1970. This rapid increase is placing intense pressure on the economy and on the natural resource base. A high rate of population growth is a particularly acute problem for Nepal, which has a very limited supply of arable land and a heavy reliance on subsistence agriculture. In the last decade, the population grew at an average of 2.6 percent per year (compared to 2 percent in 1965-70), the result of continuing high fertility combined with a decline in the crude death rate from 24 per 1,000 population in 1965, to 14 per 1,000 at present.

106. At the current growth rate, the population will double again in the next 30 years. Although a substantial part of this increase is already determined by the great momentum for growth represented by the large number of women of reproductive age—4.5 million in 1991, compared to 2.7 million in 1970—a reduction in fertility in the near future would make a significant difference in total population size twenty years from now.

107. Rapid population growth combined with ecological degradation has driven down the availability and productivity of agricultural land to precarious levels; for instance, the average size of land holdings per household in the Hills is less than one hectare, which keeps most people living

below subsistence levels. In the Terai, increased population has significantly aggravated the deterioration of pastures and forests. Population pressures have worsened the scarcity of fodder and fuelwood, exacerbated the contamination of surface water and driven the supply of clean water to critically low levels.

108. Current population growth and migration rates suggest that the land base in the rural Terai will reach saturation in about 15 years. The likely consequences of this would be substantial urbanization—with projections suggesting that the urban population would increase five-fold to about 8 million by 2010—and a tremendous need for off-farm employment opportunities. Under present assumptions, by the turn of the century new entrants would be joining the labour force at an annual rate of 420,000. Given the likely saturation of the arable land base, almost all of these new workers would have to be absorbed in off-farm employment. However, the absorptive capacity of the manufacturing sector is currently low, adding only nine thousand jobs per year at present.

109. The above scenario has staggering implications for the further aggravation of poverty in Nepal. An estimated 49 percent of the current population lives in absolute poverty, defined as having incomes below the level required to support a minimum daily calorie intake (about $100 per capita per annum). If population growth continues unabated, it is likely that within the next twenty years per capita GDP will stagnate at around $180 per annum. The cost of getting public policy wrong, with respect to curbing population growth, would be to add a further 15 million absolute poor to the population over the next two decades. For these reasons, *bringing down the rate of population growth is the single most important element of both environment and development strategies in Nepal.*

Population Policies

110. The most urgent population objective, and one that is closely related to the high priority accorded by HMG to poverty alleviation, is to reduce fertility levels in order to lower the rate of growth of population. The EFYP has set a target of reducing the total fertility rate[1] from 5.8 to 4.0. HMG's policies to achieve this and other population-related targets rely on direct measures to improve the range and availability of family planning and health care services, and indirect measures such as improving the status of women through education and employment.

111. HMG's population control policies include the following:

(i) Creation of social and economic development conducive to the formation of small families. This involves supporting and accelerating development programmes designed to alleviate poverty and raise living standards.

(ii) Promotion of women's development, adult literacy and education programmes that help improve the economic and social status of women, including their access to family planning.

(iii) Integration of family planning programmes with all MOH's primary and general health programmes to promote healthier but smaller families.

(iv) Expansion of health post and hospital activities to provide more family planning service delivery and expansion of outreach service delivery.

(v) Promotion of NGOs and private organisations that can improve delivery of and stimulate demand for family planning services at the village level.

(vi) Expansion of manpower and health service capability in the areas of family planning, mother and child health care delivery and women's training, through training and extension services.

Population Programmes

112. The details of HMG's population policies are contained in a strategy document (HMG 1992c).

The following paragraphs summarise the main programme elements of HMG's population policy.

113. **Family planning and maternal and child health care delivery.** One of the most immediate ways in which the fertility rate can begin to be reduced is to more effectively meet the demand for FP. A recent report (New Era 1988) suggests that about 32 percent of women of child-bearing age would like to regulate their fertility by limiting or spacing births.

114. The past failure of the FP delivery programme was due to a number of factors: (i) the lack of a clearly defined family health policy with sufficient priority given to FP; (ii) reliance on a narrow target-setting approach at the planning level; (iii) an insufficient range of FP options offered to individuals; (iv) an ineffective outreach service delivery that did not develop an adequately community-oriented approach and did not utilise female outreach workers; and (v) poor management and insufficient coordination, monitoring and supervision.

115. HMG's new health policy with regard to FP/MCH delivery relies on a number of component programmes: (i) establishing of hospital-based FP/MCH units mandated to provide clinical contraceptive services, as well as other MCH services, such as immunization; (ii) establishing mobile units linked to the hospital-based FP/MCH units offering a complete range of permanent and temporary contraceptive services as well as training of local Health Post staff; and (iii) launching a clinical training centre programme using the hospital-based FP/MCH units as sites for training physicians and other health workers in FP delivery.

116. These clinical FP/MCH service delivery programmes will be complemented by further innovations in outreach service delivery aimed at intensifying and improving the effectiveness of primary health care and FP/MCH services at the village level and below. The new policy is based on expanding the current number of Health Posts through the creation of Primary Health Centres and Sub-Health Posts. An essential element in the success of this programme will be the recruitment of additional female FP/MCH workers.

117. **Information, education and communication** (IEC). Apart from the expansion and reorganisation of FP/MCH delivery services, HMG's policy also emphasises the importance of raising awareness with regard to FP/MCH issues. It is proposed that a national IEC programme be developed that would be implemented by line agencies, NGOs and community leaders.

118. This programme would target a number of different groups. Awareness of population issues at the leadership level requires a continued process of interaction—for example through the National Committee for Population, which is chaired by the Prime Minister—to periodically discuss specific population issues on the basis of studies and papers prepared by a technical secretariat. IEC directed at the people presently operates on a small scale relative to efforts in nearby countries. There is scope for substantial expansion based on careful evaluation of effective materials and challenges to delivery such as Nepal's difficult terrain, varied ethnic groups and widespread illiteracy.

119. **Status of women.** HMG's policy is to improve the status of women. Such improvement is not only a desired social end in its own right, but will also contribute to lowering fertility and child and maternal mortality rates.

120. The focus of this policy is to initiate and expand programmes that increase the enrollment of the female school-age population and increase the involvement of qualified women in development programmes, particularly those prioritising female recruitment as health-service providers. These measures will help to raise the age at marriage of women, and improve female participation in education and employment.

121. **Institutional arrangements.** The success of these programmes will depend to a large extent on improving the institutional arrangements governing the FP/MCH. Part of the task involves elevat-

ing the importance of the goal of curbing population growth. In 1991, HMG established a multisectoral National Committee for Population, comprised of ministers from relevant line agencies and chaired by the Prime Minister. The Population Division of the NPC serves as secretariat to the Committee; however, to date the Committee has not been very active and the Population Division requires strengthening in order to play a central role in the overall planning of population policies and the inter-sectoral collaboration process.

122. The MOH is the main line ministry through which service delivery is carried out. Organisational reforms within it have been implemented with a view to moving from a system of numerous vertical programmes to an integrated primary health care system. Although the general direction of these reforms was well-intended, insufficient political commitment and financial resources have meant that they have instead taxed the management capacity of the MOH, without significant positive impact. It will take time to develop an efficient, well-functioning health system. However, the urgency of the population problem in Nepal and the poor state of health of millions of mothers and children calls for a priority focus on those reforms already instituted to facilitate FP/MCH service delivery in the context of primary health care. HMG will concentrate on implementing a series of well-planned incremental steps towards integrating priority health interventions that are likely to have a practical and immediate impact, rather than a drastic overhaul of

ACTION PLAN FOR POPULATION

Policies	Recommended Actions	Institutional Responsibility	Time Frame
Improve delivery of FP/MCH services to lower fertility rates	Recruit additional local female MCH workers from programme areas	MOH	Immediate, continuous
	Prepare a revised plan for outreach supervision service	MOH	Short-term
	Expand the range and availability of FP methods	MOH	Immediate
	Investigate the potential for private sector (including NGOs) involvement in service delivery	MOH, NPC	Short-term
Raise awareness with regard to range and availability of FP products and the importance of population control	Use a variety of techniques to develop an effective information, education and communication campaign	MOH, MCI, NPC, NGOs	Continuous
Improve institutional arrangements for developing population policies	Strengthen the Population Division in NPC to enable it take a central role in advising the National Committee for Population, and in developing population policies	NPC	Immediate
Improve the socio-economic status of women	Promote adult literacy and education programmes, increase the school enrollment rate for girls, establish skill training programme, extend income generation activities and loan schemes, and make appropriate legal provisions.	NPC, MOH, , MECSW, MLD, MOA	Immediate, continuous

current structural arrangements.

HEALTH AND SANITATION

123. The health status of the population in Nepal is almost universally poor. Infant mortality is 102 per 1,000, with one child in six dying before the age of five. Many of these deaths are accounted for by diarrhoeal diseases, often complicated by malnutrition and acute respiratory infections. Life expectancy remains very low at about 54 years. Data regarding health are deficient. However, if common determinants of health are considered, estimates of these indicators place Nepal among the most disadvantaged countries in the world (Table 2.1).

124. Environmental degradation has three damaging effects. It harms human health, reduces economic productivity, and leads to the loss of "amenities", a term that describes the many other ways in which people benefit from the existence of an unspoiled environment. The health is threatened among others by contaminated drinking water, particulates in city air and smoky indoor air caused by use of such cooking fuels as dung and wood.

125. The lack of adequate clean drinking water and sanitation, safe food supplies and medical facilities are major contributory factors to the poor state of health in Nepal. The previous section discussed HMG's policies with regard to family planning and maternal and child health care, and it is hoped that the measures recommended will reduce the risks of child and maternal mortality. This Section discusses measures needed to improve the availability of clean water, as well as steps to improve awareness concerning the importance of sanitation, which it is hoped will strengthen the demand for improved sanitary conditions and reduce the incidence of waterborne diseases.

Drinking Water Supply

126. Coverage. Nepal faces an enormous task in providing water and sewage facilities to a rapidly growing population widely scattered over its rugged terrain. By the end of 1992, less than half the population had access to safe water supplies (Table 2.2).

127. The level of water supply services in urban areas is generally inadequate and deteriorating under the impact of rapid population growth and industrial expansion. In most of the 36 municipalities where a water supply system is in place, the supply is intermittent, with some areas receiving only a few hours of supply per day in two shifts. The level of service among the municipalities varies depending on the agency responsible for the system and the type of connection.

Table 2.1: Health and Social Indicators of Development in Nepal

Social Indicator	Nepal	Average for Low-Income Countries
Infant Mortality Rate (per 1,000 live births)	102	69
Life Expectancy (years)	54	62
Daily Calorie Supply (per capita)	2,077	2,406
Population per Doctor	30,220	5,800
Adult Literacy (percent of population)	36	60

Sources: HMG. 1992a. Eighth Plan (1992-97). *(Kathmandu: NPC), and World Bank. 1992.* World Development Report 1992. *(Washington DC: The World Bank).*

Table 2.2: Population Served by Drinking Water Supplies, 1970-90

Population served (thousands)	1970	1980	1990
Urban	461	714	1,196
(percent of urban population covered)	(100)	(80)	(75)
Rural	186	862	5,753
(percent of rural population covered)	(2)	(6)	(35)
Total	647	1,576	6,949
(percent of total population covered)	(6)	(11)	(38)

Source: HMG. 1992b. Water Supply and Sanitation Coverages. *(Kathmandu: DWSS, MHPP).*

128. Besides these quantitative shortages, there are various problems related to quality of water. Infiltration of sewage into the water supply system caused by poor construction results in contaminated drinking water supplies. Furthermore, only a few cities have facilities for proper treatment of water from surface and groundwater sources; elsewhere treatment is limited to chlorination. High levels of naturally occurring metals and minerals in some areas and high iron content in ground water pose a public health threat.

129. That poor water supply and sanitary conditions are imposing significant health and productivity costs is apparent from the high incidence of illnesses related to water, sanitation, and household and personal hygiene. Diarrhoea and dysentery are leading causes of morbidity (40 per 1,000 cases) and child mortality (16 percent of total deaths); typhoid, hepatitis and parasitic infections of the gut are also common.

130. The water supply and sanitation sector faces a number of institutional, operational, financial and policy-related difficulties. HMG has stated its desire to decentralise activities in the sector and the organizational framework of lead agencies are undergoing restructuring. Much remains to be done to realise the aim of getting local communities actively involved in and sharing the responsibility for providing water and sanitation services.

131. **Institutional issues.** It is generally accepted that many of the problems in the delivery of water supplies are institutional. Thus, an important theme in HMG's water sector development strategy (HMG 1991b) is the need for institutional restructuring and development to establish an effective institutional framework for a decentralised sector programme. The principal institutional issue is to shift the main focus of HMG from direct service provision to facilitating the delivery of services by a variety of private and local government entities.

132. Institutional restructuring needs to take place at a number of levels. First, as the main aim is to decentralise service provision, central government agencies must develop and improve on those functions that cannot be delegated to lower levels of government. Central agencies will concentrate on: (i) establishing policies and sector planning, together with monitoring and evaluation of performance in achieving policy objectives; (ii) establishing the sector institutional framework, including the definition of government and private roles, and defining the legal framework; (iii) overseeing and controlling government agencies; and (iv) coordinating donor inputs. In establishing the sectoral institutional framework, the ambiguities that arise when one department has both policy-making and implementation functions need to be eliminated by clearly separating administrative responsibilities and assigning

policy making and monitoring functions to ministries and any residual responsibilities for implementation to departments.

133. Second, with regard to urban water supply in the 36 municipalities, responsibility is split between the DWSS (under the MHPP), with responsibility for 23 of the small towns, and the NWSC, which is responsible for the 13 larger municipalities, including those in the Kathmandu Valley. At a general level, there needs to appropriately staffed entities to carry out the full range of technical, financial and managerial activities required to provide urban populations with adequate water and sanitation services. This, in turn, requires a commitment to develop more self-sustaining autonomous urban water and sanitation utility operations.

134. To achieve this, the role of *provision* should be separated from that of *regulation*. Experience from other countries suggests that conflicts of interest emerge when an agency acts both as supplier of water and Wastewater services and as the service regulatory body. A more successful institutional arrangement is where there is a water utility responsible for aspects of service provision and a public regulatory authority that monitors the activities of the utility. One advantage of this separation of powers is that service delivery agencies are released from serving multiple tasks and can pursue better-defined and specific objectives. It is essential that the agencies remain free from undue political interference. For the utility, managerial autonomy, particularly as regards personnel policies, is essential. In the case of the regulatory body, freedom to set reasonable tariffs is critical. HMG plans to establish a Tariff Fixation Commission to govern tariff-setting in the electricity sector, and is intending to consider the question of an overall utilities commission that would set tariffs for all utilities.

135. There is considerable scope for involving the private sector in the distribution of drinking water in urban areas. The possibility of entrusting water distribution and system maintenance responsibilities to users' groups or other private enterprises could be explored. Urban areas might be divided into a number of blocks (existing ward boundaries could be adopted as a starting point) and each such block could be assigned to an interested private group.

136. Increased community involvement in urban areas is also an important element in encouraging people to realise that they can influence decisions and that it is their responsibility to call the water utility to task when it fails to provide adequate service, and to cooperate with the utility to prevent illegal connections, meter tampering and the improper dumping of wastes. To give consumers a voice in water-related issues, consumers' associations and ratepayers' boards that are properly integrated into the decision-making process need to be established.

137. Third, most rural water and sanitation projects have been implemented solely by DWSS, with some donor support. In the past, there was a tendency toward over-programming due to pressures at local and central levels for more projects than could be constructed under the budget. As a result, project completion periods extended for up to a decade, and there was considerable waste in the form of investment tied up in partially completed, non-functioning schemes. Even after completion, many schemes failed to provide the water expected, and some provided none at all. This was partly due to inferior initial construction, but also due to inadequate arrangements for O&M. It became clear that sustainability requires more community involvement in O&M and that this, in turn, requires a greater sense of community ownership from project inception. The community itself must be the primary decision maker, investor, maintainer, organiser and overseer.

138. Within the community, it is important to realise that some community members are more affected than others by improvements in water supplies. Women, in particular, shoulder the burden of fetching water and have the most interest in seeing improvements made and sustained. Sustainability of rural water supply

projects is dramatically enhanced when women have key responsibilities.

139. Recent moves to promote the development of user groups at the village level are an encouraging sign. During this early stage of involving rural communities in water supply projects, however, considerable assistance will still be required from other agencies, particularly during the planning stages. Communities are often short of the skills, tools and materials necessary for project completion, and are unlikely to know the range of available technologies and the associated costs. The private sector, including NGOs, typically has knowledge of technologies and can provide the necessary inputs.

140. **Financial issues.** A major factor in the failure of public institutions in urban areas to provide an adequate level of service has been their extremely weak financial position; the NWSC, for example, has consistently made operating losses—almost NRs. 58 million in 1990. This weak financial position results in insufficient funds for O&M and the system declines further. An estimated 40 percent of water supplied is currently unaccounted for in the Kathmandu Valley, which further undermines the Corporation's financial integrity. Some solutions are technological. Water meters have in the past become clogged, forcing people to bypass them. A proper system of meter maintenance is required, and water leaks need to be identified and fixed quickly. However, these improvements will need to be accompanied by an expanded and properly funded infrastructure construction programme. This can only be done if sufficient resources are mobilised from consumers.

141. A system of water tariffs that reflects the cost of providing water and charges individuals on the basis of the quantity of water consumed is preferred to ensure an efficient use of supplies. To achieve this, there needs to be a substantial increase in tariffs. The difficulty is that people are unwilling to pay more without seeing immediate benefits from service improvements, but such improvements are unlikely to materialise quickly given the many institutional issues that presently compromise delivery. Public understanding and support for resource mobilisation policies should be secured through improved public dialogue.

142. The principles of cost recovery are also becoming more institutionalised in rural areas. Greater involvement of local communities through small but important cash contributions and the more widespread practice of contributing labour enhance the perception of project ownership, improving the chances of project sustainability. Rural communities, where cash is scarce, are more likely to focus on appropriate designs, and some NGO programmes already make use of this approach.

143. **Water source protection.** In many rural areas, insufficient attention has been paid to protecting water sources. A lack of understanding about the transmission mechanisms of waterborne diseases means that people often pollute water sources indiscriminately in various ways and manners without understanding the consequences. Free-grazing livestock also pollute water with their wastes. Deforestation in watersheds has facilitated the contamination process by providing easier access to water sources.

144. These problems are the result of drinking water projects that are too narrowly defined: projects which provide a water supply without considering the wider environmental requirements for project success. The past lack of community involvement has also resulted in the expectation that government will provide and maintain water supply projects and that the community's role is merely to receive the service.

145. Rural water supply projects are beginning to place a much greater emphasis on community participation. Communities are starting to have a say in the type of water supply system they would like and are prepared to pay for; they are contributing directly to projects either through cash or more often through labour; and they are being made responsible for system maintenance. New projects also include programmes to educate people about sanitation and the need for protect-

ing water sources by planting trees and building fences. Future rural water supply projects will need to encourage community participation in project design and implementation, develop public health education programmes and institute water source protection measures.

146. **Water rights.** Providing sufficient water is essential for meeting people's minimum needs and for developing an expanded system of household sanitation and industrial Wastewater treatment. Current levels of water supplied to urban areas are insufficient for these needs; indeed, domestic consumers in urban areas often receive the lowest priority for water. There are competing needs for water, as it has many economic uses; for example, irrigation water can dramatically improve crop yields, and many industrial processes utilise large amounts of water. The quantity of water available in urban areas is affected by upstream use, mainly in irrigated agriculture. Inappropriate pricing of irrigation water, ambiguous water rights and illegal connection all result in overuse of water upstream and insufficient supplies for urban households and industries.

147. To date little effort has been made to clarify the basis on which scarce water resources should be allocated, and to clearly define water rights. This is a difficult issue but one that needs urgent attention. The legal and administrative framework for the regulation of water resources is currently under study. A draft Water Resources Act sets out a new framework and deals with some of the most critical elements. Appropriate by-laws now need to be formulated and enforced.

Sanitation

148. Improved water supply systems on their own are unlikely to result in a substantial improvement in health conditions as long as faecal-oral transmission mechanisms remain unaffected. There is an urgent need to give a much higher priority to investing in sanitation. At present, no towns outside the Kathmandu Valley have waterborne sewerage systems. Programmes are needed to deal with all aspects of sanitation: disposal of human excreta; personal and food hygiene; and disposal of solid and liquid wastes. Environmental sanitation education programmes are necessary to inform people of the health implications of unsanitary conditions and what they can do to improve hygiene.

149. **Coverage.** Sanitation coverage is even more limited than drinking water supply, with just three percent of the rural and 34 percent of the urban population, equivalent to six percent of the national population, being provided with sewage disposal facilities. Only about 25 percent of people in the three cities in the Kathmandu Valley have access to a proper sewerage system. The fact that access to a latrine is considered sufficient for sanitation services indicates the expected level of service. In fact, 94 percent of the country's population does not even have this facility. There is no operating sewage collection and treatment facility in Nepal and untreated water from individual latrines, factories and municipal sewers is commonly discharged into natural water bodies. Dead animals are also disposed of alongside water bodies, further contaminating drinking water sources.

150. **Raising demand.** The low level of demand for sanitation in Nepal reflects widespread ignorance about the relationship between disease and sanitation. Improvements will require efforts to first educate people about desirable changes, and then to motivate and empower them to make those changes. There are many approaches to changing attitudes. Education programmes aimed at increasing awareness about sanitation could be incorporated into programmes outlined earlier that seek to improve understanding about FP and MCH practices. Case studies from Nepal and neighbouring countries indicate that participatory techniques that involve village groups, particularly women, in the design and construction of facilities can contribute significantly to increasing the demand for sanitary facilities and their success and sustainability.

151. Past attempts to cover all capital and O&M costs have failed as the public authorities imple-

menting sanitation projects have had insufficient funds and managerial capacity. A new approach is needed, based on a much greater role for communities and the private sector. Identifying what kind of service people want and are willing to pay for is an important step that has been given insufficient attention to date.

152. Given the low per capita income, it is not clear how much people in Nepal are willing to pay for sanitary systems. Studies in urban areas at the ward level, and rural areas at the settlement level, would provide some initial answers. Sanitation projects will only succeed if they provide the type of service that people want. It is likely, however, that people—especially in urban areas where population densities are high, per capita incomes are above the national average and the results of inadequate sanitation are more clearly noticeable—are willing to pay for a reliable sanitary disposal system. It is necessary to offer people a choice of the type of system, as costs can vary considerably depending on the type of system constructed[2]. Which type of system people would like is a choice that should be made at the community level in consultation with the service providers.

153. In the Kathmandu Valley, there are programmes in which community groups can initiate the construction of sewers and contribute towards the cost. In residential areas where drainage problems are serious, people are often motivated to contribute to the cost of collection and conveyance away from their property. Without coordinated efforts for collection and treatment, however, this may only transfer the problem from one area to another. Ambiguous institutional arrangements result in unresponsive public authorities while the public is left with the continuing problem of poor drainage and sewerage.

154. **Stormwater drainage.** No HMG line agency has clear responsibility for building and maintaining stormwater drainage channels. Failure to provide adequate drainage results in damage to other infrastructure, such as roads, and the accumulation of stagnant stormwater that creates health problems as it can become a source of disease. Contaminated stormwater is polluting groundwater sources in some areas. Human and vehicular traffic flows can also be disrupted by excess stormwater if sufficient drainage is not provided. This is particularly a problem in the Terai where the terrain is more or less flat and the amount of rainfall is high.

155. The Nepali word *nali* is used to refer to stormwater drainage. Unfortunately the same word is also used when referring to the open roadside drain commonly constructed by the DOR for protection of the road itself, as opposed to stormwater drainage with area-wide coverage. This lack of distinction between the two different types of drainage is one source of confusion with regard to assigning institutional responsibilities.

156. Although side drains are often included in new road construction, the delineation of responsibility for proper urban drainage, which involves providing all roads, paths and private and public properties with adequate drainage protection, has not been specified in existing legal provisions. By default, drainage works have become municipalities' responsibility, but the municipalities have not taken up this responsibility due to insufficient funds. The result is that drainage civil works have been generally carried out in an *ad hoc* manner, with little planning and inadequate technical input.

157. The municipality is probably the appropriate institution to assign responsibility for providing stormwater drainage, as it is essentially a local issue. However, the role of the municipality needs to be confined to overall planning and monitoring and provision of technical assistance. As drainage works are fairly simple and demand a significant labour component, local communities could be encouraged to build and maintain them. Private contractors could also be used. As the benefits from stormwater drainage accrue to society as a whole, funding for it should be provided from the municipality's own budget, which is likely to increase the need for review and reform of local government finance, as current funds are insufficient for providing adequate drainage. A sound

ACTION PLAN FOR HEALTH AND SANITATION

Policies	Recommended Actions	Institutional Responsibility	Time Frame
Improve coverage and delivery of urban water supplies	Separate service provision from utility regulation	DWSS, NWSC, NPC	Short-term
	Avoid direct service provision by government agencies	DWSS	Short-term
	Set appropriate level of tariffs based on cost of supply	NWSC, NPC	Immediate
	Investigate options for greater private sector involvement	NPC	Short-term
Improve coverage and delivery of rural water supplies	Encourage greater community involvement, especially of women		
	NGOs, DWSS	Short-term	
	Combine programmes to protect watersheds with water supply projects	DWSS, DSC	Short-term
Revise institutional arrangements to shift the focus of government agencies from direct service provision to facilitating service delivery	Central government agencies will concentrate on policy making, M&E, establishing an institutional framework, overseeing government agencies and donor coordination	NPC	Immediate
Raise demand for sanitation	Develop programmes to educate people about the importance of sanitation, personal hygiene and health	MOH	Short-term
Increase sanitation coverage by providing services that people want and are willing to pay for	Conduct studies to ascertain the type of sanitary service people are willing to pay for	NPC	Short-term
	Develop clearer institutional responsibilities concerning all aspects of sanitation	DWSS, NWSC, DOR, MLD, MOH, municipalities, NPC	Immediate, continuous
Improve efficiency of water allocation among competing needs	Define the basis of allocating water rights and enact necessary legislation	MWR, MHPP, MOA	Short-term
Improve quality of drinking water	Develop drinking water quality surveillance and drinking water standards.	MOH, MHPP	Immediate
	Promote on-site low-cost sanitation options	DWSS	Short-term
Improved food safety and pesticide control	Adopt appropriate standards for toxic contaminants of food and strengthen surveillance and monitoring capability	MOA, MOH	Short-term, Continuous

mechanism for raising capital needs to be worked out.

158. **Solid waste management.** Inadequate disposal of solid wastes poses a risk to public health. The existing management of solid wastes relies on an overly centralised approach. With a rapidly growing urban population, current institutions are unable to provide an adequate level of service. The result is that piles of rubbish are left to rot in the streets, presenting a particular health risk to children who often play close by.

159. The traditional approach taken by the MHPP has resulted in people regarding solid waste disposal as the government's responsibility. With government nominally assuming responsibility, communities have little influence over trying to improve services. As with stormwater drainage, solid waste management is essentially a local problem requiring local solutions. So long as individuals are able to externalise the costs of dumping their own solid waste in the streets, anticipating that government agencies will dispose of it, there is no incentive for local communities to improve their solid waste management practices.

160. One possibility might be to turn the responsibility for initial collection over to local communities at the ward level. They could be responsible for initial household collection and delivery to a central point for collection by the municipality, which would then ensure safe, final disposal. Wards could be given the power to levy user fees for solid waste disposal on ward residents. Providing that wards can be more successful at organising solid waste collection than central government, which may demand some initial technical assistance to develop an appropriate management system, it is likely that people will be willing to pay to have their solid waste removed.

161. Organising solid waste disposal at the ward level also enables development of other local initiatives: education programmes to explain the health risks posed by rubbish in the street, and recycling programmes that would rely on residents separating their waste to enable plastic, glass and other items to be recycled.

162. **Institutional responsibilities.** Public responsibility for sanitation is fragmented among several institutions: municipalities (drainage, sanitation and solid waste); DWSS (drainage and sewerage, although the Department does not actually have any sewerage operations); NWSC (sanitary sewers); and DOR (roadside drains). Inter-agency coordination is through the National Water Supply and Sanitation Committee; however there is confusion concerning the precise role played by each agency.

163. HMG has endorsed a national policy on sanitation in March 1993. Sanitation means raising the quality of life through clean environment. Although the range of institutions associated with sanitation are multisectoral, MHPP has been identified as the lead institution. The NPC and the National Water Supply and Sanitation Committee have been given a mandate to undertake the required co-ordination activities.

POVERTY ALLEVIATION

164. The close interlinkages between a limited resource base, rapid population growth, environmental degradation, low levels of social development and widespread poverty present a complex development challenge, which requires a well-focused strategy to ensure economic development and poverty alleviation on a sustainable basis.

Poverty, Environment and Population

165. Poverty is both a cause and effect of environmental degradation. Lacking assets and choices, open access to Nepal's natural resources has provided the poor with the only feasible short-term mechanism for their survival. Environmental degradation has three damaging effects. It harms human health, reduces economic productivity and leads to the loss of amenities. It also imposes significant costs on the poor through low and declining farm productivity, leading to reduced incomes, and rising production and household maintenance costs.

166. The impact of inadequate soil fertility on farm productivity has been discussed in the section on Land Management. The need to obtain fodder and fuelwood from increasingly distant and less productive sources reduces the time available for productive activities. The time taken to fetch water also increases as supplies diminish due to greater demand from domestic, agricultural and industrial consumers.

167. Policies aimed at improving the quality of life of the poor therefore need to tackle poverty, environment and population issues simultaneously, through targeted programmes that assist the poor directly; environmental programmes that emphasize the need for community management of resources and develop the institutional capacity of users to manage their own resources; and programmes aimed at reducing the number of children families must provide for.

Poverty Alleviation Policies

168. Based on the need to develop a multi-sectoral approach to poverty alleviation, HMG's policies for reducing the number of poor people are based on four central elements (HMG 1993):

(i) a reduction in the rapid rate of population growth that presently adds about 250,000 a year people to the number of absolute poor (see section on Population for further details on HMG policies in this area);

(ii) an increase in agricultural productivity (see sections on natural resource management for more details);

(iii) an expansion of off-farm employment opportunities; and

(iv) the development of measures to provide direct relief to the millions who are currently poor and are likely to remain so in the foreseeable future.

169. It is beyond the scope of this environmental report to review in detail the direct interventions that are planned under (iv) as part of HMG's poverty alleviation strategy. Discussion here is instead limited to issues associated with providing improved off-farm employment opportunities.

Off-Farm Employment

170. Population growth has resulted in a reduction in the average size of landholdings and an increase in landlessness. In the search for an improved standard of living, migration has been a significant feature over the past 20 years. Improved off-farm employment is one approach that may provide important opportunities for many poor people to find gainful work.

171. **Migration.** Between 1971 and 1991, there was a pronounced shift in population down from the mountain and hill areas to the Terai . Most of those migrating originated in the Hills, whose share of population fell seven percent to 46 percent. Another shift involving a further two percent of the population moved out of the Mountains. Together these shifts raised the Terai population by nine percent to 47 percent of the country's total, and overall, population in the Terai almost doubled during this twenty-year period.

172. The success of an extensive malaria-eradication programme during the 1950s permitted settlement of large areas of the Inner and Outer Terai. Concern about the ability of upland agricultural systems to produce sufficient food and fibre for a rapidly growing population, and the opening up of large areas of unsettled land suitable for cultivation led the government to formally encourage the process through its official resettlement programme. The resulting increases in agricultural output in the Terai were obtained at the expense of its forests. Faced by an increasingly pressing need to improve agricultural production, this settlement strategy was generally appropriate, but with Terai forests now in increasingly short supply, HMG has ended its formal resettlement programme. Spontaneous migration from the Hills and Mountains continues, however, and is placing considerable pressure on the natural resource base.

173. In part this pattern reflects better economic opportunities available in other parts of the country; however, in Nepal's case, with almost half of the population living in absolute poverty, economic hardship is a significant determinant of migration. The decision to migrate is often viewed as a last, sometimes desperate attempt to obtain land to farm. With soil fertility declining and forests being degraded, poor farmers are often left with no alternative. It is hoped that the actions recommended in the sections on natural resource management will contribute to improving the productivity of hill and mountain farming systems, and thus reduce the need to migrate. However, in many areas of the Hills and Mountains, the carrying capacity of the land has already been exceeded. In these areas the prospects for improving the productivity and profitability of agriculture are severely limited, and people will continue to migrate in search of a better standard of living.

174. **Infrastructure development.** Attempts by government to control directly the pace and direction of migration are unlikely to influence individuals driven by economic necessity. Government policies can, however, have a dramatic indirect impact on individual decision-making. As the population projections outlined earlier suggest that the land base in the Terai will reach saturation during the next two decades, the most important policies are those that promote off-farm employment opportunities. One of the most appropriate strategies to encourage is the development of infrastructure.

175. The construction of roads to link farms and markets, irrigation facilities to provide water to increase agricultural productivity, hydroelectric projects to supply power, and schools and hospitals to provide basic social services all provide important employment opportunities for the poor; some existing Food-for-Work programmes have already proved successful in this area. In providing improved infrastructure, however, projects need to be carefully designed to minimise adverse environmental impacts. Sections on Irrigation, Roads and Hydroelectric Development discuss some of these problems.

Notes

[1] The total fertility rate is the average number of live births a woman could expect to have if she was to live through her reproductive years experiencing the current age-specific fertility rates.

[2] Recent advances in low-cost technologies mean that communities do have a real choice in deciding what kind of sanitation system they would like. HMG should use the experience gained by international donor-agency activities in other low-income countries to develop a possible menu of options to offer communities together with the cost of the various options.

ACTION PLAN FOR POVERTY ALLEVIATION

Policies	Recommended Actions	Institutional Responsibility	Time Frame
Reduce rapid rate of population growth	[See Action Plan for Population]		
Increase agricultural productivity	[See Action Plans on Land, Forest and Rangeland, and Water Resource Management]		
Expand off-farm employment opportunities	Design environmentally appropriate infrastructure projects utilising unemployed skill of the poor	All relevant development agencies	Short-term, continuous
Develop measures to provide direct relief to the poor	Prepare various targeted interventions to assist the poor with social services and income-generating opportunities	NPC	Longer-term

3 Safeguarding national heritage

176. Nepal has a rich natural and cultural heritage. In recent years, however, growing concern has been raised regarding the degradation of these resources. Conflicts have developed between local residents and authorities in areas surrounding some of the designated protected areas and national parks. Areas adjacent to cultural and historical monuments and religious shrines are being damaged by encroachment, poor maintenance and unsanitary conditions. Growing congestion along the most popular trekking and mountaineering routes is leading to an accumulation of solid waste and localised deforestation.

BIODIVERSITY CONSERVATION

177. Nepal has developed an impressive network of protected areas as a means of conserving its biodiversity. Problems have emerged, however, in the management of these areas, and a number of new models for park management are being developed by both private NGOs and public institutions.

Status of Biodiversity

178. Thirty-five different forest types have been identified in Nepal. Estimates vary as to the number of plant and animal species contained in these and other ecosystems but approximate numbers indicate there are over 6,500 species of flowering plants, over 1500 species of fungi and over 350 species of lichens. About 370 species of flowering plants are considered endemic to Nepal and around 700 species are known to possess medicinal properties. The fauna of Nepal include about 175 species of mammals, 850 species of birds, 180 species of fish, 640 species of butterflies, 143 species of moths (though some estimates put this figure at more than 1,000) and 180 species of dragonflies.

179. If Nepal were to lose its remaining humid tropical forest, it has been estimated that ten species of highly valuable timber, six species of fibre, six species of edible fruit trees, four species of traditional medicinal herbs and some 50 species of little known trees and shrubs would be lost forever. In addition, the habitat for 200 species of birds, 40 species of mammals and 20 species of reptiles and amphibians would be severely affected.

180. Efforts are already being made to conserve this diversity by establishing protected areas in ecologically important region. Such a system can protect and conserve biological diversity *in situ*. However, outside protected areas, where most wildlife habitat occurs wildlife resources are virtually unprotected. Poaching of wildlife, including birds, and capturing live animals for trade pose a serious threat. Similarly, aquatic species including fish, receive little direct protection. Unauthorised collection of orchids from the wild has further endangered some species.

181. Several wildlife species have become rare and endangered in Nepal due to mismanagement. Currently, 26 mammals, nine birds and three

reptiles have been legally classified as endangered. The protected wildlife species list under the National Parks and Wildlife Conservation Act (1973) is not comprehensive and several identified endangered species are not included. The list needs updating based on further research into the status and ecology of endangered species.

182. Conserving biological diversity *ex-situ* also is important to save species in which populations have been reduced to an unviable level. Nepal's Royal Botanical Garden and the Central Zoo are responsible for *ex-situ* conservation of genetic materials, but they are hampered by the lack of human, financial and technical resources. The small gene bank maintained by the National Agricultural Research Council in Kathmandu suffers from similar problems.

183. Many terrestrial and aquatic plant and animal species that are either cultivated and domesticated or left in the wild remain underexploited in terms of their potentials to provide food, fibre, energy, wood, medicines and other products useful to man, while others are being harvested beyond their natural regenerative capacity. Several indigenous species of crops, animals, birds and fishes play significant roles in the traditional food systems of many areas. These species are well-adapted to local agro-ecological conditions and are hence environmentally compatible. Other desirable traits are low input requirement and drought and pest resistance. In the process of agricultural modernisation, these indigenous species are becoming threatened as exotic germplasms are introduced and specialisation replaces traditional multiple-cropping and mixed farming systems. A concerted effort is needed to conserve, enhance and promote such indigenous species/lines which occur in natural ecosystems of forests, pastures and rangelands, rivers, lakes and ponds, and farmlands.

184. **Monitoring biodiversity**. A number of biodiversity databases are being established to collect inventory data related to regional ecosystems, including the scientific cataloging of flora and fauna, although there is no overall national programme to monitor biodiversity.

185. In the absence of systematic inventories knowledge of the status of Nepal's flora and fauna remains incomplete. It is not even clear which species have become extinct and which need immediate protection. Some species known to be endangered by international trade have been listed in the CITES Appendices. However, in the absence of full supporting information, many species that are feared to be endangered have not received protected status, either in Nepal or internationally.

186. Several programmes are compiling other types of databases related to biodiversity issues, but these are scattered across a number of different institutions. For example, the Forest Survey and Research Centre (under MFSC) collects information on forest resources; the DNPWC assembles some information on wildlife species and their habitats in protected areas; and the Department of Botany works on herbarium collection, flora compilation and *ex-situ* conservation of plant species. The Divisions of Entomology and Fishery (under NARC) maintain records on insects and fishes respectively. The Natural History Museum and Department of Zoology at Tribhuvan University also keep record of species of fauna. There is a need to consolidate and publish this scattered information in order to improve knowledge about biodiversity.

Protected Area Management

187. HMG's main efforts in biodiversity conservation have involved an extensive network of national parks and protected areas developed over the past two decades, covering more than 15,000 square kilometers, almost 11 percent of Nepal's total land area. The protected area network includes eight national parks, four wildlife reserves, two conservation areas and one hunting reserve. Sagarmatha and Royal Chitwan National Parks have been included in the United Nations World Heritage List due to their outstanding natural values, and the Koshi Tappu Wildlife Reserve has been included in the list of wetlands of international importance under the Wetland Convention.

188. However, the present network of parks and protected areas is not complete, and not all physiographic zones are fully represented. The tropical evergreen forests and temperate and subtropical broadleafed forests are missing in the system. The mid-mountain region is also poorly represented, with only one percent protected area coverage, as compared with at least four percent for all other zones and 17 percent in the case of the High Himal.

189. Wetlands in Nepal have often been overlooked as an important habitat. Many wetlands are suffering the consequences of land and water pollution and disturbance by humans; some have been drained and converted into agricultural land. A wetland inventory being developed as part of the NCS Implementation Project could form the basis for a wetland protection policy.

190. **Management issues.** Despite the impressive coverage of the protected area system, several problems relating to management have emerged. In some areas conflicts have developed between the park authorities and local residents regarding the latter's right to extract products, such as fuelwood and fodder, from protected areas to meet their essential needs. The restriction or denial of access to parks and reserves has in some cases resulted in economic and social hardship for local people. Ineffective communication and management has worsened this problem, leading to sometimes acrimonious relationships between local people and park authorities.

191. Second, successful protection has allowed animal populations to expand in protected areas. As a result, some species are having a serious impact on local communities, causing injuries (and occasional fatalities) of humans, livestock losses and the destruction of crops, and so adding to the conflict between people and parks.

192. Third, to enforce protected area regulations, park authorities rely on the assistance of the Royal Nepal Army. Although deployment of the army has helped reduce poaching within protected areas, it has created its own difficulties. Administrative authority has become divided, leading to some confusion about who has overall authority for parks. Also, soldiers who are assigned to protect parks are not given any special training and consequently lack an adequate appreciation of their new, non-military role. In addition, the cost of army protection is high, taking up about three-quarters of DNPWC's total budget.

193. Fourth, in the past, communities have not been involved in management decisions and have not been entitled to a share of locally generated revenues from park activities. Local people have therefore tended to regard parks with suspicion: not only has their access to areas where once they were free to go been restricted—they have not received adequate compensation for this loss of access.

194. Fifth, there has been a perverse effect on areas in the immediate vicinity of protected areas. Because of the restrictions inside the protected areas, extractive activities have been intensified in the surrounding areas, causing severe damage to ecosystems.

195. Finally, and reflecting some of the points above, many protected areas either adhere to outdated management plans that rely mostly on exclusion through tight policing rather than encouraging local participation, or have no plans at all.

196. HMG is now taking steps to address these issues based on the recognition that successful park management relies on developing good relations between park authorities and the local people who are affected by the existence of protected areas.

197. **Involving people.** There is a growing realization that the ultimate success of protected areas depends upon the cooperation and support of local people. Autonomous, non-governmental committees should be created in each affected areas authorised to collect funds, including tourism revenues, and to allocate them for sustainable community development. Channelling tourist

revenues into community development will help to increase people's participation in national parks and reserves.

198. People living outside the boundary of protected areas but adjacent to them should be compensated for loss of resource usage. The compensation should be in the form of community development works, including agriculture, supported by funds raised from tourism and government allocation, as well as from international sources.

199. These new approaches are being tried in the Annapurna Conservation Area and the Makalu-Barun Conservation Projects, and some success at involving local people directly in project planning and implementation has been achieved. These approaches are, however, innovative and experimental, and the extent to which they may be replicated for other areas is not yet clear. With deforestation, environmental degradation and disappearing species, environmental concerns need to be made an integral part of protected area management.

200. The National Parks and Wildlife Conservation Act (1973)—the main act that governs the conservation of ecologically valuable areas and their indigenous wildlife—has recently been amended to introduce the concept of revenue sharing. Local communities will be permitted to retain 30 to 50 percent of locally generated revenues for development projects.

201. **Institutional arrangements.** There are several institutions responsible for biodiversity conservation in Nepal. The main responsible agency is the DNPWC (under the MFSC), but it faces major constraints in managing and protecting areas due to the lack of financial and human resources. The Plan for the Conservation of Ecosystems and Genetic Resources prepared as part of the Forestry Sector Master Plan noted that "DNPWC has little effective management capacity, no working policy instructions, suffers from shared responsibilities, lack of coordination with other agencies of HMG and with local communities, and has substantial unmet training needs".

202. The DNPWC's authority to act is further limited in a number of key areas: (i) Confusion regarding administrative authority for park management between Royal Nepal Army and DNPWC (ii) the Department of Immigration is responsible for issuing trekking permits, with the result that DNPWC has no involvement in planning numbers or destinations of trekkers; (iii) with no power to regulate the numbers or activities of trekkers in parks, there is little incentive for DNPWC to coordinate with other government ministries, such as the Ministry of Tourism, to improve management; and (iv) DNPWC has neither the mandate nor the resources to work with communities outside protected areas who are most seriously affected by the presence of parks and reserves.

203. There is a strong need to substantially improve the institutional capacity of DNPWC to enable it to carry out its duties effectively. Given some of the difficulties outlined above it may be desirable to reconsider the role of the army as park protectors. Closer inter-departmental coordination is only possible if a forum exists for discussion and if responsibilities are modified to reflect DNPWC's role as the lead agency for protected areas.

204. Other institutions directly involved in biodiversity protection include the DOF, which is responsible for taking care of all flora, fauna and timber species within territories. Biodiversity outside protected areas currently receives little attention. To remedy this, the Master Plan for Forestry Sector suggests that wildlife management outside protected areas be made the responsibility of the District Forest Office. Where necessary the DFO should be strengthened by a wildlife management expert from the nearest park or reserve. This proposal requires further scrutiny. Finally, the Department of Botany carries out *ex-situ* conservation of species in the Botanical Garden. Department of Agriculture, NARC and NGOs should be strengthened to conserve, develop and wisely use genetic diversity to meet future need for increased agriculture production.

ACTION PLAN FOR BIODIVERSITY CONSERVATION

Policies	Recommended Actions	Institutional Responsibility	Time Frame
Strengthen the capacity of DNPWC to act as the main institution responsible for protected areas	Reassess the role of the army as park protectors to minimise "people-park" conflicts ; develop an alternative protection force	DNPWC, RNA	Immediate
	Commission a study to resolve the problems of overlapping jurisdiction in protected areas and to recommend a simplified procedure for handling various activities affecting protected area management	DNPWC, MTCA, DOT	Short-term
Ensure adequate representation of Nepal's major ecosystems in the protected area system	Review the representativeness of the existing protected area system	NPC, MFSC, MOA	Immediate
Involve local people directly in the management of parks	Develop mechanisms for benefit-sharing with people whose livelihoods are adversely affected by parks	DNPWC	Short-term
	Effectively harness the efforts of NGOs to test and develop appropriate models of park management	DNPWC, NGOs	Short-term, continuous
	Set up a Task Force to prepare guidelines for the development of management plans	DNPWC, NGOs	Immediate
	Enact and enforce necessary legal and regulatory measures to implement major international treaties and conventions, as well as to control illegal wildlife trade within the country	MFSC	Short-term
Preserve endemic and endangered species and their habitats	Promote tourism in protected areas, consistent with conservation objectives	MFSC, MTCA	Short-term
	Identify, and take actions to protect, marshes, wetlands and water bodies significant to biodiversity conservation	MFSC, MWR, NEA	Short-term
	Develop management plans to conserve biodiversity, while providing for people's basic needs	DNPWC, NGOs	Immediate, continuous
	Mount a study to assess the status of biological diversity of endemic plants and animals, both terrestrial and aquatic, occurring outside protected areas in farmlands, pastures, rangelands, forests, rivers, lakes and ponds	MFSC, MOA, NARC	Immediate
Promote private and public institutions for biological resource inventory and conservation	Collate and disseminate data on biodiversity from various, existing databases, and establish a national biodiversity database	DNPWC, MFSC, NARC, DOB, TU, NGOs	Short-term
	Identify and strengthen institutions responsible for research, education and training in biological resource management	DNPWC, TU, NGOs	Short-term

205. **Management plans.** Management of protected areas is likely to succeed only if plans are prepared in consultation with local resource users and park authorities that specifically address the management issues outlined above. Many protected area plans are out dated and need revision. Some protected areas have no management plan at all and appropriate plans need to be prepared. The DNPWC should be responsible for developing management plans. However, there are at present no specific guidelines for the development of plans for protected areas, and DNPWC's current institutional capacity to develop such plans is inadequate. Part of the overall improvement in DNPWC's institutional capacity might include the establishment of a Task Force to prepare and develop guidelines for management plans.

206. One important approach that should be considered when developing plans for nature conservation areas is the concept of a strictly protected core area, surrounded by a sustainable resource use area with multiple-use management in the periphery to ameliorate park-people difficulties. The core zone would be managed as a national park, strict nature reserve or wildlife reserve, and the peripheral zone with its human settlements would be managed as a conservation area. This idea has already been introduced in the Makalu-Barun region where the core area, free of permanent settlements, will be managed as a national park with the primary objective of nature conservation, and the area with human settlements will be managed as a conservation area where sustainable multiple-use resource management and community development programmes will be launched. HMG has recently promulgated the necessary legal provisions to develop buffer areas outside protected areas.

CULTURAL HERITAGE

207. The long and complex cultural history of Nepal encompasses an extraordinary natural heritage. Most sites or areas of special heritage importance are a blending of both natural and cultural values. Heritage sites may be of immediate aesthetic, architectural, historical or social significance, but the cultural inspiration grows from the natural site and its historical development. Over time, the links with and inspiration for many monuments and sites have been lost or overtaken by cultural transformation. Traditional management processes have been lost with social and religious change and government control. Despite considerable effort on the part of many people to conserve the heritage of Nepal, it is apparent that many places of significance have deteriorated over the last two decades.

208. Art, literature, music, language and folklore are also an integral part of Nepal's cultural heritage. The impact of modernisation will alter people's perception of culture, as new methods of communication and forms of media permeate to rural areas and as infrastructure opens up previously inaccessible areas. It is not within the scope of this report to address these issues, which are more social than environmental in content. Instead the coverage is limited to cultural resources that are directly related to historical and religious monuments, shrines and other antiquities—the more tangible elements of cultural heritage.

Status of Cultural Heritage

209. Nepal has a rich cultural heritage. A preliminary survey of 72 districts outside the Kathmandu Valley conducted by the DOA has identified 864 historical and 119 cultural heritage sites. Within the Kathmandu Valley, the Kathmandu City Development Committee has listed a total of 870 religious and cultural shrines and monuments.

210. There is a general perception, however, that this cultural heritage is deteriorating, though no detailed studies have been carried out to assess the extent of the deterioration. Although many traditional fairs (*jatra*) and festivals (*parva, chahad*) continue to be observed, much of the physical infrastructure developed over centuries to promote and facilitate the continuity of religious and cultural values has suffered from neglect and poor maintenance. Buildings are in danger of collapse; shrines, temples and other important structures are poorly maintained, and those in urban areas are

often crowded out by illegally constructed buildings; theft of statues and other antiquities is also a problem.

211. One of the most serious threats to heritage sites in urban areas is uncoordinated development that results in unsuitable buildings being erected close to temples, shrines and other important monuments. Sites are also suffering from encroachment and deteriorating sanitary conditions. There is a need to adopt a holistic approach and develop plans with the involvement of local people that can address the need for new construction while recognising the importance of preserving the aesthetic qualities of such sites. Some of these issues are addressed in more detail in the Section on Urban and Industrial Development.

Preserving Cultural Heritage

212. Development involves a process of change. It is not possible, or even desirable, to try to maintain every temple or shrine in Nepal. People's priorities change, and with it people's views of which monuments are important to them. The solution to preserving Nepal's cultural heritage lies in developing local institutions to support heritage sites that local people value, and in encouraging international institutions to support sites whose importance extends beyond national concerns, and for which local resources may not be sufficient for adequate preservation.

213. HMG's policy is to develop a framework that enables prioritisation of cultural sites in need of preservation and restoration. A nationwide inventory of heritage sites is currently being prepared. Criteria for assessing the importance of different sites are also being developed. The intention is to prepare a National Heritage Conservation Register that identifies sites of greatest significance for which national resources are required.

214. For the preservation of sites of local importance, a local system based on the user-group concept or a strengthening of traditional institutions is required. More viable and effective mechanisms are needed through which the necessary resources can be made available to local communities to preserve their own heritage.

215. Additional revenue-raising possibilities could also be explored. One of the main reasons people come to Nepal is to enjoy its cultural treasures, but apart from tourist-related fees they contribute little to ensuring the preservation of the very culture they come to enjoy. It is likely that tourists are willing to pay user fees to enjoy Nepal's built heritage just as much as they have proved willing to pay to enjoy its natural heritage. One possible first step might be the development of voluntary fees. A study could be commissioned to examine possible options.

216. **Institutional arrangements.** Traditionally, the preservation of Nepal's cultural heritage was associated with the *guthi* or trust. Leaders established private or public *guthis* to which they endowed, as an act of piety, land, other property or funds. These resources were used to maintain various forms of cultural expression, such as monuments or festivals.

217. Creation of the *Guthi Sansthan* in 1964 consolidated all such trusts into a national undertaking and replaced the decentralised, autonomous system of management with a centralised system. Since its creation, the *Guthi Sansthan* has faced an increasing problem of resource scarcity. It has been unable to maintain updated records on where *guthi* lands are located, and has only collected a fraction of the revenue from the areas of land entrusted to it. As a result, it has been unable to adequately maintain and manage the numerous shrines and monuments all over the country that come under its jurisdiction.

218. In response to the *Guthi Sansthan's* inability to carry out its responsibilities, HMG has stated its intention, in the EFYP, to transfer all *guthi* lands to private ownership. In the absence of a properly supported alternative institution to manage heritage sites, this policy needs to be reassessed. A hasty transfer of *guthi* land could leave Nepal with no local capacity at all to preserve its important cultural heritage.

219. Nearly all major restoration and development activities are carried out by the Department of Archaeology, which has a large mandate. Not only does it control all museums, but it is also responsible for the protection and preservation of monuments, temples, monasteries, public shelters (*pati, pauwa*), water spouts, icons, paintings and manuscripts; the study of historical, cultural and artistic heritage; documentation of important historical, archaeological and artistic sites; and the publication of research material pertaining to the history of Nepal. Inadequate funding and manpower means that HMG has to rely on external support to carry out these functions. Donor interventions have tended to encourage a piecemeal approach to heritage management, and as a result the DOA has had no clearly stated policy on heritage preservation—an issue that requires immediate attention[1].

TOURISM

220. More than 325,000 tourists currently visit Nepal each year, and arrivals are expected to grow annually by eight to ten percent for the next few years. Gross foreign exchange earnings from tourism exceed $60 million per year and represent around 47 percent of the total value of the country's merchandise exports. The contribution of the sector to total GDP is also increasing. Tourism is thus an expanding economic sector supporting various service and ancillary industries, generating direct as well as indirect employment opportunities for an increasing number of people.

221. More than 70 percent of the tourists visit Nepal for pleasure, holidays and sightseeing, whereas around 14 percent come for the purpose of trekking and mountaineering. The growth rate of trekkers is higher than that of the pleasure seekers. Sightseeing tourists are concentrated mostly in urban areas, whereas trekkers are spread in rural and mountain regions.

222. The tourist trade is highly seasonal, particularly in the case of trekkers and mountaineers, 40 percent of whom arrive in October and November. It is also highly spatially concentrated. About 90 percent of tourists enter the country by air through Kathmandu, with the cultural heritage of the city and its surroundings being the principal

ACTION PLAN FOR CULTURAL HERITAGE

Policies	Recommended Actions	Institutional Responsibility	Time Frame
Review the institutional arrangements governing the protection of cultural heritage sites	Prepare a detailed strategy document for cultural heritage preservation	DOA	Short-term
	Develop or revitalise Heritage Conservation Action Plans	DOA	Immediate, short-term
	Assess the effectiveness of the Guthi Sansthan in providing resources for preserving cultural sites, and investigate possible alternative institutional arrangements (Note: Suspend transfer of guthi lands to private individuals until after this review)	DOA, MECSW, NPC	Short-term Immediate
Improve the level of knowledge concerning the status of cultural resources	Develop a priority listing of heritage sites in need of preservation and/or restoration	DOA, NPC	Short-term, continuous
Investigate mechanisms for raising additional revenue to fund preservation work	Commission a study to identify possible options	DOA, DOT, NPC	Short-term

centre for sightseeing. Most tourist travel taking place outside the Kathmandu Valley is to Pokhara and national parks, and the importance of Pokhara and parks as target destinations is therefore considerable. Weak marketing efforts on the part of the tourism industry and limited infrastructure are the main reasons for the lack of development of alternative sites and routes.

223. The seasonality of tourism is a contributory factor to increasing tourist pressure in certain areas. Many trekking routes are congested during the spring and autumn seasons, when the flow of visiting tourists can exceed the number of local inhabitants. A continued increase in this spatial concentration will tend to reduce the attractiveness of areas to visitors.

Environmental Problems

224. The unbalanced distribution of visitors, in both spatially and seasonally, has generated a number of environmental problems. Congestion, the loss of cultural assets in urban areas, and deforestation and littering in rural areas all lead to reduced attractiveness of these sites.

225. Although tourists' fuelwood consumption is insignificant on a national scale, the relatively high concentration of tourists in certain areas can result in substantial local deforestation, usually at high altitudes where regeneration is slow. Regulations now prohibit the use of fuelwood by trekking and mountaineering groups in mountain parks, and although these represent a powerful tool in forest conservation, they have not been effectively implemented and the pressure on forests has often simply been transferred to areas immediately adjacent to the parks.

226. Use of non-biodegradable materials by trekkers and mountaineers and the lack of proper solid waste disposal systems have led to visually intrusive littering and consequent hazards to human health. Water contamination arising from refuse disposal and the location of toilet huts close to watercourses has adversely affected human health and local vegetation. There is thus a pressing need to increase awareness regarding tourism-related environmental impacts and actions to address them.

227. There has been little in the way of incentives or regulations to address these environmental problems. There are no effective monitoring systems, few or no sanitary facilities and a lack of awareness among both local inhabitants and foreign visitors. Recent attempts to promote more effective waste disposal and sanitary practices have had some success in the Annapurna Conservation Area. Tourism cuts across several sectors and hence its proper management requires a multisectoral approach.

Tourism Policies

228. HMG is currently developing a new tourism policy to address a number of strategic issues that remain unresolved. They include: (i) whether Nepal should continue to encourage unlimited numbers of low-budget trekking tourists, or instead seek to attract a limited number of high-budget travellers; (ii) how new tourist areas can be opened up so as to maximise tourist revenues while minimising environmental and social damage; (iii) identifying an appropriate mechanism for charging fees for trekking and mountaineering permits; and (iv) how to develop the institutional capacity to monitor and regulate the environmental impacts of tourism.

229. Improved institutional arrangements will enable HMG to better monitor what is taking place in the tourism sector. At present, trekking permits are issued by Immigration Department, mountaineering permits are issued by the Ministry of Tourism and Civil Aviation and the Nepal Mountaineering Association, and park entrance permits by the DNPWC. The warden of the protected area is responsible for controlling and minimising tourist impact on environment and natural resources, though he has no control on how many people are admitted. One possibility is the development of a "one-window" approach to issuing permits. As this will necessitate inter-ministerial cooperation, it is suggested that a Task Force be

ACTION PLAN FOR TOURISM

Policies	Recommended Actions	Institutional Responsibility	Time Frame
Improve institutional arrangements in the tourism sector	Establish a Task Force to assess ways to improve the current system of issuing permits and revenue sharing	MTCA, DOI, NMA, DNPWC, NGOs	Immediate
Raise awareness concerning the importance of environmental preservation	Ensure fuelwood is not used by trekkers and trekking companies;		
promote the use of biodegradable materials; encourage effective waste management systems in national parks	MTCA, NGOs, DNPWC	Short-term, continuous	
Finalise preparation of a Tourism Policy	Determine appropriate mix of high- and low-budget travellers, and identify suitable strategies to achieve this mix	MTCA	Short-term
	Identify a mechanism for assessing appropriate tourist fees for national parks, trekking and mountaineering	MTCA, DOI, NMA, DNPWC, NGOs	Short-term
	Determine the basis upon which new areas will be opened up for tourist travel	MTCA, DNPWC	Short-term
	Develop environmental management plans for tourist routes and destinations, both presently used and those to be opened up in future	MTCA, DNPWC	Short-term
	Encourage the role of the private sector in identifying, developing and marketing new products and activities in new areas	MTCA	Short-term

formed to look into this issue. A study could be commissioned to resolve the problem of overlapping jurisdictions.

Note

[1] One important aspect of policy should be the amendment of the Ancient Monuments Protection Act (1956) to fulfill international obligations assumed by signing the World Cultural and Natural Heritage Convention (1972).

4 Mitigating adverse environmental impacts

230. Both human actions and development projects can have adverse environmental impacts. Rapidly growing urban areas are showing signs of environmental deterioration with insufficient infrastructure adding to congestion and posing a threat to health. Inappropriate siting of industrial operations in residential areas is exposing people in some areas to high levels of pollution. Improperly designed and inadequately managed infrastructure projects, particularly large-scale projects, can also have serious negative effects on the environment. HMG is taking steps to minimise these impacts through improving the level of infrastructure services, assessing the need for improved land regulations and their effective enforcement, and developing a system of environmental impact assessment designed to identify and correct potential adverse effects early in the project cycle.

URBAN AND INDUSTRIAL DEVELOPMENT

231. The urban population is growing rapidly in Nepal, although the absolute level of urbanisation and industrialisation remains quite low compared to neighbouring countries. Cities can provide a basis for increased economic activity through growth in the industrial and service sectors, but if the process is not properly managed the result can be uncontrolled urban sprawl, while inadequate infrastructure provision can lead to a deteriorating environment characterised by high levels of disease and poor living conditions.

232. The rapidly expanding transport network has led to the emergence of several semi-urban sprawls on strategic locations along the main national highways. Many of these areas already lack adequate physical and service facilities. This trend is most likely to continue in the future if corrective measures are not initiated now. Most of these areas would not be qualified even to be called "urban areas" as per present definition. Policies and actions are urgently needed to be systematized for such settlements with improved environmental conditions.

233. There is evidence that environmental conditions have already deteriorated considerably in the Kathmandu Valley and some Terai towns. Rapidly expanding urban settlements and haphazard development of industrial establishments in and around such settlements have generated a range of environmental problems affecting human health and welfare. Air and water pollution have worsened due to inadequate sewerage, improper disposal of solid wastes, industrial effluents and discharges, and emissions from motor vehicles. Growing congestion of human settlements, commercial areas and vehicular traffic in cities has a detrimental effect on the economic and social transactions and the general level of human health not to mention the efficient use of fuel and the timely flow of traffic.

Urbanisation

234. The level of urbanisation in Nepal is among the lowest in the world. At the time of the 1952 census, only three percent of the population lived in urban areas. By 1971, the proportion had risen to four percent, and by 1991, it was slightly over nine percent. During the decade from 1981-91, the urban population rose by 75 percent, with the Terai experiencing the highest increase.

235. The urban population is concentrated in the Central Hills and in the Central and Eastern Terai, which together account for more than 70 percent of the total urban population. Urban areas in the Central Terai more than doubled their population between 1981-91, while in the Eastern and Western Terai, the increases were about 80 and 70 percent, respectively. None of the Mountain zones has any designated urban areas.

236. Continued in-migration from outside urban areas is the main contributory factor to growth in urban areas. The pattern and environmental implications of continued migration are discussed in the section on Poverty Alleviation.

237. **Urban Environment Management**. There is an urgent need to properly guide and coordinate the actions of various government agencies, municipalities, non-governmental organizations, private sector and donors involved in mitigating different aspects of urban environmental problems. As the level of involvement of these agencies increases, there is a greater possibility for duplication of effort and inefficient resource utilisation. Individual projects that are narrowly focused and uncoordinated may sometimes reflect the interest of donor agencies rather than the actual needs of the country. In the Kathmandu Valley, for instance, donor involvement ranges from site-specific pollution control projects to a much broader programme on regional metropolitan environment improvement.

238. HMG recognises the need for a holistic approach addressing urban environmental problems in a comprehensive and coordinated manner. The recently endorsed Human Settlement Programme requires HMG to prepare a comprehensive Urban Environment Management Programme. An Urban Environment Management Committee has been constituted under the EPC to guide and coordinate the formulation of this programme. This programme will develop a coherent framework for coordinating various activities in areas related to the urban environment, including the development of guidelines for industries, land development, residential development, settlement planning, water supply and waste disposal, pollution control, development and management of urban parks and open spaces, restoration and preservation of cultural heritage sites, and upgrading of environmentally degraded urban areas.

239. **Provision of infrastructure**. Failure to adequately plan for the growth of urban areas has resulted in inadequate infrastructure services for urban populations. Planning infrastructure takes time, courage and vision; time because infrastructure projects often have a long gestation period; courage because infrastructure projects involve governmental decisions on how to allocate scarce resources; and vision because infrastructure projects begun now will only have an impact in the future. The consequences of past governments' failures to demonstrate these characteristics in planning the development of the Kathmandu Valley is being felt by all who live there.

240. Failure to provide adequate infrastructure places a severe burden on potential investors. Instead of investing in productive capital that can provide the basis for increased off-farm employment, scarce funds must be directed toward purchasing the necessary equipment to provide a basic level of infrastructure to enable firms to properly function. Examples in Kathmandu include the need for cesspits due to an inadequate sewage disposal system, for generators due to intermittent power supplies, and for pumping equipment and extra tanks due to insufficient supplies of drinking water. Appropriate on-site options will need to be developed and adopted. Problems relating to water supply and sewerage are discussed in the Section on Health and Sanitation.

241. If the same problems are to be avoided in other growing urban areas, high priority must be given to planning infrastructure services. Failing to do so will consign another generation of Nepalis to absolute poverty.

Urban Land Development

242. Land brokers and private individuals are the most important agents in urban land development in Nepal. The key issue is how to transform the present informal system into a more rational one, so that inefficient land use gives way to planned development. Administration of the usual land development regulations—including zoning, density standards and subdivision regulations—is hampered by the public's lack of understanding of their benefits, insufficient involvement of those most affected, and the absence of adequate enforcement mechanisms.

243. In keeping with recommendations in other sections of this report, government should act as a facilitator in urban land development, assisting the private sector to act as efficiently as possible while maintaining adequate safeguards to protect the public interest. Current bottlenecks include the ceiling on land ownership, insufficient financing, a poor cadastral system, the lack of cooperation between infrastructure agencies, and the double land registration tax. The Guided Land Development Programme discussed below offers a potentially useful model of public-private cooperation, although it has not been without problems.

244. The Town Development Act (1988) created a system of Town Development Committees to assist with the task of planning urban areas. One of the TDC's responsibilities is to divide demarcated town development areas into appropriate land use zones, and to manage all basic community services located within urban settlements. The Municipality Act (1990) empowers municipalities to carry out the same functions.

245. Despite these laws, urban planning is still largely ineffective. Existing legislation contains no definition of what urban plans should contain or who should participate in formulating them. Few planning regulations have been promulgated to implement the legislation, while laws passed to facilitate land development have actually hindered it[1].

246. **Land use planning.** One of the main problems in establishing and maintaining adequate infrastructure is the haphazard growth caused by the absence of appropriate land use planning. Few controls are currently placed on where and how people can build houses or operate industrial or commercial enterprises. The result has been chaotic urban land development with multi-purpose areas used for residential, industrial, commercial, recreational, agricultural, religious and cultural purposes. The problems caused by this type of growth are considerable. People are exposed to polluted air and contaminated water from industries, cultural and religious sites become overrun and lose their unique qualities, and agencies providing infrastructure face obstacles in installing and maintaining equipment because of difficulties in gaining access.

247. There is thus a tremendous need to develop broad land use zoning regulations in urban areas. Urban plans can often be used as a starting-point for identifying appropriate zones; however, although most municipalities do have urban plans—the Kathmandu Valley has had a number of different plans developed since the mid-1960s—these have for the most part been ignored.

248. Using zoning to guide future land use development is essential in reducing and preventing widespread environmental deterioration. Unfortunately, environmental conditions in many urban areas are already poor, and people are suffering the environmental consequences of living next door to polluting industrial enterprises. Some attempt has already been made to controls the siting of industries so as to minimise the effects of industrial pollution. Guidelines prepared by the Industrial Promotion Board classify industries into two categories: industries that are prohibited within the Kathmandu Valley and within ten kilometres of urban centres, and those

that are prohibited within five kilometres of towns and densely populated areas. However, existing industries are exempted from the guidelines, it is not specified how the guidelines are to be implemented and which agency should enforce them.

249. The challenge for urban institutions will be to encourage industrial enterprises to relocate to special industrial districts. With proper incentives this should be feasible. One possibility is to extend the use of the Pollution Control Management Plans developed for Hetauda and Balaju industrial districts. These plans outline a number of different strategies for reducing pollution and their costs. Cost-sharing between the public and private sector could be a feature of these plans, as the cost to firms of reducing pollution may be considerable. Limited subsidies might be made available to cover some of these costs.

250. One important incentive is the provision of appropriate infrastructure, such as waste disposal and effluent treatment plants, and adequate water and power supplies. Economies of scale should make it possible to provide services to industrial districts at lower than normal cost. It must be recognised, however, that the present tariff structure for water and electricity provides little incentive for industries to conserve use; some even gain free access to service through illegal connections. Under these conditions, incentives alone may prove insufficient in encouraging industries to relocate and it may be necessary to use the threat of closure as a coercive measure.

251. Zoning is primarily a tool aimed at improving local environmental conditions through the rational siting of different types of buildings and commercial and industrial operations. It is important that local communities be provided with an institutional mechanism to ensure that their opinions receive sufficient weight in determining appropriate land uses.

252. **Guided Land Development Programme.** Although zoning can assist in defining categories of land use and can encourage a more efficient siting of industries while protecting residential areas from undue exposure to industrial wastes and pollution, it is a broad tool. Within designated areas there is a need to plan appropriate infrastructure, including access roads and the connection of water and sewage disposal systems.

253. In the past, central control of urban land development has failed to guide this construction process. The result has been an over-concentration of ill-designed and poorly constructed buildings that often encroach on public space and prevent the efficient delivery of infrastructure services. As with other urban topics, land development is primarily a local issue, and attempts at centralised control are likely to fail. Lack of sufficient community involvement encourages individuals to act to maximise their own private benefits without due regard for their neighbour or the community in general.

254. The Guided Land Development Programme is one approach that has been taken to improve the process of urban land development. Started in the Kathmandu Valley, GLD has been extended to Biratnagar, Birendranagar, Birgunj and Pokhara. It begins with a road improvement plan for a local area prepared on a cadastral map. The rights of way for widening existing roads and adding new road links are plotted along property lines to minimise the acquisition of land from individual plots. At the beginning of the planning process, a local advisory committee is formed in each area and a building moratorium is imposed for several months. In the course of preparing the GLD plan, planners have extensive consultations with local landowners and residents. Upon completion of the process, property owners agree to give up the needed rights of way at no cost in exchange for the anticipated rise in land values. The building moratorium is then lifted, building permits are issued in accordance with the plan, and the new roads are transferred to public ownership and recorded on the cadastral map.

255. The GLD programme has not been without difficulties, however. There have been cases where some local people have not been included in the consultation process, and completed plans have

not been disseminated on a wide enough basis, with the result that later land development does not follow the plan. Road rights of way are often not demarcated in the field, giving individuals the opportunity to encroach.

256. Funding for physical improvements in GLD areas has also been insufficient, so environmental conditions have not improved as much as was initially hoped. This is partly a reflection of the inadequate state of municipal finances. One possibility might be a Betterment Tax, assessed on the increase in local property prices realised as a result of the improved road access and infrastructure services. Proceeds from this tax would then provide resources to help fund physical improvements. However, this proposal needs to be seen in the context of a wider review of local government taxation. At present municipalities rely heavily on the *octroi*, an indirect tax collected at the road entry point of each town, and levied on all goods brought in except those for daily consumption. Current levels of municipal finance, mainly from *octroi* revenues, are insufficient to fund much-needed infrastructure improvements, while the *octroi* is economically inefficient and regressive, and it is acting as a disincentive to local businesses. A thorough review of municipalities' revenue-raising methods is needed.

257. **Urban land regulations.** Current regulations often encourage inefficient urban land development. There are many difficulties with the current system of building permits and regulations that are outside the scope of this environmental report to consider in detail. A few examples are given to illustrate some of the problems.

258. The Land Act of 1964 imposes a ceiling on land ownership of 2.5 hectares in the Kathmandu Valley, 4 hectares in other Hill areas, and 17 hectares in the Terai. One estimate suggests that the minimum financially viable construction plot size in the Kathmandu Valley is 10 hectares. Thus, the ceiling prevents private agents from pooling land to ensure a more orderly subdivision, and landholdings continue to be fragmented.

259. Even assembling a 2.5 hectare plot in the Kathmandu Valley is problematic. Land ownership on the fringes of main urban areas is very fragmented, reflecting previous use as farming land. Negotiating with many parcel owners is a time-consuming task, and the mechanisms for land transfer can generate disputes over rightful ownership, plot boundaries and other property rights. The poor state of cadastral records contributes to the problem, and efforts are now being made to improve the system of updating records in a timely manner.

260. The "double" land registration tax is also a major constraint to efficient development. The tax is payable by both the buyer and seller of land. Thus, a property developer would have to pay twice, once when buying and once when selling. The total tax payable can thus become a significant cost to the developer, and acts as a disincentive.

261. Developing a more efficient system of urban land development requires action on a number of issues: (i) local communities should be more directly involved in the urban planning process; (ii) broad land use zones need to be determined by consultation with existing and potential users of urban areas to mitigate the potentially harmful environmental impact associated with multi-use sites in close proximity; (iii) regulations that adversely affect the efficient development of urban land by the private sector should be removed; and (iv) building regulations that specify the basic parameters governing property construction should be developed in consultation with the private sector, and the capacity of municipalities to enforce such regulations should be dramatically improved.

Air and Water Pollution

262. The deteriorating quality of air and water in many urban areas is imposing significant social and economic costs on the population. The high incidence of waterborne and respiratory diseases raises health costs and results in lower levels of productivity among those affected.

263. Solutions to these complex problems require action on a number of different fronts. Programmes are needed to improve water supply and sewerage systems and to raise awareness concerning the importance of sanitation. Measures are also required to encourage industrial enterprises to reduce emissions and to treat more of their own waste. Emphasis should also be placed on improving efficiency through better resource management and conservation. Achievement of these aims will require considerable strengthening of industrial sectors and the institutions currently responsible for water supply and sanitation.

264. **Sources of pollution.** As with many developing countries that rely on fuelwood as a major source of energy, indoor air pollution poses a considerable threat to public health, especially in rural areas. In urban areas, haphazard growth of settlements and industrial establishments and a dramatic increase in the number of vehicles have worsened air pollution, as have smoke and dust particles emanating from brick kilns, cement factories, stone quarries and other air-polluting industries. Several factors have contributed to this human health hazard, including the lack of proper zoning and the absence of enforceable air quality standards.

265. Water pollution poses a serious threat to water supplies in both urban and rural areas. Empirical studies throughout Nepal (NPC/IUCN 1991a) have often found high levels of bacteriological contamination. While the range of results is high, levels of faecal coliform contamination consistently exceed WHO guidelines for water considered fit for human consumption. Most of the empirical work has focused on Kathmandu, but the few studies on rural water supply that have been undertaken show similarly high levels of bacteriological contamination. Surface and groundwater sources appear to be equally affected. Groundwater in some areas also shows undesirably high levels of various metals and minerals, for example iron and manganese in the Terai and ammonia and iron in the Kathmandu Valley.

266. In urban areas, water pollution is being caused by the dumping of untreated sewage and industrial effluent directly into water bodies. The Bagmati River, for example, which runs through Kathmandu and is an important source of the city's drinking water, is considered biologically dead along stretches of the river inside the urban area. An additional problem in Kathmandu involves the parallel laying of sewerage and water supply pipes coupled with poor maintenance, which has resulted in the drawing in of sewage into water supplies causing serious contamination.

267. In rural areas, deforestation around water sources has left many of them unprotected, permitting contamination by animal and human wastes. This is accompanied by a general lack of awareness concerning the importance of avoiding defecation in proximity to water sources and supplies.

268. **Indoor air pollution.** Smoke from the burning of biomass fuels coupled with poorly ventilated dwellings poses a serious health hazard for millions of Nepalis every day. Indoor air pollution is a major cause of respiratory disease, imposing high economic costs in terms of lost productivity and treatment.

269. The development of alternative sources of energy to fuelwood provides the best long-term solution to this problem. The substitution of kerosene and LPG has so far been confined to the Kathmandu Valley, where higher per-capita incomes, reduced supplies of fuelwood, and better availability of alternative fuels have encouraged substitution. Rural electrification through hydropower schemes also offers scope for substitution. All these alternatives require increased incomes. It is likely, therefore, that rural energy use will continue to be based on biomass products for the immediate future and alternative methods need to be developed for reducing individuals' exposure to air pollutants.

270. Smokeless *chulos* offer a mechanism for conducting most of the smoke outside of dwellings; however, take-up rates have not been high. Reasons include: (i) a lack of knowledge concern-

ing the detrimental effects of smoke on health; (ii) marketing strategies that have promoted *chulos* on the basis of improved energy efficiency (they use 10-20 percent less fuelwood), ignoring the beneficial health impacts; and (iii) *chulo* designs that have sometimes been based on the use of locally unavailable materials, making construction costs expensive and maintenance difficult.

271. A revitalised smokeless *chulo* programme is necessary, accompanied by education programmes to inform people of the health risks associated with long exposure to smoke and the potential health benefits of conducting smoke away from dwellings, as well as the energy savings from reduced fuelwood use. Further research is needed to assess the most appropriate *chulo* design for particular areas.

272. **Industrial pollution.** A growing number of people are exposed to pollution from industrial enterprises. A number of factors contribute to this process: industrial plants inappropriately sited close to population centres; insufficient emphasis given to fuel efficiency; little, if any, pollution abatement equipment used to reduce emissions; and a total lack of industry pollution standards.

273. Incentives to existing industries to relocate away from population centres and zoning to prevent new industries from setting up in inappropriate locations offer one solution to the problem. These locational issues are discussed more fully in the above section on Urban Land Development.

274. To date, very little pollution abatement equipment has been used by industries in Nepal. Investors wishing to maximise profits have opted for the cheapest technology, which unfortunately, often turn out to be the most polluting ones as well. It is society in general that has to pay the consequences of this pollution, and society in general that has the most to gain from industrialists adopting less-polluting technologies. As these technologies typically cost more, HMG may need to offer a limited range of subsidies, targeted initially at the most polluting industries. Research work has already been carried out in Nepal to identify "pollution-prone" industries (NPC/IUCN 1991b). The cement, leather and tanning, paper and pulp, soap and chemicals, sugar and textile industries have all been identified as discharging multiple types of high-level pollution. Specially focused industrial studies should be commissioned to identify ways of increasing resource-use efficiency, and to investigate cleaner technologies that might be suitable for use in these industries.

275. A less costly method of reducing emissions is to encourage greater operational efficiency. The MOI is currently developing a number of pilot projects addressing issues of industrial energy efficiency and pollution reduction. One project will concentrate on improving industrial boiler efficiency by introducing operational adjustments and minor repairs. Field survey at four industrial enterprises found capacity utilisation varying between 33 and 70 percent, providing a good opportunity to improve the efficiency of fuel use and reduce emissions associated with the incomplete combustion of petroleum products. The project will also investigate the possibilities of small-sized boilers using rice husks as a sustainable, substitute source of energy for diesel and fuel oil.

276. Another pilot project will promote the use of energy-efficient brick kilns. This technology is not only cleaner, because it burns fuel more efficiently, but it makes use of low-quality coal as a substitute energy source for the fuelwood currently widely used in brick kilns. These pilot projects demonstrate how economic efficiency and environmental improvements can go together, as efforts to increase fuel-use efficiency mean that less fuel is required and lower emissions result.

277. EIA is another mechanism enabling better design of industrial projects incorporating pollution abatement measures. Draft industrial sector EIA guidelines are in the final stages of preparation for HMG endorsement.

278. Another option that could be investigated in the future is the possibility of taxing polluting industries. Again the emphasis should be on identifying those industries that pollute most and

then developing taxes that will penalise those that pollute above an agreed norm. It will be essential to include industrial firms in this process in order to explain the need for taxation. The possibility of earmarking pollution taxes to assist firms to install pollution control equipment should be investigated, as this would help convince firms that the tax is being imposed to help them help society, rather than as another slice of their profits being commandeered. Pollution and health impact data should be established on a regular basis.

279. **Vehicular pollution.** People in many urban areas, in particular the Kathmandu Valley, experience considerable exposure to vehicular pollution, though the precise composition of pollutants has yet to be studied in depth. A UNDP-funded project Kathmandu Valley Vehicular Emission Control Project is looking into this issue. The problem of pollution from mobile sources is aggravated not only by a growing number of vehicles in the cities, by the common practice of importing old vehicles, but also the use of leaded, often substandard and adulterated fuel, poor vehicle maintenance, narrow and dilapidated roads, and poor traffic management.

280. An integrated approach that tackles all these problems is needed. First, older vehicles are imported because high import tariffs (up to 250 percent) act as a considerable disincentive on importing new ones. The result is an aging vehicle stock with old engines that pollute considerably more than modern engines. Existing tariffs should be reviewed to develop a structure that balances revenue-raising requirements with the need to reduce the present incentive to import older vehicles.

281. Second, fuel adulteration appears to be an issue, though to date no comprehensive studies have dealt with this. Kerosene and diesel are both subsidised, while petrol is heavily taxed. The large price differential has encouraged individuals to adulterate petrol with kerosene, leading to higher emissions and reduced engine life. The widespread use of less polluting petrol-powered vehicles has also been deterred due to the relatively high cost of fuel. Some reduction in the price differential has recently taken place, and HMG will continue to review its pricing policies in this area.

282. Third, some doubt has also been raised regarding the quality of imported petroleum products. Possible sources of contamination include poor refining, improper storage, dirty tankers that are not properly cleaned after each use and poor petrol-station storage. With a monopoly on the purchase and distribution of petroleum products, the Nepal Oil Corporation is responsible for checking its products for possible contamination and taking steps to improve fuel quality; however, at present, there appears to be no mechanism to consistently check the quality of petroleum products. One possibility would be to assess the findings of a recent paper (USAID 1992) that recommended privatisation of the purchase and distribution of petroleum products.

283. Finally, poor vehicle maintenance contributes to the emissions problem, as badly tuned engines cause considerably more pollution than properly tuned ones. There is a need to look at developing a system for the pollution-testing of vehicles. Ideally this system would require an annual engine tune-up. It may be possible to integrate this system into the existing annual licensing system. Experience from other cities with vehicular pollution problems, such as Bangkok and Mexico City, may also provide some guidance on how to develop such a system. Private sector involvement in this process would be encouraged.

284. **Monitoring.** Studies on pollution have been isolated, and there is, at present no systematic monitoring of air and water quality being carried out in Nepal. This situation urgently needs to be addressed, through water monitoring systems set up along rivers that provide drinking water for major urban areas, and through air monitoring in centres of high population density. One possibility would be for Nepal to join the Global Environment Monitoring System run by the United Nations Environment Programme, utilising its technical assistance in setting up an appropriate system.

285. In some developing countries, water and air quality monitoring systems have failed after a few years because government institutions have been incapable of maintaining the necessary level of commitment to record observations regularly and provide necessary maintenance to the monitoring equipment. To avoid this happening in Nepal, the responsibility for recording information could be contracted out to the private sector. Forthcoming review (NPC/IUCN) identifies a number of private laboratories in Nepal capable of providing this service if a clear commitment was given to use the private sector. The recorded information could then be integrated into an environmental database and published as part of a state of the environment report on a regular basis.

286. **Pollution standards**. Considerable emphasis has been placed on developing standards; however, to date no air or water quality standards have been formally approved. The Bureau of Standards and Metrology has developed a draft set of water quality standards. They are very similar to the WHO standards, which are generally considered to be targets for countries to strive to attain rather than practical, implementable standards. HMG should collect water quality standards currently in force in neighbouring countries and assess their applicability for Nepal. The imperative is to improve water quality from bad (say, more than 1,000 faecal coliforms per 100 millilitres) to moderate (less than 10 faecal coliforms per 100 millilitres), not necessarily to develop standards based on the stringent levels of industrial countries.

287. More thought needs to be given to the method by which standards will be enforced as standards on their own will change nothing. A system needs to be developed that periodically tests water and levies fines to penalise firms that exceed the guidelines. In time, public water supply agencies should also have to meet the standards or face prosecution.

288. With a historically low level of industrialisation, Nepal has not had to concern itself with issues of air pollution; however, an increasing number of industries are being developed in sectors that do pose a threat to public health if emissions are not properly controlled. Therefore, there is a need for HMG to declare air quality standards, and more importantly to put in place an effective enforcement system.

289. As in the case of water quality standards, air quality standards in neighbouring countries that have a higher level of industrialisation could be used as a starting-point. A task force including representatives from government, industry and environmental groups could be created to set appropriate standards and discuss options for enforcement.

Special Case of the Kathmandu Valley

290. The Kathmandu Valley is experiencing many environmental problems stemming from unplanned growth. As the country's capital, Kathmandu is suffering from the effects of an over-concentration of public and private sector development. Most public utility offices and corporate headquarters, with their significant requirements for space, utilities and staff are located in Kathmandu . The unavoidable consequence of this has been an ever-increasing attraction for private concerns engaged in trade, commerce and industry, and in social services like education and health.

291. It is natural for central secretariats to be physically located in the capital. However, it is not necessary for every national agency, private or public, to do likewise. When most public sector facilities and support are concentrated in the capital, the private sector is encouraged to establish its activities in and around this area to service them, further exacerbating the already distorted growth pattern.

292. It has thus become necessary to take a new look at the unsustainable growth taking place within the Kathmandu Valley. One way of addressing the problem is to adopt a policy that would lead to a gradual *deconcentration* of the main central level establishments by shifting them to other development regions. HMG should take the

ACTION PLAN FOR URBAN AND INDUSTRIAL DEVELOPMENT

Policies	Recommended Actions	Institutional Responsibility	Time Frame
Transform present informal system of urban land development into a more formal one	Review the present system of urban land regulations to remove constraints to efficient land development, and formulate enforceable building standards	Municipalities, MHPP	Immediate
	Directly involve local communities in land development plans	Municipalities	Immediate, continuous
	Further develop the use of Guided Land Development as a tool for more efficient land use planning	Municipalities, DHUD	Short-term
	Encourage industrial enterprises to relocate away from centres of population to special industrial districts	MOI, municipalities	Short-term
Reduce the level of indoor smoke pollution	Revitalise smokeless chulo programme and inform people of the health risks of smoke	MECSW, MOH, MWR, MFSC, MLD	Short-term
Promote greater fuel efficiency to reduce air emissions	Implement proposed pilot projects to improve industrial boiler efficiency, and introduce "cleaner" brick kiln technology	MOI	Short-term
Reduce the level of industrial pollution	Finalise preparation of industrial sector EIA guidelines for HMG endorsement	MOI, NPC	Immediate
	Develop pollution control management plans for industrial areas	MOI	Short-term
	Investigate the possibility of minimal taxes on the most pollution-prone industries	MOI, NPC	Longer -term
Reduce the level of vehicular air pollution	Review tariff structure for imported vehicles	MOF, NPC, MWT	Immediate
	Continue to review pricing policies for petroleum products; assess the desirability of privatising the purchase and distribution of petroleum products	MOF, MOS, NPC	Short-term
	Investigate mechanisms for setting up regular pollution testing of vehicles	MWT, NPC	Longer-ter m
Improve data availability on air pollution	Set up air and water pollution monitoring stations	MOI, MHPP, MWR, NPC	Short-term
Develop realistic air and water quality standards, and institutional enforcement.	Assess the relevance of standards from neighbouring countries as an initial basis for standards in Nepal; use experience of more industrialised countries as a guide for appropriate institutional arrangements	BSM, MOI, NPC, MHPP	Immediate
Foster and improve coordination among government agencies,	Prepare a comprehensive urban environment management programme focusing on practical policies, strategies and actions	UEMC, MHPP	Immediate
NGOs, private sector and donors involved in urban development and environmental protection	Prepare and implement an Environmental Action Plan for the Kathmandu Valley addressing the growing problem of degradation	MHPP, Municipalitie, NPC	Immediate

initial step by relocating the headquarters of most government corporations to other areas. Such a move would motivate private entrepreneurs to relocate their industrial and trade-related activities in various regions.

293. With the dispersal of corporate headquarters, new opportunities would be opened up for local populations in terms of access to physical and social infrastructures, educational and medical facilities, public utilities, and increased employment. From the medium- to long-term perspective, this appears to be the most effective measure to genuinely foster regional balance—an avowed goal of the government.

294. While some environmental issues affecting the Kathmandu Valley are addressed through donor-funded interventions, it is suggested that HMG look into developing and implementing an Environmental Action Plan for the Valley in order to assess the problems of the Valley in a comprehensive framework. Some baseline work has been accomplished through the World Bank funded Bagmati Basin Water Management Study and the Asian Development Bank sponsored Kathmandu Valley Urban Development Plans and Programmes.

INFRASTRUCTURE DEVELOPMENT

295. Continued expansion of infrastructure services is essential to the development process in Nepal. Irrigation facilities can double or triple agricultural productivity; roads provide important farm-to-market connections and reduce distribution costs; and hydroelectric power can provide the basis for an alternative, sustainable source of energy. However, if they are not properly designed and implemented all three types of projects can have considerable adverse environmental impacts, which can in turn lead to significant economic losses and the squandering of scarce resources. As with other sectors covered in this report, the successful management of infrastructure projects requires the direct involvement of anticipated beneficiaries. The most appropriate role for government is as facilitator rather than as direct service provider.

Irrigation

296. Providing irrigation water to areas that previously did not have it can transform agricultural productivity. In a country with a low per capita availability of arable land, efforts to boost agricultural productivity need to be based on increasing the intensity of production rather than on extending cultivated area. Irrigation development is an essential component in this strategy ; however, if not properly implemented, it can bring serious environmental problems. Past investments in irrigation have not taken adequate account of potential problems, environmental or otherwise.

297. The irrigable land resources of Nepal are estimated to be about 1.76 million hectares, of which 74 percent are in the Terai. Groundwater supplies in the Terai are not generally restricted by geography and the supply is secure in all seasons. The estimated upper limit of groundwater development as the sole source of irrigation water is about 350,000 hectares, while a further 150,000 hectares within existing government schemes could benefit from the development of groundwater for conjunctive use.

298. Estimates suggest around 1.03 million hectares are being currently irrigated. Of this, about 820,000 are in farmer-managed schemes. These figures are, however, misleading, as many projects are performing below design capacity and are often unable to provide water year-round. Currently, groundwater irrigation forms only a small part of the total irrigated area. Private development of groundwater irrigation has been constrained by small and fragmented land holdings, technical difficulties and the low investment capacity of most farmers.

299. Problems with water management have led to a number of environmental problems associated with irrigation projects: water supplies are often not scheduled and are unrelated to crop requirements; systems are not metered so their capacities are not known; and water distribution is arbitrary and therefore unequal. Because of insecure future water availability, there is an incentive for farmers

to consume more than they need, which results in leaching of nutrients and drainage problems in the canal head area and shortages for farmers distant from the water source. Large projects are intended to supply water during the winter to dry-season crops; however, in some the available irrigation is only supplemental, providing additional water to monsoon crops.

300. Efforts to improve the performance of irrigation projects are focusing on improved management and better planning, design and implementation that tries to anticipate potential difficulties before they emerge.

301. **Surface drainage**. Inadequate surface drainage in irrigation projects results in waterlogging as excess water is retained in the command area. The result is a decline in crop yields. A WECS (1982) report on large irrigation projects found on-farm drainage deficient in all four projects studied due to two related problems. First, with little emphasis on water management, farmers are inclined to take as much water as they can whenever it is available. Second, even if farmers are educated as to the importance of proper drainage, they may choose to ignore this advice for a number of reasons: (i) with limited arable land, farmers are reluctant to give up productive agricultural land to apparently unproductive usage, (ii) in many areas there may be insufficient labour to carry out the labour-intensive task of digging drainage ditches, and (iii) government agencies have traditionally constructed irrigation systems, so farmers have the perception that it is the government's responsibility to maintain them. Solutions to these problems include improved management and conservation of scarce water resources, reinforced by programmes to educate farmers about the problems of overuse and the need for adequate drainage.

302. **Groundwater extraction**. There is considerable potential for increasing the availability of irrigation water from groundwater sources. So far, some 110,000 hectares has been developed. More stress is being given to groundwater development in the Terai, where supplies are typically accessible by shallow tubewells. Development of privately-owned shallow tubewells offers a great potential for irrigation though there is a need to monitor this process carefully to prevent excessive pumping. Mining of groundwater can be studied by checking water table levels. A permit system is intended to restrict groundwater pumping; however, insufficient monitoring has meant that this tool is not being used effectively.

303. **Management**. Irrigation schemes developed so far generally fail to deliver the expected level of service. Scarce investment funds are thus not fully utilised, and farmers do not feel they have an influence over managerial issues. Cost recovery is also poor as farmers are not inclined to pay for an inadequate delivery service.

304. There are two major categories of irrigation systems in Nepal: farmer-operated and agency-operated. The former encompasses a large number of small-scale schemes scattered all over the country and covering more than three-quarters of the total irrigated area. The latter is constructed and operated by government agencies. Available evidence suggests that farmer-operated schemes are more efficient in terms of water delivery and cost effectiveness. Agency-operated schemes often have higher unit costs, and inappropriate system design can result in a shortage of water being delivered.

305. Despite the better performance and demonstrated viability of farmer-operated systems, public-sector emphasis has been on large-scale, agency-managed systems. With the adoption of a new Irrigation Policy 1992 based on the Master Plan for the Irrigation Sector (HMG 1989), HMG is now promoting farmer participation in the design, operation and management of small- to medium-scale schemes by transferring agency-managed systems to community users' groups. Larger-scale projects will be handed over to Water Users' Groups or brought under participatory management.

306. An important component of improved management is an appropriate set of laws and regulations to govern the operation of irrigation

systems. Rules should deal with issues such as how water rights are to be allocated and who is to enforce them; who is to be responsible for carrying out O&M; the basis on which fees are to be collected, who will collect them and who determines how to use them. It is also important to establish a system of fines and other disciplinary measures for those who break the agreed rules, and also for those who illegally tamper with irrigation systems and divert them for their own use. Settlement of such management-related issues are best handled by the users' groups themselves. The recent Water Resources Act envisages the development of rules for irrigation.

307. A particular benefit of developing a strong users' group is that this group becomes a basis through which important messages can be channelled to farmers; for instance, material on the need for conservation and how to achieve this, or information on promoting low-cost soil conservation measures.

308. **Conservation**. Water on government-run irrigation schemes is often delivered on an arbitrary basis, for limited periods of time, and at subsidised prices. Farmers take as much as they can, resulting in wasted water, waterlogging, leaching of soil nutrients, and excessive runoff from agro-chemicals contaminating both surface water and groundwater. Those furthest from the canal head may receive no water at all as it is diverted by those nearest the primary distribution point. Part of the solution to these problems lies in educating farmers about appropriate water use, particularly the fact that irrigation water is scarce and costly to supply. These efforts need to be supported by a system of fees that encourages farmers to make more efficient use of supplies.

309. The raising of fees is usually organised through users' groups. Farmer-operated schemes typically have an adequate system for collecting fees to cover basic O&M costs. Government-run systems, however, have often been unable to collect O&M fees. The success of these projects has consequently been limited and many are experiencing environmental problems.

310. Even where irrigation fees are successfully collected, they rarely bear any relationship to the quantity of water used. Fees are usually fixed on an area basis and farmers pay according to the total area of land that they irrigate. Thus, although funds are available to cover O&M costs, the fee structure provides little incentive for farmers to conserve water. Monitoring the amount of water that passes through an irrigation system is an essential first step to developing an improved fee structure that relates to the amount of water actually used. Developing such a fee structure will need the cooperation of farmers, so the issue of who manages irrigation systems and how, is important.

311. **Environmental impact assessment**. In a country such as Nepal with a fragile geological formation, construction work can cause landslides and diverted river flows can upset the hydrological balance and adversely affect aquatic life. Remedial measures are needed to address these problems. EIA offers an opportunity to systematically assess the likelihood and severity of these problems and to develop programmes to minimise their impact. Draft EIA guidelines for the water resources sector are currently being finalised.

312. Past experience shows that local environments near construction sites often suffer when an irrigation project is undertaken. Encroachment into forests is common to fetch fuelwood for workers and timber for use in construction.

313. Irrigation schemes entail diversion of different amounts of water from the source at different times in accordance with crop water requirements and the efficiency of the conveyance system. Extractions during the monsoon period generally pose no problem because of the abundance of water; however, extractions during the dry season can adversely affect aquatic life downstream. A recent example of the importance of this problem is the delay in implementing the 9,500-hectare NCA East Rapti Irrigation project, due to controversy over the quantity of water available for the Royal Chitwan National Park, a source of tourist revenues and an important site for biodiversity

preservation.

314. Rivers carry a large amount of sediment especially during the monsoon season. Though main canals are generally closed during high floods, silt-laden water is unavoidable at low monsoon flows when water demand is high. Different levels of siltation , from severe to moderate, can be observed in many irrigation schemes, directly undermining the system capacity and resulting in lowered water deliver.

315. Physical infrastructure to reduce sediment inflow to an acceptable level should be well conceived, but has been overlooked in many past instances. Nonetheless, silt will continue to enter into irrigation systems, requiring a well-planned maintenance schedule, best achieved with farmer participation. This is not only desirable but essential because agency resources for O&M are often insufficient to maintain the system at optimal levels.

Roads

316. Further economic and social development in Nepal requires the construction of more roads. Roads provide the most flexible form of transport for the movement of people and goods. They can stimulate agricultural production and facilitate marketing activities, as well as encouraging the provision of other public services, such as health and education facilities. For these reasons, there is a strong "felt need" for roads in Nepal.

317. Unfortunately, road development can also result in serious environmental damage. Environmentally unsound construction methods, coupled with underlying unstable geological formations and technically unsound road alignments, have scarred on the landscape by exposing large areas of earth and rock to erosionary forces, resulting in the subsequent destabilisation of mountain slopes. Other localised environmental impacts associated with the road construction site include deforestation, and air and noise pollution.

318. One possible alternative to secondary or district-level road construction is the so-called "green roads" approach being tested in Palpa and Dhading districts. These pilot projects aim to build low-cost, low-traffic, fair-weather village access roads using conservation-oriented and labour-intensive construction techniques. which respect the fragile mountain ecosystem and provide maximum benefit to the local population.

319. During the construction phase, cutting operations are limited and cut and fill materials are carefully balanced. Bio-engineering methods are used in slope protection measures. Construction workers are typically owners of the surrounding land, so it is in their interest to protect their land from environmental degradation by following environmentally sound construction methods. Road maintenance will be funded through the collection of tolls.

320. As with other sectors, greater involvement of local people in the decision-making process is likely to result in a more sustainable outcome. The extensive use of private-sector contractors, who focus on constructing a road as cheaply as possible, who are rarely provided with environmental conditions that they must satisfy, and who do not directly bear the costs of any environmental damage associated with road construction or operation, has resulted in unsustainable roads.

321. For national roads projects under the DOR, there is a need to strengthen the Environmental Management Unit created within the DOR. An ambitious full-time staffing structure and work programme was developed about four years ago when the Unit was established, but, because of funding constraints and staff shortages, only staff with other full-time jobs are nominally assigned to the Unit. A properly funded Unit could provide a powerful tool in ensuring contractors on large road projects implement necessary environmental mitigation measures.

322. One area that Unit could work on is the development of EIA guidelines for road construction. EIA provides an opportunity to predict adverse environmental impacts and to develop

mitigatory measures *prior* to construction work.

Hydroelectric Power

323. Tremendous opportunities and difficulties exist simultaneously with regard to Nepal's hydroelectric potential. In a country where 90 percent of energy needs are met from dwindling sources of biomass and few hydrocarbon deposits have been discovered, the need for alternative energy sources is critical. However, the extreme seasonal fluctuation in the availability of water coupled with the ever-changing landscape make planning and constructing large infrastructure projects difficult.

324. The environmental and social problems associated with the construction of large hydroelectric projects are well known: Major changes in the hydrologic cycle can result in damage to aquatic ecosystems; downstream river flows are affected; and reservoirs inundate inhabited areas requiring people to be resettled. Careful planning that includes detailed proposals to minimise the impact of these problems is essential.

325. Several zones within the mid-Himalayan region are known to be seismologically active. Earthquakes measuring five to six on the Richter scale are a frequent phenomenon, generating uncertainty regarding dam safety and water leakage due to faults in the relatively pervious limestone rock that abounds in these zones. There is hence the need to conduct detailed surveys and continuous earthquake monitoring in these areas in order to assess the foundation conditions of various structures.

326. When people are dislocated, plans are required not only for their physical resettlement in suitable areas with adequate infrastructure, but also with regard to the social and economic environment. Those relocated must be consulted beforehand and measures should be taken to ensure that their living standard is maintained at least at the same level as before, and to enable them to share the benefits of the project.

327. There is also the issue of human impacts on infrastructure development projects. These include squatter settlements, unplanned land use in the catchment areas leading to accelerated erosion and pollution, and development of new economic activities with potentially adverse impacts on the environment.

328. The deposition of eroded material is a major problem for hydroelectric projects. Sedimentation imposes a high cost in terms of shortened investment life, high maintenance requirements and reduced services. A comparison of the design and currently estimated life of reservoirs in Nepal indicates that erosion and sedimentation are not only severe and costly, but accelerating. It is clear that the original project estimates of expected sedimentation rates were faulty and based on limited reliable data over too short a period. Minimum data requirements for adequately modelling sedimentation flows are well-known internationally, and in developing future hydroelectric projects it is essential that sufficient data be gathered before investment decisions are taken. Failure to do so may result in systems with reduced generating lives and may increase the chances of catastrophic disaster.

329. The most significant environmental impacts of a hydropower project include the alteration of ecology from riverine to lake, destruction of wildlife, threats to the survival of migratory aquatic species, climatic changes and the risk of dam failure due to seismic activity. As with irrigation projects, EIA is a necessary tool in planning a hydroelectric project. Where large projects are being considered it is also desirable to undertake a broader basin-wide study, such as the one carried out for the proposed Arun hydroelectric project. These studies aim to look at the wider socio-economic, environmental and cultural impacts of large projects and to propose measures to deal with problems that may have been overlooked by planners focusing exclusively on project related aspects. Possible effects of the project on the multiple-use capabilities of the area should be studied, particularly with regard to foreclosing any future resource use options. Conversely, the multiple-use possibilities afforded by the project

ACTION PLAN FOR INFRASTRUCTURE DEVELOPMENT

Policies	Recommended Actions	Institutional Responsibility	Time Frame
Ensure adequate surface drainage on irrigation projects	Educate farmers on the importance of surface drainage; include drainage as an element in the design of projects	DOI	Immediate, continuous
Develop groundwater resources in the Terai as a source of irrigation water	Ensure groundwater extractions are not excessive through monitoring and enforcement of the current system of permits	DOI	Short-term, continuous
Improve management of irrigation schemes to maximise productivity gains	Transfer management responsibilities from government line agencies to farmers and water users' groups	DOI	Immediate, continuous
	users' groups should develop rules governing the operation of irrigation systems	DOI	Short-term
Encourage conservation of scarce irrigation resources	Use fees and labour to cover at least O&M costs and promote conservation by making farmers aware of the costs involved	DOI	Short-term
Ensure the use of EIA for irrigation projects with significant environmental impacts	Finalise draft EIA guidelines for water resources	MWR, NPC	Immediate
Promote the use of environmentally friendly road construction methods	Investigate the potential for more widespread use of the "green roads" approach	DOR	Short-term
Improve the capacity of DOR to undertake environmental assessments of road projects	Strengthen the Environmental Management Unit in DOR to enable it to monitor road contractors to ensure that necessary environmental mitigation measures are implemented	DOR	Immediate
	Develop EIA sector guidelines for road construction	DOR, NPC, MWR	Short-term
Minimise environmental impact of hydroelectric projects	Ensure the use of EIA when designing a hydroelectric project	MWR, WECS, NEA, HDC, NPC	Short-term, continuous
	Where economically feasible, encourage the construction of mini- and micro-hydroelectric projects at sites with minimum geological risk	MWR, NEA, HDC	Continuous

should be examined, such as commercial or sport fisheries, tourism and outdoor recreation. If a hydropower project is one of several projects planned on a river system, an overall assessment of the combined impact becomes important.

330. Apart from large hydroelectric projects, there is considerable scope for the development of much smaller mini- or micro-hydroelectric schemes. With active participation of private entrepreneurs, development of hydroelectric projects up to one mega-watt capacity should be encouraged in regions where the extension of the national grid system is not feasible. Development of other appropriate energy sources such as solar energy, wind energy and biogas should be encouraged to substitute for or supplement fuelwood and dung.

331. The careful planning of smaller hydroelectric projects is as important as large-scale projects. An EIA is needed, and local communities need to be directly involved in the planning, construction and maintenance phases.

Note

[1] An example is the Land Acquisition Act (1977), which authorises the government to acquire land for public purposes, while requiring compensation for the private landowner. However, the law does not specify that compensation must be at market value, and the result has been considerable mistrust by the private sector of public initiatives to improve urban land management through land acquisition.

5 Legislation, institutions, education and public resources

332. This document is primarily concerned with environmental issues in Nepal, and the material presented in the preceding four sections has focused on analysing these issues from a sectoral perspective. However, a number of broad development policies are necessary to provide the correct framework for addressing environmental problems.

333. First, appropriate legislation and regulation is absent in a number of key sectors, and needs formulating. In other sectors where laws have been passed, either appropriate rules for their implementation have not been drawn up, or the institutional capacity to enforce them is weak. Little attention has so far been given to the use of economic incentives as a means of changing individual behaviour and discouraging environmentally-damaging activities.

334. Second, continued institutional reform is essential to HMG's development objectives. This entails reorienting the role of government agencies and making greater use of local institutions, NGOs and the private sector.

335. Third, environmental education and awareness-raising programmes are necessary to sensitise the citizenry, decision-makers and field workers in all sectors. Environmental education hence should be incorporated in all formal and nonformal education programmes run by public and private sectors and NGOs.

336. Finally, there is a need to prioritise actions and the resources necessary to support them. This will require hard decisions about which expenditures contribute most to the overall achievement of HMG's developmental and environmental objectives.

LEGISLATION, REGULATION AND ECONOMIC INCENTIVES

337. Environmental policy is largely concerned with changing individual behaviour to discourage activities that pollute and degrade the environment while encouraging those that do not. Legislation is the tool for implementing environmental policies, whenever special powers, rights or responsibilities need to be defined in law. It is necessary to clearly define what constitutes a polluting or damaging activity and what the punishments are for those who transgress. Laws are, however, only a tool; how laws are enforced is equally important. The capacity of government agencies to enforce environmental regulations has been limited in the past. Future legislation will need to include greater efforts to assign institutional responsibilities, and to define the mechanisms by which laws will be enforced. Economic incentives that make those who pollute more pay more may offer another alternative.

Environmental Legislation

338. Environmental legislation in Nepal to date, has been piecemeal, and many loopholes mitigate against prosecuting those who damage the envi-

ronment. Many important areas of environmental concern are covered by insufficient legislation, for example, air and water quality standards and land use zoning in urban areas.

339. Typically, environmental legislation describes the general issues to be covered under a law, but does not specify the manner in which laws are to be implemented, leaving this instead to regulations. Regulations remain to be passed for the effective implementation of many environmentally-related laws.

340. In the case of forestry, enabling legislation for classifying forests into community, leasehold and private forestry was enacted in 1961. However, the legislation did not specify the modalities for transferring forests from government ownership to the various new categories; as a result, the status of forests remained virtually unchanged. These problems are being addressed through new legislation and the preparation of by-laws to guide implementation.

341. **Pesticides and Insecticides.** Pesticides and Insecticides are necessary to boost agricultural production and their use has been increasing with improved agricultural practices. Public health services are also using insecticides to control malaria. However, Nepal is low user of pesticides and insecticides as compared to other South Asian countries. The Agricultural Inputs Corporation and numerous private dealers import and sell pesticides for agricultural use. Improper use, unsafe handling and disposal of date expired pesticides containing high toxic chemicals have had adverse effects on public health and pose increased risk of poisoning and polluting the environment. Registration, licensing and quality control of pesticides and insecticides produced locally or imported and integrated pest management system are needed to reduce adverse effects of pesticides on public health and environment.

342. The government has enacted the Pesticides Act, 1991 to regulate import, export, production, sale, purchase and use of pesticides. The Act has made it mandatory for a person or organisation to acquire a certificate of registration before the import, export, sale or purchase of pesticides. A committee on pesticides is to be constituted to render necessary advice to HMG for the determination of the national policy on pesticides and for its implementation. Contravention of the Act may result in a fine up to five thousand rupees. The maximum fine is too low to deter the violation of the Act's provisions by the most serious offenders. Though the Act was enacted in 1991 it has not entered into force yet. Similarly, even after two years of enactment of the Act, pesticides regulations have not been passed by the government. The government should immediately prepare pesticides use and disposal guidelines and manuals to prevent the misuse and avoid public health hazard.

343. In other cases, environmental management is covered by various overlapping laws. The result is that management of some areas is made the responsibility of a number of different agencies, presenting problems of inter-agency coordination and duplication of work. Other areas fall between the provisions of the legislation, with the result that no agency is made responsible. In urban planning, for example, both the TDCs and the municipalities have been given the legal obligation to establish and manage basic community infrastructure, and there is thus the potential for duplication of effort. On the other hand, no agency has been given the formal responsibility for providing stormwater drainage, the lack of which has contributed to deteriorating urban environmental conditions. Another example is that of mines and minerals, which are generally administered by the Department of Mines and Geology; however, where mineral deposits occur within a forest area, they fall under the exclusive jurisdiction of the DOF. Such independent lines of authority are not conducive to developing an integrated approach to conservation.

344. HMG intends to enact a comprehensive environmental protection legislation that will place a high priority on sustainability, intergenerational equity and the "polluter pays" principle. Another legal issue that is being consid-

ered is clarifying existing legislation to remove resource ownership and use conflicts, including the "double" ownership of land and the issue of downstream water use rights. It is hoped that these changes will fill many of the holes in the present environment-related legislation. For this to be the case, however, more attention will need to be paid to developing mechanisms to implement laws.

345. **International conventions.** Nepal is party to several major international conventions relating to the environment, including the Convention on Wetlands of International Importance, the Convention Concerning the Protection of the World Cultural and Natural Heritage, and the Convention on International Trade in Endangered Species of Wild Fauna and Flora. The Conventions on Biological Diversity and Climate Change were signed by Nepal in 1992, and are awaiting formal ratification by Parliament.

346. The membership of these conventions carries certain obligations that exert some influence over environmental policy. For example, CITES appendices recognise a number of species as endangered, and obliges the government to prevent trading in these species to the best of its ability. Some conventions also include financial protocols that provide a mechanism for directing resources to developing countries. The World Heritage Fund, under the World Heritage Convention, for example, has already provided Nepal with financial assistance for the repair and protection of several historic buildings in the Kathmandu Valley.

Regulation and Enforcement

347. Legislation is only the start, however. Regulations that govern the enforcement of laws also have to be developed and enforced. Those that are not properly enforced will have little impact, while those that rely on undue coercion will be either circumvented or incur high social costs in the form of popular opposition. Despite this, there is still a need for environmental regulations that protect people from undue risk of exposure to environmental threats. A clear example is the need for regulations governing hazardous waste and toxic substances, such as the storage and disposal of unused pesticides.

348. Although Nepal has an extensive court system and a growing body of laws that seek to protect the environment, the judicial system has so far played only a small role in environmental disputes, and convictions for environmentally-damaging actions have been few. In part, this reflects the lack of practical rules covering the implementation of legislation, but it also reflects the weak capacity of relevant environmental institutions to enforce existing legal provisions.

349. Appropriate institutional mechanisms are needed to implement regulations effectively (see section on Institutional Development for more details). The past inability of government agencies to implement regulations is related to many factors. With regard to natural resource management, one problem has been an approach to protection that has relied too heavily on coercion and exclusion. In the management of national parks, for example, the DNPWC has relied on the RNA to police parks and prevent local people from having access to resources. This has led to disputes that have had a negative effect on park management. A new approach currently being promoted is based on developing national parks in cooperation with local people.

350. This report has suggested that the direct involvement of local people in decision-making is likely to reduce the need for regulations. Where individuals feel that they have control over the management of their own resources, there is a much greater incentive for them to conserve and manage those resources sustainably. Where resources such as forestry and watershed systems are managed communally, communities have developed their own rules and regulations for resource management. Despite the nationalisation of forests, for example, indigenous management systems have been able to endure and prosper because of the government's limited institutional capacity to enforce its own legislation. Rules governing protection, harvesting and distribution of forest products have been developed, although

they are often only concerned with forest protection rather than improving forest productivity. Indigenous management systems do not necessarily equate with sound forest management. However, many examples of indigenous systems of environmental management suggest that where people have a stake in the ownership of resources, they will develop their own rules and regulations governing use and access.

351. **Project planning**. One method of trying to ensure sufficient consideration is given to integrating environmental considerations with development objectives is through the use of EIA during the planning stage of a project or programme. The main aim of EIA is to provide a framework for analysing the potential adverse environmental impacts of projects, and to develop mitigatory measures to minimise the impacts. It also provides an opportunity for full public participation, involving all groups that might be affected.

352. Donor-funded projects, particularly large infrastructure projects, typically already require an EIA. HMG has recently gazetted National Environmental Impact Assessment Guidelines and is developing sectoral EIA guidelines. In the near future, EIA is likely to be made a legal obligation for all proposals that are shown by an initial examination to have significant environmental impacts.

353. Draft Environmental Planning Guidelines have also been developed that present a framework for integrating environmental concerns into the planning process from the village-level up to central government line agencies. Recent efforts of the NCS Implementation Project in environmental planning at both local and national levels need to be further strengthened.

Economic Incentives

354. Laws and regulations are not the only method available to ensure environmental protection. Economic incentives can also be developed that use the pricing mechanism to affect individuals' behaviour. It is possible to devise incentives that make it more costly to pollute than not to pollute. It is also possible to price resources so that they better reflect the environmental costs and benefits of extracting them. The advantage for a bureaucracy, particularly one that finds enforcement difficult, is that economic incentives are usually self-regulating, requiring less administration than regulations.

355. It is also possible to develop incentives that unwittingly have undesirable environmental impacts. One example is the current petroleum pricing policy. Because of the price differential between kerosene and petrol, there is evidence that people are adulterating petrol with kerosene in order to reduce the overall cost of fuel. The results are higher exhaust emissions and reduced engine life.

356. In some cases, such as fertilizer and petroleum product pricing policies, the goal is to limit subsidies and reduce any unintended adverse environmental impacts. In other cases there is a need to develop new systems of incentives. One possibility is to investigate the use of taxes to limit industrial pollution. The impact of a tax on polluting industries is intended to encourage a move to less-polluting technologies with less or no tax payable, and to provide revenues to assist in treating the emissions that are released. To implement and monitor such a system, however, is likely to require additional institutional mechanisms for monitoring pollution that may not be appropriate at this time.

INSTITUTIONAL DEVELOPMENT

357. Past attempts by government institutions to control environmental management from the centre have failed. For example, the impact of the nationalisation of forest lands in 1956 increased uncertainties about who had ownership and control over forests. Nationalisation removed the incentive to manage the forests sustainably, and in many areas, people responded to these uncertainties by abandoning previous indigenous methods of management, instead regarding the resource as a free good to be exploited until it was completely exhausted.

ACTION PLAN FOR LEGISLATION, REGULATION AND ECONOMIC INCENTIVES

Policies	Recommended Actions	Institutional Responsibility	Time Frame
Tighten loopholes in existing environmental legislation	Complete preparation of comprehensive environmental protection law	NPC, MLJPA	Immediate
Enable HMG to meet its obligations as signatory to various international conventions	Amend existing legislation, or enact new laws, for implementing international conventions	NPC, MLJPA	Short-term
Ensure all regulations are accompanied by appropriate mechanisms for enforcement	Develop institutional mechanisms to implement regulations effectively, and ensure all regulations specify the institution responsible for implementation	NPC, MLJPA	Continuous
	Involve local people in decision-making to reduce the need for regulations	All ministries	Continuous
Ensure sufficient consideration is given to integrating environmental considerations with development objectives	Complete sectoral EIA guidelines to ensure relevant projects receive adequate environmental scrutiny		
Complete sectoral environmental planning guidelines and develop local- and national-level planning manuals for better integration of environmental concerns in development plans	NPC, concerned sector		
NPC, MLD and concerned sectors	Immediate		
Expand use of economic incentives to encourage more environmentally benign activities	Review environmental impact of current pricing policies on fertilizers and petroleum products to ensure they are not having a negative economic impact by encouraging pollution, rather than discouraging it	NPC	Short-term
	Investigate options for developing taxes to discourage pollution	NPC	Longer-term
Provide legal measures to prevent and control air and water pollution	Develop pollution prevention and control legislation	NPC,/MHPP	Short-term
Ensure strict product and service liability with respect to those products and services which are hazardous to public health and significantly degrade natural resource base	Enact strict product and service liability legislation	NPC/MOS	Short-term
Ensure effective implementation of Pesticides Act, 1991	Prepare pesticides regulations, guidelines and manuals	NPC, MOA, MOH	Immediate

358. HMG has now embarked on a process of decentralisation that seeks to make greater use of village- and district-level institutions, rather than relying on central government agencies. For this process to be successful, there is a need to strengthen and redefine institutions from local users' groups up through government ministries and departments.

Decentralisation

359. HMG is committed to a process of decentralisation. The cooperation of local communities is essential for dealing with the complex challenges of resource conservation and environmental protection on a sustainable basis. A participatory approach giving a central role to local people—the ultimate beneficiaries—is far more likely to generate a sense of purpose and responsibility than past models of rural and urban development that relied on the flow of goods and services from the centre to the periphery. These models of development have singularly failed to deliver the goods and services that people want, need and are willing to pay for.

360. The three main objectives of the decentralisation policy are: (i) to enable local people to develop appropriate institutions to suit their development needs; (ii) to make local political bodies and other agencies providing services at the local level accountable to local people; and (iii) to keep the accounts of local entities open and transparent. Central government agencies will facilitate the process of local development through the provision of supplemental funds, technical and institutional support, and manpower development, but with a greatly reduced role as direct service providers.

361. Action has already been taken to institute decentralisation. The District, Village and Municipal Acts were promulgated in March 1992, and multi-party local elections were held in mid-1992. Working procedures for the District and Municipal Acts have been gazetted and the village procedures are nearing completion. Training and orientation programmes for elected officials and HMG field staff have been initiated. Manuals dealing with user group formation and operation in different sectors are undergoing field testing. Governance manuals for planning, accounting and personnel management are being developed and will shortly provide the basis of a major nationwide training programme.

362. Municipalities, DDCs and VDCs are now able to organise and undertake development works directly. Local entities will be able to develop their ability to mobilise resources through taxes and levies at the local level. Government will provide block grants through the Local Development Fund (yet to be established) to which local institutions will have direct access. Foreign donors may, in concurrence with the government, also contribute directly to the Local Development Fund without having to route resources through central level agencies as is currently the case. The private sector and NGOs will be able to participate more substantially in local development efforts through contractual arrangements with the local institutions concerned.

363. Government ministries are beginning to reorient their role away from direct project implementation and service provision, and towards supporting local-level institutions through training and other forms of technical assistance. DDCs and VDCs are improving their ability to develop and implement projects, and the number of local NGOs is increasing, enabling user groups and other community organisations to take on a greater role in managing financial resources and developing projects and programmes.

364. Despite this progress, many of the mechanisms to enable devolution of power to local authorities have not yet been put in place. The human resource and institutional base in most districts and municipalities is still weak; local government and user group accounting and audit systems have yet to be developed; and provisions to facilitate the raising of local revenues have not been fully defined and enacted.

365. Decentralisation involves giving control to

local institutions capable of taking on all the duties and obligations that control entails. Thus, for example, if village groups are permitted to raise their own revenues, it is the duty of these groups to make it clear to people how the revenues are collected and what they are spent on. To achieve this goal, considerably more work needs to be undertaken to finalise the arrangements for bringing local-level institutions directly into the decision-making process.

Village-Level Groups

366. A recurring theme throughout this report has been the important role that has been played by village groups in the management of natural resources in the past, and how this role must be enhanced in the future if the development and protection of natural resources is to be assured.

367. **User groups.** There is a growing realisation that user groups should be the basic unit of community management of resources. User groups already manage a variety of resources, including forests, irrigation projects, drinking water schemes and roads. The success of these groups will depend on their ability to carry out all of the responsibilities required of institutions managing both financial and natural resources. It is essential to develop clear, simple rules governing the separation of powers between the non-political user groups and the VDC—the basic political unit at the community level. There is otherwise the serious possibility that user groups will become the domain of the rich and powerful. Some possible ground-rules have been suggested in an NPC document (HMG 1991c).

368. Local capabilities severely limit the scope and size of projects that can currently be managed by local institutions. The need to integrate environmental and development concerns requires special attention from the planning through the O&M stages of project implementation. Hence, environmental assessment needs to be made an important component in local development planning. HMG agencies can assist by raising environmental awareness and promoting appropriate environment-related activities. HMG can also facilitate the further development of user groups to manage resources by enhancing the role played by intermediary NGOs, and can assist in human resource development through education and training. In particular, there is a significant need to provide training in basic bookkeeping and accounting techniques for local institutions.

369. **Village and District Development Committees.** If user groups are the basic unit of community resource management, then the VDC is the basic political unit where decisions concerning the use of public resources should be made. Where resources are generated at the village level, VDCs are permitted to plan, implement and manage their own projects. The DDC authorises funds when resources are required from the district budget for district- and village-based projects. In this case, VDCs may propose projects for funding; however, decisions about which projects are to be funded are taken by the DDC.

370. District plans are discussed at the DDC, in the presence of line agency personnel. Plans for projects are approved and forwarded to the NPC and concerned line agencies. Final decisions about district budget allocations are then made by central ministries in Kathmandu. Once finalised, budget allocations were formerly considered fixed and not subject to reallocation to other sectors by district- and village-level institutions. As part of the process of decentralisation, however, some steps have been taken recently towards devolving budgets and permitting greater control over resources at the local level. This fiscal year, for example, block budgets for local road construction were given directly to DDCs, rather than being allocated through prior planning by the DOR. Plans are also being considered to devolve budgets for small-scale irrigation and drinking water projects. However, no concrete steps have been taken to date insofar as transferring personnel authority over line agency field staff.

371. There are thus two main elements that require HMG action. First, the capacity of local institutions to act as financial and natural resource

managers needs to be enhanced. The MLD is currently drafting operational guidelines to assist local-level institutions in building up their capacities. The private sector, including NGOs, also has a significant role to play in providing basic training for local groups. Second, further political reforms are needed to give more autonomy to local development councils in deciding—in conjunction with user groups—where scarce resources should be allocated.

Non-Governmental Organisations

372. The past ineffectiveness of government agencies to bring about significant socio-economic change at the village level has encouraged the search for other organisations capable of bringing about this change. Reforms to the political process that have highlighted the importance of decentralisation have been accompanied by a dramatic increase in the number of NGOs involved in a wide variety of activities. NGOs represent a heterogeneous group of organisations, from self-help, community-based groups, to "local" service NGOs (typically external to the community), to national and international NGOs[1]. There are now thousands of NGOs operating in Nepal. It is important to note, however, that despite the increase in the number of NGOs, they still operate on a limited scale and work only in a small minority of communities.

373. The EFYP places considerable emphasis on promoting community-based development through NGOs and local users' organisations. Earlier activities of NGOs were restricted to provision of social welfare. The EFYP, however, envisages a role for NGOs in the productive sectors as well as in general socio-economic development. Despite this commitment, regulations relating to registration and organisation and tax laws that limit access of NGOs to public resources are both imposing constraints on effective NGO operation.

374. **Self-help NGOs.** Thousands of local self-help NGOs are involved in activities as diverse as the management of community forests or providing access to credit and agricultural labour exchange. This type of NGO represents a considerable development potential, as they can provide services to group members that could not be provided by individual self-help groups. They can also mobilise local resources very effectively as they are operated by the beneficiaries themselves. The proximity of self-help groups to community members and their accountability enable them to provide services demanded by communities that other institutions have failed to provide effectively.

375. The potential for expanding the scope and operations of self-help NGOs is limited by three considerations. First, there is a lack of appropriate mechanisms for financial accountability. To address this, groups will need to build financial systems that are simple enough to ensure local transparency, yet detailed enough to ensure efficient management and cost control. Second, project planning and monitoring is similarly undeveloped. Simple, but efficient mechanisms for planning, monitoring and controlling projects can assist in the expansion process. Third, there is a lack of functional linkages between self-help groups, local political structures and government line agencies. These linkages, if developed, could provide an essential source of additional finance to permit self-help NGOs to grow.

376. **Local service NGOs.** Local service NGOs originated to provide social services to the poor on a voluntary basis. They are normally district-based and have good relations with district governments and line agencies. This permits them to mobilise more external resources for their projects than some other types of NGOs. There has been a tendency for local service NGOs to implement projects directly. The fact that they are *external* to communities means that local beneficiaries' interests may not be sufficiently well-represented in the planning process. There is thus a need for these NGOs to develop a role as facilitator rather than implementor. Accounting skills and programme planning and monitoring are also constraints to expansion.

377. **Regional, national and international NGOs.** The strength of this group of NGOs lies in

their ability to mobilise external resources. They also have a large geographical sphere of operations, and could have a significant development impact in Nepal. To do this effectively will require an improvement in their capacity to adequately monitor their projects and improve strategic planning, basing interventions on a rational analysis of where resources would be best allocated.

Central Government Ministries

378. This report strongly advocates government ministries and departments significantly reduce their role as project and programme implementors, and instead focus on facilitating local-level institutions and the private sector in implementing the projects and programmes they want. Rather than exerting influence through the control of central resources, government agencies can encourage policies through the use of technical assistance, training, and monitoring and evaluation. To develop this role, however, there needs to be a significant improvement in the ability of agencies to perform these tasks.

379. **Capacity-building.** There is a serious lack of managerial and technical capacity in some government agencies. Frequent changes in senior management of government departments and entities in the public sector further undermine the ability of ministries to act effectively. The issue of availability of sufficiently well-qualified staff is partly a function of the broader question of public administration in Nepal, and the ability of the public service to recruit, motivate and retain capable staff. This broader question of the structure and management of public service, including issues of recruitment, tenure, classification and compensation, is being considered by HMG as part of overall public sector reform.

380. Some measures require priority actions. First, a greater effort needs to be made to appoint staff on the basis of their qualifications, experience and proven past performance. Second, where there is a shortage of qualified staff, local or foreign technical assistance should be used. Third, it is necessary to reduce the rapid turnover of senior staff in ministries, state enterprises and financial institutions.

381. **Environmental units.** As part of its efforts to integrate environmental concerns into the planning process, HMG is committed to setting up environmental units in all relevant ministries. Units already exist in the MFSC, in the DOI and DOR, and in the NEA.

382. The precise role of the units and how they will fit in to the existing institutional framework has not been fully worked out yet. One possibility is that rather than making the units separate entities, they will constitute an integral part of the existing planning cells. In this way it is hoped that environmental concerns can be integrated into all development functions of the ministries.

383. Some additional considerations in developing the role of environmental units are suggested. The units should have a clear mandate as to what their duties are. Units could act as "watchdogs" over the ministries' operations; however, whether or not they would have the power of veto over operations that do not satisfy environmental concerns needs to be made clear. If it is not practical for the units to have veto powers, then some alternative formal mechanism through which they can affect policy is essential.

384. **Environment Protection Council.** Established in 1992, the EPC has a broad mandate that includes formulating appropriate policies and acts, coordinating the activities of various agencies and developing suitable institutions for effective implementation of environmental policies and programmes. The Council is also responsible for regular monitoring and follow-up activities.

385. The EPC's ability to respond swiftly to a wide range of environmental issues depends to a great extent on the capability of the small secretariat within the NPC that is responsible for developing policies and programmes for the council to review. At present, the secretariat is overstretched even though it has only limited responsibilities.

ACTION PLAN FOR INSTITUTIONAL DEVELOPMENT

Policies	Recommended Actions	Institutional Responsibility	Time Frame
Entrust responsibility of local-level decision-making to local-level institutions	Improve human resource and institutional base to enable local-level institutions to carry out their responsibilities	MLD	Immediate, continuous
	Promote formulation of new user groups; support existing ones	MLD	Immediate, continuous
	Develop appropriate local government and user group accounting and audit systems	MLD	Short-term
	Continue with progressive devolution of sectoral budgets	MOF, MLD	Continuous
	Review and revise provisions for raising local revenues	MLD	Short-term
	Develop rules governing the functional linkages between local-level institutions	MLD	Immediate
Reduce constraints facing NGOs to promote community-based development	Build local financial and project planning and monitoring systems that are simple enough to ensure local transparency, while enabling a sufficient level of detail to ensure efficient management and cost control	MOF, MLD	Short-term, continuous
Improve capacity of HMG agencies to carry out their responsibilities effectively	Continue with on-going public sector reform programme	MOF, NPC	Continuous
	Appoint staff on the basis of ability and merit	All ministries	Continuous
	Use short-term technical assistance to fill skill gaps	All ministries	Continuous
	Reduce the turnover of senior staff	All ministries	Continuous
	Develop institutional arrangements for the relationship between the proposed environmental units and line agencies	All relevant ministries	Short-term
	Strengthen capacity of EPC Secretariat to act as an advisory body to the EPC	NPC	Immediate
	Assess the need for establishing a broader environmental protection agency to advise the EPC	NPC	Longer-term

386. The longer-term needs for preparing environmental policies, monitoring and evaluating existing environmental policies, and for enforcing environmental regulations may require an expansion of the current EPC Secretariat into a broader environmental protection agency. If this becomes necessary, the agency's mandate must be clearly specified to prevent it from becoming another bureaucratic obstacle to development. A central environmental agency should be autonomous. While the director of such an organisation would be a government appointee and the agency would be expected to implement government policy on the environment, its day-to-day running would be left to the director and management team.

ENVIRONMENTAL EDUCATION

387. As in all other areas education and awareness-raising efforts are critical in shaping people's

perception, attitude and behaviour towards environmental concern. These efforts enable individuals to appreciate better environmental policies, legislation and regulation, and foster individual responsibility toward sustainable resource management and development.

Formal Education Programme

388. Some elements of environmental education already exist in courses of study ranging from primary to tertiary levels. However, these are inadequate in explaining the impact of human activities on the basic life support system.

389. Over 60 percent of primary school age (6-10 years) children are enrolled in schools. Only about a third of these children complete the primary school cycle. After leaving school, most children take up household chores and income generating activities in rural areas. More often than not, these activities constitute direct interaction with the surrounding environment. It is therefore important to incorporate environmental lessons from Grade I.

390. Besides imparting basic concepts of the environment, it is essential to teach conservation skills as students advance to higher grades. At the tertiary level, advanced courses of study are required to prepare manpower for handling the critical environmental problems facing the country.

391. In addition to infusing environmental concerns in existing courses and/or introducing separate courses, these concerns need to be reinforced through extracurricular activities, supplementary readers, resource materials, and practical experience. Equally important is the need for training and follow-up programmes for teachers.

Nonformal Education and Training Programme

392. Lack of awareness on the part of rural and urban adults about the consequences of human activities on the environment is to a great extent responsible for the ongoing degradation of Nepal's natural and cultural resources. In order to reverse this trend, a host of nonformal education and training programmes are needed.

393. Relevant environmental concerns need to be incorporated in the programmes of established training institutions, and HMG has already initiated programmes towards this end. Environmental concerns should be incorporated in all training programmes giving priority to those designed for women, adult literacy class participants, extension workers and non-school-going children.

394. Separate awareness-raising and training programmes should be devised to reach the large number of children and adults who have no access to education. Similar programmes will be conducted to sensitise the country's legislators, policymakers and planners.

395. Agencies in the public and private sectors and NGOs should ensure that environmental awareness components are built into their development activities and training programmes.

396. Workshops, seminars and mass media play an important role in conveying environmental messages to a wide audience in a quick and effective manner. Greater use should be made of newspapers, magazines, wall newspapers, billboards, radio, television and other media such as street theatre, drama and puppetry, in raising public awareness about the ways of keeping Nepal's air, water and land clean, and preserving its precious natural and cultural heritage.

PUBLIC RESOURCE MANAGEMENT

397. Public resources are limited in Nepal. Foreign resources, in the form of grants and loans, constitute well over half of the total development budget. Estimates suggest that available resources are likely to remain constrained in the medium-term. In order to sustain HMG's priority development activities in the face of resource constraints and severe competition for limited resources, there

is a need to review government expenditures.

398. A review of government expenditure would comprise three elements. First, attempts need to be made to mobilise additional resources, for example by expanding the tax base, reducing tax exemptions and rationalising tariffs. Second, expenditures on less essential programmes need to be curtailed. These might include subsidies and transfers to inefficient public enterprises. Third, public administration reform needs to continue, as well as measures to improve government procedures like fund release procedures, expenditure monitoring and control, and procurement procedures.

399. It is beyond the scope of this report to review the entire public resource management system. HMG has already initiated a number of programmes aimed at tackling some of the resource management issues mentioned. The focus here is on assessing selected public expenditure issues that are relevant to the environment, and the potential for increasing funding for priority environmental issues consistent with the development objectives of the government.

Resource Allocation and the Environment

400. There is a growing recognition that project quality is more important than quantity. To maximise returns from limited resources, HMG will need to decide on priority areas for funding. This will mean the inevitable need to make trade-offs, as current resources are insufficient to fund all on-going projects. Some progress towards identifying priorities is taking place through the public expenditure review currently being implemented.

401. With regard to environment-related activities, it has been proposed that as part of the follow-on to the NEPAP, priorities will be clearly identified and an investment programme developed. In general terms the present document has sought to

ACTION PLAN FOR ENVIRONMENTAL EDUCATION

Policies	Recommended Actions	Institutional Responsibility	Time Frame
Incorporate environmental concerns in all formal education programmes	Integrate environmental concerns in the primary education curriculum and textbooks being revised now	MECSW	Immediate, continuous
	Infuse environmental concerns in existing courses or introduce new courses at secondary, higher secondary and tertiary levels	MECSW, TU	Immediate, continuous
Incorporate environmental concerns in nonformal education and training programmes	Infuse environmental concerns in training programmes run by governmental and non-governmental agencies	Training centres/units of all Ministries, NGOs	Immediate, continuous
	Design and implement short-term orientation/training programmes to convey important environmental messages to specific target groups in urban and rural areas	All relevant government agencies, NGOs	Continuous
	Incorporate environmental concerns in communication, media and other informal educational channels and communicate environmental messages through such mass media as magazines, newsletters, newspapers, radio and television	All relevant government agencies, NGOs, mass media	Continuous

identify areas where action is needed. These activities, however, have additional resource requirements that, given the scarcity of public funds, will need to be found through cost-savings in other areas.

402. There are several areas of current public funding that may not only be inefficient in terms of maximising returns from government expenditure, but may also be exerting a detrimental effect on the environment. Many of the observations here reiterate sectoral recommendations made elsewhere in this report, particularly with regard to users of environmental resources making more realistic contributions of financial resources to encourage conservation and promote sustainability.

403. **Irrigation.** In the past, the bulk of expenditures was concentrated on large-scale irrigation development; this has only recently begun to change. In recent years, around 30 projects have accounted for three-quarters of the total budget allocation for irrigation, but the returns from these investments have been poor. Several projects have been physically completed, but have been marred by cost overruns and a significant under-achievement of benefits. The command area served is often less than half of what had been originally intended, leading to very low economic rates of return. A case-by-case review of these projects is needed to determine whether necessary project-specific solutions can be found to warrant continued financial support. If they cannot, then further support with public resources is not justified and the relevant project should no longer be funded.

404. Resource allocations for other irrigation development activities have been minimal. Funding for medium- and small-scale irrigation, deep tubewells and low-lift pumps is less than one-fifth of the budget. Smaller-scale irrigation based on groundwater development is less resource intensive and the greater participation of farmer organisations tends to enable a smooth hand-over to user groups after project completion. Smaller farmer-managed schemes are also less likely to encounter environmental problems associated with the significant hydrological changes that often accompany large irrigation projects. This suggests that more emphasis should be given to these types of projects, and less to the large-scale projects. HMG's new irrigation policy emphasises farmer involvement in the creation and management of capital assets, advocates the turnover of completed medium -to small- scale schemes to farmer groups to improve maintenance, and includes measures to improve cost recovery to ensure adequate funds are generated for O&M.

405. **Fertilizer subsidies.** The fertilizer pricing and distribution system, coupled with AIC's monopoly on the import and distribution of fertilizer has created a situation where the government has been faced with an open-ended commitment to rapidly rising subsidies that can exert a major claim on local resources. Not only does the subsidised price place pressures on scarce government resources; in some parts of Nepal the lower prices are encouraging overuse. In the absence of appropriate research and extension work that focuses on developing and disseminating recommendations for fertilizer applications, individuals buy and apply as much fertilizer as possible to maximise short-term profits. In other areas, inefficiencies within AIC have resulted in supplies not being provided on a timely basis for farmers.

406. HMG has now permitted private sector involvement in the purchase and distribution of fertilizer. It is hoped that this involvement will help decrease government expenditure on subsidies, improve supplies to farmers and reduce the incentives to over-apply fertilizers. Despite the announcement to involve the private sector, ambiguities concerning future government pricing policies with regard to fertilizer, and the terms and conditions under which the private sector will operate, have meant that to date private trade has not been established. It will be necessary to remove these doubts before any significant involvement of the private sector materialises.

407. **Forestry.** The MPFS emphasises community participation in forestry resource management, conservation of natural resources and protection of

the soil from erosion. However, the success of the MPFS in promoting increased resource flows to the forestry sector has been mixed. Despite significant increases in the forestry budget in real terms, the share of forestry in total government spending has remained fairly static, and budgetary allocations and expenditures have been considerably less than the recommendations of the MPFS, which were endorsed by HMG. There is therefore a need to review public expenditure in the forestry sector. Improving the efficiency of existing expenditures coupled with better monitoring of resource allocations will help to increase both the absolute level and the effectiveness of public resources.

Note

1 It is beyond the scope of this report to consider in detail the potentials and limitations of different types of NGOs. A recent report (CECI 1992) reviews in detail the history, current state and future prospects for NGOs in Nepal, and provides the basis for many of the comments in this section.

ACTION PLAN FOR PUBLIC RESOURCE MANAGEMENT

Policies	Recommended Actions	Institutional Responsibility	Time Frame
Review current levels of government expenditure to ensure resources are directed to priority areas	Continue with ongoing public resource management review	MOF, NPC	Continuous
Review government expenditures to ensure sufficient resource allocation for environmental protection	Where appropriate, ensure sectoral resource allocations follow endorsed Master Plans, e.g., forestry	MOF, NPC	Immediate, continuous
	Review impact of current public expenditure policies to ensure they are not having a perverse impact by encouraging pollution, rather than discouraging it, e.g., fertilizers, petroleum products	MOF, NPC	Immediate
Develop a monitorable, fully costed, prioritised, time-bound action plan for the environment	Institute follow-on phase of the NEPAP process to identify priorities and develop a sectoral investment programme	NPC	Short-term

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