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Country Environmental Analysis

Strengthening Institutions and Management Systems for Enhanced Environmental Governance

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ABBREVIATIONS AND ACCRONYMS

ADB	Asian Development Bank	FINNIDA	Finnish International Development Agency
AEPC	Alternative Energy Promotion Center	LPG	liquefied petroleum gas
ARI	acute respiratory infection	LRI	lower respiratory infection
CEA	Country Environmental Analysis	MDG	Millennium Development Goal
CLTS	community-led total sanitation	NEWAH	Nepal Water for Health
COPD	chronic obstructive pulmonary disease	NGO	nongovernmental organization
DALY	disability adjusted life year	Nr(s)	Nepalese rupee(s)
DANIDA	Danish International Development Assistance	PCC	pollution control certificate
DDC	district development committee	PM	particulate matter
DGIS	Directorate General for International Cooperation of the Netherlands	SDC	Swiss Agency for Development and Cooperation
EIA	environmental impact assessment	SEAM-N	Strengthening of Environmental Administration Management at the Local Level in Nepal
ENPHO	Environment and Public Health Organization	SLTS	school-led total sanitation
ESAP	Energy Sector Assistance Program	SNV	Netherlands Development Organization
ESPS	Environment Sector Program Support	UNDP	United Nations Development Programme
FAO	Food and Agriculture Organization of the United Nations	UNFCCC	United Nations Framework Convention on Climate Change
GBD	Global Burden of Disease (project)	UNICEF	United Nations Children's Fund
GDP	gross domestic product	UNIDO	United Nations Industrial Development Organization
HCA	Human Capital Approach	USAID	United States Agency for International Development
IBRD	International Bank for Reconstruction and Development	VDC	village development committee
ICIMOD	International Centre for Integrated Mountain Development	WEPCO	Women Environment Preservation Committee of Nepal
IDA	International Development Association	WHO	World Health Organization
IEE	initial environmental examination		
IUCN	World Conservation Union		

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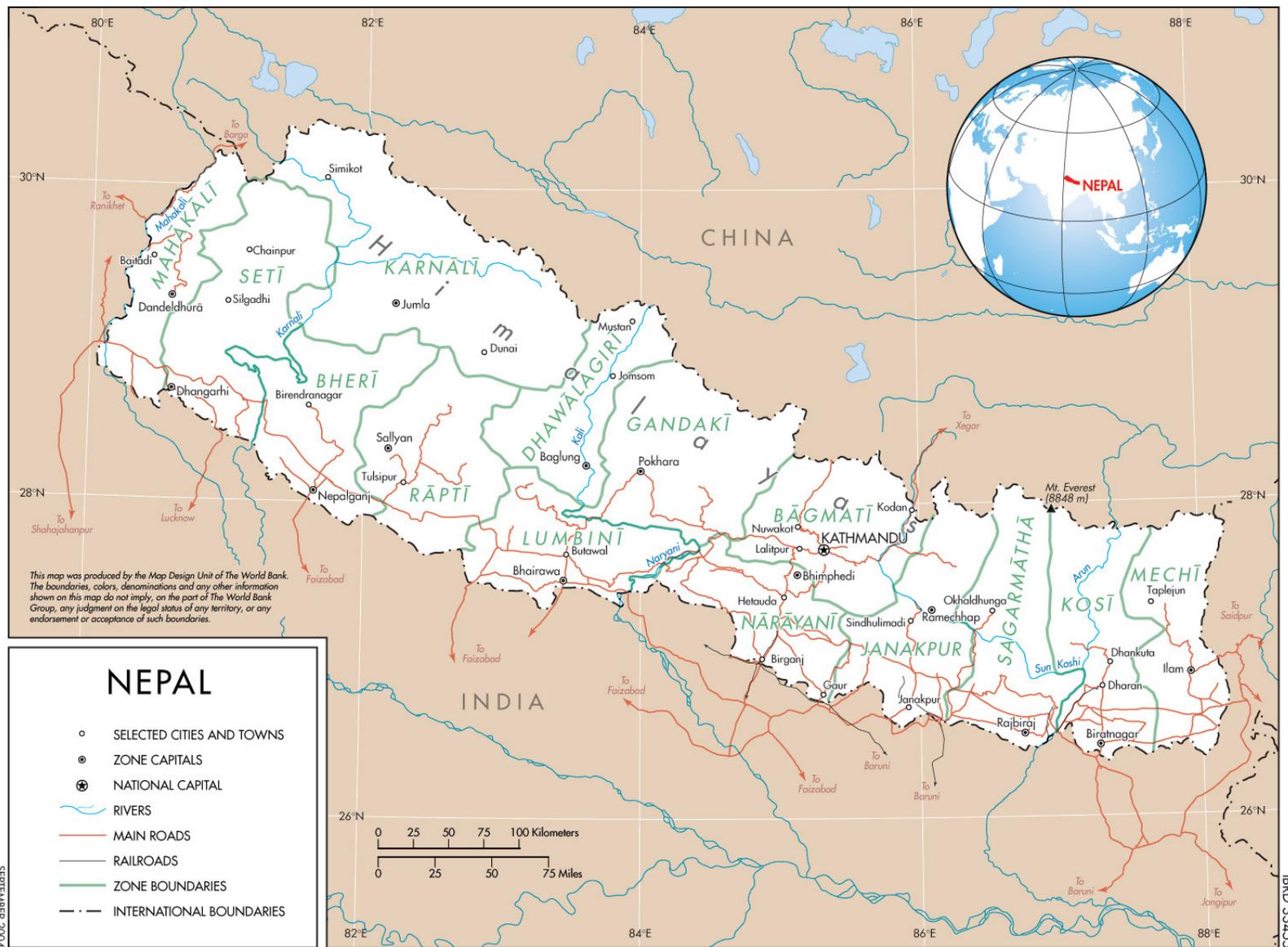
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Map of Nepal



Executive Summary

1. The Government of Nepal's Tenth Five-Year Plan (2002–2007) puts forth a comprehensive framework of development initiatives and institutional reforms. The Plan is based on four main pillars: (a) broad-based economic growth; (b) social sector development; (c) good governance; and (d) social inclusion and targeted programs. The Tenth Plan also recognizes that sustainable economic growth must take into account environmental protection and natural resource management, and therefore commits Nepal to taking action to address a wide range of environmental management challenges.

2. Following the Second People's Movement of April 2006 and the signing of a comprehensive peace agreement in November 2006, Nepal is at a critical juncture in its growth and development. After years of conflict and instability, Nepal now faces what some have referred to as an "open moment" in which a brighter future for the country seems possible. To achieve the full potential of this opportunity, one of the greatest challenges for the new government will be to strengthen the capacity of institutions to deliver on the country's development and reform agenda, an agenda that requires and relies on strong environmental management to support growth, sustainable livelihoods, and poverty reduction.

3. Historically, Nepal's growth has depended on its natural resource base – in particular agriculture, forestry, fisheries, and tourism – either directly or indirectly. Today's economic growth is more broad based, with consequent implications for the nature and diversity of environmental impacts. There are new drivers of economic growth, such as the service sector and small and medium-sized businesses in urban and peri-urban areas. The modest growth achieved in recent years has come at a high environmental cost, and the prospect of more rapid growth as one of the peace dividends will lead to even greater environmental pressures. Despite some progress from a few successful policy initiatives and programs, the overall environmental conditions in both rural and urban areas are deteriorating, and, if left unaddressed, will potentially impede the country's reform agenda and growth prospects. Already, the aggregate environmental health costs associated with poor environmental management are estimated to reach close to 3.5% of gross domestic product (GDP), representing a significant burden on Nepal's economy.

4. The sustainability of poverty reduction efforts and the ability to deliver quick results will, in large part, depend on how effectively institutions can practice cross-cutting approaches and ensure an integrated delivery of the outputs and services envisioned in the Plan. This will require improving the performance of public sector institutions and prioritizing public interventions, developing alternative delivery mechanisms through devolution to local bodies, enhancing the role of civil society, community-based organizations and the private sector in development activities, and ensuring greater accountability through better monitoring mechanisms.

Objectives and Process

5. In approaching the very wide range of environmental issues and challenges facing the country, and in consideration of the broad and complex post conflict agenda facing

the Government of Nepal, it was agreed to undertake a focused Country Environmental Analysis (CEA), which would explore a select number of issues within the context of the country's growth and development strategy, and the inherent institutional and capacity constraints prevailing in Nepal's public sector. These issues, selected in consultation with key counterparts in the environmental and sector agencies, were based on a consideration of (a) recent and emerging socioeconomic trends; (b) environmental pressures; (c) the current status of knowledge of key environmental issues; and (d) the potential scope to achieve improvements in the near term. The scope of the study recognizes that the country faces many environmental priorities and pressures, and considerable efforts by donors and nongovernmental organizations (NGOs) have been focused on the natural resource and agricultural areas, but less attention has been given to other emerging drivers, such as infrastructure development and rapid urbanization. The CEA also recognizes that another important emerging challenge is adaptation to climate variability and change. This will be addressed in a separate and detailed study.

6. The main objective of the CEA is therefore to identify opportunities for enhancing the overall performance of select environmental management systems through improvements in the effectiveness of institutions, policies, and processes. Specifically, the proposed outcomes of this exercise are as follows:

- An analysis of the major gaps and shortcomings in the current policy and institutional framework for implementation, and a better understanding of the institutional underpinnings, to enable improved environmental management, performance, and compliance;
- An identification of the major obstacles and challenges in the implementation of the environmental impact assessment (EIA) system and a better understanding of how to improve cross-sector integration in selected priority sectors;
- A greater awareness of the major obstacles and challenges facing local governments in the devolution of environmental responsibilities, particularly as it relates to urban environmental management issues associated with solid waste management, air quality, and industrial pollution;
- An identification of the implications and costs associated with urban environmental health risks, particularly as they relate to urban water supply and sanitation and urban air pollution issues;
- Recommendations for policy and institutional reforms and ways to improve public sector performance and implementation effectiveness, and to strengthen public participation in the environmental decision-making process.

7. The comprehensive scoping exercise has resulted in a CEA built upon the following three primary study components: (a) an examination of the environmental issues associated with infrastructure development, focusing on the EIA process in priority growth sectors; (b) an analysis of environmental issues linked to rapid urbanization, focusing on the growing problems of solid waste, poor air quality, and industrial pollution, and the resulting impacts on environmental health; and (c) an analysis of the policy and institutional underpinnings related to key environmental management systems at the national and local levels. Key results and findings from these three study

components are presented in more detail in the following chapters. They provide the basis for a discussion of the challenges and options facing Nepal in regards to improving the performance of key environmental management systems and institutions to support its growth and poverty alleviation agenda.

Environment Sector Overview: Linkages and Challenges to Growth, Sustainable Livelihoods, and Poverty Reduction

8. It is critically important to recognize the environmental context, linkages, and challenges that Nepal will face in achieving its sustainable development and poverty reduction goals. Recent Government of Nepal studies suggest that more than 38% of its GDP is derived from its environment and resource sector, which includes agriculture, fisheries, forestry, and mining and quarrying. In addition, significant portions of the power, water, manufacturing, trade, and tourism sectors are also dependent on the environment in one form or another, directly or indirectly. Taking these sectors into consideration alongside the more traditional natural resource sectors, it is estimated that the total contribution of environment-related income to Nepal's economy may well be over 50%. All environmental pressures, therefore, have the potential to strain the country's environment-related income and, in turn, the country's overall economic and human development performance. These pressures, which are on the rise, fall into two broad areas: natural resource management and environmental pollution management.

Natural Resource Management: Increased Burden on the Resource Base

9. Nepal has five main categories of ecosystem – forests, wetlands, rangelands, agroecosystems, and mountain ecosystems. Over 39% of Nepal's total geographic area is classified as forest, of which at least 23% is forested. Under Nepal's Forest Act (1993) patches of government forests have been handed over to community forestry user groups and leaseholding forestry user groups. While community management has brought positive signs of forest quality improvements, overall there has been a trend towards declining forest cover and quality, with certain regions of the country facing a more serious decline. It has been estimated that one quarter of Nepal's forest area is heavily degraded, which has led to loss of biodiversity, increased landslides, and soil erosion.

10. In spite of the existence of appropriate policies, including the National Wetland Policy, ecosystems such as wetlands and rangelands have been subjected to growing degradation. A World Conservation Union (IUCN) rapid assessment in 1998 showed that the Terai wetlands faced several threats, including drainage, agricultural runoff, and overharvesting of resources. In 2004, an IUCN review found additional threats from inappropriate infrastructure construction, poor management of wetlands and surrounding areas, and the spread of invasive alien plant species such as water hyacinth. At the same time, the IUCN review noted that wetlands play a significant socioeconomic role in Nepal. Rice and fish are some key wetland-based agricultural products, and there are over 20 ethnic and caste groups – making up almost 11% of Nepal's population – that are traditionally dependent on wetlands for their livelihoods. Awareness of the potential (and vulnerability) of wetlands, including riverine environments, has increased with the growth of water-based tourism (for example river rafting) and hydropower development.

11. The *Nepal State of the Environment Report* (UNEP 2001) also noted the loss of agricultural diversity, decline of soil fertility, and increased use of agrochemicals as growing concerns. Moreover, the lack of an overall land use policy has led to more forest and agricultural land being lost to expanding settlements and urbanization. This, combined with the effects of conflict, has led to a more rapid pace of urbanization and a rapidly growing and relatively new source of environmental degradation that has put increasing pressures on the traditional natural resource base.

Environmental Pollution Management: Increased Pressures from Urbanization and Industrial Development

12. Although Nepal is one of the least urbanized countries in the world, its rate of urbanization has increased dramatically and now stands as the highest in South Asia. It is estimated that the total urban population in 2006 had reached approximately 3.8 million of the total population of 25 million. The government predicts that by 2011, 24% of the total population will be living in urban areas (NPC/MoPE 2003). While urbanization itself has been a powerful driver of economic growth, the rapid increase in rural-urban migration can, nonetheless, lead to more urban poverty and greater exposure to unhealthy environmental conditions due to poor water quality, lack of proper sanitation, and high levels of air pollution.

13. Another source of urban environmental pressure is coming from industrial activity and industrial growth. While Nepal's industrial activity represents only 10% of its GDP, it is expected to double to 20% by 2020, as envisaged in Nepal's Industrial Development Perspective Plan. Furthermore, much of Nepal's industrial growth is likely to come from small and medium-sized industries concentrated in urban and peri-urban areas. Of the total number of industries registered in the country, 1,579 (48%) are registered in Kathmandu district and 1,959 (59%) are registered within the three districts in the Kathmandu Valley. Being close to basic amenities and infrastructure gives industries greater access to markets and saves in transportation costs. However, it also results in increased water and air pollution from the dumping of industrial waste into adjacent water bodies and the release of toxic emissions into the air.

14. Rapid urbanization and growth from the industrial sector will create serious challenges for all of Nepal's municipalities but will have a particularly marked effect on the Kathmandu Valley, given its already large population and concentration of industrial activity. The Bagmati and Bishnumati Rivers are already highly polluted with the increased effluent discharges from both population and industrial growth, creating serious implications for public health. It is estimated that the top five water-borne diseases already account for 9% of all outpatient visits in health institutions nationwide. Continued rapid urbanization and unchecked industrialization have the potential to exacerbate the country's performance on the environmental health front. Poor environmental management could itself become a constraint to growth and limit the poverty alleviation benefits associated with high levels of economic growth.

15. In an effort to better understand the implications of poor environmental management to growth, sustainable livelihoods, and poverty reduction, this CEA explores the significance and implications of key issues associated with growing infrastructure

development, rapid urbanization, poor environmental health, and the need for more effective policies and institutions, which, if not properly addressed, will impede Nepal's ability to achieve its long-term development and reform agenda.

Growth and Environment: Moving towards More Sustainable Development

16. As Nepal pursues its growth agenda, investments in infrastructure development will increase in size and significance. Increased investments in infrastructure will create additional challenges for natural resource and environmental management. To adequately address these pressures, Nepal will require a strong EIA system, sound policy guidelines, and more effective management.

Infrastructure Development and Role of the EIA

17. On the infrastructure front, the two primary growth areas are likely to be the hydropower and road sectors, both of which have received much emphasis in Nepal's development strategy. The Tenth Plan has set targets for completing 36 hydroelectric projects and starting 11 new projects during the Plan period. Currently less than 1% of the country's hydropower potential has been developed. In term of transport infrastructure, Nepal's existing road network is the least developed in the region, with only 30% of the rural population having relatively easy access to all-weather roads. The Tenth Plan targets the realization of 20,000 kilometers of operational roads by the end of the Plan period, which includes the annual construction of 1,200 kilometers of rural and agricultural roads. These development objectives represent significant environmental management challenges for the institutions charged with their implementation and for the protection of Nepal's environment.

18. The main instruments for ensuring environmental sustainability in infrastructure development are the environmental impact assessment (EIA) and the initial environmental examination (IEE). These instruments were made mandatory through the enactment of the Environment Protection Act and Environment Protection Rules (1997) (Government of Nepal 1997). Over the past year, the Ministry of Environment, Science, and Technology, in consultation with sector agencies, has initiated a review of the effectiveness of EIA implementation. The CEA supported this effort through a case study analysis of the implementation effectiveness of several projects in the hydropower and roads sectors. The analysis found several policy gaps and implementation deficiencies in the EIA and IEE processes that affected the attention and quality given to incorporating environmental concerns into the planning, design, implementation, and monitoring stages of projects.

19. One of the main concerns identified is the apparent inadequacy of the screening criteria, which currently consist of project size, cost, and location, but do not include project impacts on the surrounding environment. Another area of concern is the lack of site-specific information needed for several critical components of the EIA process, including scoping, alternative analysis, and impact evaluation. And, despite mandatory requirements in the Environment Protection Act and Rules for public consultation and monitoring, there is little evidence of effective implementation of these provisions. The

Ministry of Environment, Science, and Technology has revised the Environment Protection Act and Rules to improve EIA effectiveness (the resulting amendments are published in the Nepal Gazette, August 2 2997, Bhadra 3, 2064). These efforts are described in chapter 2.

Urbanization and Service Delivery: Dealing with the Effects of Increased Population Pressures

20. The rapid increase in urbanization is bringing increased pressures on environment-related services and environmental health, particularly in the areas associated with solid waste, air quality, and industrial pollution management. However, local governments, faced with increasing demands for environmental services and improved environmental conditions, lack the financial, technical, and human resources to properly deliver services and manage the various dimensions of the urban environment.

Environmental Health

21. Poor quality of drinking water, low coverage of sanitary facilities, and heavy use of solid biomass (primarily fuelwood) in kitchens is increasing the burden of disease on Nepal's population, both rural and urban. These environmental risk factors have resulted in premature death and disease, especially among the poor and vulnerable groups, and are placing increased health costs and a significant economic burden on the country, estimated at close to **US\$258 million** or nearly **3.5%** of the country's GDP.

22. In Nepal's urban areas, rapid and haphazard urbanization is exerting immense pressure on the urban environment, particularly with the growth in the number of slum and squatter settlements, with dismal living conditions, crowded poor quality housing, and minimal access to water and sanitation. With weak capacities for environmental service delivery coupled with inadequate budgets, municipalities are struggling to keep pace with the demand. Environmental health costs in urban areas are estimated to be nearly **US\$51.2 million** in 2005, which is **0.7%** of Nepal's GDP.

23. As urban populations grow, the demand for environmental services such as water, sanitation, and sewerage fails to keep up with the supply. Contaminated surface and groundwater sources, poor feces disposal, and inadequate sanitation and sewage disposal continue to affect human health. Urban air quality in the Kathmandu Valley – while still much higher than national and international standards – is starting to stabilize after recent government initiatives. Other urban areas are also experiencing the growing public health threat, with increases in respiratory infections, and reports of chronic bronchitis in hospital and health facilities. While indoor air pollution from solid fuel use is primarily a rural issue, household surveys reveal that around 35% of urban residents use biomass fuels for cooking, resulting in exposure to smoke and particulates and increasing the incidence of respiratory infections, especially among the urban poor.

24. While urban environmental health costs represent a smaller burden on Nepal's economy than the rural equivalent, these costs are expected to grow if current trends in urbanization and service delivery continue. While the government is making good progress on interventions addressing these environmental health risks, much more

attention to and allocation of resources for water supply coverage, drinking water quality, proper waste disposal, and improving air quality are needed to meet Nepal's Millennium Development Goals (MDGs).

25. **Solid waste management.** One of the greatest challenges facing local governments is to generate sufficient revenue to provide basic urban environmental services, such as solid waste management. The five municipalities in the Kathmandu Valley, together, spend approximately Nrs. 235 million (US\$3.2 million) annually on solid waste management. Kathmandu Metropolitan City alone spends approximately 23% of its budget on solid waste management. With the growing amount of waste generated, and the rising cost of salaries and fuel associated with waste collection and disposal, the cost of solid waste management is increasing rapidly. It appears that the current situation is unsustainable, considering that less than half of the solid waste generated gets collected. Yet one of the main sources of revenue for local governments, the local development fee, is being phased out by 2013, and, consequently, local governments will urgently need to explore new mechanisms to bring in the necessary revenues to provide financial sustainability in the future.

26. Currently, much of the waste from Kathmandu and Lalitpur is being landfilled in Sisdol, 28 kilometers from Kathmandu. The Sisdol landfill is expected to be filled in less than two years. There are several landfill alternatives that need to be explored, including placing greater emphasis on recycling and composting, given the high potential and feasibility of recycling and composting a large portion of Kathmandu's waste. In addition, projects that recover and utilize landfill gas generated can be developed under the Clean Development Mechanism of the Kyoto Protocol in order to mobilize additional needed resources.¹

27. **Air quality management.** An air pollution inventory conducted in the Kathmandu Valley found that the main sources of air pollution in the valley are vehicle emissions, road dust, and emission from brick kilns. In 2005, vehicle emissions were responsible for 37% of the total PM₁₀,² the main source of air pollution in the valley. Resuspended dust, which is also caused by vehicles, accounted for 25% of the PM₁₀, and brick kilns were responsible for 11% of total PM₁₀ emissions. Various studies, as well as the data from Kathmandu's six air quality monitoring stations, show that Kathmandu's air pollution, particularly the concentration of particulate matter, is already several times higher than national and international standards. While air pollution is most pronounced in the Kathmandu Valley, it is also emerging as a growing public health concern in other large urban areas.

28. In recent years the government, as well as other key stakeholders, has initiated important steps towards reducing air pollution in the Kathmandu Valley, resulting in some positive improvements. The most notable air pollution control measure was the

¹ The Clean Development Mechanism "is an arrangement under the Kyoto Protocol allowing industrialized countries with a greenhouse gas reduction commitment (called Annex 1 countries) to invest in projects that reduce emissions in developing countries as an alternative to more expensive emission reductions in their own countries" (Wikipedia).

² PM₁₀ is particulate matter of less than 10 microns diameter.

banning of Bull's trench brick kilns and the promotion of the less polluting vertical shaft brick kilns and fixed chimney kilns. The Ministry of Environment, Science, and Technology has also recently prepared a comprehensive Air Quality Management Plan, but it has not been endorsed by the government nor developed into concrete actions with a defined schedule of implementation. The Air Quality Management Plan is an important beginning, but steps need to be taken to prioritize the menu of actions, based on feasibility and effectiveness, and involve key stakeholders in its implementation.

29. **Industrial pollution.** Nepal is still in the early stages of industrial development. Nonetheless, the pace of industrial development and growth of nonagricultural activity (such as construction) will increase as the country becomes less dependent on the agricultural sector. There are an estimated 3,300 large-, medium-, and small-scale industries and 80,000 cottage industries registered in the country. Over 50% are manufacturing industries, such as tanneries and carpet and garment manufacturers, and a large portion are small and medium enterprises. Most of these industries are clustered in urban areas, close to energy, water, and transportation infrastructure, leading to increased discharges into urban water bodies and airsheds.

30. While the total number of industries remains relatively small, industrial pollution is of increasing concern because industries have not adopted adequate pollution control measures and monitoring, and enforcement of industrial pollution is weak and ineffective. There have been some attempts to control industrial pollution through the introduction of cleaner technologies in certain sectors, but with limited success. The level of awareness about good environmental management practices and industrial pollution issues is still very low among key stakeholders, including small industries and government regulators. Moreover, there is a lack of clear mandates and of sufficient resources for compliance monitoring and enforcement by responsible agencies. Therefore, building greater awareness of pollution prevention practices and environmental management systems will be increasingly important as the industry sector grows.

Policies and Institutions: Moving towards Stronger Governance and Performance

31. Nepal has adopted a fairly comprehensive set of environmental policies and laws that cover a broad range of environmental and sector issues. These policies and laws are generally sound, although there are some policy gaps and legislative inconsistencies that may exist and require clarification. One of the areas of legislative ambiguity can be found in the Environment Protection Act and Rules, with regards to the enforcement role of the Ministry of Environment, Science, and Technology in relation to other sector agencies. Another legislative ambiguity can be found in the Local Self-Governance Act (1999), which mandates the transfer of environmental management responsibilities to local governments, while sector policies retain authority at the national level. However, possibly the most urgent challenge is in strengthening the capacity of various institutions to effectively implement environmental policies and laws.

National Government Institutions

32. For the purposes of the CEA, six national agencies with environmental management responsibilities were examined – the Ministry of Environment, Science, and Technology; the Ministry of Forests and Soil Conservation; the Ministry of Water Resources; the Ministry of Local Development; the Ministry of Physical Planning and Works; and the Ministry of Industry, Commerce, and Supplies. The ability of these agencies, particularly the Ministry of Environment, Science, and Technology, to fulfill their statutory responsibilities for environmental management is very constrained. This is due, in part, to the lack of sufficient resources – human, technical, and financial – and the lack of formalized coordination mechanisms between environment and sector agencies and national and local governments. One area of critical concern is in compliance and enforcement where there is little, if any, monitoring and enforcement by either the Ministry of Environment, Science, and Technology or the sector agencies. This has affected the implementation effectiveness of various environmental laws and environmental management systems, most notably the EIA/IEE system.

33. Several organizational models have been proposed for restructuring and strengthening the Ministry of Environment, Science, and Technology, which now need to be considered in the context of the current political desire to restructure government into a federal system. A strong environmental authority requires adequate staff resources, technical expertise, and dedicated financial resources to effectively discharge its environmental responsibilities. Given the fiscal and resource constraints facing the government, creative measures should be explored to support agencies, such as outsourcing technical functions and introducing pollution charges. This is particularly important for the environmental assessment process and industrial pollution management, where the growth demands and impacts will be the greatest.

Local Government Institutions

34. The Local Self-Governance Act requires the national government to delegate or devolve responsibilities, including environmental management and pollution control, to locally elected bodies. However, while the Act requires the decentralization of government functions, the transfer of these responsibilities to local bodies and capacity building of local governments have been very limited. In addition, the national government continues to exert significant authority over the administrative management of local governments by retaining control over the executive officers of all municipalities.

35. For the most part, national ministries have not developed plans for the orderly transfer of responsibilities to local bodies or dedicated appropriate resources for local capacity building. From a national government perspective, the lack of capacity at the local level has been a deterrent to the transfer of responsibilities to local governments. But from the local government perspective, it has been seen as an excuse to retain exclusive authority at the national level. Recently, with donor support, the government has initiated a pilot project in eastern Nepal that devolves the responsibilities for monitoring environmental compliance to two district development committees, and the Ministry of Industry, Commerce, and Supplies has delegated IEE approval to the district cottage industries offices for certain types of cottage industries. These initiatives are to be

applauded, but additional efforts need to be made. With the new political shift in the country, it can be expected that the push for decentralization of power will accelerate and, consequently, greater emphasis to simultaneously build local capacity and transfer functions to local governments will be required.

Key Stakeholder Institutions

36. National and local governments face serious capacity constraints, which impede their ability to effectively and adequately perform their environmental management responsibilities. There are many stakeholder groups in Nepal with proven skills and experience that could assist and support governments in environmental management. The Government of Nepal has promoted many good policies and practices that engage communities as integral partners with government in conservation and development efforts, most notably the empowerment of community forestry groups in forest conservation activities. In addition to local communities and civil society organizations, the private sector has entrepreneurs who have valuable experience and who have promoted innovation in dealing with environmental management problems such as solid waste management. Greater stakeholder involvement in environmental management should be strongly promoted throughout the development process, including public consultation and citizen monitoring.

37. While the principle focus of the institutional analysis has been on the executive branch institutions, other branches of government will also have an increasingly influential role in ensuring improved environmental performance. The Supreme Court in Nepal has delivered several important court decisions that have directed the establishment of environmental standards and the clean-up of local water bodies. Parliament will also play an important role in establishing environmental policies and priorities through legislation and in the adoption of a new permanent Constitution, which may include the right to clean environment. The oversight role of the executive branch agencies could be further strengthened as the country moves towards a federal system of government.

Rising to the Challenges: An Action Plan for a Way Forward

38. The benefits of stronger environmental management to growth, sustainable livelihoods, and poverty reduction need to be constantly promoted and reinforced as Nepal proceeds with the peace process and its ambitious development strategy. The analysis supported by the CEA confirms that there are urgent needs and significant opportunities for strengthening environmental management among various institutions. In order to improve the overall performance of the country's environmental management systems, the Government of Nepal is encouraged to consider implementing a comprehensive set of cross-cutting reforms and actions that would focus on (a) updating the policy and regulatory framework for environmental management; (b) clarifying national agency roles and responsibilities; (c) strengthening institutional capacity for environmental assessments and enforcement; (d) empowering local governments to assume greater responsibilities; (e) expanding beyond traditional government institutions to enhance performance and accountability; and (f) improving institutional capacity and

access to information.

39. While the menu of reforms and actions should be diverse and cover a broad range of options, the Government of Nepal should consider the following actions as top priorities in addressing the three thematic areas of this report – ensuring infrastructure development is sustainable, meeting the pressures from rapid urbanization, and strengthening environmental governance and performance.

(a) Ensuring Infrastructure Development Is Sustainable

- **Strengthen the EIA/IEE mechanism and address the policy gaps in the EIA/IEE regulations.** The EIA system is the primary tool for managing environmental impacts from infrastructure development and industrial development. The Ministry of Environment, Science, and Technology has initiated a review, in conjunction with sector ministries, of the gaps and inefficiencies in the EIA system. This effort should continue to be supported through a dedicated working group approach that brings key government stakeholders into the review process. In particular, emphasis needs to be placed on strengthening the screening criteria, project scoping, alternative analysis, and impact identification and evaluation. Furthermore, the Ministry of Environment, Science, and Technology should take additional measures to improve the overall quality of EIA reports, taking the necessary steps to simplify the administrative requirements for clearances. One way to provide greater clarity and guidance in the EIA process is to utilize sector-specific manuals, such as the Department of Electricity Development manual for the hydropower sector.
- **Establish an environmental information clearinghouse to improve knowledge of site conditions and impacts.** One of the major deficiencies identified in the EIA/IEE process has been the lack of site-specific information to understand the scope of environmental conditions and predict potential environmental impacts from a proposed project. Although considerable environmental information has been accumulated over the years, serious information gaps exist and often data are haphazardly dispersed and difficult to access. A national information clearinghouse should be established to collect, consolidate, and expand the database of relevant environmental, sector, and local information needed to improve the quality and review of projects. The clearinghouse could also be expanded to collect and disseminate information on other issues of concern, such as environmental health, cleaner technology, and climate adaptation.

(b) Meeting the Pressures from Rapid Urbanization

- **Work with municipalities to explore options for a more sustainable financial framework that could support environmental services.** There are serious challenges with municipal finances in Nepal. Substantive improvements will only be possible through additional reforms, institutional development, and more effective decentralization, including that of revenue generation. The main source of municipality funding, the local development fee, is scheduled to be phased out by 2013. This is happening at a time when the need and the demand for urban

services are increasing rapidly. Although municipalities' own sources of revenue are growing, this will not suffice to replace the local development fee. Smaller municipalities have even fewer options to generate revenue. While systemic solutions are likely to take time to implement, shorter-term measures should be pursued where possible. In order to diversify municipal sources of revenue, financing measures need to be explored, including introducing new taxes and fees and making a concerted effort to utilize the Clean Development Mechanism more effectively.

- **Address environmental pressures of urbanization through specific targeted interventions.** While local governments face many environmental pressures, three areas of growing concern from rapid urbanization are solid waste, air quality, and industrial pollution. Some programs have been created to address these concerns, but more targeted emphasis is needed. For solid waste, alternatives to the current solid waste management system need to be explored, including more aggressive source separation, recycling, and composting. For air quality, the draft Air Quality Management Plan should be prioritized and implemented based on expected impacts and implementation difficulties for each of the strategies. Finally, regulatory and financial incentives to promote industrial compliance, such as self-audits, reporting, and monitoring, should be pursued with key growth industry associations.

(c) *Strengthening Environmental Governance and Performance*

- **Strengthen the role, responsibilities, and capacity of environment and sector agencies.** The discharge of environmental management responsibilities, particularly in the area of monitoring and enforcement, has been uneven across the agencies and has led to serious gaps in compliance. A strong environmental agency is needed at the national level to support the development, implementation, and enforcement of environmental laws and policies. Several organizational models for strengthening the Ministry of Environment, Science, and Technology have been proposed, which should be given serious consideration. At the same time, given the current political situation and the level of environmental management experience in the sector agencies, there are also significant returns to be achieved by increasing the environmental capacity in sector agencies through specialized environmental training, sector-specific guidance manuals, improved information management systems, and greater interagency coordination.
- **Empower local governments to assume greater environmental management functions.** The Local Self-Governance Act requires the devolution of responsibilities, including environmental management, to the local governments. However, with a few exceptions, little has been done to either build the technical capacity or transfer mandated functions to local governments. The extent of knowledge of urban environmental issues is limited primarily to solid waste management and, in particular, to street-sweeping activities. Specialized technical training and targeted pilot programs should be provided to local governments, including in the EIA/IEE system, landfill alternatives, and cleaner technologies.

The capacity of local governments could also be strengthened by involving the private sector and civil society in the promotion, delivery, and monitoring of environmental services and programs.

40. The numerous development partners of the World Bank and Nepal can support the government in these efforts through technical assistance, institutional capacity building, and investment operations. This could be in areas such as the EIA, investments in urban environment improvements such as air quality, or maximizing the use of Clean Development Mechanisms for renewable energy, cleaner technologies, and solid waste management. Whatever the final course of action chosen, Nepal is at a critical juncture in its development and there is currently an open moment, or window of opportunity, to successfully strengthen environmental management at the national and local levels.

1. Background and Objectives

Country Overview

1.1 Renowned for its majestic Himalayas, Nepal is rich in its geographic, natural, and cultural diversity. Nepal is divided into three broad geographic areas: the mountain region, the hill region, and the Terai region. Moving from east to west, the three regions lie parallel as continuous ecological belts, and are bisected by the country's river system. Nepal is a relatively small country, measuring roughly 650 kilometers long by 200 kilometers wide, with a total land mass of 147,181 square kilometers. Situated between two Asian giants – China and India – Nepal has been characterized as a “yam caught between two rocks”. Since it is a landlocked country, Nepal is heavily dependent on India for transit facilities and access to the sea (Bay of Bengal) for delivery of its goods, even those coming from China.

1.2 Nepal has a population of 25 million, with approximately 85% of its population living in rural areas. The population is growing at a rate of 2.3% per year, and the ratio of population to arable land is one of the highest in the world. Poverty is worst in the remote mid-western and far-western districts of the country, where the population has limited access to basic amenities such as paved roads, market centers, and health facilities. Life expectancy has increased to 60 years, but is still lower than in neighboring South Asian countries. Life expectancy for women is lower than for men due to high maternal mortality. Infant mortality rates are among the highest in the region.

1.3 For the past decade, Nepal's development has been seriously constrained by political instability and violent insurgency. As a result of political and security problems, there has been a major disruption of livelihoods for millions of rural households, a significant increase in population migration to urban areas, and a steady loss of economic productivity. During the 1990s the gross domestic product (GDP) growth rate averaged around 5%. However, since 2001, with the intensification of the conflict and slowed momentum in exports, the growth rate has been averaging only around 3%. Notwithstanding this, the Nepal Living Standards Survey 2003/04 reports a significant decline in the incidence of poverty by 11% over the last eight years, with 31% of Nepalis classified as poor in 2004 compared to 42% in 1996 (Central Bureau of Statistics 2004).

1.4 Much of Nepal's growth has been historically dependent on the direct and indirect use of its rich and diverse natural resource base – agriculture, forestry, fisheries, and tourism. In 2003, agriculture alone accounted for 40% of GDP, while industry and the construction sector contributed 20% to the overall economy. While still relatively small, the emerging drivers of growth are coming from the service sector and small and medium-sized enterprises in urban and peri-urban areas. It has been estimated that the key drivers of growth over the last year were construction, trade, restaurants, and hotels. In this context of resurgent growth, the policy and institutional framework for environmental governance will play an increasingly important role in the country's development and reform agenda.

1.5 Subsequent to the Second People's Movement of April 2006 and the signing of a comprehensive peace agreement in November 2006, Nepal has embarked on a historic

stage in the country’s development. After years of conflict and instability, Nepal now faces what some have referred to as an “open moment” in which old social and political constraints have been lifted by the momentous political shift. A brighter future for the country now seems possible. To achieve this possibility, one of the greatest challenges for the government will be to establish strong institutions that will be able to deliver on a development and reform agenda – an agenda which will build on improving the livelihoods of the country’s poor and on ensuring that growth is environmentally sustainable for future generations.

Environment Context

1.6 In Nepal, the linkages between the environment and livelihoods have been well documented – forests supplying fuelwood, compost used as fertilizers on farms, grazing areas for domestic animals, wetland and rangeland products used to secure the livelihood of local communities. Recent Government of Nepal studies have found that Nepal’s environment is critical to its development, as more than 38% of its GDP is derived from the agriculture, fisheries and forestry and the mining and quarrying sectors (Ministry of Finance 2006). Equally importantly, significant portions of the power, water, manufacturing, trade, and tourism sectors are also dependent on the environment in one way or another. When factoring this dependence in with the more traditional natural resource sectors, it is likely that the total contribution of environmental income to Nepal’s economy may well be over 50%. A breakdown of the relative contribution of various sectors to Nepal’s GDP is provided in table 1.1.

Table 1.1 Gross Domestic Products by Sector

Industry	Millions of Nrs. 2005/06	% of overall GDP
Agriculture, fisheries, and forestry	212,827	38.1
Mining and quarrying	2,669	0.5
Manufacturing	41,768	7.5
Electricity, gas, and water	12,508	2.2
Construction	56,558	10.1
Trade, restaurants, and hotels	56,139	10.1
Transport, communications, and storage	55,919	10.0
Finance and real estate	64,937	11.6
Community and social services	54,544	9.8
Total	557,869	100.0

Source: Ministry of Finance 2006.

1.7 The global importance of Nepal’s biodiversity has been documented in several global assessments of biodiversity hotspots (Critical Ecosystem Partnership Fund for the Eastern Himalayan Region, the Global 200 priority ecoregions of the World Wide Fund for Nature (WWF), and the Important Bird Areas of Birdlife International). As a consequence, a number of donors and nongovernmental organizations (NGOs) have supported Nepal with environmentally related programs, particularly targeting natural

resource management in rural areas. While there have been some significant successes in natural resource management, most notably programs in community forestry, the overall environmental conditions in both rural and urban areas are rapidly deteriorating. The degree and nature of environmental degradation varies across the country, but negative impacts on livelihoods and sustainable development have resulted from increased loss of wetlands due to infrastructure construction, poor water quality from unmanaged development, and increased health problems from urban air pollution, among other factors. In addition, Nepal's Initial National Communication to the United Nations Framework Convention on Climate Change (UNFCCC) notes that there will be growing negative impacts on Nepal's ecosystems and people's livelihoods with predicted increases in temperatures and changes in rainfall patterns in the future (MoPE 2004). Appendix A gives an overview of the environment sector.

Human Development Context

1.8 With an average per capita GDP of US\$270 (2005), Nepal is the poorest country in South Asia and the twelfth poorest country in the world. As noted above, over the last decade Nepal has made considerable progress in reducing poverty, with the poverty rate falling from 42% to 31% between FY1995/96 and FY2003/04 (World Bank 2006c). Evidence of improvements in the standard of living is also confirmed by other indicators, including (a) increase in agricultural outputs and ownership of durables; (b) increase in consumption of luxury foods; (c) decline in number of households with inadequate food consumption; and (d) improvements in the population's self-assessment of adequacy in housing, clothing, health care, and education. Box 1.1 illustrates some of the main factors involved in the country's growth and poverty reduction progress.

1.9 In addition to consumption and income gains, Nepal has been successful in demonstrating significant progress towards achieving many of the human development targets of the Millennium Development Goals (MDGs), such as education and gender equity targets. For example, as a result of significant increases in a number of education-related initiatives – including net enrollment and youth literacy – the country is likely to meet the primary enrollment and gender-related MDGs (appendix B). Despite this notable progress, the success in meeting other goals, such as integrating sustainable development, has been much more difficult.

1.10 As Nepal faces an “open moment” with regards to its political future, so too does the country face an opportunity to set a new course for achieving its human development and environmental sustainability goals. A fresh analysis of current approaches and new ways of linking growth, poverty reduction, and environmental management is needed.

Box 1.1 How Has Poverty Been Reduced in Nepal?

Nepal's decline in poverty has been driven by growth in per capita consumption expenditure and income that, in turn, has been driven by five main factors:

(a) Increased remittances. With an estimated 1 million workers abroad in 2004 (primarily in India, the Gulf States, and East Asia), remittance inflows have soared from 3% to 12% of GDP. The share of households receiving remittances has also increased from 24% in FY1995/96 to 32% in FY2003/04. The increase in remittances is responsible for more than half (6.2%) of the overall

reduction in the headcount poverty rate between FY1995/96 and FY2003/04.

(b) Higher agricultural wages. Agricultural wages rose 25%, nonagricultural unskilled wages rose 20%, and skilled wages more than doubled. Increased aggregate demand, improved connectivity, and better access to markets stimulated entrepreneurial activities and allowed nonagricultural incomes to increase. Out-migration and availability of jobs outside the agricultural sector tightened local labor markets. This stimulated agricultural wages, improving the welfare of the agricultural laborers, who tend to be the poorest.

(c) Increased connectivity. Between FY1995/96 and FY2003/04, Nepal's road network grew by 6.7% per year. The largest expansion occurred in roads classified as "district or rural roads", which grew 11% per year. This pro-poor expansion, along with improved modes of transportation, increased access to shops, markets, schools, and hospitals. Improvements in rural connectivity helped raise nonagricultural employment and incomes.

(d) Urbanization. Urbanization has been a powerful driver of poverty reduction, moving workers from low-productivity jobs in rural areas to higher productivity activities in urban areas. Changes in the population shares across urban and rural areas and across regions accounted for about one fifth of the overall reduction in the poverty headcount rate. Urbanization was also important for changing social relations between advantaged and disadvantaged ethnic population groups, as discrimination is less entrenched in urban areas.

(e) A decline in the dependency ratio. The number of nonworking people per working adult fell between FY1995/96 and FY2003/04 as a result of the decline in fertility that began in the 1980s. In urban areas, the number of working males per household increased the most.

Source: IDA 2007.

Nepal's Development Strategy and Core Development Policies

1.11 The Government of Nepal has adopted the Tenth Plan, which is, in effect, the country's Poverty Reduction Strategy. It presents a comprehensive framework of economic and institutional reforms in a broad range of areas. The Plan focuses on four reform pillars: (a) broad-based economic basic growth; (b) social sector development; (c) good governance; and (d) social inclusion and targeted programs. From a sector-specific standpoint, the Plan proposes to (a) improve delivery of education and health services through community participation; (b) support decentralization through transfer of responsibilities and resources to local bodies; (c) expand electricity coverage through hydropower and private sector involvement in power sector activities; (d) implement community-led approaches for water and sanitation services; (e) develop infrastructure and institutions for solid waste management; and (f) improve industrial competitiveness through fiscal and regulatory reform (box 1.2).

1.12 The sustainability of poverty reduction efforts and the ability to deliver quick results will, in large part, depend on how effectively institutions can practice cross-cutting approaches to ensure the integrated delivery of outputs and services as envisioned in the Plan. This will require (a) improving the performance of public sector institutions and prioritizing public interventions; (b) developing alternative delivery mechanisms through devolution to local bodies; (c) enhancing the role of civil society, community-based organizations, and the private sector in development activities; and (d) ensuring greater accountability through better monitoring mechanisms.

Box 1.2 Sector Growth Targets

Some of the sector-specific outcomes and milestones of the Country Assistance Strategy support the Poverty Reduction Strategy. These include:

Infrastructure development. In the power sector, improved efficiency of the National Electricity Authority (as measured by reduction in system losses), increased private sector participation, and an additional 30,000 households in remote areas served by community-managed hydropower (increasing access to electricity from 40% to 55%); in the roads sector, percentage of main road network in poor condition reduced to 10% and road access increased to 70 district headquarters.

Agriculture. Overall agricultural growth of 4.1% along with irrigation reforms, market development, and agricultural diversification.

Social sector development. In the health sector, essential health care services implemented in 25 districts with management transferred to communities and NGOs; in the education sector, 1,000 primary schools transferred to community management; extend rural water supply and sanitation services based on community-driven approach in rural areas to 10% and 5%, respectively.

Source: World Bank 2003.

1.13 As part of the Tenth Plan, Nepal recognizes that sustainable economic growth must take into account environmental protection, and it has committed to taking action to address a wide range of environmental management challenges. The Government of Nepal has also committed itself to achieving the MDGs, including MDG 7, which requires governments to “integrate the principles of sustainable development into country policies and programs and reverse the loss of environmental resources”.

1.14 The World Bank’s Country Assistance Strategy for Nepal also recognizes the importance of environmental policies in the effective implementation of the Tenth Plan and the Bank’s assistance program in Nepal. The Strategy also notes the large donor and NGO presence in Nepal’s environment sector. In view of the above, and the Bank’s limited involvement in Nepal’s environment sector in recent years, it was proposed to undertake a review of environmental issues and environmental management activities to better understand the current context. The Nepal Country Environmental Analysis (CEA) is designed, therefore, to highlight opportunities for strengthening environmental management and governance. It will serve as the basis for a renewed dialogue on priority issues and for identifying desirable outcomes for possible Bank support.

Objectives of the Nepal CEA

1.15 In approaching the wide range of Nepal’s environmental challenges, it was agreed with the Government of Nepal that the CEA should focus on a select set of issues of particular concern in the context of growth and the current institutional framework. Recognizing that the country faces a crowded and complex agenda of environmental concerns, it was agreed that the current challenge is to examine issues related to implementation performance in a select number of areas where enhanced performance has the potential to lead to improving environmental outcomes and which can be supported through a small menu of activities. The CEA effort also recognizes that a

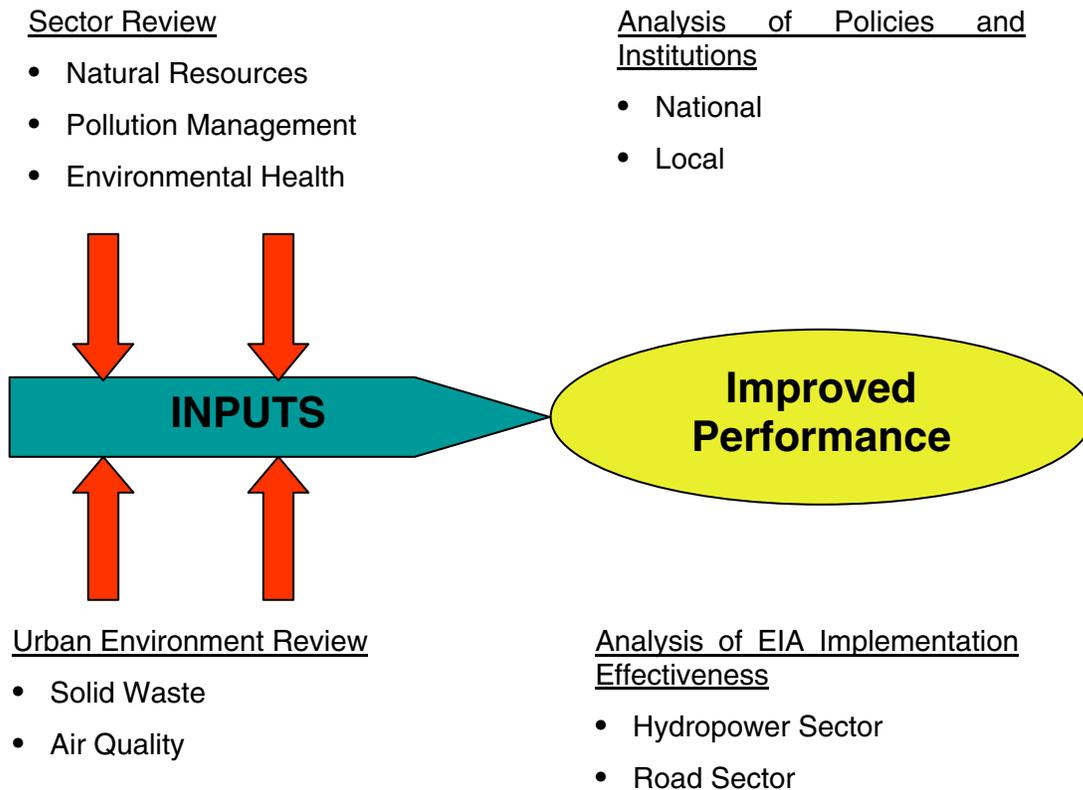
number of donors and NGOs have supported Nepal with environment-related programs, in particular in the area of natural resource management in rural areas, but little assistance has focused on institutional and performance-related issues in infrastructure development and rapid urbanization, areas to be covered under the proposed Nepal CEA exercise.

1.16 The main objective of the CEA is to identify opportunities for enhancing environmental governance and performance by improving the effectiveness of institutions, policies, and processes in the implementation of the EIA system and urban environmental management. The CEA has three primary components: (a) an examination of the environmental issues associated with infrastructure development, focusing on the EIA process in priority growth sectors; (b) an analysis of environmental issues linked to rapid urbanization, focusing on the growing problems of solid waste, poor air quality, and industrial pollution, and the resulting impacts on environmental health; and (c) an analysis of the policy and institutional underpinnings related to key environmental management systems at the national and local levels. The overall approach for the CEA is illustrated in figure 1.1.

1.17 The expected outcomes of the CEA aim to better inform the government decision-making process and guide the support provided by the World Bank and other development partners, so that they may more effectively address the environmental challenges to poverty-reducing growth. Specifically, the expected outcomes are as follows:

- An analysis of the major gaps and shortcomings in the current policy and institutional framework for implementation, and a better understanding of the institutional underpinnings, to enable improved environmental management, performance, and compliance;
- An identification of the major obstacles and challenges in the implementation of the EIA system and a better understanding of how to improve cross-sector integration in selected priority sectors;
- A greater awareness of the major obstacles and challenges facing local governments in the devolution of environmental management responsibilities, particularly as they relate to urban environmental management issues associated with solid waste management, air quality, and industrial pollution;
- An identification of the implications and costs associated with urban environmental health risks, particularly as they relate to urban water supply and sanitation and urban air pollution issues;
- Recommendations for policy and institutional reforms and ways to improve public sector performance and implementation effectiveness, and to strengthen the public participation in the environmental decision-making process.

Figure 1.1 Nepal CEA Approach



Process and Methodology

1.18 The CEA was undertaken in close collaboration with the Ministry of Environment, Science, and Technology and the National Planning Commission, the key counterparts, and with the participation of local consultants. The methodological framework followed by this study builds on previous sectorwide reviews, environmental reports, environmental assessments, and other secondary data compiled or undertaken by the Government of Nepal and the country's many development partners. It takes into consideration Nepal's poverty reduction and development strategies as well as environmental and sector policies. In view of the growth-environment nexus in Nepal's development strategy, the CEA covered a case study analysis of two key growth sectors – highways and roads – to evaluate the effectiveness of EIA implementation in those sectors. This involved a review of EIA reports and documentation, and field visits to project sites to verify information collected, to interview key informants, and to collect additional data. The case study analysis allowed for a deeper understanding of the barriers and contributors to EIA performance in practical terms at a project level.

1.19 Another important feature of this study has been the extensive consultations and dialogue with the various government departments involved in the implementation of policies and programs and with the diverse stakeholders who are impacted or concerned by the effectiveness of these institutions. These consultations involved individual meetings, stakeholder surveys, roundtable discussions, and workshops with

representatives from national and local governments, environmental organizations, private sector associations, research and academic institutions, civil society organizations, and the media. The highly consultative process not only allowed for knowledge sharing, but also for developing a common understanding of the challenges and the options for moving forward. The main consultation meetings and workshops that have contributed to this study are presented in appendix C.

Structure of the Report

1.20 This report provides an analysis of the cross-cutting issues and challenges for strong environmental management and effective implementation of Nepal's Tenth Plan. The report is arranged in five thematic chapters. Chapter 1 provides an environmental overview and the linkages of environmental management to poverty reduction and growth. Chapter 2 examines the importance of infrastructure development and the role of the EIA system in regards to sustainable growth and to the environment. Chapter 3 analyzes the effects of rapid urbanization and increasing environmental pressures from solid waste, air quality, and industrial pollution management. Chapter 4 analyzes the policy and institutional challenges at the national and local levels. Chapter 5 offers a way forward, proposing a menu of options for strengthening environmental management and institutional performance.

2. Growth and Environment: Ensuring Sustainable Development

Infrastructure Development

2.1 As Nepal pursues its development agenda, growth in infrastructure will expand and potentially increase the pressures on natural resources and threaten environmental quality, notwithstanding the benefits it brings in terms of poverty reduction. Much of Nepal's growth, even in times of armed conflict, has been in the power and roads sectors, while other sectors have shown a decline (Ministry of Finance 2006). As a consequence, the power and roads sectors have received a great deal of emphasis in Nepal's Tenth Plan. It is therefore important to understand the opportunities for strengthening environmental management in these strategic sectors. This can be accomplished through the more effective deployment of the main environmental management instruments promulgated by Nepali law, namely the EIA and IEE procedures.

Power Sector

2.2 Based on the 2001 census, 40% of Nepal's households have access to electricity (Central Bureau of Statistics 2002). However, there is a large disparity between rural and urban area access to electricity. In rural areas, only about 30% of the population has access to electricity, in contrast with roughly 90% of the urban population. More conservative estimates suggest that only 18% of Nepal's population has access to electricity. The quality of the electricity supply is poor, with high system losses and frequent outages. Rapid urbanization and the increased growth rate in industries have also led to a steady rise in the demand for commercial energy. Nepal's power sector, however, is hindered by a series of institutional problems that constrain its efficient development and the mobilization of resources for future investments. As a result, the Government of Nepal has adopted a strategy for developing its hydroelectric potential to serve the energy needs of its people and to pursue its export goals, a key development objective.

2.3 Nepal's Tenth Plan has set targets for completing 36 hydroelectricity projects and starting 11 new projects in the Plan period. Nepal has 83,000 megawatts of hydropower potential, of which the actual production is only 240 megawatts, or less than 1% of the feasible output. If this natural resource were harnessed more effectively, the country could meet its domestic demand for electricity as well as export hydropower and potentially transform the economy. Currently, Nepal depends on biofuels, mainly wood, to meet its energy needs. The high dependence on wood without an emphasis on replantation of trees has resulted in deforestation, topsoil erosion, water pollution, flooding, and other environmental problems.

2.4 The inadequate supply of and access to electricity is a major constraint to economic development and poverty alleviation. The challenge lies in how to harness Nepal's tremendous water resources into an environmentally sustainable source of energy. Nepal has taken steps in this direction with the adoption of the Hydropower Development Policy in 1992 and the enactment of the Electricity Act in 1992 and the Electricity Regulation Act in 1993. Donors have also offered the government support in developing its hydropower potential. Through a bilateral agreement with the Government

of Nepal for a five-year (2001–2006) hydropower program, the United States Agency for International Development (USAID) is providing technical assistance and training to (a) set up a streamlined legal and regulatory framework and simpler licensing procedures; (b) strengthen institutional capacity to address environmental and social impacts; (c) implement a new policy that promotes investment in both domestic and export markets; and (d) establish a Power Development Fund, with World Bank support, as a catalyst for energy investment.³

Roads Sector

2.5 Because of Nepal’s mountainous terrain and often difficult weather conditions, roads and aviation are the major modes of transportation in the country. However, Nepal’s total road network and density is the lowest in the region. Only 30% of the rural population has access to all-weather roads and more than 60% of this network is concentrated in the lowland (Terai) areas of the country. The poor condition of the road network seriously hinders the delivery of goods and services to the poor in remote areas, affecting both economic development and sustainable livelihoods.

2.6 The environmental risks and challenges associated with road construction and maintenance have both direct and indirect impacts on growth. Some of the direct impacts from road construction include soil degradation from loss of topsoil, water quality degradation from changes in surface water and groundwater flows, and biodiversity impacts due to loss of wildlife habitat and plant species. The indirect impacts include forward linkages from changes in land use and settlement patterns from new roads and backward linkages from mining and quarrying of roads material. In addition, rapid urbanization and increased demands for vehicles in urban areas has led to increased air pollution and traffic congestion.

2.7 In the Tenth Plan, the Government of Nepal has emphasized the role of roads and other transportation infrastructure as an overarching objective in reducing poverty in the country. The Tenth Plan has envisaged that 20,000 kilometers of operational roads will be completed by the end of the Plan period, and will include an annual construction of 1,200 kilometers of rural and agricultural roads and 600 kilometers of earthen roads. The Road Transport Policy, which included the development of a 20-year road master plan, was established in 2001. It has been estimated that Nepal will need to invest 2.5% of its GDP (US\$150 million) in developing its transport sector, which is double its present annual spending (World Bank 2007a). Therefore, future investment in the road sector is expected to rise dramatically as a major component of the country’s development strategy in order to improve connectivity, to promote growth, and to reduce poverty.

Role of the Environmental Impact Assessment

Use of EIAs and IEEs

2.8 One of the main tools for ensuring environmental sustainability in infrastructure development is the use of the environmental impact assessment and initial environmental

³ USAID Nepal web site: http://www.usaid.gov/locations/asia_near_east/countries/nepal/.

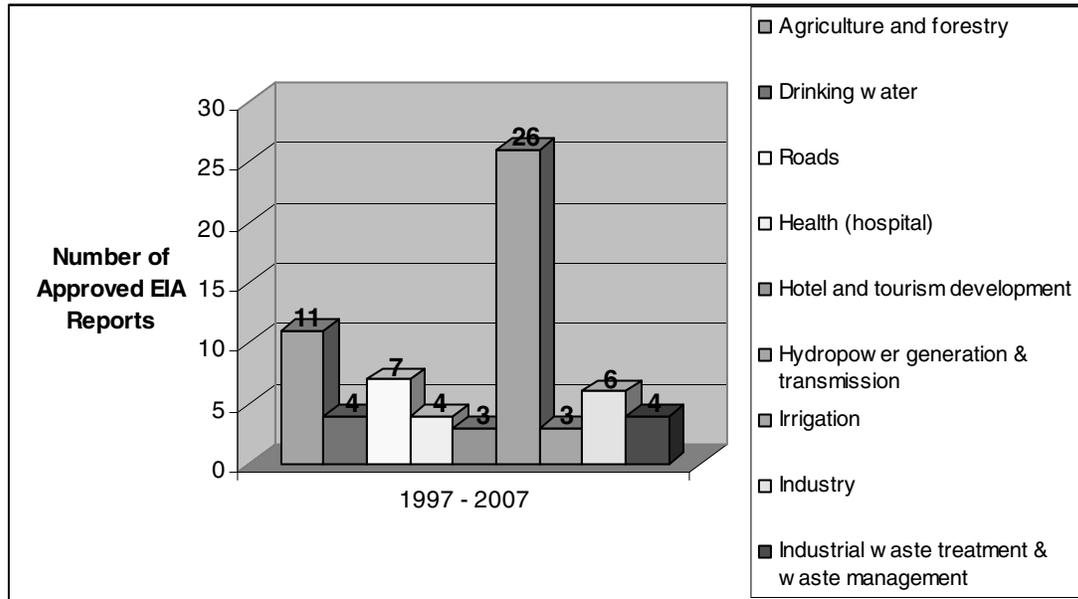
examination (EIA and IEE), which was made mandatory by the Environment Protection Act and Environment Protection Rules of 1997 (Government of Nepal 1997). Quite often, the EIA is the only tool that is used to ensure that environmental issues are addressed in the construction of infrastructure such as hydropower plants and roads. The EIA process is designed to ensure that development projects are constructed in a way that avoids or minimizes adverse impacts on natural resources, such as wildlife habitats, and prevents or decreases risks to human health or to ecosystems from environmental pollution, such as water pollution.

2.9 As with environmental and sector policies in general, the Environment Protection Act and Rules have their strengths and weaknesses. Over the past year, the Ministry of Environment, Science, and Technology, in consultation with the sector agencies, reviewed the effectiveness of the implementation of the Environment Protection Act and Rules and identified several policy deficiencies and inconsistencies. Accordingly, the Ministry developed proposed changes to address these deficiencies and underwent a consultation process to review these changes with key stakeholders. The resulting amendments in Schedules 1 and 2 of the EPR have been published in the Nepal Gazette, August 2 2004, Bhadra 3, 2064. This study looked at the institutional performance and barriers to effective implementation of the EIA process by reviewing existing literature, holding extensive stakeholder consultations, and analyzing selected case studies in the two priority sectors mentioned above – the hydropower and road sectors. The general findings from this EIA analysis, as well as selection criteria for the case studies, are summarized below and offer additional inputs for the Ministry of Environment, Science, and Technology to consider in its review of proposed changes to improve EIA effectiveness.

Selection of EIA and IEE Case Studies

2.10 The hydropower and road sectors were selected for case study analysis because of their importance in Nepal's Tenth Plan and because of their different levels of experience in environmental assessment and private sector participation. Some of the first EIA studies done in Nepal included a number of hydropower projects, such as the Arun III Hydropower Project and the Kaligandaki Hydropower Project. These were initiated in the early 1990s prior to the enactment of the Environment Protection Act and Rules. A number of guidelines and manuals have also been prepared for the hydropower sector by the Department of Electricity Development to improve environmental assessment processes. Consequently, there is considerable experience in the environmental assessment of the hydropower sector compared to other sectors. In contrast, there has been less experience in and focus on the environmental assessment process of the road sector. Of the 68 EIA studies that have been approved between 1997 and 3 July 2007 most projects have been in the hydropower sector and fewer in the road sector (see figure 2.1). Although the Rural Access Program (supported by the United Kingdom's Department for International Development) has prepared a manual for the IEE of rural roads, there is generally less knowledge and guidance when it comes to preparing and reviewing EIAs of the road sector. In addition, while the private sector is actively engaged in hydropower development, it has not been involved, to date, in the road sector.

Figure 2.1 Number of EIA Studies and Scoping Documents Approved by Sector as of July 2007



Source: Data from Ministry of Environment, Science and Technology, 2007.

2.11 The specific case studies were selected after extensive consultation with key ministries and stakeholders within the Government of Nepal. The criteria for selecting these case studies were developed and approved after careful consideration at a national stakeholders' workshop in December 2006 (appendix D).

2.12 Based on the criteria, two hydropower sector and two road sector EIAs and one hydropower sector and one road sector IEE were selected for case study analysis. All of the road projects are government projects and two of the three hydropower projects are private sector projects. Other key information about each of these projects is presented in table 2.1.

Table 2.1 Details of Environmental Assessment (EA) of Case Studies

Name of projects	Proponent	Length/capacity	Main funding source	EA study	Year of EA approval	Project construction dates	Consultants involved in EA study	Contractors involved	Consultant involved during detailed design and construction for environmental management plan	Provision of environment-related professional
Middle Marsyangdi Hydropower Project, Udipur VDC of Lamjung district	Nepal Electricity Authority (NEA)	69 MW	KfW/NEA/ Govt. of Nepal	EIA	1999	2000 Under construction	Domestic consultants involved through a joint venture of private consulting company for carrying out EIA study	International contractors (German and Chinese)	Domestic consultants involved for environmental management plan during detailed design and construction stages	No provision
Indrawati Hydropower Project, Sindhupalchok district	Private developer	7.5 MW	Domestic private sector funding	EIA	2002	2004 Under operation	Domestic consultants involved through a joint venture of private companies	International contractors	No consultants	No provision
Banepa-Bardibas Road Project (Section II)	Department of Roads	39 Km	Govt. of Japan through JICA	EIA	2002	2003 Construction completed	Local consulting firm	International contractors	No consultants	No provision
Basantapur-Chainpur-Khandbari Road Project	Department of Roads	96 Km	Asian Development Bank funded	EIA	2001	2006 Under construction	International consultants and in house experts from Dept. of Roads	Local contractors	International consultant	No provision
Piluwa Khola Hydropower Project, Sankhuwasabha district	National private developer	4 MW	Domestic private sector funded	IEE	2000	2000–2003 Under operation	Individual consultants are engaged to carry out IEE-level studies	Domestic contractors	No consultants	No provision
Tansen-Tamghas Feeder Road Project	Department of Roads	75 Km	World Bank	IEE	2003	2003–2006 Under operation	Local consulting firm	Local contractors	Local consultant	No provision

Source: Winrock International Nepal 2007a.

Findings from the Case Study Analysis and Stakeholder Consultations

2.13 There were eight key components or stages in the EIA system; each component was analyzed in each of the case studies. First, it was important to evaluate the project screening process to determine whether the criteria adequately indicated whether an EIA or IEE should be applied. Second, the scoping of the project was examined to identify how environmental issues and concerns were raised by the project proponent and the stakeholders. Third, the alternative analysis was reviewed to determine how effectively all project options, including no-build, were analyzed. Fourth, the impact identification, evaluation, and prediction process was examined to assess how thoroughly environmental impacts were considered. Fifth, the environmental management plans were assessed for pragmatic mitigation measures and monitorable indicators. Sixth, the public participation process was reviewed to determine whether the public was meaningfully involved during project preparation. Seventh, the clearance process was reviewed to identify administrative streamlining procedures between agencies. Finally, the monitoring process of the projects was evaluated to assess how effectively it complied with EIA recommendations and enforced the EIA approval. After this process, a comparative analysis of Nepal's EIA program was conducted to assess consistency and harmony of safeguard provisions across donor organizations, specifically the Asian Development Bank and the World Bank.

Screening Process: Need for Clearer and Stronger Criteria

2.14 There are three screening criteria under the Environment Protection Rules used to determine EIA or IEE thresholds – project size, project cost, and project location (i.e. whether it is in an environmentally sensitive area). There are no criteria for project impact on the surrounding environment. In terms of existing criteria under the Environment Protection Rules, what constitutes a “project” and what constitutes an “environmentally sensitive area” is unclear. It is also unclear whether the subprojects of sector projects that involve a number of subprojects, such as the Road Network Development Project, require environmental assessments. The Environment Protection Rules employ cost threshold limits, making it possible for a project proponent to avoid an EIA by either downsizing the project or by breaking the project below the threshold limits. Also, the Rules make no explicit provision for environmental assessment of industrial estates, nor has it been updated to include many types of industries that could have adverse environmental impacts, such as garment industries and carpet industries.

2.15 The case studies found that all the selected road projects met the legal requirements of the Environment Protection Rules' screening criteria. In large part, this may be due to the fact that the road projects were funded by international donors and were required to meet more stringent requirements. For the selected hydropower projects, one project (Piluwa Khola Hydropower Project) was screened for an IEE based on its size (5 megawatts); although if the cost of the project (Nrs. 30 million) were considered, it would have had to undergo an EIA. This was considered legally valid because the regulatory authority issued notification that the cost threshold is only applicable for projects that are not listed based on project size. Additionally troubling is the fact that Piluwa Khola's project design was significantly altered after IEE approval (e.g. changes

in cross-drainage structures) and a further environmental analysis was not undertaken. More problematic still is the fact that the capacity of Indrawati Hydropower was increased from the size threshold of 5 megawatts to 7.5 megawatts after the IEE had been approved. Although an EIA was subsequently carried out, there is no guidance in the Environment Protection Rules as to the process to follow when significant project design changes occur after the EIA or IEE approval.

2.16 These case studies suggest that the screening criteria used in regards to project size, cost, and location need to be made more stringent. In addition, explicit provisions regarding subprojects and project modifications should be added. In some countries, the following criteria are used in determining which projects should be subject to an EIA: (a) the magnitude of the project (such as a transmission line longer than 10 kilometers); (b) the polluting potential of the project, regardless of the magnitude (such as metal finishing or electroplating industries); and (c) the environmentally sensitive location of the project, regardless of size or polluting potential (such as in wetlands of concern). Adopting similar criteria into the Environment Protection Rules would provide coverage to a wider range of projects and would help to address some of the concerns with the present screening process.

Scoping of Projects: Need for Greater Clarity and Specificity

2.17 The preparation of scoping documents and terms of reference are the responsibility of the project proponent. These documents are reviewed and approved by the Ministry of Environment, Science, and Technology in the case of EIA-level studies and the concerned ministry in the case of IEE-level studies. However, there are no guidelines under the Environment Protection Rules for the preparation of scoping documents and the extent of information required. For example, there are no guidelines for the delineation of the project influence area. As a result, projects use different methods for determining such areas and a true assessment of the potential scope of environmental impacts is made more difficult. In addition, in a system where the project proponent prepares the terms of reference a potential conflict of interest may be created and could lead to the avoidance of complex environmental issues and poor follow-up on compliance. Site-specific information is also required to more accurately identify and predict the proposed project's potential environmental impacts. Furthermore, the Environment Protection Rules do not indicate a period of validity for the scoping documents, even though project designs or baseline conditions could change after their approval.

2.18 A review of environmental assessment reports from the case studies found the information in the reports to be variable – some scoping documents were very brief and others more elaborate. Only the Middle Marsyangdi Hydropower Project clearly delineated the project influence area and other issues required under the Environment Protection Rules. The other case study projects provided only generic information in their scoping document for the environmental assessment. For example, the Banepa-Bardibas Road Project did not include information such as project influence area, impact identification, and prioritization of issues, as required in the EIA study. However, as a result of public consultations in Middle Marsyangdi and the Basantapur Khandbari Feeder Road Project, site-specific information was identified for these projects and

incorporated into their environmental assessment report.

2.19 The lack of clear scoping guidelines can cause confusion and serious gaps when it comes to accurately assessing the scope of the project and its potential environmental impacts. Some sectors have developed good practice manuals and guidance tools that, if properly and regularly used, would improve the scoping of projects. For example, the Rural Access Program has developed an outline of clear recommendations for defining the influence area of a rural road project. Similarly, the Department of Electricity Development has developed the *Manual for Preparing Scoping Documents* for hydropower sector projects. These manuals should be used as guidance models in other sectors.

Alternative Analysis: Need for Site-Specific and Sector-Specific Application

2.20 The Environment Protection Rules require the EIA and IEE to undergo analysis in order to assess alternative project development options, such as alternative design, alternative project site, alternative time schedule, and the use of alternative raw materials. The alternative analysis required for the EIA also requires consideration of other factors, such as the short-, medium-, and long-term impacts of project implementation and the consequences of nonimplementation. While the Environment Protection Rules include a recommended alternative analysis format, it appears to be most suited to the industry sector. The recommended format requires an assessment of alternative raw materials, operation schedule, and alternative energy. When other sectors have used this format to analyze alternatives, the information provided is less relevant for their particular sector and consequently less relevant in the consideration of sector alternatives. For example, a more suitable alternative analysis for the road sector would include alternative routes, construction technology, construction schedule, etc. Similarly, the alternative analysis required for hydropower is different from that of either road or industry projects.

2.21 Review of the case studies once again showed inconsistencies in the compliance with and completeness of the alternative analysis requirement. Among the case studies, the Middle Marsyangdi Hydropower Project and Banepa-Sindhuli-Bardibas Road Project had conducted the best alternatives analyses. However, even the Middle Marsyangdi Hydropower Project did not compare the alternatives in terms of environmental costs and benefits. The Basantapur-Chainpur-Khandbari Road Project appeared to use the alternative analysis to justify its already selected site. It did not include other analysis such as alternative design or construction methods, do-nothing alternatives, or environmental cost and benefits.

2.22 One way to address this inconsistency in alternative analysis is to develop sector-specific guidelines. The Department of Electricity Development has prepared a sector-specific manual for the hydropower sector that presents guidelines for alternative analysis based on the needs and circumstances of the hydropower sector. Once again, sector-specific manuals or guidelines, such as the Department of Electricity Development manual, are needed to better inform and guide the alternative analysis process.

Impact Identification, Evaluation, and Prediction: Need for Site-Specific Data

2.23 Under the law, the requirements for impact identification, prediction, and

evaluation are very extensive. The Environment Protection Rules require that the EIA studies identify and predict positive and negative environmental impacts in terms of (a) social, economical, and cultural impacts; (b) biological impacts; and (c) physical impacts. It also asks that the EIA identify the magnitude, in terms of time and schedule, of possible impacts, as follows: (a) the geographic area on which the implementation of the project is likely to have a positive or negative impact, and the time schedule of those impacts; (b) the impact of waste and pollution that will be emitted through the implementation of the project; and (c) the direct, indirect, and cumulative impacts of project implementation on the environment. However, as with other provisions in the Environment Protection Rules, compliance with this requirement has been relatively poor. This is in large part due to the fact that impact identification and predictions have relied on generic information and have lacked site-specific and quantifiable data. In addition, there is insufficient knowledge and appropriate tools, such as mathematical models or overlay methods, to accurately identify, predict, and evaluate impacts.

2.24 For most of the case study projects, impact identification and predictions referred to generic impacts, such as “landslide along the road alignment”, and did not quantify impacts in accordance with baseline conditions. While the EIAs of the Middle Marsyangdi Hydropower Project and the Basantapur-Khandbari and Banepa-Bardibas Road Projects all identified and predicted impacts, they varied significantly in the quality and scope of their environmental assessments. The Middle Marsyangdi report not only included site-specific impacts, but also the nature of predicted impacts – such as direct or indirect impacts and the extent, duration, and magnitude of impacts – during both the construction and operational stages of the project. This was accomplished by using appropriate tools, such as maps and surveys, for assessing land loss and changes in land use, loss of forest products, and damage to community infrastructures. On the other hand, the Banepa-Bardibas Road Project report only included a summary table describing the nature of impacts in terms of direct or indirect, magnitude, duration, and extent. It did not attempt to evaluate their level of significance.

2.25 One of the primary reasons for the poor quality of impact identification, prediction, and evaluation in the case studies is the poor quality of environmental baseline information and the lack of site-specific information. As mentioned, there is not enough knowledge regarding scientific or mathematical models or methods for the identification, prediction, and evaluation of impacts. This informational gap in site-specific conditions and technological methods underscores the critical need for establishing a strong center or system for expanding the collection, storage, analysis, and dissemination of environmental information.

Environmental Management Plan: Need for Pragmatic Mitigation Measures and Monitorable Indicators

2.26 The Environment Protection Act states that the EIA study should include a “procedure of monitoring the impact of the implementation of the proposal on the environment”. Similarly, the Environment Protection Rules require the IEE report to include “matters to be monitored while implementing the proposal”. Environmental management plans are intended to be used by project proponents to ensure that mitigation measures and environmental monitoring have been adopted.

2.27 Of the six cases studies, only the IEE of the Piluwa Khola Hydropower Project did not include an environmental management plan. The environmental management plan of the Middle Marsyangdi Hydropower Project was found to be most complete and convincing, with clearly stated project activities, likely environmental impacts, mitigation measures to be adopted, monitoring indicators, frequency of monitoring, and institutional arrangements for monitoring. The Indrawati Hydropower Project and Basantapur-Khandbari Road Project environmental management plans did not have monitoring and auditing plans, while the Tansen-Tamghas Road Project plan had mitigation measures that did not match those presented in the IEE report.

2.28 Some of the reasons for the shortcomings in the environmental management plans are the lack of experienced environmental professionals, the allocation of limited resources by the proponent, and inadequate incorporation of pragmatic mitigation measures and monitoring indicators. EIA studies are normally carried out by consulting firms based on the lowest cost; this often directly affects the quality of the environmental management plan. In order to strengthen the quality of the EIA reports and the environmental management plans, the EIA team should be made up of a proper mix of professionals, and should specifically include an experienced environmental professional.

Public Participation Process: Strengthen to Provide More Meaningful Involvement

2.29 The Environment Protection Rules make public consultation mandatory for EIA and IEE projects. This requirement includes publishing notices in a national newspaper, submitting notices to concerned village development committees (VDCs), district development committees (DDCs), and municipalities, and in the case of EIAs, conducting a public hearing at the project site. As required by law, almost all projects publish public notices requesting the public's input for the scoping documents. However, in most instances, very few comments are submitted by stakeholders in response to such notices. Similarly, with certain exceptions, very few people attend public hearings during the environmental assessment stage of projects. From the public's perspective, the reasons for this include low literacy rates, poor understanding of the project's impacts, inadequate notice time, and feeling that comments will not be taken seriously. At the same time, many project proponents have not made efforts to actively seek local participation and inputs, believing that NGOs and local residents will present obstacles to project implementation in terms of cost and time. Public consultation is viewed as a burdensome legal obligation and not as a helpful tool in improving the understanding and quality of the project. However, it has been used as a forum to collect site-specific information, as was demonstrated in the Middle Marsyangdi Hydropower Project.

2.30 In the case studies, the public consultation process was generally poor, with limited participation from general stakeholders and affected VDC people. For a number of road projects under consideration, the public hearing was either absent or held far from the project site, at the district headquarters, resulting in limited participation from the government and project officials and the study team members. One way to improve the effectiveness of the public participation process would be hold public hearings at the village level near the project site to the extent possible. A summary of public involvement during the environmental assessment stage of each of the case study projects is found in table 2.2.

Table 2.2 Public Involvement in the Environmental Management Assessment Stage

	Environmental assessment stages						
	Public consultation	Publication of notice	Comments & suggestions	Public hearing locations	Participants in public hearing	Minutes of meeting of public hearing	Stakeholders recommendations
Middle Marsyangdi Hydropower Project	Yes, in several locations	Yes	Attached, from DDC and VDCs	One location	600	Yes	Yes, from DDC and VDCs
Indrawati Hydropower Project	Yes, in one location	Yes	Attached, from NGOs and VDCs	One location	58	Yes	Yes, from VDCs and NGOs
Banepa-Bardibas Road Project	No	Yes	One	One location	32	Yes	Yes, from VDCs
Basantapur-Khandbari Road Project	Yes	Yes	Only DDC and VDCs	One location	78	Yes	Yes, from DDC and VDCs
Piluwa Khola Hydropower Project ^a	n.a.	Yes	No	n.a.	n.a.	n.a.	n.a.
Tansen-Tamghas Road Project ^a	n.a.	Yes (assumed)	No	n.a.	n.a.	n.a.	n.a.

n.a. Not applicable.

a. These were IEE projects, so a public hearing was not required.

Source: Winrock International Nepal 2007a.

2.31 The exception to the norm was the Middle Marsyangdi Hydropower Project; regular public hearings were held throughout the project, both during the scoping preparation and during the environmental assessment stages of the project. In addition, one-on-one and group meetings were held at the central, district, and village levels and involved diverse stakeholders, including political leaders, business leaders, NGOs, and farmers. At the final public hearing, approximately 600 people were in attendance. In part, this can be attributed to the magnitude of the project, which covered 12 VDCs and a population of over 19,000 people. However, it also reflected the project proponent's proactive engagement to reach out to the public through many means other than the public hearing and to ensure inputs from stakeholders with diverse interests.

2.32 One reason for the low level of public participation, by agencies and stakeholders, is that there is no guidance on what level of local participation constitutes meaningful public consultation. Nor is there any attempt to change attitudes towards the process. In an effort to improve the public participation process, some countries, including neighbors in the region, have recently adopted specific public consultation guidelines (box 2.1). Whether these public consultation guidelines will in fact improve the effectiveness of the public participation process remains to be seen. But they are at least a signal, and

recognition by some governments, of the importance of and necessity for ensuring more meaningful public participation in the decision-making process.

Box 2.1 EIA Guidelines for Public Consultations

The Pakistan Environmental Protection Agency has adopted *EIA Guidelines for Public Consultation*. These guidelines recommend that public consultation should go beyond simply listening to public concerns; it requires active engagement with the public in the development of acceptable solutions to address their concerns. Specifically, it states, “Proponents should explain their proposals clearly to affected communities, actively listen to the communities’ responses, and make prudent changes to the proposal to avoid or mitigate adverse impacts.”

The India Ministry of Environment and Forests recently published *Draft Notification for the Re-Engineering of the EIA Process*. The draft notification replaces “public hearing” with “public consultation”, reflecting a paradigm shift in the expected outcomes. Public consultation aims to force project proponents to proactively seek the views of affected communities at various stages of project development and to integrate these concerns into the project design. The public consultation process is also aimed at two different sets of interested people – consultations at the project site with persons having a plausible material stake in the project and consultations with persons having a plausible stake in the environmental aspects of the project.

Sources: World Bank 2006a, 2006b.

Clearance: Simplification of Administrative Processes between the Ministry of Environment, Science, and Technology and Sector Agencies

2.33 A past study indicates that the Ministry of Environment, Science, and Technology takes 14 to 40 days to approve the scoping documents for road sector projects. In the case of hydropower sector projects, the Ministry has taken 9 to 126 days to approve the scoping and terms of reference. Similarly, the time the Ministry has taken for the review and approval of EIA documents has varied from 31 to 214 days for road projects to 35 to 525 days for hydropower projects. However, this estimation does not include the time that concerned sector agencies have taken for review and recommendations (Uprety 2003).

2.34 For the six projects considered in the case studies, the average time for clearance varied from 7 to 17 months (table 2.3), with clearance for hydropower projects taking more time than for road projects. As the case studies illustrate, the time taken for the EIA process is generally longer than what has been estimated under the clearance process. Some of the main reasons for the delays in clearance are noncompliance of EIA documents with the legal provisions (e.g. noninclusion of 15 days public notice or proof of public hearing), and poor quality of EIA reports, from which important information, such as baseline information, site-specific conditions, impact identification, or mitigation measures, is missing, sometimes even after the Ministry of Environment, Science, and Technology (including the Review Committee) has provided comments and suggestions for improvements. This is reflective of the casual attitude of the sectoral agencies, which invest minimal efforts to complete the EIA as a procedural formality. Another reason for the delay is the time taken for administrative review processes in the Ministry of Environment, Science, and Technology and in the sector agencies. Clearance for hydropower projects seems to take longer than for road projects because hydropower

projects undergo review at both the ministry and department levels.

Table 2.3 Timetable for EIA Clearance Process for Sample EA Documents

Name of project	Scoping document, terms of reference (months)		EIA study (months)		Total time taken in months
	Estimated	Actual	Estimated	Actual	
	Middle Marsyangdi Hydropower Project	3	5	8	
Basantapur-Khandbari Road Project	2	4	6	9	13
Indrawati Hydropower Project	2	3	4	7	10
Banepa-Bardibas Road Project	2	3	3	7	10
Piluwa Khola Hydropower Projects	1	2	3	5	7
Tansen-Tamghas Road Project	2	3	3	4	7
Average in months	2	3.4	4.8	7.8	11.2

Source: Data from Ministry of Environment, Science and Technology, 2007.

2.35 Recently, the Ministry of Environment, Science, and Technology has taken steps to simplify the administrative requirements and reduce the time taken for clearance without compromising on compliance with legal provisions or quality of the EIA report. One measure would direct comments toward the project proponent and the EIA team rather than through the administrative channel of the concerned ministry or department. Another measure would be to hold regular review meetings. These measures are expected to reduce the time for clearance by approximately four months.

Monitoring and Enforcement: Need for More Focused Attention

2.36 The Environment Protection Rules contain provisions for environmental monitoring and environmental auditing. However, the rules do not explicitly define the roles and responsibilities of the Ministry of Environment, Science, and Technology, or other ministries with respect to these enforcement functions. While the Environment Protection Act does include a section providing for environmental inspectors in the Ministry of Environment, Science, and Technology for environmental monitoring, it indicates, in this same section, that concerned sector agencies are also responsible for monitoring. This has led to confusion; most sector agencies do not conduct environmental monitoring, stating that it is the responsibility of the Ministry of Environment, Science and Technology. In addition, the Environment Protection Rules require environmental auditing two years after implementation of a proposal has begun. However, to date, no environmental auditing has been performed.

2.37 In the review of the case studies, only two projects – Middle Marsyangdi Hydropower Project and Tansen-Tamghas Road Project – have been carrying out

environmental monitoring. In the Middle Marsyangdi Hydropower Project, monitoring is being performed in accordance with the environmental management plan that was presented in the EIA document. In contrast, in the Tansen-Tamghas Road Project the environmental monitoring indicators that are being utilized differ from those contained in the IEE report. In both these projects, consultants have been retained to ensure the monitoring of EIA recommendations. However, the Middle Marsyangdi Hydropower Project is also utilizing a Participatory Environmental Impact Monitoring Committee, which includes representatives from local government, the local community, and other stakeholders.

2.38 The lack of monitoring by concerned agencies and the Ministry of Environment, Science, and Technology makes it more likely that instances of noncompliance with EIA and IEE recommendations during implementation stages will go undetected and unaddressed. In addition, this can result in situations of no accountability should a project proponent make significant modifications in project design, and affect mitigation measures, after approval. Consequently, priority attention should be given to (a) clarifying agency roles and responsibilities for monitoring and enforcement; (b) dedicating resources to perform these functions, particularly for the Ministry of Environment, Science, and Technology; and (c) developing a targeted and coordinated plan for environmental monitoring among agencies. In addition, local governments and communities should be utilized to support compliance monitoring.

Harmonization with Donor Requirements

2.39 Finally, the study also compared the environmental safeguard policies of the World Bank and the Asian Development Bank with the requirements of the Environment Protection Act and Environment Protection Rules (see appendix E). This comparative analysis suggest that the current Government of Nepal policies generally comply with safeguard requirements of the World Bank and the Asian Development Bank with respect to the conduct of environmental assessment studies, incorporation of mitigation measures, and project planning, design, and construction. However, there are major inconsistencies in how EIA and IEE screening criteria are defined. Donor organizations primarily base criteria on the magnitude and the significance level of environmental impacts. In Nepal the current practice is to base criteria on the size or cost of the project. The Environment Protection Act and Rules do not encourage the use of strategic environmental assessments and the public participation provisions and monitoring systems envisioned in the legislation have not been effectively implemented. These gaps in policy and implementation must be seriously addressed if Nepal's EIA system is to be found in full harmony with donor requirements.

Next Steps

2.40 The policy and implementation gaps in the EIA process have reduced the effectiveness of the EIAs and IEEs in ensuring that environmental impacts from infrastructure development are minimized and mitigated. While some hydropower and road projects have filed the EIA or IEE report with due diligence, others have done so

more reluctantly, perceiving the EIA requirements as an unnecessary burden to growth and development rather than a sustainable tool to support it. In these cases, little attention is given to addressing environmental concerns or to incorporating them into the planning, design, or implementation of the project. In addition, there have been weaknesses in the monitoring of compliance with EIA recommendations and approvals by the Ministry of Environment, Science, and Technology and sector agencies. Recognizing these weaknesses, the Ministry revised the Environment Protection Act and Rules recently to improve EIA effectiveness (box 2.2). This effort is applauded and should receive priority attention. In particular, emphasis needs to be placed on strengthening the screening criteria, project scoping, alternative analysis, and impact identification and evaluation.

Box 2.2 Recent Efforts by the Ministry of Environment, Science, and Technology to Improve EIA Implementation Effectiveness

- A policy decision has been taken by the Ministry to send comments and suggestions on the EIA directly to the proponent. The proponent can submit the revised report directly to the Ministry instead of going through the sectoral agency.
- Preparation and publication of guides is being undertaken with assistance from the Royal Norwegian Government on (a) licensing and the EIA process; (b) EIA report approval process; (c) environmental management plan; (d) environmental monitoring; and (e) environmental auditing.
- Revised terms of reference are being issued for several projects.
- Amendments to Schedules 1 and 2 of the Environment Protection Rules are approved and have been published in the Nepal Gazette on August 20, 2007.
- A policy decision has been taken by the Ministry to make the proponent bear the cost of public notice and the cost of the EIA report suggestion committee.
- A study has been commissioned by the Ministry to introduce an accreditation process related to EIA preparation.
- Ministry of Environment, Science, and Technology is pursuing environmental monitoring reports by project proponents in the spirit of the EPR 1997.
- Procedures are being considered to undertake public disclosure of EIA-related decisions by the Ministry.

Source: Personal communication with Batuk Uprety, Under-Secretary (Technical), Ministry of Environment, Science, and Technology, July 2007.

2.41 As in many developing countries, the EIA system is the principal instrument for ensuring environmental sustainability in the development process in Nepal. Much of the potential for achieving environmental outcomes will come from actions taken by the sectors; mainstreaming environmental concerns into sectoral policies and guidelines is therefore essential. One way to do this is to utilize sector-specific guidelines for EIA preparation and implementation, such as the environmental guidelines prepared for hydropower projects. In addition, sectoral development policies should be reexamined to determine whether they have inadvertently established disincentives for improved

environmental management and how greater incentives can be created to promote mainstreaming of environmental considerations into the development process. There is also a need for training (possibly including accreditation) on environmental impact analysis to EIA report preparers and orientation to project developers and decision makers of the concerned agencies about the benefits of mainstreaming environmental management in sector operations in order to attain sustainability of investments.

3. Urbanization and Service Delivery: Meeting the Population Pressures

3.1 While urbanization is a relatively new phenomenon in Nepal, the rate of urbanization, according to the 2001 census, is among the highest in South Asia (3.3 million people or 14.2% of the Nepalese population lived in 58 municipalities) (Central Bureau of Statistics 2002). Between 1991 and 2001 the municipal population increased by 94%, or 6.8% per year. Based on this, it is estimated that the total urban population in 2006 was approximately 3.8 million of the total population of 25 million. The government predicts that by 2011, 24% of the total population will be living in urban areas (NPC/MoPE 2003). This urbanization trend in Nepal is presented in table 3.1.

Table 3.1 Urbanization in Nepal

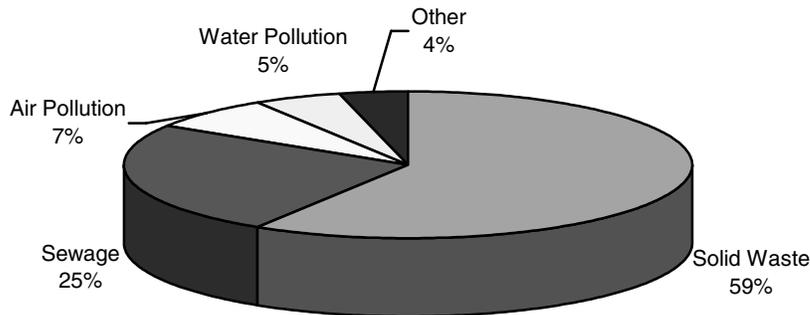
Year	Number of municipalities	Urban population (millions)	Urban population (%)	Average annual increase (%)
1952/54	10	0.24	2.9	-
1961	16	0.34	3.6	1.65
1971	16	0.46	4.1	3.23
1981	23	0.96	6.3	7.55
1991	33	1.70	9.2	5.89
2001	58	3.29	14.2	6.84

Source: Central Bureau of Statistics 2003.

3.2 However, the rapid increase in urban population is not matched by a similar increase in the provision of resources and knowledge to effectively address the growing challenges of urban environmental management. The World Bank Report on Urbanization and Service Delivery in the Context of Decentralization (World Bank 2004) found that the population pressures place enormous demands on housing markets, infrastructure systems, and environmental resources, and that the “Current urban land management and infrastructure service policies and institutions are not positioned to meet the challenge, and need to be restructured to avoid the worse case scenarios.”

3.3 For the purpose of this CEA, after extensive consultation with concerned government departments and key stakeholders, three areas in urban environmental management were studied – solid waste management, air quality, and industrial pollution. Solid waste management was chosen because in public opinion polls it is identified as the most pressing concern facing the general public. In a Central Bureau of Statistics survey in 1996, most urban residents ranked solid waste as the number one environmental problem in their city (figure 3.1) (Central Bureau of Statistics 1997). Although this poll was conducted a decade ago, problems associated with solid waste have worsened. On the other hand, while municipalities have paid relatively little attention to air quality and the issue does not rank as high in concern as other environmental problems, such as solid waste and water pollution, the levels of urban air pollution have risen and will continue to rise. Finally, industrial pollution is an emerging area of concern, as the pace of industrial development in urban areas increases without proper environmental management and monitoring.

Figure 3.1 Public Opinion on Main Environmental Problems in Urban Areas



Source: Central Bureau of Statistics 1997.

3.4 Urban environmental issues also have to be viewed within the context of the fiscal conditions faced by the municipal governments and the environmental health implications for the urban population. For instance, some of the main factors preventing municipalities from delivering urban environmental services are the lack of funds and revenue generation, their limited innovative financing, and the need to reduce unnecessary costs. One of the most significant consequences of not managing the urban environment effectively is the intangible environmental health costs on growth and development, especially for vulnerable populations such as children under five, women, the elderly, and the poor. Therefore, understanding the broader context of fiscal and environmental health costs can better inform decision makers about the integration of urban environmental management issues. These issues are explored next in the chapter.

Achieving Financial Sustainability to Provide Urban Environmental Services

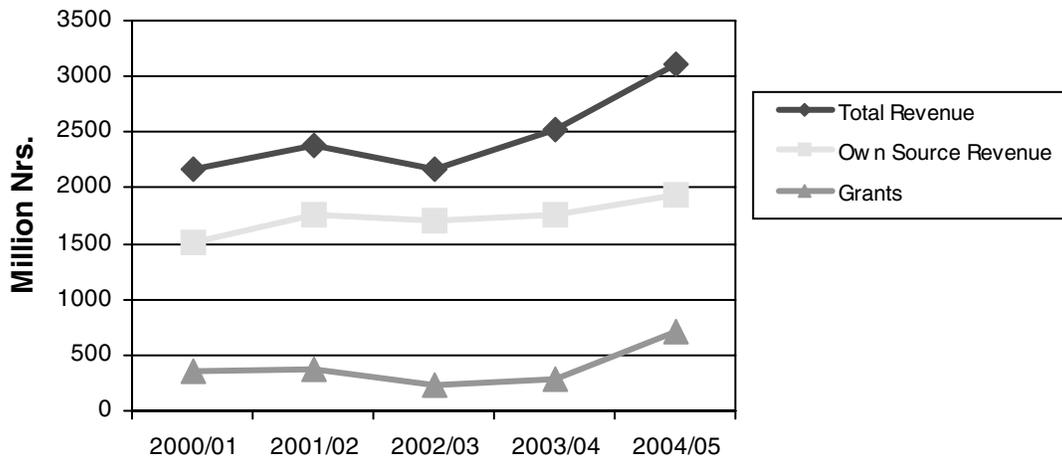
3.5 One of the overarching challenges facing municipalities, whether it is in managing solid waste, air quality, or industrial pollution, is the lack of adequate financial resources to provide basic urban services. Most municipalities rely heavily on the local development fee, which will have to be phased out by 2013 because it is considered a trade barrier by the World Trade Organization.⁴ Other than the local development fee, sources of municipal revenue include the house and land tax, business tax, vehicle tax, property rental, and fees or fines; altogether these are termed “own source revenue”. Finally, there are government grants on which the municipalities rely for funding. Despite the fact that municipalities’ own source revenue – property rentals and fees or fines – is

⁴ This fee is collected from different custom points of the country in addition to import customs by the central government, and it is redistributed to the 58 different municipalities on the basis of specific criteria.

growing at about 7% per year, this growth is not fast enough to replace the local development fee, and smaller municipalities have an even more limited capacity to generate revenue. While the municipal revenue has generally grown in the last five years, as illustrated in figure 3.2, the local development fee accounted for more than 32% of the total revenue for municipalities in 2004/05 and grants accounted generally for 22% of the total municipal budget.

3.6 The decentralization process in Nepal has focused on devolving responsibilities to the local bodies, but not necessarily the resources to take on these responsibilities. As effective urban environmental management programs will require sufficient and sustainable financial resources for implementation, there is an urgent need to find creative revenue sources that will support municipalities in delivering these programs. Some of the revenue-generating options to consider might include allowing intergovernmental fiscal transfers, permitting local governments to charge service fees or share in existing taxes, or increasing the tax rates. None of these options are politically easy, but with the phasing out of the local development fee, achieving financial sustainability is essential for ensuring that basic municipal services can be provided in the future.

Figure 3.2 Trends in Municipal Revenue 2000–2005



Source: ENPHO 2007.

Environmental Health

3.7 Environmental health issues, such as indoor and urban air pollution and inadequate water and sanitation, are of growing concern in Nepal. With expanding populations and rapid urbanization, demand for environmental services such as clean water, proper sanitation, and cleaner fuels is outstripping supply. As a result, vulnerable subgroups in the Nepali population continue to fall sick and die from largely preventable diseases such as diarrhea and respiratory infections.

3.8 Sickness and deaths attributed to environmental risk factors impose a significant economic burden on Nepal’s economy. The costs of these environmental problems have

been estimated in this report to help policy makers in Nepal appreciate the magnitude of these issues and better integrate environmental health considerations into economic development decision making. These costs not only include the medical costs of treatment and lost productivity due to sickness and care-giving, but also provide an estimate of the value of pain and suffering from premature death and disease.

3.9 Overall, the analysis shows that Nepal’s economic costs associated with lack of water and sanitation, and indoor and urban air pollution, amounts to **US\$258 million** – or **3.5%** of the country’s GDP (table 3.2). This is comparable in range to other valuation studies on environmental health carried out in the South Asia region. The detailed analysis of environmental health and related costs for Nepal is found in appendix F; the methodology used to estimate environmental health costs is set out in appendix G. The analysis in this chapter draws on the data contained in those appendices.

3.10 **Urban environmental health.** Rapid and haphazard urbanization has been exerting immense pressure on Nepal’s urban environment in recent years, particularly with the growth in the number of slum and squatter settlements, with dismal living conditions, crowded poor-quality housing, and minimal access to water and sanitation (ADB/ICIMOD 2006). With weak capacities for environmental service delivery coupled with inadequate budgets, municipalities are struggling to keep pace with the demand. As a result, many cities in Nepal are facing environmental problems related to solid waste management, wastewater management, and drainage, and the consequent health impacts from exposure to these risks.

Table 3.2 Aggregate Environmental Health Costs for Nepal

	US\$ (millions)	% of GDP
Indoor air pollution	\$147.3 (\$110.4–\$182.3)	2.0% (1.49–2.47%)
Lack of water and sanitation	\$89.2 (\$78.4–\$100.4)	1.21% (1.06–1.36%)
Urban air pollution	\$21.1 (\$17.7–\$24.6)	0.29% (0.24–0.33%)
Total	\$258 (\$206.6–\$307.3)	3.49% (2.79–4.16%)

3.11 For urban areas in Nepal, the analysis estimates environmental health costs to be nearly **US\$51.2 million** in 2005, which is **0.7%** of Nepal’s GDP. While these estimates appear to be relatively low (when compared to rural environmental health), growing urbanization is expected to translate into increasing environmental problems and accompanying disease burdens, especially for the urban poor. Environmental problems are often more critical in larger municipalities; Kathmandu, for example, is suffering from extremely poor air quality, severe degradation of rivers, and improper management of waste. With increasing urbanization, smaller municipalities will also soon face major problems of environmental management and they have even less resources to deal with these challenges. Therefore, urban environmental health is an important issue that needs to be addressed immediately to improve the quality of life of a growing urban population and boost the economic productivity of urban centers. The economic costs attributed to environmental health risks for urban areas presented in this report then set a benchmark against which future estimates can be compared, providing an indication of the success of programs and policies aimed at improving environmental health in Nepal’s urban areas.

Inadequate Water and Sanitation

3.12 Nepal has the poorest drinking water and sanitation coverage in South Asia. Varying estimates of the coverage, using different criteria, make it more difficult to ascertain the true extent of this problem (table 3.3). On the whole, water and sanitation access figures for urban areas are seen to be much higher than those in rural areas. However, these spatial averages for water and sanitation coverage hide the intra-urban inequalities that exist within Nepali cities and towns.

3.13 **Water coverage and quality.** Most urban centers in Nepal have piped water supply systems. According to the 2001 census, 67% of the urban population has access to piped drinking water, while 26% depends on handpumps and tubewells (Central Bureau of Statistics 2002). Even within urban areas, there is a significant variation in coverage: a 2002 survey of nine municipalities outside Kathmandu showed piped water coverage varying from 7% to 65% of households (ADB/ICIMOD 2006). In addition, the demand for drinking water in urban areas far exceeds the available supply. For example, in the Kathmandu Valley, the water demand is over 200 million liters per day, but the Nepal Water Supply Corporation is able to supply only about 90 million liters per day during the dry season, and even this is irregular.

Table 3.3 Sanitation Coverage in Nepal: Differing Estimates

Source	Urban	Rural	Total
	% of population		
Central Bureau of Statistics 2002	78	41	47
UNDP/Government of Nepal 2002	80	25	30
UNDP/Government of Nepal 2005	81	30	39
WaterAid Nepal	67	19	27
Central Bureau of Statistics 2004	—	—	39

— Not available.

3.14 The quality of drinking water from both surface water and groundwater sources is also of increasing concern in urban Nepal. The Bagmati River, which is the major surface water body for the Kathmandu Valley, is heavily polluted, with some 21,000 kilograms of domestic sewage discharged into its waters daily (ADB/ICIMOD 2006). Additionally, while groundwater levels in the valley are dropping due to overextraction for drinking water purposes, poor sewage and feces disposal practices are also contaminating the groundwater aquifers. As a result, many Kathmandu residents depend on alternative means, such as private dug wells and tankers, to meet their water needs. Although the Nepal Water Supply Corporation has water treatment systems in the Kathmandu Valley, the water that reaches the consumers is often contaminated. According to studies done by ENPHO, almost half of the water that is supplied is deficient in chlorine and is microbially contaminated.

3.15 **Sanitation.** Urban sanitation, including access to toilets, wastewater management, and drainage, is a major problem in all municipalities in Nepal. Only 76% of the urban

population has access to toilets, while 24% uses open spaces such as riverbanks and fields for defecation. Even among people who have toilets, many practice open defecation for convenience and maintenance cost reasons. In terms of feces disposal, it is estimated that 35% of the toilets are linked to drainage or sewage systems, 55% discharge into septic tanks, and the remaining 10% into open drains and ditches (FCM/MuAN 2002). There are five municipal wastewater treatment plants in the Kathmandu Valley to treat a small portion of the wastewater generated within the valley, but among these, four are either not functioning or only partially functioning.

3.16 Health impacts. In urban areas in Nepal, contamination of drinking water with fecal coliform bacteria is widely prevalent, caused by inadequate protection of water source areas, open defecation in water sources, poor protection of waterways, and poor maintenance leading to cross-leakage of sewers and water pipes. Diarrheal diseases, intestinal worms, gastritis, typhoid, and jaundice are the top five water-borne diseases and constitute 9% of all outpatient visits in Nepal’s health institutions (Department of Health Services 2006). Poor sanitation and improper hygiene practices (such as poor hand and food hygiene behaviors) also lead to both skin and diarrheal diseases.

3.17 Economic damage. Inadequate access to water and sanitation leads to premature deaths and disease, which in turn impose costs on Nepal’s economy. These costs include the expenses incurred to treat illness from diseases attributed to poor water and sanitation. Other costs include lost productivity from when adults fall sick and stay home from work, or when primary care-givers have to take care of sick children (and potentially lose wages). Furthermore, the pain and suffering from premature death and illness is also valued (by calculating the burden of disease in Disability Adjusted Life Years (DALYs), and costing these DALYs at the GDP per capita). Only diarrheal disease was included in these cost calculations, which therefore represent an underestimate of the total costs attributed to inadequate water and sanitation in Nepal.

3.18 The analysis shows that in urban areas in Nepal, every year, about 175 children under the age of five are estimated to die due to lack of water and sanitation. Nonfatal cases of diarrhea in urban areas have been estimated to be just over 1 million per year in children and about 1.8 million in adults. The total number of DALYs lost per year is about 6,400. The monetary estimate of these health impacts is obtained by valuing a DALY as equivalent to GDP per capita (US\$272). This translates into an annual cost of about US\$12.2 million in 2005 (table 3.4).

Table 3.4 Estimated Urban Health Costs Due to Inadequate Water and Sanitation

Type of costs	Est. cost (US\$)
Costs of diarrheal deaths potentially averted by water supply/sanitation interventions	3,388,683
Costs of diarrheal cases potentially averted by water supply/sanitation interventions	269,669
Costs of illness (medical costs + lost productivity costs)	8,542,690
Total costs due to inadequate water supply and sanitation	12,201,042
Total costs as % of GDP	0.17%

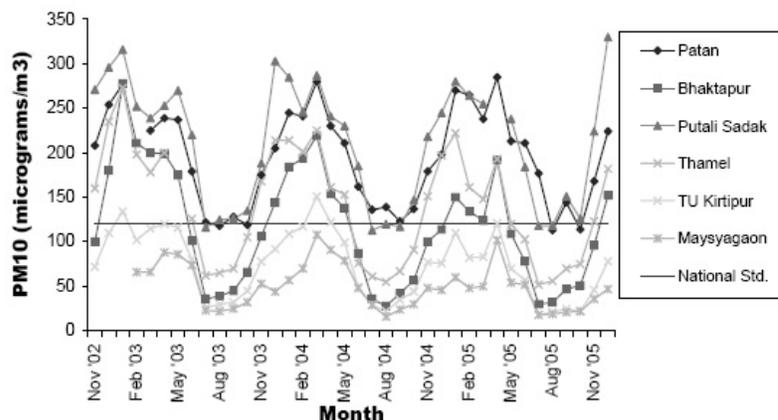
3.19 **Financing and technology options.** Drinking water and sanitation projects have been prioritized by the Government of Nepal. One such ambitious project to supply drinking water to the Kathmandu Valley is the Melamchi inter-river basin transfer, being undertaken by the government. In urban as well as rural areas, drinking water supply and sanitation projects are being subsidized by the Fund Board, as well as through a Sanitation Revolving Loan Fund. Nepal Water for Health (NEWAH) programs provide varying amounts of subsidies for different drinking water and sanitation systems, for example gravity flow schemes (80%), tubewells (85%), and school latrine projects (87%).

3.20 Innovations in technology and service delivery in urban areas are working in tandem to find new ways to access water, improve water quality, and dispose of feces. For example, ENPHO is working with NGO Forum for Urban Water and Sanitation to promote rainwater harvesting in water-stressed areas, such as Kathmandu. In sanitation technology, more than 100 Ecosan toilets – dry toilets that conserve water, and separate out feces to be used as organic fertilizer – have been adopted in the peri-urban areas of Kathmandu. For household water treatment in urban areas, filters, chlorine disinfection solutions (such as Piyush), and solar disinfection technologies are being promoted.

Urban Air Pollution

3.21 Air pollution is emerging as a major problem in Nepal’s urban centers, particularly in the Kathmandu Valley and large cities. The Kathmandu Valley’s bowl-shaped topography, which restricts air movement and traps pollutants, and its climate, make it especially vulnerable to air pollution. This problem is further compounded by the rapid and haphazard growth leading to dense settlements, the mushrooming of polluting industries, a poor road network, and a largely unmanaged transportation system. Various studies and the data coming from Kathmandu’s six monitoring stations show that Kathmandu’s air pollution, particularly the concentration of particulate matter (PM), is already several times higher than national (figure 3.3) and international standards. Similarly, the few sporadic studies done in other urban areas of Nepal indicate that air pollution is also a problem in other cities, such as Birgunj and Biratnagar. Studies have also indicated that the high pollution level, particularly in the dry season, is having serious adverse impacts on the health of the citizens and the economy as a whole.

Figure 3.3 Concentration of Particulate Matter



3.22 The main sources of air pollution in urban areas are vehicles, industries, resuspended road dust, and burning waste. An air pollution inventory done in the Kathmandu Valley indicates that the main sources of air pollution in the valley are vehicle emissions, road dust, and emission from brick kilns. In 2005, vehicle emissions were responsible for 37% of the total PM₁₀,⁵ the main source of air pollution in the valley. Resuspended dust, which is also caused by vehicles, accounted for 25% of the PM₁₀, and brick kilns were responsible for 11% of total PM₁₀ emissions. Himal Cement was the main industry causing air pollution in Kathmandu, but it has now been closed. Air pollution from vehicles is generally due to poor fuel quality, poorly maintained vehicles, inadequate transport-related infrastructure, and lack of proper land use and transport planning. A combination of all of these factors is causing the air quality to deteriorate in Nepal's cities.

3.23 **Health impacts.** High levels of exposure to air pollutants produce symptoms of both upper and lower respiratory tract irritation and can result in severe respiratory diseases, such as asthma and chronic bronchitis. Air pollutants may also affect other systems in the body, such as the cardiovascular system and the central nervous system. In Nepal's urban areas, especially in the Kathmandu Valley, outdoor air pollution typically consists of a complex mixture of multiple pollutants including suspended particulate matter (dust, fumes, mist, smoke) and gaseous pollutants (sulfur compounds, carbon monoxide, nitrogen compounds, organic compounds such as hydrocarbons, volatile organic compounds, and polycyclic aromatic hydrocarbons).

3.24 No long-term epidemiological studies have been conducted to assess the health impacts of Kathmandu's air pollution, but a few studies have undertaken a one-time medical examination of an exposed population or have used dose-response relationships to indicate that the health impacts of Kathmandu's air pollution can be quite severe. Records from major hospitals in the Kathmandu Valley also indicate that the number of chronic obstructive pulmonary disease (COPD) inpatients in the Kathmandu Valley hospitals has increased significantly.

3.25 **Economic damage.** Increasing air pollution in Nepal's urban areas, especially in the Kathmandu Valley, is imposing a negative economic impact from premature deaths, illness, medical costs, and lost productivity. Costs of health impacts from particulate matter, including premature mortality, hospital admissions, restricted activity days, and emergency visits, have been assessed. In the absence of proper data on treatment costs, informed estimates have been provided by medical experts in Kathmandu.

3.26 Urban air pollution in Nepal is estimated to have caused nearly 7,000 premature deaths in 2005, and about 2,106 new cases of chronic bronchitis. Annual hospitalizations due to urban air pollution are estimated at 4,764, while emergency room visits are at around 93,400. Assessing these health impacts conservatively by using GDP per capita (US\$272), this translates into an annual cost of about US\$19 million.

3.27 In addition, the costs of illness may be calculated based on estimates of treatment for chronic bronchitis and other morbidity, obtained from medical experts in Kathmandu and based on average treatment costs at private hospitals (to get real costs, as opposed to

⁵ PM₁₀ is particulate matter of less than 10 microns diameter.

subsidized costs at public hospitals). The cost of illness burden related to hospitalization and outpatient visits from exposure to particulate matter is estimated to be about US\$2 million. Altogether, the total economic costs of urban air pollution in Nepal are estimated at about **US\$21 million**, or **0.29%** of Nepal's GDP (table 3.5).

3.28 The Nepal Government has had some success in initiating programs to address the urban air quality problem in Kathmandu, notably the ban on the import of new three-wheelers and two-stroke two-wheelers, new tailpipe emission standards and inspections, and the import of unleaded fuel. With the support of international agencies and national NGOs, Kathmandu now has a good air quality monitoring system. More recently, with the closure of the Himal Cement factory, and the ban on polluting Bull's trench brick kilns, the air pollution level around Kathmandu has begun to stabilize over the last three years. However, the rapid growth in traffic congestion and very high levels of PM₁₀ in the valley's air clearly indicate the need for more action.

Table 3.5 Estimated Health Costs Due to Urban Air Pollution in Nepal

Type of cost	Est. cost (US\$)
Costs of premature mortality from particulate matter (PM _{2.5})	15,186,923
Costs of morbidity endpoints ^a from particulate matter (PM ₁₀)	3,903,578
Costs of illness (medical costs + lost productivity costs)	2,012,000
Total costs attributed to urban air pollution	21,074,932
Total costs as % of GDP	0.29%

a. Includes chronic bronchitis, hospital admissions, emergency room visits, restricted activity days, lower respiratory illness in children, and respiratory symptoms.

Indoor Air Pollution

3.29 A large majority of Nepali households use biomass for cooking, especially firewood and agricultural residues. The smoke created from burning these fuels causes increased respiratory infections and subsequent deaths, especially among young children and women. However, most of the use of biomass for cooking is concentrated within rural areas, with increased usage of cleaner fuels, such as liquefied petroleum gas (LPG), being found in urban areas, including the Kathmandu Valley. This makes indoor air pollution primarily a rural issue; however, the growing numbers of urban poor – especially those living in city slums – remain exposed to smoke from traditional stoves, poor ventilation, and congested settlements.

3.30 **Health impacts.** Information on indoor air quality through exposure monitoring in Nepal is limited, and the few studies have focused mostly on rural areas. Acute lower respiratory infection (LRI), chronic obstructive pulmonary disease (COPD), and tuberculosis are the three most common diseases associated with indoor air pollution in Nepal. These mainly occur due to prolonged exposure to smoke and dust (ADB/ICIMOD 2006). In Nepali cities and towns, about 35.4% of the population still uses biomass fuels for cooking, resulting in exposure to smoke and consequent respiratory infections (Central Bureau of Statistics 2004). Another major source of indoor air pollution is tobacco smoking, which further compounds the health impacts of biomass use.

3.31 **Economic damage.** Results from the valuation analysis reveal that in 2005 indoor air pollution led to about 336 child deaths in urban areas of Nepal. In terms of morbidity in young children (LRI) and the impact on women (LRI and COPD), a total of 2,990 DALYs are lost to indoor air pollution every year. With a value per DALY assigned to be equivalent to GDP per capita of US\$272, this translates into an annual cost of about US\$81 million. The total cost of indoor air pollution is therefore calculated to be **US\$17.9 million**, equivalent to **0.24%** of Nepal's GDP (table 3.6).

3.32 Numerous rural energy programs have been launched and are currently ongoing in Nepal; their goal is to provide the rural areas with a broad range of technology options and service delivery approaches. These broadly include rural energy access programs, programs on improved cookstoves and biogas, and renewable energy projects. Recognizing the rural focus of these energy programs, it is also important for the government to consider energy options for the growing numbers of the urban poor in Nepal, with appropriate subsidies and access to cleaner fuels and improved cookstoves.

Table 3.6 Estimated Urban Health Costs Due to Indoor Air Pollution in Nepal

Type of cost	Est. cost (US\$)
Costs of LRI deaths from indoor air pollution (children < 5 and women)	8,516,718
Costs of COPD deaths from indoor air pollution (women > 15)	1,954,894
Costs of LRI/COPD cases from indoor air pollution (children < 5 and women)	1,707,075
Costs of illness (medical costs + lost productivity costs)	5,671,067
Total costs due to indoor air pollution	17,849,754
Total costs as % of GDP	0.24%

Next steps

3.33 Children and the poor living in cities and towns in Nepal continue to fall sick and die from largely preventable diseases attributed to inadequate coverage and quality of water and sanitation facilities, and indoor and urban air pollution. While urban environmental health costs represent a smaller burden on Nepal's economy (than the rural equivalent), these costs are expected to grow if current trends in urbanization and service delivery continue. While the government is making good progress on interventions addressing these environmental health risks, much more attention and resources for water supply coverage, drinking water quality, proper waste disposal, and improving air quality are needed to meet Nepal's MDGs. Within the urban space, this is especially important for children under five years of age, women, the elderly, and slum dwellers. In addition, capacities and budgets of municipalities need to be enhanced and strengthened in order for them to effectively address these environmental health concerns in the long run.

Solid Waste Management

Legacy of Centrally Driven Solid Waste Management Promotion

3.34 In 1980, a major project was launched with bilateral assistance to reorganize and manage solid waste in the Kathmandu Valley. Although the project was successfully implemented and had several strengths, including efforts to promote recycling and public

awareness, it relied on a centralized waste management system. The project created the Solid Waste Management and Resource Mobilization Center to manage the solid waste problem and did not work directly with the municipalities, although solid waste management was a statutory responsibility of the municipalities. While there were advantages of economies of scale in a centralized system, there were a few drawbacks. These included (a) a lack of municipality capacity building for solid waste management; (b) the absence of a formalized institutional structure for continuing a centrally managed solid waste management system; and (c) an overdependency on international expertise, machinery, and finance.

3.35 Since the project ended, the role of municipalities in solid waste management has increased and in 1999, with the introduction of the Local Self-Governance Act, municipalities in the Kathmandu Valley took over all solid waste management responsibilities from the Solid Waste Management and Resource Mobilization Center. The role of the Center, which still lacks clarity, was limited to developing new landfill sites and coordinating matters between municipalities or between municipalities and local communities living around landfill sites.

3.36 Most recently, the Japanese Government has championed the Clean Kathmandu Valley study, whose objectives are to formulate action plans for recycling and waste collection in the respective municipalities and to pursue technology transfer for solid waste management in the Kathmandu Valley. In order to benefit from economies of scale, the study has proposed a facility development plan within an umbrella concept for solid waste management. The Kathmandu Valley would share resources for the development of solid waste treatment and for disposal facilities and establish an institutional arrangement with the Solid Waste Management and Resource Mobilization Center and the municipalities to coordinate its operation. The Clean Kathmandu Valley study project, like its predecessor, has proven to be very successful, but there are some weaknesses that will require municipality attention in the future, particularly with regards to sustainable financing of solid waste management service provision.

Waste Processing: Need for Greater Collection Efficiency and Recycling Alternatives

3.37 The Clean Kathmandu Valley study focused primarily on technology transfer and development of landfills; relatively little attention was paid to the issue of waste processing and recycling. At present, less than half of the solid waste generated gets collected and almost all of the collected waste is dumped haphazardly. According to a survey done by the Solid Waste Management and Resource Mobilization Center, 21 municipalities dump their waste on riverbanks, 19 municipalities dump waste in open piles, and 10 municipalities have some sort of dumping site. The country has only three engineered landfill sites, one for Kathmandu, one for Pokhara, and one for Tribhuvannagar. Notwithstanding the prevailing poor practices, it is widely recognized that the potential for using solid waste as a resource and for improving waste management systems in the country is high.

3.38 Although most of Kathmandu's waste can be recycled, and the government's policy is to maximize recycling, very little of Kathmandu's waste is actually being recycled. Since recycling is economically driven, the recycling rate is particularly low for

those materials whose market value is low. This includes organic waste, some types of plastics, and broken glass. Organic waste recycling is a major concern because few private entrepreneurs are interested in this waste stream as it is difficult to handle and the market value for the finished product is very low. Furthermore, because organic waste is by far the largest component of the waste stream, and it tends to cause problems such as smell and the generation of leachate and methane in landfills, initiatives for expanding organic waste recycling are urgently required. However, because almost two thirds of the waste that is generated in Nepal is organic, composting of this waste could significantly reduce the cost and environmental impacts of waste management. There is a great potential for using this organic waste as a resource, as most of this waste is recyclable by using simple technologies. In many places municipalities are now promoting household composting, community composting, and recycling, to a certain extent. For example, Kathmandu and Lalitpur municipalities are providing compost bins at subsidized rates and providing regular training to community groups, while Kirtipur has initiated a program to collect recyclable plastics from households. These innovative programs are important in reducing the amount of municipal solid waste requiring disposal and need to be further promoted and expanded. The national government, particularly through the Solid Waste Management and Resource Mobilization Center and the Ministry of Local Development, should assist the municipalities in this process.

3.39 Organic waste is also the main component in the waste stream that contributes most significantly towards the pollution potential of the leachate. Stabilization of organic waste through composting will result in a more stable and less polluting residue for final disposal. Studies have shown that composting of the organic fraction of the waste results in a 90% decrease in the pollution potential of leachate in the resulting residue. This would enable landfill sites for residue disposal to be constructed with a lower level of containment than that required for sites where mixed municipal solid waste is landfilled. Since the construction of disposal sites for the residue would result in significant cost savings without compromising environmental quality, municipalities should be encouraged to engage in composting not only as a resource recovery measure but also to reduce capital costs of disposal site construction. Although odor problems are traditionally associated with municipal solid waste composting plants, there are plants in India and Sri Lanka operating successfully with no odor problems, which demonstrates that compost plants can be operated in such a way that they are odor free.

Limited Financial Resources: Exploring New Mechanisms to Ensure Financial Sustainability

3.40 The Clean Kathmandu Valley project assisted in the development of the Sisdol landfill site as an engineered site for the disposal of solid waste. In the process, it has significantly raised the cost of solid waste management in Kathmandu because of the high transportation costs related to the Sisdol landfill site. Unfortunately, the project did not address how to identify and implement measures to maintain the site and to reduce the overall cost of solid waste management.

3.41 There is a critical need to find financially sustainable long-term solutions for waste management. The five municipalities in the Kathmandu Valley together spend approximately Nrs. 235.55 million (US\$3.2 million) annually on solid waste management

and Kathmandu Metropolitan City alone spends approximately 23% of its budget on solid waste management. With the growing amount of waste generated and the rising cost of salaries and fuel associated with waste collection and disposal, the costs of solid waste management are increasing. With the high cost of operation and maintenance, municipalities not only need to reduce solid waste management costs but also to explore mechanisms that would raise revenues to provide financial sustainability in the future. There may be opportunities for optimizing the use of financial resources that are being acquired at present. In 2004/05, Kathmandu Metropolitan City spent approximately US\$35.50 per ton on solid waste management, which can be considered on the high side even for some developed countries with much better and sophisticated waste management systems. This shows that municipalities such as Kathmandu Metropolitan City may have opportunities for improving their solid waste management by better or more efficient allocation of the existing resources within the different units of operation that comprise the solid waste management system.

3.42 Street sweeping and waste collection together form the largest expense for municipalities. Therefore, these activities need to be made more efficient and cost effective. Similarly, as the cost of secondary transportation has gone up significantly with the operation of the Sisdol landfill, serious efforts need to be made to reduce the amount of waste requiring landfilling. There are several options to reduce solid waste management costs through improvements in collection efficiency and more revenue generation. On the collection efficiency side, one option to reduce cost is to promote source separation and household composting. It is estimated that the cost of waste collection per household can be reduced from Nrs. 78 to Nrs. 19 by introducing source separation and household composting (Bhattarai 2003). At present, Kathmandu Metropolitan City is promoting household composting by selling compost bins and vermi compost kits at subsidized rates. While this program is an excellent first step, Kathmandu Metropolitan City should be more aggressive in expanding its program to promote household composting. This would require the continuation of its subsidy program, together with increased public awareness, marketing, and after sales service. The potential for a centralized or semicentralized composting facility within the Kathmandu Valley or at the transfer station should be explored as a means of reducing transportation costs of waste disposal at the Sisdol landfill site. Since this would result in a reduction of up to 60% of the waste requiring final disposal, there could be significant cost savings in transportation costs. While it is well known that finding adequate land for centralized or semicentralized composting facilities within the Kathmandu Valley is difficult due to population density, considering the potential for transportation cost savings, this option should be seriously looked at prior to rejection.

3.43 At present, Kathmandu Metropolitan City has not done much to facilitate the collection of inorganic recyclable waste, items such as metals, plastics, paper, and glass that are being separated from the waste stream by scavengers and itinerant waste buyers. It is estimated that this informal sector of waste pickers is contributing Nrs. 371 million annually to national income and providing employment to 6,000 people through the collection and selling of recyclable materials. A formal mechanism of source separation is needed as a means to reduce the amount of waste entering the landfill. Source-separated collection is not only an efficient way of collecting recyclable materials, but it can also prevent the contamination of these materials and thus raise their market value.

3.44 On the revenue side, at present the government is levying a scrap tax on people who collect recyclable materials. This could in fact serve as a disincentive to recycling. The tax rates are high and the government collects about Nrs. 50 million per year from this tax, which is passed on to three DDCs within the Kathmandu Valley. However, the revenue collected is not spent on solid waste management-related activities. At a minimum, the tax revenues should target the improvement of solid waste management activities in the municipalities either by expanding existing activities or by introducing new recycling and composting programs. Alternatively, the scrap tax should be repealed and substituted with tax incentives to encourage further recycling and to promote new market opportunities.

3.45 Utilization of the private sector in waste collection can also reduce municipality costs. Private sector operators are generally more efficient than the municipalities and if they are allowed to collect fees for their services, experience has shown that they can provide efficient services to the municipal residents and, at the same time, ease the administrative and financial burden to the municipality. Private sector involvement in waste collection has been tested in several Kathmandu Metropolitan City wards and has resulted in a one third reduction in the number of municipal staff required for this service. It is projected that if this model is used in 60% of the municipalities and 40% of the waste is taken to the Balaju transfer station rather than to the Teku transfer station, Kathmandu Metropolitan City could save Nrs. 83.7 million or 36.3% of the total cost of solid waste management. However, private sector participation should be formalized. The service provider should be chosen through a competitive selection process, and the service should be managed through contract documents with performance standards and penalties for noncompliance. The first step in this direction is the preparation of model contract documents for use by all municipalities.

Limited Landfill Capacity: Exploring Alternatives

3.46 Currently, wastes from Kathmandu and Lalitpur are being landfilled in Sisdol, which is 28 kilometers from Kathmandu. Because of the long hauling distance, the cost of solid waste management has increased significantly in the past few years. With the Sisdol landfill expected to be filled in less than two years, a new solution needs to be developed urgently. The government is currently conducting an EIA of the Banchare Danda landfill located about 2 kilometers west of Sisdol. This assessment has to be done quickly and then other options also need to be established, especially since the Banchare Danda landfill will be very costly to operate. Small municipalities such as Bhaktapur and Madhyapur Thimi are unlikely to be able to afford to take their waste to this landfill, at least in the short to medium term.

3.47 There are several landfill alternatives to Banchare Danda. Among these, one option would be to establish a compost plant and a landfill at Taikabu, east of Bhaktapur. This site has been identified as a good site for a landfill and having a compost plant there would bring several benefits, such as a reduction in the cost of waste management, a reduction in the capital and operations cost required for landfill, a reduction in the landfill's environmental impacts, an increase in the life of the landfill, and benefits for local communities in terms of jobs and compost availability. The investment requirements and risks can be significantly reduced by involving a private company in

developing the compost plant. Based on the experience of the private sector in waste collection in the Kathmandu Valley, the cost of operating the compost plant could be significantly lower than if operated by the public sector, resulting in an overall reduction in costs for the public. The project could also be developed as a Clean Development Mechanism project in order to mobilize additional resources.⁶ This would also address the problem of final waste disposal and would lower the cost of waste management further, addressing two of the most pressing solid waste management problems in Nepal.

3.48 However, at this point it appears that the Sisdol landfill site may reach capacity before a suitable alternative is in place. Therefore, while longer-term options are being debated and evaluated, immediate steps have to be taken to ensure that the life of the Sisdol landfill site can be extended, in the interim. An option for extending the life of the Sisdol landfill is to compost the waste as a volume reduction and waste stabilization measure so that the volume of waste requiring disposal will be less than 50% of what is disposed of at present. A second option worth considering is to redesign the final profile of the existing landfill site to be compatible with the surrounding terrain, which is hilly. This option could increase the volume of void space from the present design volume quite significantly. These options should be considered immediately, preferably in combination, so that the life of the Sisdol landfill can be extended until a longer-term solution is agreed upon and available for use.

Next Steps

3.49 Since financial sustainability is the key to successful solid waste management programs in municipalities, the Government of Nepal should immediately initiate a program to assist in exploring options for revenue enhancement. This is especially urgent as municipalities will be losing the local development fee by 2013. The heavy reliance of municipalities on the local development fee requires urgent action to ensure that there will not be a breakdown or a significant reduction in the quality of local service provision in 2013. The present costs to most municipalities in the Kathmandu Valley show that there are opportunities for improving solid waste management by better or more efficient allocation of the presently used resources. This is an essential first step to ensure that improvements in solid waste management are sustainable. Municipalities should also seriously consider user charges as an alternative, as residents in certain areas are already paying for waste collection.

3.50 Waste management costs can be reduced by source separation and home composting programs, as shown by Bhattarai's studies in 2003. A concerted effort to introduce home composting in residential areas, where space is not a constraint, will also reduce the overall costs of waste collection, transport, and disposal. The scrap tax is a serious disincentive to the increase of waste recycling in the valley. Furthermore, the funds collected by the tax are not earmarked to improve solid waste management. The Government of Nepal should explore ways of ensuring that this tax does not serve as a

⁶ The Clean Development Mechanism "is an arrangement under the Kyoto Protocol allowing industrialised countries with a greenhouse gas reduction commitment (called Annex 1 countries) to invest in projects that reduce emissions in developing countries as an alternative to more expensive emission reductions in their own countries" (Wikipedia).

disincentive to recycling. Considering the present expenditures in managing municipal solid waste in the valley, incentives to encourage recycling and to expand market opportunities for recycled products are imperative. If the scrap tax is to be continued, a mechanism for diverting at least a portion of the collected revenue for improving solid waste management should be explored. Private sector participation has clearly shown its benefits in the Kathmandu Valley. A more organized and formal structure to further encourage private sector participation is urgently needed to maximize the benefit from private sector involvement. For this, the preparation of model contract documents for use by municipalities is urgently needed. The alternatives suggested in this report for the development of future landfill sites for waste disposal should be considered by the government based on a cost-benefit analysis. Large-scale composting of the organic fraction of the waste stream should be seriously considered, as it will not only reduce the quantity of waste requiring disposal, but it will also reduce the level of containment required at the landfill site. At the same time, immediate steps should be taken to increase the life of Sisdol landfill site, such as composting the waste to reduce the volume requiring disposal and reengineering the final profile of the landfill to accentuate the surrounding terrain, as the implementation of any of the desired longer-term alternatives for waste disposal will take much longer than the projected life of the Sisdol site.

Urban Air Quality Management

Air Quality Management: Policy and Institutional Framework

3.51 One of the primary constraints in air quality management in Nepal has been the lack of clear and coordinated policy and an effective institutional framework for addressing the main drivers and impacts of poor air quality management. While the Environment Protection Act and Environment Protection Rules provide legal authority to prevent and control pollution that may cause significant adverse impacts on the environment and public health, the law is generic and does not specifically address air pollution. There are standards for vehicle emissions, but there are no ambient air quality standards that exist and are available for enforcement.

3.52 The Ministry of Environment, Science, and Technology has the environmental responsibilities under the Environment Protection Act and Rules, but there are also several sectoral agencies with roles and responsibilities for managing critical aspects of urban air quality. Currently, the main air quality management work being done by the Ministry is the operation of the six monitoring stations in the Kathmandu Valley. The Ministry has recently developed a comprehensive Air Quality Management Plan, but the challenge remains in its implementation. As noted above, the Ministry is not the only agency responsible for air quality, but it needs to take the lead in coordinating efforts among various agencies and stakeholders in formulating and implementing policies and programs that address the impacts of air quality on public health.

3.53 Furthermore, improvements in air quality are determined not only by the effectiveness of environmental policies, but also by the integration of environmental impacts and consequences in the development of sectoral policies in transportation, energy, and industry, among others. For example, the Nepal Oil Corporation is responsible for petroleum products, but it has not been able to ensure the supply of good

quality petroleum. In order to ensure the quality of petroleum, the Corporation needs to import petroleum fuels that are less polluting, such as low-sulfur diesel, and there should be a system whereby quality tests are done by a third party. In addition, action should be taken against vendors of adulterated petroleum. The Government of Nepal should ensure that the costs of externalities are taken into account when decisions on importation of petroleum are made. Also required are serious commitment from the government and initiatives from the Nepal Oil Corporation to promote cleaner fuels such as liquefied petroleum gas, low-sulfur diesel and ethanol-blended petrol.

3.54 Similarly, the Department of Transport Management, which falls under the Ministry of Labor and Transport Management, is responsible for registering vehicles, conducting fitness tests on vehicles, conducting emission tests on vehicles that were registered after 2000, and allocating routes for public transport. Given the large contribution of vehicle emissions to air pollution, the Department of Transport Management has an important air quality management role. However, even though it has a larger mandate to implement the National Transport Policy, the Department's role has mainly been limited to routine work such as registering vehicles and issuing driving licenses and route permits. The Department does not have an overall plan for transportation and air quality management, nor does it have the expertise or resources for planning and implementing an efficient and environmentally friendly transportation system in the valley. If the government is serious about improving air quality, the Department should be provided with the human and financial resources to effectively discharge its mandate, particularly with regard to conducting emission tests on vehicles.

3.55 Municipalities also play an important role in environmental management, including transport and air quality, but so far they have done very little in this sector. All municipalities are involved in solid waste management and some municipalities are also maintaining urban roads, but they are not actively involved in transport management. In Kathmandu, Madhyapur Thimi, and Bhaktapur trolleybus systems are operating, but are not managed well. However, municipalities can play a role in air quality management in other ways, such as banning the ad hoc disposal of waste and storage of construction materials on the streets, in order to reduce resuspended dust and facilitate traffic flow. Air quality management has cross-cutting implications that require a multidisciplinary approach and the involvement of diverse environmental and sectoral agencies at the central and local levels. The multitude of stakeholders results in the need for an effective coordination mechanism and the government's serious commitment to want to improve the air quality situation in the Kathmandu Valley.

Air Quality Management Action Plan: Need for Implementation

3.56 Over the years the government, as well as other key stakeholders, has initiated important steps towards controlling the air pollution in the Kathmandu Valley. This has led to some positive improvements. The most notable air pollution control measure was the ban of the Bull's trench kilns and the promotion of the less polluting vertical shaft brick kilns and fixed chimney kilns. In addition, the government has banned three-wheeler diesel vehicles and adopted vehicle emission standards and ambient air quality standards. Government actions have a good track record of yielding substantive results, but more needs to be done. Since the government has demonstrated the political will to

take action to implement difficult decisions to improve the air quality situation in the Kathmandu Valley, taking further steps should not be difficult. But action is needed urgently.

3.57 Recently, the Ministry of Environment, Science, and Technology prepared a draft Air Quality Management Plan. The plan is comprehensive and strives to meet the national ambient air quality standards within five years. It has not, however, been endorsed by the government nor has it been implemented into concrete actions. The plan proposes a long list of activities relating to different sectors, such as vehicle emission control, industrial pollution control, solid waste management, land use planning, and institutional strengthening. This draft action plan is a good start, but the challenge is to prioritize actions and begin implementation of the plan. It should be noted that Kathmandu has had at least two prior air quality management action plans in the past, which were not implemented. Reasons for this may have included lack of political will, inadequate financial resources, and no effective institutional arrangements for addressing air quality management. The question is how to overcome a similar fate of inaction with the latest Ministry plan. Urgent action should be taken by the government in this regard.

3.58 To achieve this, the activities in the plan need to be prioritized based on the level of difficulty in their implementation and their expected impacts. Also, the Ministry should identify the resources required for each activity within and outside government, and the level of public awareness needed to create the political will for action. High-impact activities that can be implemented easily and with limited resources should immediately become implementation priorities. Some of these activities could include the removal of road and sidewalk encroachments, the promotion of electric vehicles, and the promotion of cleaner production in industries.

Institutional Capacity: Need for Increased Awareness and Support for Public Involvement

3.59 One of the main challenges in air quality management is the lack of a proper institutional framework and generally weak institutional capacity. Currently, the Ministry of Environment, Science, and Technology is the main agency responsible for air quality management, but the Ministry's effectiveness is limited due to the lack of adequate human, technical, and financial resources. Although there have been some efforts to increase the awareness of air quality issues within the Ministry, this process has been moving slowly, particularly with regards to implementation of control measures. Other institutions, such as the Department of Transport Management, industries, and municipalities, also play a key role in improving air quality, but their awareness of and response to this problem have been minimal. The private sector also contributes to the air quality debate through vehicle importation, transportation and auto repair services, and the supply of petroleum products, which can all have an adverse impact on air quality.

3.60 The greatest motivator, and perhaps most effective player, in improving air quality has been the public. Continuous pressure from local communities and NGOs convinced the government to take action against the brick manufacturing industry, which was at one time contributing 31% of suspended particulate matter and 27% of PM₁₀ pollution in the Kathmandu Valley (box 3.1). In addition, the media, through

organizations such as the Nepal Forum of Environmental Journalists, also galvanized public awareness and applied political pressure for air quality improvements. Recently, over sixty individuals from various organizations have formed the Clean Air Network Nepal, which will act as a citizens' forum to promote and organize public campaigns for cleaner air.

Box 3.1 Air Quality Improvements in Kathmandu's Brick Industry

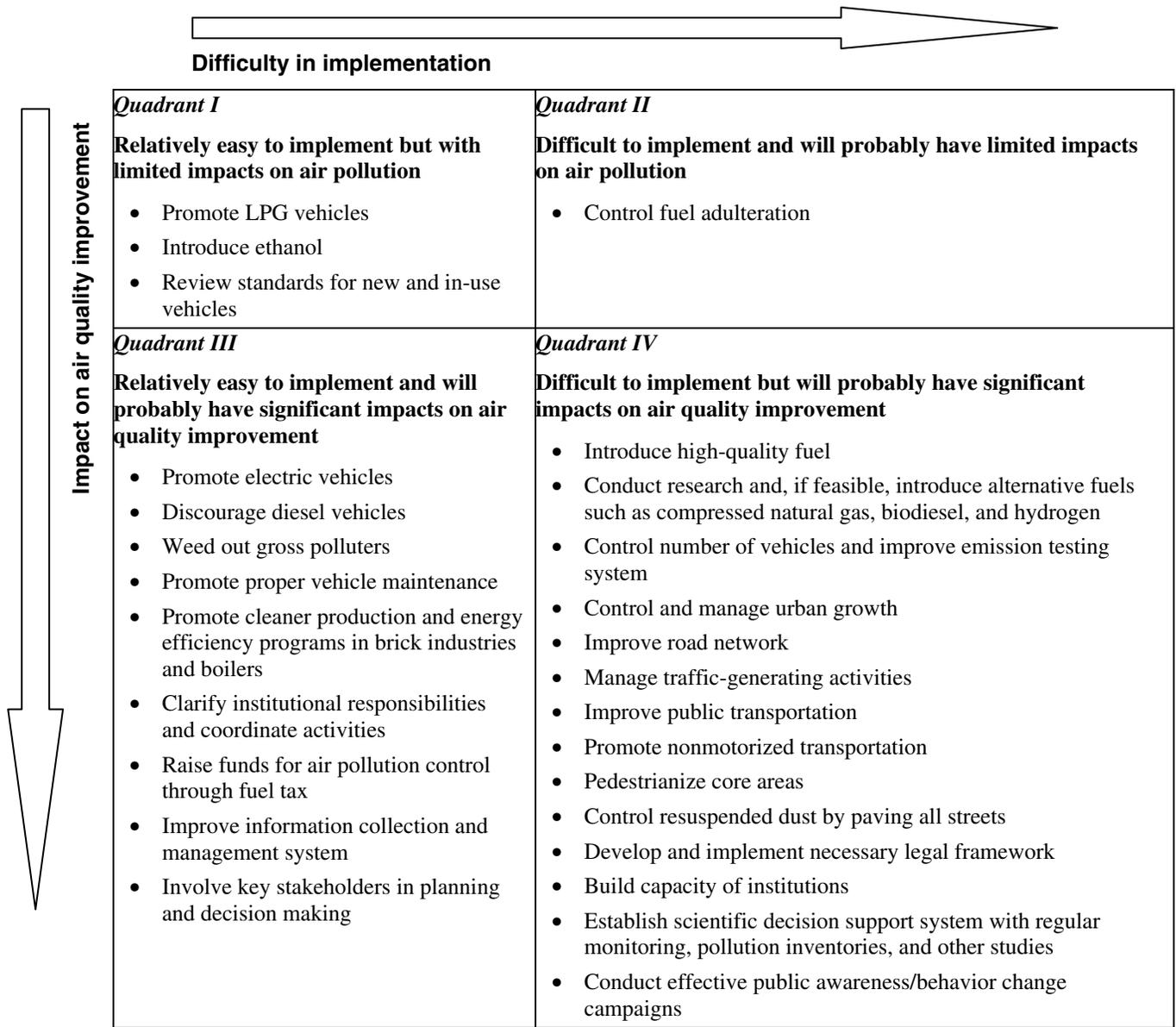
Brick manufacturing is a major industry and also one of the main sources of air pollution in the Kathmandu Valley. Currently about 115 brick kilns in the valley produce about 520 million bricks and consume about 100,000 tons of coal per year. According to an emission inventory from 1993, brick kilns were responsible for 27% of PM₁₀ and 31% of suspended particulate matter in the Kathmandu Valley. Since 2004, however, the brick industry has gone through a major transformation as the whole industry switched over from the polluting moving chimney Bull's trench kilns to the cleaner fixed chimney and vertical shaft kilns. The transformation of Kathmandu's brick industry and its positive impact on the valley's air quality can be a useful case study from which lessons can be drawn for air quality management in other sectors.

The first step to improving the brick industry came with the protests of local people suffering from the pollution from brick kilns. In the late 1990s, several local groups in areas such as Jhaukhel in Bhaktapur and Tikathali in Lalitpur started raising the issue of pollution from the brick kilns with local government authorities as well as with the industrialists through letters, meetings, and protests. Later, they were supported by local NGOs, who carried out scientific studies to justify their claims. The studies found that the pollution level in areas with brick kilns were about three times higher than in control areas. The children studying in a school near brick kilns in Tikathali suffered more from respiratory problems than similar children from a control area. The results of the environmental and public health studies and the persistent and passionate agitation by the local communities were highlighted by the local media.

Continuous pressure from local communities and NGOs finally forced the government to take action against brick kilns. Initially, several illegal kilns were shut down and later the government took the bold decision to completely ban Bull's trench kilns. Although the implementation of the decision was delayed by a year, the government went ahead and implemented the decision despite pressures from industrialists. At the same time, DANIDA and the Swiss Agency for Development and Cooperation (SDC) supported the decision by demonstrating cleaner technologies for brick production. Ultimately the industrialists agreed to shift to a new technology. By 2005, all the polluting moving chimney brick kilns in the Kathmandu Valley had been replaced by cleaner kilns.

Source: ENPHO 2007.

Figure 3.4 Activity Matrix for Air Quality Improvement



Next Steps

3.61 The deteriorating urban air pollution situation in Kathmandu warrants immediate action by the government. With multiple stakeholders responsible for different aspects that could contribute towards a deteriorating airshed, an effective institutional mechanism to coordinate action required for improving the situation is the most urgent need. Although the Ministry of Environment, Science, and Technology has made an excellent start by developing a comprehensive Air Quality Management Plan, its ability to improve the air quality situation in the Kathmandu Valley will depend on the government’s endorsement of the plan and the level of political commitment to implement it. The experience in the brick industry is evidence that with political will, significant advances can be made. Therefore, a first step would be for the Ministry to prioritize the actions

recommended in the plan, based on their difficulty in implementation and their expected impacts. The activity matrix in figure 3.4 is a good starting point. Thereafter, government endorsement of the plan with an agreed time frame for implementation is essential. However, government endorsement needs to be backed with the allocation of adequate resources to commence implementation. High-impact activities that can be implemented fairly easily with limited resources should immediately become a priority for implementation. With the focused attention on improving public awareness, the public can be expected to play a role in providing the policy makers with a political base for making decisions that will have long-term benefits, with the possibility of short-term costs. This should be coupled with a program to increase institutional capacity in the Ministry of Environment, Science, and Technology and in other sector agencies and local governments.

Industrial Pollution Management

3.62 Although the industrial sector only contributes 10% of Nepal's GDP, the pace of industrial development in urban areas is increasing as the country moves to expand beyond its heavy reliance on the agricultural sector. Industrial investment is also expected to rebound, contingent upon whether the current political situation remains stable. The Industrial Development Perspective Plan of Nepal targets an increase in the contribution of the industrial sector to the GDP from the present 10% to 20% by 2020.

3.63 Currently, there are over 3,300 registered large-, medium-, and small-scale industries (table 3.7). Large- and medium-scale industries are registered with the Department of Industries, while approximately 2,100 small and 80,000 cottage industries are registered with the Department of Cottage and Small Industries. Of the medium and small industrial sector, over 50% are manufacturing industries such as carpets, garments, leather tanning, and handicrafts. The registered industries employ an estimated 338,665 people, of which almost 64% are in the manufacturing sector.

Table 3.7 Number of Industries by Sector (up to First Nine Months of 2005/06)

Category	Example	Number of industries			
		Large	Medium	Small	Total
Agro based	Tea, grain mill	0	0	0	0
Construction	Housing	0	0	0	0
Energy based	Solar, hydropower	20	10	0	30
Manufacturing	Garment, carpets, jute, leather, paper	124	380	1,249	1,753
Mineral	Quarry	1	1	2	3
Service	Information technology, entertainment	63	259	501	823
Tourism	Travel agencies, hotels, restaurants	54	124	331	509
Total		276	848	2,178	3,302

Source: ENPHO 2007.

3.64 Most industries are clustered in industrial or urban areas close to energy, water, and transport infrastructure or highways. Of the total number of industries registered in

the country, 1,579 (48%) are registered in the Kathmandu district and 1,959 (59%) are registered within the three districts in the Kathmandu Valley. Being close to basic amenities and infrastructure provides industries with greater access to markets and savings in transportation costs. However, it also results in increased water and air pollution from the dumping of industrial waste into adjacent water bodies and the release of toxic emissions into the air.

3.65 Although the number of industries in Nepal is relatively small, industrial pollution is of growing concern because industries have adopted virtually no pollution control measures and the effective monitoring and enforcement of industrial pollution is weak. An inventory of industrial pollution in 1997 found that the total volume of wastewater generated by industries was estimated to be around 8.5 million liters, with an annual loading of 5,741 tons of biological oxygen demand and 9,597 tons of total suspended solids from over 2,000 water-polluting industries (Devkota 1997). It is estimated that the Bagmati and Bishnumati rivers in the Kathmandu Valley were receiving industrial wastewater from 1,224 industries, which accounted for 70% of the total volume of industrial effluent in the country. However, a more recent study of the pollution load from selected industries indicates that the impact of industrial pollution on the environment is much higher than earlier estimates (table 3.8).

Table 3.8 Pollution Load of Selected Industrial Sectors

Sector	Production	Wastewater m ³ /yr	BOD tons/yr ^a	COD tons/yr ^b	Solid waste tons/yr
Soap and chemical	Soap	12,543	42.4	320.6	—
Wool processing	Dying	318,000	146.3	524.7	125
	Washing	750,000	6,000	600	n.a.
Fermentation	Distillery	181,410	181	272	—
	Brewery	292,620	42,096	23,702	—
Leather tanning	Chrome tanning	1,368,000	410.4	6,024	11,832

a. BOD = biological oxygen demand.

b. COD = chemical oxygen demand.

— Not available.

n.a. Not applicable.

Source: Unpublished baseline studies conducted by Environment Sector Program Support and Ministry of Industry, Commerce, and Supplies.

Industry Regulation and Enforcement: Mixed Results

3.66 Pursuant to the Environment Protection Act and Rules (1997) and the Industrial Enterprises Act (1992), the Ministry of Environment, Science, and Technology and the Ministry of Industry, Commerce, and Supplies are entrusted to regulate the discharge of industrial effluent to the surface waters or land. Industries have been classified into two categories – highly polluting industries, which are prohibited within the Kathmandu Valley and within 10 kilometers of other urban centers (Category A) and industries that are prohibited within 5 kilometers of towns and densely populated areas (Category B).

Several pollution control standards have been promulgated, including generic effluent discharge standards, nine sector-specific standards to control water pollution, and a recently drafted brick kiln emissions standard. In addition, any industry whose pollution level is deemed to be less than the prescribed national standards shall receive a pollution control certificate (PCC) valid for three years. In 2002, after the publication of five industry-specific effluent discharge standards, the Department of Industries made an attempt to monitor industrial pollution and issue PCCs. However, this practice was stopped because the process for issuing these certificates was not clearly defined and differences in interpretation arose between the Department of Industries and the Ministry of Environment, Science, and Technology. While this problem could have been resolved by clarifying the regulations this has not been done to date, and subsequently no PCCs have been issued to industries. In any event, it is unclear how effective certification or licensing programs would be without strong monitoring and compliance programs, as well as incentives and awareness programs.

3.67 One of the main weaknesses in industrial pollution control has been the lack of an effective system for monitoring and compliance. Consequently, although the number of industries is small and most industries are not very polluting, little monitoring and enforcement takes place, particularly in the small and medium enterprise sector. It is estimated that compliance of industries with environmental standards is extremely low at around 5–10%, and that too was only in industries that received DANIDA-funded Environment Sector Program Support (ESPS). In the absence of effective monitoring and enforcement programs, there is neither accountability nor incentives for industrial compliance.

Zoning of Industries: Creating Unintended Consequences

3.68 The government has established nine industrial districts in various parts of the country and formulated rules regulating the type of industries that can be established in the Kathmandu Valley and other municipalities. The attempt to concentrate industries has its benefits; it allows the realization of external economies of scale, for example through provision of common treatment facilities; it enables separation of industries from residential areas; and it creates conditions for easier monitoring of facility compliance. However, there are problems that arise from the establishment of industrial districts. Due to infrastructure constraints, most industrial districts are established within urban areas. More people are therefore exposed to pollution generated from these districts. In addition, many investors prefer not to establish industries within industrial districts because the land must be rented and cannot be purchased, so it cannot be used as collateral for financing. As a result, many plots within industrial districts are lying vacant while industries are being randomly located in residential areas or along highways. The government has also not been very effective in motivating industries to stay away from environmentally sensitive areas, in part due to lack of planning and in part due to lack of supporting infrastructure in designated industrial districts.

Lack of Knowledge and Compliance Incentives

3.69 One of the main barriers to compliance is the lack of human and financial resources. Other barriers are deficient knowledge management and lack of credible

compliance deterrents and incentives. From the knowledge management perspective, most small and medium enterprises lack information on environmental management practices and cleaner processes, including cleaner technologies. In many cases, small and medium enterprises are not even aware of the environmental impacts associated with their activities. In addition, they are usually low-investment operations and face financial barriers related to access to capital for investments in cleaner technologies. The result is that small and medium enterprises can be more polluting to the surrounding environment and utilize energy and raw materials more inefficiently than large industries.

3.70 In recent years, some externally funded projects have promoted pollution prevention and control in industries. The Technology and Environmental Division of the Ministry of Industry, Commerce, and Supplies has been involved in organizing programs on environmental awareness, pollution prevention, and energy efficiency through the ESPS. In addition, donor organizations, such as the United Nations Industrial Development Organization (UNIDO) and DANIDA, have supported pilot projects to promote cleaner technologies that have had limited success (box 3.2). Although some industries have demonstrated the positive impacts of cleaner production, overall there is still a serious lack of access to information on pollution prevention and cleaner technologies, particularly in the case of small and medium enterprises. Industries are therefore yet to see the long-term benefits for them from better environmental management. In India, the Ministry of Environment and Forests, in collaboration with industrial associations, has adopted programs to provide targeted technical information to small and medium enterprises on different environmental technologies and alternative approaches to pollution prevention, which could be replicated in Nepal. However, in the absence of effective enforcement, it is unlikely that the access to environmental management knowledge will be enough to see any significant improvement in the situation.

Box 3.2 Past Experiences in Industrial Pollution Prevention in Nepal

Nepal has received assistance on industrial pollution control from several donors. From 1996 to 1998 UNIDO assisted in establishing a central effluent treatment plant and a chrome recovery unit for three tanneries in Birgunj, and a separate effluent treatment plant and chrome recovery unit for a large tannery processing over 500 hides per day. The objective was to set up a reliable model for pollution control in tanneries. The industries contributed the cost of civil work, while the cost of machinery and software was borne by the project. A self-monitoring and reporting system for the participating tanneries and a central testing laboratory for waste analysis was also established in the regional office of the Nepal Bureau of Standards and Metrology in Birgunj. However, after a while the tanneries stopped using both effluent treatment plants, including the chrome recovery units. The reason cited was loss of competitiveness in the market in comparison to other tanneries that operated with no treatment facilities.

The DANIDA-supported ESPS constructed a central effluent treatment plant for the 45 operating industries of the Hetauda industrial district, the largest industrial estate in the country. A treatment plant with a series of stabilization ponds was constructed by the project. Polluting industries, such as leather tanning, soap, ghee, and bone processing, were then requested to set up pretreatment units to bring their pollution load within prescribed Nepal standards for discharge into the public sewer system. In order to motivate the industries, the project also provided access to soft loans and technical assistance. However, in spite of the support from the project, the industrialists have not set up the pretreatment facilities and the effluent treatment

plant is not functioning as designed. A legal case filed by the local communities against the pollution is pending.

Some success has been observed in industrial energy efficiency projects. In 1994, the World Bank supported a Government of Nepal project that focused on energy audits and energy-saving options in industrial boilers, industrial equipment, and hotel lighting. This project was carried forward as a component of the ESPS in 2000 and has achieved good results through sustained use of low-cost, energy-saving options.

Source: ENPHO 2007.

3.71 In addition, self-monitoring and reporting systems also need to be more strongly promoted and institutionalized. In the absence of a strong government-led monitoring system, institutionalization of industry-led self-monitoring systems, particularly among the highly polluting industries, can play an important role. Although self-monitoring exists in Nepal, one of the main reservations of the industry sector, as in many countries, is the fear that the data submitted could be used against them. To overcome this concern, other countries have adopted both regulatory and financial incentives to encourage greater voluntary compliance (box 3.3). The Ministry of Industry, Commerce, and Supplies should consider introducing similar incentives to encourage voluntary compliance by industries.

Box 3.3 Incentives to Encourage Improved Environmental Management by Industries

In India, the Gujarat Pollution Control Board has adopted regulatory incentives to promote industries that choose to design and implement environmental management systems, such as ISO 14001. These incentives include giving priority environmental approvals within 45 days and extending water consents by one year. Industry-specific guidelines for certain sectors, for example the aluminum, cement, and paper industries, have also been developed.

The West Bengal Pollution Control Board, with support from the India-Canada Environment Facility, has created a package of incentives to assist small and medium enterprises in their conversion to cleaner technologies. A fund was created to provide a matching grant of 50% of capital costs for companies willing to meet higher standards and convert from coal to less polluting oil-fired burners. In addition, technical assistance on how to meet standards is provided.

Source: World Bank 2006a.

Institutional Responsibility for Enforcement: Unclear Mandates

3.72 In many countries, including those in the region, industrial pollution control management and enforcement of compliance with emission or effluent standards is carried out by the regulatory environmental organization, such as the central or state pollution control boards in India. However, in the case of Nepal, there is no dedicated environmental regulatory agency and industrial pollution monitoring is carried out by the ministry of the concerned industry sector, for example the Ministry of Industry, Commerce, and Supplies, with an oversight role for the Ministry of Environment, Science, and Technology. A potential conflict of interest could arise, as the Ministry of Industry, Commerce, and Supplies is mainly responsible for the promotion of industrial

development on the one hand, and the enforcement of industrial pollution standards on the other hand. Because of this conflicting mission, the Ministry may be perceived as biased when it comes to enforcing standards, such as the closure of a polluting facility. In Thailand, a similar situation existed with the Ministry of Industry, which monitored and enforced environmental standards for industry, and with the Ministry of Natural Resources and Environment, which was responsible for ensuring industrial compliance with environmental standards (box 3.4).

Box 3.4 Thailand: Conflicting Mandates and Missions for Industrial Pollution

One of the most challenging issues Thailand faces in protecting its environment is that several different agencies administer and enforce the environmental laws. This fragmented authority creates overlapping jurisdiction and responsibilities and different implementation standards. As a result, while the delegated agency, the Ministry of Natural Resources and Environment, is responsible for developing national pollution standards, policies, plans, and pollution control regulation, other ministries are often responsible for the implementation and enforcement of standards and regulations.

The most notable overlapping of authority exists between the Department of Industrial Works and the Pollution Control Department, which both have legal oversight over factories. The Department of Industrial Works, however, is the primary agency responsible for promoting business enterprises, while also enforcing the laws against such enterprises. As a regulator, the Department has almost absolute power over permitting and enforcing effluent standards. Such competing missions create conflict within the agency. The Pollution Control Department, on the other hand, is the national pollution control agency, but it only has indirect authority over industries. It issues no permits or licenses; it only sets national effluent and ambient standards. The Pollution Control Department can advise the Department of Industrial Works to take remedial or enforcement action against polluting facilities; however, it cannot directly enforce against regulated entities, except in rare circumstances when the Department of Industrial Works fails to act.

Source: USAID 2004.

3.73 One proposal to resolve this conflict of agency missions in Nepal is to create an independent environmental enforcement agency and transfer all of the environmental enforcement functions to this agency. At a minimum, greater coordination between the Ministry of Environment, Science, and Technology and the Ministry of Industry, Commerce, and Supplies is needed to ensure effective compliance and enforcement of regulations for polluting industries. This would involve regulatory reforms such as developing a scheduled plan for monitoring facilities, a system for the exchange of compliance information, and promoting joint inspections where appropriate.

Role of Local Governments and Civil Society Organizations in Compliance Monitoring

3.74 Local bodies, such as DDCs and municipalities, can play an important role in compliance monitoring and enforcement, but so far they have not been involved. Recently, with support from FINNIDA, the government has initiated a pilot project in Eastern Nepal that devolves the responsibilities for monitoring environmental compliance and recommending pollution control certificates to the two DDCs of Morang and Sunsari.

In these districts, committees with representation from municipalities, industries, and civil society have been formed for the purpose of involving multiple stakeholders in environmental monitoring and voluntary enforcement. Although it is too early to evaluate this project, it may pave the way for ensuring environmental compliance through local initiatives with communities (box 3.5). In addition, civil society has been actively engaged in raising awareness in environmental problems and imposing changes in the operation of industrial polluters. In the Kathmandu Valley, civil society played a critical role in the introduction of cleaner brick technology, and on a smaller scale, women from the Jhyaluntaar Community Forest User Group instigated the relocation of a polluting stone-crushing industry that was operating in their forest.

Box 3.5 Local Government and Public Involvement in Environmental Compliance

In 2001, FINNIDA started the Strengthening of Environmental Administration and Management at the Local Level in Nepal (SEAM-N) project for the industrial corridor between the municipalities of Biratnagar and Dharan. The area consists of one submetropolis (Biratnagar), two municipalities (Ithari and Dharan), and seven VDCs from two districts (Morang and Sunsari). The corridor has 390 industries (216 in Morang and 174 in Sunsari), of which 59 have been identified as major polluting industries. The project provided assistance to industries in introducing and implementing environmental management tools such as cleaner technology, environmental management systems, and self-monitoring and reporting systems. The project has also provided some grants to industries for implementing resource conservation measures. The approach taken by FINNIDA was to involve citizens on a local level, including schoolchildren and communities, in order for all stakeholders to have a shared role and responsibility in environmental monitoring and voluntary enforcement of the environmental legislation.

In June 2006, in response to initiatives taken by local bodies, municipalities, and chambers, and pursuant to Environment Protection Act and Rules provisions regarding the delegation of power, the Ministry of Environment, Science, and Technology delegated all of its powers to the Ministry of Local Development as a special pilot test project. The Ministry of Local Development, in turn, delegated all of this power to two DDCs in Morang and Sunsari. This has led to the formation of local committees with representatives from DDCs, VDCs, municipalities, and the private sector in Morang and Sunsari to coordinate efforts at ground level. Although this pilot is in its initial stage, it would seem that engaging local governments and the public in the environmental management and compliance of industrial corridors can become an effective way to meet compliance requirements.

Source: ENPHO 2007.

Next Steps

3.75 There are several initiatives that can be taken by the Government of Nepal to improve the industrial pollution management situation in the country. An initial step should be to clarify the roles between the Ministry of Environment, Science, and Technology and the Ministry of Industry, Commerce, and Supplies in environmental regulation and monitoring, with clear lines of accountability and coordination. Thereafter, the Government of Nepal should ensure that adequate financial and human resources are provided for both institutions to discharge their mandate. In an environment where institutional capacity in government agencies is generally weak, a top-down regulatory approach to industrial pollution management is less likely to succeed. Therefore, the

regulatory framework should also include incentives to encourage compliance. Financial and regulatory incentives for industries to participate in a regulatory program where self-monitoring and reporting, with the requisite safeguards built in to prevent abuse, should be explored. These would build on the experiences gained in the pilot programs funded by DANIDA, UNIDO, and others. Greater accountability of the industrial sector is possible if environmental compliance monitoring includes committees with civil society representation at the local level. Local bodies such as DDCs and municipalities should also play an increasingly important role in compliance monitoring as their capacity is strengthened. Underpinning the success of initiatives to improve industrial pollution management is the need for increasing awareness among stakeholders of the need for better environmental management. The cornerstone of improved industrial pollution management should be pollution prevention and cleaner production. A pilot program in a limited geographic area to explore alternative institutional mechanisms for environmental management and monitoring, financial and regulatory incentives to encourage compliance, and greater participation of civil society in environmental compliance monitoring would be a first step towards improving industrial pollution management in Nepal. Once this model is tested and refined based on the pilot experience, a program of scaling up with the aim of implementing a countrywide program should follow.

4. Policies and Institutions: Ensuring Strong Governance and Performance

4.1 Policies and institutions establish the “rules of the game” that enable a society to collectively solve a variety of problems, to allocate benefits arising from a set of actions, and to assign responsibilities for paying their costs (Ostrom 1998). Laws and policies are the formal rules that govern institutions, with laws being legally binding and policies as guiding principles. Institutions can also be influenced by informal rules of behavior, traditional approaches, and attitudinal relationships. For institutions to govern well, they must be able to manage and adapt within these formal and informal rules. In the environmental management context of Nepal there are several other factors that must be considered, including the content and implementation of environmental and sector policies, the mandates and relationships of national and local institutions, and the practical capacities and resources of institutions. This chapter will therefore examine all these factors in analyzing the governance framework and the institutional performance for effective environmental management.

Overview of Policies, Legislation, and Institutions

Policies and Legislation

4.2 The Government of Nepal has enacted several important policies and laws to govern the overall management of its natural resources and to address the growing environmental problems facing the country. The major national environmental policies include the National Conservation Strategy (1987), the Nepal Environmental Policy and Action Plan (1993), the Sustainable Development Agenda (2003), and Nepal’s Tenth Five-Year Plan (or Poverty Reduction Strategy) (2002–2007). The Tenth Plan requires the Government of Nepal to ensure the environmental sustainability of economic growth and take action to address a range of environmental challenges. The 1990 Constitution also mentions that the State shall give priority to the protection of the environment. More significantly, the Interim Constitution of Nepal, 2006, has recognized the fundamental “right to clean environment”, which will have far-reaching implications for future policy decisions and the ability of citizens to hold government accountable for its actions or inactions in protecting the environment.

4.3 The main environmental legislation, which establishes the overall environmental management framework in the country, is found in the Environment Protection Act (1997) and the Environment Protection Rules (1997). Under the Environment Protection Act and Rules, the primary tools for ensuring the protection of natural resources are the environmental impact assessment (EIA) and the initial environmental examination (IEE), which are analyzed in more detail in chapter 2 of this report. The other major focus of the Environment Protection Rules is the prevention and control of pollution; it prohibits anyone from creating pollution that would cause significant adverse environmental impacts or threats to public health and be contrary to prescribed standards.

4.4 Other sector policies and legislation, such as the Industrial Enterprises Act (1992) and the Water Resources Act (1992), have also been adopted to address concerns that are

specific to a sector but have significant environmental implications (see appendix H). Another significant law relating to environmental management and pollution control is the Local Self-Governance Act (1999). This Act gives locally elected bodies – VDCs, DDCs, and municipal governments – responsibilities for a number of local development issues, including the environment and waste and pollution management.

Institutions

4.5 There are multiple institutions in Nepal that play an important role in delivering or influencing environmental results and performance. These institutions represent both the public and private sectors and are involved at the national and local levels. They are graphically represented in appendix I.

4.6 For the purposes of this study, six principle national agencies with environmental management responsibilities were examined – the Ministry of Environment, Science, and Technology, the Ministry of Forests and Soil Conservation, the Ministry of Water Resources, the Ministry of Local Development, the Ministry of Physical Planning and Works, and the Ministry of Industry, Commerce, and Supplies. Nepal also has a two-tier system of local government. The lower level consists of VDCs and municipalities; the second tier consists of DDCs. A brief description of each institution’s roles and responsibilities is provided in box 4.1.

Box 4.1 Snapshot of the Institutions Responsible for Environmental Management

The assignment of responsibility for various aspects of environmental and natural resource management and pollution control is as follows:

- National Planning Commission has overall responsibility for formulating national development plans and policies, including monitoring and evaluation of agency plans, policies, and programs relating to the environment.
- Ministry of Environment, Science, and Technology is responsible for the formulation and implementation of policies, plans, and programs pertaining to the environment.
- Ministry of Physical Planning and Works is responsible for developing the national transportation and road network, and improving access to water supply and sanitation facilities.
- Ministry of Industry, Commerce, and Supplies is responsible for promotion and implementation of industrial and commercial policies, including those pertaining to industrial pollution and mineral exploration.
- Ministry of Forests and Soil Conservation is responsible for rangeland management (with overlapping responsibility for livestock and pasture development with the Ministry of Agriculture), mountain biodiversity management, biodiversity, soil conservation, and forest resources.
- Ministry of Water Resources is responsible for utilization and management of water resources, including large dams and hydropower projects, irrigation systems, and natural disaster management.
- Ministry of Local Development has overall responsibility for strengthening local governance and capacity of local governments, including for solid waste management.

- District development committees (DDCs) are responsible for environmental management at the district level; there are 75 DDCs.
- Village development committees (VDCs) are responsible for environmental management at the village level; there are 3,913 VDCs.
- Municipalities are responsible for environmental management at the municipality level: there are 58 municipalities.

Source: Government of Nepal data.

4.7 **Legislative.** Three Parliamentary committees exist with legislative authority for setting environmentally related policies: (a) the Natural Resources and Means Committee, for water resources and agriculture policies; (b) the Environment, Communication, and Technology Committee, for environment, science, and technology policies; and (c) the Physical Infrastructure and Development Committee, for construction, transport, and development policies. In addition, the legislature will play a key role in other important governance policies that can strengthen government accountability and transparency, such as the Right to Information Act (2005).

4.8 **Judiciary.** Although Nepal does not have “green bench” in the judiciary to deal with environmental issues, the court has played a key role in establishing environmental policies. The Supreme Court has issued several important court decisions directing executive branch agencies to adopt appropriate environmental standards and measures (appendix J). These include orders for setting standards for air, water, and noise pollution, and the government has since issued standards for ambient air quality and drinking water. At the same time, other court orders, such as halting of discharge of untreated waste and effluents into local water bodies, have not been enforced.

4.9 **Civil society.** According to data provided by the Social Welfare Council, 1,035 nongovernmental and three international nongovernmental organizations are working on environmental management and conservation efforts. The highest number of NGOs is based in Kathmandu (429), followed by Chitwan (41), and only two districts (Manang and Rukum) do not have any registered environment-related NGOs. There are also 14,337 community forest user groups that are managing community forests pursuant to the Forest Act. The community forestry program is widely acknowledged to be one of the most successful examples in Nepal of devolving environmental management to community-based user groups (see appendix A).

Environmental and Sector Policies: Gaps and Inconsistencies

4.10 Nepal has adopted a fairly comprehensive set of environmental policies and laws, which cover a broad range of environmental and sector issues. These policies and laws are generally sound, but there are some policy gaps and legislative inconsistencies that may exist and create confusion regarding roles and responsibilities for implementation. One of the areas of legislative ambiguity that may sometimes create confusion relates to the allocation of roles and responsibilities between the Ministry of Environment, Science, and Technology and other sector agencies responsible for the monitoring and enforcement of environmental conditions. Under the Environment Protection Act and

Rules, the responsibility for the environmental monitoring of EIAs and IEEs lies with the concerned ministry related to the project proposal, but with overall oversight by the Ministry of Environment, Science, and Technology. Under the Water Resources Act, the Ministry of Water Resources is authorized to enforce water pollution regulations. However, the Ministry of Water Resources believes that the Environment Protection Act and Rules have effectively transferred these pollution control responsibilities to the Ministry of Environment, Science, and Technology. As a consequence of this confusion, monitoring and enforcement of water pollution regulations have often fallen through the cracks. In some sector agencies there is a perception that as the Ministry of Environment, Science, and Technology has primary responsibility for the enforcement of the Environment Protection Act and Rules, they need not assume responsibility for ensuring compliance with EIA or IEE approvals and conditions. This is the case despite the fact that there are statutory provisions in the Environment Protection Act and Rules that would hold the issuing sector agencies accountable for the environmental enforcement of EIAs and IEEs.

4.11 Another significant legislative inconsistency revolves around the question of who should ultimately be responsible for environmental management in the context of the government's commitment to decentralized governance. This question will grow in practical importance as the new government is expected to focus greater attention on supporting local rule and autonomy. The Environment Protection Act and other sector legislation were promulgated prior to the Local Self-Governance Act and therefore do not reflect decentralized governance nor recognize the role for local governments in environmental management. For example, the Industrial Enterprises Act does not give any authority to local bodies in industrial pollution management and the role of local bodies is limited to site verification. Similarly, the Solid Waste Management and Resource Mobilization Act was enacted before the Local Self-Governance Act and does not clearly delineate the role for local governments, although local governments have assumed primary responsibility for solid waste management.

4.12 In addition to these legislative ambiguities in existing statutes, there are also policy gaps in addressing media-specific pollution problems, such as air pollution. Although Nepal has sector policies and legislation related to environment, transportation, energy, and industry that have implications for air quality, separate legislation to comprehensively manage the many diverse sources affecting air quality does not exist. Consequently, while the National Transport Policy has several provisions related to vehicle emissions, it ignores other significant aspects of vehicle emission control, such as clean fuels, inspection and maintenance systems, and transportation demand management. The Ministry of Environment, Science, and Technology has prepared a draft Air Quality Management Action Plan for the Kathmandu Valley, but it is yet to be endorsed by the government and therefore has not been implemented. While progress can be made by utilizing existing acts and regulations, given the complex and growing problem of air pollution, a comprehensive Clean Air Act will be needed in the foreseeable future.

Institutions: National

National Environmental Agency: the Role of the Ministry of Environment, Science, and Technology

4.13 As noted earlier, there are multiple agencies and institutions at the national level that have a role in environmental management. Ideally, a strong national environmental agency is needed to serve as the central authority to ensure the overall implementation and enforcement of environmental laws and policies. This agency should have the power to set the standards for environmental performance and ensure the compliance of environmental standards and laws of public and private institutions. The Ministry of Environment, Science, and Technology was created in 2005 when the environment functions of the previous Ministry of Population and Environment were transferred to the then Ministry of Science and Technology, but unfortunately it has not yet been able to fully achieve these dual functions of setting environmental standards and ensuring environmental compliance.

4.14 There are currently three organizational models under consideration for restructuring and strengthening the Ministry of Environment, Science, and Technology. A study commissioned by an environmental support project (MSG Environmental Services 2002) recommended the establishment of an environmental promotion and conservation center as an autonomous organization under the administrative purview of the Ministry of Environment, Science, and Technology. One of the strongest advantages of such an autonomous organization would be its ability to generate and retain revenues to operate and meet agency mandates, a system that has proven to be very effective in other countries in the region (box 4.2). A second option, currently favored by the Ministry of Environment, Science, and Technology, would establish an Environment Department within the Ministry. This option would be less autonomous, but the department may have more convening and policing power as a government agency. A third option, as Nepal is in the midst of developing a new Constitution, is to establish a new constitutional body for the environment. The center proposed under the first option could be likened to the Nepal Agricultural Research Center, which has been established as an autonomous body under Nepal's legislation; and the department proposed under the second option could be likened to the Department of Standards and Metrology. Depending on the legislative and policy mandates of a national environmental agency, the strengths and weakness of these various institutional models are provided in table 4.1.

Box 4.2 Examples of Environmental Revenue Generation and Retention

In India, the Water Cess Act of 1977 authorizes the state pollution control boards to charge industries and municipalities a water cess calculated on the volume of water consumed and for consent fees. The fees collected are sent to the central government, but 80% of the fees are to be returned to the state pollution control boards. Staff costs for compliance monitoring and enforcement activities are funded in large part by revenues from the water cess, although this varies from state to state depending on the financial conditions and needs of the state. In some states, like Maharashtra and Karnataka, the state pollution control boards have greater resources and consequently stronger environmental programs, due to the high revenues collected from the water cess.

In the Philippines, the Lake Laguna Development Authority instituted an environmental user fee or pollution charge system for corporations as an economic incentive to encourage compliance. The user fee applies to all enterprises within the Laguna de Bay region, including commercial and industrial establishments, agro-based enterprises, clustered developments, and domestic households. The revenue generated has provided the Lake Laguna Development Authority with the necessary resources and flexibility to pursue its environmental management, water quality monitoring, river rehabilitation, and public outreach programs.

Sources: OECD/USAID 2006; Laguna de Bay Masterplan web site <http://www.lda.gov.ph/masterplan.htm>.

Table 4.1 Strengths and Weaknesses of Various Environmental Institutional Models

Criterion	Autonomous environmental center	Government department within MoEST^a	Constitutional environmental body
Degree of autonomy	More autonomous and flexible – can focus on assigned task	Less autonomous and less flexible – may be influenced by other immediate priorities of government	Not part of government executive body so very powerful – decision has to be implemented by all government bodies but may have less direct involvement in ministry-level forums and may have less involvement and influence on different sectors on day-to-day basis
Salary incentive	Can offer competitive salary and attract high-caliber people but more opportunity for political interference	Potentially less political interference – must stick to government salary scales, which may not be a strong motivator of staff performance	Members hired through hearing, including a public hearing (so less political interference), so highly professional person likely to be hired but changes are only possible through change in the Constitution, so could be more difficult to change or adapt the body. Can make rules and regulations and can implement them but must stick to government salary scales, which may not be a strong motivator of staff performance
Staffing	Staff numbers could be adjusted more easily and may not be influenced by government staff cutting	Changes in staff numbers may take longer time to adjust (and will be governed by government commitment to reduce overall staff numbers)	
Career and job mobility	Career civil servants may not be interested in working in such centers as it could	Staff could have more career growth options and can move into different	Can hire own staff or can get government staff on deputation

Criterion	Autonomous environmental center	Government department within MoEST^a	Constitutional environmental body
	limit their career and movement across government institutions	government institutions	
Revenue potential	May be able to retain revenue generated by itself	Generated revenue must go to the Central Treasury	Cannot generate revenue
Enforcement capacity	May not have any clout in policing compliance as cannot have semijudiciary role	More clout in policing and it can have semijudiciary role by law (such as given to Department of Standards and Metrology, who can fine offenders on the spot etc.)	Strong authority, as good as Supreme Court or Commission for the Investigation of Abuse of Authority
Horizontal and vertical linkages	Less inter-sector policy influence and may not have the clout to delegate responsibilities to other institutions	Could have more inter-sector policy influence and delegate some responsibilities to other government institutions	Coordination can be poor and authority cannot be easily decentralized to local authorities – more centralized organization (e.g. to DDC)
Research and development	May have better role in research, development, and extension-related activities	May have less effective role in research, development, and extension-related activities than an independent center	May seem like development and environment are disparate
Role for civil society	Civil society representatives can be involved in the center's governance through bodies such as a council	Formally, civil society may not have a role in the governance of government department	Formally, civil society may not have a role

a. MoEST = Ministry of Environment, Science, and Technology.

Source: Winrock International Nepal 2007a.

4.15 Whether or not any of these organizational models are chosen, the Ministry of Environment, Science, and Technology's current institutional capacity is very constrained, impeding its ability to discharge its regulatory responsibilities as an environmental agency. The Ministry has been given the regulatory authority to approve EIA documents, including scoping documents, terms of reference, and EIA reports, as well as environmental monitoring and auditing reports. In addition, the Environment Protection Act and Rules legally provide for the appointment of environmental inspectors so that the Ministry can discharge its duties. Section 8(1) of the Act states: "In order to effectively carry out or cause to be carried out the acts of the mitigation, avoidance or control of pollution or the acts required to be carried out in accordance with the Initial Environmental Examination or the Environmental Impact Assessment report, the Ministry may, by fulfilling the procedures prescribed by the Public Service Commission appoint Environmental Inspectors or designate any employee to carry out functions of such Inspectors."

4.16 However, environmental inspectors have not been allocated or appointed, leaving

the Ministry with a serious resource gap in fulfilling its responsibilities, particularly with regards to enforcement of EIAs and IEEs. For example, environmental auditing is supposed to be carried out after two years of a project's commission, but no auditing has been undertaken to date. In terms of addressing control of pollution, the Ministry's role has been limited to addressing referred complaints, as the primary jurisdiction for industrial pollution management falls with the Ministry of Industry, Commerce, and Supplies. And while complaints related to EIA and pollution control issues are referred to the Ministry of Environment, Science, and Technology, it is legally unclear whether the Ministry or the sector agency has the ultimate responsibility for resolution of these complaints and the initiation of enforcement actions.

4.17 In order to address these institutional shortcomings, the capacity of the Ministry of Environment, Science, and Technology needs to be seriously strengthened. First, increased resources should be allocated to the Ministry, particularly for environmental monitoring and enforcement. Currently, the Ministry is one of the weakest ministries and possesses only a small cadre of technical staff. Second, the Ministry should develop standard operating procedures and performance guidelines for environmental compliance, including requirements for reporting and inspections. The Ministry should also assist sector agencies in formulating sector-specific technical guidelines for the review and approval of EIAs and IEEs. Finally, the Ministry should develop a strategic long-term plan that prioritizes the areas where capacity could be strengthened with increased internal resources and training, or where outsourcing of functions to the private sector or delegating to local governments could supplement capacity gaps. These priority areas should include EIA review and approvals, environmental impact and data analysis, compliance monitoring and enforcement, information management and dissemination, and public education and consultation.

Compliance and Enforcement: The Role of Environment and Sector Agencies

4.18 Despite statutory provisions that require monitoring and the enforcement of environmental standards and laws, most government agencies have not been able to completely fulfill these responsibilities for a number of reasons. One of the reasons most often cited is the lack of adequate staff resources to perform compliance monitoring and inspection. As noted above, the Ministry of Environment, Science, and Technology has been legally authorized to appoint environmental inspectors to monitor and audit EIA compliance, but these positions have never been allocated or filled. At the same time, sector agencies are legally mandated to monitor project compliance with EIA approvals, but resources for monitoring have not been provided in the overall agency budget unless the project budget specifically allocates it (usually this applies to government-implemented projects). The exception to this general rule is the Ministry of Forests and Soil Conservation and its departments, which specifically provide for monitoring programs for those projects that they implement.

4.19 Even where projects themselves undertake monitoring, such as hydroelectricity projects, monitoring reports are often not sent to the concerned agencies for review and action. In cases where a project has been implemented in a forest or protected area by another institution, there is often no attempt made to involve the concerned agency, namely the Ministry of Forests and Soil Conservation and the Department of Forest. Most

agencies do not have a formal reporting mechanism to receive, review, and address compliance or noncompliance of EIA and IEE recommendations and other pollution-related issues. When a complaint is received – whether through a local government agency, nongovernmental agency, or member of the general public – there is little, if any, documentation of the complaint and follow-up. Because there are no structured or formal reporting mechanisms for project proponents, or complaint mechanisms for the public, there is little feedback, transparency, and accountability in compliance and enforcement.

4.20 In addition to the lack of formal reporting and complaint mechanisms, agencies often do not exercise the penalty powers that are prescribed to them under the existing laws when violations are found. For example, the Industrial Enterprises Act (1992) empowers the government to issue directives to prevent and mitigate environmental pollution and even close industries for noncompliance with such directives (Industrial Enterprises Act, Sections 15(d) and (e)). There is no evidence that the Ministry of Industry, Commerce, and Supplies has utilized this provision to close a facility; whether this is because of inadequate facility monitoring or the reluctance to close a facility is uncertain. Similarly, the Water Resources Act (1992) allows for the imposition of water pollution fines and compensation for damages (Water Resources Act, Section 22(1)). However, there have not been prosecutions under this act; this may be due in part to the confusion regarding the roles of the Ministry of Water Resources and the Ministry of Environment, Science, and Technology in the enforcement of regulations regarding water pollution and in part due to the lack of documented violations and enforcement strategies.

Judiciary and Parliament: Role in Environmental Compliance

4.21 All three main branches of government are important for environmental governance in Nepal – the executive (including the Office of the Prime Minister, the ministries, and the National Planning Commission), the legislative (House of Representatives and the National Assembly), and the judiciary (including the national and local courts). While the principle focus of the institutional analysis has been targeted at the executive branch institutions, other branches of government have played an increasingly important role in ensuring environmental compliance. The Supreme Court in Nepal has delivered several court decisions that have established significant policies on environmental management and enforcement (see appendix J). In the area of air pollution, the Supreme Court has issued directives for the introduction of air quality standards, vehicle emission testing and certification, and pollution fees for petrol and diesel products sold in the Kathmandu Valley. Similarly, in the area of waste pollution, the Court directed Pokhara Sub-Metropolitan City not to dump untreated waste in the Seti River and Kathmandu Metropolitan City and Lalitpur Sub-Metropolitan City to use scientific measures to manage waste instead of dumping it on the banks of the Bagmati River. Although these court orders have created significant legal precedents for environmental policies, many of these decisions have not been adequately implemented and judicially enforced.

4.22 Unlike India, an activist environmental bench or “green bench” has not yet evolved in Nepal. In India, the courts have assumed a powerful role in judicially mandating environmental policies and actions by both public and private institutions in order to improve performance. For many, the courts are perceived as filling the vacuum

left by the executive branch agencies in ensuring environmental compliance and enforcement. A similar situation may develop in Nepal as the various ministries and departments struggle to fulfill their monitoring and enforcement responsibilities. The Interim Constitution also establishes an important fundamental right for citizens, the constitutional “right to clean environment”. If adopted, this constitutional right will increase the critical role of the courts, through public interest litigation, as a way to ensure citizen enforcement of environmental policies and laws. Consequently, ways to enhance the environmental awareness and the effectiveness of judicial orders and citizen enforcement should be explored.

4.23 Parliament has a critical role in establishing environmental policies and priorities through the enactment of legislation, but it can also play an important oversight role. As noted in this report, there are existing statutes that may require a clarification of legislative intent regarding respective roles and responsibilities for environmental management, and there are growing areas of environmental concern that may require enactment of new laws. In addition, Parliament will be adopting a permanent Constitution in which the “right to clean environment” is an important provision under consideration, with far-reaching implications. While Parliament does not currently have a reporting requirement for agencies regarding the enforcement of legislative mandates, this should seriously be considered. There are currently three Parliamentary committees with some environmental jurisdiction – the Natural Resources and Means Committee, the Environment, Communication, and Technology Committee, and the Physical Infrastructure and Development Committee. These committees could provide legislative oversight of the implementation of statutory mandates, such as compliance with the EIA and IEE requirements. In discussions with Parliamentarians, it was also pointed out that Parliament could serve a role in facilitating communication between agencies and communities in the monitoring of development projects and improving the public consultation process within local communities.

Interagency Coordination: Formal Mechanisms to Improve Performance

4.24 In addition to establishing a strong national environmental agency and having oversight by the judiciary and Parliament, there should be a formal mechanism to coordinate institutional roles and performance among agencies. The National Planning Commission is the highest-level government body for the formulation of development plans and policies, including the incorporation of environmental management issues. While the National Planning Commission provides important policy guidance and interagency coordination, its role in the environment is by necessity limited, given its broader policy responsibilities. The Environment Protection Council was formed to serve the environmental coordination function, but has not met for several years and therefore has been ineffective. As environmental management issues grow in significance and complexity, the need for interagency and intergovernmental coordination will be increasingly important. While the Ministry of Environment, Science, and Technology could take the lead in coordinating the environmental activities of various ministries, its cabinet-level status is not as strong compared to other ministries, which could undermine and limit its convening power. Meaningful coordination will require the highest level of government leadership, whether through the National Planning Commission or a

reactivated Environment Protection Council, and a demonstration of political commitment to improving environmental performance.

Institutions: Local

Devolution of Responsibilities to Local Governments: From Goal to Reality

4.25 The Local Self-Governance Act requires the devolution of responsibilities, including environmental management, to the local governments. However, the implementation of this has not been fully realized. At the national level, the responsibilities of environmental management are spread among the Ministry of Environment, Science, and Technology, the Ministry of Local Development, the Ministry of Physical Planning and Works, the Ministry of Industry, Commerce, and Supplies, and the Ministry of Labor and Transport Management and their respective departments. For the most part, these ministries have not developed an adequate plan or dedicated appropriate resources for capacity building and transfer of mandated responsibilities to the local governments. There are several reasons for the slow progress towards devolution of responsibilities.

4.26 One of the primary reasons cited for the slow progress in devolution is the local governments' lack of capacity. This can, in part, be attributed to the years of conflict, which have created political instability and a vacuum in local leadership. This, in turn, has created a situation where local bodies have had limited access and ability to build broader capacity in areas such as environmental management. For national and local governments, the progress towards devolution has been a "chicken or egg" dilemma. From a national government perspective, the lack of capacity at the local level has been a deterrent to the transfer of responsibilities to those governments. But, from the local government perspective, it is seen as an excuse to retain exclusive authority at the national level. With the new political shift in the country, it can be expected that the push for decentralization of power will accelerate. Consequently, greater efforts will be required to simultaneously build local capacity and transfer functions to local governments. An analysis of capacity needs for local governments will be discussed later in this chapter.

4.27 With regards to the orderly transfer of environmental functions to local governments, the national government will need to establish a clear protocol to set forth the preconditions for delegation and the requirements for maintaining delegation. The preconditions for delegation should include appropriate technical capacity, adequate staffing resources, and demonstrated political commitment by the local government. Once programs are delegated, the national government should also establish reporting, monitoring, and performance requirements to ensure that national laws and policies are being enforced. If national laws and policies are not being adequately enforced, then the national government should have the power to intervene and either take independent enforcement actions or withdraw authority from the noncompliant local government.

Local Autonomy and Governance: Constraints and Challenges

4.28 At the local level, the DDCs, the VDCs, and the municipalities are the main

institutions responsible for environmental management. For urban environmental management issues, the municipalities are the main governing institutions. Municipalities are guided by the Local Self-Governance Act and are led by locally elected mayor, deputy mayor, ward chairpersons, and ward members. In the past four years, the process of urban environmental management has been affected by the lack of elected representatives in the municipalities. Unlike the central government, Nepal's municipal governments have historically been more stable. Elected officials served their full term and were considered by many to be more accountable and responsive to people's needs. However, in recent years, due to the absence of elected representatives, municipalities in general have not been able to effectively manage as before or to respond as quickly to the people's concerns. With the peace process, this situation is expected to improve.

4.29 The main responsibility of the Ministry of Local Development is to coordinate with local governments and administer the distribution of local development fees and grants. The Ministry is also authorized to deputize the executive officer of each municipality, who is then designated as the secretary of the municipal board and is responsible for the overall day-to-day management of the municipality. The municipalities, including the mayors, are given no authority or input into the selection of the executive officers, even though they will head the day-to-day administration of their municipality. Since the executive officer is appointed by the Ministry of Local Development from among its staff, the executive officer is usually more responsive and accountable towards that Ministry than towards the mayor and the other elected local representatives. Also, while the municipalities are free to hire other necessary staff, human resource recruitment is guided by the national hiring rules and as a result there is limited flexibility in staff recruitment and management. In addition, since the Ministry of Local Development distributes the local development fee and grants, it exerts significant influence and control over municipalities, most of which, particularly the smaller ones, depend heavily on the Ministry for resources. These two factors often cause difficult management and administrative problems for local governments.

4.30 The Local Self-Governance Act requires local governments, in formulating a village or municipal plan, to give priority to "projects that can contribute to protect and promote the environment". However, there are no indications of how, and if, this is being practically applied in the VDCs and in the municipalities. The Local Self-Governance Act provides for the establishment of environmental committees under locally elected VDCs, DDCs, and municipalities, but it is unclear how many of the local governments have actually constituted environmental committees and how effective these committees have been in delivering environmental services or improving environmental quality at the local level. An assessment of seven VDCs in Nepal's eastern Terai was conducted by SEAM-N in 2002. It was found that five VDCs did not have such committees and only two of them planned to constitute such a committee. The study also found that VDCs were implementing very few projects to "protect or promote the environment" (Karna 2002).

4.31 In order to effectively meet their mandates under the Local Self-Governance Act, local governments need to be given and assume greater authority in fulfilling their responsibilities. This will require a greater role and flexibility in the selection of the executive officer and staff, increased funding for environmental services, and the

establishment of environmental committees to assist in the effective delivery of environmental services.

Institutions: Capacity Building

Sector Agencies: Need for Technical Expertise

4.32 There are multiple agencies at the national level with some responsibility for environmental management in their mandate, but the number of staff, technical expertise, and resources for effectively fulfilling their environmental responsibilities vary among the institutions. Generally it is estimated that less than 1–2% of technical staff within sector line ministries have environmental skills, which is a serious shortcoming, as environmental compliance is the responsibility of these sectors. On one end of the spectrum, the Ministry of Forests and Soil Conservation has a high number of technical staff trained in natural resource management and conservation, including environmental assessment. In the Ministry of Water Resources, the staff capacity for environmental assessment varies among different departments. In the Ministry of Industry, Commerce, and Supplies, staff with environmental responsibilities have received training on environmental assessments under the Industrial Environmental Management Project, but have not received training in industrial pollution management. The overall staff capacity for dealing with environmental issues in the different departments of the Ministry of Physical Planning and Works is generally weak, as in some other ministries. Efforts to build capacity are hindered by the divergence in the agencies' primary missions: in the Ministry of Forests and Soil Conservation the primary mission is to protect natural resources, whereas in the Ministry of Industry, Commerce, and Supplies the primary mission is to promote industrial development. Another reason for the different levels of technical proficiency of agency staff is variations in donor assistance in capacity building. For example, the Department of Electricity Development received support from USAID for strengthening environmental assessment. Consequently, the staff has greater technical capacity and higher awareness of environmental issues.

4.33 To compound this problem, most sector agency staff members do not have a strong incentive to build their capacities on environmental issues. Nepalese civil servants are categorized into two main service groups – technical and administrative. Technical groups are divided into different subgroups – for example engineering or medicine – which are further subdivided. There is no technical group on environment. Training on issues, such as environmental science, that are not considered to contribute to the staff member's core competency does not count towards their promotion. Reform of the civil service categories has been suggested, but it is a long-term option. In the short term, training in environmental assessment should be made mandatory for all environmentally related units in the sector agencies. The scope of this training can range from establishing an understanding of the preconditions for EIA and IEE approval to the auditing and monitoring of EIA and IEE recommendations. In addition to training, supporting capacity measures could include the development of sector-specific good practice manuals, guidance and information exchange, and skill transfers with other EIA and IEE professional networks, both within and outside government.

Local Governments: Need for Technical Expertise

4.34 At the local level, DDCs, VDCs, and municipalities are the main institutions responsible for environmental management, but they generally lack the necessary capacity and resources to fulfill their responsibilities. For the most part, the extent of municipal involvement in urban environmental management issues has been limited to solid waste management, and then only to employment of street sweepers to clean the streets and then dump the waste at convenient locations. There are, of course, exceptions to this, and some municipalities have introduced innovative solid waste management programs. However, in regards to other environmental challenges, such as air quality and industrial pollution, local governments have little, if any, knowledge and capacity to address these issues. It should also be noted that outside the Kathmandu Valley there is even less knowledge and capacity in local governments to handle environmental management challenges and provide basic services.

4.35 Strengthening the environmental management capacities of local governments should, therefore, be considered a top priority for national government and donors. A pilot project for strengthening the environmental management capacity of local governments has been supported by the Government of Canada in partnership with the Ministry of Local Development and the Ministry of Environment, Science, and Technology (box 4.3) and could be used as a model to expand capacity building in other functional and geographic areas.

Box 4.3 Case Study in Capacity Building of Local Governments

A pilot project for strengthening local environmental management capacities and actions has been implemented in a number of VDCs in four districts of Nepal. This pilot program is supported by the Canadian Government in partnership with the Ministry of Local Development, and in collaboration with the Ministry of Environment, Science, and Technology, the National Planning Commission, other relevant ministries, and selected DDCs, municipalities, and VDCs. The project helped to establish a village environmental development fund in each VDC project. This fund is locally managed by a village-level management team and the project supported the preparation of village environmental development plans and their implementation.

The stress was on helping local people learn about their own environment, prioritize local actions, and implement initiatives. Local communities, VDCs, DDCs, and other stakeholders were encouraged to partner and to contribute to these initiatives. Ultimately, the project's contribution only constituted about 23% of overall local investment, as other resources were mobilized by local communities. Over 500 local initiatives were prioritized and implemented by local communities, the majority being drinking water and sanitation projects. The project notes that "The quality of environmental assessment carried out and reviewed locally might be modest in terms of quality of report, but it is more practical, efficient in the implementation and monitoring phases."

Source: ENPHO 2007.

Environmental Information Management: Improving Knowledge and Accessibility

4.36 Another major challenge in environmental management is the lack of knowledge

of and information sharing in environmental conditions, problems, and solutions. This is particularly true in the area of EIAs. The case study analysis of the EIA process found that most projects relied on generic information and lacked site-specific information essential for identifying and predicting environmental impacts. Private sector projects had poorer site information than the projects being funded by international funding agencies, because of their reliance on secondary information sources and poor resource allocation for information collection. Only one project, the Middle Marsyangdi Hydropower Project, was able to present numerical values on air, water, and noise-related information. None of the projects had undertaken trend analysis, which is the change in baseline conditions without project implementation.

4.37 Similarly, many small and medium enterprises face significant challenges in environmental compliance, in large part because they lack the knowledge of environmental standards, pollution control measures, and cleaner production alternatives. It is estimated that compliance with environmental laws and regulations by small-scale industries is extremely low, at around 5–10% of the estimated 2,000 small and medium enterprises in Nepal. At the same time, the pollution load from industries is a growing concern. One of the key impediments to complying with environmental standards is the inability of small and medium enterprises to understand environmental problems, their impacts, and the possible solutions. Access to information on environmental management systems, waste minimization, pollution prevention, and cleaner technologies would assist industrial efforts to improve environmental performance.

4.38 There is also a need to further strengthen the knowledge base on the emerging challenge of climate change and adaptation, in particular sector impacts and adaptation options. To date, most work on climate change has been on knowledge development, with a major focus on the water resource sector, including water-induced disaster management. Work in other key sectors, such as human health, forestry and biodiversity, and agriculture, is only just starting. There is also a need to strengthen the awareness of climate change issues outside the Kathmandu Valley, particularly among local governments and affected sectors. To increase awareness, the Ministry of Environment, Science, and Technology and the Climate Change Network should work with the DDCs to encourage the inclusion of climate change issues in their development plans and with national federations such as the NGO Federation, the Federation of Community Forestry Users Nepal, and the National Federation of Irrigation Water Users.

4.39 Informed decision making, particularly with complex environmental issues, requires that the decisions be formed and based on accurate and updated data and information. The demand for environmental information is escalating and key stakeholders, such as project proponents, civil society organizations, and the media, are demanding more informed decision making. Although over the years considerable environmental data have been accumulated in the country by government and nongovernmental institutions, donor projects, and individual researchers, gaps in essential information still exist. Also, the data are often dispersed and not easily accessible. The need for a consolidated and centralized database, where information can be widely shared and easily accessed, is critical. Initially, existing data and information can be systematically collected from the various institutions and verified as to their quality and reliability. Then, information management systems need to be linked and integrated to

help facilitate the exchange and transfer of knowledge of environmental conditions, trends, and best practices at the national and local levels.

Stakeholder Groups: Partners in Environmental Management

4.40 National and local governments face serious capacity constraints, which impede their ability to effectively and adequately perform their environmental management responsibilities. There are many stakeholder groups in Nepal with proven skills and experience that could assist and support governments in environmental management. The Government of Nepal has promoted many good policies and practices for involving communities as integral partners with government in conservation and development efforts, most notably the empowerment of community forestry groups in forest conservation activities. Community forestry groups have played an important role in conserving and protecting forest resources. At the same time, these programs have allowed forestry group members to keep a substantial portion of their income from forests and to share in protected area royalties with relevant buffer zone communities. The role of civil society was also a critical factor in creating the public pressure and the political will for institutional action in improving air quality management, such as the government ban on the use of old moving chimney Bull's trench kilns in the Kathmandu Valley. Civil society organizations and NGOs have also played an important role in actively improving environmental services such as solid waste management by promoting composting alternatives, recycling at household and community levels, and public education campaigns (box 4.4). In several countries, government agencies have utilized citizens to support compliance monitoring and to supplement limited enforcement resources (box 4.5). Greater involvement of civil society organizations and local communities in environmental management activities, such as public awareness campaigns and citizen monitoring, should be actively promoted.

Box 4.4 Civil Involvement in Environmental Management in Nepal

The Women Environment Preservation Committee (WEPCO) is a nonprofit organization established in 1992 by a group of women from Lalitpur in response to growing threats to the environment in the Kathmandu Valley. WEPCO has been involved in waste management, composting, paper recycling, and education campaigns for more than 15 years and has received several national and international organizational awards for its efforts.

The Nepal Pollution Control and Environment Center is providing waste collection to over 10,000 households and is also operating composting plants in Ward 5 of Kathmandu and at the Central Zoo. It has also expanded its services to other cities in Nepal.

National Environmental Pollution Control Nepal is providing waste collection services in several cities, including Lalitpur, Kirtipur, and Dhulikhel.

Source: ENPHO 2007.

Box 4.5 Examples of Citizen Involvement in Monitoring and Oversight

In India, Development Alternatives, an NGO, is working in 78 cities on community-based monitoring of particulate matter, sulfur monoxide, and nitrogen oxide parameters with air quality

kits provided to local students and local NGOs. The data from these kits are shared with the Central Pollution Control Board, which validates the data collected. The data are used by cities to help develop city-level action plans. Similarly, the Banwasi Sewa Ashram citizen monitoring project, supported by the Central Pollution Control Board, invites polluting industries to the table to discuss initiatives they have taken for mitigation and control.

In the Philippines, the concept of multipartite monitoring has been introduced. Under this approach a monitoring team consisting of representatives from the Department of Environment and Natural Resources, the project proponent, NGOs, and local community residents may jointly undertake compliance monitoring of a licensed facility. The Department of Environment and Natural Resources is creating regional community advisory and monitoring committees in each regional office, which will involve NGOs and the private sector in all phases of EIA, including compliance monitoring.

Sources: World Bank 2006a; International Network for Environmental Compliance and Enforcement web site, <http://www.inece.org/>.

4.41 In addition to local communities and civil society organizations, the private sector has entrepreneurs who have valuable experience and have promoted innovation in dealing with environmental management problems such as solid waste management. The Solid Waste Management Association of Nepal estimates that there are over 50 private solid waste management providers in the Kathmandu Valley with total monthly transactions of Nrs. 8 million and employing 2,500 staff. However, these private companies are not widely recognized or consulted, particularly by local governments, even though they can provide helpful environmental services and can supplement government resources that are often strained by lack of technical capacity and inadequate staffing. Similarly, private consultants and academic and research institutions have environmental expertise that could be outsourced or utilized in an advisory capacity in areas requiring technical or specialized expertise. One area where technical assistance is urgently needed is the EIA/IEE process, particularly for the review and monitoring of environmental assessments.

4.42 There is also a role for the media in both raising public awareness of environmental issues and holding government accountable for their actions or inactions. In the past, media associations have played an influential role in Nepal by voicing environmental concerns on different issues and in different venues. For example, the Nepal Forum of Environmental Journalists was instrumental in raising public awareness of the air quality in the Kathmandu Valley, which led to the Supreme Court decision on controlling vehicle emissions in the valley. Similarly, it has been suggested that the media can play a future role in promoting the importance of the EIA process in ensuring environmental sustainability of development projects and holding project proponents accountable for complying with environmental guidelines.

Next Steps

4.43 An overarching theme that emerges throughout this report is the need to improve environmental governance by strengthening institutions and incentives with regards to environmental management and compliance. Strengthening environmental institutions in Nepal will require actions on a number of fronts – enhancing the leadership role of the Ministry of Environment, Science, and Technology, strengthening environmental management capacity in sector agencies, increasing the role of local governments, and

widening the involvement of civil society and the private sector. While the policy and legislative framework for environmental management is generally sound, stronger clarification of roles and responsibilities is needed, particularly the relative roles of the Ministry of Environment, Science, and Technology and sector agencies in the enforcement of the Environment Protection Act and Rules and sector laws. Priority should also be placed on strengthening compliance and enforcement procedures and systems, including focusing on the role that other branches of government, the judiciary and Parliament, can play in ensuring compliance.

4.44 Another important policy objective regarding institutional strengthening is the devolution of responsibilities to local governments pursuant to the Local Self-Governance Act, which has not been fully realized but can be expected to accelerate under the new government. Here, priority needs to be placed on building the technical capacity of local governments and gradually transferring responsibilities through hands-on and targeted demonstration projects in environmental management. Finally, it is important to recognize that utilization of community groups and private entrepreneurs can expand the resources and capacity of government institutions and at the same time provide greater transparency and accountability in environmental governance and institutional performance. More specific actions are proposed for institutional strengthening at the national and local level in chapter 5.

5. Rising to the Challenges: An Action Plan for a Way Forward

5.1 Nepal faces a broad range of environmental challenges, which have had a major bearing on the country's development and reform agenda articulated in its Tenth Plan. This report provides an important analysis of the links between growth and environment, particularly the role of the EIA process in ensuring sustainable infrastructure development in key growth sectors. The report also examines the effects of rapid population growth in urban areas on the urban environment, delivery of environmental services, and environmental health. Finally, the report provides a better understanding of the policy and institutional framework required for improving environmental management and compliance at the national and local levels.

5.2 It is clear from this report that stronger environmental performance measures will be required to address Nepal's many environmental challenges to sustainable development and poverty reduction. This will involve a comprehensive set of cross-cutting reforms and specific actions that would be focused on (a) updating the policy and regulatory framework for environmental management; (b) clarifying national roles and responsibilities; (c) empowering local governments to assume greater responsibilities; (d) strengthening institutional capacity for credible enforcement; (e) expanding beyond traditional government institutions to enhance performance; and (f) improving institutional capacity and access to information. The menu of proposed reforms and actions should be diverse and cover a broad range of options in addressing the three thematic areas of this report – ensuring infrastructure development is sustainable, meeting the pressures from rapid urbanization, and strengthening environmental governance and performance. The Government of Nepal should consider an action plan (summarized in appendix K) that could include the following options:

Strengthening the EIA/IEE System to Ensure Sustainable Development

5.3 The Government of Nepal has enacted the Environment Protection Act and Environment Protection Rules, which generally serve as a sound legal foundation for the EIA/IEE system. However, there are important policy gaps and implementation inconsistencies that create confusion about the necessary elements and responsibilities for ensuring that infrastructure development projects proceed in an environmentally sustainable manner. The EIA/IEE system needs to be strengthened as follows:

- **Address the policy gaps in the EIA process.** The primary tool for managing environmental impacts of growth sectors is through the EIA process. However, key policy provisions should be clarified and strengthened, including screening criteria, project scoping, alternative analysis, and project identification and evaluation.
- **Develop sector-specific guidelines for EIA.** A review of environmental assessment reports and case study analysis found inconsistencies in the application and implementation of EIA requirements. Where agencies, such as the Department of Electricity Development, have prepared sector-specific manuals that outline guidelines based on the particular needs of the sector, environmental performance has been enhanced.

- **Require comprehensive training on the EIA process.** Training in environmental assessments should be provided for all environmentally related units in sector agencies and local governments. It should cover a broad range of issues, including the benefits of the EIA process for sustainability, conditions for approval, project alternatives and mitigation measures, post-monitoring, and auditing of projects. In addition, supporting capacity measures should include development of sector-specific manuals and accreditation mechanisms, guidelines for public participation, and information exchanges within and outside government.
- **Establish an environmental information clearinghouse.** Although considerable environmental information has been accumulated over the years, serious information gaps exist and data are haphazardly dispersed and difficult to access. A national information clearinghouse should be established to collect, consolidate, and expand the database of relevant environmental, sector, and local information needed to improve the EIA system. Information could also be collected and disseminated on other issues of concern, such as cleaner technology and climate adaptation.

Clarifying National Roles and Responsibilities for Environmental Management

5.4 There are multiple national agencies, environmental and sectoral, with important roles and responsibilities in environmental management, but their responsibilities for EIA or environmental enforcement are often unclear. Institutional responsibilities could be clarified by considering the following actions:

- **Create an independent environmental enforcement agency.** Environmental authority at the national level that is fragmented creates confusion and should be centralized into a single and strong environmental agency. There are several organizational models for strengthening the Ministry of Environment, Science, and Technology currently under review that should be considered. In any organizational model, the environmental authority should be given the power to not only set standards for environmental performance but also ensure enforcement of environmental standards and laws.
- **Clarify the agency roles in monitoring and enforcement.** One of the areas of legislative ambiguity in the Environment Protection Act and Rules and in other sector legislation concerns the role of the Ministry of Environment, Science, and Technology in relation to other sector agencies, particularly with regards to the monitoring and enforcement of environmental conditions. While sector agencies clearly have a role in compliance monitoring, it should be clarified that the Ministry has primary responsibility for enforcing regulations related to environmental assessments, industrial pollution, and water pollution.
- **Dedicate resources for monitoring and enforcement.** Although the laws explicitly provide for environmental monitoring and enforcement, agencies are constrained because of insufficient resources. Additional resources should be provided to the Ministry of Environment, Science, and Technology and sectoral agencies for compliance monitoring, particularly of EIAs and IEEs. This could

include resources from increased budget allocations or introduction of creative dedicated sources of funding, such as fees for EIA and IEE processing, water consumption fees, and industrial pollution charges.

- **Establish mechanisms for reporting and documenting compliance and enforcement.** Most agencies do not have formal mechanisms for the reporting and review of, and response to, performance compliance or environmental violations. Incentives for self-auditing and environmental management systems should be introduced for project proponents and industrial facilities, such as expedited reviews or financial assistance for good performance. Structured procedures for the documentation of and response to public complaints should be instituted and be easily accessible to the public, including what referrals and actions were taken on the complaints.

Enhancing Service Delivery to Meet the Pressures of Urbanization

5.5 A number of actions may be taken in response to the environmental threats posed by increasing urbanization:

- **Explore alternatives to the current solid waste management system in the Kathmandu Valley.** In addition to the need for a more sustainable financial framework to support solid waste management in the longer term, there are other opportunities available to improve sustainability. These include pursuing greater collection efficiencies, minimizing waste volumes through more aggressive source separation, recycling efforts and composting of biodegradable materials, and examining lower-cost alternatives to landfilling at Banchare Danda through a comprehensive cost-benefit analysis.
- **Provide a legal framework for improving air quality.** While the Ministry of Environment, Science, and Technology has prepared a draft Air Quality Management Action Plan, it has not yet been endorsed by the government nor has any action been taken to implement it. The plan needs to be prioritized based on the expected impacts and on the difficulty in implementation. In the long term, the plan needs to be given a binding legal authority through the adoption of a comprehensive Clean Air Act.
- **Create regulatory and financial incentives to promote industry compliance.** Given the generally weak capacity of government regulators in Nepal, a top-down regulatory approach to industrial pollution management is less likely to succeed. Financial and regulatory incentives to comply are necessary, such as self-monitoring and reporting with requisite safeguards to prevent abuse. Successful donor-supported industrial management pilot programs should be replicated and scaled up.

Empowering Local Governments to Assume Environmental Management Functions

5.6 The Local Self-Governance Act requires the devolution of responsibilities, including environmental management, to the local governments. Greater efforts are needed to simultaneously build stronger local capacity and gradually transfer functions to local governments by pursuing the following:

- **Increase funding sources to provide for environmental services.** Most municipalities have relied heavily on the local development fee, but this will be phased out by 2013 and municipalities' own source revenue will not grow fast enough to replace it. Measures are needed to diversify the municipal revenue base, which could include allowing intergovernmental fiscal transfers, permitting local governments to charge service fees or share in existing taxes, or increasing or introducing new taxes and fees. In addition, local governments should explore opportunities for bundling small-scale project activities under Clean Development Mechanisms.
- **Provide greater flexibility in the hiring of municipal staff.** Municipalities, including elected mayors, are currently given no authority in the selection of their executive officers, even though they will head the day-to-day administration of the municipality. This has created difficult management and administrative problems for the delivery of local services. Local governments should be given greater authority in the hiring and management of local staff, with appropriate reporting to and supervision by the Ministry of Local Development.
- **Develop and implement pilot programs for local environmental governance.** There has been very limited delegation of environmental functions to local governments. More needs to be done to identify functions (such as IEE approvals) that could be delegated to local governments with appropriate oversight. Successful donor projects that are aimed at strengthening the capacities of local governments in environmental management (such as the Village Environmental Development Fund Project supported by the Canadian International Development Agency) should be replicated and scaled up in other functional and geographic areas. To the extent possible, pilot projects should also promote community-based environmental management.
- **Provide specialized training in environmental management.** In general, the extent of local government knowledge of environmental management issues has been very limited. Two immediate areas where local governments should receive environmental training are in the environmental assessment process and solid waste management. The environmental assessment training should focus on building local government capacity to assume IEE approvals for small-scale projects. Municipalities should receive specialized training in solid waste management strategies and options, including solid waste collection, recycling, and landfill alternatives.

Expanding the Institutional Stakeholders to Enhance Performance and Accountability

5.7 The role of civil society has been a critical factor in creating public pressure and political will for institutional action in improving environmental management. While the traditional focus on the role of government has been limited to the executive branch institutions, the judiciary and legislative branches also play an important role in pursuing environmental compliance. The role of these institutions can be strengthened by the following actions:

- **Increase civil society involvement in environmental management.** Local

communities are the most affected by project development and government regulation, but often the least informed and least involved in environmental decision making. First and foremost, the public consultation process needs to be strengthened by actively involving the public as early as possible in the planning and design of projects through informal community mechanisms and awareness measures. Civil society organizations, the media, and other nongovernmental organizations can also be instrumental in raising awareness of the importance of the EIA process and increasing public accountability for compliance with EIA standards.

- **Promote the use of the private sector in delivering environmental services.** Private sector entrepreneurs have demonstrated valuable experience and innovation in dealing with environmental management problems such as solid waste management. The private sector has generally proven more efficient in delivering services and could help ease the administrative and financial burden on local governments. Municipalities should formalize private sector participation in solid waste collection through a competitive selection process, with standards for performance and provisions for public education.
- **Strengthen the oversight role of the judiciary branch and Parliament.** The Supreme Court has issued several court decisions that have established significant policies on environmental management, but many of these decisions have not been enforced. Parliament has also played a critical role in establishing environmental policies through legislation, but to date has had little oversight over policy implementation. These institutions should consider measures to strengthen their oversight role, such as requiring agencies to report to parliamentary committees on the status of compliance with environmental laws or imposing legal sanctions on agencies for noncompliance of court directives.

5.8 A number of environmental challenges considered in this report are being addressed through a range of thematic and sector-specific initiatives that are either already under way or are being planned. This CEA will provide opportunities for Nepal to discuss possible areas of cooperation with its numerous development partners, including the World Bank. Discussions on potential areas of cooperation could include technical assistance for institutional capacity building of the Ministry of Environment, Science, and Technology, sector agencies, and local governments in key areas of environmental management, such as EIA implementation; utilization of Clean Development Mechanisms to supplement financing of the country's environmental management strategies in renewable energy, cleaner technologies, and solid waste management; and scope for further analytical work or specific sector reforms to support the integration of stronger environmental policies within the context of broader country reforms.

5.9 All of the proposed activities outlined above would help the Government of Nepal fulfill its strong commitment to achieving the MDGs as reflected in its Tenth Plan. The CEA provides an important roadmap in developing a renewed and stronger engagement between the Government of Nepal and the World Bank in the support of sustainable growth and human development in relation to the environment.

Appendix A. Environment Sector Overview: Linkages and Challenges to Growth, Sustainable Livelihoods, and Poverty Reduction

A.1 Looking ahead, it is important to understand the environmental challenges that the Government of Nepal is facing, and will continue to face, in its efforts to achieve its sustainable development and poverty reduction goals under the Tenth Plan. Although the strategic framework and plans for meeting these goals have varied across the sectors, a common and growing concern has been the impacts of development, both positive and negative, on the country's environmental resources. In order to effectively integrate and mainstream environmental management in the implementation of these sector plans, it is important to reinforce the linkages between strong environmental management performance and growth, sustainable livelihoods, and poverty reduction.

Strong Environmental Management Performance: Why It Is Essential for Growth, Sustainable Livelihoods, and Poverty Reduction

A.2 The linkages between natural ecosystems and human well-being (including public health, provision of basic goods and services, social well-being, and security) are globally recognized. The *Millennium Ecosystem Assessment* (2005), for example, states that "Ecosystems are essential for human well-being through their provisioning, regulating, cultural, and supporting services."⁷ *World Resources 2005* has also noted that "Environmental risks such as unclean water, exposure to indoor air pollution, insect-borne diseases, and pesticides account for almost a quarter of the global burden of disease, and an even greater proportion of the health burden of the poor" (WRI 2005). The connection between environmental sustainability and poverty reduction is also recognized by the international community, with a specific commitment in Goal 7 of the Millennium Development Goals (MDGs) to "integrate the principles of sustainable development into country policies and programs and reverse the loss of environmental resources".⁸

A.3 In Nepal, the linkages between the environment and livelihoods have been well documented – forests supplying fuelwood, compost used as fertilizers on farms, grazing areas for domestic animals, wetland and rangeland products used to secure the livelihood of local communities. Recent Government of Nepal studies have found that Nepal's environment is critical to its development, as more than 38% of its GDP is derived from the agriculture, fisheries and forestry, and mining and quarrying sectors (Ministry of Finance 2006). Equally importantly, significant portions of the power, water, manufacturing, trade, and tourism sectors are also dependent on the environment in one form or another. When factoring this dependence in with the more traditional natural resource sectors, it is likely that the total contribution of environmental income to Nepal's economy may well be over 50%. A breakdown of the relative contribution of various sectors to Nepal's GDP is provided in table A.1.

A.4 The linkages between a majority of the MDG targets and environment sustainability are strong in Nepal because of its largely agrarian rural society. This is particularly true for poverty reduction and health improvements, as illustrated in table A.2. For example, reducing child mortality, MDG 4, will require addressing the environmental challenges of water and air pollution, as much of the child mortality in Nepal has been attributed to poor drinking water and poor indoor air quality.

⁷ See Millennium Ecosystem Assessment web site: <http://www.maweb.org/en/index.aspx>.

⁸ See United Nations Millennium Development Goals web site: <http://www.un.org/millenniumgoals/>.

A.5 Aspects of Nepal's environment sector are explored through three cross-cutting areas: (a) the impacts of current growth and development on the natural resource base; (b) the consequences of unmanaged pollution; and (c) the emerging challenges of climate variability and change. A preliminary overview of these areas is given here to provide a contextual framework in which to understand the specific environmental management challenges associated with growth and environment, rapid urbanization, environmental health, and policies and institutions that are detailed in the report.

Table A.1 Gross Domestic Products by Sector

Industry	Millions of Nrs. 2005/06	% of overall GDP
Agriculture, fisheries, and forestry	212,827	38.1
Mining and quarrying	2,669	0.5
Manufacturing	41,768	7.5
Electricity, gas, and water	12,508	2.2
Construction	56,558	10.1
Trade, restaurants, and hotels	56,139	10.1
Transport, communications, and storage	55,919	10.0
Finance and real estate	64,937	11.6
Community and social services	54,544	9.8
Total	557,869	100.0

Source: Ministry of Finance 2006.

Table A.2 Linkages between MDG Targets and Environmental Sustainability

MDG	Targets	Linkages to environmental sustainability
Goal 1: Reduce poverty and hunger	Target 1: Between 1990 and 2015, halve the proportion of people whose income is less than US\$1 a day	Nepal's environment is critical to its development, as more than 38% its GDP is derived from the agriculture, fisheries and forestry, and mining and quarrying sectors. It is estimated the total trade in nontimber forest products in Nepal is approximately US\$18 million per year and that harvesters receive about 30% of the total value of this trade (Ministry of Finance 2006). Significant portions of the power, water, manufacturing, trade, and tourism sectors are also dependent on the environment and it is likely that the total contribution of environmental income to Nepal's economy may well be over 50%.
	Target 2: Between 1990 and 2015, halve the proportion of people who suffer from hunger	The linkages between the environment and livelihoods in Nepal are well documented. Forests, wetlands, and rangelands provide important resources that support the livelihoods of local communities. The environment supplies fuelwood, timber, nontimber forest products, leaf litter, fodder and grazing for domestic animals, and uncultivated foods.
Goal 2: Achieve universal primary education	Target 3: Ensure that, by 2015, children everywhere, boys and girls alike, will be able to complete primary	Local forest degradation and water source depletion in some localities has meant that women and girls spend longer hours collecting forest-related products and water from further distances. In some cases, this has resulted in

MDG	Targets	Linkages to environmental sustainability
	schooling	households not allowing their children, particularly girls, to attend school. Studies have found that a girl's level of educational attainment, in poor households, dropped as fodder and water availability decreased. This suggests that additional household labor falls to school-age girls (Cooke 1998).
Goal 3: Promote gender equality and empower women	Target 4: Eliminate gender disparity in primary and secondary education, preferably by 2005, and in all levels of education no later than 2015	As above.
Goal 4: Reduce child mortality	Target 5: Between 1990 and 2015, reduce the under-five mortality rate by two thirds	Much of child mortality in Nepal has been attributed to poor environmental health conditions, such as the poor supply of quality drinking water and sanitation services, and indoor and outdoor air pollution.
Goal 5: Improve maternal health	Target 6: Between 1990 and 2015, reduce the maternal mortality ratio by three quarters	Women are more exposed to indoor air pollution in rural Nepal than men.
Goal 6: Combat HIV/AIDS, malaria, and other diseases	Target 7: By 2015, have halted, and begun to reverse, the spread of HIV/AIDS and other major diseases	Environmental health linkages.
	Target 8: By 2015, have halted, and begun to reverse, the incidence of malaria and other major diseases	Poor access to good water and sanitation services and poor air quality has been found to cause several diseases and cases of ill health in Nepal.
Goal 7: Ensure environmental sustainability	Target 9: Integrate the principles of sustainable development into country policies and programs, and reverse the loss of environmental resources	All of the above.

Natural Resource Management: Increased Pressures on the Resource Base

A.6 The global importance of Nepal's biodiversity has been documented in several global assessments of biodiversity hotspots (Critical Ecosystem Partnership Fund for the Eastern Himalayan Region, the Global 200 priority ecoregions of the World Wide Fund for Nature (WWF), and the Important Bird Areas of Birdlife International). Nepal's Biodiversity Strategy (2002) classified the country's ecosystems into five categories: forests, wetlands, rangelands, agroecosystems, and mountain ecosystems. In addition, Nepal's legally designated protected areas have been considered a separate category.

A.7 As noted earlier, a number of donors and NGOs have supported Nepal with environment-related programs, particularly targeting the area of natural resource management in rural areas. As a result, programs on community forestry, watershed management, and wetland conservation have received significant attention by government ministries, such as the Ministry of Forests and Soil Conservation, and several prominent NGOs, including the WWF, the World Conservation

Union (IUCN), and the International Centre for Integrated Mountain Development (ICIMOD). While there have been notable successes in natural resource management, there are increasing pressures on the natural resource base that will affect its long-term sustainability.

Protected Areas

A.8 Nepal’s protected areas include a number of national parks, wildlife reserves, conservation areas, and a hunting reserve. Nepal has nine national parks, three wildlife reserves, one hunting reserve and three conservation areas (table A.3). The total area of protected lands constitutes just over 18% of Nepal’s territory. Eight national parks (excluding Shivapuri) and all three wildlife reserves also have legally designated buffer zones around them. If these areas are included, the total protected area in Nepal exceeds 19% of the total land area.

Table A.3 Protected Areas

Protected areas	Terai	Hills and mountains
National parks	Chitwan, Bardiya	Sagarmatha, Khaptad, Makalu-Barun, Shivapuri, Rara, Langtang, Shey-Phoksundo
Wildlife reserves	Shuklaphanta, Parsa, Koshi Tappu	
Conservation area		Annapurna, Manaslu, Kanchenjunga
Hunting reserve		Dhorpatan

A.9 Nepal’s protected areas have been important in preserving many of its threatened animal species, including the tiger and the one-horned Asian rhinoceros populations. In addition, one assessment of the Terai forests reports that forested areas inside the Terai protected areas have actually increased between 1990/91 and 2000/01 (Department of Forest 2005). However, an assessment of Nepal’s protected areas management program, conducted jointly by the WWF and the Department of National Parks and Wildlife Conservation in 2005 (Nepali et al. 2006), found that the protected areas face a growing number of challenges. These challenges include illegal settlements, dam building, illegal harvesting of timber, overcutting of fuelwood, hunting, and grazing of domestic animals inside protected areas. Another important challenge has been the armed conflict, which has restricted the mobility and presence of the protected areas’ staff.

A.10 The report also discussed the impacts of protected areas on sustainable livelihoods and poverty reduction. The pressures faced in conservation areas are lower than in other protected areas due to the local community’s involvement in decision making regarding resource use and in deterring illegal resource use. Except for protected areas in the Terai, people can live and carry on their traditional livelihoods inside all of Nepal’s protected areas. An estimated 111,893 households, with a total population of 714,178, live in the 11 buffer zones. Also, the protected areas in Nepal’s mountains are major tourism destinations for trekking and for mountain climbing; this generates some local economic income, though it has primarily been limited to the employment of porters and guides.

Forests

A.11 The Department of Forest estimates about 5.83 million hectares, or 39.6% of the total geographic area, to be “forest area”. The Food and Agricultural Organization of the United Nations (FAO) estimates that Nepal has 27.3% forest cover (3.9 million hectares), of which a quarter is heavily degraded.

A.12 The FAO notes that Nepal’s forest cover dwindled by 1.8% annually from 1990 to 2000.

An assessment of forest cover changes in the Terai districts for the period 1990/91 to 2000/01 found that there was an overall loss of 13,278 hectares of forest, although there was a net gain of 4,227 hectares of hill forest (Department of Forest 2005). A recent analysis by Winrock International (2005) for the World Bank's Program on Forests concluded that "If well-managed and acknowledged, forests can play an even more important role. If managed for specific products, forests can yield significant revenue and can greatly contribute to poverty alleviation."

A.13 Pursuant to the Forest Act, many patches of government forests have been handed over to local communities for management as community forests. By the end of 2005, over 1.2 million hectares of forest lands had been given to 14,337 community forest user groups to manage. Degraded forest lands have also been leased to poor households to raise their livelihood standards through production of fodder, forage, and medicinal plants. Nepal's community forestry program is widely acknowledged as one of the most progressive and proven examples of devolving management over forest resources to community-based user groups (box A.1).

Box A.1 Forestry and Linkages with Livelihoods

The links between the environment and livelihoods have been well documented in Nepal. The links between farm and forestry – forests as a source of fuelwood, fodder and grazing areas for domestic animals, and forest leaf litter and compost as fertilizers on farms – are strong in the country. Much of subsistence agriculture depends on these linkages to maintain soil productivity. Additionally, the collection and use, or sale, of nontimber forest products is also important to the livelihoods of many Nepali households. Nepal's community forestry and leasehold forestry management areas have increased in many parts of the mid-hills and Terai districts. The total trade in nontimber forest products in Nepal is estimated at US\$18 million per year, with the harvesters getting about 30% of the total value (Kanel 1999).

The poor are more dependent on communal resources for their livelihoods. In a central Nepal watershed, upper zone households were unable to meet their annual food requirements from their small and poor-quality landholdings. Of these households, 81% were engaged in nontimber forest product collection to supplement their livelihoods. In more accessible lower zones, only 37% of households were engaged in nontimber forest product collection. They possessed relatively larger and better quality landholdings and access to other sources of income than upper zone households (Pandit and Thapa 2004).

Notwithstanding the positive benefits of community forestry on forests and community development, several studies have found that community forestry practices often marginalize poorer households and their access to benefits has been low. Studies from Nepal, one of the first countries to make a serious attempt to devolve forest management, show that the lack of access to information and the elite control of forest user groups have cut many of the poor out of benefits from community forestry programs, particularly women (WRI 2005). Further, these studies suggest that participatory forestry programs, while conserving the forests, still have to find effective ways to move from the community to the individual households, or targeted groups within communities, in order for them to play a meaningful role in poverty alleviation (Chhetri, Sigdel, and Malla 2001).

Source: Winrock International Nepal 2007b.

Rangelands

A.14 Nepal's rangelands cover about 1.75 million hectares, or nearly 12% of the country's total land area. Nearly 80% of the rangelands are located in the high mountains and in the high

Himal areas. The key issues for rangeland management include overgrazing, conversion to agriculture, invasion of undesirable species, and drying of alpine meadows through climate change. Rangeland management efforts in the past have included promotion of different forage grass species. However, overall work on rangeland management has been limited.

A.15 An assessment of grassland ecology and management in protected areas of Nepal has shown that grasslands in the Terai and in the mountains are important for local livelihoods. The study reported that, in Terai's protected areas, the "effects of disturbances, particularly cutting and burning" on grasslands was not known (Peet et al. 1999). In the high mountain areas, degradation of grasslands was observed in many parts, such as on the upper slopes of Sindhupalchok (Rayamajhi et al. 1999).

Wetlands

A.16 An IUCN review of the status of and threats to wetlands in Nepal estimated that total wetland area in the country exceeds 5% of the country's total area, but the full extent is not yet known (IUCN 2004). Nepal wetlands are freshwater inland wetlands, both natural and artificial. IUCN's rapid assessment of Terai wetlands (Bhandari 1998) lists 80 natural lakes, 55 important floodplain areas, and 12 marshes, as well as reservoirs and canals. The country also has approximately 6,000 rivers and rivulets, including permanent and seasonal rivers, streams, and creeks, as well as 24 geothermal springs, marshes, alpine and tundra-type wetlands, and approximately 6,000 hectares of fishponds.

A.17 The IUCN rapid assessment (Bhandari 1998) showed that the Terai wetlands faced several threats, including drainage, agricultural runoff, and overharvesting of resources. Also, the IUCN review of 2004 found additional threats from inappropriate infrastructure construction, poor management of wetlands and surrounding areas, and the spread of invasive alien plant species such as water hyacinth. At the same time, the IUCN review noted that wetlands play a significant socioeconomic role in Nepal (IUCN 2004) (box A.2).

Box A.2 Wetlands and Livelihoods

Wetlands have a significant socioeconomic role in Nepal (IUCN 2004). Rice and fish are examples of key wetland-based agricultural products. Over 20 ethnic and caste groups, making up almost 11% of Nepal's population, are traditionally dependent on wetlands for their livelihoods. Studies have also shown that poorer households are more dependent on products from communal wetlands to supplement their food intake and for income generation. Awareness of the potential (and vulnerability) of wetlands, including riverine environments, has increased with the growth of water-based tourism (for example river rafting) and hydropower development. Several community-managed micro-hydropower programs have benefited communities, and have even helped in meeting some MDGs. However, the experience with large hydropower projects in Nepal has been mixed. Some studies provide evidence of imposition of costs on local people through displacement, loss of livelihoods, degradation of natural resources, and erosion of social capital (Upadhyaya 2002).

Source: Winrock International Nepal 2007b.

Agroecosystems

A.18 Agricultural land occupied about 28% of Nepal's total area in 2000, an increase from 23.5% in 1986 (ADB/ICIMOD 2006). Agriculture, combined with forestry and fisheries, accounts for more than 38% of the country's GDP. In the agroecosystems, soil fertility decline, loss in agrobiodiversity, and increasing use of agrochemicals have been identified as growing concerns. Nepal's *State of the Environment Report* (UNEP 2001) notes that the agricultural sector is adversely affected by the loss of fertile topsoil due to soil erosion, landslides, and floods.

A.19 The significant acceleration of soil erosion and fertility losses, which are of particular concern to the agricultural sector, has been attributed to poor land management. In several watersheds – particularly in areas where there has been market-oriented agricultural production, such as in the Jhikhu Khola watershed near the Kathmandu Valley – soil erosion and other nutrient losses occur as a result of agricultural intensification. Also, the fact that Nepal lacks a general land use policy has meant that while some forest and rangelands are being converted to agricultural land, some prime agricultural land is being lost to expanding settlements and urbanization, such as in the Kathmandu Valley.

Pollution Management: Pressures from Urbanization and Industrial Development

A.20 Urbanization and industrialization in conjunction with poor environmental management have led to deteriorating environmental and health conditions. The combination of inadequate sanitation and wastewater treatment facilities and the lack of effective pollution control measures have been major contributors to the impaired water quality in the country’s river systems. In moving ahead, development strategies will not only have to address the challenges of natural resource management, but also the constraints and barriers associated with the effective management of urban and industrial sources of pollution.

Rapid Urbanization

A.21 While urbanization is a relatively new phenomenon in Nepal, the rate of urbanization, according to the 2001 census, is among the highest in South Asia (3.3 million people or 14.2% of the Nepalese population lived in 58 municipalities) (Central Bureau of Statistics 2002). Based on the rate of urbanization between 1991 and 2001, it is estimated that the total urban population in 2006 was approximately 3.8 million of the total population of 25 million. The government predicts that by 2011, 24% of the total population will be living in urban areas (NPC/MoPE 2003). According to census data, between 1991 and 2001 the municipal population increased by 94%, or 6.8% per year (Central Bureau of Statistics 2002). This urbanization trend in Nepal is presented in table A.4.

Table A.4 Urbanization in Nepal

Year	Number of municipalities	Urban population (millions)	Urban population (%)	Average annual increase (%)
1952/54	10	0.24	2.9	-
1961	16	0.34	3.6	1.65
1971	16	0.46	4.1	3.23
1981	23	0.96	6.3	7.55
1991	33	1.70	9.2	5.89
2001	58	3.29	14.2	6.84

Source: Central Bureau of Statistics 2003.

A.22 Different factors have caused a dramatic increase in both the number of urban settlements and the urban population. One of the main reasons for the high rate of urbanization is migration from the villages. Due to extreme poverty, lack of economic opportunities, and, more recently, insurgency in rural areas, many people, especially the young, are migrating to cities in search of opportunities for employment, education, health, and security. While the poverty level in urban areas is lower than in rural areas, increasing rural-urban migration is leading to more urban poverty and unemployment, two emerging issues for Nepal.

A.23 Experiences in other countries show that rapid urbanization will often lead to increases in

urban poverty, particularly in slum and squatter settlements, which are usually crowded and unhygienic. The urban poor are also more vulnerable. They have fewer coping skills to deal with environmental and health problems associated with poor sanitation and water quality, increased air pollution, and poor solid waste management.

Industrial Development

A.24 The industrial sector plays an important role in economic development, employment generation, and poverty reduction. Although the industrial sector only contributes 10% to Nepal’s GDP, the pace of industrial development is increasing as the country moves to expand beyond its heavy reliance on the agricultural sector. Also, industrial investment is expected to rebound, contingent upon whether the current political situation remains stable. The Industrial Development Perspective Plan of Nepal has targeted an increase in the industrial sector’s contribution to the GDP from the current 10% to 20% by 2020.

A.25 Growth in the industrial sector will have significant environmental consequences in terms of air pollution, water pollution, and hazardous wastes from production processes and waste disposal. Much of Nepal’s industrial growth will come from small and medium enterprises, which generally pollute more because they have limited knowledge of and access to cleaner technologies, treatment facilities, and environmental management systems. In the Kathmandu Valley, where most of these enterprises are located, industry has contributed to the increase of effluent discharges into the rivers and to the increase of particulate matter emissions. Their contribution to the total pollution load in the valley, however, is less compared to other pollutants such as municipal wastewater and vehicle emissions.

Emerging Challenges: Adapting to Climate Variability and Change

A.26 Currently, Nepal’s greenhouse gas emissions are extremely small in global terms and its overall potential for mitigation measures that could have global impacts is limited. Nepal’s Initial National Communication to the United Nations Framework Convention on Climate Change (UNFCCC) showed that its total greenhouse gas emission in 1994/95 was equivalent to 39,306 gigagrams of carbon dioxide (CO₂) (table A.5). Land use change and the forestry sector were the main sources of CO₂. The energy sector is the second largest emitter of greenhouse gases (MoPE 2004).

Table A.5 National Greenhouse Gas Inventory of Nepal 1994/95 (gigagrams)

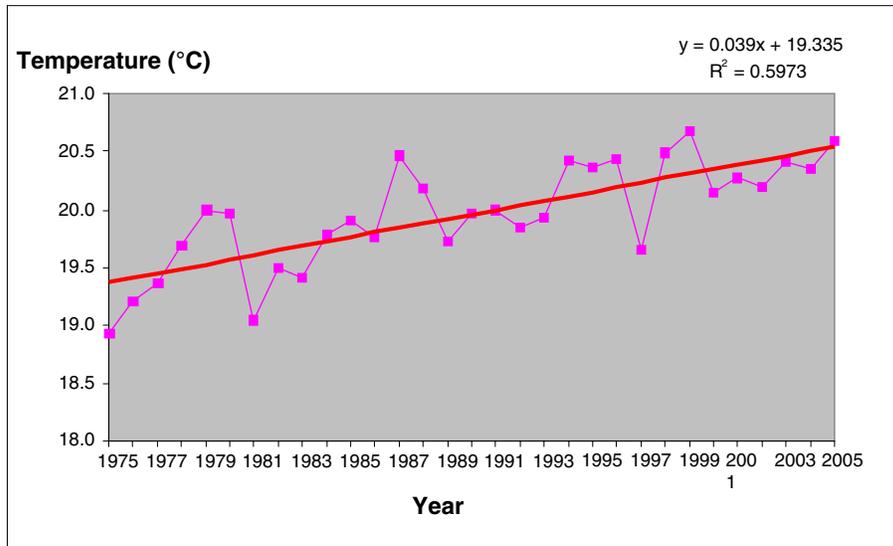
Greenhouse gas (source and sink categories)	CO₂ emission	CO₂ removal	Methane emission	N₂O emission
1. Energy	1,465		71	1
2. Industrial processes	165			
3. Agriculture			867	29
4. Land use change & forestry	22,895	– 14,778		
Total emission and removal	24,525	– 14,778	938	31
Net emission	9,747		938	31

Source: MoPE 2004.

A.27 While its contribution to greenhouse gas emissions is tiny, Nepal will face a significant challenge in responding to the effects and impacts of climate variability, climate change, and extreme weather events. Available data suggest that there was an average increase in the mean annual temperature by 0.06°C per year between 1977 and 1994 (figure A.1). This rapid warming has undoubtedly contributed to the reported increase in the melting rate of Himalayan glaciers.

The projected temperature change above the baseline average is estimated at 1.2°C for 2030, 1.7°C for 2050, and 3.0°C for 2100. Furthermore, climate change models in Nepal have predicted that with increased temperatures there will be more variability in rainfall patterns, with decreased winter precipitation and higher-intensity monsoon rains. As a consequence, Nepal's Initial National Communication to the UNFCCC notes that with predicted increases in temperatures and changes in rainfall patterns, there will be significant negative impacts on Nepal's ecosystems and people's livelihoods. Specifically, there will be negative impacts on public health, forestry and biodiversity, agriculture, and water resources (MoPE 2004).

Figure A.1 Nepal's Temperature Trend



Source: Baidya 2007.

Public Health Implications

A.28 While the impacts of increased temperatures on public health have not yet been fully studied, it has been predicted that there may be an increased range of lower-altitude disease vectors, such as mosquitoes, with the warming of higher altitudes. As a result, these vectors could spread diseases such as malaria, kala-azar, and Japanese encephalitis in the lower regions (Alam and Regmi 2004). Several estimates of the potential distribution of malaria have been produced, using different climate change scenarios. These projections indicate that, in the future, malaria is most likely to extend its range into the fringes of established endemic areas and affect unprepared or nonimmune populations (Martens et al. 1995). The vulnerability of these populations to diseases is significantly increased by growing population densities and poor sanitation.

A.29 It is also predicted that increased incidence of malaria associated with climate change may significantly strain the economies of many countries of the region. Picard and Mills (1992) estimated losses of five working days for infected persons, during the period from infection to recovery, in two districts in Nepal. Mills (1994) found that the economic consequences of malaria could be high in the areas without malaria control programs. The current lack of primary health care for significant numbers of the population will also contribute to their vulnerability to future climate change. Additional health impacts are also expected from climate's impacts on agriculture (reduced nutrition) and water resources (reduction in availability).

Forestry and Biodiversity Implications

A.30 The *Millennium Ecosystem Assessment* has noted that climate change is one of the most

important drivers of biodiversity loss. It mentions that “Climate change is projected to exacerbate the loss of biodiversity; increase the risk of extinction for many species, especially those that are already at risk due to factors such as low population numbers, restricted or patchy habitats and limited climatic range; and adversely impact ecosystem services essential for sustainable development.”

A.31 In the case of Nepal, the Initial National Communication noted that vegetation patterns would be altered by changes in temperature and precipitation, which in turn would affect the biodiversity of forests. Nepal has a striking variety of species, including 60 that are currently endangered. One study has found that 2.4% of biodiversity may be lost with climate change (MoPE 2004). However, no study has been done on the possible impacts of climate change on biodiversity and ecosystems in Nepal. In addition, the threat of climate change to biodiversity has not been internalized in the Nepal Biodiversity Strategy (2002).

Agricultural Implications

A.32 Nepal’s agricultural sector is highly dependent on the weather, particularly on rainfall. Given the low productivity increase of the last few years compared to population growth, climate change is likely to have serious consequences for Nepal’s agriculture. Most of the population is directly dependent on a few crops, such as rice, maize, and wheat. The predicted decrease in precipitation from November to April would adversely impact the winter and spring crops, threatening food security.

A.33 With the dependency on agriculture, over 80% of all water in Nepal is used for irrigation. Higher temperatures, increased evapotranspiration, and decreased winter precipitation may bring about more droughts in Nepal (Alam and Regmi 2004). Increased water evaporation and evapotranspiration may also mean that crops will require more water through irrigation. Competition between alternative water uses will then increase, especially with an increase in population. Nepal’s Initial National Communication identifies both positive and negative impacts of climate change on agriculture (MoPE 2004).

Water Resource Implications

A.34 Increased temperatures are expected to affect water resources in a number of ways. Analysis of the mean monthly river discharges, for example, shows that global warming would melt snow cover on the mountain tops earlier, thereby shifting the peak discharge month from August to July. This could lead to increased flooding as well as more pronounced variations in water availability throughout the year (MoPE 2004). The changes in temperature and precipitation will alter the hydrological cycle and water resources. In some areas, drought could become a problem (MoPE 2004) (box A.3).

A.35 The rapid rate of snowmelt in the high Himalayas is also expected to create or expand glacial lakes and initially increase river flows. The potential increase in disasters from glacial lake outburst floods is perhaps the most relevant climate change-related threat for many parts of Nepal (Raut 2006). Out of 2,323 glacial lakes in Nepal, 20 have been found to be potentially dangerous because of their apparent potential for glacial lake outburst. With limited opportunities for safe and sustainable livelihoods in the mountains, population densities are growing within the river valleys, where the vulnerability to glacial lake outburst floods increases. The growth in population means that there are now more people exposed to glacial lake outburst floods and other climate-related disasters. This is compounded by the expansion of infrastructure and settlements in the vulnerable areas (MoPE 2004).

Box A.3 Climate Change and Water Resources in Nepal

The analysis of climate data from four recording stations representing the inner Terai, mid-mountains, from the early 1970s to 2000, and one for the high mountains from 1988 to 2000, has shown that there has been a clear warming trend in Nepal. The maximum temperatures were increasing faster than the minimum temperatures, indicating a widening temperature range. Though there was no clear change in the precipitation trend, there was a decrease in the number of rainy days and an increase in the number of higher intensity rainfall events. In addition, the hills and mountains were found to be warming faster than the plains, i.e. the warming rate was increasing with altitude. A rise in temperature will have a substantial impact on the water balance, including soil moisture, atmospheric water, and surface runoff. Likewise, a temperature increase will reduce the glacier ice reserves and ultimately could reduce the total water availability in Nepal. Poor people and subsistence farmers would be hardest hit by a temperature rise. Similarly, the hydropower potential of Nepal would also be reduced due to decreased water availability in the Himalayas. However, because of the diverse topographical, physical, and environmental characteristics of the basins, the impact may vary from basin to basin. Though the higher-altitude areas are more sensitive to climate change, less information is available from those regions due to poor accessibility and the fact that there are fewer climate stations there.

Source: Chaulagain 2006.

Summary

A.36 It is clear that Nepal's growth, sustainable livelihoods, and poverty reduction efforts rely heavily upon the country's environment and natural resource sectors. While there is some evidence of improvements to the health of some natural resource ecosystems, Nepal's overall environment is facing increasing pressures and challenges from a number of different sources. The effectiveness of natural resource management and pollution management efforts to deal with these pressures and challenges has been mixed. For example, community forestry efforts are touted to have improved sustainable use of forest resources and forest conservation efforts. However, the consequences from ineffective pollution management have resulted in deteriorating water quality and air pollution, particularly in urban areas. To understand the implications of poor environmental management in relation to growth, sustainable livelihoods, and poverty reduction, this report will provide an in-depth analysis of the significance and implications of key issues associated with growing infrastructure development, rapid urbanization, poor environmental health, and effective policies and institutions, which, if not properly addressed, will impede Nepal's ability to achieve its long-term development and reform agenda.

Appendix B. Progress towards Achieving Millennium Development Goals

MDG	MDG targets	Nepal's current position	Prospects and issues
Goal 1: Eradicate extreme poverty and hunger	Between 1990 and 2015, halve the proportion of people living in extreme poverty and hunger	The poverty headcount rate declined dramatically from 42% in FY1995/96 to 31% in FY2003/04. Some progress in reducing malnutrition with prevalence of stunting among children three years of age or younger dropping by 11% between 1996 and 2001.	There is a likely chance that poverty goals will be met. Nepal needs to improve the developmental impact of remittances and jump start improvements in agriculture. Given that the prevalence of stunting is still high at 43%, and the problem of underweight and wasting prevalence has not improved (45–55% and 10–15% respectively), it is unclear if malnutrition goals can be met.
Goal 2: Achieve universal primary education	Achieve universal primary education by 2015	Net attendance rate of primary-aged children rose from 57% (FY1995/96) to 72% (FY2003/04), net enrollment ratio rose from 69% to 84%, and youth literacy from 56% to 73%. These are significant gains that bode well for meeting the primary enrollment MDG.	The quality of primary education remains a concern, as the system is characterized by high repetition rates, high dropout rates, and low completion rates. Given the current level of achievements, attainment of universal primary education remains a challenge.
Goal 3: Promote gender equality and empower women	Progress towards gender equity and empowering women by eliminating gender disparity in primary and secondary education by 2005	Access of girls to education has improved as the gender parity index (ratio of net enrollment of girls to boys) increased from 70% in FY1995/96 to 86% in FY2003/04. Females have been the biggest beneficiaries of the increase in literacy rates.	Growth in completion rates by girls has outpaced that for boys. If the trend continues, gender parity in primary education will be reached by 2010.
Goal 4: Reduce child mortality	Reduce infant and child mortality rates by two thirds between 1990 and 2015	The infant mortality rate has been declining at 3.7% per year since the mid-1980s, with a drop from 79 per 1,000 live births in FY1995/96 to 51 in FY2005/06. Child mortality fell more sharply from 118 to 65 in the same period mainly due to greater coverage in immunization, and disease prevention and treatment.	Given current trends, there is a good chance of attaining the child mortality target. Progress in reducing infant mortality has been slow and the rate will have to accelerate to meet the MDG. Progress in reducing child and infant mortality in eastern and far-western regions has been slow and will not meet the target.
Goal 5: Improve maternal health	Reduce maternal mortality rate by three quarters between 1990 and 2015	Maternal mortality remains high (394 per 100,000 live births in 2006). More than 6 out of every 10 deliveries are not assisted by skilled attendants.	Prospects of achieving the maternal mortality MDG are unclear due to lack of comparable data over time.

MDG	MDG targets	Nepal's current position	Prospects and issues
Goal 6: Combat HIV/AIDS, malaria, and other disease	By 2015, have halted and begun to reverse the spread of HIV/AIDS, incidence of malaria, and other major diseases	TB-related deaths have fallen from 15,000–18,000 (1994) to 8,000–11,000 annually, and TB cases have been declining (301 per 100,000 in 2000 to 258 in 2003). The prevalence rate of HIV/AIDS in the general population is unknown, although it has been estimated that 62,000 are living with HIV infection (2003).	Prospects for curbing TB are positive but there are two challenges: (a) coinfection with HIV and TB cases could render detection and treatment more difficult; and (b) an increase in incidence of multidrug-resistant forms of TB. Data gathering and estimation of HIV/AIDS rates are still at an early stage.
Goal 7: Ensure environmental sustainability	Integrate the principles of sustainable development into country policies and programs, and reverse the loss of environmental resources	There are issues – e.g. depletion of soil nutrients and arsenic contamination in the Terai – that show that environmental sustainability remains a problem. But other initiatives, in drinking water and forestry, show positive progress. Nepal has a national sustainable development strategy and a sound policy framework for environmental management.	There is a less likely chance of achieving goals pertaining to sustainable management of environmental resources. There is a better chance of attaining water supply and sanitation coverage goals. Deforestation remains a serious local problem in many mountain and hill areas. There are also increasing commercial pressures on biodiversity resources. Poor environmental management in urban and peri-urban areas is an emerging concern.
Goal 8: Promote global partnerships	Develop a global partnership for development	Exports/GDP has stagnated at around 16% since FY2001/02 due to weakening external demand and competitiveness. Nepal is dependent on foreign assistance to meet its investment needs. The fiscal deficit is financed mostly by grants and concessional aid. Public external debt stands at 43% of GDP.	Nepal's growth and poverty reduction prospects hinge on its ability to restore stability, under which development can proceed and the country can undertake structural reforms and appropriate investments, as well as confront the issues of the lagging regions and disadvantaged ethnic and caste groups.

Sources: Adapted from: Central Bureau of Statistics 2004; World Bank 2006c; Ministry of Health 1996, 2001; NPC/UN 2005.

Appendix C. List of Consultation Meetings and Workshops That Contributed to the Nepal CEA

Date	Consultation
21 June 2006	Workshop on the role of NGOs and private companies in solid waste management in Kathmandu
25 June 2006	Roundtable on solid waste management with five municipalities of Kathmandu and the Solid Waste Management and Resource Mobilization Center
28 June 2006	Donor's roundtable meeting
28 June 2006	Presentation and discussion of draft Air Quality Management Plan prepared by Ministry of Environment, Science, and Technology with air quality professionals associated with Clean Air Network Nepal
29 June 2006	First national workshop and stakeholder consultation
July 2006	Half-day workshop with environment and sector agencies on EIA implementation
21 August 2006	Interaction with industrialists at Balaju industrial district
22 August 2006	Interaction with Municipal Association of Nepal
21 September 2006	Roundtable at Ministry of Environment, Science, and Technology regarding organizational structure
31 October 2006	Workshop on environmental compliance by industries
15 January 2007	Second national workshop and stakeholder consultation
16 January 2007	Thematic workshop on environmental health issues in Nepal with government and donors focusing on the valuation of environmental health costs exercise
17 January 2007	Interaction with the Parliamentary Committee on Environment and Supreme Court Justices
18 January 2007	Thematic workshop on climate change and adaptation organized in collaboration with Ministry of Environment, Science, and Technology
19 January 2007	Interaction with Environment Improvement Coordination Committee at Hetauda municipality

Appendix D. Criteria Used for EA Case Study Selection

Criteria	Reasons for choosing the criteria
Environmental assessment done after 1997	To assess if the environmental assessments follow the Environment Protection Act and Rules.
Cases from road and hydropower sectors	Road and hydropower sectors have huge potential for expansion, large investments, and significant environmental impacts.
Project information easily available	To facilitate analysis in the short time available.
Mix of donor-funded, private sector, and solely government funded projects	To analyze if effort and quality varies and to identify good practices.
Mix of under-construction and operational projects	To analyze how completed projects have included EIA recommendations/mitigation measures and their effectiveness and to see what implementation mechanisms are in place in ongoing activities for incorporating EIA recommendations.
Environmental assessment largely undertaken by national experts	To learn lessons on current local capacity and future needs, and encourage less dependence on foreign experts.
None of the team members were involved in the environmental assessment studies	To avoid any biases.

Appendix E. Comparison of World Bank, ADB, and Nepal Government Policies Relating to EIA

Contents	World Bank policies	Asian Development Bank policies	Government of Nepal policies	Remarks
Mandatory requirement of EA for development project	<p>The World Bank's Safeguard Policy OP 4.01 clearly indicates that the Bank requires environmental assessment (EA) of projects proposed for Bank financing to help ensure that they are environmentally sound and sustainable, and thus to improve decision making for sector investment lending, financial intermediary lending, emergency recovery projects.</p> <p>The World Bank's BP 4.01 indicates that EA for a proposed Bank-financed operation is the responsibility of the borrower. Bank staff assist the borrower, as appropriate.</p>	<p>Environmental Policy (5b) of the Asian Development Bank (ADB) integrates environmental consideration into ADB operations. Lending operations make mandatory provisions to conduct EA studies of all loans, program loans, sector loans, sector development program loans, financial intermediation loans, and private sectors investment operation. This policy also states that the borrower is responsible for carrying out EA studies and implementing the EA recommendation. The ADB also monitors the implementation of the agreed environmental measures by the borrowers.</p>	<p>The Environment Protection Act, which is the umbrella legislation for environmental conservation, indicates in Section 3 that a proponent shall have to carry out an IEE and EIA of the proposals as prescribed. Section 4 of the Environment Protection Act also states that upon the commencement of this act, no one shall implement or cause to be implemented a proposal without getting it approved by the concerned agency or the ministry. Environment Protection Act, Section 18, also indicates that in case any person carries out any act without the approval of EA or any act contrary to the approved proposal, the prescribed authority may close down such act immediately, and if any person or organization has done such an act, may, according to the degree of offence, punish that person with a fine up to Nrs. 100,000.</p>	<p>Prevailing government of Nepal policies match the requirements of Bank and ADB policies of conduct of EA studies and incorporate the mitigation measures in project planning, design, construction, and operation to ensure the integration of environmental concerns into development endeavors.</p> <p>No provision for sector environmental assessment for, as per Environment Protection Act, the EA studies can be made only for project-level studies.</p>
EA requirement for types of lending, projects, programs	<p>OP 4.01 of World Bank requires EA studies for sector investment lending, financial intermediary lending, emergency recovery projects.</p>	<p>ADB Environment Policy requires EA studies for program loans, sector loans, sector development program loans, and private sector investment operations.</p>	<p>The Environment Protection Rules 1997 of the Government of Nepal and other sector legislation make mandatory the provision of EA studies for private projects, for government projects, and for projects funded by domestic as well as international funding.</p>	<p>No provisions of EA for sector projects or plans are made in prevailing policies.</p>
Environmental screening / classification	<p>Bank screening criteria for EA studies include: Category A: A proposed project is classified as Category A if it is likely to have significant adverse environmental</p>	<p>ADB screening criteria for EA studies include: Category A (with potentially significant environmental impacts); Category B (with potentially less</p>	<p>The Government of Nepal's prevailing legislation classifies in accordance with Schedules 1 and 2 of the Environment Protection Rules 1997.</p>	<p>Screening criteria of Bank and ADB are primarily on the basis of magnitude and significance level of environmental impacts.</p>

Contents	World Bank policies	Asian Development Bank policies	Government of Nepal policies	Remarks
	<p>impacts that are sensitive diverse, or unprecedented. These impacts may affect an area broader than the sites or facilities subject to physical works. EA for a Category A project examines the project’s potential negative and positive environmental impacts, compares them with those of feasible alternatives (including the “without project” situation), and recommends any measures needed to prevent, minimize, mitigate, or compensate for adverse impacts and improve environmental performance. For a Category A project, the borrower is responsible for preparing a report, normally an EIA (or a suitably comprehensive regional or sector EA).</p> <p>Category B: A proposed project is classified as Category B if its potential adverse environmental impacts on human populations or environmentally important areas – including wetlands, forests, grasslands, and other natural habitats – are less adverse than those of Category A projects. These impacts are site specific; few, if any, of them are irreversible; and in most cases mitigation measures can be designed more readily than for Category A projects. The scope of EA for a Category B project may vary from project to project, but it is narrower than that for Category A. Like Category A, it examines the project’s potential negative and positive environmental impacts and recommends any measures needed to prevent, minimize, mitigate, or compensate for adverse impacts and improve environmental performance. The findings and results of</p>	<p>significant environmental impacts); Category C (unlikely to have significant environmental impacts); Category FI (credit line for subprojects through a financial intermediary, or equity investment in a financial intermediary).</p> <p>A project’s environment assessment category is determined by the category of its most environmentally sensitive component, including both direct and indirect impacts. An IEE is required for Category B projects, and an EIA, requiring greater depth of analysis, for Category A projects. No environmental assessment is required for Category C projects, although their environmental implications nevertheless need to be reviewed.</p>	<p>Projects requiring EIA: All projects listed in Schedule 2 are required to undergo thorough EIA-level studies.</p> <p>Projects requiring IEE: All projects listed in Schedule 1 are required to undergo thorough IEE-level studies.</p> <p>Projects not requiring EA studies: Projects that are not listed in Schedule 1 and 2 do not require any EA-level studies and they are allowed to be implemented without incorporating EA recommendations.</p> <p>The Environment Protection Rules provide the criteria on the basis of thresholds limits. The thresholds are determined on the basis of the following basic criteria: + size of the project + location of project (sensitive areas, etc.) + project cost</p>	<p>No threshold has been recommended for the classification of a project requiring EIA and IEE, nor EA studies.</p> <p>Government of Nepal policy screening criteria are mainly based on thresholds. The implication of the provisions may allow small projects with significant adverse impacts to be implemented without EA studies and incorporation of environmental mitigation measures. Similarly, large projects with minimum or no adverse impacts require EA studies, resulting in project implementation delays and additional cost from EA studies.</p>

Contents	World Bank policies	Asian Development Bank policies	Government of Nepal policies	Remarks
	<p>Category B are described in the project documentation.</p> <p>Category C: A proposed project is classified as Category C if it is likely to have minimal or no adverse environmental impacts.</p> <p>Beyond screening, no further EA action is required for a Category C project.</p> <p>Category FI: A proposed project is classified as Category FI if it involves investment of Bank funds through a financial intermediary, in subprojects that may result in adverse environmental impacts.</p>			
Environmental assessment / preparation of reports	<p>WB OP 4.01 indicates the definitions of EA-related elements covering EIA, environmental audit, environmental management plan, hazard assessment, project influence area, risk assessment, sector environment assignment.</p> <p>WB OP 4.01 provides the requirement of EIA studies and report contents: executive summary, policy, legal and administrative framework, project description, baseline data, environmental impacts, analysis of alternatives, environmental management plan, and appendices.</p>	<p>ADB's Policy 5(b) indicates the important considerations for conducting EIA and IEE studies for Category A and B projects, including assessment of induced, indirect, and cumulative impacts, examination of alternatives, achieving environmental standards, design of least-cost measures, development of environmental management plan, monitoring requirement, formulation of institutional arrangement, and meaningful consultation. The report format is flexible but includes a matrix describing the environmental consequences and mitigation measures.</p>	<p>Environment Protection Rules 1997 indicate the IEE and EIA formats in Schedules 5 and 6 respectively. The EIA requirement includes name and address of proponent, executive summary, basic information relating to project, identification of impact, alternative analysis, measures to reduce impacts, environmental management plan, review of policy and legislations, monitoring, references.</p>	<p>EA requirements of Bank and ADB are similar. However, the Government of Nepal's EA report is more focused on industry-related projects, which sometimes creates confusion for the study team when carrying out EA studies for infrastructure-related projects.</p>
Environmental standards and emission level	<p>The <i>Pollution Prevention and Abatement Handbook</i>, which contains pollution prevention and abatement measures and emission levels, has been published for Bank-related projects. Taking into account borrower country legislation and local conditions, the EA may recommend alternative emission levels and approaches to pollution prevention and abatement for</p>	<p>The ADB does not have environmental standards. However, ADB policy indicates that the ADB will follow the standards and approaches laid down in the World Bank's <i>Pollution Prevention and Abatement Handbook</i>.</p>	<p>The Government of Nepal has also developed and published environmental standards for industry-related projects (six standards). EIA should adopt Government of Nepal standards as well as Bank standards.</p>	<p>The Government of Nepal has published only six standards. EIA should follow the international standards, depending upon the guidelines of funding agencies.</p>

Contents	World Bank policies	Asian Development Bank policies	Government of Nepal policies	Remarks
	the project. The EA report must provide full and detailed justification for the levels and approaches chosen for the particular project or site.			
Public consultation	WB OP 4.01 states that for all Category A and B projects proposed for IBRD or IDA financing, during the EA process, the borrower consults project-affected groups and local NGOs about the project's environmental aspects and takes their views into account. The borrower initiates such consultations as early as possible. For Category A projects, the borrower consults these groups at least twice: (a) shortly after environmental screening and before the terms of reference for the EA are finalized; and (b) once a draft EA report is prepared. In addition, the borrower consults with such groups throughout project implementation as necessary to address EA-related issues that affect them.	ADB policy requires public consultation and access to information in the EA process. For Category A and B projects, the borrower must consult with groups affected by the proposed project and local NGOs. The consultation should be carried out as early as possible in the project cycle so that the views of the groups to be affected by the project are adequately taken into account in the design of the project and environment mitigation measures. Such consultation will also take place during project implementation to identify and help address environmental issues that arise. For Category A projects, the borrower will ensure that consultation will take place at least twice: (a) once during the early stages of EIA fieldwork; and (b) once when the draft EIA report is available, and prior to loan appraisal by the ADB.	Environment Protection Rules make mandatory provision for public consultation: IEE-level studies: Section 7 of the Environment Protection Rules make mandatory provision for public consultation as follows: A 15-day notice should be published in the national newspaper requesting the comments, suggestions, and concerns; these concerns and suggestions are to be incorporated in IEE studies. The proponent shall send the notices to concerned VDCs, DDCs, health posts, and municipalities describing the project and the potential environmental impacts, and requesting that the concerned stakeholders and individuals submit their concerns and suggestions. The concerned stakeholders should submit the comments and suggestions within 15 days of the publication of notices. For EIA-level studies, the proponent shall publish a notice in any national-level newspaper, requesting that the VDC or the concerned municipality, as well as the schools, hospitals, health posts, and concerned individuals or institutions of that area, offer, in writing, their suggestions concerning the possible environmental impact of the proposal. After the publication of a notice, pursuant to subrule (1), anyone who wishes to offer opinions	Provision of public consultation is adequately covered in Government of Nepal policies. However, they are not very effective due to various reasons: lack of public meetings required as per legislation; and public notices are not very effective.

Contents	World Bank policies	Asian Development Bank policies	Government of Nepal policies	Remarks
			<p>and suggestions to the concerned proponent in connection with the proposal may do so within 15 days from the date of publication of such notice. The comments and suggestions obtained from this process will be included in the scoping documents. The next step in public consultation is the public hearing, which obliges the proponent to conduct a public hearing at the project site after the preparation of a draft EIA report with the intent of providing opportunities for the local communities and stakeholders to express their additional concerns. The issues brought forth at this hearing should be incorporated in the final EIA report. The Environment Protection Rules also oblige the proponent to submit the recommendations of concerned VDCs or municipalities along with the EIA report.</p>	
Information disclosures	<p>WB OP 4.01: When the borrower officially submits a Category A or Category B EA report to the Bank, the Region places a copy of the full report in the project file. It also sends the English-language executive summary of a Category A EA report to the Board Operations Division, Corporate Secretariat, under cover of a transmittal memorandum confirming that the executive summary and the full report (a) have been prepared by the borrower and have not been evaluated or endorsed by the Bank; and (b) are subject to change during appraisal. The results of a Category B EA, when there is no separate report, are summarized in the Project Information Document. The EA is also disclosed through the</p>	<p>ADB policy-environmental assessment reports for ADB projects are intended to be accessible to interested parties, and the general public. The summary EIA and IEE reports are required to be circulated worldwide, through the depository library system, and are placed on the ADB web site. The full EIA or IEE reports are also made available to interested parties upon request. The ADB's 120-day rule requires that the summary EIA, or in relevant cases the summary IEE, is made available to the general public at least 120 days before Board consideration of the loan, or in relevant cases, before approval of significant changes in project scope. The 120-day rule applies to all public and private sector Category A and selected</p>	<p>The Environment Protection Rules 1997 state that the IEE draft report shall be made public for comments and suggestions. Evidence of publication of notices and comments and suggestions are to be affixed with IEE documents for approval. In the absence of such documents, the IEE report will not be accepted for approval.</p> <p>Similarly for EIA-level studies, the Environment Protection Rules provide that after the submission of the EIA report, the Ministry of Environment, Science, and Technology should publish a public notice for a one-month period, and open the EIA report to the public for review.</p>	<p>Public disclosure system is adequately provisioned in policies. However, they are not very effective.</p>

Contents	World Bank policies	Asian Development Bank policies	Government of Nepal policies	Remarks
	Bank's Infoshop website (www.worldbank.org/infoshop)	Category B projects deemed to be environmentally sensitive. To facilitate the required consultations with project-affected groups and local NGOs, the borrower will provide relevant information on the project's environmental issues in a form and language(s) accessible to those being consulted.		
Implementation of EA recommendations / environmental management plan	During project implementation, the borrower reports on (a) compliance with the measures agreed upon with the Bank on the basis of the findings and results of the EA, including implementation of any environmental management plan, as set out in the project documents; (b) the status of mitigation measures; and (c) the findings of monitoring programs. The Bank bases supervision of the project's environmental aspects on the findings and recommendations of the EA, including measures set out in the legal agreements, any environmental management plan, and other project documents.	Category A and environmentally sensitive Category B projects require, as part of the environmental assessment process, the development of environmental management plans that outline specific mitigation measures, environmental monitoring requirements, and related institutional arrangements. Loan agreements include specific environmental covenants that describe environmental requirements, including the environmental management plans. The provisions for the plans must also be fully reflected in the project administration memoranda. To ensure proper and timely implementation of the environmental management plans and adherence to the agreed environmental covenants, the ADB requires, for all Category A projects and all environmentally sensitive Category B projects, that (a) borrowers/executing agencies submit semiannual reports on implementation of environmental management plans, and this requirement is reflected in the loan agreements; and (b) annual environmental review missions from the ADB conduct a detailed review of environmental aspects of projects to ensure that the borrower/executing agency is implementing the environmental	The Environment Protection Act 1997 indicates that in the case of any person carrying out any act without getting a proposal approved under Section 6 or acting contrary to the approved proposal, the prescribed authority may close down such an act immediately, and any person or organization that has done such an act, may, according to the degree of the offence, be punished with a fine of up to Nrs. 100,000	Provision of noncompliance of EA recommendations is mentioned in the Environment Protection Act 1997. However, it is not a very effective tool to force proponents to abide by the EA recommendations.

Contents	World Bank policies	Asian Development Bank policies	Government of Nepal policies	Remarks
		management plans and fulfilling the environmental covenants.		
Institutional capacity development of borrowers	When the borrower has inadequate legal or technical capacity to carry out key EA-related functions (such as review of EA, environmental monitoring, inspections, or management of mitigation measures) for a proposed project, the project includes components to strengthen that capacity.	To improve environmental governance, the ADB will support and encourage the strengthening of legislative and regulatory frameworks, and will provide demand-driven technical assistance to strengthen the capacity of environmental management agencies to deliver core functions such as EIA review, environmental monitoring, setting and enforcing of environmental standards, and environmental awareness and training.	The Environment Protection Act 1997 also provides for institutional capacity development, which covers the establishment of an environmental protection council, recruitment of environmental inspectors, etc.	The prevailing institutions are not capable enough to undertake the responsibilities as stated in the policy documents.

Appendix F. Environmental Health in Nepal

F.1 Environmental health costs represent a significant burden on Nepal's economy. While good progress is being made on interventions to address environmental risks, much more attention and resources need to be invested in water supply coverage, drinking water quality, proper waste disposal, and improving air quality in order for Nepal to meet its MDGs. This is especially important for the most vulnerable subgroups of Nepal's population, including children under the age of five, women, the elderly, and the poor.

F.2 As the evidence shows, the environmental health implications of poor water supply and sanitation as well as indoor and urban air pollution dramatically impact Nepal's ability to achieve targets for reducing child mortality, improving maternal health, combating diseases, and other MDGs. Overall, the analysis shows that Nepal's economic costs associated with lack of water and sanitation, and indoor and urban air pollution, amount to **US\$258 million**, or **3.5%** of the country's GDP (table F.1). This is comparable in range to other such valuation studies on environmental health carried out in the South Asia region.

Table F.1 Aggregate Environmental Health Costs for Nepal

	US\$ (millions)	% of GDP
Indoor air pollution	\$147.3 (\$110.4–\$182.3)	2.0% (1.49–2.47%)
Lack of water and sanitation	\$89.2 (\$78.4–\$100.4)	1.21% (1.06–1.36%)
Urban air pollution	\$21.1 (\$17.7–\$24.6)	0.29% (0.24–0.33%)
Total	\$258 (\$206.6–\$307.3)	3.49% (2.79–4.16%)

F.3 The costs of these environmental problems have been estimated in a report to help policy makers in Nepal appreciate the magnitude of these issues and better integrate environmental health considerations into economic development decision making. These costs not only include the medical costs of treatment and lost productivity due to sickness and care-giving, but also provide an estimate of the value of pain and suffering from premature death and disease. This analysis only covers a limited number of diseases attributed to the three environmental risk factors in question; it therefore underestimates the economic burden these environmental risk factors place on Nepal.

Inadequate Water and Sanitation

F.4 Nepal has the poorest drinking water and sanitation coverage in South Asia. Varying estimates of the real coverage make it difficult to ascertain the true extent of this problem. While the 2001 census notes that 82% of Nepal's population have access to drinking water from improved sources, WaterAid Nepal claims only 48% have access to such sources within a 15-minute walk. The 2001 census also reports that more than 53% of the population has access to safe (piped) water, while the Nepal Living Standards Survey of 2003/04 puts this figure at 44% (Central Bureau of Statistics 2002, 2004).

F.5 **Contamination of water sources.** Most of the drinking water supplied in Nepal is unfit for consumption. In the Kathmandu Valley, 40% of the water available through wells, spouts, and pipes were found to have a high contamination of fecal coliform bacteria (Central Bureau of Statistics 2005). In a test of 67 gravity flow water supply schemes, 91% were contaminated with bacteria (of which 64% were highly contaminated). In the Terai region, iron, manganese, and coliform contamination were found to be above World Health Organization (WHO) standards (Central Bureau of Statistics 2005). Also, over 11% of tubewells tested in 20 Terai districts were

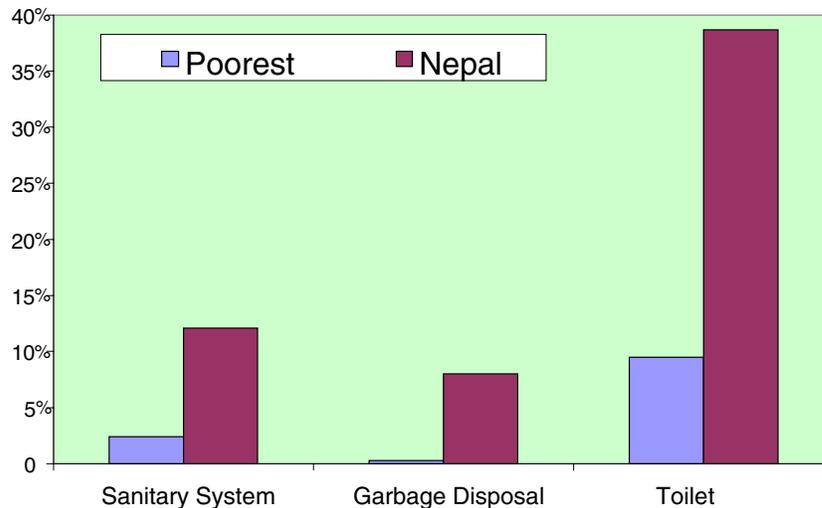
found to have arsenic content above the WHO standards (10 parts per billion) and 2.4% had levels above the national interim standard (50 parts per billion) (National Arsenic Steering Committee, as of June 2006).

F.6 Inadequate sanitation. As with water supply, sanitation coverage remains poor. According to government statistics, about 47% of households (78% urban; 41% rural) in Nepal have access to toilet facilities, of which half are modern flush toilets. Other sources show national estimates ranging between 27% and 39% access to sanitation, with only 19% to 25% found in rural areas (table F.2). The Nepal Living Standards Survey 2003/04 reports that about 39% of households have access to toilets, 12% have access to sanitary systems (primarily sewers, sewage disposal), and only 8% have access to proper garbage disposal facilities. Sewage and garbage disposal system coverage in the rural areas is only 3.7% and 0.8% respectively (Central Bureau of Statistics 2004). Access to a sanitary system (sewage disposal), garbage disposal, and toilets is also lowest among the poorest population and is better in the richer quintiles of the population. Figure F.1 displays the huge gap in access to sanitary facilities between that available to the poorest population and the national average.

Table F.2 Sanitation Coverage in Nepal: Differing Estimates

Source	Urban	Rural	Total
	% of population		
Central Bureau of Statistics 2002	78	41	47
UNDP/Government of Nepal 2002	80	25	30
UNDP/Government of Nepal 2005	81	30	39
WaterAid Nepal	67	19	27
Central Bureau of Statistics 2004			39

Figure F.1 Uneven Access to Sanitary Facilities



F.7 Apart from the rural-urban differential, there is also a wide variance in coverage by region. The far-western region, for example, has the lowest percentage coverage of overall sanitary services. Sewage and garbage disposal system coverage is lowest in the mountains (1%

and 0.3% respectively), while toilet coverage is lowest in the Terai (30%).

F.8 Difficulty meeting targets. For drinking water quality, the Tenth Five-Year Plan (Poverty Reduction Strategy Paper) targets 85% coverage by 2007, and a 25-year National Water Plan (2002–2027) targets 100% coverage by 2017. Despite a significant improvement in drinking water coverage from 1990 to 2000, the current rate of progress, especially in rural areas, makes reaching the MDG target ambitious. On sanitation, the country's Tenth Five-Year Plan goal of providing access to improved sanitation to 50% of households by 2007 looks difficult to achieve in the rural areas. Meanwhile, the National Water Plan goal of providing everyone with access to sanitation facilities by 2017 is highly unrealistic. WaterAid Nepal, which has more conservative estimates for both water and sanitation, estimates that 11,300 additional households have to be connected to improved drinking water sources and around 14,000 households have to be connected to improved toilet facilities per month from 2000 to 2015 to meet the MDG targets.

F.9 Resource gaps. Different sources claim that between US\$1 billion and US\$2 billion in additional resources will be needed to meet the MDGs in the drinking water and sanitation sectors. The Water Resources Strategy estimates that Nrs. 184 billion (US\$2.6 billion) would be spent on the Water Supply and Sanitation Program over the 10th to 14th Plan periods (2003–2027), of which two thirds will be for water supply. The majority of this expenditure, however, will go towards developing urban water supply and sanitation infrastructure. At the national level, the government reports an increase of 8% in the water and sanitation sector between the 10th Plan and the 14th Plan periods. Even so, less than 5% of public expenditure goes towards the drinking water and sanitation sector. Furthermore, such expenditures are heavily biased towards water supply, with under a quarter spent on sanitation programs (especially in the rural and small towns programs). At the local level, too, less than 5% of VDCs' and DDCs' own resources go towards drinking water and sanitation facilities.

F.10 Health impacts. Poor water quality and poor sanitation are major sources of environmental risks to human health. Diarrheal diseases, intestinal worms, gastritis, typhoid, and jaundice are the top five water-borne diseases (Department of Health Services 2006). Poor sanitation and improper hygiene practices (such as poor hand and food hygiene behaviors) also lead to both skin and diarrheal diseases. Poor sanitary conditions also provide breeding grounds for mosquitoes and flies, which spread disease such as malaria, kala-azar, filariasis, and viral encephalitis. Over 23,000 cases of malaria have been identified in the last three years, with the most new cases found in Nepal's far-western region. Kala-azar is endemic in 12 Terai districts of Nepal, with over a thousand cases and 17 deaths recorded in 2004/05 alone.

F.11 Vulnerable groups. Children under five years of age are the most vulnerable to diarrheal diseases; about 22% of this subgroup suffers from various diarrheal diseases. UNICEF estimates that about 13,000 children under the age of five died from various diarrheal diseases in 2005. Deaths and illness from diarrheal diseases are reported to have increased in the last three years (Department of Health Services 2006). The poor are also disproportionately impacted – the Nepal Living Standards Survey found that 20% of the poorest people suffer from diarrheal diseases; this correlates with their poor access to quality drinking water, as only 3% of such households have access to piped water (Central Bureau of Statistics 2004). Diarrheal diseases are also more common among rural residents and their occurrence is highest in the mid-western region of the country.

F.12 Economic costs. Inadequate access to water and sanitation leads to premature deaths and disease, which in turn impose costs on Nepal's economy. These costs include the expenses incurred to treat illness from diseases attributed to poor water and sanitation, incorporating doctor fees, laboratory tests, drugs, and bed charges when hospitalization is needed. Other costs include lost productivity when adults fall sick and stay home from work, or when primary care-givers

have to take care of sick children (and potentially lose wages). Furthermore, the pain and suffering from premature death and illness can also be valued by calculating the burden of disease in disability adjusted life years (DALYs), and costing these DALYs at the GDP per capita. Only diarrheal disease was included in these cost calculations, which therefore represent an underestimate of the total costs attributed to inadequate water and sanitation in Nepal.

F.13 Estimates from one study suggest that providing access to water and sanitation to the entire population in the WHO subregion of SEAR-D (to which Nepal belongs) would reduce the cases of diarrhea by nearly 18.3%. This figure is used as a proxy for Nepal, with additional data and assumptions on population, disease incidence and duration, and treatment costs. It has been estimated, using Global Burden of Disease (GBD)⁹ methodology, that every year 2,174 children under the age of five die due to lack of adequate water and sanitation. Nonfatal cases of diarrhea have been estimated to be about 13 million per year in children and about 14.4 million in adults. The total number of DALYs lost per year is nearly 78,000. The monetary estimate of these health impacts is obtained by valuing a DALY between US\$245 and US\$300, an estimate centered in the GDP per capita of US\$272 (see table G.1 in appendix G for explanation of lower and upper bound values). This translates into an annual cost of about US\$21million.

F.14 In addition, the costs of illness can be calculated based on estimates of the costs of treatment for diarrheal diseases, from the use of oral rehydration salts for mild cases, to the costs of doctor visits and hospital stays (for severe cases). The cost of illness burden related to the lack of water and sanitation is estimated to be about US\$68.3 million. Altogether the total economic costs due to inadequate water and sanitation are estimated at about **US\$89.2 million** (ranging from US\$78.4 to US\$100.4 million), or **1.21%** (ranging from 1.06% to 1.36%) of Nepal’s GDP (table F.3).

Table F.3 Estimated Health Costs Due to Inadequate Water and Sanitation in Nepal

Type of cost	Est. cost (US\$)
Costs of diarrheal deaths potentially averted by water supply/sanitation interventions	19,983,973
Costs of diarrheal cases potentially averted by water supply/sanitation interventions	940,205
Costs of illness (medical costs + lost productivity costs)	68,276,642
Total costs due to inadequate water supply and sanitation	89,200,821
Total costs as % of GDP	1.21%

F.15 Since access to water and sanitation varies considerably between rural and urban areas in Nepal, these costs have also been disaggregated spatially. In rural areas, the total costs from inadequate access to water and sanitation are estimated to be about US\$74 million. In urban areas, with far better access to water, sanitation, and sewage disposal facilities, economic costs are estimated to be about US\$12.2 million (table F.4). However, even though urban coverage figures are much better, intra-urban and urban-rural inequalities are often masked in the averages – in terms of access to environmental services, slum dwellers and the urban poor are often far worse off than higher-income urban dwellers, as well as being worse off than the rural poor.

⁹ The Global Burden of Disease project (GBD) is a worldwide collaboration of over 100 researchers, sponsored by WHO and the World Bank and based at the Harvard School of Public Health.

Table F.4 Estimated Rural and Urban Health Costs Due to Inadequate Water Supply and Sanitation

Type of cost	Estimated cost (US\$)	
	Urban	Rural
Costs of diarrheal deaths potentially averted by water supply/sanitation interventions	3,388,683	20,198,440
Costs of diarrheal cases potentially averted by water supply/sanitation interventions	269,669	789,214
Costs of illness (medical costs + lost productivity costs)	8,542,690	53,019,747
Total costs due to inadequate water supply and sanitation	12,201,042	74,007,401

F.16 **Programs and policies.** Drinking water and sanitation projects have been prioritized by the government. Eighteen drinking water and sanitation priority projects plan to meet basic levels of service (NPC/UNICEF 2006). In rural areas of Nepal, over 26,000 water points have been established; most of the technologies promoted for drinking water are gravity flow for stream and spring sources, and shallow tubewells and dug wells for groundwater sources. The Melamchi inter-river basin transfer is an ambitious, and expensive, effort by the government to supply drinking water to the Kathmandu Valley.

F.17 **Financing options.** Several government drinking water supply and sanitation projects are being subsidized. The Fund Board provides for around 70% of drinking water project costs, while the rest is borne by the beneficiary community in cash and kind. Also, a Sanitation Revolving Loan Fund has been established in beneficiary communities, with available grants able to support the installation of latrines in 25% of households without sanitary facilities. This fund is managed by the community as a revolving fund that provides loans to the members for latrine construction. Similarly, Nepal Water for Health (NEWAH) programs provide varying amounts of subsidies for different drinking water and sanitation systems, for example 80% for gravity flow schemes, 85% for tubewells, and 87% for school latrine projects.

F.18 In addition to subsidies to water supply and sanitation projects, innovations in technology and service delivery are working in tandem to find new ways to access water, improve water quality, and dispose of feces. Technology innovations include new ways to access source waters and alternative sanitation options. Service delivery approaches focus on a range of activities, both at the household level (such as for water treatment) and at the community level (such as for sanitation), and include private sector initiatives (on the supply side).

F.19 **Technology innovations** include:

- **Source water.** In areas with increasing and acute water shortages, innovative technologies such as rainwater harvesting and fog water harvesting are being promoted. The Fund Board plans to promote rainwater harvesting in 32 rural communities to benefit over 19,000 people by 2009. Additionally, NEWAH and the Environment and Public Health Organization (ENPHO) are also working with local populations in water-stressed areas to help in the adoption and installation of rainwater harvesting systems. In regions of dense fog, such as in eastern Nepal, feasibility studies and piloting of fog water harvesting are also being carried out. In one program, about 900 liters of fog water are collected every day to provide water for the pilgrims visiting the Pathivara Temple in the Taplejung district during the summer (NEWAH 2005a).
- **Ecological sanitation.** Ecosan is a dry toilet that conserves water and separates out feces

to be used as organic fertilizer. It is being promoted in Nepal; currently, more than 100 Ecosans have been adopted in the peri-urban areas of Kathmandu.

F.20 Service delivery approaches include:

- **Household water treatment systems.** At the household level, various water quality improvement technologies are being piloted and promoted in Nepal. Water testing kits are being piloted in several communities so that local populations can check their drinking water quality and then seek protection measures if necessary. Commercially available chlorine solutions for water disinfection, such as Piyush, are becoming popular in Nepal – in 2004/05, around 110,000 units of Piyush were sold. Filtration technologies such as biosand filters and colloidal silver filters are being promoted to remove pathogens, iron, and turbidity from drinking water; while the Kanchan arsenic filter is being promoted in the Terai districts and in the Kathmandu Valley. Solar disinfection (SODIS) technology – which uses the synergetic effects of UV-A solar radiation and temperature to destroy pathogens in water – has been adopted by over 20,000 households in Kathmandu.
- **Community-level sanitation programs.** Community-led total sanitation (CLTS) – an approach based on collective community action to stop open defecation – is being promoted in Nepal. So far, about 14 villages in six districts have been declared “open defecation free” and another 18 villages in 7 districts have adopted this approach to achieve total sanitation (WaterAid Nepal 2006). A similar community-level approach, school-led total sanitation (SLTS), which aims at stopping open defecation in schools and surrounding settlements, is being implemented in at least 50 schools in 15 districts. The United Nations Children’s Fund (UNICEF) and the Nepal Red Cross Society plan to implement SLTS in 800 and 60 schools respectively within the next three years (WaterAid Nepal 2006).
- **Private sector role in sanitation marketing.** To complement community-level sanitation, toilet construction and supply has been encouraged by programs aimed at vitalizing the private sector, especially in rural areas, to sell sanitary equipment in local markets, thereby reducing transport and other costs. The SaniMart project, promoted by NEWAH, has helped construct over 100 toilets and rehabilitate 75 more in a village of 294 households (NEWAH 2005b).

Next Steps

F.21 In Nepal, water supply and sanitation policies have been formulated and targets have been set; however, without major interventions and additional resources, reaching these targets will be difficult. There is an important need to target communities in the mountains of the western, mid-western and far-western regions of the country, where programs to improve water supply and sanitation facilities are lacking. To enable the expansion of water and sanitation facilities, local bodies, including municipalities, DDCs and VDCs, should be given more responsibilities relating to scheme selection and implementation.

F.22 Furthermore, efforts are needed to bolster the role of local NGOs in implementation and the role of communities in the operation and maintenance of water supply and sanitation schemes to ensure sustainability. In terms of approaches, sanitation programs should be integrated into all water supply programs to ensure the quality of the water and to reduce related health hazards. Programs and service delivery approaches at the household and community levels – such as the Sanitation Revolving Loan Fund, CLTS, SLTS, SaniMart, and Ecosan – need to be appropriately scaled up. Approaches that are demand driven and require community participation in the operation, management, and maintenance of water supply and sanitation schemes need to be

applied widely. In terms of financing, the government does not have a policy to provide subsidies or microcredit for toilet construction. Given the lack of sanitation facilities, a national program to promote toilet construction and use needs to be implemented. To capitalize on the health benefits of improved water supply and sanitation measures, it is imperative to simultaneously disseminate hygiene promotion messages, including messages on better handwashing practices, on improved water storage measures, and on good personal and household hygiene.

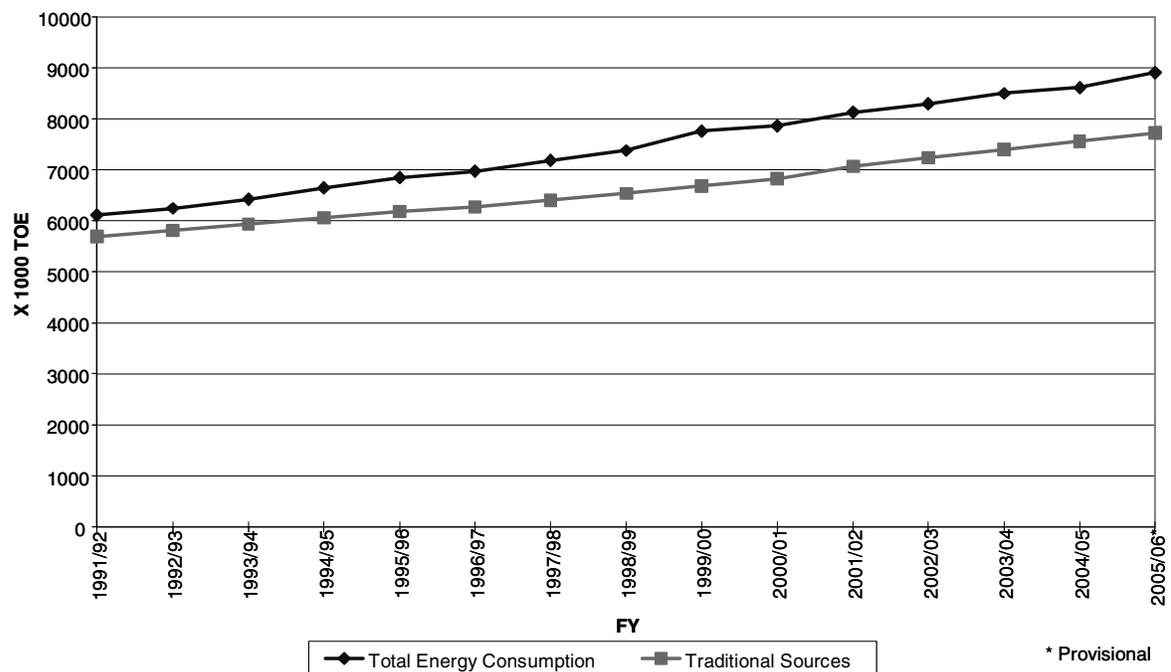
Rural Energy and Indoor Air Pollution

F.23 About 2.4 billion people worldwide burn biomass (wood, crop residues, charcoal, and dung) for cooking and heating. The smoke created from burning these fuels turns the kitchens of the world’s poorest countries into death traps. Indoor air pollution from the burning of solid fuels kills over 1.6 million people, predominantly women and children, each year. Smoke in the home is one of the world’s leading child killers, claiming the lives of nearly 1 million children each year (ITDG 2004).

F.24 **Rural energy use.** The vast majority of Nepali households use biomass for cooking, especially firewood and agricultural residues. The share of traditional, commercial, and renewable energy was 87.7%, 11.75%, and 0.53% respectively during FY2004/05. Of the total traditional energy consumption, the share of fuelwood was 89%, of agricultural residue 4.34%, and of cattle residue 6.57%.

F.25 Energy consumption growth over the 15 years to 2005 was almost linear, with an annual average increase of 2.7% (figure F.2). The annual average growth rate of traditional energy consumption was 2.2%. The contribution of alternative energy technologies in Nepal, including hydropower, has been rising rapidly in the last decade. However, as it starts from a small base, alternative energy still only contributes about 0.6% of the total current energy demand. Though within total energy consumption the share of traditional sources of energy is gradually decreasing, its utilization is still increasing at a steady pace.

Figure F.2 Total Energy Consumption and Traditional Sources in Nepal



F.26 Plans and targets. The renewable energy component of the Tenth Plan (2002–2007), the Hydropower Development Policy (2001), the Renewable Energy Perspective Plan of Nepal (2000–2020), the Perspective Energy Plan (1991–2017), the Water Resources Act (1992), and the Electricity Act (1992) are the main policy, planning, and legislative documents guiding the energy sector in Nepal (ADB/ICIMOD 2006). The Tenth Plan (NPC 2002) emphasizes rural electrification and plans to supply energy to an additional 10% of the population through the national grid and an additional 5% of the population through alternative sources of energy during the Plan period. Some of the quantitative targets for the renewable energy sector include 200,000 biogas plants in 65 districts, 2,700 solar dryers/cookers in 20 districts, 100 solar drinking water and irrigation projects in 15 districts, 4,000 improved water mills, and 250,000 improved cookstoves in rural areas.

F.27 Exposure to smoke. In Nepal, the use of biomass fuels such as wood, dung, agricultural waste, and charcoal as cooking and heating fuel is the principle cause of indoor air pollution, especially in the rural areas (ADB/ICIMOD 2006). In the higher altitudes, houses have smaller doors and windows to keep warmth in during the winter season, and ventilation is poor. Combustion is incomplete in the use of mud stoves; this results in high smoke emissions and contributes to burns and injuries due to the stove's poor design. Most kitchens do not have chimneys or hoods for smoke exhaust. Use of low-efficiency cookstoves in poorly ventilated kitchens cause severe indoor air pollution that contains particulate matters, carbon monoxide, nitrous oxides, sulfur oxides (more with coal), formaldehyde, and polycyclic organic matter, including carcinogens (WHO 2002). Though indoor particulate matter of less than 10 microns in diameter (PM_{10}) is considered to be safe at 0.05 milligrams per cubic meter (mg/m^3), PM_{10} concentration is often found to be as high as 1 to 5 mg/m^3 in smoky kitchens.

F.28 Exposure monitoring. Information on indoor air quality through exposure monitoring in Nepal is limited. One study, done by the Nepal Health Research Council and others (2001), indicated that PM_{10} concentration in cooking areas in places where biomass (wood) is burnt was 8,207 micrograms per cubic meter ($\mu g/m^3$); and in places where kerosene and liquefied petroleum gas (LPG) are used as fuel concentrations were 3,414 $\mu g/m^3$ and 1,504 $\mu g/m^3$ respectively. Another study done by Davidson and others in 18 houses in Nepali villages in 1986 revealed that the total suspended particles (TSP) was 8,800 $\mu g/m^3$, with 21 parts per million (ppm) of carbon monoxide (CO) and 368 parts per billion (ppb) of nitrous oxide (N_2O), where biomass (wood) was used as fuel. In the high hills region, Practical Action is carrying out impact monitoring to assess pollution loads of CO and $PM_{2.5}$ in 33 households in Rashna district. With the introduction of hoods, there has been a reported 70% decline in pollution levels. This study is now being expanded to 200 households, with a combination of ventilation and insulation intervention (use of T82 personal dosimeter).¹⁰ Also, another new study is being carried out in Kathmandu in collaboration with Kirk Smith.¹¹

F.29 Health impacts. Acute respiratory infection, chronic obstructive pulmonary disease (COPD), and tuberculosis are the three most common diseases associated with indoor air pollution in Nepal. These mainly occur due to prolonged exposure to smoke and dust (ADB/ICIMOD 2006). These diseases account for almost 6% of all outpatient visits to health institutions (Department of Health Services 2006), and a significant percentage of these can be correlated to indoor air pollution.

F.30 Vulnerable groups. Women are primarily responsible for cooking in Nepali households;

¹⁰ Meeting with Practical Action, November 2006.

¹¹ Anil Raut, Winrock Nepal, personal communication, November 2006.

therefore, they and their young children often suffer the most from indoor air pollution, which leads to or aggravates respiratory diseases. Acute respiratory infection continues to be one of the top killers of children under five years of age. This is because they are especially susceptible to an increased exposure to smoke while their mothers are cooking, which is compounded by their poorly developed immunological systems (Raut 2004). Of the total deaths in the 12 months before the 2001 census, pneumonia and asthma/bronchitis accounted for about 4.2% and 6.9% respectively (CBS 2001). COPD is another major risk, especially among women, and has been strongly associated with smoke exposure from cooking on open biomass stoves (Winrock International Nepal 2004).

F.31 In the Nepali context, the incidence of acute respiratory infection is also affected by the climate, terrain, and living conditions of the people in various regions. In the mountains and high hill regions, attempts to conserve heat in households results in poor ventilation, and consequently higher incidence of acute respiratory infection and COPD than in Terai households. With a higher dependence on biomass for cooking, rural people have higher exposure to smoke than their richer counterparts living in urban areas where alternative (cleaner) fuels are available.

F.32 **Economic costs.** The use of biomass for cooking, and poor ventilation, results in acute lower respiratory infection (LRI) in women and young children under five. In addition, prolonged exposure to smoke also results in COPD in women. With very few studies on smoke exposure monitoring in Nepali households, data from similar monitoring carried out in developing countries is used to estimate the proportion of children and women affected by indoor air pollution. Every year, indoor air pollution prematurely kills, on average, 5,223 children in Nepal. In terms of morbidity in young children (LRI) and the impact on women (LRI and COPD), a total of 34,670 DALYs are lost to indoor air pollution every year. Valuing DALYs from both sickness and death from respiratory infections and COPD as equivalent to GDP per capita of US\$272, this translates into an annual cost of about US\$78.4 million.

F.33 The costs of illnesses are based on the information (preliminary estimates from Ministry of Health 2006) that 42.9% of children with acute respiratory infection are taken to a health provider and on the assumption that for each case the care-giver loses the equivalent of about one day of work to take care of the child. This includes treatment costs as well as lost productivity due to care-giving, and amounts to about US\$69 million. The total cost of indoor air pollution is therefore calculated to be **US\$147.3 million**, which is almost **2.0%** of Nepal's GDP (table F.5).

Table F.5 Estimated Health Costs Due to Indoor Air Pollution in Nepal

Type of cost	Estimated cost (US\$)
Costs of LRI deaths from indoor air pollution (children < 5, women)	58,977,433
Costs of COPD deaths from indoor air pollution (women > 15)	9,980,965
Costs of LRI/COPD cases from indoor air pollution (children < 5, women)	9,443,878
Costs of illness (medical costs + lost productivity costs)	68,947,632
Total costs due to indoor air pollution	147,349,908
Total costs as % of GDP	1.99%

F.34 In Nepal, the use of cooking fuels and their availability are often determined by climate and terrain. Therefore, when analyzing costs associated with indoor air pollution, it is useful to consider a disaggregation by spatial location (urban versus rural) as well as by ecological region (mountains, mid-hill regions and Terai) in order to better inform interventions aimed at improving energy access and at reducing indoor air pollution through better stoves and cleaner fuels. Due to

the inadequate disaggregated data by ecological region, this analysis of environmental health costs from indoor air pollution has only been undertaken for rural versus urban areas. Given the high percentage of biomass fuel use in rural regions, the associated economic costs in terms of health impact and productivity loss are several times higher than similar valuation done for urban areas. In rural Nepal, the total costs of indoor air pollution are estimated at nearly US\$130 million, while that in urban areas of Nepal is estimated to be US\$17.8 million (table F.6). Again, with growing urbanization in Nepal and increasing numbers of urban poor (who live in congested settlements and cook with biomass), the urban health costs are expected to rise.

Table F.6 Estimated Rural and Urban Health Costs Due to Indoor Air Pollution in Nepal

Type of cost	Estimated cost (US\$)	
	Urban	Rural
Costs from premature mortality due to indoor air pollution	10,471,612	59,056,639
Costs from LRI and COPD morbidity in women and children under five, due to indoor air pollution	1,707,075	7,824,013
Costs of illness (medical costs + lost productivity)	5,671,067	62,507,880
Total costs due to indoor air pollution	17,849,754	129,388,532

F.35 **Programs and policies.** Numerous rural energy programs have been launched and are currently ongoing in Nepal; their goal is to provide the rural areas with a broad range of technology options and service delivery approaches. These broadly include rural energy access programs, programs on improved cookstoves and biogas, and renewable energy projects.

- **Rural Energy Development Program** was started in 1996 as a joint program by the Government of Nepal, the United Nations Development Programme (UNDP), and the World Bank. It complements the rural electrification objective of the Government of Nepal's Tenth Five-Year Plan by promoting micro-hydro schemes and solar, wind energy, and biogas technologies. In phase I, the Rural Energy Development Program supported 100 VDCs in 15 districts with the installation of 120 micro-hydro schemes, 1,524 solar home systems, 2,953 toilet-attached biogas plants, and 7,200 improved cookstoves. The program is currently in phase II.
- **Improved Water Mill Support Program** was implemented by the Alternative Energy Promotion Center (AEPC) through the Centre for Rural Technology, Nepal, with the support of the Dutch Government. The improved water mill is a modified version of the traditional water mill and can provide a diverse range of services, such as hulling, oil expelling, saw milling, and electricity generation. The program's goal is to install 4,000 improved water mills by 2007. A total of 937 improved water mills had been installed by the end of March 2005.
- **Energy Sector Assistance Program (ESAP)**, a program of Danish International Development Assistance (DANIDA), is a broad rural energy access project that includes support to AEPC, support to micro-hydro development, promotion of solar energy and improved cookstoves, and financial assistance to renewable energy investments. ESAP phase I (2000–2006) installed 200,000 improved cookstoves, 2,914 kilowatts of micro-hydro, and 69,524 solar home systems (far above the planned targets). Phase II is ongoing, with targets set for improved cookstove installations in the mid-hill regions and the Terai, dissemination of household and institutional gasifiers, and stoves for use in the

high hill regions.

- **Improved Cookstove Program** is a national program executed by AEPC with support from ESAP. It is being implemented in the mid-hill regions of Nepal through local NGOs and the government. Currently AEPC/ESAP works with more than 10 regional service centers providing technical backstopping and quality monitoring to over 100 local NGOs. The next phase of AEPC/ESAP, phase II (2007–2011), targets the installation of 500,000 improved cookstoves, of which 400,000 will be in the mid-hill regions and 100,000 in the high-altitude areas (V. B. Amatya, personal communication, 2006).
- **Biogas Support Program** is the major program to support the promotion of biogas use in Nepal. Currently in phase IV, the program has assisted in the installation of 150,000 biogas plants in 66 districts of Nepal. The success of Nepal’s biogas program can be attributed to strict quality control. The Biogas Sector Partnership Nepal, a nongovernmental organization, is executing phase IV of the Biogas Support Program with the financial and technical support of the Netherlands Development Organization (SNV). The subsidy component for phase IV has been cofunded by KfW, SNV and the Directorate General for International Cooperation of the Netherlands (DGIS), and AEPC. The Biogas Sector Partnership-Nepal has plans to have 200,000 biogas plants installed by 2009 (BSP 2007).

F.36 The micro-hydro, solar photovoltaic (PV), improved cookstove, solar thermal, and biogas subsectors have proven technologies that are being widely disseminated through promoting awareness, capacity building, quality assurance, subsidies, and microfinance. To maximize the utilization of renewable energy resources and contribute towards environmental protection and sustainable rural development, the Government of Nepal is providing subsidies for renewable energy technologies (table F.7). This is expected to improve service delivery and service delivery efficiency in the use of such technologies in rural areas, especially among low-income rural households. This proposed subsidy policy is expected to be revised every two years.

Table F.7 Subsidy Policies to Promote Renewable Energy in Nepal

Renewable energy source	Summary of subsidy policies (Nepalese rupees; Nrs.)
Micro-hydropower	Nrs. 8,000 per household for new project up to 5 kW capacity Nrs. 10,000 per household for new project from 5 kW to 500 kW Nrs. 4,000 per household for add-on project, providing electricity to villages
Solar energy system	<i>Solar home system</i> Subsidy of Nrs. 5,000–7,000 for installing system of 10–18 Watt peak (Wp); and Nrs. 6,000–10,000 for > 18 Wp, depending on remoteness <i>Solar cooker</i> Subsidy is 50% of its market value, but will not exceed Nrs. 4,000 <i>Solar dryer</i> Subsidy to family-sized solar dryer costing up to Nrs. 20,000 is up to 50%; for dryers in rural areas for commercial purpose, subsidy up to 70% <i>Solar water pump</i> Subsidy of solar pumps up to 1,000 Wp capacity will be 75% of its cost
Biogas	20 specified districts of Terai = Nrs. 6,000 per plant 40 specified hilly districts with road access = Nrs. 9,000 per plant 15 specified remote districts without road access = Nrs. 12,000 per plant For small users, 4–6 cubic meters capacity plants subsidy of Nrs. 500 per plant
Improved water mill	Subsidy of Nrs. 9,000 for grinding and Nrs. 18,000 for hulling and grinding in specified districts

	Additional Nrs. 1,500 for grinding and Nrs. 3,000 for hulling and grinding in all specified remote districts not connected by roads
Improved cookstove	No subsidy for households mud improved cookstoves in hills and mid-hills 50% subsidy for improved cookstoves in high mountains, but not more than Nrs. 2,500
Wind energy	Feasible wind electrification projects based on wind chargers to provide lights in village will be provided subsidy at a rate similar to solar home system based on number of households served by each installation

Source: AEPC 2006.

F.37 **Service delivery models for rural energy access.** A number of different service delivery models have been put in place to increase the access to energy through grid-based electrification and also through off-grid-based renewable energy technologies. They include:

- **Private sector supply of household technologies** such as biogas and solar home systems. Private sector companies aggressively market their products and this, together with government support, results in a strong distribution and retail chain. Artisans supplying improved cookstoves to individual homes are another successful example of the private sector-led supply system.
- **Community ownership of micro-hydro and rural electrification networks.** Communities are involved in the projects from the planning to the management stages. Community involvement not only reduces costs, but also accelerates implementation and is sustainable because of communities' ownership of the project.
- **Private company provision of rural electrification services.** Private companies are involved in rural electrification because of their commitment to community development and also as a means of maintaining a good relationship with the local community where their power plants are situated. The rural electrification is cross-subsidized either by income from urban consumers or through the sale of electricity to the National Electricity Authority.

F.38 Nepal has been successful in reaching over 10% of the country's population with a range of renewable energy technologies. The poor rural population's degree of access to energy services depends on the specific technologies in question. Improved cookstoves are low cost and are available to the poor. Electricity from micro-hydropower is generally available to all residents of the community. So that the poor can participate in these programs, they are often allowed to make their contribution in labor and in kind rather than in cash. Solar home systems and biogas are expensive household-level technologies and generally are not affordable to those below the poverty line.

Next Steps

F.39 In the coming years, Nepal plans to invest significantly in rural energy support with specific efforts to improve the use of renewable energy technologies. To improve service delivery and service delivery efficiency in the use of renewable energy technologies in rural areas, especially among low-income rural households, the revised subsidy policy, proposed in 2006, is a step in the right direction. Plans for the coming years include (a) a significant scaling up of biogas and improved cookstove technologies in rural areas; and (b) market development to move the Nepali population (especially the urban poor) "up the energy ladder" to cleaner fuels (such as LPG) in peri-urban and urban areas.

F.40 As the National Improved Cookstove Program (coordinated by AEPC) is scaled up, there is a clear need for better coordination between the several improved cookstove programs, and for

improved consistency in technology (suited to specific ecological regions), design (suited to user needs), costs (financing modalities), training, and quality control. Current improved cookstove technologies are best suited for the mid-hill regions in Nepal. There is a potential demand for about 2.5 million units, but only about 10% of the households are using improved cookstoves. Current attempts at designing and promoting special metal stoves for cooking and space heating in high-altitude areas in Nepal (above 2,000 meters) is likely to expand the market by an additional 500,000 units. Though a government policy has given a 50% subsidy on metal stoves, programs need to be designed for the effective marketing of such stoves in remote areas. Biogas technology is also being scaled up in response to this potential demand. Of the projected demand of 1.9 million households, only about 150,000 households have so far adopted this technology. While biogas has been shown to have positive impacts on the environment, livelihoods, and the economy, poor households are often unable to afford these units due to the high up-front costs. While subsidies provide some support, more work is required to encourage financing of biogas by microcredit institutions that have been reluctant to invest in biogas as it is considered an unproductive sector.

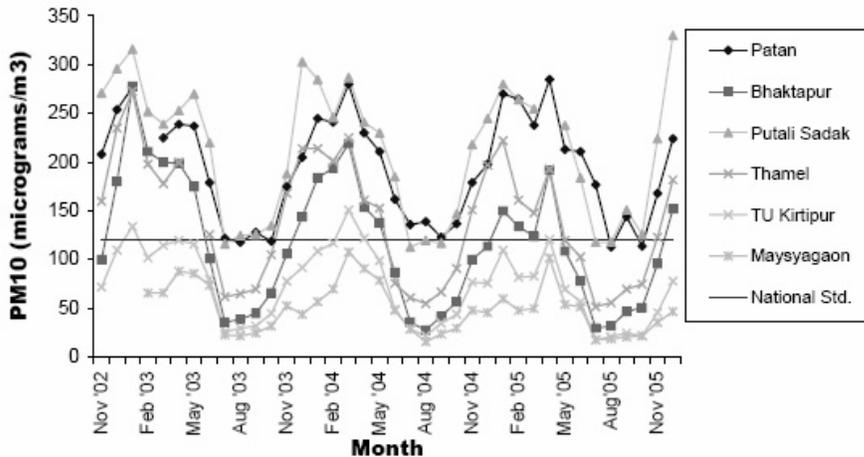
F.41 With these expansion plans, there is an urgent need for quality control, proper dissemination of specific technical standards for biogas and improved cookstove technologies, and the standardization of new improved cookstove models. The potential for expanding the scope of the regional renewable energy service centers, currently in place for biogas technologies, to provide technical backstopping for all renewable energy technologies (improved cookstove, biogas, solar, etc.) should also be explored further. This might prove to be an important cost-cutting measure, as well as providing communities with options for potential upgrades. In addition to technical support, better information dissemination materials (in local languages) should be made available with information on local contacts. User manuals specific to each renewable energy technology should be distributed widely for better operation and maintenance.

Urban Air Pollution

F.42 Air pollution is emerging as a major problem in Nepal's urban centers, particularly in the Kathmandu Valley. The Kathmandu Valley's bowl-shaped topography, which restricts air movement and traps pollutants, makes it especially vulnerable to air pollution. This problem is further compounded by the rapid and haphazard growth leading to dense settlements, the mushrooming of polluting industries, a poor road network, and a largely unmanaged transportation system. Various studies and the data coming from Kathmandu's six monitoring stations show that Kathmandu's air pollution, particularly the concentration of particulate matter (PM), is already several times higher than national and international standards (figure F.3). Similarly, sporadic studies done in other urban areas of Nepal indicate that air pollution is a problem in other cities, for example Birgunj and Biratnagar. Studies have also indicated that the high pollution level, particularly in the dry season, is having serious adverse impacts on the health of the citizens and the economy as a whole.

F.43 The main sources of air pollution in urban areas are vehicles, industries, resuspended road dust, and burning waste. An air pollution inventory done in the Kathmandu Valley indicates that the main sources of air pollution in the valley are vehicle emissions, road dust, and emissions from brick kilns. In 2005, vehicle emissions were responsible for 37% of the total PM₁₀, the main source of air pollution in the valley. Resuspended dust, which is also caused by vehicles, accounted for 25% of the PM₁₀, and brick kilns were responsible for 11% of total PM₁₀ emissions. Himal Cement was the main industry causing air pollution in Kathmandu, but it has now been closed. Air pollution from vehicles is generally due to poor fuel quality, poorly maintained vehicles, inadequate transport-related infrastructure, and lack of proper land use and transport planning. A combination of all these factors is causing air quality to deteriorate in Nepal's cities.

Figure F.3 Concentration of Particulate Matter



Source: ENPHO 2007.

Health Impacts

F.44 High levels of exposure to air pollutants produce symptoms of both upper and lower respiratory tract irritation and can result in severe respiratory diseases, such as asthma and chronic bronchitis. Air pollutants may also affect other systems in the body, for example the cardiovascular system and the central nervous system. In Nepal's urban areas, especially in the Kathmandu Valley, outdoor air pollution typically consists of a complex mixture of multiple pollutants including suspended particulate matter (dust, fumes, mist, smoke) and gaseous pollutants (sulfur compounds, carbon monoxide, nitrogen compounds, organic compounds such as hydrocarbons, volatile organic compounds, and polycyclic aromatic hydrocarbons).

F.45 The most significant health impact of outdoor air pollution has been associated with particulate matter and, to a lesser extent, with ground-level ozone. Particles smaller than 10 microns diameter (PM_{10}), and especially those smaller than 2.5 microns ($PM_{2.5}$), penetrate deep into the human body and cause health impacts such as acute respiratory infection (both upper and lower respiratory tract infections), chronic obstructive lung disease (especially bronchitis), asthma attacks, cardiovascular disease, and lung cancer. Certain population subgroups, such as the elderly, children, and individuals with existing respiratory or cardiovascular diseases, are at increased risk from exposure to particulate matter.

F.46 No long-term epidemiological studies have been conducted to assess the health impacts of Kathmandu's air pollution, but a few studies have undertaken a one-time medical examination of an exposed population or have used dose-response relationships to indicate that the health impacts of Kathmandu's air pollution can be quite severe (box F.1). Records from major hospitals in the Kathmandu Valley also indicate that the number of COPD inpatients in Kathmandu Valley hospitals has increased significantly.

F.47 Increasing air pollution in Nepal's urban areas, especially in the Kathmandu Valley, is imposing a negative economic impact from premature deaths, illness, medical costs, and lost productivity. Costs of health impacts from particulate matter have been assessed, and health conditions such as premature mortality, hospital admissions, restricted activity days, and emergency visits have been considered. In the absence of proper data on treatment costs, informed estimates have been provided by medical experts in Kathmandu.

F.48 Urban air pollution in Nepal is estimated to have caused nearly 7,000 premature deaths in

2005, and about 2,106 new cases of chronic bronchitis. Annual hospitalizations due to urban air pollution are estimated at 4,764, while emergency room visits are at around 93,400. Assessing these health impacts conservatively by using GDP per capita (US\$272), this translates into an annual cost of about US\$19 million.

Box F.1 Studies Estimating Health Impacts of Urban Air Pollution in Nepal

In Nepal, information regarding the health impacts of urban air quality is limited. There have been a handful of studies that have monitored the impacts of urban air pollution, mostly around the Kathmandu area, on vulnerable groups such as children and roadside residents.

- A 1997 World Bank study estimated 85 cases of excess mortality and 1.5 million respiratory symptom days due to PM₁₀ exposure.
- In 1998, leaders conducted a survey among children in Kathmandu based on the secondary data collected from Kanti Children's Hospital. It showed that respiratory infections increased from 10.9% of the total outpatient visits in 1996 to 11.6% of the total outpatient visits in 1998. The other health impacts observed were eye irritation and infection during dry months.
- A study by Nepal Environmental and Scientific Services and the Nepal Health Research Council in 2001 found that about nine children under the age of five die prematurely due to PM₁₀ levels in Kathmandu. In 2002, Clean Energy Nepal surveyed schoolchildren around brick kilns and found that the brick kilns had a significant impact on the health of these children.
- In 2003, a study by Clean Energy Nepal and ENPHO estimated that a reduction of the PM_{2.5} level in Kathmandu by half would result in a reduction of mortality by 7% and of hospital admissions by 24%. The study further suggested that a reduction in the annual average of the PM₁₀ level in Kathmandu to 50 µg/m³ would prevent over 2,000 hospital admissions, 40,000 emergency room visits, 135,000 cases of acute bronchitis in children, 4,000 cases of chronic bronchitis, and 500,000 asthma attacks.
- A recent study (2006) by the Nepal Health Research Council, using the environmental burden of disease (EBD) approach, estimated that the attributable burden due to PM₁₀ concentration in the Kathmandu Valley against the baseline concentration of 10 µg/m³ is 1,926 cases of premature mortality per year.

Source: CEN/ENPHO2003.

F.49 In addition, the costs of illness may be calculated based on estimates of treatment for chronic bronchitis and other morbidity obtained from medical experts in Kathmandu, and based on average treatment costs at private hospitals (to obtain real costs, as opposed to subsidized costs at public hospitals). The cost of illness burden related to hospitalization and outpatient visits from exposure to particulate matter is estimated to be about US\$2 million. Altogether, the total economic costs of urban air pollution in Nepal are estimated at about **US\$21 million**, or **0.29%** of Nepal's GDP (table F.8).

Table F.8 Estimated Health Costs Due to Urban Air Pollution in Nepal

Type of cost	Est. cost (US\$)
Costs of premature mortality from particulate matter (PM _{2.5})	15,186,923
Costs of morbidity endpoints ^a from particulate matter (PM ₁₀)	3,903,578
Costs of illness (medical costs + lost productivity costs)	2,012,000
Total costs attributed to urban air pollution	21,074,932
Total costs as % of GDP	0.29%

a. Includes chronic bronchitis, hospital admissions, emergency room visits, restricted activity days, LRI in children, and respiratory symptoms.

Next Steps

F.50 The Nepal Government has had some success in initiating programs to address the urban air quality problem in Kathmandu, notably the ban on the import of new three-wheelers and two-stroke two-wheelers, new tailpipe emission standards and inspections, and the import of unleaded fuel. With the support of international agencies and national NGOs, Kathmandu now has a good air quality monitoring system. More recently, with the closure of the Himal Cement factory, and the ban on polluting Bull's trench brick kilns, the air pollution level around Kathmandu has begun to stabilize over the last three years. However, the rapid growth in traffic congestion and very high levels of PM₁₀ in the valley's air clearly indicates the need for more action. The Air Quality Management Action Plan recently drafted by the Ministry of Environment, Science, and Technology offers a good starting point from which interventions need to be prioritized according to their level of difficulty in implementation and expected impacts. Complementing this should be a program to increase the institutional capacity of the Ministry and other sector agencies and local governments involved in air quality management. Lastly, but importantly, recognizing the potential role of the public in advocacy, attention should be paid to improving public awareness on the issues of air quality and possible interventions to address the matter.

Appendix G. Estimating Environmental Health Costs

G.1 Environmental health issues, such as indoor and urban air pollution and inadequate water and sanitation, are of growing concern in Nepal. The true costs of these environmental problems need to be assessed to understand their importance. Studies carried out so far have been limited in scope or coverage. An assessment of health impacts and its valuation can be powerful tools for planning and advocacy. This study attempts to provide an estimate of the value of these environmental health issues in Nepal. Results from this study are expected to help policy makers better integrate environmental health into economic development decision making. Translating health impacts into economic costs is seen also to be a powerful means of raising awareness about environmental health issues and facilitating progress toward sustainable development.

G.2 This study is limited in its coverage and scope, and therefore represents an underestimate of the costs of environmental health risks in Nepal. Early conversations and consultations with stakeholders in Nepal revealed that indoor air pollution, inadequate water sanitation, and urban air pollution were seen as the major environmental health risk factors in Nepal. It was therefore decided to restrict this valuation study to these three factors. Other potential environmental health risk factors may have included vector-borne diseases such as malaria, and the health impacts from toxics (increased use of pesticides and insecticides).

G.3 **Methodology and data sources.** Using the methodology outlined in box G.1, the analysis for environmental health costs in Nepal was undertaken for the Country Environmental Analysis. For population and health data, key sources have included the Nepal Demographic and Health Survey (Ministry of Health 2006), the Nepal Living Standards Survey 2003/04 (Central Bureau of Statistics 2004), UNICEF's report on the State of the World's Children (UNICEF 2006), and the World Bank's World Development Indicators (World Bank 2006d). Treatment costs data (costs of health care provider visits) were estimated by key informants (medical doctors from hospitals in Nepal).

Box G.1 Methodology

Step 1. Quantification of Health Impacts

(a) *Determine mortality and morbidity attributable to the environmental risk factors*

- Identify exposed groups of population
 - Examples (under 5 yrs, and > 5 yrs) for water supply and sanitation, indoor air pollution; females > 15 yrs (indoor air pollution)
- Use *dose-response functions* where appropriate (such as for urban air pollution; or *odds ratios* (such as for indoor air pollution) to convert exposures to health impacts
 - Calculate for multiple health endpoints
- Examples for urban air pollution: premature mortality, chronic bronchitis, hospital admissions

(b) *Convert to disability adjusted life years (DALYs) to provide common measure of disease burden for illnesses, premature mortality*

- Use DALY methodology from WHO
- Disability weights, age weights: use subregional figures as proxy for country
 - e.g. diarrhea, disability weight = 0.11
 - e.g. diarrhea, age weight = 0.31 (< 5 yrs), 1.00 (> 5 yrs)
- Discounting at 3%

Step 2. Valuation of Health Impacts

- For mortality:
 - DALYs valued at GDP per capita (human capital approach)
- For morbidity:
 - DALYs valued at GDP per capita to account for cost of pain and suffering (human capital approach)
 - Cost of illness = treatment costs + value of time lost to care-giving and illness

A. Economic Analysis of Impact of Inadequate Water and Sanitation

G.4 Inadequate access to water and sanitation leads to premature deaths and disease, which in turn imposes a cost on Nepal's economy. These costs include the expenses incurred to treat illness from diseases attributed to poor water and sanitation. Other costs include lost productivity from when adults fall sick and stay home from work, or when primary care-givers have to take care of sick children (and potentially lose wages). Only diarrheal disease was included in these cost calculations, which therefore represent an underestimate of the total costs attributed to inadequate water and sanitation in Nepal.

Part I: Quantification of Health Impacts

G.5 **Mortality (children under five years).** The under-five mortality rate was 65 per 1,000 live births (Ministry of Health 2006, preliminary report), and diarrhea is estimated to be responsible for about 22% of under-five deaths. This implies that more than 11,800 children under five die annually from diarrheal disease. According to Hutton and Haller (2004), providing access to water and sanitation to the entire population in the WHO subregion of SEAR-D (which includes Nepal) would reduce the cases of diarrhea by 18.3%. This then translates into 2,174 deaths in children under five years from unclean water and poor sanitation. At 34 DALYs per under-five child death, diarrheal deaths in this age group in Nepal represents a total annual loss of about 73,364 DALYs.

G.6 **Morbidity (children under five years).** About 12% of Nepali children under the age of five had diarrhea in the preceding 10 days. With a population of children under five years of age of 4.15 million (World Bank 2006d), the estimated number of cases of diarrheal disease among children is about 13 million cases per year. Key parameters and assumptions:

- Average duration of diarrheal disease of four days;
- Severity weight of 0.11 (Murray and Lopez 1996);¹²
- Average age weight of 0.31 (WHO).

From these calculations, the number of DALYs lost from morbidity in children under the age of five years is estimated at 879 DALYs per year.

G.7 **Morbidity (population above five years).** As in many developing countries, most of the information on diarrheal incidence in Nepal comes from household surveys, usually the Demographic and Health Survey, which measures this indicator only for children under five years of age (as they are the most severely impacted). Therefore, this study uses results from studies conducted in Colombia, Vietnam, and the provinces of Qena and Damietta in Egypt, where the

¹² The severity weight of 0.11 was assumed given a scale of 0 (being in perfect health) to 1 (representing death).

average prevalence ratio is 5. Therefore, for Nepal about 2.4% of the population over the age of five (12% divided by 5) is estimated to have diarrheal diseases over a 10-day period. With a population over five years of age of about 23 million, the estimated number of cases of diarrheal disease is about 14.4 million per year. Key parameters and assumptions:

- Average duration of diarrhea of four days;
- Severity weight of 0.11 (Murray and Lopez 1996);
- Age weight of 1.0 (WHO).

From these calculations, the number of DALYs lost from morbidity among the population over five years of age is estimated at 3,174 DALYs per year.

Part II: Valuation of Health Impacts

G.8 Valuing DALYs lost. From part I of this analysis, the total number of DALYs lost from both mortality and morbidity associated with diarrheal diseases was approximately 77,417. Using the Human Capital Approach (HCA), the total annual cost of lost DALYs from diarrheal diseases due to inadequate water and sanitation ranges from a low of US\$79 million to a high of US\$101 million (equivalent to an average of US\$89 million, which is 1.2% of Nepal's GDP).

G.9 Valuing the costs of illness. Children with *mild and moderate cases* of diarrhea are usually treated at home with oral rehydration solutions or other forms of oral rehydration therapy, such as weak tea, or home brews. In Nepal, about 29.3% (Ministry of Health 2006) of diarrhea cases are treated at home using oral rehydration therapy (estimated oral rehydration solution costs = US\$1.7 per case). With nearly 700,000 cases of mild and moderate diarrhea treated at home, the total medical costs are estimated at US\$1.8 million per year. Children with *severe cases* of diarrhea are often taken to a primary health clinic for treatment; in Nepal this constitutes about 26.9% of diarrhea cases (Ministry of Health 2006). At a cost of US\$49 (Nrs. 3,500) per case of severe diarrhea in children, this translates into US\$31 million per year.

G.10 In terms of lost wages due to care-giving, for each case of severe diarrhea, it is assumed that one day equivalent (assumed US\$1.2, weighted average of rural and urban household wages) is taken by a care-giver to look after a child.

G.11 Also for Nepalis above five years of age, the number of diarrheal cases taken to health care clinics for treatment is estimated to be half that of children under five – i.e. about 13.5%. Again using costs per treatment estimated by doctors in Kathmandu, total treatment costs of nearly US\$20 million per year were estimated. In addition, due to diarrheal episodes, Nepali adults (above five years) lose US\$12 million per year in lost wages. Altogether the total economic costs due to inadequate water and sanitation are estimated at about **US\$89 million** (ranging from US\$78.5 to US\$100.6 million), or **1.21%** (ranging from 1.06% to 1.36%) of Nepal's GDP (table G.1).

G.12 Since access to water and sanitation varies considerably between rural and urban areas in Nepal, these costs have been disaggregated spatially as well. In rural areas, the total costs from inadequate access to water and sanitation are estimated to be about US\$74 million. In urban areas, with far better access to water, sanitation, and sewage disposal facilities, economic costs are estimated to be about US\$12.2 million (table G.2). However, even though urban coverage figures are much better, the intra-urban inequalities are often masked in the averages – slum dwellers and the urban poor are often far worse off in terms of access to environmental services than higher-income urban dwellers.

Table G.1 Health Costs Due to Inadequate Water and Sanitation in Nepal

Item	Base case	Lower bound ^a	Upper bound ^a
% cases of death and illness avoidable with improved water supply and sanitation	18.3%	16.5%	20.1%
Diarrhea deaths in children from lack of water supply and sanitation	2,174	1,956	2,391
<i>Total mortality (DALYs)</i>	73,364	66,028	80,701
Diarrheal illness in children < 5 from lack of water supply and sanitation (days)	9,510,877	8,559,790	10,461,965
Diarrheal illness in adults from lack of water supply and sanitation (days)	10,530,310	9,477,279	11,583,341
<i>Total morbidity (DALYs)</i>	4,053	3,647	4,458
Total DALYs	77,417	69,675	85,159
Value of a DALY: GDP per capita (US\$) for Nepal	272	245	300
<i>Valuation of DALYs (US\$)</i>	21,087,877	17,081,181	25,516,332
<i>Cost of illness (US\$)</i>	68,276,642	61,455,160	75,111,862
Total costs due to inadequate water supply and sanitation (US\$)	89,364,520	78,536,341	100,628,194

a. Lower bound estimate assumes cases of illness and death avoidable with improved water supply and sanitation are 16.5%; value of a DALY is US\$245. Upper bound estimate assumes cases of illness and death avoidable with improved water supply and sanitation are 20.1%; value of a DALY is US\$300.

Table G.2 Estimated Rural and Urban Costs Due to Inadequate Water and Sanitation

Item	Estimated costs (US\$)	
	Urban	Rural
Costs of diarrheal deaths potentially averted by water supply and sanitation interventions	3,388,683	20,198,440
Costs of diarrheal cases potentially averted by water supply and sanitation interventions	269,669	789,214
Costs of illness (medical costs + lost productivity costs)	8,542,690	53,019,747
Total costs due to inadequate water supply and sanitation	12,201,042	74,007,401

B. Economic Analysis of Impact of Indoor Air Pollution

G.13 The use of biomass for cooking, and poor ventilation, result in acute lower respiratory infection (LRI) in women and young children under five. In addition, prolonged exposure to smoke also results in chronic obstructive pulmonary disease (COPD) in women. With very few studies on smoke exposure monitoring in Nepali households, data from similar monitoring carried out in developing countries is used to estimate the proportion of children and women affected by

indoor air pollution.

Part I: Quantification of Health Impacts

G.14 Estimating exposed population. In Nepal, 84.8% of the population uses firewood and straw for cooking (Central Bureau of Statistics 2004). Estimates for SEAR-D exposure rates to indoor smoke (Smith, Mehta, and Maeusezahl-Feuz 2004) have been used to estimate that exposed population share in Nepal from fuel use is 83.5% (sensitivity range from 56.6% to 85.0%).

G.15 Estimating attributable ratios. Annual new cases of acute respiratory infection and COPD morbidity and mortality (D_i) from fuelwood smoke was estimated from the following equation:

$$D_i = PAR * D_i^B,$$

where D_i^B is baseline cases of illness or mortality, i is estimated using cause-specific death rates for SEAR-D region, and PAR is given by:

$$PAR = PP * (OR - 1) / (PP * (OR - 1) + 1),$$

where PP is the % of population exposed to fuelwood smoke, and OR is the odds ratio.

G.16 In the absence of Nepal-specific odds ratios, this analysis using the figure of 2.3 from Smith, Mehta, and Maeusezahl-Feuz 2004. This figure means that the probability of getting an acute respiratory illness when using biomass fuels is an estimated 2.3 times higher than if not using biomass fuels.

G.17 Mortality and morbidity from respiratory infections. To approximate mortality data for the Nepalese population, baseline data on acute respiratory infection and COPD deaths available for the WHO SEAR-D subregion have been used. Every year, some 11,000 children under the age of five die due to LRI in Nepal. Among female adults, it is estimated that nearly 6,000 die due to LRI or COPD. For baseline data on morbidity, the Nepalese population at risk is multiplied by the incidence rate of the illness considered. Two weeks' incidence of acute respiratory infection in children is 8% (Ministry of Health 2006). The incidence of acute respiratory infection for the female population over 15 is estimated to be 0.6%. The incidence of COPD in the female population over 15 is taken from Shibuya, Mathers, and Lopez 2001.

G.18 Multiplying the baseline data for mortality and morbidity from respiratory infections by the attributable ratios provides estimates for deaths and illness from indoor air pollution in Nepal. This analysis shows that every year, indoor air pollution prematurely kills an average 5,223 children in Nepal. In terms of morbidity, there are 4.1 million cases of LRI estimated in young children and 0.6 million in women. Furthermore, an additional 44,000 cases of COPD are found in women in Nepal. Converting these deaths and illnesses to DALYs reveals a total of 287,827 DALYs are lost due to indoor air pollution every year.

Part II: Valuation of Health Impacts

G.19 Valuing DALYs from both sickness and death from respiratory infections and COPD as equivalent to GDP per capita of US\$272 (using the human capital approach), this translates into an annual cost of about US\$78.4 million.

G.20 Costs of illnesses are based on the information (preliminary estimates from Ministry of Health 2006) that 42.9% of children with acute respiratory infection are taken to a health provider and on the assumption that for each case the care-giver loses the equivalent of about one day of work to take care of the child. This time is valued using the average rural household wage income (estimated at US\$1.5 per day). The total cost of illness – treatment costs as well as lost productivity due to care-giving – attributed to indoor air pollution is estimated at about US\$69

million.

G.21 The total impacts from indoor air pollution are the sum of health costs from excess mortality and morbidity, and the costs of illness. Estimated total damage costs from indoor air pollution range from US\$110.4 million to US\$182.3 million per year (equivalent to an average **US\$147.3 million**, which is almost **2.0%** of Nepal's GDP) (table G.3).

Table G.3 Mortality and Morbidity Due to Indoor Air Pollution

Indoor air pollution	DALYs	Value (US\$)	Value as % of GDP
Mortality due to LRI in children under five	176,277	48,016,629	0.65%
Morbidity due to LRI in children under five	6,910	1,882,238	0.03%
Mortality due to LRI in women	40,239	10,960,804	0.15%
Morbidity due to LRI in women	4,140	1,127,709	0.02%
Mortality due to COPD in women	36,642	9,980,965	0.14%
Morbidity due to COPD in women	23,620	6,433,932	0.09%
Costs of illness (medical costs + lost productivity costs)		68,947,632	
Total costs due to indoor air pollution		147,349,908	1.99%

G.22 In Nepal, when analyzing costs associated with indoor air pollution, it is useful to consider a disaggregation by spatial location (urban versus rural) as well as by ecological region (mountains, mid-hill regions, and Terai). Due to the inadequate disaggregated data by ecological region, this analysis of environmental health costs from indoor air pollution has only been undertaken in rural versus urban areas. Given the high percentage of biomass fuel use in rural regions, the associated economic costs in terms of health impact and productivity loss is several times higher than similar valuation done for urban areas. In rural Nepal, the total costs of indoor air pollution are estimated at nearly US\$130 million, while that in urban areas of Nepal is estimated to be US\$17.8 million (table G.4). With growing urbanization in Nepal and increasing urban poor (who live in congested settlements and cook with biomass), the urban health costs are expected to rise.

Table G.4 Estimated Rural and Urban Health Costs Due to Indoor Air Pollution in Nepal

Type of cost	Estimated cost (US\$)	
	Urban	Rural
Costs from premature mortality due to indoor air pollution	10,471,612	59,056,639
Costs from LRI and COPD morbidity in women and children under five, due to indoor air pollution	1,707,075	7,824,013
Costs of illness (medical costs + lost productivity)	5,671,067	62,507,880
Total costs due to indoor air pollution	17,849,754	129,388,532

C. Economic Analysis of Impact of Urban Air Pollution

G.23 Increasing air pollution in Nepal's urban areas, especially in the Kathmandu Valley, is imposing a negative economic impact from premature deaths, illness, medical costs, and lost

productivity. Costs of health impacts from particulate matter have been assessed, and health conditions such as premature mortality, hospital admissions, restricted activity days, and emergency visits have been considered. In the absence of proper data on treatment costs, informed estimates have been provided by medical experts in Kathmandu.

Part I: Quantification of Health Impacts

G.24 Monitoring air pollutants. The air quality monitoring system in the Kathmandu Valley is still relatively recent, and consists of six monitoring stations in Putali Sadak, Patan Hospital, Thamel, Bhaktapur, Kirtipur, and Matsyagaon. Because monitoring information was available for only a few cities in Nepal, PM₁₀ levels based on average projections for all urban areas of Nepal (estimated by the Development Economics Research Group at the World Bank) were used.¹³ Most recent estimates for annual average PM₁₀ emissions in urban Nepal are 114 µg/m³. Fine particulate matter (PM_{2.5}) is estimated to be 64% of PM₁₀ levels (CEN/ENPHO 2003).

G.25 Determining exposed populations. For this part of the methodology, the study assumes that 80% of Nepal’s urban population is exposed to air pollution. Some health outcomes primarily affect only certain segments of the population, such as restricted activity days for adults, and LRI in children and women. For Nepal as a whole, population data were available by various age groups.

G.26 Using established dose-response coefficients. The best available research evidence on the mortality effects of ambient particulate pollution (PM_{2.5}) on a population are the dose-response coefficients of Pope et al. (2002). For morbidity effects, dose-response coefficients from the Ostro (1994) global review of health impact studies (PM₁₀) and the Abbey et al. (1995) estimates of chronic bronchitis associated with particulates (PM₁₀) are used (table G.5).

Table G.5 Urban Air Pollution Dose-Response Coefficients

Annual health effect	Dose-response coefficients	Per 1 µg/m³ annual average ambient concentration of:
Mortality (% change in cardiopulmonary and lung cancer mortality)	0.8%	PM _{2.5}
Chronic bronchitis (% annual incidence)	0.9%	PM ₁₀
Respiratory hospital admissions (per 100,000 population)	1.2	PM ₁₀
Emergency room visits (per 100,000 population)	23.5	PM ₁₀
Restricted activity days (per 100,000 adults)	5,750	PM ₁₀
Lower respiratory illness in children (per 100,000 children)	169	PM ₁₀
Respiratory symptoms (per 100,000 adults)	18,300	PM ₁₀

Sources: Mortality dose-response coefficient (PM_{2.5}) from Pope et al. 2002; morbidity dose-response coefficients from Ostro 1994 and Abbey et al. 1995 (PM₁₀).

G.27 Calculating health impacts. Using the WHO Global Burden of Disease methodology, the health effects of urban air pollution are converted to DALYs. In 2005, an annual average concentration of 10 µg/m³ was chosen by the World Health Organization as the long-term guideline value for PM_{2.5}. This figure is used in the Nepal analysis along with the appropriate dose-response coefficients to calculate the health impacts.

¹³ <http://www.worldbank.org/nipr/Atrium/mapping.html>.

Part II: Valuation of Health Impacts

G.28 In Nepal, the total number of mortality and morbidity DALYs attributed to urban air pollution was found to be approximately 70,000 in 2005. Using the human capital approach, this translates into an annual cost of US\$16 million, ranging from US\$13.4 million to US\$19.3 million. The cost of illness burden related to hospitalization and outpatient visits from exposure to particulate matter is estimated to be about US\$2 million. Combining these treatment and lost productivity costs along with costs of mortality and morbidity, the total economic costs of urban air pollution in Nepal are estimated at about **US\$21 million**, or **0.29%** of Nepal’s GDP (table G.6).

Table G.6 Estimated Health Costs Due to Urban Air Pollution in Nepal

Effects/costs	Cases	DALYs	Valuation (US\$)
Premature mortality from particulate matter (PM _{2.5})	6,969	55,754	15,164,991
Morbidity endpoints from particulate matter (PM ₁₀)			
<i>Chronic bronchitis (PM₁₀)</i>	2,106	4,633	1,260,275
<i>Hospital admissions (PM₁₀)</i>	4,764	76	20,734
<i>Emergency room visits (PM₁₀)</i>	93,461	421	114,396
<i>Restricted activity days (PM₁₀)</i>	13,919,461	4,176	1,135,828
<i>Lower respiratory illness in children (PM₁₀)</i>	261,868	1,702	462,983
<i>Respiratory symptoms (PM₁₀)</i>	44,300,197	3,323	903,724
Costs of illness (medical costs + lost productivity costs)			2,012,000
Total costs attributed to urban air pollution (US\$)			21,074,932
Total costs as % of GDP			0.29%

G.29 Nepal’s economic costs associated with lack of water and sanitation and indoor and urban air pollution amounts to **US\$258 million**, or **3.5%** of the country’s GDP (table G.7). This is comparable in range to other such valuation studies on environmental health carried out in the South Asia region.

Table G.7 Aggregate Environmental Health Costs for Nepal

	US\$ (millions)	% of GDP
Indoor air pollution	\$147.3 (\$110.4–\$182.3)	2.0% (1.49–2.47%)
Lack of water and sanitation	\$89.2 (\$78.4–\$100.4)	1.21% (1.06–1.36%)
Urban air pollution	\$21.1 (\$17.7–\$24.6)	0.29% (0.24–0.33%)
Total	\$258 (\$206.6–\$307.3)	3.49% (2.79–4.16%)

G.30 This analysis of economic costs of environmental risk factors in Nepal is an underestimate of the true economic costs. Due to the lack of availability of country-specific data on other disease outcomes, this analysis was restricted to fewer health endpoints. Additionally, international and subregion (SEAR-D) estimates were sometimes used as proxy for Nepal, in the absence of related country data. For example, in indoor air pollution, the lack of exposure monitoring data for Nepal meant that the analysis used odds ratios from international studies.

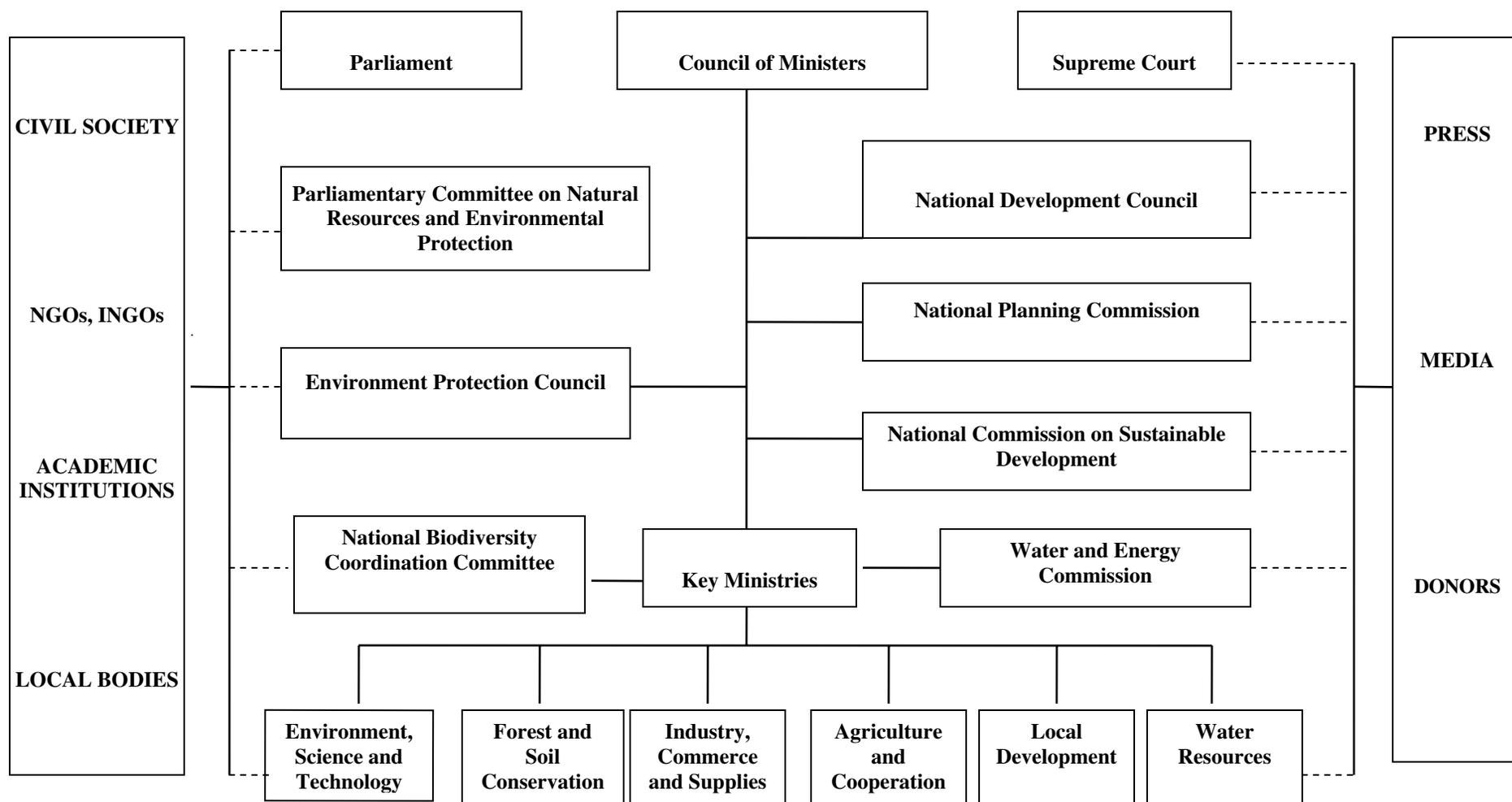
Furthermore, this analysis represents a first step in highlighting the importance of environmental health issues in Nepal. Subsequent economic analyses, such as cost-benefit analyses, would serve as important guidance to help the Nepal Government choose appropriate environmental health interventions.

Appendix H. List of Environment-Related Laws and Other Measures of Nepal

#	Measure	Date	Purpose
1	Private Forest Nationalization Act	1957	Nationalizes all the natural forests in the country
2	Aquatic Life Conservation Act	1961	Forbids the introduction of poisonous, noxious, or explosive materials into a water source or the destruction of any dam, bridge, or water system with the intent to catch or kill aquatic life
3	Land Act	1965	Provides for land consolidation and development along with control of land degradation
4	Forest Protection (Special Arrangement) Act	1967	Conserves and manages forest and biodiversity
5	Forest Areas Land Act	1971	Land ownership and usage of forests
6	Plant Protection Act	1972	Monitors the selling, import and export, and transplantation of various kinds of plants and their products from one district to another; regulates the use of pesticides; establishes plant quarantine station; deals with the prevention and treatment of plant disease
7	National Parks and Wildlife Conservation Act	1973	Protects wildlife and wetlands; defines wildlife as any wild animal, including mammals, birds, fish, and reptiles
8	Pasture Lands Nationalization Act	1974	Guidelines for management of pasture lands
9	Tourism Act	1975	Makes it mandatory for mountaineers to keep the environment clean and abide by the specified conditions
10	Soil and Watershed Conservation Act	1982	Preserves the comfort and financial interest of the public by controlling natural disasters such as flooding and landslides
11	King Mahendra Trust for Nature Conservation Act	1982	Formulates rules for conservation, maintenance, and management of wildlife and other natural resources
12	Solid Waste Management and Resource Mobilization Act	1986	Ensures solid waste management through the collection, transportation, recycling, disposal, and classification of hazardous waste
13	Town Development Act	1987	Conserves wildlife and vegetation, including natural environment within the reserved areas
14	Management and Resource Mobilization Act	1987	Manages solid waste and controls air, water, and soil pollution from solid waste
15	Nepal Water Supply Corporation Act	1989	Takes necessary steps to control water pollution and provides legal provision to penalize those who are found contaminating drinking water
16	Seed Act	1989	Deals with registration, certification, ownership, and release of seeds

#	Measure	Date	Purpose
17	Pesticide Act	1991	Calls for the registration of pesticides before they can be imported, exported, and produced. Requires container and label specification and licensing for any person, institution or agency selling, formulating, or professionally spraying pesticides
18	Vehicle and Transport Management Act	1992	Defines and prescribes necessary standards for vehicles
19	Electricity Act	1992	Makes provision for licensing to carry out electricity generation with no substantial adverse effects on environment
20	Industrial Enterprises Act	1992	Regulates industries by only providing permits to those industries that will not have significantly adverse effect on the environment
21	Water Resources Act	1992	Minimizes environmental damage to wetlands, especially to lakes and rivers, through the requirement of (a) environmental impact assessment; (b) detailed economic, technical, and environmental report prior to the survey or use of water resources; and (c) environment study and subsequent report before a license is granted
22	Forest Act	1993	Ensures the development, conservation, and proper utilization of forests and forest products
23	Pesticides Regulation Act	1993	Regulates pesticide entry into the country by permitting the import of only registered chemicals
24	Buffer Zone Management Rules	1996	Conserves buffer zone around forest, wildlife, natural environments and natural resources, and biodiversity; provides for development work in this area
25	Environment Protection Act	1997	Makes necessary arrangements to open the EIA report to the general public so they may render opinions and suggestions
26	Environment Protection Rules	1997	Provides for the institutionalization of the EIA system, pollution control, management of environmental conservation areas, and management of environment fund
27	Kathmandu Valley Development Authority Act	1998	Provides guidelines for the Kathmandu Valley environment
28	Animal Health and Livestock Services Act	1998	Provides for import regulation through quarantine check-posts and standard formulation for biochemicals
29	Buffer Zone Management Guidelines	1999	Provides for sustainable utilization and conservation of natural resources in the buffer zones and sustainable protection of national parks and reserves

Appendix I. Key Environmental Institutions in Nepal



INGO = international nongovernment organization, NGO = nongovernment organization

Source: Compiled from various sources by ADB/ICIMOD 2006.

Appendix J. Environment-Related Court Cases in Nepal

No.	Name	Filing date	Verdict date	Petitioner	Respondent	Major issues	Results/achievement
1	Drinking water case	July 1999	June 2001 (2058-3-26)	Pro Public	Nepal Water Supply Corporation et al.	Fresh and pure drinking water to be provided by the government. It was reported that the people had to consume contaminated water instead of pure drinking water supplied by the government-owned corporation.	The duty of the Nepal Water Supply Corporation must be maintained, as stipulated by the law, to provide clean and fresh water. Nepal Water Supply Corporation has yet to provide safe water to all its clients.
2	Balkhu open space case	July 1997 (054-4-20)	Jan. 2002 (2058-9-17)	Pro Public	Council of Ministry et al.	The government decided to provide ownership of the open space to the state-run media Gorkhapatra Corporation to construct its building. The case was filed for the protection of the open space at Balkhu, Kathmandu.	The Court quashed the government decision to grant ownership to the government-owned Gorkhapatra Corporation and directed the government to use that land only for common public purposes. The public land was thus protected.
3	Forest protection case (TCN)	Sept. 1998 (2055-5-25)	(2059-2-13)	Pro Public	Council of Ministry et al.	The government decision to give a monopoly of cutting and selling timbers to the government-owned Nepal Timber Corporation was challenged.	The Court quashed the petition by reasoning that the decision of the government is of an administrative and policy nature, which is in line with legal provisions.
4	Pollution standard case	July 1999 (056-3-17)	Nov. 2001 (058-10-26)	Pro Public	Ministry of Population and Environment	Asked for introduction of water, air, and noise pollution standards under Environment Protection Act as it is a statutory duty of the Ministry.	The Court ordered the respondent to set standards for water, air, and noise pollution. The government has since issued standards for ambient air quality and drinking water quality.
5	Water pollution standard case	Sept. 1999 (056-6-13)	Aug. 2001 (058-4-12)	Pro Public	Ministry of Water Resources et al.	Setting standards of water pollution for different purposes.	The Court issued a mandamus to the Ministry of Population and Environment and the Ministry of Water Resources to set a tolerance limit on the pollution of water resources and a standard of water resources to be used for different purposes. This has not yet been done.
6	Import of substandard Indian vehicle case	Sept. 2000 (057-6-5)	Sept. 2001 (2058-6-11)	Pro Public, Leaders Nepal & Martin Chautari		The decision of government to import Indian vehicles by self-certification of manufacturers is contrary to the Nepal Vehicle Emission Standard 2000. On the basis of the Prime Minister's agreement with	The Court upheld the decision of the government. However, it ruled that as per the Nepal Vehicle Emission Standard 2000, it was not appropriate to rely on the certificate issued by the manufacturer company of a foreign country. The Court directed the

No.	Name	Filing date	Verdict date	Petitioner	Respondent	Major issues	Results/achievement
						India to allow import of Indian vehicles into Nepal and on the basis of self-certification by the manufacturers, the Ministry of Population and Environment directed accordingly, to import Indian vehicles without conformity of production.	government to set up an in-house certification mechanism with testing facility for type approval and conformity of production. This certification mechanism is not yet in place.
7	Bagmati River dumping case (Balkhu-Chovar)	Jan. 2001 (057-10-10)	Dec 2001 (2058-9-20)	Pro Public et al.	HMG Council of Ministers et al.	To maintain the ecology of the Bagmati River, the demand was to stop dumping of municipal waste on its banks.	The Court issued a mandamus to the cabinet, Ministry of Local Development, Ministry of Population and Environment, Kathmandu Metropolitan City, and Lalitpur Sub-Metropolitan City to manage municipal waste with full compliance with scientific measures under existing environmental laws, including EIA. The municipalities, however, still dump waste on the banks of the Bagmati.
8	Rani Pokhari case (1)	(052)	9 June 1997 (20054-2-27)	Pro Public et al.	HMG Council of Ministers et al.	To protect the Rani Pokhari area, a historical cultural heritage site situated in the heart of Kathmandu City and built by King Pratap Mall 300 years ago, from encroachment, the petition demands the maintenance of the pond by demolishing the building built by Nepali Police, and its renovation as a good public park and open space.	The Court did not order the demolition of the police building but made a directive order in the name of the Council of Ministers for the formulation of a uniform national policy in religiously, culturally and historically important areas.
9	Waste dump in Seti River case	20 Nov. 2001 (058-8-5)	2 June 02 (0059-2-19)	Pro Public et al.	Pokhara Sub-Metropolitan City	The petition called for a halt to the dumping of untreated municipal waste into the Seti River by Pokhara Sub-Metropolitan City.	The Court issued a mandamus to the respondents not to discharge the wastes and effluents without treatment.
10	Pew Lake protection case	27 Nov. 2001 (058-8-11)	7 April 2002 (058-12-25)	Pro Public et al.	Pokhara Sub-Metropolitan City	Pokhara's Phewa Lake is famous for its beauty. The lake was being polluted by Pokhara Sub-Metropolitan City and nearby hotels and restaurants. The demand was to protect Phewa Lake from pollution.	The Court issued a mandamus to the Pokhara Sub-Metropolitan City to keep the lake clean and free from pollution and wastes.

Appendix K. Summary of Proposed Action Plan Recommendations

Key to timeline:

Short term: 1 year

Medium term: 2–3 years

Long term: 3–5 years

Key issues	Actions	Responsible institutions	Timeline
Strengthen EIA/IEE system	Clarify policy gaps in Environment Protection Act and Rules implementation, including: Strengthen screening criteria Clarify project scoping Strengthen site-specific analysis Improve public participation process Simplify clearance process	Ministry of Environment, Science, and Technology; sector agencies	Short term
	Develop sector-specific guidelines and manuals for EIAs and IEEs	Ministry of Environment, Science, and Technology; sector agencies	Short to medium term
	Require comprehensive training on EIA policies and process	Sector agencies; private sector; civil society	Short to medium term
	Establish environmental information clearinghouse for EIA and other issues	Ministry of Environment, Science, and Technology; sector agencies	Medium to long term
Clarify national roles and responsibilities	Consider establishment of independent environmental enforcement agency	National Planning Commission; Ministry of Environment, Science, and Technology	Medium to long term
	Clarify agency roles in monitoring and enforcement	Ministry of Environment, Science, and Technology; sector agencies	Short to medium term
	Dedicate resources for monitoring and enforcement	Ministry of Environment, Science, and Technology; sector agencies	Short to medium term
	Establish mechanisms for reporting and documenting enforcement	Ministry of Environment, Science, and Technology; sector agencies	Medium to long term
Enhance urban service delivery	Explore alternatives to current solid waste management system	Kathmandu Metropolitan City; DDCs; VDCs	Short to long term

Key issues	Actions	Responsible institutions	Timeline
	Endorse and implement proposed Air Quality Management Action Plan	Ministry of Environment, Science, and Technology; sector agencies; Kathmandu Metropolitan City	Short to long term
	Introduce regulatory and financing incentives to promote industry compliance	Ministry of Environment, Science, and Technology; Ministry of Industry, Commerce, and Supplies; industry associations	Medium to long term
Empower local governments	Explore funding sources to provide for urban environmental services	Ministry of Local Development; Kathmandu Metropolitan City; DDCs; VDCs	Short to long term
	Provide greater flexibility in hiring of local administrative staff	Ministry of Local Development; Kathmandu Metropolitan City; DDCs; VDCs	Short to medium term
	Implement pilot programs for local environmental governance	Ministry of Local Development; Kathmandu Metropolitan City; DDCs; VDCs	Medium to long term
	Provide specialized training in urban environmental management issues	Ministry of Local Development; Ministry of Environment, Science, and Technology; Kathmandu Metropolitan City; DDCs; VDCs	Short to medium term
Enhance role of stakeholders	Involve civil society organizations in monitoring environmental compliance	Ministry of Environment, Science, and Technology; sector agencies; civil society organizations	Short to medium term
	Promote utilization of private sector in delivering environmental services	Kathmandu Metropolitan City; DDCs; industry associations	Short to medium term
	Support oversight role of judiciary and Parliament	Judiciary and Parliament	Medium to long term

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