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**Environmental and Natural Resources Management
in South Asia:
An Assessment of Issues and Opportunities**

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FINAL REPORT

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I. Introduction

1.1 Significance of Sound Environmental Management in South Asia

The region of South Asia—defined for this analysis as the seven countries of Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, and Sri Lanka—has been the cradle of several great civilizations and is today home to more than one-fifth of the world's people. With an area roughly the same as that of the continental United States but with four times the population, it is already one of the most densely settled regions of the world. Yet, its population growth rate exceeds the developing world's average. This places strains on key natural resources—water, air, land, sea—that will continue to grow if measures are not taken simultaneously to reduce the rate of human expansion and to manage these resources wisely.

Encouraging stability, economic development, and democracy in this region is of vital interest to the United States. The repercussions of political and security turmoil in the region—such as in Afghanistan and Kashmir or the incipient nuclear arms race between India and Pakistan—illustrate that South Asian instability can exacerbate other negative regional and global phenomena, including terrorism, and can interfere with both the peaceful conduct of commerce and evolution of democratic forces. Competition over increasingly scarce natural resources represents a very real threat to regional security. Driven by the demands of its already large (in absolute terms) middle class, South Asia also is becoming an important trading partner for the United States and in the global marketplace. The region is confronting both the positive and negative economic and cultural dimensions of globalization while coping with gross inequities in the distribution of development's benefits within society. This poses severe challenges to the region's established, though still maturing, democratic institutions, which continue to evolve as models observed by the rest of the developing world.

"I am profoundly convinced that the future of life on earth as we know it will be decided in the Asia-Pacific region during the first few decades of the 21st Century."

Maurice Strong
President, UN University for Peace
Closing Remarks at the Second Mayor's
Asia-Pacific Environmental Summit
Honolulu, May 2001

The sheer size of South Asia's human population and the growing economies of the region present both opportunities and challenges to global environmental systems. Foremost among the challenges is the region's rapidly increasing level of greenhouse gas emissions that result from an enormous population base that uses fossil fuels—especially coal—as the principal source of energy for a burgeoning power sector. If significant mitigation measures are not undertaken

soon, emissions are expected to surpass those of the United States during the early part of the 21st Century.

1.2 Background on the Assessment and Associated Dialogue

These and related considerations prompted the Asia and Near East (ANE) Bureau of the US Agency for International Development (USAID), in close cooperation with the US State Department's Office of Oceans, Environment, Technology and Science (State/OES), to commission the *South Asia Regional Environmental Profile*. The profile's main purpose was to review and inform US Government (USG) country-level and regional assistance programs in South Asia on significant current and likely future environmental and natural resources management issues affecting US interests. The study also was to form the basis for organized discussion on these topics among US agency representatives and between these representatives and development experts or stakeholders in the region—with this dialogue an important associated outcome of the exercise.

As the study got underway, it quickly became apparent that a number of similar country- and regional-level reviews of environmental and/or natural resources management issues were available or in process. These included a recently completed environment strategy exercise by the World Bank for the South Asia region; an ongoing review of key issues—including environmental—in the “South Asia Growth Quadrangle” (Bhutan, Bangladesh, India and Nepal) by the Asian Development Bank; and a range of country studies by these organizations as well as United Nations Environment Program. (*State of the Environment 2001* reports are in preparation for all South Asian nations as background to the 2002 World Summit on Sustainable Development.) Thus, it was decided that this study would include a thorough review of this literature and that, rather than a “profile,” an assessment of conditions and trends and their implications for programming would form the basis for the dialogue and report. Further, a Web-based guide to this literature and other on-line resources would also be produced as a user-friendly aid to further study and analysis. (See the list of references given in this report and the associated Web site located at: <http://www.irgltd.com>.)

This activity was implemented through the Environmental Policy and Institutional Strengthening Indefinite Quantity (EPIQ) Contract of the USAID Global Bureau Environment Center. The authors of this report served as both the core team conducting the assessment and organizers of the associated dialogue. Additional contributing authors assisted with the analysis of selected topics, as well as with the preparation of the reference collection of studies, databases, and Web sites of relevance to this subject. The EPIQ consortium members involved were International

Resources Group as the lead organization, with inputs from Winrock International, the World Resources Institute, and Management Systems International.

The South Asia region, as noted, was defined for the purposes of this assessment as comprising Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka. The focus of the analysis was on the USAID-presence countries of Bangladesh, India, Nepal and Sri Lanka, though background data and reference collection—and some limited analysis—also was conducted for Afghanistan, Bhutan, the Maldives, and Pakistan.

As an important input to the study—and in keeping with the associated objective of furthering dialogue among the USG and regional stakeholders and experts—the core team members conducted a brief trip to South Asia during the period of January 7–24, 2001. Visits were made to Sri Lanka, Bangladesh, Nepal, and India. The team also attended the “Greening of Industry Network–Asia Conference” in Bangkok to hold meetings with participants from and/or with a knowledge of relevant issues in South Asia. One team member visited the Asian Development Bank in Manila for further information sharing, and another member made a private visit to Pakistan, not sponsored by USAID, but allowing for some non-governmental discussions. The results of this trip and related analyses were presented in a Trip Report entitled, *South Asia Regional Environmental Profile: Field Consultations and Associated Findings*, and distributed to those with whom the team consulted.

A “Joint South Asian State Department–USAID Environment, Science and Technology Officers Conference (SA-ESTOC)” was held in Kathmandu, Nepal, from April 17–20, 2001, to continue dialogue on these issues. Initial assessment findings were presented at the meeting and served as the basis for discussions. The meeting also provided valuable inputs to the study, and every effort has been made to incorporate comments and suggestions made during the meeting into this report. A seminar presenting the assessment’s preliminary findings and conclusions was held in Washington, DC, on May 15, 2001, and discussions at that meeting further served to refine the this report.

The EPIQ team appreciates John Wilson, USAID manager of the exercise, for his guidance and assistance in arranging the January field consultations and various elements of the sub-regional SA-ESTOC and Washington, DC, dialogue. We are also indebted to the four US Government posts visited for their time and help in making appointments with local counterparts and otherwise facilitating the work of the team. We were encouraged by the very positive response to the SA-ESTOC meeting shown by all participating posts. Special assistance is acknowledged from the State Department’s South Asia Regional Environmental (Hub) Officer, Deborah Seligsohn, and her deputy, Jay Pal Shrestha, in their Kathmandu base. We would also like to

extend our thanks to USAID/Nepal, especially to Donna Stauffer and George Like, for support received and for the ready willingness to serve as co-hosts of the SA-ESTOC meetings. (See Annexes 1-3 for the meeting agenda, participants, and local press coverage.)

While this assessment of environmental and natural resources management trends and conditions and their implications for assistance programming in South Asia attempts to summarize observations and opinions received during the field discussions and subsequent analysis by the EPIQ team, it represents the views of the authors and does not reflect positions of the USG or our other sources of information. All comments on the Trip Report and on preliminary findings presented in Kathmandu and Washington, DC, have been gratefully received, and the authors apologize if suggestions made have not been fully incorporated into this report.

1.3 Organization of the Report

The report begins with a review of current conditions and major environmental and natural resource trends from a regional perspective and using a series of thematic maps. The second section examines the implications of these trends in more detail at the country level and also reviews regional activities of the USG and other organizations. A third section summarizes key issues raised, and the final section presents conclusions and recommendations.

2. Regional Conditions and Trends

2.1 Spatial Analysis of Current Environmental Conditions

This section presents findings on current environmental and natural resources conditions and trends through reference to a series of thematic maps. Using a region-wide perspective, the analysis is primarily of current conditions and trends across geographic space rather than over time. We believe that it is instructive to begin with a perspective that considers the region as a whole, both physically and statistically—and represented spatially. The following series of maps, which highlight key issues, were developed collaboratively by International Resources Group and the World Resources Institute (WRI) and produced by WRI.¹

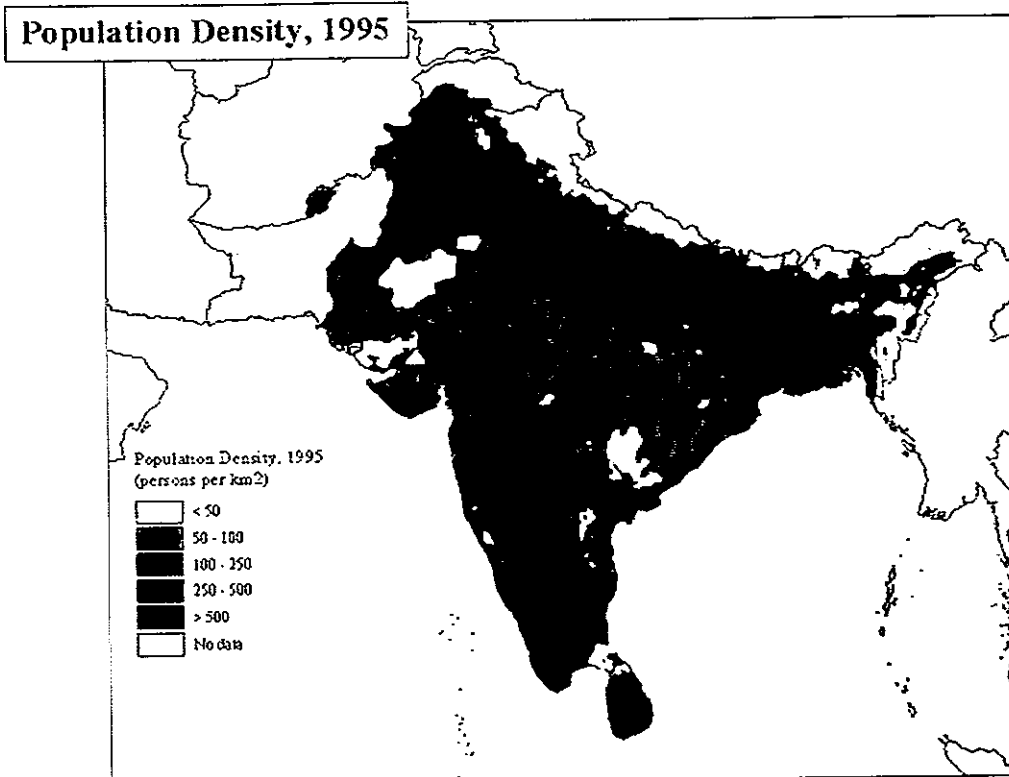
In general, we have avoided projections, which can be conjectural. The underlying purpose of this assessment and the associated dialogue are to identify and consider strategies to influence the course of events affecting South Asia's environment. Fortunately, future outcomes have the potential to be influenced positively by the types of strategic and policy choices to which this assessment is addressed.

2.2 Taking a Regional Perspective

The analysis begins with three spatial representations of current and important conditions in the region, covering population, land use, and river basins. Exhibit 2-1 shows population density in 1995. While the region is already heavily populated, settlement patterns are not uniform. Where land is arable, especially where irrigated, population density is high. Population is particularly crowded into the sharp band that runs east from the Pakistani Punjab across northern India and Nepal and into Bangladesh. This region closely follows the upper Indus Basin and Ganges-Brahmaputra River Basin. Additional striking concentrations of population—although geographically smaller—are visible in the southern areas of the sub-continent and in coastal zones.

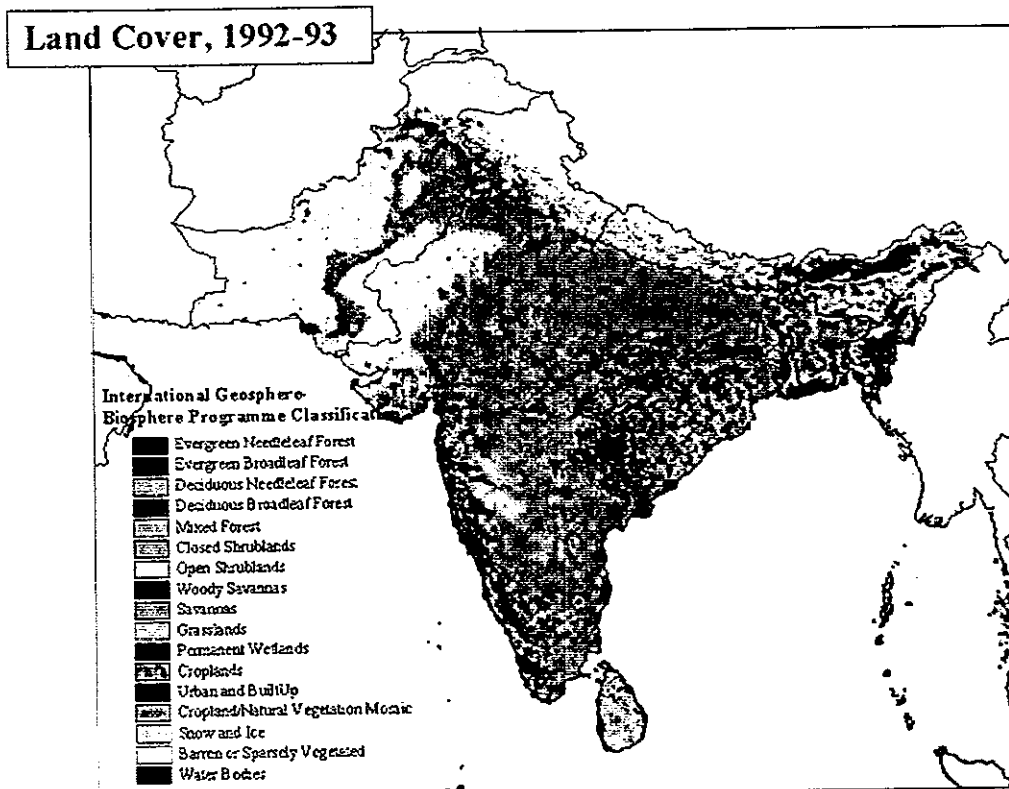
Exhibit 2-2, which shows land cover in 1992 and 1993, contains an enormous quantity of data. However, important points from this image may best be derived by viewing it as a picture. The color orange represents cropland, while red represents urban and built-up areas.

¹ WRI is a member of the USAID EPIQ Consortium, for which IRG is the lead organization.



Sources: C.E.S.N., FPRI, WRI, 2000. Gridded Population of the World, Ver. 2a, ESRI 1996

Exhibit 2-1: Population Density, 1995



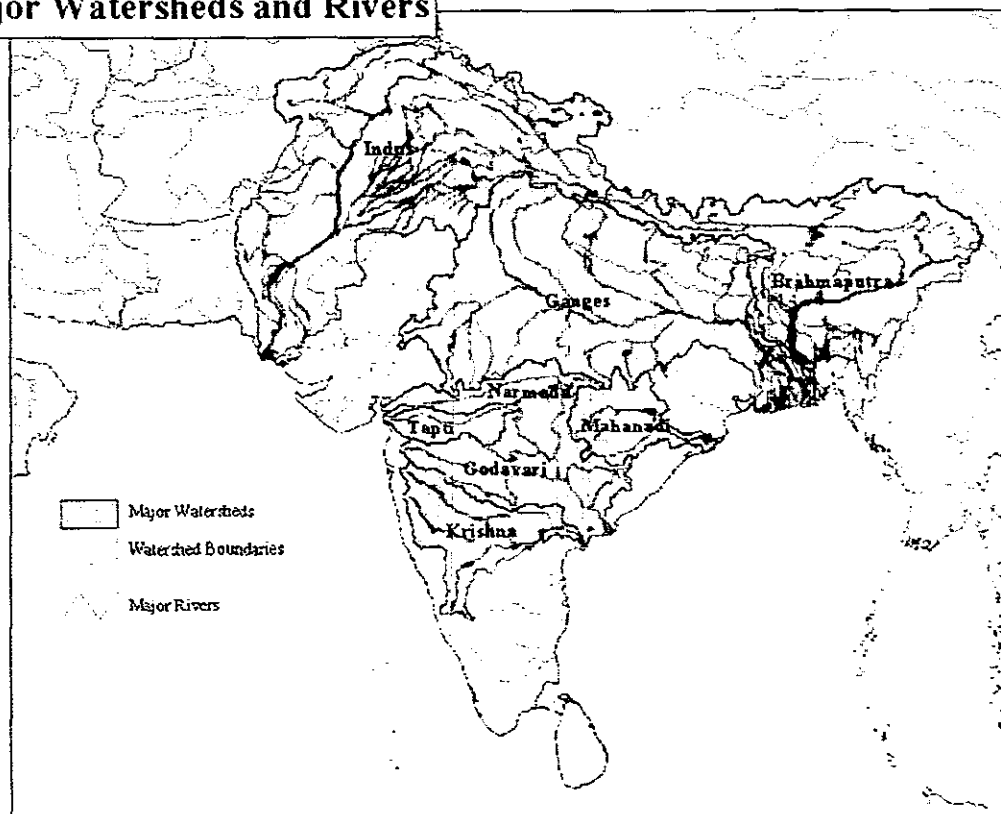
Sources: Global Land Cover Characteristics Database, Version 1.2, 1993. USGS EROS Data Center, ESRI 1996.

Exhibit 2-2: Land Cover in 1992-1993

A primary theme and finding of the assessment quickly emerges from the overlay of this and the previous image. It is the essential distinction—from both a strategic and a policy perspective in an important relative comparison—between natural versus man-made environments. The map of the region is a canvas of nearly continuous cropland, freckled with urban and built-up areas.

It has been said that a river basin is a good metaphor for a macro economy, with upstream and downstream linkages. *If this is true, then the region is a series of interdependent sub-economies.* The largest and most important basins—the Brahmaputra, the Ganges and the Indus—are indifferent to political boundaries and have long formed the basis for the region's main civilizations. They cross current national borders and play a vital role in regional political and economic stability. It also is worth noting that these and other basins cross state borders within countries. Further, they transect what has been the traditional frontier of the now blurring rural-urban divide—at a time when urban-rural competition for water is becoming acute.

Major Watersheds and Rivers



Sources: Revenga, et al. 1998. *Watersheds of the World: Ecological Value and Vulnerability*. WRI, ESRI 1996 (country boundaries), ESRI 1993 (rivers)

Exhibit 2-3: Major Watersheds and Rivers

To complete the introduction to current conditions, and with the spatial context now established, we present below in Table 2.1 South Asia's principal development indicators.

Table 2.1: Development Indicators for South Asia

	Bangladesh	Bhutan	India	Maldives	Nepal	Pakistan	Sri Lanka
1998 Population	128	1.7	987	0.3	24	153	19
Population Growth	2.2	2.4	1.8	3.2	2.5	2.7	1.2
GNP/Capita	360	430	370	1180	220	500	800
Human Development Index	.37	.35	.45	.68	.35	.45	.71
Gender-related Development Index	.34	.33	.42	.67	.33	.40	.70

2.3 Key Environmental and Natural Resource Trends

Exhibit 2-4 offers perspectives on the natural conditions in the region and the most important environmental trends identified during the assessment, affecting water, forestry, soils, coastal resources, energy, and urban pollution.

The mean precipitation and rainfall variability maps at right, based on averages from 1901 to 1996, provide a perspective on the crucial resource of water. Note that rainfall variability is highest almost in precisely the regions where precipitation is lowest. South Asia is currently facing one of its most severe droughts on record—with effects stretching from Central Asia through Southwestern China, Afghanistan, and Pakistan and into northern India. This image provides a vital snapshot of where droughts have occurred, are occurring, and are likely to recur. Climatic events such as these

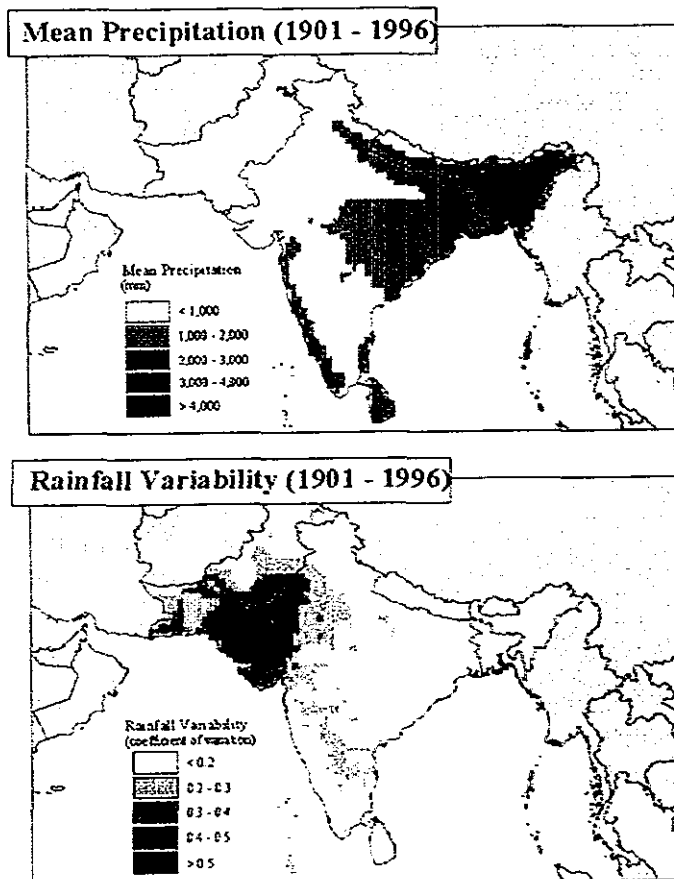
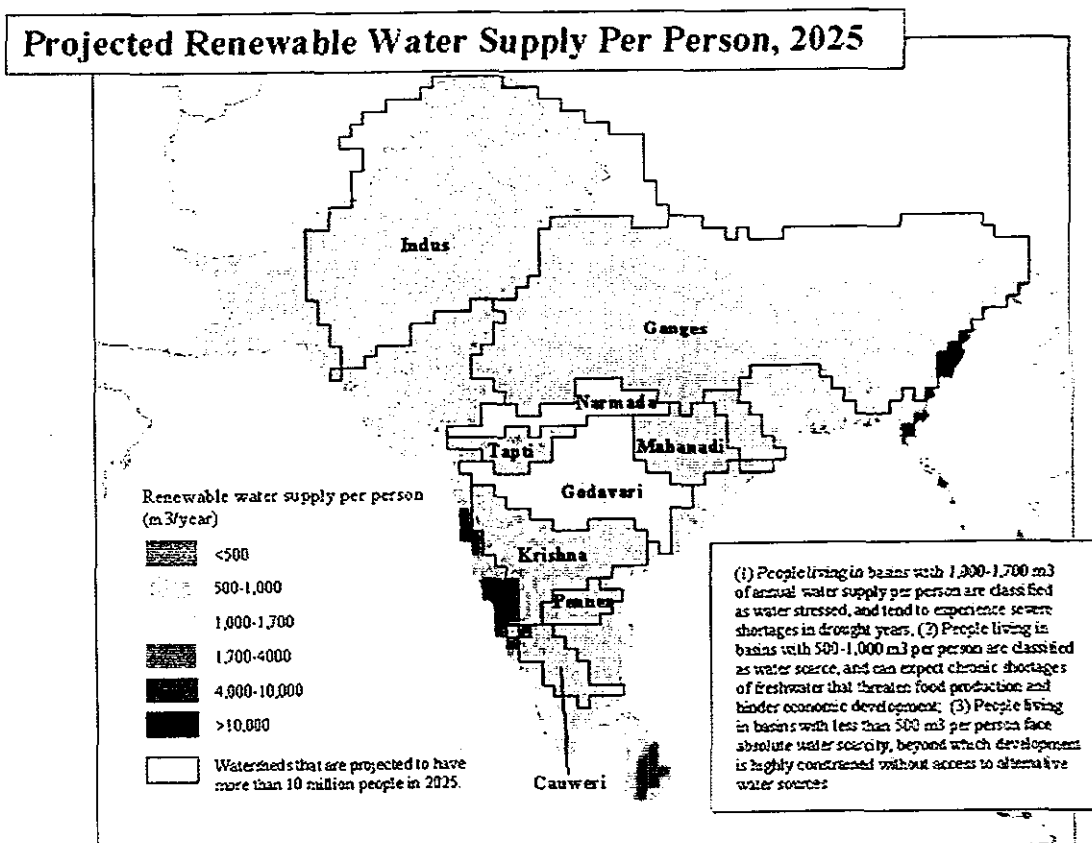


Exhibit 2-4: Mean Precipitation and Rainfall Variability, 1901-1996

respect no political borders. In times of great stress, neither will environmental refugees—creating political, economic, and environmental consequences. As population density grows, competition for water will increase, and soil and water resources will continue to be degraded because of pressures on their use. The potential implications of water-related climatic events—causing floods and droughts—are clear and constitute an important area for policy and program response at national and regional levels.

Surface water availability varies greatly and roughly follows the pattern of mean annual precipitation. If we were to overlay this image with that of the river basins—showing the course of the major rivers—settlement patterns along the rivers and irrigated plains would become fairly obvious. It would be equally clear that water is irreplaceable as a condition for livelihood and human welfare.

However, a consideration of water supply in physical volume provides only a *partial* picture of water availability relative to needs. Exhibit 2-5 shows the projected renewable water supply per person for 2025. The areas of “water stress,” “water scarcity” and “absolute water scarcity” (with



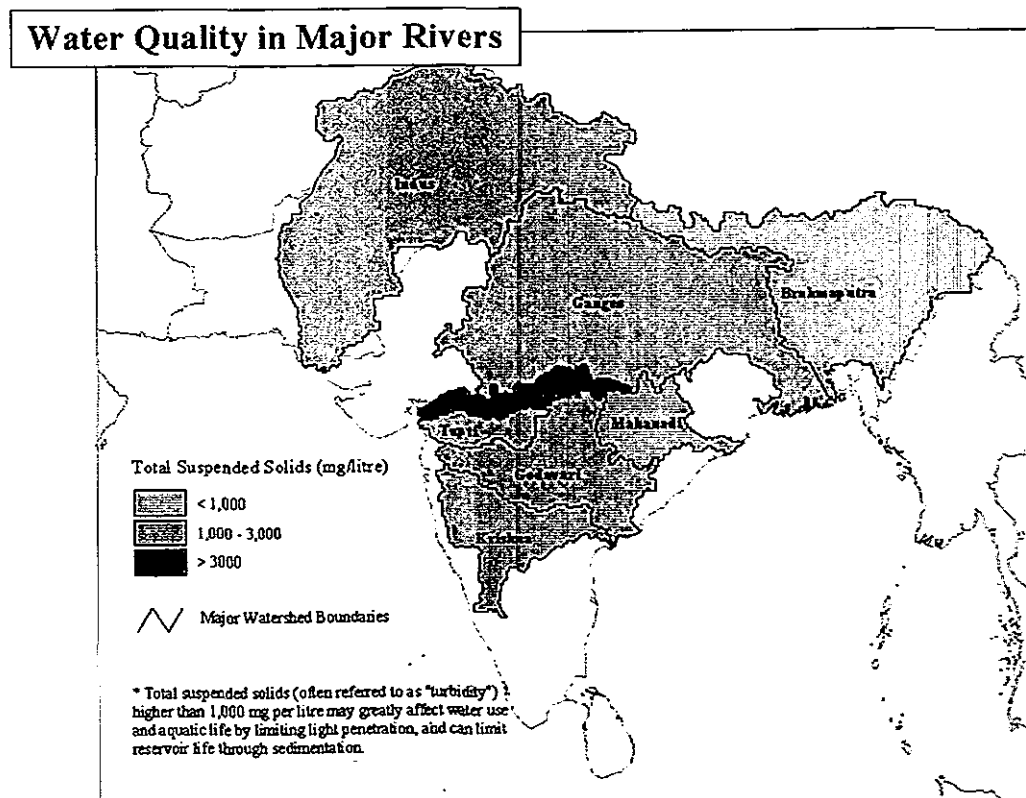
Sources: Revenga, et al. 2000. *Pilot Analysis of Global Ecosystems: Freshwater Systems*. WRI, ESRI 1996.

Exhibit 2-5: Projected Renewable Water Supply per Person for 2025

less than 500 m³ per person per year) will be at tremendous risk in the future. As demonstrated by the “water riots” that occurred recently in Hyderabad, competition over this vital resource can be expected to intensify over the next decades—potentially to the point of outright conflict.

Yet, this analysis of water availability is incomplete without consideration of the amount of water that is usable, based on its quality.

Water pollution from urban settlements and industry already presents major problems in the most densely populated parts of the region. Exhibit 2-6 uses one measure of water quality—turbidity—a rough indicator of the broader issue. By this measure, five of the subcontinent’s eight major watersheds already suffer either “significant” or “major” degradation of water quality, based on 1995 data. Only the blue-colored basins—representing average concentrations of less than 1000 mg per liter—are considered acceptable. The Brahmaputra’s favorable condition is largely due to the “dilution solution” derived from the vast amounts of water flowing through the system during the rainy season.



Sources: UNEP Global Environmental Monitoring System (GEMS) 1995. Water Quality of World's River Basins, ESRI 1996.

Exhibit 2-6: Water Quality in Major Rivers

While we were unable to obtain the data to present a credible projection of this situation to 2025, it does not take much imagination to discern the trend and appreciate the implications. Recall the previous map that projected significant water stress, scarcity or absolute scarcity, simply based on the *quantity* of available water. *Water quality* will have at least as important an impact on its effective availability in the future.

The conservation of natural forests and associated biodiversity is another issue of importance both within the region and from a global standpoint. However, we should understand the extent of such resources under discussion in the current context of South Asia. The green areas of this map (exhibit 2-7) represent lands with natural forest; the gray areas are without natural forest. Though it is possible that this representation may slightly overstate the case, there simply is not much natural forest left in the region to manage and conserve. As noted on the map showing vast areas of cropland (exhibit 2-2), most of South Asia is already used for settlements or is characterized by rural landscapes heavily influenced by human activity. Forests remain an important part of the landscape and rural economy, but, in an environment that has already been

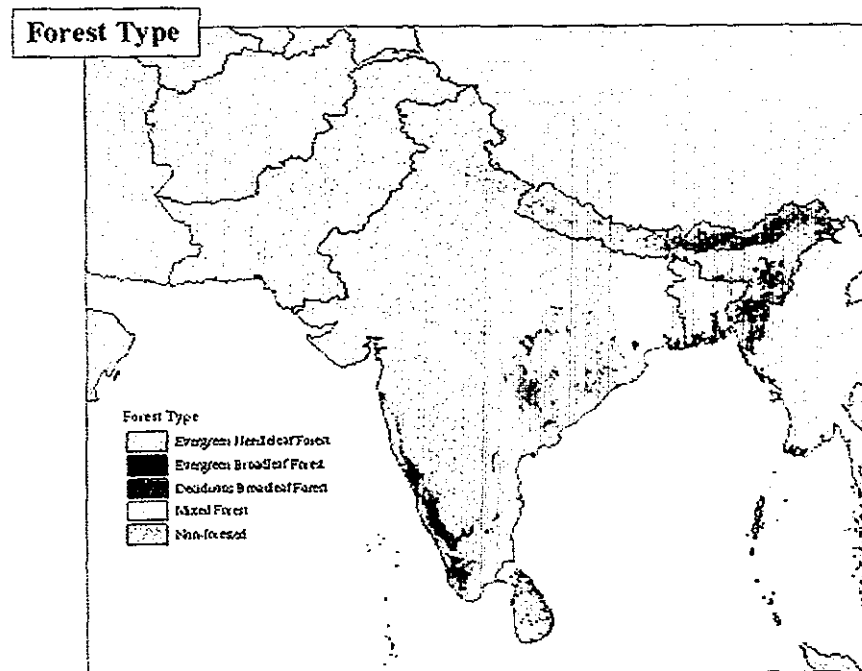
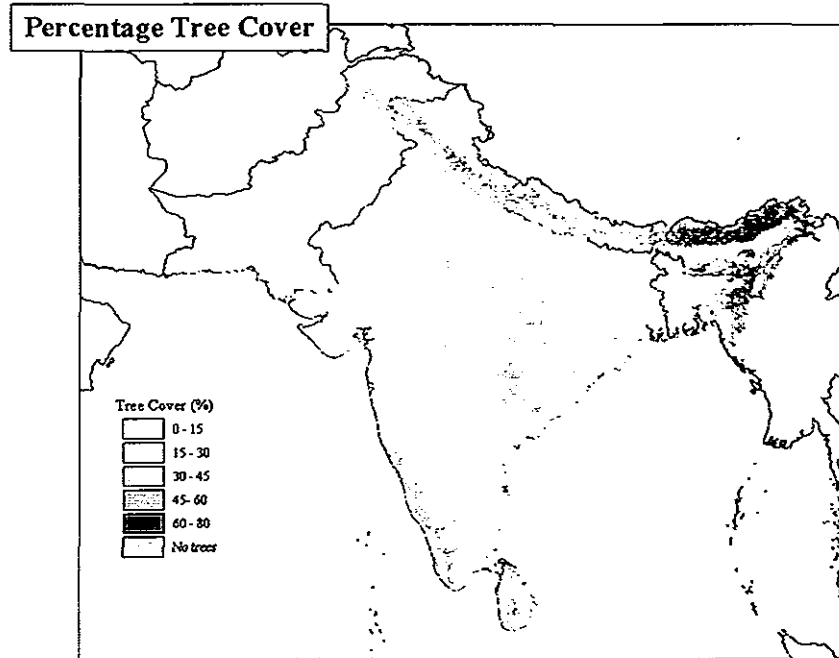


Exhibit 2-7: Forest Type

fundamentally altered by human settlement, "forestry" is not synonymous with "natural forests" (exhibit 2-8). Significant forested areas in the region outside of natural forests hold resources that clearly provide a range of environmental and economic services to the human population of South Asia. The map of population density (exhibit 2-1) shows a striking band of forested area

running from northern Pakistan and India through southern Nepal and into Bhutan and northeast India and juxtaposed just to the north (and east, along the Burmese border) of the densely

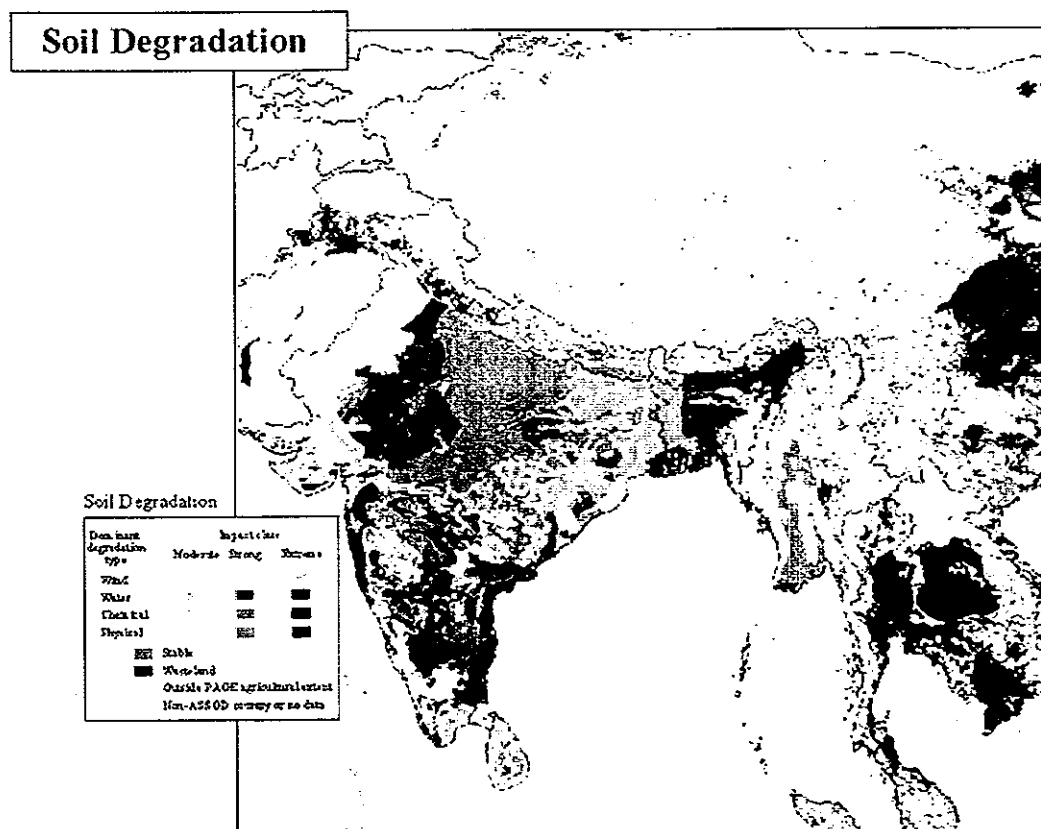


Sources: D'Fries et al. 2000. A New Global 1-km Data Set of Percentage Tree Cover Derived from Remote Sensing. ESRI 1995.

Exhibit 2-8: Percentage Tree Cover

populated zone already identified. This holds implications for the legal and illegal trade in forest products and regional thinking about this issue. There is already a thriving cross-border market for timber and forest products from the Nepali terai to meet market demand in India.

Exhibit 2-9, which shows regional soil degradation, contains an enormous amount of data. For the purposes of this assessment, it is sufficient to focus on the main blocks of color. Each color group represents a different source of soil degradation. The deeper the color, the more intense the degradation. It is instructive to pay particular attention to the areas of extreme water-induced degradation (dark blue), of extreme chemical-caused degradation (deep red) and of extreme wind erosion (deep yellow). It is clear that the region's soils are being heavily affected by degradation derived from a range of causes and forces.

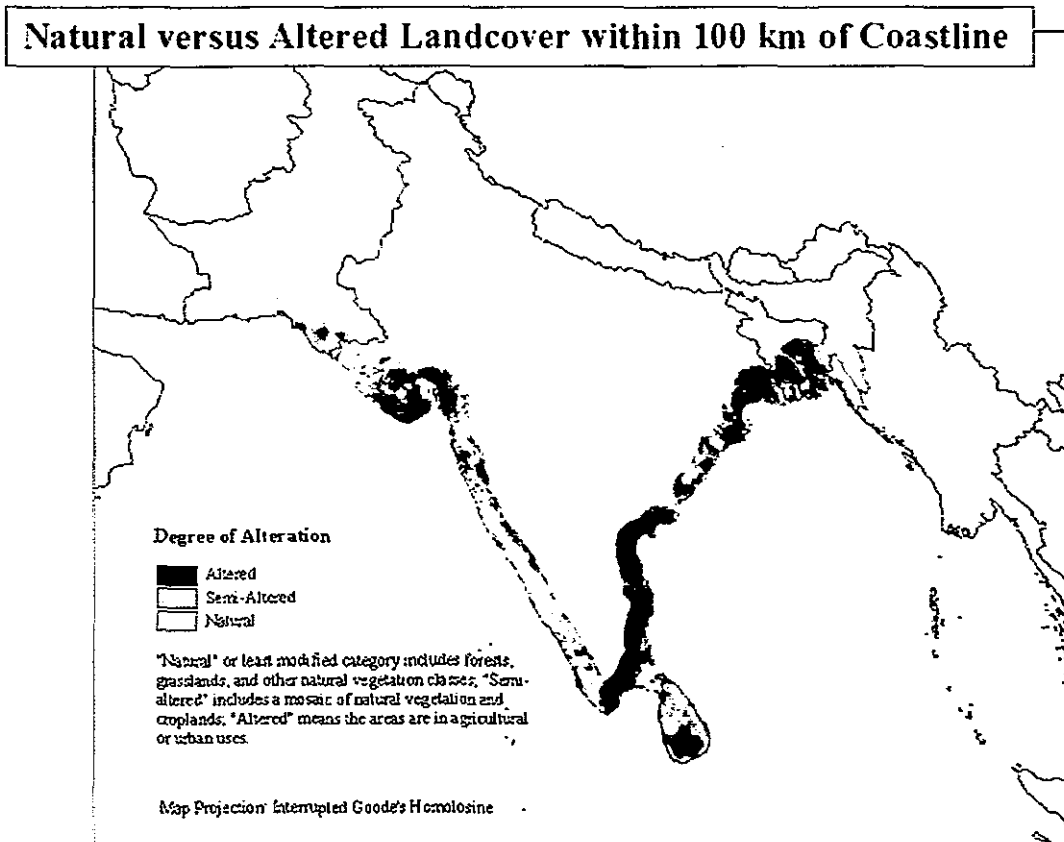


Source: IFPRI and WRI, 2000. PAGE Agroecosystems. Based on the Assessment of the Status of Human-Induced Soil Degradation in South and Southeast Asia (ASSOD) (van Lyden and Oldeman, 1997) and reinterpreted data from GLCCD, 1998 and Doel and Siebert, 1999.

Exhibit 2-9: Soil Degradation

Exhibit 2-10 shows the extent to which degradation has taken place in the sensitive coastal areas of the sub-continent. In this map of natural versus altered landcover in the coastal zone, another clear message emerges: Except in the forested areas of India's western coast and the coastal desert of Pakistan, the coastal landscape is largely altered—indicating a decline in the integrity of coastal ecosystems.

The map does not show the impact of coastal development in the nearshore and offshore ocean zones, where we know that impacts, such as pollution, spread with the current. (The assessment did not examine fishery resource issues.)



Sources: Burke, et al. 2001. Pilot Analysis of Global Ecosystems Coastal Ecosystems WRI, ESRI 1996

**Exhibit 2-10: Natural versus Altered Landcover
within 100 km of the Coastline**

2.4 Energy and Environmental Issues

Demographic and economic trends in the region also are driving some significant shifts in energy-use patterns that already have had profound environmental consequences. These will be even more important to South Asia and the planet's atmosphere in the future.

The first of the two charts shown in exhibit 2-11 illustrates per capita consumption of *renewable* energy, by country, from 1971 to 1997 (disregard the line for Nepal, which contains a data anomaly). The second chart shows per capita consumption of *non-renewable* energy for the same period. Taken together, they tell an important story. There has been no growth in per capita renewable energy consumption, while non-renewable energy consumption shows substantial expansion. This is particularly striking in India and Bangladesh.

Economic history tells us that the region is at an income level and development stage where energy demand will rise much faster than population. In economic terms, there is a high "income elasticity of demand" for modern energy sources (primarily electric power produced with fossil fuels). The reasons are straightforward:

- Renewable fuels are becoming increasingly scarce;
- Urbanization and rising incomes are leading to more energy-intensive lifestyles; and
- The region is at a stage in its development in which large numbers of people will switch from using traditional (wood, dung, etc.) fuels to modern fuels.

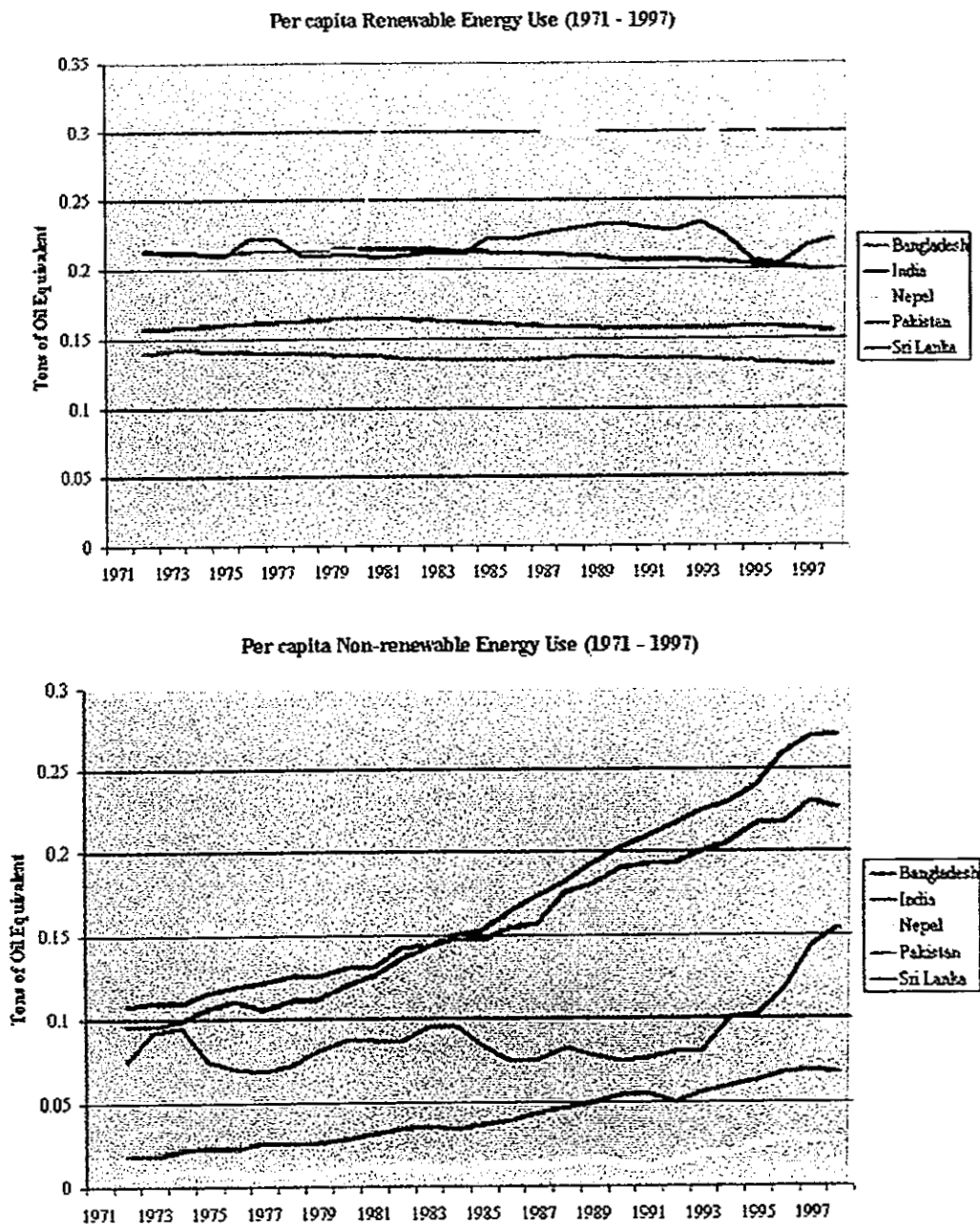
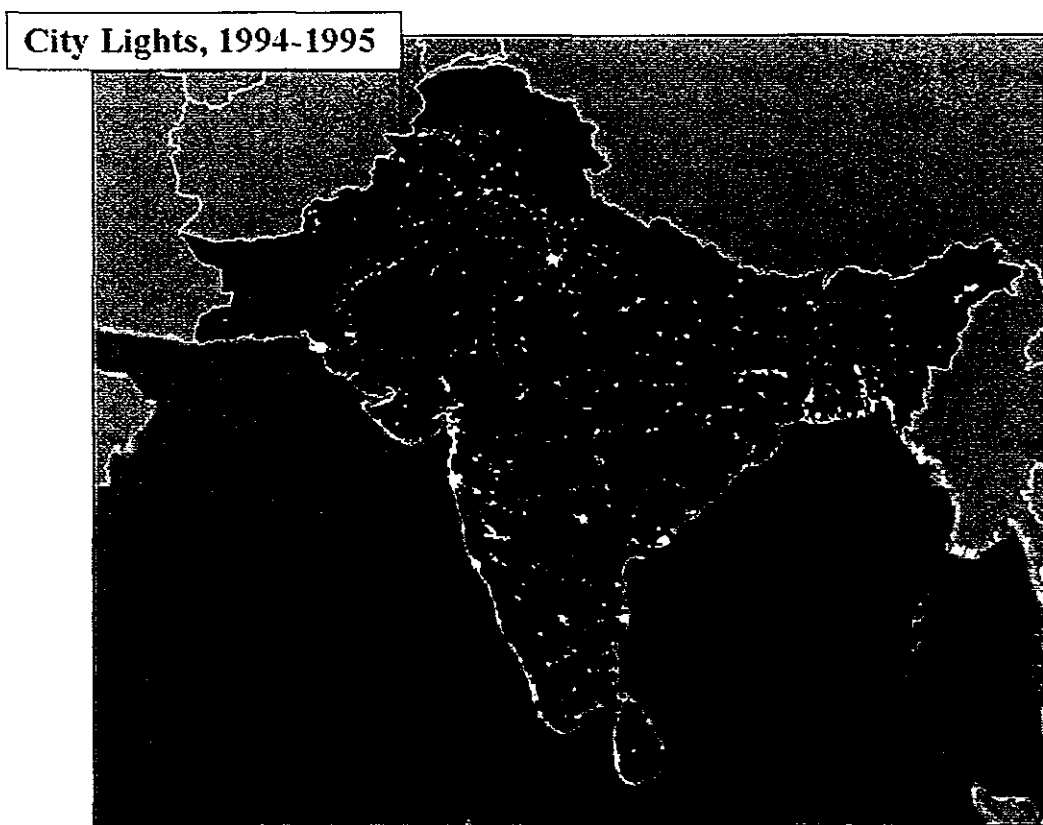


Exhibit 2-11: Per Capita Consumption of Renewable and Non-renewable Energy, 1971-1997

It has been said of China that “a quarter of a billion households woke up one day and realized they could afford a refrigerator.” As the curves for India and Bangladesh suggest, we are entering a period of accelerating and potentially explosive demand for modern energy in the region. For Asia as a whole (not just South Asia), the World Bank has estimated that \$1 trillion of investment will be needed over the next 20 years to meet this burgeoning demand for electricity.

The extent of power consumption already apparent in the region is readily evident from exhibit 2-12. It is fairly easy to locate the region’s capitals and other major cities and to discern areas of high energy use. A previous chart indicated that energy demand is likely to rise much faster than income over the next 25 years. More and bigger stars will fill this constellation.



Sources NOAA National Geophysical Data Center 1998 Stable Lights and Radiance Calibrated Lights of the World, ESRI 1996

Exhibit 2-12: City Lights, 1994–1995

This image also highlights important cross-border electricity issues that pertain to where electricity is used and where it can be produced. Nepal and Bhutan are in a position to produce hydropower for their own demands and India’s, as well. In addition, Bangladesh could certainly export gas or gas-derived electricity to India if the political situation would allow. Such issues

will become even more important and may well shape major aspects of the regional political dialogue over the next 25 years.

Finally, this image of the distribution of urban centers can also serve as a rough indicator of air pollution. As energy use rises, it will be increasingly difficult to simply “export” pollution from the cities to the suburbs, as has been done around Delhi and elsewhere. Transboundary air pollution already is becoming a potentially contentious issue in the region, with implications for agricultural productivity, as well. As the “continuous canvas of cropland” gives way to one of urban, peri-urban, and suburban settlements, crops will receive less light and hundreds of millions of inhabitants will breathe more polluted air.

2.5 Looking Ahead

Exhibit 2-13 shows urban areas and their trade zones, with the smallest indicated as having between 500 thousand and 1 million people and the largest with more than 5 million. There are

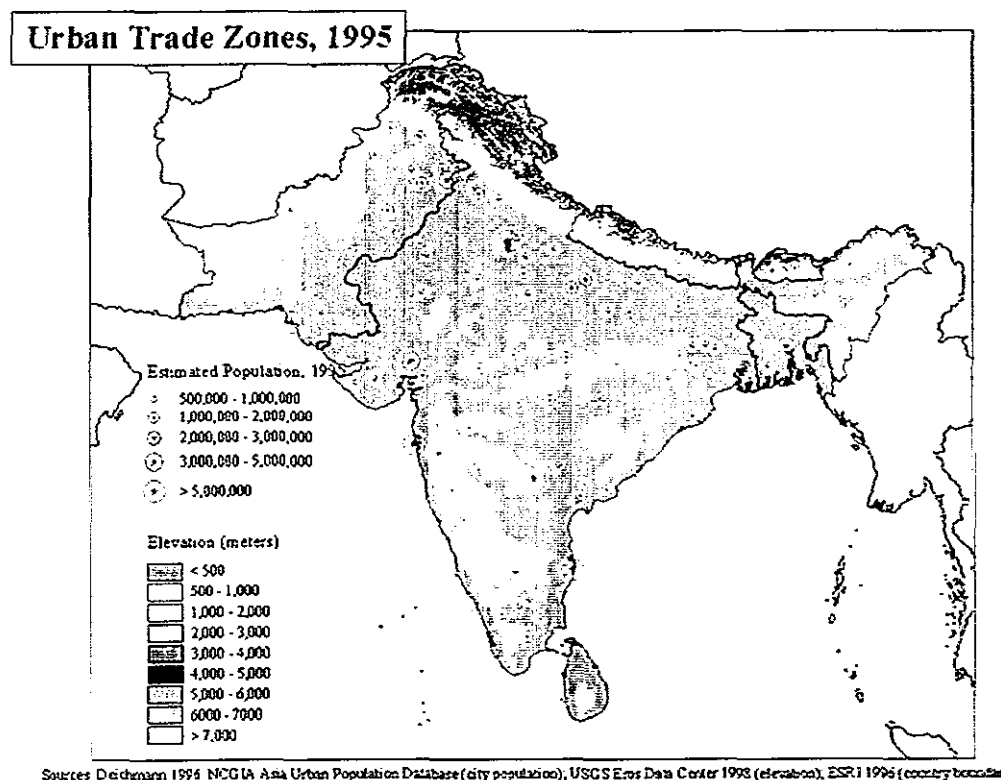


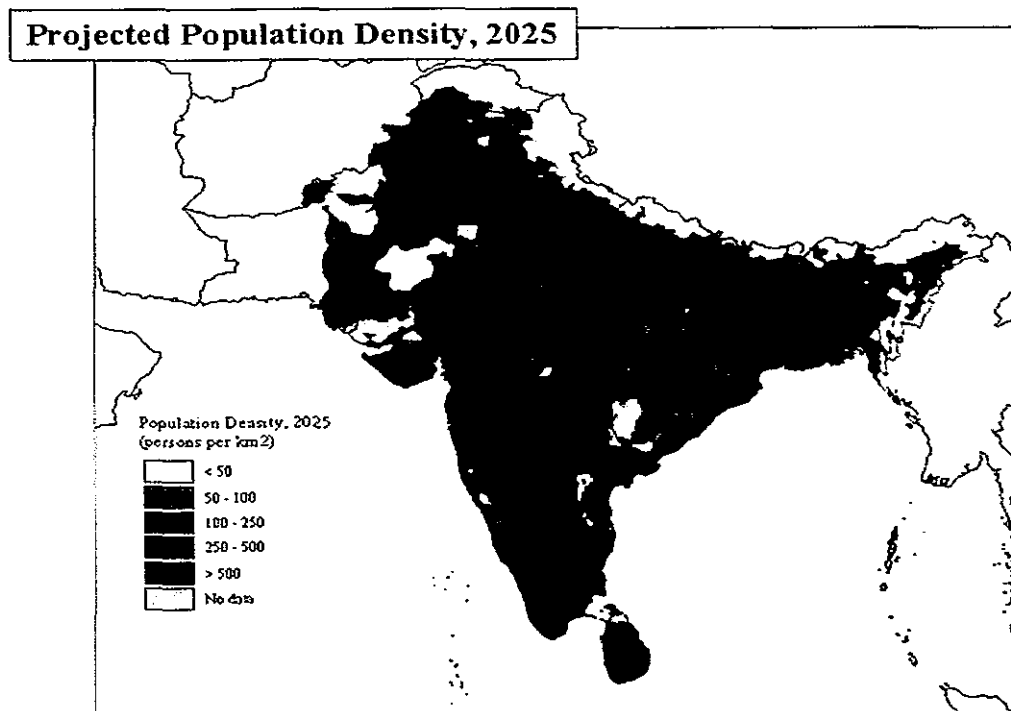
Exhibit 2-13: Urban Trade Zones in 1995

hundreds of smaller urban areas—many in the 250,000 to 500,000 range—that do not appear on the map.

The circles roughly represent current trade and commercial zones around each city. Most projections—including the rigorous “2047” study done by the Tata Energy Research Institute (TERI)—show that the region’s urban population will likely grow from today’s 25 to 30 percent of the total population to around 50 percent of the total by the middle of the century, even as overall population rises.

Thus, within the next two generations, virtually all of the region’s more populated zones will lie within the market influence of a small, medium, or large city. As populations come under increasing market influence, the economics of rural production are likely to change, the impact of urban pollution is likely to spread, and the urban–rural competition for resources may intensify—including pressure on water, forests, trees, and soils.

Exhibit 2-14 depicts the region’s projected population density in 25 years. At first glance, this map does not look significantly different from the 1995 map shown in exhibit 2-1. Part of the reason is that the black areas represent densities of 500 to 36,000 people per km², so that increases above 500 persons per km² are not visible. However, a closer comparative look reveals



Sources: WRI, 2000. Population density projections, 2025, ESRI 1996.

Exhibit 2-14: Projected Population Density in 2025

that the previous red areas have turned dark red, and dark red areas have turned black. The dark areas have become larger and more widespread. The projected population densities have filled in substantially over the course of time.

As the region's population turns the corner past the 1.5 billion mark and moves toward 2 billion, South Asia's environment must be understood and managed in *fundamentally new ways*. Whether the "green," "blue," or "brown" environment is under consideration, it must be managed as an essentially man-made space in South Asia. This is true even when considering the fate of such resources as biodiversity—the "greenest" and "purest" of natural resources. Natural resources management cannot be separated from the trajectory of industry, urban and rural incomes, productivity, trade, technology, and governance. This is the challenge to the region's environmental and economic policies and institutions, as well as to assistance agencies such as USAID, which can direct their aid to helping the people of the region cope with the problems posed by these trends.

3. Observations and Issues at the Country and Regional Levels

3.1 Introduction

Based on this regional overview, section 3 offers a distillation of the most significant issues affecting environment and natural resource management at national or sub-national levels in the target countries. This section also takes stock of current, environment-related USG assistance in the region. The majority of USG assistance in South Asia is programmed and implemented bilaterally, although there also are several regional programs of significance. The review of current USG—and mostly USAID—activities draws heavily upon materials collected and discussions held during the April 2001 SA-ESTOC meeting in Kathmandu. Productive consultations also were held with USG officers, senior South Asian government officials, and NGO representatives in Bangladesh, India, Nepal, and Sri Lanka during the January 2001 visits to these countries by the core study team members.

As noted, most discussions with USG representatives were held with USAID and State Department officials. Primarily because of time constraints, the team did not have an opportunity to consult adequately with other USG agency representatives in the field, including those representing the Department of Interior, the Environmental Protection Agency, the Department of Energy, the National Institutes of Health, the National Oceanographic and Atmospheric Administration, and the Centers for Disease Control and Prevention. The following sub-sections briefly summarize the main themes and programmatic responses at the national level that emerged from these discussions.

3.2 Bangladesh

USAID/Bangladesh has recently restructured its natural resource management efforts to create a specific Strategic Objective covering environmental management. The timing of this assessment was useful to help place these national activities—mostly on sustainable inland fisheries, watershed management, and forest conservation—into a regional context. USAID/Bangladesh's new strategy adds forest conservation efforts in response to Bangladesh's participation in the debt buy-back program under the US Tropical Forest Conservation Act (see Annex 4 for a summary of current, environment-related activities). Further, an active bilateral assistance program in the energy sector—relating primarily to natural gas development—has many

environmental dimensions. These bilateral energy activities are being closely coordinated with those supported by the new South Asia Regional Initiative/Energy (SARJE).

Four areas of high priority emerged and are presented below, in order of their perceived degree of significance:

Water Management. Resting at the confluence of three of the world's largest rivers—the Ganges, the Brahmaputra, and the Meghna—much of Bangladesh is an enormous flood plain. Several severe flooding events over the past 15 years have spurred donor support for the rethinking of national approaches to water resource planning. Improving water management remains a top social, economic, and political priority in the country. Increasing emphasis in the USAID/Bangladesh program, as well as in within the Government of Bangladesh, also is being given to managing water at the local level, especially to improve understanding of catchment area or watershed capacities and boundaries. As urban and industrial growth continues, these sectors are bringing high-value water uses to the bargaining table to compete with agriculture for water supply. They also present increased threats to water quality from municipal wastewater and industrial pollution, with associated risks to human health and economic productivity.

Bangladesh has less than 10 percent of its area within the river basins that provide more than 90 percent of its water, giving the country little control over the waters entering its borders. The 1996 Treaty on the Sharing of the Ganga Waters at Farakka Barrage was a step forward in this regard, and there is a desire to go further with neighboring countries to enact additional agreements and otherwise to cooperate on transboundary water management (as evidenced by recently announced plans to move forward with a feasibility study on Padma Barrage downstream of Farakka).

However, a widespread perception remains among environmental professionals and officials in Bangladesh that the country is adversely affected by poor forest and other land use practices in neighboring upstream states (a view not generally supported by scientific evidence, which indicates that land use patterns can have only limited impact upon hydrological patterns in the geologically young Himalayan region). Further, there is risk of outright conflict over water management—as witnessed by tensions along the border with Myanmar/Burma, derived in considerable measure from disputes over water. Although the Indo-Bangladesh Joint Rivers Commission provides a useful institutional mechanism for bilateral discussions on such topics (the two countries share 54 rivers), it is considered very slow and cumbersome. Institutions are needed for concrete multilateral dialogue involving Bangladesh, India, Nepal, Bhutan, China, and/or Myanmar/Burma, but the lack of political will and openness to this dialogue presents formidable challenges.

Disaster Preparedness and Natural Resources Management. Bangladesh is subject to drought; flooding from monsoon rains; typhoons (and associated wind damage); and earthquakes (particular concern was voiced about the risk of major rivers shifting courses, as has occurred in the past). The extremely high population densities in the country compound the risks of natural disasters. While considerable attention has been given to physical and institutional preparations for disasters (especially floods), many believe that more can and should be done to reduce the human costs of extreme natural events. A particular gap relates to flood prediction and warning capacity—especially because it rests on inter-country information sharing. Strong disaster preparedness depends upon good land-use planning, and efforts to address the former at the country level could improve understanding and application of sound rural and urban resource planning principles. There is also a sense that attention to this topic could provide a non-contentious vehicle for improving regional cooperation with Bangladesh's neighbors on broader natural resource management issues.

Arsenic Contamination of Drinking Water. While many questions remain unanswered about the causes of and possible remedies for arsenic poisoning of tubewells in Bangladesh (as well as in West Bengal and the *Terai* of Nepal), the calamitous extent of the exposure is now becoming apparent. This problem will draw the attention of water managers, geologists, health experts, and others concerned with the sustainable development of Bangladesh's rural areas for years to come. The problem must be addressed as a central issue in national and regional water management planning and development. On the positive side, it has the potential to improve regional relations, as it could draw together the Governments of West Bengal State and Bangladesh to cope with and find solutions to this common problem.

Coastal and Marine Resources Management. Bangladesh's coastal regions receive little concerted management attention at present, other than for fisheries production. With the prospect of significant offshore gas exploitation over the next decade, concerns have risen in the environmental and business communities about the need for adequate environmental safeguards. Oil spill contingency planning appears to be of high priority. As in many countries, a plethora of institutions have overlapping mandates relating to coastal and marine resource management. USAID/Bangladesh has no explicit coastal resource management activities, and, while the Asian Development Bank (ADB) is currently moving forward with a regional project on coastal resource management in cooperation with World Conservation Union (IUCN), this institutional complexity has contributed to its decision, thus far, not to include Bangladesh among the participating countries (the Maldives, Pakistan, Sri Lanka, and Kerala State in India). The ADB and Global Environment Facility also support forest and protected area management in the Sundarbans coastal region, the last habitat of the Bengal tiger, with a parallel effort planned in

the Indian portion of the Sundarbans. Despite multiple constraints, further attention to improving the management of Bangladesh's coastal and marine resources may be warranted.

3.3 India

As the second most populated and seventh largest country in the world, India faces an entirely different scale of environmental challenges than its neighbors. The combination of these characteristics, along with its decentralized form of government, means that the neighboring countries often have closer working relationships with adjacent state governments than with central government agencies. However, the size of the country's tax base and budget and the relatively high availability of well-trained environmental and economic experts mean that more resources are available to these central government bodies in terms of staff and access to information than is generally the case elsewhere in the region. The country is also able to command an influential place on the world stage.

As USAID/India currently prepares a new assistance strategy, this assessment offers an opportunity to provide useful input on environmental and natural resource management issues in the country and within the regional context. (Annex 4 offers a summary of current and planned USAID environmental activities.)

The quality of urban environments is deteriorating throughout India, with rising levels of air and water pollution and weak provision of sanitation services. These factors contribute to high human costs through negative impacts on human health and morbidity. Delhi, Mumbai, and Chennai rank among the top ten most polluted cities in the world, and several others are not far behind. Table 3.1 indicates the degree to which these costs can directly affect macro-economic development prospects, even in a large economy such as India's.

The urbanization trend is a direct result of national policies promoting industrialization as the principal path to economic development. Urbanization in India—its underlying causes, relationships with unsustainable rural resources management, and the associated and growing pollution problems connected to both settlements and industrialization—are the subject of analysis by USAID/India and the US-Asia Environmental Partnership (US-AEP) as part of the current strategic planning exercise at the country level.

USAID/India (and the USG generally) had identified the consequences of urbanization as a focus area in the previous environmental assistance strategy for the country. Program responses have included the introduction of innovative financing approaches for the provision of urban environmental infrastructure and a range of efforts in collaboration with chambers of commerce

to promote cleaner production practices in the private sector. In recent years, this assistance also has included a strong emphasis on reducing greenhouse gas emissions (due, in part, to sanctions imposed after India's nuclear weapons test). The addition of the South Asia Regional Initiative for Energy (SARIE) complements USAID/India's ongoing support for power sector restructuring and the promotion of cleaner and more energy-efficient industrial production, despite questions about India's full participation.

Table 3.1: Major Environmental Costs in India (\$ Millions)

Problem	Nature of Adverse Impact	Low Estimate	High Estimate
Urban Air Pollution	Health (urban)	517	2,102
Water Pollution	Health (urban and rural)	3,076	8,344
	Higher incremental costs for clean water supply	Not estimated	Not estimated
Industrial Hazardous Waste	Health (long-term, especially cancer)	Not estimated	Not estimated
Soil Degradation	Loss of agricultural output	1,516	2,368
Rangeland Degradation	Loss of livestock carrying capacity	238	417
Deforestation	Loss of sustainable timber supply	183	244
Costal and Marine Resources	Unsustainable harvesting of marine resources	Not estimated	Not estimated
Biodiversity Loss	Loss of use, option, and existence values	Not estimated	Not estimated
Tourism	Decline in revenues	142	283
Total Costs of Environmental Degradation (as a % of GDP)		5,672 (2.64%)	13,758 (6.41%)
Average of low and high estimates (as a % of GDP)			9,715 (4.53%)

Source: Brandon and Hommann, 1995 (cited in Gupta, 2000).

This "brown" emphasis of USG assistance programs in India means that relatively little attention is being given by USAID and others to "green" problems of natural resource degradation—except through indirect efforts to stabilize population growth. The authors were struck with consistent concerns raised by experts in the region about a nexus of agriculture, population, and environment issues. Rural population pressures are outstripping gains from agricultural intensification such that the natural resource base is deteriorating in many places. Out-migration

from such areas, either to cities or to regions with higher agricultural productivity, is generating another set of environmental and natural resource challenges. Perhaps too much of a split in thinking exists between the "green" and "brown" sides of the equation. The two are obviously intertwined, most notably through the potentially positive release of pressure on rural resource systems from well-planned urban and industrial growth. Further analysis on this subject would seem warranted.

Three main topics were identified as potentially of high significance beyond the urban, industrial, and energy problem areas already being addressed by USAID/India's programs:

Competition over Scarce Water Resources. Whether in the wet or dry areas of the country or in urban or rural settings, competition over the allocation and management of water resources is emerging as a top environmental issue. With India's wide bio-geographic, socio-economic, and cultural variations the nature of these issues can hardly be generalized. Each area of the country seems to have a unique set of water management challenges. India's decentralized form of government also means that management of watercourses shared by multiple states may present some of the same challenges inherent in "transboundary" river basin management involving multiple nations. (India must also play an important role in international water management efforts, as mentioned in the sections on Bangladesh and Nepal.) Water management in India is a rising crisis that already affects national and regional economic and political stability.

In partial response to the "agriculture-population-environment nexus" mentioned above, as well as these issues, USAID/India has identified the "water-energy nexus" as a possible area of emerging priority for Mission support.

The principal context is given in analysis provided by USAID/India in table 3-2, juxtaposing simultaneous crises relating to water and power.

It remains to be seen how this new area of assistance can respond to the broader set of forces by linking rural and urban populations. However, an initial emphasis on simultaneously improving the efficiency of pump irrigation and urban water supply seems promising.

Table 3-2: Simultaneous Crises Relating to Water and Power

Water Crisis and Need for Planning

- Limited Renewable Water Resources
- High Population Growth
- Lack of Integrated Water Resources Planning & Management
- Increasing Cost of Water Supply Expansion
- Deteriorating Water Quality

Power Sector Crisis and Need for Reform

- Low Capital Productivity in the Power Sector
- Poor Technical and Management Performance
- Halting Power Sector Reforms
- Power Shortages and High Losses

Environmental Determinants of Human Health in Urban Areas. India's rapid urban growth is leading to enormous health problems derived from environmental causes. Rigorous studies have recently underscored previous conclusions based on anecdotal evidence. Environmental factors—ranging from indoor and outdoor air pollution to a scarcity of clean water supplies—are creating staggering social costs through increased disease and morbidity (table 3.1). The poor and socially weak suffer the most. USAID regional activities on urban development (through Delhi-based South Asia RUDO) and on urban and industrial environmental management (through US-AEP) address aspects of these problems. However, scope remains for improved coordination between USG health, child survival, and environmental programs in understanding and responding to the environmental determinants of human health in urban and rural areas.

Disaster Preparedness, Response and Links to Natural Resources Management. Like Bangladesh, India is a disaster-prone country, subject to droughts, floods, wind damage, and earthquakes (as so tragically illustrated in Gujarat not long ago). The legacy of Bhopal also has left sensitivity to the threat of man-made disasters. Many leading scientists involved with global climate change research believe that, at least for typhoons, the combined effects of more intense storms and sea level rise will lead to even higher damage. There is a call for greater attention to be given to disaster forecasting and advance-warning systems in India and to both physical and institutional preparations and responses. As elsewhere in the region, clear opportunities exist for complementarity between disaster preparedness and improved rural and urban development planning. As noted, India's neighbors believe that attention to the topic of weather and flood data sharing could provide a non-contentious vehicle for improved regional cooperation on broader natural resource management issues—especially regarding transboundary water resources.

3.4 Nepal

USAID/Nepal has a new assistance strategy covering the period of 2001–2005. It emphasizes provision of improved family planning and health services, as well as forest and water management, especially helping the country develop its considerable hydropower potential (estimates run as high as 80,000 MW) in an environmentally and socially sound manner. (Annex 4 summarizes the Mission's environment-related assistance activities). Both the community forestry and hydropower activities have explicit environmental dimensions. The former is gradually being phased out, while the latter is on track for further expansion. As Nepal remains extremely poor with a weak and fragile government (further shaken by the recent regicide and ongoing Marxist insurgency), USAID and other donors play a vital role in supporting basic services for the population. As in Bangladesh, the heavy donor influence in Nepal can also be a point of contention, especially with regard to the existence of dependency relationships or other

disincentives for positive change. (The EPIQ team was reminded during the January discussions that the country has been described as “over-advised and under-nourished.”)

But the role of the donors appears to be minor compared to other social and economic forces at work. Already heavy and still growing population pressure on a natural resource base limited by mountains in the north and India to the south exerts a fundamental influence on the country's development pattern. A Maoist insurgency is severely restricting the provision of government services in several parts of the country, underscoring wider calls for improved governance and greater attention to equity and transparency in the development process. (Maoists are attempting to take further advantage of the current crisis in the monarchy.)

The country's environmental and natural resource issues may be described according to the two major geographic zones, distinguishing between the mountainous region (where the emphasis is on environmentally sound tourism development), and the middle hills and *terai* zones (where there is significant in-migration, expanding small and medium-scale industrial development, growing land alienation, and other land management problems and where relations with India exert heavy influence on resource use patterns). While forests are recovering in parts of the mid-Western region of the country, protected areas (conservation reserves and forest lands) are under severe pressure elsewhere in the middle hills and *terai* zones. It is also clear that the poor, women, and those of low caste pay the highest price for environmental degradation—whether in rural or urban settings. The Government is currently preparing its Tenth Five-Year Development Plan, and there is at least a stated intent to include environmental planning and management in a more prominent manner than in previous development strategies.

Three topics are identified as potentially worthy of further attention or emphasis:

Demographics and Land Degradation in the Middle Hills and Terai Zones. There is a need for stronger attention and a better understanding of how to respond to links between rural poverty alleviation and sustainable natural resource management. There has been some success with community forestry efforts in recent years (USAID assistance is being planned out), but even this appears to be having some negative consequences for those who depend upon the availability of grazing lands for their livelihoods. The middle hills and *terai* regions of the country face both rapid in-migration and high natural population growth coupled with weak infrastructure and access to government services. This contributes to the underpinnings of the Maoist insurgency, and it is a fundamental environmental and development challenge facing the country. Given the links with India, solutions will necessarily require a regional dimension, if not response.

Ecotourism Development in the Mountain Zone. Despite growing pollution in Kathmandu and congestion in some top tourist destinations, Nepal's reputation remains largely intact as one of the world's premier locations for nature-based tourism. The draw of its mountain ecosystems and unique cultural heritage is subject to increasing constraints because of poorly planned tourism development and growing strains on infrastructure. (ADB has recently completed an analysis of ecotourism's potential and is planning follow-up financing.) Since nearly all international tourists pass through Kathmandu, any improvements in the city's environmental quality will benefit not only its citizens but also the tourism industry. Micro-hydropower projects being supported by Norwegian and German aid, among others, are getting high marks, but this does not yet fully meet the need nor tap the potential. Such projects should be complemented by larger mini-hydropower investments as a way to reduce land pressures from fuelwood consumption and otherwise to improve rural infrastructure in support of ecotourism and other economic activity.

Environmentally and Socially Sound Hydropower Development. As evidenced by USAID/Nepal's current programs, there is widespread agreement that development of the country's significant hydropower resources lies at the core of the national development strategy. While this topic is largely addressed by these USAID programs, it was mentioned often enough in discussions to bear repeating. Furthermore, expanded demand for clean energy within the South Asia region (especially for export to India) presents opportunities for regional and global economic and environmental benefits. US business involvement in the exploitation of this potential offers further links to US interests. Somewhat ironically, a principal constraint to further development lies in the need to proceed in an environmentally and socially responsible manner. The recent release of a comprehensive set of reports by the World Commission on Dams establishing internationally recognized norms for such actions should be met with relief by those who have previously been confused about how to proceed without drawing the ire of environmentalists and others concerned with social justice. It would be in the Government of Nepal's best interests to embrace these standards so that they now can move ahead with environmentally and socially sound hydropower development. Unfortunately, sentiments within the Electricity Development Center and even the Ministry of Environment remain unnecessarily defensive.

3.5 Sri Lanka

Discussions were held with both USAID/Colombo and Embassy staff responsible for environmental issues. In addition, extensive interactions with government officials and NGO and private-sector representatives took place, particularly as afforded by one EPIQ team member's

participation in the January 2001 “Workshop on New Directions in Land and Other Natural Resources Management” sponsored by Asian Development Bank.

A thorough review of Sri Lanka’s policies and institutional capacities for natural resource management has recently been completed by IRG under the ADB’s Sustainable Natural Resources Management for Development (SUNREM) Project. At present, the ADB plans or has underway more than \$200 million in natural resource management projects, covering forestry, coastal resources, water management, and biodiversity conservation. A further ADB assistance program to improve land resource management—as a complement to assistance from the World Bank and Australia—is in the design stage.

Given the scale of these investments relative to Sri Lanka’s size, there has been considerable interest of late and positive movement toward the reform of natural resource management policies and institutions (mostly through conditions attached to loan agreements). While no similarly concerted effort is underway with regard to urban and industrial pollution management, public and official awareness is growing regarding the trade-offs between urban and industrial expansion and environmental quality.

The ADB took over the role of lead donor on the subject of environment from USAID after completion of USAID’s Natural Resources and Environmental Policy (NAREP) Project in 1996. Since that time, US environmental assistance has been very limited and has mostly come through the US–AEP under the rubric of enhancing the competitiveness of key Sri Lankan economic sectors in the global marketplace. USAID is scheduled to phase-out its bilateral activities in 2002, after which time a foundation or other institution will be established to protect the “legacy” of US assistance. In the meantime, the Mission remains eager to participate actively in US–AEP and SARI/E.

Despite the ongoing civil strife associated with the separatist movement in the north and eastern parts of the country, Sri Lanka has continued to enjoy relatively rapid economic growth. However, if the country is to hold together, the devolution process outside of the conflict zone will need to set an example for provincial autonomy—including, significantly, the management of land and other natural resources. Together with demands for greater transparency and public consultation in government decision-making, this has pushed governance issues to the forefront of natural resources and environmental policy discussions.

In addition to the ongoing natural resource sector reforms mentioned above (covering forests, coasts, water, biodiversity and land), two additional and complementary topics were identified:

Environmental Information for Enhanced Transparency and Better Management Decisions. As evidenced by the frustrations encountered by SACEP/UNEP in trying to prepare a State of the Environment report for Sri Lanka, there is precious little reliable information available on current trends and conditions regarding environmental quality and the health of natural systems. (This chronic problem throughout the region hampers the design and monitoring of policies and programs to target environmental problems.) The last such review was conducted in 1990 under USAID's NAREP Project, and the Sri Lankan National Science Foundation's current attempt to update this study appears to suffer from both a lack of good data and any concerted effort to evaluate trends in environmental quality or resource degradation over the past decade. At the same time, there are increasing calls for greater transparency in the handling and public disclosure of environmental information, as well as improvements in both public consultation and participation, in the design and implementation of environmental programs and policies.

Environmental Dimensions of a Looming Energy Crisis. The country is facing a severe electrical energy supply problem. It has exploited its considerable hydropower potential to the maximum, subject to environmental, social, and economic constraints. The last project proposed was turned down on environmental grounds, because it would have resulted in the loss of a number of culturally and aesthetically significant waterfalls (though there is pressure to reactivate the project). Numerous attempts to construct new thermal power-generating plants have been thwarted over the past 15 years by a combination of weak political leadership and even weaker environmental and social analyses. There has also been some discussion about the possibility of buying power and/or coal from India (to be explored through the SARI/E program). The result is a country of 19 million people that currently is at the mercy of the monsoon rains. Rolling brownouts already are commonplace. Failure to fill the hydropower reservoirs would result in a major energy crisis that would cripple the economy. (When last this happened in 1996, it was estimated to have cost the country at least 2 percent of GDP growth for the year; and subsequent increases in demand have made the situation even more critical. A coal-fired power plant has recently been approved for construction north of Colombo, but this will only buy some time). The solution will lie in a combination of demand management and supply expansion. Considerable scope for energy efficiency improvements remains, and power supply expansion must still pass through the strongest environmental impact regulations in the region and a political system that, thus far, has failed to exert sufficient vision and leadership on this subject.

3.6 Bhutan

Information on Bhutan was collected from secondary sources. As mentioned, Bhutan's experiment with hydropower development in close cooperation with India is being carefully observed in Nepal. The country has a noteworthy and unique approach to development—applying strict cultural and nature-based controls—and an unconventional set of development indicators emphasizing collective social welfare. However, it is a model that Nepal, its most similar neighbor, would be hard pressed to emulate, especially given the difference in population pressures. Despite its small size and isolationist policies, Bhutan cooperates productively in regional and global fora. For the moment, at least, the country appears to have achieved a reasonable balance between environmental management and economic development. However, both the negative and positive external forces of globalization—together with growing internal pressures on the country's fragile mountain ecosystems and its still undemocratic political structures—may be difficult to control beyond the next decade. Bhutan receives no direct US environmental assistance.

3.7 Maldives

Based on discussions in the region (the Maldives are covered by the US Embassy in Colombo), it is clear that this island nation has become very actively engaged with other small island states in international forums calling for attention to the threats from global climate change (particularly those associated with sea level and temperature rise). Their economy depends largely on fisheries and tourism—both of which directly depend upon healthy and productive coastal and marine ecosystems. Attention to wise natural resource management—both within the borders of the archipelago and in the global commons—is a matter of high national priority. Despite the small population, environmental issues are given strong attention. Strong interest exists in supporting such efforts at the US Post in Colombo (in part because of the prospects for supportive positions in international fora), but assistance resources are extremely limited. As noted, the Maldives is in active discussions with the ADB (and IUCN) about participating in a new regional initiative on coastal resources management. Other environmental issues of greatest note are the supply of fresh water, sanitary disposal of solid wastes, and efforts to develop renewable energy resources.

3.8 Pakistan

The inability to adequately address the environmental challenges of Pakistan—due to rigidities imposed by sanctions in force at the time of the analysis—is one of the disappointments of this study. Discussions with an IUCN staff member from Karachi and others involved with industrial

environmental management in the country were held at the GIN-Asia Conference, and one of the team members also traveled to Pakistan in a private capacity—affording an opportunity for further discussions with NGO representatives. A representative from the Karachi US Consulate attended the Kathmandu SA-ESTOC meeting. However, no concerted effort was made to assess the key environmental issues in Pakistan (see ADB 2000b for a good recent summary). Pakistan is facing concerns similar to those in neighboring countries relating to population pressures on the natural resources base. (Human suffering and outright internal conflict associated with the current drought shows the fragility of this balance.) The major environmental issues in Pakistan appear to be primarily tied to the consequences of unplanned urban and industrial development. This is exacerbated by the ongoing drought that—together with the severe civil strife in neighboring Afghanistan—has driven refugees into the country and placed even greater strains on scarce resources. Though statistical analysis for the country remains weak, there is growing evidence of the heavy cost to human health paid by urban populations subject to severe air and water pollution. Significant and concerted attention is needed to tackle both water management and air pollution problems. At present, there is no direct US assistance to Pakistan on environmental matters.

3.9 Regional Programs and Organizations

In addition to the country-level issues and program responses, a number of initiatives are underway to address environmental and natural resource management problems at the regional level. Here, we will touch on current USG environmental assistance provided to two or more countries in South Asia (see Annex 4 for summary information) plus some key initiatives of donors and regional organizations.

US-Asia Environmental Partnership. US-AEP's country-level activities—generally planned in conjunction with bilateral environmental assistance—are built upon dual underlying premises. First, it is believed that a “clean revolution” can yet be fomented in Asian urban and industrial production, and, second, US-AEP has the conviction that Asia is set to embark on an unprecedented investment binge on urban and industrial infrastructure to satisfy economic growth expectations that should be shaped to be environmentally sound. US-AEP aims to promote and reinforce forces favoring the introduction of a sustainable, clean, economic growth regime by influencing public and private decision-makers who will plan these infrastructure investments. In the process, it promotes export of US environmental goods and services. Although South Asia receives relatively less attention under US-AEP compared to East and especially Southeast Asia, US-AEP has had some influence in the sub-region through its well-targeted activities. For example, US-AEP plays a lead role in USG environmental assistance to

Sri Lanka, where other resources on this subject are scarce. Likewise, activities in India and Bangladesh complement those of the bilateral missions and the South Asia RUDO. There has been a tendency over the past two years to place greater emphasis on urban as opposed to industrial environmental management issues.

SARIE. A range of regional energy policy and institutional strengthening activities are now getting underway through the SARIE program. Energy issues—and their environmental dimensions—were considered of high priority in all country discussions. (India's full participation is still to be formalized.) Work plans for the first year of activities are now being implemented for all four components of SARIE, covering technical assistance, training, rural energy, and exchange programs. Three of the four SARIE participating countries (the exception being Sri Lanka) have significant bilateral activities in place to complement this regional effort.

As described in its literature, the SARIEnergy program is designed to bring together public- and private-sector energy players from across the region to facilitate cross-border energy cooperation and development. SARIEnergy also will mobilize critical private-sector capital, technology, and management expertise. According to SARIEnergy documentation, the first phase, which began in 2000, is a four-year and \$50-million program to:

- Build professional and institutional capacity for sustainable energy development within governments, regulatory bodies, utilities, NGOs, and the private sector through regional workshops, seminars, formal courses, and study tours—providing an opportunity also for formal and informal networking among the region's energy professionals;
- Promote private sector support for, and civil society participation in, energy policy development through information-based dialogue among government, private sector, and NGOs to assuage concerns and advocate opinions related to energy sector reform, privatization, and foreign investment in the energy sector; and
- Create and strengthen regional forums, networks, and associations to influence politicians and decision-makers toward energy cooperation and development, with target groups for regional networking to exchange ideas, problems, and best practices including government technocrats, energy professionals, environmentalists, utility executives, regulators, trade and industry associations, and NGOs.

With its explicit goals relating to reduction of greenhouse gas emissions and the clear implications of energy policy for air pollution and other natural resource management concerns,

this regional “energy” program will continue to serve as a principal “environmental” assistance vehicle in South Asia for years to come.

State/OES Regional Environmental Hub. Currently, five regional environmental activities are planned or underway in South Asia, sponsored by the Regional Environmental Hub (see Annex 4 for summary information). These cover the topics of:

- Adaptive strategies for floods and droughts,
- Water quality monitoring,
- Geophysical and geochemical causes of arsenic poisoning in the Bengal Basin,
- South Asian participation in the Global Invasive Species Program, and
- Regional flood information exchange.

Most of these activities are supported by modest one- to two-year grants implemented through NGOs or in cooperation with other USG agencies.

ADB. The Asian Development Bank has just completed its review of environmental and natural resource management problems and responses in the Asia–Pacific region, summarized in a report entitled, *Asian Environment Outlook 2001*. This document served as one of several basic references for the EPIQ assessment, and good communications were established with both the operational and environmental divisions of the Bank that will aid future donor-coordination efforts. With specific respect to South Asia, the ADB has attempted over the past several years to coordinate country-level investments on a sub-regional basis (particularly on transboundary infrastructure such as transportation and energy links and, potentially, water). This builds on similar models the Bank has applied in the Greater Mekong Subregion and in Central Asia. Its efforts center on the four countries of Bangladesh, Bhutan, India, and Nepal. However, for many of the same reasons that SAARC is faltering (having mostly to do with disagreements between India and its neighbors), the ADB sub-regional approach to South Asia thus far has not proved very fruitful. But the Bank is still trying—with an analysis underway at present that includes an investigation of transboundary environmental problems that might be addressed through the “South Asian Growth Quadrangle.” A new, Asia-wide regional technical assistance project to help countries respond to the threat of climate change (“PREGA”) also will provide South Asian countries with additional resources for development of feasibility studies and financing assistance for projects qualifying under Joint Implementation and/or Clean Development Mechanism criteria (though India is a noticeable non-participant). Plans for a South Asian regional technical assistance project to improve coastal resource management also have been mentioned above.

SACEP. As noted, the EPIQ team also learned that the South Asia Cooperation in Environment Programme (SACEP), with offices in Colombo, is currently preparing "State of the Environment" reports for all South Asian Association for Regional Cooperation (SAARC) member countries. The United Nations Environment Programme (UNEP) is providing support for this effort. Much of this is being done in preparation for the UN World Summit on Sustainable Development to be held in Johannesburg in September 2002. The lack of reliable data on environmental conditions and trends in Sri Lanka and other countries is severely hampering their ability to produce accurate analyses and to draw reliable conclusions. This obvious constraint also will bear on USAID environmental programming efforts.

IUCN. Discussions were held with the World Conservation Union (IUCN) on their regional activities relating to biodiversity conservation and coastal resource management. (The EPIQ study team's local consultant in Sri Lanka recently spent two years working on the IUCN regional biodiversity effort.) With offices throughout the region, IUCN is a significant environmental player—acting variously as a quasi-governmental body, NGO, think tank, and consulting organization. A new regional project on coastal resource management involving IUCN and funded primarily by ADB is in the advanced planning stage. IUCN also is a partner to State/OES for several regional activities (see Annex 4).

ICIMOD. Kathmandu meeting participants drew heavily upon the regional program experience of the International Center for Integrated Mountain Development (ICIMOD), which serves as a principal partner of State/OES in the region. ICIMOD representatives discussed the implications of human population flows out of the Himalayan mountain regions and into lower-lying areas, as well as issues of rangeland management, glacial lake outbreaks, and ecotourism development. Repeating a story heard repeatedly in Nepal, the ICIMOD experts supported the view that natural geological forces (mass wasting) have been shown to account for the vast majority of sediments flowing out of the Hindu-Kush Himalayan Mountains and into the downstream states—despite widespread views in the lower riparian states that poor upstream land-use practices are to blame for sedimentation and flooding. It would appear that deforestation and poor agricultural erosion control often have important localized impacts, but the ability of human measures is sorely limited for influencing the erosion process and associated sediment flows in rivers. Likewise, severe rain events in the upstream areas of rivers cannot be contained and downstream flooding will occur—whether or not upper slopes are well forested. Useful discussions on Bhutan also were held with ICIMOD staff.

ADPC. The Asian Disaster Preparedness Center in Bangkok also was visited by one of the study team members to assess its role in regional cooperation on disaster preparedness and response. The need to explore opportunities for improved coordination between emergency management

efforts and broader natural resource management activities emerged from the Kathmandu meeting as an important subject for further study and action (see Annex 5 for a summary of USG-supported emergency management activities in the region). Discussions at ADPC revealed that the heads of emergency management agencies throughout the region have indicated their readiness to cooperate on hydrological disaster management—a fact borne out by the action plan that emerged from the May 2001 meeting of hydro-meteorological officials on flood information exchange co-sponsored by State/OES, USAID/OFDA and Dannida.

4. Summary of Key Issues Raised

4.1 Environmental Governance Inadequacies across the Region

The regional analysis and Kathmandu discussions both pointed to the lack of effective environmental governance institutions as a key crosscutting constraint to action in response to pressing environmental and natural resource management challenges. Government environmental institutions in all branches—executive, legislative, and judicial—are generally weak and uncommitted to devising policies and programs to respond to environmental problems. Information on environmental conditions and trends is poorly collected and, even where it exists, it is often withheld to serve narrower bureaucratic interests. The costs of inattention to the environmental consequences of development remain poorly understood by governments and the public. The institutions of civil society hold the key to a future of transparency and broad-based response to environmental challenges in the region, but they currently lack maturity.

Cabinet-level environmental agencies are now established in all South Asian countries, but they remain generally weak and without clear direction. Their principal regulatory vehicle has been the application of environmental impact assessments to review large development projects, but this process has been poorly implemented and even subject to considerable corruption in several countries. Efforts to control industrial pollution through rigid permitting schemes—tied often to unrealistic emissions and discharge standards—have also had disappointing results. The over-emphasis of donors in supporting these fragile government environmental bodies has been to the detriment of other potentially more influential institutions. Line ministries of central governments deserve much greater attention. Outside of the executive branch, legislative bodies are of growing importance as sources of innovation and action to address environmental issues of social concern, but they have received very little support with respect to their dealings with environmental matters. Likewise, as illustrated by the activist high court of India, the judicial branch can play a significant role in shaping environmental policy. However, it, too, has received relatively little assistance in building its understanding of environmental issues and exploring options for positive action.

At the same time, there is a strong trend toward decentralization and devolution within the region. This means that an entirely new group of government agencies—at state, city, and local levels—will require environmental management skills. The task ahead in this area is indeed daunting, but it also offers opportunities for innovation and the leapfrogging of technologies and tools—such as the application of advanced urban planning and geographic information system

techniques. It also holds the promise of empowering those who stand to benefit more directly from environmental improvements.

Existing economic policies at the central and regional government levels are replete with subsidies and other distortions that under price natural resources and a clean environment. Policy formulation also is weak, with limited policy expertise within government and only a handful of university centers or think tanks available to carry out the necessary analysis and evaluate policy options. In part because of poor policy design—but also due to ineffective institutions and faltering political will—policy implementation remains extremely weak across the region. Policy approaches need to be devised that are sensitive to limited enforcement capacities and take full advantage of both economic incentives and public pressures.

As encountered by UNEP/SACEP in their current efforts to prepare *State of the Environment 2001* reports for each of the SAARC-member countries, there are severe shortages of reliable data on environmental and natural resources trends and conditions. This further hinders effective policy formulation, as do significant constraints on the release of what little information is available to the public or even to other government agencies or industries. The adage “information is power” remains apt for this sector in the region, though the realities of Internet-based information exchange and the ready access to remote sensing data are rapidly breaking this down. An environmental NGO in Sri Lanka is preparing to introduce public right-to-know legislation, and the region would benefit greatly from further testing of disclosure-based policy incentives that rely on public pressure (and shame) to encourage altered behavior among industries and individuals. Improved mechanisms—beyond the scoping exercises of environmental impact assessment—also are needed in better organizing and incorporating public consultation on and participation into decision-making on environmental policies and programs.

Notwithstanding considerable legislative progress in recent years within the region (with some notable set-backs), the development of laws to provide basic democratic rights of discourse, assembly, and information access, the institutions of civil society still remain weak. NGOs continue to grow in their capacity and influence, and they deserve further encouragement. The media is maturing in its coverage of environmental news, and a regional network of environmental journalists—with a secretariat in Sri Lanka—has been established and is functioning. Professional associations in environmental fields also are beginning to develop and play more important roles in setting standards for credentials and behavior as well as shaping society’s thinking on key environmental topics. Examples include associations of environmental impact assessment practitioners in Sri Lanka and urban planners in India. As these institutions

mature, the region will likely see a more robust set of approaches to its environmental problems, and direct assistance to this process seems strongly warranted.

4.2 Water Resources Mismanagement

The assessment team was impressed with the extent to which the need for sound water management—for urban, rural, industrial and environmental uses—was found to be underpinning the prospects for sustainable development throughout the region. This includes water management challenges at both the national and transboundary levels. The prospect of national and regional conflict over this resource repeatedly was raised as an issue of growing concern. Table 4.1 summarizes the most important water issues identified. The pattern of inefficient and unsustainable water resource exploitation must be altered if severe development constraints and human suffering are to be avoided.

As noted, rapidly increasing competition among users includes agricultural (surface/groundwater), rural, municipal, industrial, hydropower, transport, and in-stream flow (ecosystems). At the same time, supplies are being constrained by pollution, which reduces effective surface and groundwater availabilities. Especially on the sub-continent, unsustainable deep aquifer exploitation is widespread and deserves immediate attention. In general, the region's water suffers from inefficient allocation and use—with higher-valued urban and industrial users often unable to use market or other mechanisms to bid away scarce water resources from those who derive lower marginal benefits from irrigation water use.

4.3 Urbanization and Deteriorating Urban Environmental Quality

This study also has shown that urbanization—in the context of a landscape already heavily influenced by dense human populations—is a key trend affecting environmental quality and management in the region. A loose consensus among the South Asian mayors attending the recent "Mayors' Asia-Pacific Environmental Summit" emerged that air pollution is fast becoming their top environmental priority. While new research on the high health costs from respiratory illness partially explains this concern, there is also a growing realization that outdoor air pollution spreads its ills without respect to economic or social class. The two most important targets for air pollution reduction appear to be transport (for outdoor pollution) and cooking stoves (for indoor pollution). As noted above, water management concerns also rank as an important consideration, with urban water supply systems remaining under funded and inefficient. Likewise, sewage and sanitation systems have poor geographic coverage within cities, and daunting investment requirements hang over the heads of urban planners throughout

the region. Municipal waste remains the largest source of organic pollution in surface waters—contributing greatly to the spread of water-borne disease and associated human suffering. Solid waste management also presents enormous challenges, along with a wider range of urban planning and “green space” considerations of importance to urban residents.

Table 4.1 Key Water Management Issues in South Asia

Regional Cooperation on Water Management

Although regional cooperation on transboundary water allocation and water quality issues remains problematic in South Asia, there is encouraging progress in response to the common threat of flooding and other hydrological disasters. A meeting of the heads of meteorological departments of all South Asian countries was held in May 2001 with USG support and in cooperation with the World Meteorological Organization and the Kathmandu-based International Center for Integrated Mountain Development. A joint action plan was agreed at the meeting that will lead to greatly improved information exchange and collective efforts on flood forecasting. This is seen as a first step toward broader cooperation on transboundary water management issues.

Drinking Water

South Asia is urbanizing very rapidly, and the provision of water supply to burgeoning cities is a top priority for municipal authorities. Water-borne diseases are a major contributor to high infant mortality where access to clean drinking water is limited. In the arid regions especially of Western India, Southern Pakistan and Afghanistan, water supply shortages become acute whenever there is a drought—such as is currently occurring. Optimism of the past few years regarding the ability of the private sector to invest in water infrastructure is fading, though this must continue to be an important part of the financing and water supply management.

Irrigation

Agriculture remains by far the largest water consumer in the region. The efficiency of irrigation remains generally low, and many perverse incentives constrain efforts to improve the situation. Prices paid for water (or its delivery) are very low relative to the marginal cost of water provision and marginal value of water to production. In India, subsidized energy in agricultural areas compounds the problem by encouraging highly wasteful pump irrigation practices. Transfer of authority over the management of local irrigation systems is moving ahead only slowly. There are opportunities for market-oriented and other policy changes that would have far reaching effects on the efficiency of water allocation and use both within the agricultural sector and between agriculture and other—often higher valued—users.

Aquatic Ecosystems and In-Stream Water Flows

There is almost categorical under-appreciation of the important biophysical—and sometimes directly economic, such as transportation—services provided by maintaining minimum in-stream flows of waterways and both natural and manmade drainage systems. Only in Bangladesh has there been any recent attention to the importance—in this case to inland fisheries and associated aquatic ecosystems—of maintaining appropriate drainage patterns and minimum flows. Elsewhere, inattention to this issue is contributing to problems of waterlogging and/or salinization associated with irrigation systems. Deltaic ecosystems are at the greatest risk from the consequence of low—and often highly polluted—river and drainage system flows and saltwater intrusion into coastal aquifers.

Unsustainable Groundwater Extraction

The rate of groundwater extraction for agricultural and other uses in many arid and semi-arid parts of South Asia is clearly greater than the natural recharge rates of these aquifers. This is particularly troubling because of the highly dense and poor populations that have come to rely on these unsustainable water sources. This situation is further complicated in southern Nepal, West Bengal, and Bangladesh by the discovery of toxic levels of arsenic in many wells—effectively rendering them unusable. Sound scientific analysis of groundwater management problems and programs to address these issues are urgently needed.

4.4 Energy-related Environmental Issues

Greater efforts need to be made to see that energy and environmental management go hand-in-hand in the region if synergy among these closely interrelated concerns is to be achieved. This is true at all scales of analysis: regional, national, and local. The regional linkages between upstream hydropower and downstream consumers have been noted, as have potential relationships between Bangladesh and its neighbors as natural gas supplies are exploited. At the

national levels, power-sector restructuring will improve efficiencies in energy production and distribution, and decisions regarding especially India's coal-based electricity sector will have significant environmental implications with national, regional, and global dimensions. At the more localized level, USAID/India seems intent on exploring an integrated strategy to improve simultaneously the efficiency of municipal water supply and rural energy services. Likewise, USAID/Nepal's efforts to help develop that country's vast hydropower resources must be centered on ensuring that the full social and environmental costs of investments are incorporated into planning and decision-making. The linkages between energy consumption for transport and cooking—especially in urban areas—and the generation of air pollution have already been mentioned. Along with water management issues, energy-related environmental challenges in South Asia will continue to be a topic of high priority for policy and program attention over the next few decades.

5. Conclusions and Recommendations

5.1 Introduction

This final section attempts to summarize the main points raised in the report and the extent to which USG environmental and other assistance programs currently address the high-priority assistance needs identified by the assessment. The assessment scope stopped short of requesting the development of a detailed strategic response to these problems—leaving this to the USAID/ANE Bureau and the South Asian Missions. However, we identify below some areas that should be of interest for programming attention based on a comparison of the apparent need versus current responses. Four areas are identified, one that is crosscutting in nature and three that deal with more sector-specific issues.

5.2 Environmental Governance

There is no more fundamental underlying cause of the current environmental and natural resources management problems in the region than the widespread failure of environmental governance systems. Weaknesses may be found across the full gamut of environmental institutions, from government agencies, legislatures, and courts to various elements of civil society needed to articulate and act upon environmental challenges.

Further, there are few examples of current USAID programs that attempt to address environmental governance issues as an explicit target. Instead, such efforts are woven into the more sector-oriented programs of the Missions, such as those dealing with water management in Bangladesh, hydropower in Nepal, and both urban and industrial issues in India. While some aspects of US-AEP's assistance activities to the region address issues of environmental governance—especially by encouraging attention to environmental issues by professional and industry associations—this appears to be a secondary goal. At a more basic strategic level, the region has no systematic environmental policy support programs (since completion of the USAID NAREP Project in Sri Lanka), even though severe policy and institutional shortcomings constrain progress. Environmental governance topics deserving much stronger attention include the failure of key institutions at the regional, national, and local levels; widespread corruption hindering the implementation of existing environmental policies; and unrealistic policy frameworks, often based on Western standards and taking little account of either enforcement or compliance costs. Adjustments to or introduction of new systems of governance interventions in

these areas would be cost-effective—potentially able to reach tens of millions of beneficiaries. They also can strongly reinforce democratic reforms.

It is recommended that explicit regard be given to adding further emphasis on environmental governance in USAID's assistance programs to the region—either as a part of environmental assistance or building environmental dimensions into democracy and economic growth programs. Attention also should be given to the analysis and development of improved environmental and natural resources policies as a complement to all other environment-related assistance and, to the extent possible, integrated into broader economic and trade assistance.

5.3 Water Management

A widening body of literature makes the economic and environmental case for increased attention to water management problems in the region, primarily based on the effects of poor water quality on human health and of water misallocation and use inefficiency on the productivity of agriculture and industry. This study's analysis has shown how those areas of the region with the lowest available water resources are also at the greatest risk of drought—as is currently occurring in Pakistan and neighboring countries. Despite increasing competition between expanding urban and industrial water users and those in the agricultural and rural sectors, good economic and institutional approaches are limited for dealing with matters of efficient water use and allocation.

Water management issues in the region already receive considerable attention, and there are plans to expand this further. In Bangladesh the MACH Project deals with inland fisheries management increasingly in a sub-catchment context. USAID/Nepal focuses a significant portion of its resources on environmentally and socially sound hydropower development. In India, progress has been made in developing successful models for financing urban water infrastructure, and the Mission is moving ahead with plans for a new program to address the “water–energy” nexus. The recently developed regional action plan for flood information exchange represents an important—if modest—step forward to encourage greater cooperation across South Asia on addressing hydrological risks as well as related issues.

There are opportunities for improved coordination of Mission-level, water-related activities across the region, especially where the possibility of cross-border bilateral cooperation exists. The potential for expanding regional cooperation in response to the common threat of hydrological disasters—based on the recent successful dialogue on this subject—also should be further supported.

5.4 Urban Environmental Management

The phenomenon of urbanization is so pervasive a force within the region that it is difficult to separate it from the other identified topics, and, in many key respects, it should be considered a sign of progress. However, it creates tremendous environmental management challenges associated with the reengineering of natural systems and the sheer numbers of people crowded onto a finite natural resource base.

At the Mission level, through RUDO/SA and with inputs from US-AEP, USAID is already dealing with several important environmental dimensions of the region's urbanization process (see the upcoming USAID/India-RUDO paper on urbanization appropriate responses). More than any other of the region's environmental activities, urban programs address environmental governance issues, such as those dealing with city managers' associations, government capacity building, and the establishment of healthy urban financial institutions. Structural issues within USAID remain—mostly to do with the relationships between the RUDO office and bilateral Mission programs—that also need to be addressed in planning appropriate responses.

Given the importance placed on both urbanization and environmental governance issues by the assessment, it would seem prudent for USAID's urban programs to build on the foundations of existing assistance and look to its expansion with respect to environmental dimensions. Target areas might include issues such as urban property rights as they affect incentives for sound urban landscape planning, as well as support to decentralization and devolution processes that will influence the efficient provision of environmental services (such as water supply, sanitation, transportation planning, and solid waste management).

5.5 Energy and Environmental Management

As dramatically illustrated by the "City Lights" satellite image presented in Section 2, South Asia is rapidly making the transition to use of a modern electricity grid. This can reduce the burning of traditional fuels with associated air pollution reductions, but, with coal as the principal power source, some of these gains will simply be offset by other problems. The energy-environment connection is also regional or even global (climate change) in nature, from issues of transboundary air pollution to interstate cooperation for natural gas or hydropower trade. It is important that environmental considerations not be taken as an afterthought in energy planning and investment, and, likewise, environmental planners ignore energy issues at the peril of their efforts to improve environmental quality and the sustainability of natural resource systems.

Fortunately, much of the energy-related assistance provided to the region already has explicit environmental dimensions, though there does not seem to be any systematic attention to measuring these benefits (other than those associated with greenhouse gas emissions reductions as mandated by USAID's Global Climate Change Initiative). Support for power sector restructuring is an area of assistance that must be mindful of local, national, regional, and global environmental implications of alternative patterns of reform.

The new SARI/E program should further develop these energy–environment linkages on a regional level. It also would be useful to review these relationships further at the national level with an eye to incorporating environmental considerations fully into energy-related assistance and carefully monitoring and evaluating the environmental consequences of energy policy and program adjustments.

5.6 Priorities for Further Analysis

In closing, it is important to note again the limits of the current analysis and to identify priorities for further study in support of sound decisions on assistance programming.

This assessment primarily was based on interactions with arms of the US Agency for International Development and the US Department of State—both in the region and the support offices based in Washington, DC. As noted, adequate attention could not be devoted to a host of other USG bodies engaged in environmentally relevant programs of cooperation in South Asia at the country and regional levels. Any follow-on analysis should certainly incorporate these organizations and their perspectives.

The other shortcoming of the current analysis is its geographic scope. The study team was not able to visit or adequately cover the non-USAID recipient countries of Pakistan, Maldives, and Bhutan nor the important interactions with the neighboring states of Afghanistan, China, and Burma. The omission of systematic attention to Pakistan is particularly limiting—especially in the aftermath of recent developments turning the eyes of the world to Afghanistan and its neighbors. Assuming positive economic, social, and political development in Afghanistan, there may be renewed opportunities for cooperative engagement supporting its economic development. The close links with Pakistan and some geographic considerations argue for including Afghanistan in the South Asia region, though its relationship with Central Asian neighbors also will need to be carefully considered (it is, for example, an important upstream riparian state in the Amu Darya River Basin flowing into Turkmenistan and Uzbekistan). Careful attention should be given to understanding how best to improve natural resources management in both Pakistan and Afghanistan as an underpinning to their economic development.

Annex 1

**Agenda for the Joint State Department–USAID South
Asia Regional Environment, Science, and Technology
Officers Conference
Kathmandu, April 17–20, 2000**

Agenda

Tuesday, 17 April: Arrivals and Opening Reception

14:00 – 16:00 Participant registration at Radisson Hotel (conference hall anteroom)

17:30 – 19:00 Reception hosted by US Ambassador Frank at the Ambassador's residence

Wednesday, 18 April: Overview of Key Issues and Preliminary Discussions

8:30 – 9:30 Welcome and overview of workshop objectives and schedule

John Wilson, USAID/ANE

Mark Sigler, State/PCI/OES

Deborah Seligsohn, State/South Asia Environmental Hub

Tom Armor, EPIQ/MSI (Facilitator)

9:30 – 10:30 Important demographic and natural resource management trends in South Asia

Asif Shaikh, EPIQ/IRG

Tom Gardner Outlaw, Population Action International

10:30 – 10:45 Coffee break

10:45 – 11:15 Discussion of key trends in the region

11:15 – 12:00 Overview of EPIQ team preliminary findings

David McCauley, EPIQ/IRG

12:00 – 12:30 Discussion of EPIQ team preliminary findings

12:30 – 13:30 Lunch break

13:30 – 14:30 Panel on natural resources management issues and discussion

George Like, USAID/Nepal

Charles Uphaus, USAID/Bangladesh

Michael Mates, US Consulate/Karachi

Mahesh Banskota, IUCN/Nepal

14:30 – 15:30 Panel on urban and industrial environmental issues and discussion

Dennis Zvinakas, USAID/Philippines/USAEP

Richard Edwards, USAID/India

Ananda Mallawatantri, USAID/Sri Lanka/USAEP

Shreekant Gupta, Delhi School of Economics

15:30 – 15:45 Coffee break

15:45 – 16:15 Regional water management issues

Deborah Seligsohn, State/South Asia Environmental Hub

John Wilson, USAID/ANE

Nanda Abeywikrema, IMWI/Global Water Partnership

16:15 – 16:45 Discussion of regional water issues and potential program responses

16:45 – 17:00 Participant inputs to second day's agenda

Evening No program

Thursday, 19 April: Further Discussion of Issues and Prioritization for Action

8:30 – 9:00 Improving links between natural resources and disaster management

David McCauley, EPIQ/IRG

Marcus Meunch, ISST/Kathmandu

Atiq Rahman, Bangladesh Center for Advanced Studies

9:00 – 9:30 Discussion of natural resources and disaster management links

9:30 – 10:00 Environmental management as a regional security issue

Robert Anderson, Environmental Security Specialist

10:00 – 10:30 Discussion of environmental management as a regional security issue

10:30 – 10:45 Coffee break

10:45 – 12:00 Break-out groups

12:30 – 13:30 Lunch break

13:30 – 14:45 Break-out group presentations and discussion

14:45 – 15:00 Coffee break

15:00 – 16:00 Field representatives' final guidance to EPIQ study team

16:00 – 17:00 Discussion and conclusions regarding EPIQ team findings and follow-up analysis

David McCauley and Asif Shaikh, EPIQ/IRG

John Wilson, USAID/ANE

Tom Armor, EPIQ/MSI (Facilitator)

19:00 – 22:00 Cocktail reception (hosted by EPIQ) and conference banquet (hosted by USAID).

***Friday, 20 April: State-USAID and Field-Washington Understanding and Coordination
(Agenda Subject to Adjustment based on Inputs from the Participants)***

- 9:00 – 9:30 Overview of ESTOC day's agenda
Mark Sigler, State/PCI/OES
John Wilson, USAID/ANE
Deborah Seligsohn, State/South Asia Environmental Hub
- 9:30 – 10:30 Updates on current Washington developments
Mark Sigler, State/PCI/OES
John Wilson, USAID/ANE
- 10:30 – 10:45 Coffee Break
- 10:45 – 12:00 World Summit on Sustainable Development (Rio+10)
Mark Sigler, State/PCI/OES
- 12:00 – 13:30 Lunchtime panel on Bottom-up versus top-down regional cooperation approaches
Gabriel Campbell, ICIMOD
Dipak Gyawali, Nepal Water Conservation Foundation
Brian Peniston, Mountain Institute
- 13:30 – 15:00 Field perspectives – lessons and questions for Washington
- 15:00 – 15:15 Coffee Break
- 15:15 – 16:30 Field perspectives (cont'd)
- 16:30 – 17:00 Wrap-up and next steps
Tom Armor, EPIQ/MSI (Facilitator)
- 17:30 – 18:30 Closing Reception

Saturday, 21 April: Departure of Participants

All day Participant departures

Annex 2

**List of Participants for the Joint State Department-
USAID South Asia Regional Environment, Science,
and Technology Officers Conference,
Kathmandu, April 17-20, 2000**

Name	Title	Organization and Address	Tel	Fax	Email & www
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Annex 3

**Press Coverage for the Joint State Department–USAID
South Asia Regional Environment, Science, and
Technology Officers Conference,
Kathmandu, April 17-20**

NATIONAL DAILY

THE RISING NEPAL

Kathmandu Friday April 20, 2001 Baishakh 07, 2058.

Water shortage to hit South Asia

BY A STAFF REPORTER

Kathmandu, April 19 – A three-day workshop is being held in Kathmandu from April 18-20 to discuss the perspectives, trends and conditions of key issues related to environmental and natural resources in South Asia and to assist the US government to better understand the problems of environment in South Asia.

Called as the review workshop on the preliminary findings on a study done by USAID's Global Bureau Environmental Centre through the Environmental Policy and Institutional Strengthening Indefinite Quantity (EPIQ), it is meant to help the US government's region-wise and country-specific programmes.

The review workshop will be followed by a seminar in Washington D.C. on the study's findings possibly in May.

Robert Kerr, Public Affairs Officer at the US Embassy in Kathmandu, said the review workshop is being participated by 40 participants from the US missions and agencies in the region and experts from Nepal, India, Bangladesh and Sri Lanka.

"The outcome of the study, under the South Asia Regional Environmental Profile, will help the US government to thrash out its strategy on the current and the likely future environmental and natural resources management issues affecting US interests in South Asia," he said.

At a press conference today, Dr. John Wilson, Environmental Officer at the USAID's Bureau for Asia and the Near East, said the result of the study will help for making decisions at the regional and country-specific level on key environmental issues. He said EPIQ's preliminary study has found water, energy and environment will be the key issues of the region in future.

Elaborating it further, Dr. David McCauley, Director of Asia-Pacific Region of the International Resources Group said, the preliminary findings of the study has identified four sectoral and three cross-cutting issues as key to the trends and conditions of South Asia's environmental and natural resources.

The four key sectoral issues are: water resource management; forest and land resource management; urbanization; and the energy and its environmental dimension.

On the water resource management, he said South Asia will face severe shortage of water in the next 10-20 years, but there are also opportunities for regional cooperation for flood

protection, water-sharing and trans-boundary cooperation of energy and hydro-power development.

He said the forest and land management is already human dominated and human influenced. He said human domination of forest and land may be slightly less in Nepal, but it is characterized by high density of crop and population density.

Urbanization will be another environmental challenge for South Asia with pollution of air and water and problems of solid waste disposal and wastewater management. He said South Asia urgently needs urban planning.

Regarding energy, Dr. McCauley said the region needs to have improved efficiency in the electricity sector and concerns regarding energy production and consumption. He said there is a tremendous potential of regional cooperation in the energy sector.

The three cross-cutting topics identified by the preliminary report relates to better coordination in disaster forecasting, preparedness and management; role of the judiciary on laws and actions to improve environmental quality, need for more public awareness and participation in environment management and need for more cooperation between the government and the private sector, NGOs and the civil society to address inefficiency and corruption of government on environmental issues; and growing potential of misunderstanding leading to conflicts over natural resources.

HEADLINES



The Kathmandu Post

Kathmandu Friday April 20, 2001 Baishakh 07, 2058.

Trans-border efforts for environment stressed

Post Report

KATHMANDU, April 19 – Environmental experts from USA and South Asian region have called for trans-border efforts among South Asian countries in environmental management and water resources conservation.

Experts participating the Joint USAID-State Department's South Asia Environment, Science and Technology Officers' Conference here have also pointed out the urgent need to tackle issues related to water resources management, forest and land management, urbanization and energy. This was informed at a press conference held here Thursday to highlight the five-day conference, which is scheduled to conclude Friday.

Talking to newsmen, David McCauley, one of the consultants involved in commissioning an environmental report focusing on the region, called for integrated regional efforts to tackle the region's worsening environment and energy related issues. He blamed growing population pressure as the major challenge and the factor behind the region's depleting forest and fast diminishing water resources.

Annex 4

**Summary of Planned or Ongoing USAID and
State Department Environmentally Related Activities
in South Asia**

BANGLADESH

Activity	SO and Funding Source	Implementer(s)	Timeframe	Value of Assistance	Comments
1. Management of Aquatic Ecosystems through Community Husbandry (MACH)	SO6: DA & CSD	Winrock International and local NGOs	6/99-5/02	\$16 m	Ongoing
2. Tropical Forest and Biodiversity Conservation through Debt Buy-back under TFCA	SO6: DA and CSD	Winrock International and TBD	6/01-5/03	\$200k + \$6m endowment	Underway and planned for expansion

INDIA

Activity	SO and Funding Source	Implementer(s)	Timeframe	Value of Assistance	Comments
1. Trade in Environmental Services and Technology/Clean Technology Initiative (TEST/CTI)	SO4 (IR4.2): DA	Tetra Tech; ICICI	09/92-9/02	\$30 m	Ongoing
2. Greenhouse Gas Pollution Prevention (GEP)	SO4 (IR4.1): DA	Louis Berger; DOE; NTPC, ICICI, IDBI	4/95-3/05	\$39 m	Ongoing
3. Energy Conservation and Commercialization (ECO)	SO4 (IR4.1): DA	Nexant; MoP, ICICI/USEA	01/00-9/04	\$25 m	Ongoing
4. Financial Institutions Reforms and Expansion (FIRE-D)	SO4 (IR4.3): DA	TCGI-PADCO, NIUA, IL&FS, HUDCO	10/99-9/03	\$18 m	Ongoing
5. Energy Management Consultation and Training (EMCAT)	SO4 (IR4.1): DA	IDBI, PFC	6/91-12/02	\$27 m	Phasing out
6. Water-Energy Nexus	SO4	TBD	9/01-9/06	TBD	Planned

NEPAL

Activity	SO and Funding Source	Implementer(s)	Timeframe	Value of Assistance	Comments
1. Community Forestry and Buffer Zone Management Programs	SO1: DA	WWF, CARE, USDOJ, United Mission to Nepal	1996-2002	\$9.6 m	Will be phased out in Sept. 2002
2. Environmentally and Socially Sound Hydropower Development	SO4: DA	International Resources Group, USEA	7/99-9/01	\$3.8 m	Ongoing, New phase planned
3. Governance of Natural Resources and Selected Institutions	SO5: DA, ESF	TBD	2001-2005	TBD	Planned

SRI LANKA

Activity	SO and Funding Source	Implementer(s)	Timeframe	Value of Assistance	Comments
1. Industry Survey on Pollution Control as it Relates to Competitiveness	SO4: DA (US-AEP)	Nathan/Management Systems; EML; IESC	9/00-3/01	\$50 k	Evaluation of findings underway
2. Other US-AEP (to be completed)	SO4: DA (US-AEP)	US-AEP Contractors	2001-2002	\$50-150k	Planned

SOUTH ASIA REGIONAL ACTIVITIES

Activity	Country Coverage	Funding Source	Implementer(s)	Timeframe	Value of Assistance	Comments
1. Adaptive Strategies for Floods and Droughts	Pakistan, Bangladesh, India, Nepal	SA ESF	ISET/Boulder and Kathmandu with partners in India, Pakistan and Bangladesh (all NGOs)	10/01-9/03	\$250 k	Ongoing; Planning meeting held in May 2001.
2. Water Quality Monitoring	Bangladesh, India, Nepal, Pakistan (Indus, Ganges)	SA ESF and USDOE	The Cooperative Monitoring Center of Sandia National Lab in cooperation with NGOs; Phase 1 DOE, State will jointly fund Phase 2.	3/99-9/02	\$300 k (\$150 k in each phase)	Ongoing, second phase began in May 2001.
3. The Geophysical and Geochemical Causes of Arsenic Poisoning in the Bengal Basin	Bangladesh, India, Nepal	SA ESF	USGS	9/00-9/04	\$250 k	Ongoing, second phase underway.
4. Global Invasive Species Program-South and Southeast Asia	Nepal, Bhutan, Bangladesh, Sri Lanka, the Maldives and 3 countries in Southeast Asia	OES Initiatives	The USFWS (through the Global Invasive Species Program) and University of Colombo (India and Pakistan to be engaged through other sources)	5/01-9/02	\$150 k	Planned
5. Regional Flood Information Exchange	Pakistan, China, Bhutan, Nepal, India, Bangladesh	OES Initiatives, OFDA/ USAID (Danida co-financing)	ICIMOD	Phase 1: 9/00-6/01; Phase II: 6/01 - 3/03	\$100 k (\$50k in 2000)	Ongoing; Second phase underway.
6. SARI/Energy	Nepal, Bangladesh, Bhutan, Sri Lanka, the Maldives (India pending, Pakistan excluded due to sanctions).	DA, SA ESF	USAID/ANE and USAID S. Asia Missions; Nexant, AED, COLE, USEA	11/00-10/03	\$50 m	Energy-oriented, but strong environmental dimensions.
7. US-Asia Environmental Partnership	Regional, main activities: India, Bangladesh, Sri Lanka	USDOC; DA	USAID, Commerce, EPA; Various contractors	1/94-9/01 ongoing?	\$10 m (S. Asia)	Five-year extension expected.

Annex 5

**DISASTER MANAGEMENT IN SOUTH ASIA
(BANGLADESH, INDIA, NEPAL AND SRI LANKA)**

U.S. GOVERNMENT DISASTER-RELATED PROGRAMS

USAID/OFDA-Funded Programs

- The **Extreme Climate Events Initiative (ECE)** was originally developed by USAID/OFDA and the National Oceanic and Atmospheric Administration (NOAA) as a follow-up initiative to the Asian Regional Meeting on El Niño-Related Crises in February 1998. The program aims to significantly improve the understanding of the impacts of extreme climate events such as El Niño and La Niña on society and the environment in the target countries of Indonesia, the Philippines, and Vietnam, with plans to extend the program to Bangladesh and Thailand.
- With USAID/OFDA funding, the **Program in Atmospheric and Oceanic Sciences (PAOS) at the University of Colorado** is developing the capability to predict major flood events in Bangladesh and is transferring this capability to local partners for improved flood early warning. Parallel to the development of the forecast technology, activities will inform and involve the user community by transferring the prediction schemes to the local scientific and user community in Bangladesh. The three-year program, begun in April 2000, will develop an effective early-warning system for the Bangladesh delta using the developed forecasting capability, in close consultation with local and national user groups. Workshops and technical assistance directed at the application of the forecast technology will also ensure that the forecasts are used for optimum benefit. Cost for three-year program: \$2.1 million.
- Since 1995, the goal of the **Asian Urban Disaster Mitigation Program (AUDMP)** has been to reduce the disaster vulnerability of urban populations, infrastructure, critical facilities, and shelter in targeted Asian cities. To reduce vulnerability, the program conducts national demonstration projects, information dissemination, networking activities, policy seminars, and professional training. The targeted countries include Bangladesh, Cambodia, China, India, Indonesia, Laos PDR, Nepal, the Philippines, Sri Lanka, and Vietnam. The program is managed by USAID's Regional and Urban Development Office for South Asia (RUDO/SA), and is implemented by the Asia Disaster Preparedness Center (ADPC). Incremental funding: \$3 million.

Example of an AUDMP project in Nepal: AUDMP partners, with the National Society for Earthquake Technology (NSET) and GeoHazards International (GHI) have implemented the Kathmandu Valley Earthquake Risk Management Project (KVERMP) to reduce the earthquake

vulnerability of Kathmandu Valley. USAID/OFDA support to NSET has raised awareness in Nepal about earthquake vulnerability and other natural hazards, and has been the engine for disaster management in Nepal. Although the KVERMP, begun in 1997, is near completion, USAID/OFDA continues to support and expand the work initiated under the project through direct funding to NSET.

- **The Program for Enhancement of Emergency Response (PEER)** is a collaborative effort of USAID/OFDA, the Miami Dade Fire & Rescue Department, and ADPC. Since October 1998, the program has aimed to develop and strengthen search-and-rescue training capabilities in Asia at the regional, sub-regional, and national levels. This initiative provides the skills and enhances the expertise of disaster managers in India, Indonesia, Nepal, and the Philippines in better coordinating search-and-rescue operations and medical response following a disaster. FY 2001 Extension: \$2.05 million.
- ADPC is also organizing USAID/OFDA's **Damage and Needs Assessment Training Program (DANA)** workshop, which will develop a standard methodology and protocols appropriate to Asia and the Pacific for assessing damage and needs following a disaster. By training country-level disaster managers in the region to conduct comprehensive and accurate assessments, disaster response efforts can optimize the mobilization and use of resources. Once the program has been adapted for Asia and the Pacific, the training will be available for government disaster managers, Red Cross staff, NGO staff, and other disaster-related personnel.

Other USAID Programs and Initiatives

USAID provides funding for **Community-Based Disaster Management (CBDM)** training courses in Bangladesh for international participants. In cooperation with CARE/Bangladesh, local government officials, international NGOs, and UN and other donor agencies receive training to help prepare communities for disaster management activities. Participating countries have included Bangladesh, Nepal, and India, among others.

National Oceanic and Atmospheric Administration (NOAA)

NOAA's National Weather Service does not have any ongoing, disaster-related programs for the four countries under this study. The closest regional program is the Program to Address ASEAN Regional Transboundary Smoke (PARTS) for Southeast Asia including Brunei, Indonesia, Vietnam, Singapore, Thailand, the Philippines and Malaysia. The objective of the program is to enhance the capacity and capabilities of NMHS to monitor, model, and generally manage episodic transboundary pollution events.

Federal Emergency Management Agency (FEMA)

According to FEMA's Director for International Programs, FEMA does not participate in regional or bilateral disaster-related programs in Asia, as they do not have funding to do so. However, they do provide technical assistance in the form of internships for disaster experts from other countries that would like to learn about FEMA activities and programs. Of the four South Asian countries reviewed, only India has sent disaster representatives to FEMA/Washington for short-term technical assistance.

U.S. State Department

The US State Department is jointly funding an initiative with USAID/OFDA called "Adaptive Strategies for Floods and Droughts." In South Asia, hundreds lose their lives and millions are displaced in annual floods and droughts. The continued and improved information exchange between country government officials is vital to continued regional engagement on these issues. The project will be implemented in India, Bangladesh, Pakistan, and Nepal through the Institute for Social and Environmental Transition (ISET) and its NGO partners. Project cost estimate: \$250,000.

Other Notable Regional Programs

The **International Decade for Natural Disaster Reduction (IDNDR 1990–2000)** was proclaimed in 1989 and was intended to reduce the loss of life and property damage, social and economic disruption caused by natural disasters through concerted international action, and appropriate use of science and technology. In July 1999, a closing ceremony for the IDNDR 1990–2000 was held in Geneva, Switzerland. During the international forum, which brought together high-level government representatives, national and local policymakers, NGOs, the scientific community, and others, the partners in the International Framework of Action for the Decade adopted the document entitled *A Safer World in the Twenty-First Century: Risk and Disaster Reduction*.

This document contains the **International Strategy for Disaster Reduction (ISDR)**, which has as its main objectives: a) to enable communities to become resilient to the effects of natural, technological, and environmental hazards, thus reducing the compound risk posed to social and economic vulnerabilities within modern societies; and b) to proceed from protection against hazards to the management of risk, by integrating risk prevention strategies into sustainable development activities. The UN Secretary General emphasized the importance of continuing the work carried out by the IDNDR, and outlined institutional arrangements for the implementation of the ISDR as a successor to the IDNDR, effective January 2000.

Overview of Disaster Management Issues By Country

BANGLADESH

Disaster Management

Recognizing that Bangladesh is extremely vulnerable to a wide range of disasters, the Government of Bangladesh (GoB) has established a consolidated framework in a National Disaster Management Plan to help respond to a disaster, as well as to mitigate the effects. The Plan incorporates the entire disaster cycle, including prevention, mitigation, preparedness, response, and recovery. It also provides guidance for operational activities regarding the mobilization and development of national resources and requests for international assistance before, during and after disasters. The GoB is clearly aware of the benefits of planning for disasters and is actively involved in preparedness and preventive measures, such as hazard and risk analysis, land-use zoning, building codes, and disaster-preparedness training. Whereas disaster management in Bangladesh was initially considered to be a structural or engineering issue, there is a growing recognition at all government levels that non-structural mitigation measures such as community disaster preparedness, training and public awareness linked to micro-income generating projects, and land-use zoning need to be given a high priority.

The Directorate of Relief and Rehabilitation was established in 1983 as an operational unit of the Ministry of Disaster Management & Relief (MDMR), which also has two specialized support organizations—the Disaster Management Bureau (DMB) and the Directorate of Relief and Rehabilitation (DRR). The Directorate has an officer known as the District Relief & Rehabilitation Officer in each District and an officer known as the Project Implementation Officer in each Thana. Overall, the GoB has seven national committees and four field-level committees to respond to and prepare for disasters. In addition to these organizations and committees, the Cyclone Preparedness Program (CPP) exists as a joint effort between the MDMR and Bangladesh Red Crescent Society.

The CPP aims to provide cyclone warning assistance, as well as assistance to people seeking shelter, rescue, first aid, and other relief and rehabilitation assistance.

To improve the country's disaster management capabilities, the GoB has instituted programs, and developed institutions to address early warning systems, information management, and communication links. Some of the associated organizations include the Storm Warning Centre (SWC), the Bangladesh Meteorological Department (BMD), the Flood Forecasting and Warning Centre, and the Bangladesh Water Development Board.

Major Natural Disasters

Bangladesh is prone to several kinds of natural disasters, including tropical cyclones with their associated storm surges, floods, droughts, tornadoes, river-bank erosions, and earthquakes.

Cyclones

Tropical cyclones are frequent in the Bay of Bengal. Immediately pre-monsoon and immediately post-monsoon are when cyclones and depressions form in the Bay of Bengal. Bangladesh has the worst record of cyclones and storm surges in the world, which have the effects of destroying crops; damaging infrastructure, homes and vital installations; and causing widespread health hazards. The storm surges associated with cyclones create both short- and long-term problems, as salt water can ruin the soil. This type of disaster is so frequent and of such a magnitude that it has exacerbated the problem of poverty and seriously affects the country's efforts toward self-reliance.

Floods

Although moderate floods often contribute to the fertility of the land, extensive river floods cause great disruption and damage to infrastructure and loss of crops. Floods indirectly contribute to the concentration of land ownership and wealth, as small landowners are forced to sell their property as a result of flooding. However, farmers have developed agricultural practices to make use of the floodwater for rice and jute, as well as for fisheries. It is when flooding increases beyond the expected levels that problems occur.

Droughts

Bangladesh occasionally experiences drought conditions that cause an extraordinary level of crop failure. In 1957, 1972, and 1979 Bangladesh experienced drought periods that resulted in significant crop failure and subsequently caused an inordinate amount of strain on Bangladesh's socio-economic conditions.

River Bank Erosion

Along the Jamuna and the Meghna rivers, erosion takes a serious toll by displacing a large number of people every year, and destroying property. As a result, the displaced population is often compelled to move to the cities, where the scarcity of land becomes even more problematic and contributes to the growth of slum areas, and growing urbanization.

INDIA

Disaster Management

India's location and geographical features render it extremely vulnerable to a number of natural hazards including cyclones, drought, floods, earthquakes, fire, landslides and avalanches. Due to the country's vulnerabilities and hazards, long-term planning, preparedness, and disaster mitigation are integral to development planning in India. Science and technology developments have allowed India to improve its implementation of flood forecasting and early warning systems, cyclone tracking systems, drought monitoring, disaster-resistant construction technologies, and improved cropping systems in order to reduce the socio-economic impact of disasters. Additionally, during the reconstruction phase of a disaster, India aims to rebuild with disaster-resistant structures to minimize the impact of future natural hazards.

Under the Indian federal system, disaster management is the responsibility of State Governments. However, a Crisis Management Group, headed by the Cabinet Secretary, consists of nodal ministries in charge of various types of disasters and supporting ministries. For natural disasters, the Ministry of Agriculture is the lead ministry, with other ministries playing a supportive role. In the event of a disaster, a multi-disciplinary Central Government team, at the invitation of the affected State, carries out disaster assessment and makes recommendations for assistance.

Major Natural Disasters

In an average year, some part of India faces the effects of drought due to the failure of monsoons in vulnerable areas, while one or two cyclones strike the peninsular region of the country. Floods are also regular feature of Eastern India, where Himalayan rivers inundate large parts of its catchment areas, uprooting people, disrupting livelihood, and damaging infrastructure. The Himalayan mountain ranges contribute to the country's vulnerability through the prevalence of earthquakes, landslides, and avalanches.

Floods

Of the annual rainfall, 75 per cent is concentrated during four months of the monsoon season (June–September) and, as a result, almost all the rivers carry heavy discharge during this period. The flood hazard is compounded by the problems of sediment deposition, drainage congestion, and synchronization of river floods with sea tides in the coastal plains. The rivers originating in the Himalayas also carry a lot of sediment and cause erosion of the banks in the upper reaches and over-topping in the lower segments.

As aforementioned, until the early 1990s, India largely depended on structural measures to prevent flooding and mitigate its effects. As structural measures alone have not yielded the desired results, non-structural measures, such as flood forecasting, flood plain zoning, flood proofing of the civic amenities of the affected villages, changing the cropping pattern, and public participation in flood-management works are being implemented. For example, the Central Water Commission (CWC) has a flood-forecasting system covering 62 major rivers in 13 States with 157 stations for transmission of flood warnings on a real-time basis. However, multi-purpose reservoirs, embankment construction, drainage channels, and dams continue to be incorporated into the overall flood management program.

Drought

Seventy per cent of India's cultivated land is in the rain-fed areas, which often suffer reverses in agricultural production and face drought conditions. The analysis of 100 years of rainfall reveals that the frequency of occurrence of below normal rainfall in arid, semi-arid, and sub-humid areas is 54 to 57 per cent, while severe and rare droughts occur once every eight to nine years in arid and semi-arid zones.

The CWC monitors the levels of 60 major reservoirs with weekly reports of reservoir levels and corresponding capacity for the previous year and the average of the previous 10 years. Similar monitoring of smaller reservoirs by the Irrigation Departments of State Governments give advance warnings of hydrological droughts with below average stream flows, cessation of stream flows, and decrease in soil moisture and groundwater levels.

India has developed and implemented several programs to combat the effects of drought. For example, the Desert Development Program (DDP), begun in 1977, aims to control the process of desertification and to mitigate the adverse effects of drought in the desert areas through such projects as forestation, sand-dune stabilization, shelterbelt plantation, grassland development, and soil and moisture conservation. The National Watershed Development Project for Rain-fed Areas (NWDPPRA) aims to conserve rain water; control soil erosion; regenerate green cover; and promote dryland farming systems, including horticulture, agro-forestry, pasture development, and livestock management, as well as household production.

Cyclones

On average, about five to six tropical cyclones form in the Bay of Bengal and Arabian Sea every year, out of which two to three may be severe. There are two distinct cyclone seasons: pre-monsoon (May-June) and post-monsoon (October-November). The principal dangers from a cyclone are gales and strong winds, torrential rain, and high tidal waves (also known as 'storm

surges'). Most casualties are caused by coastal inundation by tidal waves and storm surges. The worst devastation occurs when and where the peak surge occurs at the time of the high tide.

The India Meteorological Department (IMD) is responsible for cyclone tracking and warning to the concerned user agencies. Cyclone tracking is done through INSAT Satellite and 10 cyclone detection radars. Warnings are issued to cover ports, fisheries, and aviation departments. The warning system provides for a cyclone alert of 48 hours, and a cyclone warning of 24 hours. A special Disaster Warning System (DWS) disseminates cyclone warnings through INSAT Satellite to designated addresses at isolated places in local languages.

India also has other cyclone-related projects including the Cyclone Reconstruction Project implemented in the coastal Andhra Pradesh during 1990 to 1993. The project included reconstruction of housing and public infrastructure, drainage, and rural water supply. It also included such mitigation efforts as expanding road and communication network, planning of shelterbelt plantations, and the improvement of cyclone shelters.

Earthquakes

The Himalayan mountain ranges are considered to be the world's youngest fold mountain ranges. The subterranean Himalayas are, therefore, geologically very active. Four earthquakes exceeding magnitude of 8.0 have occurred in the past 53 years.

India has undertaken several studies on collapsed structures and better building reconstruction following an earthquake that has resulted in guidelines for earthquake-resistant building. Zone maps have also been prepared, while the IMD operates a network of 36 seismic monitoring stations. After the Maharashtra earthquake of September 1993, a project to upgrade and modernize the national network of seismological operations was undertaken.

Landslides

The Himalayan, the northeast hill ranges and the western Ghats experience considerable landslide activities of varying intensities. The rocks and the debris carried by the rivers like Kosi, which originates in the Himalayas, cause enormous landslides in the valleys. The seismic activity in the Himalayan region also results in considerable landslide movement. The heavy monsoon rainfall, often in association with cyclonic disturbances, results in considerable landslide activity on the slopes of the Western Ghats.

The devastating Gujarat earthquake of mid-2000 was met with an unprecedented national and international response. By early 2001, the World Bank and Asian Development Bank had pledged \$900 million in loans to support the region's infrastructure rebuilding, temporary

humanitarian assistance, and planning efforts to reduce the negative impacts of any future earthquakes. Approximately \$100 million in grant assistance from bilateral donors and United Nations agencies is also flowing into the region.

NEPAL

Disaster Management

Nepal is prone to various types of natural disasters due to its rugged and fragile geophysical structure, very high peaks, high angle of slopes, complex geology, variable climatic conditions, active tectonic processes, unplanned settlement, increasing population, weak economic condition, and low literacy rate. The lack of coordination among agencies related to disaster management, a constraint on resources, the lack of technical manpower, the lack of public awareness, and the remote, rural and difficult geo-physical situation of the country contribute to Nepal's difficulty in managing disasters.

Despite the above problems and limitations, Nepal is gradually picking up the momentum toward improving the disaster management situation. Policymakers have shown an interest in improving Nepal's disaster management capabilities. In June 1998, a task force was formed under the coordination of the Special Secretary of the Ministry of Home Affairs to examine the problems of disaster management in Nepal and to suggest the measures to solve them. The task force identified a number of problems after thorough examination and review of the present acts, rules, regulations, budget, and functions and duties of various agencies related to disaster management, and suggested a number of solutions for each of the identified problems.

The Ministry of Home Affairs is the focal point of disaster management in Nepal. The "Ninth Plan," which is a disaster management plan that covers the period 1998–2002, highlights the need to strengthen the disaster management capability by improving Nepal's efforts toward prevention, mitigation, and reduction of natural disasters through more advanced geological, hydrological, and meteorological technology. Hazard mapping, vulnerability assessments, risk analyses, and early warning systems must be developed, and the personnel to dedicate to these efforts should be made available. The Plan suggests that the policies and regulations concerning disaster management should be amended accordingly and emphasizes the need for international technical international assistance.

Several examples of how Nepal is increasing its disaster management capabilities are as follows: a) the Department of Mines and Geology (DOMG) is preparing a landslide inventory; b) the Water Induced Disaster Prevention Technical Centre (DPTC) is carrying out thematic studies on landslide and monitoring several landslide-prone areas; c) the Department of Roads (DOR) is

carrying out some bio-engineering works in cooperation with the Tribhuvan University (TU), in order to stabilize the slope and road cut sides; d) the Department of Hydrology and Meteorology (DOHM) and International Centre for Integrated Mountain Development (ICIMOD) are mapping flood-prone areas; e) the DOHM is generating data on earthquakes and weather forecasts throughout the country; and f) the Tribhuvan University has established a Mountain Risk Engineering Unit (MREU) for training purposes.

Major Natural Disasters

Flood, Landslide and Debris Flow

Landslides and floods are, arguably, the most destructive types of disasters in Nepal. Seventy-five percent of the total land area of Nepal is hilly, and many villages are situated on or adjacent to the unstable hill slopes, causing extensive damage to the population and property as a result of landslides, floods, and debris flows. Unplanned settlements and physical constructions without due consideration to the natural hazards contribute to Nepal's hazard vulnerability.

Drought

Uneven and irregular rainfall from monsoons causes drought effects in part of Nepal, especially in the mountainous region (the northern belt) of the country. The lack of irrigation facilities exacerbates the effects of low amounts of rainfall, which results in a higher rate of crop failure. The drought of 1994 affected 35 districts of the country and destroyed the agricultural crops cultivated in 157,628 hectares of land.

Fire

Fires occur mainly in the dry season between April and June and are most prevalent in the rural areas of the Tarai and the middle Hill region of Nepal. As more than 90 percent of the total population live in the rural areas in very poor housing, fire hazards are common.

SRI LANKA

Disaster Management

Sri Lanka's Department of Social Services, under the Ministry of Social Services, plays a key role in disaster management, as the Ministry of Social Services has been given responsibility for disaster management. In 1993, Sri Lanka prepared an Action Plan and the Disaster Counter

Measures Bill, which had as its objectives: a) prevention and mitigation of disasters; b) protection of life and property from the effects of disasters; c) maintenance and restoration of order in areas effected by disasters; and d) provision of facilities for emergency response, relief, rehabilitation, and reconstruction in the event of a disaster.

The policy framework that guides the Action Plan calls for the introduction of improved professional practices in the areas of agriculture, land-use planning, construction, and maintenance, as well as fostering scientific and engineering studies (e.g., landslide hazard mapping) as tools for sustainable development. It also encourages the shift of emphasis to pre-disaster planning and preparedness, while sustaining and further improving post-disaster relief, recovery, and rehabilitation capabilities. The integration of disaster prevention and preparedness into the national and sub-national planning process is also outlined in the policy framework.

In order to coordinate disaster management efforts on the sub-national level (hamlet, divisional, district and provincial levels), the plan suggests the formation of committees at all levels. The National Center for Disaster Management was inaugurated in July 1996 and functions as the implementing entity for the National Disaster Management Council.

Sri Lanka has written legislation strengthening disaster preparedness and prevention efforts, and has created incentives for people in landslide areas in order to mitigate the effects of landslides. The department has also provided financial assistance to the people living in the low-lying areas in the Kalutara district to build flood resistance houses, but people are reluctant to use the resources to implement such programs. Therefore, efforts are necessary to increase public awareness of hazards and how to prepare for a disaster among the people living in areas prone to disaster like floods, landslides, and severe droughts.

Major Natural Disasters

Floods, landslides, cyclones, droughts, windstorms, and coastal erosion are the main disasters in Sri Lanka. In addition to these natural disasters, the country is also subject to the effects of man-made hazards and disasters including deforestation; indiscriminate coral, sand, and gem mining; industrial hazards; and ethnic conflicts.

Floods

Floods are the most common disaster in Sri Lanka. The Kalani, Gin, Nilwala and Mahaweli Rivers are most vulnerable to flooding, and the increase in population and subsequent need for land have forced more and more people to live and work in these vulnerable areas. Heavy rainfall and the subsequent run-off of a large volume of water from the catchment areas of rivers,

deforestation, improper land use, and the absence of scientific soil conservation practices could be identified as the major factors for floods in Sri Lanka.

Among the non-structural flood mitigation methods, a flood forecasting system has been introduced in the case of Kelani Ganga. Forecasting of water levels in the river is done by means of four upstream gauges and the data transmission is done with radio equipment. An organizational setup and the necessary standing orders are available to facilitate coordination among several institutions during a flood. This pilot project has assisted the city of Colombo with preparing a mitigation plan.

Landslides

Heavy rains and geological changes in the hill country, accentuated by the indiscriminate clearance of steep slopes in the mountainous areas, have increased the occurrences of frequent landslides. Landslides have been known to cause an exceptional amount of damage or loss of life and property in Sri Lanka. For example, in January 1986 landslides claimed 51 lives, rendered nearly 100 families homeless, and affected most of the seven landslide-prone districts of the hill country.

Droughts

Every year, a part of Sri Lanka experiences short-duration drought of local significance. However, short-term drought affects the region approximately once in every 3 to 4 years. Severe droughts of national significance occur approximately every 10 years. Of the major national droughts, the ones occurring during the periods of 1953–1956, 1974–1977, 1981–1983 and 1995–1996 caused major economic set backs. Although droughts cannot be classified as sudden disasters, they do cause hardship and financial loss, mostly to farmers. In the drought of 1996, 181,095 families in 17 districts were badly affected.

Cyclones

Although cyclones do not occur frequently in Sri Lanka, the country has been affected by cyclone activity occurring in the Bay of Bengal. The most cyclone-prone areas of Sri Lanka are the Eastern, Northern and North Central regions. The cyclone of 1978 alone affected more than one million people, killed nearly one thousand people, partially or completely damaged nearly 250,000 houses, destroyed 90 percent of the coconut plantation in the Batticaloa district, and resulted in the government spending over Rs. 600 million to bring immediate relief to those affected.

Sea Erosion

More than half of Sri Lanka's 18.3 million population live in villages, towns, or cities on the coast, which are economically important because the development of commercial harbors (Colombo, Galle and Trincomalee), fishing harbors and anchorage, main lines of communication (road and rail), recreational facilities and tourism. It is estimated that over 50-55 percent of the shoreline is subjected to, or threatened by coast erosion. Shoreline retreat due to sea erosion has been a severe problem in Sri Lanka, resulting in damage to and loss of property and infrastructure facilities and has hindered development efforts.

The coast Conservation Department is statutorily responsible for taking mitigatory measures to combat sea erosion. Long-term measures are based on the Coast Erosion Management Plan (CEMP) and the Coastal Zone Management Plan. The Department also undertakes Public Awareness Programs (PAP), whereby coastal communities are educated on the basics of coastal resource management, and the need to adapt appropriate action to minimize the adverse effects of erosion.

Annex 6

List of References

References

- Armstrong, George, Patrick Durst and Carl Gallegos, 1989. **Deforestation and Its Implications for the Asia/Near East Region**, ANE Bureau, USAID: Washington, DC.
- Aslam, Malik Amin. June 2000. **Pakistan: Country Environment Policy Integration Study**. ENVORK: A Research & Development Organization, For ADB Manila. Islamabad.
- The Asia Foundation, 2000a. **Focus on the Environment: Reshaping NGO-Business Relations**, www.asiafoundation.org/publications
- The Asia Foundation, 2000b. **Focus on Pakistan**, www.asiafoundation.org/publications
- The Asia Foundation, 2000c. **A Changing Asia: Women in Emerging Civil Societies**, www.asiafoundation.org/publications
- The Asia Foundation, 2000d. **Focus on Sri Lanka**, www.asiafoundation.org/publications
- The Asia Foundation, 2000e. **Emerging Issues in Asia: Panels 2 & 4** www.asiafoundation.org/publications
- Asian Development Bank, February 2001. **Environment Policy (Working Paper)**.
- Asian Development Bank, 2000a. **Asian Environmental Outlook 2001**, Internet site: www.adb.org/environment/aeo.
- Asian Development Bank, 2000b. **Pakistan: Country Environmental Policy Integration Analysis Report**, Internet site: www.adb.org/environment/aeo.
- Asian Development Bank, 2000c. **India: Country Environmental Policy Integration Analysis Report Energy and Transportation**, Internet site: www.adb.org/environment/aeo.
- Asian Development Bank, 2000d. **Key Indicators of Developing Asian and Pacific Countries 2000, Volume XXXI**, www.adb.org/publications.
- Asian Development Bank, 2000e. **Asian Development Outlook 2001**, www.adb.org/publications.
- Asian Development Bank, 2000f. **Governance**, www.adb.org/governance.

- Asian Development Bank, 2000g. **Urban Indicators for Managing Cities.** Cities Data Book (on CD), ADB: Manila.
- Barrett, Scott and Kathryn Graddy, 2000. **Freedom, Growth, and the Environment,** Environment and Development Economics, v5, p433-456.
- Benedick, Richard Elliot; Pachauri, R.K., 2000. **Environmental Security: A Developing Country Perspective.** Environmental Change and Security Project, PECS News, Winter 2000.
- Douglass, Michael; Ooi Giok, Ling, 1999. **Industrializing Cities and the Environment In Pacific Asia: Toward a Policy Framework and Agenda for Action.** US-AEP: Washington, DC.
- Fischer, Fred C., 1999. **Final Report on Evaluations of the United States – Asia Environmental Partnership (US-AEP).** US-AEP: Washington, DC.
- Gain, Philip (ed.), 1998. **Bangladesh Environment: Facing the 21st Century,** Society for Environment and Human Development: Dhaka.
- Gambill, David, 1999. **Intentionally Sustainable: How Community-Based Resource Management Enables And Encourages The Sustainable Use Of Resources,** www.devtechsys.com/publications .
- Global Water Partnership, 2000. **Water for the 21st Century; Vision to Action – South Asia,** Presented at the World Water Forum, The Hague.
- The Greening of Industry Network, 2001. **Sustainability at the Millennium: Globalization, Competitiveness and the Public Trust** (Proceedings of the Ninth Greening of Industry) www.greeningofindustry.org.
- Gupta, Shreekant, 1999. **Country Environment Review, India: Policy Measures for Sustainable Development,** Delhi School of Economics: Delhi (for ADB).
- Hill, Richard, Swarupa Ganguli and Dede Naylor, 1997. *Environmental Flash Points in South Asia,* in **Consequences of Environmental Change: Political, Economic and Social,** Consortium for International Earth Science Information Network (CIESIN): University Center, Michigan (for DCI Environmental Center).
- HMG Nepal Department of Electricity Development, 2000. **Environmental Impact Assessment Process for Hydropower Projects in Nepal,** International Resources Group: Kathmandu.
- ICIMOD, 2000. **Mountains 2000 and Beyond: Second Regional Collaborative Program for the Sustainable Development of the Hindu-Kush-Himalayan Region,** ICIMOD: Kathmandu.

- ICIMOD, 1999a. **Annual Report of the International Centre for Integrated Mountain Development, 1999**, ICIMOD: Kathmandu.
- ICIMOD, 1999b. **Policy Focus for Mountain Development**, Newsletter No. 34. Kathmandu.
- International Resources Group, 1999. **Assessment of Joint Programming Possibilities Between the Department of State's Bureau of Oceans and International Environmental and Scientific Affairs (OES) and USAID's Global Bureau Center for the Environment (G/ENV)**, IRG: Washington, DC.
- IUCN-World Conservation Union, 1999. **IUCN Nepal: Introduction, Mission and Experience**, IUCN: Kathmandu.
- Jalal, Kazi F.; Smith, Douglas V., 2000. **Sustainable Development in Asia**. ADB: Manila.
- Kindra, G.S., and Rick Stapenhurst, 1998. **Social Marketing Strategies To Fight Corruption**, World Bank: Washington, D.C.
- Klitgaard, Robert, Ronald MacLean-Abaroa, and H. Lindsey Parris, 2000. **Corrupt Cities: A Practical Guide To Cure And Prevention**, World Bank: Washington, D.C.
- Krisna Prasad Oli et al., 1999. **Environmental Planning and Management of the Kathmandu Valley**, HMG
- Mastaller, Michael; Montgomery, Roger D.; Weinstock, Joseph A., 2000. **Bangladesh: Toward an Environment Strategy**. ADB: Manila.
- Mayors' Asia-Pacific Environmental Summit, 2001. **Communique on Livable Cities**. MAPES: Honolulu.
- McCauley, David, 2001. **The Future of Environmental Institutions in Asia** (AEO Series Report), Asian Development Bank: Manila.
- Mishra, Hemanta R. 1991. **Regional Review: South and Southeast Asia**. IUCN Commission on National Parks and Protected Areas.
- The Mountain Institute, 2000. **Nepal/Tibet Autonomous Region Transboundary Cooperation for Conservation: Strategies for Conserving Ecosystems and Sustaining Livelihoods along the Border**, TMI: Kathmandu.
- Narayan, Deepa; Patel, Raj; Schafft, Kai; Rademacher, Anne; Koch-Schulte, Sarah; Chambers, Robert; Shah, Meera; Petesch, Patti, 2000. **Voices of the Poor (Set of 3 Volumes)**, World Bank: Washington, D.C.
- Nishat, Ainun, 2000. **Challenges of the New Millennium: Issues and Approaches in Water Management in South Asia**. ADB Annual Meeting Seminar on Water (mimeo).

- Pigato, Miria et al., 1997. **South Asia's Integration into the World Economy**, World Bank: Washington, DC.
- Robb, Caroline M., 1999. **Can The Poor Influence Policy? Participatory Poverty Assessments In The Developing World**, World Bank: Washington, D.C.
- Rock, Michael, 1997. **Industry and the Environment in Ten Asian Countries: Synthesis Report of the US-AEP Country Assessments**, EPIQ/IRG: Washington, DC.
- Rood, Steven, 1998. **Decentralization, Democracy, and Development**, ARD, Inc.: Manila (for the USAID Philippines GOLD project)
- Rural Energy Development Program, 2000. **Impact Study on the Sustainable Development of the Rural Energy Development Programme**, REDP: Lalitpur.
- Seymour, Frances and George Faraday, 2001. **Emerging Environmental Governance in Asia** (AEO Series Report), Asian Development Bank: Manila.
- de Soto, Hernando, 2000. **The Mystery of Capital: Why Capitalism Triumphs In The West And Fails Everywhere Else**, Basic Books, New York, New York.
- United Nations, 1995. **State of the Environment in Asia and the Pacific**. Economic and Social Commission for Asia and the Pacific.
- United Nations Environment Program, 2001. **Nepal: State of the Environment 2001**, UNEP: Kathmandu.
- USAID. April 1988. **Policy Paper: Environment and Natural Resources**. USAID Bureau for Program and Policy Coordination, Washington DC.
- Watson, Francis, 1999. **India: A Concise History**. Thames and Hudson: Singapore.
- World Bank, 2000. **World Development Report 2000/2001: Attacking Poverty**, World Bank: Washington, DC.
- World Bank, 1998. **Vehicular Air Pollution Control in Dhaka** (Recommendations Made by the Consultative Group Meeting, Dhaka, April 26-27, 1998), World Bank: Dhaka.
- World Bank, 2000. **Indoor Air Pollution**. Energy and Health for the Poor, South Asia. Issue No. 2, December 2000.
- World Bank, 2000. **South Asia Environment Strategy: Mainstreaming the Environment to Fight Poverty**. South Asia Environment Unit, World Bank: Washington, DC.
- World Resources Institute, 2001. **Facts and Figures: Country Environmental Data**, <http://www.wri.org/facts>.

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WWF Nepal Program, 2000. **Three Decades of Partnership in Conservation (1967-2000)**,
WWF: Kathmandu.

WWF Nepal Program, 1999. **Eastern Himalayan Ecoregions: Ecoregion-based Conservation
in the Eastern Himalayas**, WWF: Kathmandu.

WWF Bhutan Program, 2000. **Bhutan: Biodiversity Assessment and Conservation Planning**.
WWF: Kathmandu.