ADB

ISLAMIC REPUBLIC OF PAKISTAN

COUNTRY ENVIRONMENT ANALYSIS

December 2008

Asian Development Bank

CURRENCY EQUIVALENTS

(as of 30 December 2008)

Currency Unit	–	Pakistan Rupees
PRs 1.00	=	$0.013
$1.00	=	PRs 79.3

ABBREVIATIONS

ADB	—	Asian Development Bank
AJK	—	Azad Jammu & Kashmir
CEA	—	Country Environmental Analysis
CET	—	combined effluent treatment
CETP	—	combined effluent treatment plant
CNG	—	compressed natural gas
CPS	—	Country Partnership Strategy
CSP	—	Country Strategy and Program
CWS	—	continuous water supply
EIA	—	environmental impact assessment
EMS	—	environmental management system
EU	—	European Union
FAO	—	Food and Agriculture Organization
FY	—	fiscal year
GDP	—	gross domestic product
IEE	—	initial environmental examination
IPCC	—	Intergovernmental Panel on Climate Change
IUCN	—	World Conservation Union
LTSF	—	Long-Term Strategic Framework
MDG	—	Millennium Development Goal
MTDF	—	Medium Term Development Framework
NEP	—	National Environment Policy of Pakistan
NEQS	—	National Environmental Quality Standards
NGO	—	nongovernment organization
NWFP	—	North West Frontier Province
PEPA	—	Pakistan Environmental Protection Act
PRM	—	Pakistan Resident Mission
PRSP	—	Poverty Reduction Strategy Paper
PSDP	—	public sector development program
SMART	—	self-monitoring and reporting tool
TA	—	technical assistance
UNDP	—	United Nations Development Programme
WS&S	—	water supply and sanitation
WTO	—	World Trade Organization
WWF	—	World Wide Fund For Nature

WEIGHTS AND MEASURES

Btu (British thermal unit	—	unit of energy
kWh (kilowatt-hour)	—	100,000 units of active power per hour
MAF (million acre-foot)	—	unit of volume of water
MW (megawatt)	—	1,000,000 units of active power

NOTES

(i) The fiscal year (FY) of the Government of Pakistan and its agencies ends on 30 June. FY before a calendar year denotes the year in which the fiscal year ends, e.g., FY2008 ends on 30 June 2008.

(ii) In this report, "$" refers to US dollars.

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EXECUTIVE SUMMARY

This study provides an assessment of the state of environment in Pakistan based on existing literature and research already undertaken as well as inputs from consultations with stakeholders in the public and private sectors. It identifies critical bottlenecks in making faster progress on environmental issues through an assessment of the regulatory and institutional framework and highlights priority areas to be addressed. The CEA also focuses on the potential benefits and environmental implications of ADB's country strategy for Pakistan which is aligned with the government development agenda of achieving high growth through infrastructure development.

Key Environmental Issues and Challenges In recent years Pakistan has experienced impressive real GDP growth accompanied by a sharp decline in poverty. However, human well-being is critically dependent on the continued availability of essential ecological services and natural resources. Pakistan's environment and natural resources are increasingly polluted and under stress. Pressing environmental concerns facing the country relate broadly to the management of scarce natural resources (green issues), pollution and waste management (brown) and issues pertaining to the potential vulnerabilities to natural hazards and climate change.

Pakistan's natural resources are increasingly under stress due to a rapid population growth and environmentally unsustainable practices. Renewable fresh water resources are fast depleting pushing Pakistan into the category of water stressed countries. Freshwater flows in Pakistan's rivers have been substantially reduced by water diversion for agricultural irrigation in recent decades. Canal irrigation, due to low levels of efficiency has resulted in salinization, thus adversely affecting crop yields. An excessive and improper use of pesticides is destroying the natural biotic balance in agriculture soils and reducing the diversity of invertebrate fauna. The reported decline in the area under the natural forest cover has implications for essential ecological services, irrigation, and for biodiversity. Mangroves, the traditional breeding grounds for commercially important sea life, have also declined. Similarly, Pakistan's arid and semi-arid rangelands are extensively degraded, due to large increase in livestock grazing. The trends and prospects for the future vary greatly depending on climatic conditions and social responses.

Pollution due to a lack of effective management has emerged as a major environmental concern in Pakistan. Over the years Pakistan's growing energy consumption needs have resulted in its increased reliance on the imported fossil fuels. Its progress towards energy efficiency has been modest due to weak technical and institutional capacities. Measures such as conversion of vehicles to cleaner fuels (CNG), no lead gasoline and low sulphur diesel have been implemented but remain insufficient to prevent deteriorating in ambient air quality in the urban areas due to increasing vehicle numbers and their hazardous emissions. Indoor air pollution is a major cause of widespread chronic bronchitis and other respiratory infections in rural households and poor urban households that depend on biomass for cooking particularly in winters.

Industrial discharges (of toxic and persistent pollutants) are contaminating some of the country's best soils and water resources. Solid waste dumped on low-lying land or burnt pollutes groundwater or generates dust and carcinogenic pollutants with adverse health implications. The disposal of untreated urban sewage is contaminating fresh water sources for downstream users. Poor sanitation and hygiene and lack of access to safe drinking water supply are contributory factors to high rate of diseases such as diarrhea in the country.

Pakistan also faces environmental challenges from natural hazards including floods, earthquakes, droughts, and cyclones. Pakistan is a flood prone country, while earthquakes and droughts are recurring phenomena in susceptible regions. Cyclones cause significant damage in the coastal areas as well as destroy standing crops several hundred kilometers inland. Additional environment challenges due to climate change are expected to directly impact on Pakistan's economy. A rise in temperatures can cause more droughts and reduce crop productivity while increased flooding can damage irrigation infrastructure.

Policy and Institutional Framework: Pakistan's overall macro policy framework takes into account environmental considerations to an extent by setting targets as well as allocating resources for environmental programs. Sector-specific policies generally do not accord due consideration to the environmental implications of the development projects. Despite a fairly adequate environmental legislation (Pakistan Environment Protection Act, 1997) and related policy frameworks together with supporting institutional mechanisms in Pakistan, there are various policy, legislative and institutional gaps. The environment impact assessment (EIA) guidelines are not adequate to ensure effective appraisal of large infrastructure projects such as dams and mega water projects. A major challenge associated with the large infrastructure projects would be to address resettlement and compensation issues in the absence a resettlement policy.

It is critical that the existing environmental legislation be reviewed and updated to align with the new growth and development strategy. Effective enforcement of environment rules and regulation requires delegation of necessary authority to the public institutions such as environment protection agencies (EPA) both at federal and provincial levels and more importantly building up their environment management capacity

Key Priorities for Action: overall Pakistan's record on dealing with the environmental issues underlines several institutional and management gaps marred with capacity constraints in the public sector. Pakistan's present pro-growth strategy and its development agenda foresee major investments in large infrastructure projects including the priority areas of urban development, energy, power, roads, water and irrigation. The potential environment challenges associated with the new policy accentuate the need to address the existing environmental issues at the outset to support the sustained growth in the long run. Based on the assessment of the state of environment and in view of the future policy objectives of Pakistan the study identifies the following priority areas for investment:

Access to basic sanitation and safe water for all: Rapid urbanization in Pakistan over the years has resulted in a higher demand for water and sanitation services. This can be addressed by developing capacities of the local water and sanitation agencies in major cities and supported by province-based regulatory frameworks. Promoting public-private partnerships for water supply and sanitation would help improve and maintain environmental quality.

Achieving energy efficiency: Sector wide reforms need to be introduced to achieve required level of energy efficiency in the country by addressing weak public sector capacity to (i) implement energy conservation programs, (ii) to integrate environmental considerations into sector plans, (ii) to establish and regulate urban mass transit systems and devise strategic regulations for the transport sector. In addition, advocacy programs could help prioritize mass transit options.

Checking urban air pollution: Urban air quality can be improved through reduction in vehicular emissions by developing national and city specific transport polices for improved traffic management, implementation of emission control regulations and monitoring. The

implementation capacities of federal and provincial agencies need to be strengthened for operational enforcement of environmental quality standards (NEQS).

Improving agriculture productivity. Specific measures to achieve improved agriculture productivity per unit of water involve (i) introduce water conservation strategies; (ii) research programs for developing crop varieties that are resilient to the looming heat stress factors associated with prospective climate change; and (ii) revival of institutional processes such as National Commission on Agriculture supported by wide-ranging consultations as an input to a national agriculture policy.

Public-private partnerships for cleaner production and the treatment of industrial effluents. Successful experience of selected industries in promoting cleaner production and effluent treatment needs to be scaled up and underscores the need for building public sector support to private sector-driven initiatives. High-priority measures should include demonstrating the economic returns to cleaner production as well as above mentioned operationalization of NEQS.

In addition, investment is required for institutional development and organizational strengthening and human capacity in the priority environment areas to fill existing gaps.

Prospective Opportunities for ADB

ADB's Country Partnership Strategy (CPS) 2009-13 for Pakistan, while broadly structured around the Government development goals, focuses selectively on (i) Sustained Growth and Poverty Reduction through Reforms and Investments in Energy and Infrastructure; (ii) : Reforms to Strengthen Governance and Financial Services to Promote Structural Transformation; (iii) : Development of Urban Services; and (iv) Effective Implementation of Projects and Programs and Capacity Building. These focus areas of ADB strategy present various opportunities to address environmental issues by providing support for better air and water quality and improved solid and waste management. Existing gaps in the environment management systems involve challenges for smooth implementation of ADB's future investment projects, they also provide potential source of opportunities to contribute to the environmental sustainability by addressing the weak areas. In this regard, potential areas of investment to be considered within ADB's assistance strategy include:

- mainstreaming environmental monitoring and management capacities of key federal agencies and provincial agencies responsible for planning and implementation of energy and transport and water resources. It would however be pertinent to carry out an internal assessment of Government's capacity to anticipate and mitigate environmental damages particularly in the road connectivity sub-sector;
- fostering partnerships with the private sector in the areas of environmental management systems such as combined effluent treatment plants and develop capacity to enhance competitiveness of the industrial sector; and
- strengthen Pakistan's ability to adapt to climate change through assistance to reduce, in particular, the vulnerability of the poor, and to protect key infrastructure in the water resources and agriculture sectors.
- This would also require ADB to strengthen its in-house environmental analysis and monitoring capacities. However, ADB can capitalize on the valuable ground-level experience gained during project phases to guide provincial policy and program reforms in the natural resources and water supply and sanitation sectors.

I. INTRODUCTION

A. Purpose

1. The Asian Development Bank (ADB) has prepared a country environmental analysis (CEA) for Pakistan in accordance with ADB's Environmental Assessment Guidelines. The CEA provides information necessary to make an informed assessment of the environmental needs, opportunities, and challenges that Pakistan faces. It discusses ways of continuing ADB's interventions in natural resources management and environmental protection, taking particular account of (i) Pakistan's Poverty Reduction Strategy Paper (PRSP) I (completed in 2003), the Medium Term Development Framework (MTDF) 2005–10 (released in 2005), the Vision 2030 (released in 2007), and the PRSP II (being finalized); and (ii) the need for ADB to more firmly embed environmental concerns into all aspects of its operations to improve its efficacy in contributing to national environmental objectives. This report is intended as a resource document on environment for ADB's upcoming Country Partnership Strategy (CPS) for Pakistan for the period 2009–2013.

B. Methodology

2. The preparation of the CEA has entailed gathering, reviewing, and analyzing information based on official documents, recent work produced by various donor agencies, and ADB's own documents, including project reports, sector studies, and country strategies prepared for Pakistan. Key stakeholders, including federal and provincial government agencies, the private sector, and representatives of civil society were consulted to inform ADB's Country Environmental Profile. The achievements of and lessons learned from implementing ADB's Country Strategy and Program (CSP) for 2002–2006 were assessed from an environmental perspective. In addition, members of the CPS team at ADB's Pakistan Resident Mission (PRM) provided inputs in response to a questionnaire specifically built on the country's development challenges. The report's key recommendations are based on an analysis of the country's environmental profile and ADB's experience in this area.

II. ENVIRONMENTAL PROFILE

A. Country Profile

3. The Islamic Republic of Pakistan is located in South Asia, with India to the east, Iran and Afghanistan to the west, and China to the north. It has a land area of 880,000 km^2, including Azad Jammu & Kashmir (AJK) and the Northern Areas. Pakistan's coastline along the Arabian Sea is about 1,046 kilometers (km) long, with 22,820 square kilometers (km^2) of territorial waters and an Exclusive Economic Zone covering about 196,000 km^2 in the Arabian Sea. The country's dominant geomorphic features include the Indus River and its drainage basin. From the mouths of Indus near the Tropic of Cancer, Pakistan extends about 1,700 km to 30^oN 70^oE to the river's sources in the Himalayan, Hindu Kush, and Karakorum mountains, where several peaks exceed 8,000 meters (m) in height.

4. Although densely settled, Pakistan's terrain is largely arid or semi-arid. Only 8% of the country's area receives more than 500 millimeters (mm) of rainfall per annum, mainly in the form of monsoon rain spread across 3 summer months of the year. This subhumid zone is essentially limited to the ecologically fragile uplands, comprising geologically recent mountains and foothills. In terms of topography, around 22 million hectares (ha) or 25% of the total land area is cultivated. Of this, good-quality soils that do not constrain crop cultivation account for only 11

million ha. The other half consists of poorer soils that significantly limit crop yields. A further 8 million ha are classed as cultivable, but are undeveloped owing to wind and water erosion, water-logging, salinity, sodicity, or lack of irrigation water.[1]

5. Forests and farmland trees were limited to 4.2 million ha in 1992, of which coniferous forests accounted for just 1.9 million ha. Although forest logging was banned that year, it has not prevented natural forests from being over-harvested. On the other hand, the Government of Pakistan and many farmers have invested in block, linear, and farmland plantations. Satellite imagery identifies 29 million ha as rangeland, of which 25 million ha (87%) has been subject to environmental degradation. Another 27 million ha is barren land, comprising snow, glaciers, rock, gravel, desert, or tidal flats, while 6.7 million ha remain unclassified, consisting mainly of highlands above 3,650 m.[2] Wetland areas (rivers and natural lakes) are limited, albeit ecologically rich and a key source of livelihoods for fishing communities and recreational service providers.

6. Pakistan is the sixth-most populous country in the world, with an estimated population of 158 million in 2007.[3] The total fertility rate has stalled at 3.8 births per female after a sharp decline in the last decade. Furthermore, the demographic momentum of a youthful age profile will contribute to more than half the population growth in the coming decade.[4] The national population is projected to reach 229 million by 2025, and 295 million by 2050, under a medium variant that assumes that the replacement fertility level will be achieved by 2050.[5]

7. Over the last 4 years, Pakistan has experienced an annual average increase of almost 7.0% in gross domestic product (GDP), while per-capita income has grown by an impressive 5.8%. Poverty in Pakistan declined from 34.5% in 2001 to 22.3% in 2005/06. The total number of the poor fell from 49.2 million in 2001 to 35 million in 2005/06.[6] Nonetheless, the country's environment and natural resources have become increasingly polluted and degraded. For example, 5.4 million metric tons (t) of human feces were directly and unsafely dumped onto land and into water sources in 2003.[7] The proportion of land under forest cover has declined from 3.3% in 1990 to 2.5% in 2005.[8] The foundations for healthy life and for the livelihoods of most Pakistanis, especially the poor, are thus being worn away. Is economic growth and poverty reduction sustainable in the context of continuing population increases and finite natural resources?

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[1] Government of Pakistan. 2007a. *Pakistan Economic Survey 2006–2007*. Islamabad: Ministry of Finance; Mian, A., and Y. Javed. 1992. *NCS* [National Conservation Strategy] *Sector Paper on Soils*. Islamabad: Government of Pakistan, World Conservation Union, and Journalists Resource Center.

[2] Government of Pakistan. 1992. *Forestry Sector Master Plan*. Islamabad: Government of Pakistan, ADB, and United Nations Development Programme; Government of Pakistan. 2005. *State of Environment Report (Draft)*. Islamabad: Ministry of Environment.

[3] Government of Pakistan. 2007a, footnote 1

[4] About 40% of females are under 15 years old and have yet to enter their reproductive years. Another 48% are 15–49 years old and in their reproductive years.

[5] Bongaarts, J. 2007. Alternative Demographic Futures for Pakistan. Lecture delivered at the Planning Commission, Islamabad, 10 September.

[6] Government of Pakistan. 2008. *Pakistan Economic Survey 2007-2008* Islamabad: Ministry of Finance.

[7] Water Supply and Sanitation Collaborative Council. 2003. *LISTENING to those working with communities in Africa, Asia and Latin America to achieve the UN goals for water and sanitation*. Available: http://esa.un.org/iys/docs/san_lib_docs/Listening_English_full_pages.pdf

[8] Asian Development Bank (ADB). 2007. *Key Indicators of Developing Asian and Pacific Countries*. Page 111. Manila:

B. The Role of Environment and Natural Resources in Pakistan's Economy

8. In Pakistan, economic growth has generally been achieved at the cost of the environment, since most production and manufacturing processes exploit healthy but scarce ecosystems. The heavy dependence on natural resources and resulting environmental degradation has generated a cycle of "ecological poverty" with implications for the sustainability of economic growth. Appendix 1 lists and defines key environmental indicators that are relevant to Pakistan.

9. **Dependence on natural resources and increased pressure on the environment.** The country's large and growing population is sustained by, and critically dependent on, the Indus River and its tributaries. Irrigated agriculture accounts for more than 90% of food and fiber, and for most of fodder production. Population growth has reduced per capita water availability to less than 1,100 cubic meters (m^3) in 2007. Furthermore, irrigation has serious environmental implications such as water-logging and salinity, both of which affect crop yields. Around 25–30% of the canal-irrigated area becomes water-logged after the monsoon season. Irrigation leads to an additional 1.7 tons of salt deposited per hectare every year. Some 8% of land suffers from severe salinity. Although the use of tube wells has reduced the extent of water-logging, the use of groundwater containing high levels of dissolved salts has resulted in sodicity, which also affects crop yields, especially in clayey soils. The drawdown of fresh groundwater has led to the intrusion of brackish water from surrounding zones, and an overall deterioration in groundwater quality. There is also an increased risk of flooding owing to rising riverbeds in the lower Indus basin. Diversions and inadequate environmental flows have resulted in seawater intrusion and the degradation of the Indus delta and adjacent coastal areas.

10. **Dependence of poor communities on natural resources.** The vast majority of Pakistan's population lives in rural areas. The rural poor comprise 34% of the rural population and include mainly landless households or small tenant farmers. In the absence of any formal sources of employment, their livelihoods are linked to agriculture and the use of natural resources. Many provide services to the agriculture sector and graze their small stock on marginal lands around farm fields. Thus, the degradation of various ecosystems has an immediate and direct impact on the livelihoods of the rural poor.[9] Similarly, the pollution of land, water, and air affects the health and livelihoods of poor households who do not have coping strategies against unexpected stress factors. There has been an impressive decline in national poverty during 2001-2005. Rural poverty, however, has fallen more slowly than the national average despite satisfactory growth in the agricultural GDP in 3 of the 4 years of poverty decline.[10] One implication of this is that poverty in Pakistan is concentrated in rural areas among households who have neither access to adequate holdings of cultivable land nor security of tenure.

11. **Estimated shares of natural resources and agriculture in GDP.** In the absence of direct data on the share of environmental and natural resources in GDP, the agriculture sector, which is heavily dependent on natural resources, gives a rough idea of the share that the latter contributes to Pakistan's GDP. Overall, the agriculture sector's share of GDP has been on the

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[9] ADB. 2002. *Poverty in Pakistan: Issues, Causes, and Institutional Responses*. Manila:

[10] World Bank. 2007. *Pakistan, Promoting Rural Growth and Poverty Reduction*. Washington, DC:

continued decline and stood at 20.9% in the fiscal year (FY)2008 (Table 1). Accordingly, the shares of all its subsectors have also fallen. Notwithstanding this decline, agriculture continues to represent the primary source of livelihoods for 66.0% of the population while employing 43.6% of the workforce.[11] The livestock subsector is a primary source of livelihoods for poor households in irrigated tracts. On rangelands around lakes and along rivers, other poor households depend on grazing small stock, minor forest products, and inland fishing for their livelihoods. Coastal fishing communities who do not own mechanized boats make a bare living from the sea.

Table 1: Components of Agriculture Sector by Share in GDP

Item	FY2000	FY2003	FY2006	FY2008
Agriculture Sector	25.9	24.0	22.5	20.9
Major Crops	9.6	8.2	7.6	7.1
Minor Crops	3.5	3.0	2.6	2.4
Livestock	11.7	11.7	11.6	10.9
Fishing	0.4	0.3	0.3	0.3
Forestry	0.7	0.7	0.4	0.2

FY = fiscal year, GDP = gross domestic product.
Source: Government of Pakistan. 2008. *Pakistan Economic Survey 2007–2008*. Islamabad: Ministry of Finance.

12. The continued decline in the agriculture sector's contribution to GDP implies that there are limited opportunities for creating additional jobs in the combined agriculture and natural resources sector. Nonetheless, these opportunities can be capitalized on by increasing labor productivity in the sector.

13. **Livestock subsector.** Within agriculture, the livestock subsector offers some prospects. According to the Livestock Census 2006, the share of livestock in agricultural growth has increased from 25.3% in 1996 to 49.6% in 2006.[12] Approximately 35 million rural inhabitants are involved in some form of livestock production. The typical family owns 2–3 cows/buffaloes, 3–4 sheep/goats and 10–12 chickens from which they earn 35–40% of their household income. In most cases, women are responsible for tending their family's livestock although men are likely to handle related financial transactions. Much of the growth in livestock production has been due to the increased production of buffalo and cow milk. Annual milk production over the last 10 years has increased from 9.4 to 13.3 billion liters—Pakistan is now the world's fifth-largest milk producer. This indicates a potential opportunity to replicate successful models of cooperatives of milk-producing households to process, chill, and sell milk from a common collection point to marketing organizations.

14. **Horticulture subsector.** The Government has identified horticulture as a potential subsector for development, and announced a program to increase the export of horticultural produce from $150 million presently to $1 billion by 2012. The program has implications for the environment and for poverty, which may vary considerably depending on how it is implemented. A business model that relies on heavy chemical inputs could increase the problems associated with agrichemical runoff without contributing significantly to poverty alleviation. A producers' cooperative model linked to competitive and efficient markets, on the other hand, could generate substantial employment and income, especially for women farmers who traditionally tend vegetable patches in peri-urban areas.

[11] (Government of Pakistan 2007a
[12] Government of Pakistan 2007a

15. **Genetically modified cotton subsector.** Another subject for environmental and social research is genetically modified cotton, with the prospect of increasing total cotton production to 21 million bales from 11.7 million bales in FY2008. This will significantly enhance the demand for female labor since virtually all of Pakistan's cotton is handpicked by women. On the other hand, the risks include dependence on external seed suppliers. It is by no means certain that farmers will reduce the application of pesticides and herbicides to which genetically modified varieties are designed to be resistant—this will depend on the manner and extent to which downstream environmental costs from nonpoint sources of pollution are internalized.

16. **Other Poverty-Environment Linkages and the Vulnerability of the Poor:** Estimates of the reduction in rural income-based poverty between 2001 and 2005 do not include access to assets such as land. In rural areas, asset-based poverty remains strongly correlated with landlessness. About 75% of rural households in Pakistan own no land. Land ownership in Pakistan is more skewed (Gini coefficient or G = 0.6) than income distribution (G = 0.3) as a result of underreported expenditure and income data on the richest households. ADB (2007) notes that moderate levels of income inequality in Pakistan coexist with high levels of inequality in variables that are essential to wellbeing, such as access to education and healthcare, asset ownership, and access to infrastructure.[13] Poverty estimates should take into consideration tenure security and access to productive assets such as water, fertilizer, and credit. These factors determine the choices and opportunities open to rural households. It is probable that, for many rural inhabitants, the quality of life has not improved despite increases in agricultural GDP per capita and reductions in the headcount of food- and income poverty.[14] On the other hand, share croppers and contract farmers have little incentive for sustainable agriculture, especially in maintaining soil quality for sustained yields and longer-term investment decisions.

C. Key Environmental Issues and Challenges

17. Studies conducted recently by the Government and donor agencies in Pakistan have highlighted a number of environmental issues.[15] Broadly, the areas of concern identified include water, energy, pollution and waste management, irrigated agriculture, and biodiversity (Table 2). Overall, these studies reveal a deterioration in all these areas. The increasing pollution of water, air, and land continues to have an enormous impact on people's health, especially that of vulnerable groups such as children. The quality and quantity of renewable natural resources such as water, forests and other vegetation, and key biological habitats have declined. The Government, private sector, and civil society have not responded adequately to meet these challenges, although there have been some exceptions, such as the switchover to cleaner fuels in the transport subsector. The following subsections build on analytical work carried out on the key environmental issues and challenges that confront Pakistan, and outline recent trends in these areas.

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[13] ADB. 2007. *Inequality in Asia, Key Indicators 2007, Special Chapter*. Manila.

[14] *Dawn*. 2007. Exaggerated Claims on Poverty Reduction. 7 July.

[15] World Bank. 2006. *Pakistan, Strategic Country Environmental Assessment*. Washington, DC: World Bank. Government of Pakistan (2005) (footnote 2); Government of Pakistan. 2006. *Pakistan Millennium Development Goals Report 2006*. Islamabad: Planning Commission.

Table 2: Key Environmental Issues in Pakistan

Environmental Issue	Government of Pakistan (2005)	Government of Pakistan (2006)	World Bank (2006)
Water			
Declining per capita availability	X	X	X
Pollution of water bodies	X	X	X
Groundwater depletion	X	X	
Inadequate service delivery			X
Energy			
Inefficient use of	X	X	
High transmission losses		X	
Air pollution (caused by vehicles and industries)	X	X	X
Health			
Impact of air pollution	X		X
Impact of water pollution			X
Lead exposure			X
Irrigated agriculture			
Soil erosion			X
Water-logging, salinity, and sodicity	X	X	X
Rangeland degradation and desertification	X		X
Intrusion of saline water into freshwater			X
Biodiversity			
Low forest cover	X		
Deforestation	X	X	X
Loss of habitats and species extinction	X	X	

Sources: (i) Government of Pakistan. 2005. *State of Environment Report (Draft)*. Islamabad: Ministry of Environment. (ii) Government of Pakistan. 2006. *Pakistan Millennium Development Goals Report 2006*. Islamabad: Planning Commission. (iii) World Bank. 2006. *Pakistan, Strategic Country Environmental Assessment*. Washington, DC: World Bank.

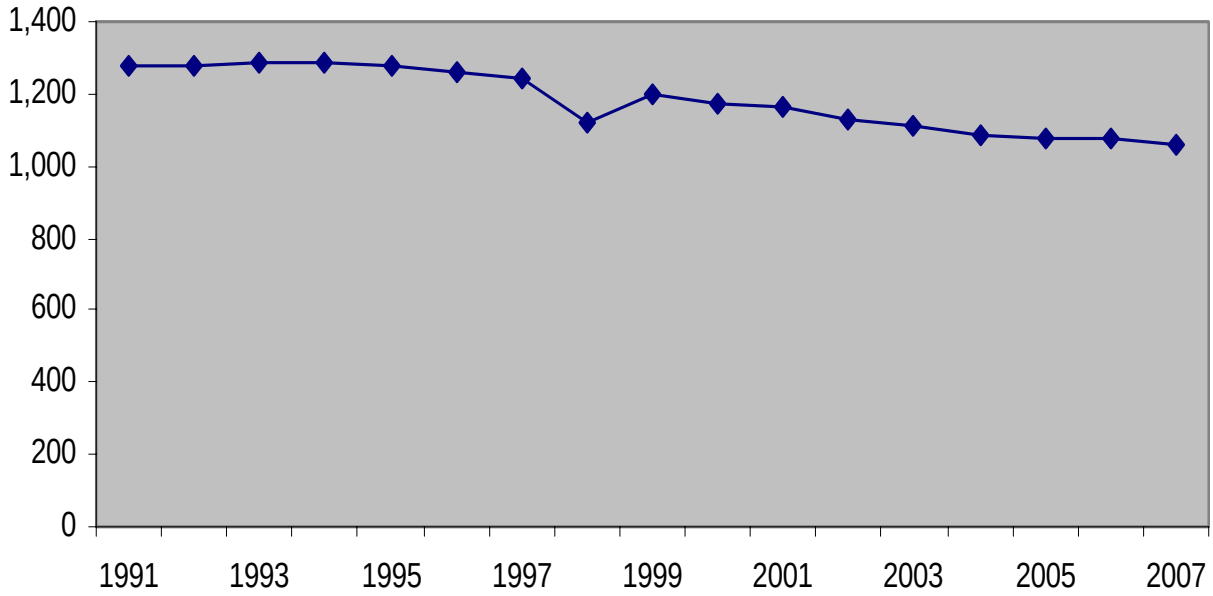
1. Water Resources

18. Freshwater sources, while renewable in the long term, have finite withdrawal limits. Pakistan has reached the withdrawal limits of its surface and groundwater sources. The per capita availability of water has decreased from 5,300 m^3 per person per year in 1951 to less than 1,100 m^3 per person per year in 2007 owing to population growth. Pakistan is heading inexorably into the category of water-stressed countries, defined as having less than 1,000 m^3 per person per year (Figure 1).

19. The mean value of inflows into the Indus Basin is 187 billion m^3, with a 20% chance of not exceeding 148 billion m^3 in any given year. After India has made all the withdrawals permitted to it under the Indus Basin Treaty, the long-term availability of surface water to Pakistan will fall to 173.6 billion m^3. Of this volume, 130 billion m^3 are already diverted at canal heads. Groundwater is a secondary or derived source. Of the annual recharge to groundwater (estimated at 57–66 billion m^3), roughly 49–52 billion m^3 are already drawn up by tubewells and used; most of the unutilized recharge occurs in areas of saline groundwater.[16]

[16] Government of Pakistan. 2002. *Water Resources Sector Study*. Part 5. Islamabad: Ministry of Water and Power.

Figure 1: Availability of Water Resources (per capita)



Source: Government of Pakistan. 2007. *Pakistan Economic Survey 2006–2007*. Islamabad: Ministry of Finance.

20. Freshwater flows into Pakistan's rivers have also been reduced substantially by water diversions for irrigation agriculture in recent decades. The decreasing flows of freshwater down the Indus as a result of dams and barrages, together with the shortage of rainfall and high temperatures has resulted in higher salinity levels in the creeks of the Indus River delta. The Indus delta's ecosystem has been degraded by diversions for irrigation since the major barrages have acted as barriers to migrating fish and rare mammals such as the Indus dolphin. Many riverine wetlands have been drained and converted to agricultural land. Most of Pakistan's natural lakes have disappeared over the last 50 years, although several new lakes have been created upstream of the dams and barrages on the Indus. Farmers, especially in the Potohar region, have also created hundreds of micro-reservoirs. While some of these have become important wintering grounds for huge concentrations of ducks and coots, as artificial reservoirs they lack the reed beds that often border natural lakes and provide a rich habitat for aquatic life.

21. Outside the Indus Basin, water is even more limited. In parts of Balochistan, geological water is being mined, while in Quetta Valley, the water table is overdrawn by 26 million m^3 each year—it is estimated that the aquifer will be exhausted by 2020 (footnote 16).

2. Energy

22. In recent years, Pakistan's rising consumption of oil vis-à-vis its flat oil production (close to 65,000 bbl/day), primarily from Southern Indus Basin, has led to increased levels of oil imports. A limited refining capacity of the country leaves it heavily dependent on petroleum product imports. Pakistan consumes close to 370,000bbl/day of oil and various petroleum products, of which nearly 80% is imported. Majority of the imports come from Middle East, with Saudi Arabia as the leading oil import destination for Pakistan. Due to the large-scale fuel switching in the power and cement industry, displaced by natural gas and coal, respectively,

and with increased use of compressed natural gas (CNG) in vehicles, oil consumption to an extent has leveled off temporarily.

23. Natural gas presently accounts for the largest share of Pakistan's energy use, amounting to about 50% of total energy consumption. Pakistan currently consumes all the domestic natural gas it produces. Over the past six years' period, natural gas consumption in the country has risen by an average annual rate of 10.4%, liquefied petroleum gas (LPG) by 17.6%, and coal by 22.8%. Despite a slight increase in production recently, Pakistan, with its growing level of consumption will need to become an importer of natural gas in the next three to five years, provided no major discoveries are executed. Consequently, Pakistan is currently exploring several pipeline options (Iran-Pakistan-India, Turkeministan-Afghanistan-Pakistan-India) and the import of liquefied natural gas from Qatar, to meet the expected growth in demand for natural gas. Coal plays a minor role in country's energy mix, although Pakistan sits on one of the largest coal reserves estimated at 185 billion tons in Thar in Southern Pakistan.

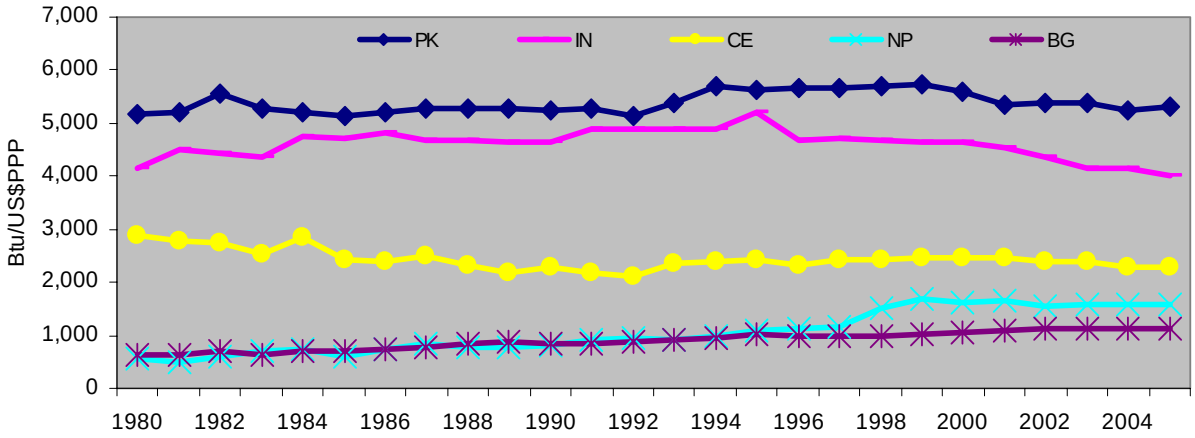
24. Pakistan's demand for electricity is also rising rapidly, close to 12% on the average. Its installed capacity is about 20,000 megawatts (MW). Conventional thermal plants using oil, natural gas, and coal account for about 66% of this capacity, with hydroelectricity making up 32%, and nuclear, 2%. In 2006, electricity generation stood at 93.6 billion kilowatt-hours (kWh). However, the Government estimates that this will need to increase to 120 billion kWh by 2010 to meet the increase in demand. Pakistan faces power shortages during peak seasons and peak hours of use, making it necessary to implement rotating blackouts ("load-shedding"). Additionally, many rural areas do not even have access to electricity, while half the population is not connected to the national grid. Technical and commercial losses caused by poor infrastructure and a significant amount of power theft represent 30% of the total electric power generated.

25. Pakistan contributes little to greenhouse gas emissions and global climate change. Its total energy-related carbon dioxide emissions measure about 100 million t, of which 46% is from oil-related emissions, 45% from gas, and 9% from coal. On a per-capita basis, this is equal to 0.7 t, compared with an average of 25 tons for the USA, Australia, and Canada; 11 tons for European Union (EU) countries, and 2.1 tons for developing countries on average.[17]

26. Overall, the country has made little progress toward achieving energy conservation and energy efficiency (measured by the number of GDP units produced using energy) even when compared with other South Asian countries (Figure 2). Energy efficiency and conservation can thus not only reduce the large financial outlays required for developing additional energy supplies in the future, but can also help minimize uneconomical 'excess' standby capacity required to cater to peak loads, reduce subsidy requirements, and defer transmission system expansion needs, thereby saving public funds and increasing returns on energy infrastructure investments.

[17] Herzog, T., Pershing J., and Baumert, K. A.. 2005. *Navigating the Numbers: Greenhouse Gas Data and International Climate Policy*. Washington, DC: World Resources Institute.

Figure 2: Energy Efficiency Trends in South Asia



BG = Bangladesh, CE = Sri Lanka, Btu = British thermal unit, IN = India, NP = Nepal, PK = Pakistan, PPP = purchasing power parity.
Source: Energy Information Administration. 2007, 20 Oct. Tables on energy intensity data. Available: http://www.eia.doe.gov

27. Pakistan, as an energy intensive is a net importer of energy, and also lags behind other countries in converting high-value primary energy (gas and oil) into useful energy services. It takes, for example, almost 5.0 times as much primary energy to produce one unit of GDP as Bangladesh, 3.4 times as much as Nepal, and 2.3 times as much as Sri Lanka. Compared with India—which is a coal-based economy and faces technical problems in the efficient conversion of primary energy from coal into energy services—Pakistan remains 33% more inefficient in converting its primary energy sources into useful energy services.[18]

3. Pollution and Waste Management

28. Recent studies have identified pollution caused by hazardous gas emissions and solid waste as a key environmental issue confronting Pakistan, with significant health implications.

a. Air Pollution

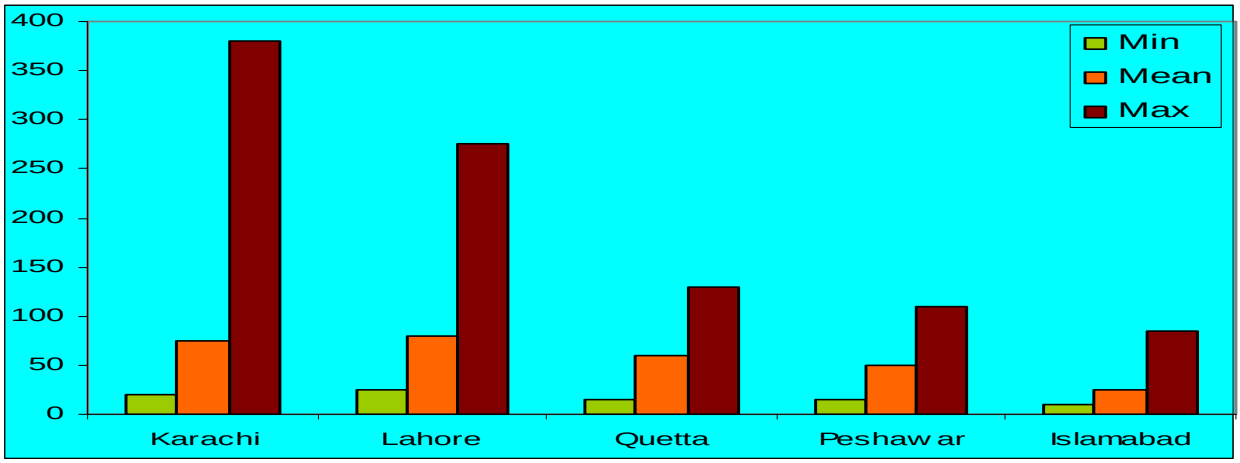
29. Air pollution in Pakistan is caused by industrial and thermal power plants, but more particularly by vehicular emissions. As a result, the outdoor air quality in Pakistan's urban areas has deteriorated significantly. In 2001, concentrations of suspended particulate matter in Lahore, Rawalpindi, and Islamabad were four to seven times higher than levels recommended by the World Health Organization. Even higher levels of fine particulate matter were measured in Gujranwala and Faisalabad in 2003 and in Quetta in 2006.

30. A substantial increase in the number of vehicles on urban roads continues to drive up levels of urban air pollution. Common gases emitted by vehicles include carbon monoxide, nitrous oxides, and ozone, and are dangerous to human health beyond certain levels of

[18] Energy Information Administration. 2007, 20 Oct. Tables on energy intensity data. Available: http://www.eia.doe.gov

concentration. Poly-aromatic hydrocarbons released by diesel-powered vehicles are known carcinogens, while smoke from diesel engines has aggravated already elevated levels of airborne soot.[19] Nitrous oxides are emerging air pollutants with the highest concentrations recorded in Karachi, followed by Lahore, Quetta, Peshawar, and Islamabad (Figure 3).[20] Industries located in urban areas are the main source of sulfur dioxide (dangerous to human, animal, and plant life) while brick kilns powered by low-grade coal are notable sources of soot.

Figure 3: Urban Air Pollution: Nitrogen Dioxide Concentrations in Pakistan's Main Cities



Source: Pakistan Environmental Protection Agency and Japan International Cooperation Agency. 2006. *Measurement of Ambient Concentration of NO_2 in Different Cities of Pakistan Using Diffusion Samplers*. Islamabad: Ministry of Environment.

31. Preventive measures—such as encouraging the use of cleaner fuels such as compressed natural gas (CNG) and diesel with a lower sulfur content, while phasing out the use of lead-based gasoline—have been implemented to contain the impact of urban air pollution. Lead has been completely phased out from all brands of gasoline on the regular retail market in Pakistan since 2005; this will lower the ambient levels of lead ethyl in coming years. Another positive trend is the extent and accelerated pace of conversion from petrol-based vehicle engines to those that are CNG-based (Table 3). As a result, Pakistan has the largest fleet of vehicles running on CNG in South Asia, and is third worldwide after Argentina and Brazil.

Table 3: Progress in Conversion of Engine Fuels to CNG

Indicator	Early 1990s	2001/2002	2002/2003	2005/2006	2007/08
Number of vehicles using CNG as fuel	500	280,000	400,000	950,000	1,700,000

CNG = compressed natural gas.
Source: Government of Pakistan. 2007. *Vision 2030*. Islamabad: Planning Commission; Government of Pakistan. 2008. *Pakistan Economic Survey.2007-08*.Islamabad: Ministry of Finance.

32. The use of biomass fuels in unventilated rooms has been identified as the primary cause of indoor air pollution, particularly in rural areas. Due to their lack of access to modern energy

[19] Qadir, F. N. 2002. Air Quality in Urban Areas in Pakistan vs. Transport Planning: Issues and Management Tools. Draft paper prepared for ADB under Regional Technical Assistance 5937.

[20] Pakistan Environmental Protection Agency and Japan International Cooperation Agency. 2006. *Measurement of Ambient Concentration of NO_2 in Different Cities of Pakistan Using Diffusion Samplers*. Islamabad: Ministry of Environment.

services, about 86% of rural households and 32% of urban households use biomass fuels for cooking purposes.[21] Most urban households, however, have switched from biomass fuels to cleaner and more convenient sources of energy. There is growing demand for connections to natural gas supplies due to the subsidized rates available to smaller domestic user. Under this policy, the consumption of natural gas by urban households has grown by a factor of 2.6 between 1991 and 2006.[22] Nonetheless, most rural households continue to rely on biomass fuels. When food is cooked in closed spaces in winter, children become sharply vulnerable to acute respiratory infections, particularly in mountain and hill areas. Simple low-cost solutions such as the use of hoods and vents can markedly reduce smoke inhalation from biomass fuel-based cooking stoves. Although projects promoting these innovations have been implemented to a small degree, they have not been incorporated in sustained rural development programs.

b. Management of Solid and Hazardous Waste

33. Roughly 48,000 tons of solid waste is generated every day in the country. Streets are treated as receptacles for waste. There is only partial segregation of recyclable waste. Waste paper, plastic, metal, glass, rubber, rags and so on are thrown on the streets along with domestic, trade and institutional wastes. Transportation is not well coordinated with primary collection, resulting in multiple handling of waste. Finally, most waste is dumped on low-lying land or burned. The industry sector is responsible for discharging some of the most toxic and persistent pollutants, including heavy metals and synthetic organic chemicals, into land and water bodies. Some of the pollutants discharged contaminate precious natural resources such as rivers, fresh groundwater, and the best arable land. Heavy metals and persistent chemicals leach from industrial dumping sites into groundwater sources. Waste burned in open spaces and at low temperatures generates dust and carcinogenic pollutants with adverse health implications.

34. Across Pakistan, surface and groundwater sources continue to be polluted by raw sewage, industrial waste, and agricultural runoff. Most of the rural population defecates in or near cultivated fields. Less than half the urban sewage is drained off through sewers and covered drains, and only a small fraction of that is treated before being disposed off into water bodies. An immediate consequence of these practices is that the majority of Pakistan's population does not have access to potable water.

35. The lack of sanitation facilities and poor hygiene is one of the main causes of Pakistan's high burden of disease. More than half the human feces produced in the country's rapidly growing cities and towns is dumped into open drains or mixed with solid waste. Germs are carried back into homes on people's hands and feet or by houseflies. Public water supplies are intermittent and most samples are contaminated at the point of use. Some 40% of urban households are not connected to a tap water supply and use pumps to draw water from shallow groundwater sources that are often heavily contaminated. About 10% of rural households still depend on open dug wells and other sources exposed to contamination. Piped water supply has reached a quarter of the rural population, but tap water has not brought about the health benefits expected. Poor sanitation and hygiene and the lack of access to a safe drinking water supply are considered key contributing factors to the high rate of disease (such as diarrhea) in the country.

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[21] Government of Pakistan. 1998. *Census of Pakistan 1998*. Islamabad: Population Census Organization.

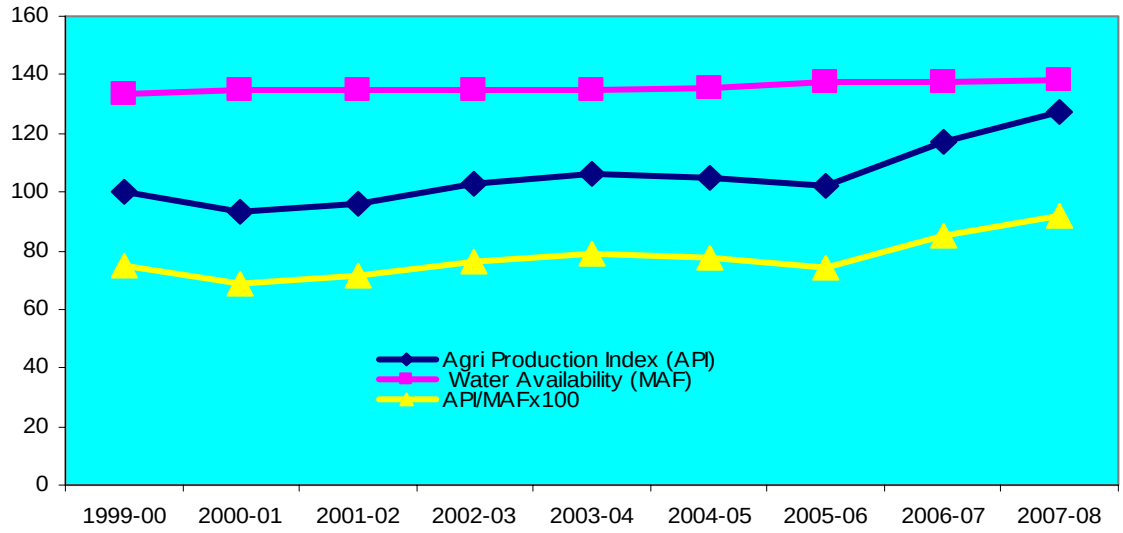
[22] Tables 14.1 and 14.6 in Government of Pakistan (2007a) (footnote 1).

4. Irrigated Agriculture and Cropland

36. Pakistan depends heavily on irrigation agriculture, which accounts for more than 90% of its food and fiber, and also for most of its fodder production. However, irrigation (based on perennial canal system) also contributes to several environmental problems. For instance, up to 30% of the canal command area becomes waterlogged after the monsoon season. The irrigation of crops with heavy water requirements (such as sugarcane and rice) deposits 20 million tons of river salts every year, and moves salts in the soil profile to the surface. The resulting salinization reduces crop yields, while the use of groundwater containing relatively high levels of dissolved salts leads to sodicity, especially in clayey soils, again, reducing crop yields. Salinity has other ratchet effects. Farmers, especially in Sindh, use excessive amounts of water to flush away salts from the soil surface and top horizons, but end up generating larger volumes of saline effluent for downstream ecosystems and users.

37. Irrigation efficiency in Pakistan is measured at around 35%. In other words, about two thirds of the water diverted from rivers to canals, distributaries, and farmers' fields is lost in conveyance, delivery, and application. Resultantly, there has been no improvement in crop productivity per unit of water use (Figure 4). The drainage of effluents from water-logged and saline fields has damaged ecosystems, including downstream freshwater lakes.

Figure 4: Crop Production per Unit of Water Available

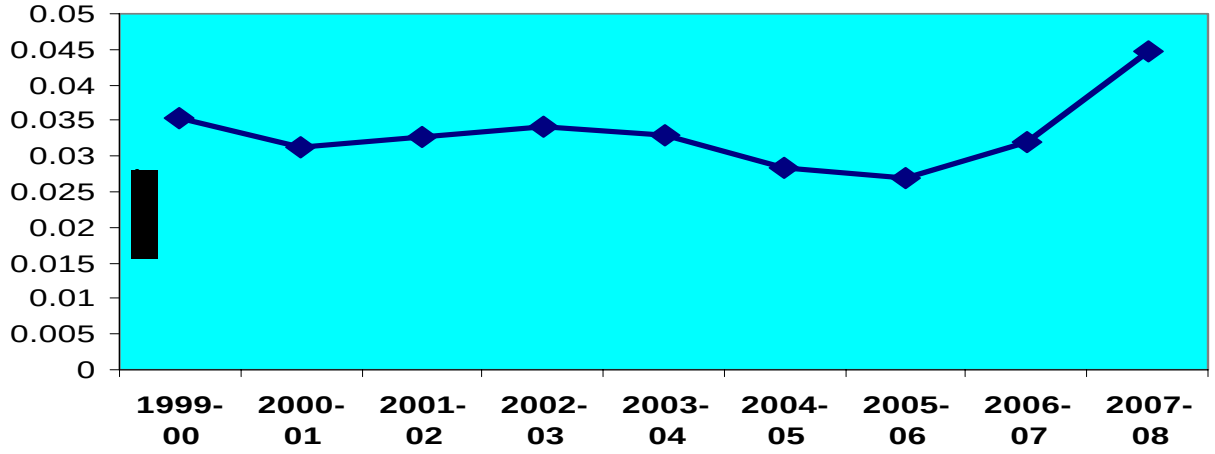


API = agriculture production index, MAF = million acre-feet.
Source: Government of Pakistan. 2007. *Pakistan Economic Survey 2006–07*. Islamabad: Ministry of Finance.

38. Since the "green revolution" of the 1960s, Pakistan's agriculture has become highly dependent on external inputs. The application of chemical fertilizers has doubled from 1.9 million to 3.8 million nutrient tons between 1991 and 2006. Since 2003, returns to per unit use of fertilizer have diminished except for last two years showing an improved productivity (Figure 5). The leaching of fertilizers from the soil has resulted in the eutrophication of natural water bodies and toxic algal blooms. Pakistan has no capacity to detect, analyze, and assess the risks of cyanobacteria-produced toxins. High concentrations of nitrates in drinking water supplies can cause "blue baby" syndrome (the lowering of oxygen content in the blood, causing respiratory and digestive problems in newborns). Pesticides are persistent and bio-accumulate in organisms, and the destruction of fish farms immediately downstream is only the first in a series

of environmental impacts of their use. The use of drugs in animal production also has environmental consequences, poisoning and extirpating bird species, such as vultures.

Figure 5: Crop Production per Unit of Fertilizer Available



Source: Government of Pakistan. 2007. *Pakistan Economic Survey 2006–07 and 2007-08*. Islamabad: Ministry of Finance.

39. The loss of organic matter is another key concern for Pakistan's croplands. Organic matter plays an important role in the physical structure of soils and, more importantly, is a medium for biological processes. The purely mineral content of soils contains nutrients that do not become available to plants until soil microorganisms have processed them into usable forms. Organic matter thus helps maintain the populations of beneficial microorganisms. The "green revolution," however, having provided farmers packages of seed, fertilizer, and water, has led them to neglect the use of organic manure, choosing instead to burn it as fuel. As a result, 96% of cropland in Punjab is deficient in organic matter content.[23]

40. A recent assessment based on the aggregated findings of reconnaissance and detailed surveys of soil erosion by the Soil Survey of Pakistan suggests that the soil structure in Punjab and the North West Frontier Province (NWFP) has not changed, while areas in Sindh and Balochistan have become prone to severe erosion between 1993 and 2003.[24] Further research is, however, needed to validate these findings and determine their underlying causes.

5. Biodiversity and Natural Resources Management

41. With its location, broad latitudinal spread, and immense altitudinal range, Pakistan spans a remarkable number of the world's broad ecological regions, as defined by various

[23] Sandhu, G. R. 1993. *Sustainable Agriculture, A Pakistan National Conservative Strategy Sector Paper*. Islamabad: World Conservation Union, and Environment and Urban Affairs Division. Table 4 reports the results of 337,714 soil samples tested by the Soil Fertility Survey and Soil Testing Institute, Lahore.

[24] Ahmad, N., and M. Rashid. 2003. *Fertilizers and Their Use in Pakistan, Extension Bulletin*. Third edition. Islamabad: National Development Finance Corporation; Brandon, C. 1995. Valuing Environmental Costs in Pakistan, The Economy-Wide Impact of Environmental Degradation. Background paper for *Pakistan 2010 Report*. World Bank, Washington, DC. Sources quoted in World Bank (2006) (footnote 15).

classification systems.[25] It contains areas that fall under (i) three of the world's eight biogeographic "realms" (Indo-Malayan, Palearctic, and Afro-tropical); (ii) four of the world's ten "biomes" (desert, temperate grassland, tropical seasonal forest, and mountain); and (iii) three of the world's four "domains" (polar or montane, humid-temperate, and dry). The great variety of landscapes, including rangeland, forest, wetland, and other wildlife habitats has generated a rich diversity of life forms.

a. Biodiversity

42. Much of the country's variety of plant and animal life has disappeared over its long period of civilization, particularly during the last 100 years. Natural ecological zones have been so widely affected by human activity that very few truly natural habitats remain. Among the countries of South Asia, Pakistan has the least variety of mammals, birds, amphibians, and higher plants per representative unit of area.

43. Since the country is largely bounded by politically drawn borders rather than an isolated, biogeographic boundary, relatively few animal or plant species are unique to Pakistan. Thus, it has relatively low proportions of endemic species (about 7% for flowering plants and reptiles, 3% for mammals, and 15% for freshwater fish). However, the proportion of "restricted range" species occurring in Pakistan is much higher; for many of these species, it contains the bulk of the global population.[26] At least four mammal species are known to have disappeared from Pakistan in the last 400 years, including the tiger, swamp deer, lion, and Indian one-horned rhinoceros.

44. The growth of the global market during the last century has led to the development of uniform cultivars of staple crops valued for their high-yield characteristics. Their spread in Pakistan has occurred at the expense of indigenous crop genetic varieties and "coarse grains," which are not protected by any legislation[27] despite the need to protect this valuable germplasm using in situ and ex situ conservation measures (footnote 26). Some of these less favored crops and indigenous cultivars of staples are genetically resistant to salinity and climate change and therefore could hold the key to feeding Pakistan in the future. Uniform cultivars of high yielding seeds are more susceptible to pest attack. The excessive and improper use of pesticides destroys the natural biotic balance of agricultural soils and reduces the diversity of invertebrate fauna. It is estimated that a quarter of the pesticides applied to crops eventually reach the Arabian Sea as runoff.[28] This has acute and chronic effects on aquatic fauna and fish-eating birds. The bioaccumulation of synthetic chemicals up the food chain ultimately returns in forms that can be toxic for humans.

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[25] United Nations Environment Programme. 1995. *Global Biodiversity Assessment*. Cambridge: Cambridge University Press.

[26] Government of Pakistan. 2000. *Biodiversity Action Plan for Pakistan*. Islamabad: Government of Pakistan, World Wide Fund For Nature-Pakistan, and World Conservation Union.

[27] Anwar, R. 1996. Pakistan Country Report presented at the 4th International Technical Conference on Plant Genetic Resources, FAO, Leipzig, 17–23 June.

[28] Ahmad, M. F. 1997. Ungulates of Pakistan. In *Biodiversity of Pakistan*. Edited by S. A. Mufti, C. A. Woods, and S. A. Hasan. Islamabad (Pakistan) and Gainesville (USA): Pakistan Museum of Natural History and Florida Museum of Natural History. Quoted in Government of Pakistan (2000) (footnote 26).

45. Pakistan has already lost much of its species diversity and endemic fauna and flora over the last few centuries, and particularly in the last several decades. It must protect its rich variety of indigenous cereal seeds given the adverse prospects of climate change.

b. Deforestation

46. Data on the natural forest cover in Pakistan varies. Government estimates report that the country's forested area has increased from 4.4% in 1992 to 5.0% in 2007.[29] This, presumably, is based on the extent of tree plantation, since the benchmarks established by the Forestry Sector Master Plan (1992) developed an inventory of land uses based on the interpretation of satellite imagery. The inventory showed that nearly 17% of NWFP comprised forested or wooded land, accounting for 40% of Pakistan's total land under forest (footnote 2). Of this proportion, the Hazara and Malakand divisions account for 97% of the forested area in NWFP.

47. However, the NWFP Forest Resource Inventory (2000) based on correlation of its satellite imagery with ground surveys, established that closed cover forests had decreased to 2.7% of land in the Hazara and Malakand divisions. These forests were restricted largely to high-altitude sites above 2,000 m, and the vast majority of mature forests were situated on steep to precipitous slopes. The Natural Forest Resource Assessment (2004) also reports that Pakistan's most valuable natural coniferous forests are declining at the rate of 40,000 ha annually, while riverine and mangrove forests are decreasing at annual rates of 2,300 and 4,900 ha, respectively.

48. One way of reconciling the three datasets is to suggest that the extent of farmland trees has increased while natural forests continue to retreat. If this explanation is accepted, the decrease in natural forests has serious implications for essential ecological services, irrigation, and biodiversity. Natural forests are among the most diverse of terrestrial habitats for wildlife, while monoculture plantations are far more sterile. The continued denudation of upland vegetation points to the greater likelihood of surface erosion, including landslides, and accelerated silting in reservoirs. However, unlike in dry lands, closing off hillsides for grazing in the active monsoon belt for 3–4 years can result in the re-growth of bushes and grass that protect watersheds; this has already been demonstrated by several dozen village organizations in Dir, Malakand, and AJK.[30]

49. Along the coast of Sindh, mangrove forests (i) play an economically significant role in protecting ports from the excessive accumulation of silt, (ii) provide breeding grounds for commercially important shrimp and fish larvae, and (iii) are sanctuaries for migratory birds. The Indus Delta and marine ecosystem of Pakistan have been greatly damaged by river blockage and diversion. Salinity has increased in the delta, and the area under mangrove forest has declined from 2,600 km^2 in the late 1970s to 1,600 km^2 in the last few years, of which only 500 km^2 now includes dense mangrove cover.[31]

50. During the last few decades, the importance of the Indus Delta's mangroves has been better understood, since they provide food and shelter for the fish larvae of about 80% of the

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[29] Government of Pakistan. 2007a.

[30] Royal Netherlands Embassy. 2003. Dir/Malakand Social Forestry Project Completion Report. Royal Netherlands Embassy, Islamabad.

[31] Pernetta, J. C., ed. 1993. *Marine Protected Area Needs in the South Asian Seas Region*. Vol. 4: Pakistan, A Marine Conservation and Development Report. Gland, Switzerland: World Conservation Union.

commercial species caught in Pakistan's waters. Some 25,000 tons of prawn and shrimp are caught annually, accounting for 68% of the value of Pakistan's fish export income (nearly $100 million), while the forests are also used by coastal villagers as a source of fuelwood and fodder.[32]

c. Rangeland Degradation

51. Pakistan has about 28.5 million ha of rangeland. The alpine grasslands of NWFP, the Northern Areas, and AJK remain relatively intact, but 85–90% of the country's arid and semi-arid rangeland has been degraded as a result of the fivefold increase in livestock numbers since Independence in 1947. In addition, the influx of more than 5 million Afghan refugees in the 1980s has transformed community pastures in the tribal areas of NWFP and northern Balochistan into open access rangelands. Their subsequent and rapid degradation is documented in local anecdotes that vividly narrate how refugees lopped off the leaves and branches of trees in the first year they arrived, chopped down tree trunks in the second, and pulled up their roots in the third.

52. Apart from changes in the composition of vegetation, increased competition for grazing land has affected the populations of wild herbivores; as a reduced base of prey, it can then only support smaller predator populations. Trends and prospects for the future vary greatly depending on climatic conditions and social responses. It is uneconomical to attempt to reverse rangeland degradation in Pakistan's sandy and rocky deserts, but it will take decades for the perennial vegetation that is most palatable to and nutritious for livestock to be reestablished naturally.

6. Transboundary Issues

53. The Ravi River and some trans-boundary drains in its basin carry into Pakistan heavy pollution loads, including persistent and toxic industrial waste, from India. In 2001, the Hudiara drain carried a daily pollution load of 45 tons of biological oxygen demand and 326 tons of dissolved solids that was discharged into the Ravi. The concentration of cadmium, manganese, and copper in the drain's water exceeded the permissible limits prescribed for irrigation water by the Food and Agriculture Organization (FAO) at water sampling point near the border village of Lalloo. As a result, the level of lead was found to be higher, on average, in blood samples taken from individuals living in Thether village (close to the Hudiara drain) than in those among the control group located in Penghali village. Similarly, the occurrence of joint problems, and skin, eye, and abdominal diseases appeared greater in Thether than in Penghali.[33] Small grants projects funded by the Global Environment Facility have been implemented by the World Wide Fund for Nature (WWF) in Pakistan and India in collaboration with research institutions assessing the scope of the problem and identifying feasible solutions.[34] These, and any broader proposals, need to be taken up in a programmatic framework at the policy level and implemented by administratively competent agencies in both countries, with regional and global backstopping.

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[32] Qureshi, T. 2007, 4 Oct. SINDHNET.

[33] Global Environment Facility Programme in Pakistan. 2001. Water Quality Monitoring of Hudiara Drain. United Nations Development Programme, Islamabad.

[34] WWF-India. 2007, 3 Nov. Toxics. Available: http://www.wwfindia.org/about_wwf/what_we_do/toxic/index.cfm

54. The Government is also concerned about the downstream environmental impact of the proposed Kishan Ganga hydroelectric power project that is to be built on the Chenab River in Indian-administered Kashmir. The Ministry of Water and Power had planned comprehensive environmental impact assessment of the project to: (i) identify any adverse impact arising from a change in flow regime; (ii) establish criteria for what should constitute an "acceptable" environmental impact; and (iii) determine the environmental and economic costs of reduced flows from the proposed dam. Following documentation, the validation of results and follow-up action to the satisfaction of affected communities as well as the Governments of Pakistan and India, is a regional and global responsibility.

7. Climate Change and Variability: Adaptation and Resilience

55. In its 2007 assessment, the first working group established by the United Nations' Intergovernmental Panel on Climate Change (IPCC) places the probability that global warming has been caused by human activities at greater than 90%. Further changes in the world's climate are now inevitable. Simulations from climate models based on projected emissions of greenhouse gases and aerosols suggest that, for greenhouse gas emissions at or above current rates, changes in climate will very likely be larger than those already observed in the last century. The models project that, for a range of plausible emissions, the global temperature will increase at an average rate of about 0.2 Celsius degrees (°C) per decade over the next 20 years. About half this near-term warming represents a "commitment" to future climate change arising from the inertia of the climate system's response to current atmospheric concentrations of greenhouse gases. The IPCC's second working group concludes in the summary of its findings (April 2007) that human-induced warming has indeed had a discernable influence on many physical and biological systems. The ongoing shifts in climate will affect the health and welfare of millions of people around the world.

56. For Pakistan, the models forecast increased flooding, rock avalanches, and water resource disruptions as the Himalayan glaciers continue to melt. Floods exceeding design parameters could destroy the dams, barrages, and other fixed-capacity irrigation infrastructure on which the country's agriculture depends. The risk of hunger will also increase because of declining crop productivity owing to heat stress. Other areas of concern include: (i) the further intrusion of saline water along the Sindh coastal zone due to an accelerated rise in sea level; (ii) more and stronger cyclones caused by rising sea surface temperatures that will affect Karachi and other coastal settlements; (iii) heat strokes brought on by summer temperature spikes; and (iv) the spread of disease vectors encouraged to breed in stagnant water bodies during mild winters.

57. Pakistani policymakers are concerned about the potential impact of global warming. It is possible to adapt to climate change by devising anticipatory response strategies to minimize the adverse impacts. The primary challenge is to develop an understanding of how climate change could affect Pakistan's uplands and rivers, its agro-ecological zones and subzones in the Indus Plain, and coastal lands. Once this information is available, specific options can be developed or adapted, such as: (i) flood control measures; (ii) modified farming systems and practices; (iii) forestation to protect river watersheds; and (iv) the creation of buffers to protect sensitive coastal resources.

58. In the long evolution of building design, human settlement patterns, and agrarian practices, climate has been a constant. More recently, the designs and specifications of critical irrigation, flood control, drainage infrastructure, communication networks, and industrial plants have been based on past records of the recurrence and magnitudes of storms and floods.

Climate change is likely to result in chains of unpredictable impact within and across sectors of the economy and society. Resilience to such impacts will require building Pakistan's capacity for analysis, anticipatory planning, and action against the backdrop of a vulnerable population.

D. Cost of Environmental Degradation

59. The sections above have described the key environmental challenges confronting Pakistan so that they can be prioritized in an objectively verifiable way. The World Bank (2006) has attempted to cost the more obvious damages to the country's environmental and natural resources.[35] Indicative estimates of the cost of environmental degradation provide a common basis for comparing its impact in different sectors, such as the health-related impact of pollution and the impact of natural resource degradation on livelihoods (Table 4). Further research could be carried out on a number of other important environmental issues, e.g., the offsite costs of deforestation, the long-term health-related costs of toxic waste generation by the industry sector, and the impact of environmental degradation on the storm-surge protection function of Pakistan's mangroves.

Table 4: Costs of Damage to Environmental and Natural Resources

Rank	Issue	Estimated Cost (Rs billion)	Range of Estimates (Rs billion)	Estimated Cost ($ million)
1	Water, sanitation, and hygiene	112.0	—	1,867
2	Agriculture (soil erosion and salinization)	70.0	45.0 to 95.0	1,167
3	Indoor air pollution	67.0	60.0 to 74.0	1,117
4	Urban air pollution	65.0	62.0 to 65.0	1,083
5	Lead exposure	45.0	38.0 to 52.0	750
6	Rangeland degradation	4.2	3.6 to 5.4	70
7	Deforestation	2.7	2.1 to 3.3	45

Source: World Bank. 2006. *Pakistan, Strategic Country Environmental Assessment (SECA)*. Washington, DC, World Bank.

60. While only partial estimates of the cost of environmental degradation and climate change are available, they correspond broadly to the contribution of various sectors to the national accounts. Ideally, net national welfare is derived by deducting from GDP the depletion of natural resource stocks and defensive expenditures (such as on health). The ranking of sectors in terms of environmental damage is fairly robust. For example, forestry products contribute less than 0.5% to GDP, but the costs of deforestation could double with the inclusion of non-marketed forestry products and downstream impacts to jump one place above rangeland degradation. At the same time, the costs of deforestation are unlikely to increase by a magnitude that will go up two places to rank alongside the impact of pollution on health.

61. This ranking system is useful in several ways. It is possible, for instance, to analyze environmental impacts in terms of incidence by type of human settlement and region. The health-related impacts of water, sanitation, and hygiene are common both in urban and rural areas. The environmental transitions theory also predicts that "brown issues," such as sanitation, could be the most important urban environmental issues confronting Pakistan at this

[35] World Bank SECA, 2006.

stage of its development.[36] Ranked second and third, respectively, are soil erosion and salinity, and indoor air pollution—both have a largely rural incidence. Urban air pollution (ranked fourth) and lead exposure (ranked fifth) are largely urban issues and relate to the use of energy by the transport sector. Finally, rangeland degradation and deforestation are rural issues.

E. Possible Impacts on Poor Communities

62. It is also possible to analyze the impact of environmental degradation on different income classes. This subsection reviews the possible effects on poor households of the baseline and trends in high-priority environmental issues. This is based on a broad qualitative review of the environmental issue alongside the situation of poor households and communities, supported by specific correlations where relevant information was available.

63. **Water supply, sanitation, and hygiene.** Poor households all over the world tend to be most affected by contaminated water supplies and poor sanitation and hygiene. In some ADB developing member countries, the under-5 mortality rate for the bottom income quintile is three times or more that for the top income quintile.[37] In Pakistan, however, the differential is relatively small[38] because children from rich households are also exposed to contaminated water supplies, for instance, and prone to fairly high rates of infectious diseases. A small study for one locality in Rawalpindi suggests that a key variable in preventing infections from contaminating water is a mother's education level (and therefore her understanding of the problem).[39]

64. **Soil erosion and degradation.** Landless sharecroppers are the poorest class in rural areas, followed (in that order) by those with nonagricultural occupations, contract farmers, those who only tend livestock, and farmers with small landholdings.[40] While it seems probable that soil degradation should affect sharecroppers the most, it is also possible that they in turn are the immediate agency for much of the soil degradation that takes place. Furthermore, soil erosion and salinity are possible reasons for some small landholders being reduced to penury.

65. **Indoor air pollution.** Women and children are most affected by it as they are more exposed and vulnerable to smoke inhalation. Some 83% of rural household use fuelwood, so health impacts may not be limited to the households in the lowest and next lowest quintile of income classes. This could well be true in congested and confined indoor spaces in urban areas, where the bottom 38% depends on fuelwood for cooking. Large cities are however privileged compared to towns and rural areas in terms of domestic connections for natural gas supplies.

66. **Urban air pollution.** Although all urban residents are exposed to outdoor air pollution, it tends to peak in the congested, highly trafficked areas of large cities, such as railway stations and bus stands, where the poor are likely to reside. Their inadequate diets also make then more

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[36] McGranahan, G., P. Jacobi, C. Songsore, and M. Kjellen. 2001. *The Citizens at Risk: From Urban Sanitation to Sustainable Cities*. London: Earthscan.

[37] Carr, D. 2004. *Health Bulletin*. Washington, DC: Population Reference Bureau.

[38] Government of Pakistan. 2005. *Pakistan Social and Living Standards Measurement Survey, 2004–05*. Islamabad: Federal Bureau of Statistics.

[39] Pakistan Institute for Environment-Development Action Research. 2007. *Rawalpindi Urban Development Project, Annual Project Report, Year 2*. Islamabad: Pakistan Institute for Environment-Development Action Research.

[40] Anwar, T., S. K. Qureshi, and H. Ali. 2003. *Landlessness and Poverty in Pakistan*. Islamabad: ADB.

vulnerable to given levels of pollution. In contrast, rich households can protect themselves from air pollution, for example, by using air-conditioned cars.

67. **Lead exposure.** Traffic police officials and workers in the transport sector are the most heavily exposed to airborne lead. However, children with growing brains are more vulnerable to lead poisoning. Instances of permanent brain retardation as a result of exposure to lead tends to be concentrated among children living in narrow streets in poor urban localities. The impact on human populations may take some more decades to work out beyond the time that Pakistan achieves a lead ethyl-free environment.

68. **Rangeland degradation.** This affects some of Pakistan's poorest people, such as the Tharis of Tharparkar in Sindh, where the drought years of the last decade have aggravated the process of desertification. In Balochistan, seasonal vegetation will flourish while the soil remains moist—following the 2007 floods in dry areas such as Lasbela and Makran—but a decade's worth of soil buildup will be necessary to reestablish the perennial bushes and herbs that are sources of nutrition for the area's livestock.

69. **Deforestation**. In Pakistan, the problem of deforestation is ascribed largely to excessive fuelwood collection, i.e., exceeding the rate at which woody biomass is able to regenerate. Not only do local communities perceive the collection of fuelwood as their right, it is also a function of poverty and of the lack of alternatives for the nonpoor. As part of the cycle, however, deforestation also causes springs to dry up and aggravates landslides: phenomenon that directly affect the local poor.

F. The Additional Environmental Challenge of Emergencies and Natural Disasters: History and Trends

70. Pakistan is prone both to artificially induced and natural disasters. A number of factors accentuate the severity of the post-disaster impact in Pakistan, which include (i) poverty, (ii) poor construction practices, (iii) the inadequate management of livestock and agriculture, (iv) a fragile natural environment, (v) weak early-warning systems, and (vi) lack of public awareness and education.

71. Floods, earthquakes, droughts, and cyclones are the main natural hazards the country is vulnerable to. Pakistan is one of the flood-prone countries of South Asia. River flooding is most severe in Punjab and Sindh while flash floods in hill torrents are common in NWFP, Balochistan, and the Northern Areas. Earthquakes recur periodically as the Indo-Australian plate shifts northward, colliding with the Eurasian plate. Characterized by low rainfall and extreme temperature variations, as much as 60% of the country's terrain is classified as semi-arid to arid. The most susceptible regions experience a 2- or 3-year-long drought every decade. Cyclones cause significant damage in the coastal areas of Sindh and Balochistan. The low-lying coastal belt allows storms to travel several hundred kilometers inland, damaging or even destroying tracts of standing crops and human settlements, and lowering agricultural productivity in the coming season by leaving the soils water-logged.

72. **Economic Impacts of Natural Disasters:** Conservative official estimates of the monetary damage caused by the most significant natural disasters that occurred between 1926 and 2006 mark the severity of the problems they pose (Table 5). A preliminary needs assessment prepared jointly by ADB and the World Bank following the earthquake that devastated much of AJK and NWFP in 2005 estimated that $5.2 billion were required for

reconstruction and rehabilitation. This represents roughly 24% of Pakistan's entire national budget for FY2007.[41]

Table 5: Estimated Number of Human Casualties and Financial Losses Arising from Natural Disasters, 1926–2006

Natural Disasters	No. of Events	No. of Casualties	No. of Affected Persons	Damage ($ million)
Droughts	4	223	2,269,300	247
Earthquakes	22	142,812	4,236,110	5,200
Epidemics	10	283	16,486	0
Spells of extreme temperature	15	1,406	574	0
Floods	53	11,767	47,600,694	2,500 to 6,000
Landslides	13	413	3,419	0
Windstorms	21	11,654	950,313	4

Source: Meeting of the Technical Working Group on Disaster Risk Management, United Nations, 17 May 2007.

73. Several areas/provinces in Pakistan are vulnerable to a disproportionate share of very high-/high-risk natural disasters (Table 6). Two of the Northern Areas' six districts face a very high probability of natural disasters, while no district in Punjab does. The fact that the Northern Areas are among the poorest with low coping strategies accentuate their vulnerability. Half the districts in the Northern Areas face either a high or very high probability of natural disasters, followed by 38% of districts in Balochistan, and only 3% of those in Punjab.

Table 6: Proportion of Districts in Pakistan Prone to Natural Disasters

Province or Area	Very High Risk	High Risk	Total
Azad Jammu & Kashmir	13	13	26
Balochistan	21	17	38
North West Frontier Province	17	13	30
Northern Areas	33	17	50
Punjab	0	3	3
Sindh	4	30	34

Source: Meeting of the Technical Working Group on Disaster Risk Management, United Nations, 17 May 2007.

74. Pakistan is also subject to a diversity of natural hazards. For example, southern Punjab is prone to droughts and flooding; Balochistan confronts the risk of droughts, earthquakes, and flash floods; Sindh is vulnerable to both droughts and floods, while NWFP faces the risk of earthquakes, landslides, avalanches, and glacial lake outburst floods.[42]

75. **Emergency Responses and Natural Disaster Management Experience:** Until the 8 October 2005 earthquake, the Government's capacity to prevent and respond to natural disasters was poorly organized. The National Calamity Prevention and Relief Act 1958 was the first significant piece of Pakistani legislation designed to address natural disasters. In practice, however, it addressed the response to natural disasters rather than prevention thereof. It did not establish any systematic plan or organization to tackle other issues concerned with disaster management. Moreover, the authority to respond to natural disasters was assigned to the

[41] ADB and World Bank. 2005. *Pakistan 2005 Earthquake Preliminary Damage and Need Assessment*. Islamabad: ADB and World Bank. Computation based on data from Government of Pakistan (2007a) (footnote 1).

[42] Murshed, Z. 2007. National Disaster Management Authority, Islamabad. Personal communication, 2 August.

provincial level since the impact of natural disasters were considered primarily at that level or below. Until 1970, the Civil Defence Organization had been assigned the task of responding to such disasters;[43] it consisted mainly of volunteers who received limited training twice a year.[44] Following the cyclone that struck former East Pakistan (now Bangladesh) in 1970, the cabinet secretariat's emergency relief cell became responsible for organizing the federal Government's response to disasters (footnote 43), but there was little change in the official management of or preparation for natural disasters.

76. Following the 2005 earthquake, the Government has recognized the importance of reducing the risk of natural disasters to ensure sustainable social, economic, and environmental development. To achieve these ends, it passed the National Disaster Management Ordinance in 2006, to be implemented by the National Disaster Management Commission (established in February that year). The commission recommended a 5-year plan to address disaster preparation and management, which included a proposed $15 million budget.[45] It also developed the National Disaster Risk Management Framework, which is to guide the entire system of disaster risk management in Pakistan. The framework calls for (i) developing disaster risk management strategies; (ii) carrying out risk analyses of potential disaster-prone areas; (iii) establishing disaster management authorities and emergency operation centers at the provincial, district, and municipal levels; (iv) technical assistance, and training and awareness programs; (v) collecting and analyzing topical data; (vi) imposing appropriate regulations; (vii) involving the media; (viii) monitoring non-government organization (NGO) activities to ensure they match international standards; (ix) early warning and surveillance systems; (x) joint training, and common standards and protocols; (xi) coordinating a national response to country-level disasters via the National Emergency Operations Center; and (xii) the Government to make available human and capital and resources that can be engaged in emergency responses. The National Disaster Management Authority has been assigned the task of implementing the framework (footnote 43).

G. Policy, Legislative, Institutional, and Budgetary Frameworks

1. Overall Environmental Management Policies

77. Macroeconomic development planning is well established in Pakistan. Perspective and medium-term development frameworks are approved at the highest levels of government with intent to provide the basis for all development planning in the country. Currently, the two key long-term macro-policy documents in operation are (i) the Vision 2030, and (ii) the MTDF 2005–10; the PRSP II is being finalized. These recent macro-policy documents make reasonable mention of environmental issues. Policies have also been developed for specific sectors, such as transport, power, water, and health which have implications for the environment. A National Environment Policy of Pakistan (NEP) was approved in 2005.

a. Vision 2030

78. The Vision 2030 was released on 22 August 2007. It aims to (i) increase the size of the economy from $141 billion to $1 trillion; (ii) raise per-capita income from $925 to $4,000; (iii)

[43] Government of Pakistan. 2007b. *National Disaster Risk Management Framework for Pakistan*. Islamabad: National Disaster Management Authority.
[44] Qazi, M. U. 2007. UNDP, Islamabad. Personal communication, 2 August.
[45] *Dawn*. 2007. When Disaster Strikes. 4 August.

eliminate poverty; (iv) reduce the population growth rate from 1.9 to 1%; and (v) raise the literacy and primary enrolment rates to 100%. It also makes a number of environmental commitments, such as the integration of environmental issues with socioeconomic planning, stricter enforcement of environmental laws, integrated water resources management, and increasing communities' participation in natural resources management. A series of action plans are needed to implement these commitments.

b. Medium Term Development Framework (MTDF) 2005–2010

79. The Government's development policies are elaborated in the MTDF 2005–10. The document is claimed to have adopted a new approach to national planning, which, until recently, was typified by 5-year plans. Indeed, the MTDF 2005–10 was produced using a relatively more extensive consultation process compared with previous 5-year plans. The Government's public sector development programs (PSDPs) and the provinces' annual development plans are now derived from the MTDF 2005–10. The planning system continues to be strongly "top-down" with plans and budgets prepared at the federal level and then translated into provincial annual plans in the form of projects and programs.

80. The MTDF 2005–10 notes that "the maintenance of a healthy natural resource base as a basis for sustaining economic growth will be addressed through increased awareness and ownership of this goal by the key economic stakeholders, in public and private sectors [*sic*]." However, there is an important gap in coordination here. While it assigns responsibility for preparing national drinking water and sanitation policies to the Ministry of Environment, the MTDF 2005–10 makes no reference to the role of the ministry or NEP in programming or coordinating environmental projects across the country.

81. At the province level, the Punjab government has, for the first time, produced a separate medium-term development framework for the period 2005 to 2010, which not only addresses environmental issues but includes a number of sound environment-related projects.

c. Poverty Reduction Strategy Paper-II (PRSP)

82. The first PRSP (2003) outlined the Government's policy for poverty reduction based on a pro-poor growth strategy. A draft PRSP-II, developed through an extensive consultative process, is currently in the process of being finalized for implementation during 2008-2011.

83. The draft PRSP-II articulates a strategy statement aimed at ensuring a broad-based sustainable growth that leads to effective poverty reduction. It is built around the following ten strategic pillars:

(i) The macroeconomic environment and real sector growth
(ii) Targeting the poor and vulnerable
(iii) Increasing productivity and value addition in agriculture
(iv) Integrated energy development program.
(v) Human development for 21st century
(vi) Making industry internationally competitive
(vii) Removing infrastructure bottlenecks through public-private partnerships
(viii) Capital and finance for development
(ix) Housing and land management
(x) Governance for just and fair system.

84. The PRSP-II document alludes to the environment under its different pillars and highlights the nexus between poverty and environment. Aligned with the MDG Goal 7 on environmental sustainability, the document aims at minimizing the potential adverse impacts of the (infrastructure) initiatives and interventions by mainstreaming environment into the decision making. Accordingly, the PRSP-II monitoring framework includes indicators on the levels of ozone depleting substances and the number of vehicles using CNG for monitoring environmental progress. The PRSP-II also strives to strengthen the institutional capacity for environmental management consistent with the provisions of National Environment Policy (NEP). It regards environmental fiscal reform as an important policy instrument to address environmental hazards by making greater use of tax sources, cost recovery, and removing environmentally harmful subsidies.

d. Environmental Policies

85. The NEP was approved by the federal Government in 2005. The policy's subsidiary papers, strategies, and plans provide an adequate framework for addressing a comprehensive range of environmental issues. However, the NEP does not prioritize or assign responsibility for certain tasks to specific institutions and agencies. It appears to rely on the voluntary implementation of its recommendations by federal, provincial, and local government agencies and other stakeholders. Nor is it a principal planning or development document; it was apparently not produced in time to influence the Planning Commission, whose working group on environment prepared a separate plan and schedule of project concepts for the MTDF 2005–10. The separate tracks that this has created remains a notable weakness in national environmental management.

86. Table 7 lists existing environmental policies, plans, and strategies; other public policies and strategies that have a bearing on the environment; and proposed policies, plans, and legislation related to the environment. While there is obvious intent to address comprehensively sector-specific and environmental issues, it remains unclear is how the Government will mediate between these instruments to ensure that they are implemented in harmony.

Table 7: Environmental Policies, Plans, and Strategies

National Policies, Plans, and Legislation

- National Environment Policy of Pakistan 2005
- National Conservation Strategy 1992
- National Environment Action Plan 2001
- Pakistan Environmental Protection Act 1997
- National Forest Policy 2002
- National Sanitation Policy 2006
- National Drinking Water Policy 2007 (Draft)
- Biodiversity Action Plan 2000
- National Action Plan to Combat Desertification and Drought
- National Environmental Quality Standards
- Building Code of Pakistan

Other Public Policies and Strategies

- Poverty Reduction Strategy Paper (PRSP)
- PRSP II (Draft)
- National Policy for Development and Empowerment of Women 2002
- Education Policy 2001
- Energy Policy (to be prepared)
- Health Policy 2001
- Housing Policy
- Industry Policy
- Petroleum Policy (2007 Draft)
- Population Policy 2002
- Private Power Policy
- Renewable Energy Policy
- Rural Development Strategy
- Trade Policy (Annual)
- Transport Policy
- Water Policy (2004 Draft)
- Transport Plan

Proposed Policies, Plans, and Legislation

- Implementation strategies for multilateral environmental agreements and the Millennium Development Goals
- Climate Change Policy and Action Plan
- Clean Development Policy
- Energy Conservation Policy
- Medicinal and Economic Plants Conservation Policy
- Resettlement Policy
- Wetlands Policy
- Clean Air Act
- Oil Pollution Act
- Water Conservation Act
- Zoological Gardens Act
- Biosafety Regulations
- Coastal Zone Management Plans
- Cultural/Historic Sites Conservation Plans
- Energy Conservation Standards
- Invasive Species Strategy and Action Plan
- Land Use Master Plan and Zoning Plans
- Oil Spill Contingency Plan
- Public Transport CNG Conversion Plan
- Protected Areas System Plan
- Strategies to Combat Desertification and Drought

CNG = compressed natural gas.

Sources: Various sources, including Hunnam, P., and A. Saeed. 2007. Situation Analysis on Environment in Pakistan. Preliminary draft report. United Nations.

e. Sector Specific and Safeguard Policies

87. Sector-specific policies, in areas such as water, power, oil and gas, and housing, elaborate the Government's priorities for key sectors of the economy. These policies derive from internal government and stakeholder-based consultations but in most cases protecting the environment is not their key focus; indeed, any reference to the environment is by default rather than by design. Sector policies assume that thematic policies, such as the NEP, will ensure that the environmental aspects of public decision-making are given adequate consideration. This represents a significant policy discord. For example, a water sector policy that subsidizes tubewell operation by imposing a flat-rate electricity charge could lead to the drawdown of water. In some critical locations, groundwater sources are dangerously close to depletion. More widespread is the looming threat of saline water intrusion into zones of fresh groundwater that underlie arable soils. All these issues can potentially create severe environmental problems. Sector-specific policies and legislation therefore need to be reviewed (i) specifically, to align them with the NEP and Pakistan Environmental Protection Act (PEPA) 1997, and (ii) generally, to ensure that they reflect the tenets of sustainable development.

88. In this regard, land acquisition and resettlement issues make a case in point. The Land Acquisition Act 1894 is used to acquire land and other properties (owned by individuals or communities) for development projects. While the Act lays down in detail the procedures involved in acquiring these lands and properties, it does not take into account contemporary concepts of the resettlement and rehabilitation of the parties affected. This has resulted in inadequate compensation and delayed payments to affected people, lack of attention to the social, environmental, economic, and cultural impacts of development and ways of compensating for adverse effects. Further, the Act is operationally implemented as a provincial law, which creates variations in the way that different provinces calculate and pay compensation amounts to the people affected.

89. Given the current focus on people-centered development, the Land Acquisition Act 1894 was deemed inadequate to ensure that the people affected by it were properly resettled and compensated. With the assistance of ADB, the Government initiated the preparation of the National Resettlement Policy, which was to be implemented as a uniform law. Its scope was extended to all public and private sector development projects that could result in the loss of livelihoods and assets, even if no physical displacement of people took place. The policy was envisaged to lay down procedures that would ensure appropriate compensation for affected individuals and communities. However, the new draft policy retains the provision under existing laws that does not allow compensation to persons without title to the land being acquired. Conversely, most multilaterals (including ADB) favor compensating such persons to ensure that the mere absence of a title does not bar them from any kind of compensation at all. This problem could delay ADB-funded projects from being smoothly implemented in Pakistan. To this end, the Government needs to finalize and promulgate the Resettlement Policy, which would also help greatly in reducing any adverse social and environmental impacts of investment in Pakistan's infrastructure.

90. With Pakistan's pro-growth policy and ADB's proposed focus on assisting infrastructure development in Pakistan, the absence of a comprehensive resettlement policy could result in numerous obstacles related to the displacement of people and nonpayment of proper compensation. Recently, Pakistani courts have begun to apply the stipulations of the Public Trust Doctrine of Common Law to decide environment-related cases. According to this doctrine, all the natural resources of a country are to be used only and exclusively for the public good. As

more development takes place, the number of court cases invoking this particular law are likely to increase.

2. Legislation: Strengths, Weaknesses, and Opportunities

91. "Environmental pollution and ecology" are part of the Concurrent List in Pakistan's constitution. This means that both federal and provincial governments have constitutionally mandated responsibilities for the management of natural resources. This raises several questions regarding the proper allocation of and coordination among various roles and responsibilities. While these remain to be settled, the Local Government Ordinance 2001 has further delegated certain environmental functions to local governments. The shortfalls in their capacity for environmental management, however, have not been adequately addressed in the last 5 years.

92. The PEPA 1997 provides a framework for (i) establishing provincial funds for (i) sustainable development; (ii) the protection and conservation of species and renewable resources; (iii) the establishment of environmental tribunals and appointment of environmental magistrates; and (iv) carrying out environmental impact assessments (EIAs) and initial environmental examinations (IEEs). Notwithstanding the above, this regulatory framework has not been put into operation to the extent envisaged a decade ago.

93. Under the PEPA 1997, the Government has the authority to delegate environmental management functions and powers to provincial governments, agencies, and local authorities. Provincial governments may, in turn, delegate to district governments. In fact, there are no fully established guidelines for delegating federal powers to the provinces, and upward accountability and roles are not particularly well defined. Provincial capacities remain limited, and very little attention has been paid to developing capacities at the local government level.

94. In 2001, the Government decided against making the National Environmental Quality Standards (NEQS) operational. This decision was taken as part of its pro-private sector development policy. Earlier, the Government, industry leaders, and civil society had made substantial collaborative efforts to formulate pollution charges that were commonly acceptable. These charges were to be introduced in a graduated manner, supplemented by a self-monitoring and reporting instrument. Nonetheless, efforts to create a level playing field encouraging the establishment of clean, efficient industrial units have remained unproductive.

95. Several sets of procedural and sector-specific guidelines have been developed for IEEs and EIAs, including guidelines for public consultations, thermal power stations, housing estates and new town development, industrial estates, oil and gas exploration and production, chemical and manufacturing plants, and road and sewerage schemes. A set of draft guidelines regulating upstream petroleum exploration has also been developed. While all these guidelines are technically comprehensive, they are used regularly only by the oil and gas sector, and in projects for thermal power plants and major roads. Most other sectors (housing, industrial estates, etc.) have yet to adopt them. Finally, the extent of public consultation in decision making is limited, and few genuinely open public hearings are held to review the environmental impact of projects.

96. Environmental tribunals in Pakistan tend to function at low level of efficiency: judges are not appointed in time and staff positions remain vacant for long periods. In contrast, a proactive superior judiciary has taken *suo moto* notice in a number of landmark cases. Decisions by the Lahore High Court have created precedents for effective public interest litigation within the main

body of civil law. The Lahore High Court, for instance, had directed the Punjab government to phase out buses, wagons that run on diesel, and replace them with buses and minibuses that are either Euro-II-compliant or use CNG, and four-stroke rickshaws, respectively, by December 2007.

3. Key Stakeholders in the Environment Sector

97. The four main categories of stakeholders for environment sector in Pakistan's are (i) government, (ii) private sector, (iii) civil society, and (iv) household. The most influential stakeholders within the government are finance, economic, and development policy institutions, particularly economic coordination committees, and project approval forums, such as central or provincial development working parties. Their decisions on resource allocation, pricing, and mega-projects have an enormous impact on the environment. Federal ministries and provincial departments with sector-specific mandates are also influential in such decision making. Less effective are ministries and departments assigned supportive, thematic, or coordination roles, such as the Ministry of Environment. Among the least influential are agencies with direct responsibility for environmental management, including the federal and provincial environmental protection agencies. As noted above, the superior judiciary has begun to take an interest in environmental matters. Appendix 2 lists the salient apex institutions concerned with the environment.

98. The way in which line departments, corporate bodies, and the private sector operate also has a significant impact on the environment and on the health of a country's citizens. Most public departments, for instance, focus on new projects at the expense of maintenance. On the other hand, the rural support programs that were initiated in Pakistan in the 1990s, and are now operating in almost every district, seek active community participation in development and maintenance. Some multinational and national corporations and their industrial units have strong environmental codes and effective pollution abatement practices: Bristol-Myers-Squibb has installed a modern waste treatment plant at its factory in Korangi, Karachi, that treats waste to standards beyond those required by the NEQS. Other corporations merely pay lip service to good practices, most ignore the environmental consequences of their actions, and yet others are deliberately neglectful. Leadership, organizational culture, sector-wide practices, and economic incentives and disincentives are some of the factors that account for these differences.

99. As demonstrated by the overwhelming response to the 2005 earthquake, civil society organizations are active all over Pakistan. Most are local, informal, and unregistered, but more than 50,000 NGOs are registered under different legislative acts. Most NGOs are welfare organizations, while a minority is oriented around the concept of participatory development focusing on education, health, social welfare, human rights, gender, and democracy. A few have explicit missions, such as environmentally sustainable development or rights-based advocacy. There are a dozen or so apex environmental NGOs in Pakistan (Table 8).

100. Apart from NGO activities, a substantial number of community-based organizations have partnered with donor-funded environmental projects, created community-level awareness of environmental issues, and implemented commendable pilot projects in forestry, solid waste management, agriculture, irrigation, small physical infrastructure development, and other related sectors.

Table 8: Apex Environmental NGOs in Pakistan and Areas of Focus

Environmental Subsectors and Issues	No. of NGOs
Sustainable forestry	8
Water supply and management	7
Energy efficiency and renewable energy	6
Environmental education	5
Biodiversity and wildlife conservation	4
Sustainable agriculture, marine and coastal resources, fisheries, climate change and ozone depletion, urban environment and development, and environmental impact controls	3
Waste management and adaptation to climate change	2
Air quality and pollution, chemicals management, rangeland management, and desertification	1
Biosafety and quarantine, and noise management	0

NGO = nongovernment organization.
Source: Hunnam, P., and A. Saeed. 2007. Situation Analysis on Environment in Pakistan. Preliminary draft report. United Nations.

4. Public Expenditure on Environment

101. The MTDF 2005–10 has allocated Rs28.3 billion under the head of environment for the period 2005–2010. This equals 1.4% of the total outlay under the MTDF 2005–10, and is five times greater than the corresponding allocation for 2000–2005 (Rs5.5 billion). Table 9 provides a breakdown of expenditure by project category.

Table 9: Environment Sector Allocations in MTDF 2005–10 (Rs billion)

Project Name or Sector	No. of Projects	Total Allocation	Federal Share	Provincial Share
Clean Drinking Water for All Project	1	10.0	10.0	—
Brown sector	65	8.2	6.0	2.2
Green sector	45	8.0	7.0	1.0
Cross sector	10	1.0	1.0	—
Capacity building	26	1.1	1.0	0.1
Total	**146**	**28.3**	**25.0**	**3.3**

MTDF = Medium Term Development Strategy.
Source: Government of Pakistan. *Medium Term Development Strategy 2005–10*. Islamabad: Planning Commission.

102. A scrutiny of the PSDP for FY2007 reveals that other ministries, such as the ministries of food and agriculture, finance, and industries, have also begun to implement projects relevant to the environment in areas including water, solid waste, ecosystem management, energy, capacity development, biosafety, carbon sequestration in forests, chemicals management, urban parks, eco-tourism, and mariculture. The total amount allocated for such projects under the PSDP for FY2007 is Rs25 billion.

103. The allocation of funds for the environment in the federal PSDP and provincial annual development plans has risen sharply in recent years. In the case of the federal Government, the increase is almost entirely due to the Clean Drinking Water for All Program. The provinces have also allocated more toward drinking water and sanitation schemes. However, as in the past, funds continue to be utilized poorly, both at the federal (Table 10) and provincial levels.

Table 10: PSDP Allocations and Expenditure on Environment(Rs. million)

Fiscal Year (FY)	Allocation	Expenditure	Percentage of Total
FY2004	4,936.1	469.8	9.5
FY2005	3,114.2	809.2	26.0
FY2006	11,678.7	908.0	7.8
FY2007	13,449.8	3,236.0	24.1

Source: Hunnam, P. and A. Saeed. 2007. Situation Analysis on Environment in Pakistan, Preliminary Draft Report. United Nations,.

5. Private Sector Investment in Cleaner Production and Effluent Treatment

104. Private industry in Pakistan has invested substantially in cleaner production and effluent treatment in advance of any effective enforcement. Most chambers of commerce and industry have functional environmental cells, of which a number actively share environmental best practices among their members. The All Pakistan Pesticides Manufactures Association, for example, strongly promotes safety, health, and environmental management procedures among its members. In addition to export-oriented industries, branch plants of multinationals and progressive units in other sectors have invested in sound housekeeping measures and waste treatment. Between 1993 and 2006, the private sector has invested around Rs7.3 billion in effluent treatment and cleaner production (Table 11), and, remarkably, in advance of the NEQS being effectively enforced.

Table 11: Investment by Industry Sector in Effluent Treatment and Cleaner Production

Industry Sector	Investment (Rs million)	Remarks
Textiles	2,500	Export-oriented sector
Fertilizer	1,400	Branch plants of multinational corporations
Pulp and paper	600	
Cement	570	
Leather	500	Export-oriented sector
Petrochemicals	200	
Automobiles	200	Branch plants of multinational corporations
Pharmaceuticals	140	Branch plants of multinational corporations
Dairy	100	
Sugar	60	
Pesticides	56	
Steel	10	
Paints	5	
CET	900	At Kasur and Korangi in public-private partnerships
Incinerators	75	For hospital waste and hazardous chemicals
Total	**7,300**	

CET = combined effluent treatment.
Source: Khan, A. U., Past, Present, and Future of NEQS Implementation in Pakistan, Paper presented at the Sustainable Development Conference, Sustainable Policy Development Institute, Islamabad, 2005. Updated with data provided by NEC Consultants (Pvt.) Ltd. on 20 August 2007.

105. Around 66% of this investment has gone into end-of-pipe treatment, 22% into good housekeeping at the level of individual industries (Figure 6), and 12% into partnering with government bodies for combined effluent treatment (CET).[46]

[46] Based on consultations with private sector representatives.

Figure 6: Private Sector Wastewater Treatment Plants

The Bristol-Myers-Squibb facility in Korangi, Karachi, treats pharmaceutical waste to standards that comply with the company's regulations.

Shakarganj Sugar Mills, Jhang. This wastewater treatment and biogas recovery plant saves substantially on the use of commercial gas.

Wastewater treatment plant at Century Paper Mills along the National Highway near Pattoki, Punjab. This dissolved air floatation plant brings waste lint to the surface for capture and reuse.

This wastewater treatment plant at Crescent Textiles, Faisalabad, has been designed and implemented by a national company providing environmental services.

III. NATIONAL ENVIRONMENTAL PRIORITIES FOR ACTION

A. Past Environmental Record

106. Like many other countries, Pakistan has shown a mixed record in dealing with environmental issues. On one hand, a number of instances have been outstandingly successful. The Hydrocarbon Development Institute of Pakistan pilot-tested a CNG outlet in the 1990s and demonstrated that the CNG storage tank and kit was reliable. Subsequently, the Government facilitated private sector investment in CNG outlets and conversion services, and vehicle owners responded in a rapid and widespread conversion to CNG. The introduction of cleaner gasoline and diesel is another example of success. Although the production of nonleaded gasoline and low-sulfur diesel requires refineries to invest heavily in tighter reforming and hydro-leaching, polluting fuels have largely been phased out in Pakistan.

107. On the other hand, the Government has dealt poorly with environmental disasters such as oil spills, chemical leaks, and discharges from highly polluting industries. The breakup of the oil tanker *Tasman Spirit* in 2003 in Karachi's harbor resulted in the contamination of the city's main beach, and was widely covered by the media for some months. The incident was handled poorly and inefficiently: there was an unnecessary duplication of effort, and responsibility and redress under international and national law remained unclear. Nevertheless, there was a great deal of public awareness of the disaster (in contrast with an earlier attempt in 1998 to cover up a near-disaster involving a chlorine gas leak from a tanker at Baja Lines in Lahore). Another particularly disturbing incident involved a nationalized chemical plant that, for 3 decades, continued to discharge several tons of mercury per year into a stream leading to the river Ravi.

108. While Pakistan faced problems in complying with the donor's conditions of resettlement in projects funded by international financial institutions, some projects have also had problems complying with environmental policies. An ADB Compliance Review Panel in the case of Chashma Right Bank Irrigation Project (Stage III) directed that remedial measures should be undertaken to meet ADB's resettlement and environmental policy conditions. A World Bank inspection mission found that the Bank-funded Left Bank Outfall Drain Project had had serious environmental and social impacts despite having undergone a rigorous internal environmental assessment.

109. Ensuring environmental sustainability is a challenging task. In the past, ADB has faced difficulties in securing policy reforms for water and energy conservation, improving productivity and equity in the use of irrigation water, and building resilience to drought and floods in various projects. In Balochistan, the provincial government undertook key policy actions to restructure public finances and improve development planning with the support of ADB's Balochistan Resource Management Program. The Balochistan government made notable progress in preparing an integrated water resource management policy and basin management plans to guide reforms and investment in the water sector. However, discontinuing the high level of subsidy on tubewells—as agreed under the program framework—proved too politically challenging to implement. Adopting a certain "sequence" of measures or contingencies is often crucial to the success of a policy reform effort.

110. Pakistan's water resources sector has made slow progress in reforms, and it continues to face capacity and institutional bottlenecks. ADB's experience with the National Drainage Program and the Second Flood Protection Project during the CSP period 2002–06 revealed that the Government's lack of commitment was one of the main obstacles to reform. The National Drainage Program made only partial progress in reforming the institutional framework and transferring responsibility for management to farmers' organizations.

111. The Rawalpindi Urban Water Supply and Sanitation Project (1998–2004) is an example of an intervention that concurred with the Government's development strategy as well as with ADB's objectives of addressing basic human needs, reducing poverty, and improving the environment. More than 70% of randomly interviewed beneficiaries reported satisfaction with the quality of their water supply, and said that their neighborhood's environment and levels of hygiene had improved with better drainage and sanitation. The Punjab Community Water Supply Project (approved in 2002) is also an instance of successful project implementation and targets achieved. In fact, the project was able to exceed its physical targets: of 685 water supply and sanitation (WS&S) schemes completed, 465 schemes were handed over to their beneficiaries. Successful health and hygiene-related education programs were organized; water meters were installed, promoting conservation, ensuring a regular supply, and reducing households' water bills. Nevertheless, for reasons relating to water quality and lack of sustainability, the project was rated "partly satisfactory" in ADB's sector assistance program evaluation report in July 2005. Lessons were learnt from that and implemented. The next stage of the project was evaluated as successful.

B. Priorities for Action

112. The first half of the CEA assesses national environmental issues and their trends vis-à-vis the policies and institutional arrangements relevant to environment; this has helped identify the main gaps hampering policy implementation. Additionally, a number of lessons can be learned from Pakistan's past record in managing its environmental problems. The following subsections describe a number of measures that will help achieve the targets set for high-priority sectors. ADB has a comparative advantage in supporting the implementation of only some of these measures. Accordingly, it invites other key actors in the environment-development sector to support those measures that do not fall within its ambit.

113. **National campaign for domestic hygiene.** Scientific research has established that domestic hygiene is the most effective barrier to the transmission of fecal-oral diseases. Washing one's hands with plain soap after defecating, and before preparing and eating any food, reduces by half the incidence of diarrhea among the children of a household. This has been practically demonstrated by action research in informal settlements in Karachi.[47] In comparison, sanitation reduces the incidence of diarrhea by 35%, and improved water quality and quantity by 15–20%.[48] There is thus a strong case for launching an intensive nationwide campaign encouraging domestic hygiene in order to achieve Millennium Development Goal (MDG) 4.

114. **Access to basic sanitation and safe water for all**. The WS&S sector needs to be reformed in order to enable Pakistan to achieve MDG 7. In turn, meeting the MDG will have a direct and significant environmental impact and reduce the burden of disease. Specific measures could include (i) enhancing competitiveness among urban WS&S schemes—through public-private partnerships, by tightly demarcating natural monopolies, and encouraging

[47] Luby, S. P., M. Agboatwalla, J. Painter, A. Altaf, W. L. Billhimer, and R. M. Hoekstra. 2004. Effect of Intensive Handwashing Promotion on Childhood Diarrhea in High-Risk Communities in Pakistan. *Journal of the American Medical Association* 291 (21).

[48] Esrey, S. A. 1996. Water, Waste and Well-Being: A Multi-Country Study. *American Journal of Epidemiology* 193 (6).

yardstick competition—and (ii) building community-led WS&S programs in rural areas. ADB supported provincial DSSPs in Punjab and Sindh provide platform for this effort.

115. **Make energy efficiency the pivot of national energy policy**. Pakistan is an energy importer, and pays heavily for its profligacy in terms of its huge balance-of-trade deficit and the health of its citizens. Technologies aiding the transition to an energy-efficient regime exist, and Pakistan's main priority should be to reform the power sector toward decentralized demand-oriented formations. Specific measures could include marketing energy conservation.

116. **Checking urban air pollution**. This entails effectively reducing vehicular emissions per passenger-mile to offset the inexorable growth in urban traffic. It can be achieved through a range of national (e.g., promoting cleaner fuels) and city-specific transport policies (e.g., appropriate modal splits). Implementation at ground level will require rethinking land use, better traffic management, and emission control regulations and monitoring.

117. **Greater "crop-per-drop" agriculture**. Freshwater is the key constraint to agriculture in Pakistan, as well as to sustaining nature. The last National Commission on Agriculture was established 20 years ago, and its 1988 report should be revisited in the light of climate change and shifting social parameters. Pakistan's main priority should be to establish a wide-ranging process of consultations and learning as input to a national agriculture policy and "more crops-per-drop" programs. It should also structure a research plan for developing crop varieties that are resilient to the looming heat stress factors associated with climate change.

118. **Restoring and sustaining essential environmental flows to wetlands**. This is likely to be the most challenging of the country's environmental priorities, because it requires that national policymakers and advisors change their perception that water released to mangrove forests and other wetlands amounts to wasted resources. However, perceptions will become easier to change as agriculture transits to cultivating crops with a lower water demand and more efficient irrigation. Nonetheless, saving the Indus delta and other wetlands is a priority that cannot wait for this transition to occur. High-level advocacy delivered by empowered civil society organizations is essential if policymakers are to be made to realize the total use and existence values of these precious ecosystems.

119. **Public-private partnerships for cleaner production and the treatment of industrial effluents**. Progressive industries in Pakistan have taken the lead in promoting cleaner production and effluent treatment. It is thus an opportune time to scale up these innovations, and there is a strong case for public sector support to private sector-driven initiatives. High-priority measures should include demonstrating the economic returns to cleaner production and operationalizing NEQS.

C. Environment-Related Information Needs

120. As information technology becomes increasingly advanced, basic information on the environment is more easily accessible. Consequently, investment priorities in environment-related information systems have shifted away from merely data acquisition tools and databases to the development of human skills and capacity to use and analyze the information available. Research centers and think-tanks associated with universities and centers of learning are generally suitable investment destinations for this purpose.

D. Key Environment Indicators

121. Most key indicators for success in the environment sector can be derived directly from the MTDF 2005–10 (Table 12). Additional indicators that address the priorities for action identified above and can be used to benchmark progress in environmental sustainability include (i) reducing child mortality (MDG 4) to validate the benefits of extending the coverage of safe WS&S, (ii) improving irrigation productivity (crop yields per unit water), and (iii) increasing the number of wetlands protected by ensuring they receive essential environmental flows. Increasing energy efficiency to, say, Sri Lanka's current level by 2015, and investments by industries in cleaner production and effluent treatment could be other useful indicators of progress.

Table 12: Key Environmental Targets under the MTDF 2005–10

Environmental Target	Status in 2004/05	Target for 2009/10
Forest cover (% of total land area)	4.9	5.2
Protected area (% of total land area)	11.3	11.6
Energy from renewable sources (megawatts)	17.0	880.0
Access to sanitation (% of population)	42.0	50.0
Access to clean water (% of population)	65.0	76.0
Sanitary landfills in major cities	0.0	2.0
Air pollution monitoring stations	0.0	4.0
Industries registered for self-monitoring	30.0	300.0

Source: Government of Pakistan. *Medium Term Development Strategy 2005–10*. Islamabad: Planning Commission.

E. Capacity Building for the Environment

122. Capacity building comprises a sequence of policy reforms followed by institutional development and organizational strengthening in addition to individual education and training. Table 13 identifies the gaps between areas of high priority and the capacity required for corresponding actions, and recommends measures for environmental agencies to fill these gaps.

Table 13: Recommendations for Capacity Building

Sector	Gaps	Priority Reforms, TA, and Areas of Investment
Water supply	– Weak local government capacities for safe and sustainable WS&S.	– Professionalize the water and sanitation agencies and implement water safety planning. – Establish competitive and performance-enhancing regulatory frameworks (e.g., provincial water assessors and regulators). – Conduct zone-level studies for implementation of continuous water supply in cities. – Secure reforms for sustainability through community ownership and management of rural WS&S.
Energy	– Limited capacity to implement energy conservation and integrate environmental considerations with sector plans – Limited capacity of city governments to establish and regulate urban mass transit systems.	– Implement sector reforms for market development and enhance competitiveness. – Improve energy efficiency. – Launch advocacy programs to prioritize mass transit options. – Strengthen civic involvement in city planning. – Devise strategic regulations for urban transport systems. – Provide TA to and invest in appropriate urban mass transit systems that are people-, fuel-, and environment-friendly (e.g., as in Curitiba, Brazil).
Health	– Lack of capacity in federal and provincial environmental protection agencies and traffic police department to abate urban air pollution.	– Make the NEQS operational. – Provide TA to and invest in strengthening federal and provincial environmental protection agencies. – Invest in the implementation of the Government's Clean Air Program.
Agriculture	– Limited capacity of agriculture departments to steer farmers toward improving water productivity.	– Kick-start agrarian reform through a new national commission on agriculture. – Launch a nationwide process of consultations on Pakistan's future agriculture
Biodiversity	– Lack of capacity to conserve biodiversity in downstream wetlands.	– Establish roundtables and bargaining arenas for the Government, civil society, and people whose livelihoods depend on wetlands.
Industry	– Lack of capacity in the private sector to avail economies of scale in CET.	– Operationalize the NEQS; open up an industry subsector for environmental services under the General Agreement on Trade in Services. – Provide TA to and invest in the privatization and liberalization of CET, and regulate through yardstick competition.

CET = combined effluent treatment, NEQS = National Environmental Quality Standards, TA = technical assistance, WS&S = water supply and sanitation.
Source: Asian Development Bank, 2007.

123. In the long run, it is probably best to invest in Pakistan's universities and technology institutions that center on individual education and training. Higher education has finally attracted the Government's attention as a key sector to be turned around. Improving individuals' capacity for environmental management by providing high-quality environmental education in Pakistan's universities will be an important step in this direction. The high rate of rotation among narrowly trained faculty, and the significant number of academics who do not return to Pakistan after completing their training abroad implies that there is no likely shortcut to capacity building. Waiting for policy reforms, institutional development, and organizational strengthening is not an option that will reap dividends quickly either.

IV. ASSESSMENT OF CSP 2002–2006

A. Overview of Past ADB Environmental Assistance

124. Environmental sustainability is identified as one of the five priorities of ADB's Long-Term Strategic Framework (LTSF) 2020. Strategy 2020 specifically puts a focus on addressing climate change. Environmental considerations are to be put at the forefront of all development planning and decision making. The LTSF envisages not only halting but reversing the enormous and costly impact of the environmental degradation that has taken place. In conceptualizing ADB's work for the medium term, environmental sustainability has remained a high priority. Managing the environment is also one of the five strategic priorities of ADB's Medium-Term Strategy II (2006–2008).

125. ADB's CSP (2002–2006) for Pakistan was built on three pillars: (i) good governance, (ii) sustainable pro-poor growth, and (iii) inclusive social development, with a key area of focus being the WS&S sector. The WS&S and waste management sectors were collectively accorded loans worth $230 million and technical assistance (TA) worth $2 million, comprising 3.3% of all outstanding loans on 31 December 2006. WS&S was an important component of the provincial Devolved Social Services Program in Punjab and Balochistan. Another ADB-funded program targeting environmental sustainability was Industrial Efficiency and Environmental Management.

126. Improving sustainable environmental management was one of the five thematic priorities of the CSP 2002–2006. However, environment overall remained a weak area of ADB's assistance pipeline under the CSP. The TA program for 2002–2004 envisaged two environmental projects: (i) the operational adoption of a self-monitoring and reporting tool (SMART) by industrial units to report their discharges, and (ii) integrated biodiversity conservation in Kirthar National Park. However, neither TA could be materialized. The precondition that the Government notify the necessary rules to make the NEQS operational was not met, as a result of which the SMART TA could not be realized. Meanwhile, other donors are already active in Kirthar National Park. As such, there was no specific environment sector project in the CSP 2002–2006 (Table 14).

127. The CSP Update (2004–2006), approved in August 2003, reconfirmed the strategic priorities outlined in the CPS. The Update reinforced the priority attached to promoting sustainable, modern, and diversified rural development in Pakistan. Improving water resources management is an increasingly important issue for Pakistan as well as one with many environmental ramifications. In alignment with the national priorities, CSP Update also included plans to reengage with the water sector through province-focused water conservation, drought mitigation, and rehabilitation of the irrigation infrastructure after a gap of several years.

Table 14: Distribution of ADB's Project Assistance to Pakistan by Sector (2002–2006)

Sector	Lending Assistance			TA Projects	
	No. of Projects	($ million)	Proportion of Total	No. of Projects	($ million)
Agriculture and Natural Resources	6	396.8	7.8	15	7.5
Education	3	102.0	2.0	3	0.7
Energy	2	351.0	6.9	9	4.8
Water Supply and Sanitation	3	200.0	3.9	4	1.7
Finance, Industry, and Trade	4	1,006.0	19.8	6	5.3
Governance	4	837.0	16.5	20	16.8
Transport and Communications	4	817.9	16.1	6	2.1
Multi-Sector	8	1,367.0	26.9	22	29.3
Total	**34** [a]	**5,077.7**		**85**	**68.3**

[a] The 34 projects represent 57 loans.
Source: ADB. 2007. Draft Country Strategy and Program Completion Report 2007. ADB, Islamabad.

128. The final CSP Update (2006–2008) noted that ADB's assistance to the social sectors would focus on attaining the MDGs and strengthening devolution. This reflects ADB's intention of harmonizing its aims with those of other donors under the Paris Declaration for Development Effectiveness. MDG 7 for environmental sustainability sets targets for WS&S and indicators for forest cover, biodiversity parks, energy efficiency, and greenhouse gas emissions. Under its renewable energy development sector investment program, ADB approved a multi-finance facility of $510 million in 2006 to support Pakistan's goal of increasing the utilization of clean and renewable energy-based power as outlined in its Policy for Development of Renewable Energy for Power Generation.

129. The increase in the share of governance operations occurred alongside a decline in share of several traditional strongholds in ADB's portfolio in Pakistan. Previously, the two largest sectors within which ADB has operated were (i) energy, and (ii) agriculture and rural development, comprising 20 and 21%, respectively, of the cumulative approved lending assistance to Pakistan until 31 December 2006. However, between 2002 and 2006, new forms of assistance approved for the agriculture and energy sectors respectively accounted for only 8% and 7% of total lending. This partly explains ADB's shift away from sectors with proximate environmental impacts.

130. The redirection of ADB's strategic priorities toward governance was operationalized through policy-based assistance in the form of program loans. These were provided to support decentralization, provincial fiscal and financial management reforms, and sector reforms such as those in the financial sector. In the social sectors (education, health, and rural WS&S), ADB substituted a programmatic, multi-sector budget support-based approach for its hitherto project-based investment strategy. This was intended to provide supplementary financing and capacity building assistance in the social sectors at the levels of provincial and local government. A total of $2.73 billion, amounting to as much as 55% of total assistance, was channeled through policy-based budget support modalities during the CSP period 2002–2006. This provides a strong argument for moving upstream from EIAs to environmental information systems, monitoring, and management.

131. The lending pipeline for 2006–2008 included the Industrial Effluent Treatment and Cleaner Production Project—a standby for the industry sector and environment subsector. The project which envisaged lending assistance worth $10 million from the Asian Development

Fund, however could not be materialized. Meanwhile, only 4 of the 11 other projects in the lending pipeline target environmental protection as a priority.

132. Portfolio performance in Pakistan during the CSP period 2002–2006 has remained weak, with performance indicators placing the country below the corresponding ADB-wide averages. Similarly, loan performance ratings during the period also remained low. The relative performance of the agriculture and natural resources portfolio was the weakest, with 50% of projects considered "at risk." This also suggests the presence of national capacity constraints in the implementation of green sector projects with environmental sustainability as their theme. Urban projects have not fared much better.

B. Environmental Assistance from Other Donors

133. The World Bank has provided support to natural resources management, irrigation and drainage, and biodiversity conservation projects in Pakistan, and achieved a range of results. The Natural Resources Management Project in AJK is generally assessed as having been successful, while drainage projects in Sindh have proved controversial. The World Bank continues to support the Pakistan Poverty Alleviation Fund, through which partner organizations extend microcredit to the poor, especially women. The program incorporates an environmental impact monitoring component.

134. The EU has provided support to environmental protection and biodiversity conservation projects in NWFP and Punjab. Significant project components have included capacity building for sustainable resource management and improving the livelihoods of local communities. In addition, the EU has provided assistance to a fisheries project, and a number of rural WS&S projects.

135. The United Nations Development Programme (UNDP) operates a capacity building program with the crosscutting aim of providing sustainable livelihoods. It has supported the formulation of Pakistan's National Environmental Action Plan, and the implementation of six community forestry projects and a biosaline project in salinity-affected and water-logged areas. UNDP's environmental programs and those of its agencies are being harmonized under the vision of "Delivering One UN."

136. Among Pakistan's bilateral donors, Canada has supported environmental policy development (national, provincial, and district conservation strategies) and provided assistance to strengthen the capacity of (i) nongovernment agencies such as the World Conservation Union (IUCN) in Pakistan and Sustainable Development Policy Institute, and (ii) government agencies such as the Ministry of Environment, and the environmental section of the Planning and Development Division.

137. Japan has provided support through projects dealing with irrigation network rehabilitation, watershed management, vehicle emissions control, and urban air quality monitoring. Currently, it provides assistance to the "clean air" and "clean water" programs being implemented by the Pakistan Environmental Protection Agency.

138. The Netherlands has supported social forestry, community-based urban sanitation, and "cleaner production" programs for industries. The latter has catalyzed investment in cleaner production and effluent treatment by conducting environmental audits and demonstrating ways in which to improve eco-efficiency and reduce effluent discharge (thereby cutting down the size and cost of effluent treatment plants). Progressive units in 16 industry sectors—including leather, textiles, paper, and sugar—have responded positively to these programs.

C. Overview of ADB's Sector Strategies and Work Programs

139. Environment emerges as both an explicit and implicit concern in various ADB projects. As noted earlier, ensuring environmental sustainability however remains a challenging task; like other development agencies, ADB too has faced difficulties in project implementation, such as securing policy reforms for water and energy conservation, improving productivity and equity in the use of irrigation water, and helping build resilience to drought and floods.

140. The Government's priorities in the energy sector still focus largely on centralized supply-side solutions. ADB restarted its lending assistance to the energy sector in 2006 with the approval of two facilities under a multi-tranche financing modality that involved staggered support over several years. Of these, the renewable energy facility seeks to combine support for investment with reforms for generating clean energy initially through small hydroelectric projects and subsequently through wind, solar, and biomass energy sources. The project, currently under implementation, will expand power supply especially in Pakistan's rural areas to serve about 600,000 new domestic connections for about 4.8 million people in two projects. One project, in Punjab, includes five small grid-connected run-of-river hydroelectric power plants with a combined installed capacity of 24.8 MW. The second project in NWFP, involves three grid-connected run-of-river plants with installed capacity of 51 MW. Together, these hydropower projects will generate annual carbon credits of 150,000 $tC0_2e$ under the Clean Development Mechanism. [49]

141. In Pakistan, ADB has had to effectively leverage its large scale of assistance and operational presence to engage in environmental policy dialogue with the Government at the strategic planning stage. ADB is thus well placed in terms of the CPS to enter apex-level policy dialogue with the Government on issues of environmental sustainability.

142. ADB's PRM has the advantage of experiential learning in provincial resource management and devolution, and is well equipped to introduce to local governments good environmental practices (such as the use of environment information systems and environmental monitoring and evaluation) that can be incorporated into provincial macro- and sector planning, as well as specific environmental planning.

143. A stronger degree of environmental sustainability could be achieved were synergies between the public sector and ADB's private sector operations better developed. This applies particularly to projects involving industrial efficiency, environmental management, and access to financial services.

D. Country Partnership Strategy 2009–2013: Links with Government Programs

144. Following a period of impressive economic growth with real GDP having risen from 4.7% in 2002/03 to 9.0% in 2004/05 (before it slowed down to 7% in 2006/07 and further to 5.8% 2007/08) the Government's policies have been directed towards an infrastructure-led sustained growth. This has implied additional investment in infrastructural development, including the construction of dams, roads, and power generation units, but it has added to the country's environmental problems, reflected in its poor social and environmental indicators. With the proposed large-scale expansion of Pakistan's national development program manifested in

[49] Asian Development Bank. 2007. Climate Change, Strengthening Mitigation and Adaptation in Asia and the Pacific.

mega-projects and programs, it is critical to have in place institutions for strategic and sector environmental assessments, capacities to plan and implement programs for environmental enhancement to offset inevitable environmental impacts, as well as environmental safeguards at the project level to minimize these impacts.

145. ADB's country strategy for 2009–13 is well aligned with the Government's policies outlined in its main policy documents, aimed at promoting broad based, sustained, private sector-led economic growth in Pakistan, leading to the creation of significant employment opportunities and a reduction in the incidence of poverty. The CPS, however, aims to be more selective and focuses its assistance pipeline on following key sectors and areas.:

Focal Area 1: Sustained Growth and Poverty Reduction through Reforms and Investments in Energy and Infrastructure

Focal Area 2: Reforms to Strengthen Governance and Financial Services to Promote Structural Transformation
- 2.1 Remove Distortions and Accelerate Value Creation to Support Structural Transformation
- 2.2 Financial Sector Reforms
- 2.3 Provincial Financial Management and Service Delivery Improvement
- 2.4 Strengthening competitiveness and participation of the private sector.

Focal Area 3: Development of Urban Services
- 3.1 Basic Urban Services and Planning

Focal Area 4: Effective Implementation of Projects and Programs and Capacity Building

E. Assessment of the CPS's Environmental Consequences

1. Potential Environmental Impacts

146. Focal area 1 of the CPS plans to promote growth by improving the efficiency of transport system, achieving enhanced access to power and electricity, and improving efficiency and the productivity of water resources. Specific projects proposed in the transport, energy, and water resources sectors could have significant environmental impacts unless properly planned, assessed, managed, and monitored. In addition to ensuring that proper environmental and social safeguards are built into individual projects, the environmental sustainability of proposed projects also needs to be assessed more carefully.

147. ADB has recently concluded a rapid assessment of the energy efficiency trends and potential developments in Pakistan with the objective to support specific operational interventions in the area. ADB has also assisted the Government to prepare a road-map for improving energy efficiency in the country. Early indications are that Pakistan can realize substantial energy efficiency gains by providing the correct incentives to consumer groups including the potential savings on electricity bills from installation of more energy efficient machinery and equipment. ADB envisions providing substantial support over time to Pakistan in this area. At the same time, ADB also needs to undertake a full review before aligning its CPS with any centralized supply-side energy sector development programs.

148. In the transport sector, CPS supports Government policies with the objective to reduce travel time and transportation cost where an internal assessment of the Government's capacity is also required to anticipate and mitigate environmental damage. ADB should, however,

continue to pursue policy reforms in combination with ground-level interventions in the water resources sector to move towards a more sustainable use and integrated management of water resources

149. To address and mitigate the potential environmental impacts, environmental safeguards can be integrated with the CPS's constituent pillars and subcomponents. Public resource management and service delivery, for instance, has created fiscal space for the provinces and enabled more sound economic planning and better service delivery. This presents an opportunity to incorporate environmental monitoring and management into provincial planning and management. The former could also be linked to the ongoing civil service reforms and to service delivery in the WS&S sector.

150. Standalone environmental units, such as the one within the National Highway Authority, tend to work in isolation and produce marginal results since their capacity for EIA is limited. Environmental considerations need to be introduced at a much earlier stage in the transport sector planning cycle, and followed up at each subsequent stage by monitoring compliance. Mainstreaming environmental management capacities in the federal Planning Commission and National Highway Authority could fill part of the gap. Other ministries and agencies can be tackled subsequently on the basis of the environmental implications of their mandates, and ADB's experience of capacity building.

2. CPS Support to Environmental Initiatives

151. The CPS pipeline for 2009-11 provides various opportunities to address environmental issues in Pakistan. A preliminary assessment of its potential beneficial impact is presented in Tables 15 and 16. The CPS could tackle "brown" environmental issues by helping to improve air and water quality and providing support to better solid and hazardous waste management. However, the CPS offers little scope for addressing "green" environmental issues (Table 16). Nonetheless, there is potential for improving the environmental profile within the CPS. Building on Pillar III (strengthening economic competitiveness), for instance, the concept of CETPs could be promoted under "build, own, and transfer" schemes or by providing concessions.

152. Under the proposed scheme or concessions for CETPs would help attract both foreign investment and experience. The industry sector, as client, would not need to resolve problems of impeded or unfair access. The monopoly at the level of individual industrial estates could be mitigated by introducing yardstick competition among effluent treatment plants across industrial estates. The precondition for these measures is that any decision to commit to the General Agreement on Trade in Services (which requires countries to open their environment-related services) is a policy issue that requires high-level government clearance.

153. Along with the requirements laid down by the World Trade Organization (WTO), the EU and other important overseas markets for Pakistani textiles and leather products are increasingly strict in imposing environmental conditions on traded products, such as the use of "eco-labels." Treatment plants are normally too expensive for individual industrial units to use, but combined treatment offers economies of scale for units discharging similar effluents in an industrial estate. Although there are two CETPs in Pakistan (at Kasur and Korangi), their operation has been long delayed by institutional bottlenecks. In this case, ADB could establish a pre-project platform that settles such issues in advance.

154. Building on focal area 3.1 (Supporting Pakistani cities and town centers) ADB can help promote the concept of continuous water supply (CWS), particularly in Karachi and Sindh's secondary cities, where the provision of an intermittent water supply is standard practice among

water utilities. It is less than satisfactory from a health point of view because empty pipes are apt to suck in sewage and other pollutants. It is not possible to detect leaks in or accurately meter an intermittent water supply system. Turning the supply on and off damages the pipe and valve hardware, incurring a substantial financial cost. The uncertainty of supply has led to the emergence of a fleet of private water suppliers who draw water from public stand posts and deliver it via tankers. In Karachi alone, about 5,000 water tankers each make an average of 10 trips a day. This diverts the use of valuable transportation assets and a sheer waste of diesel: combined, the two exacerbate Karachi's road congestion and air pollution problems.

155. The transition to a CWS is possible without increasing supply per capita, pumping requirements, and energy consumption. It requires investment in supply and demand management, of which key elements include leak detection and metering. ADB has more than adequate capacity for assisting the transition to a CWS system, giving it a comparative advantage in this areas. A TA/finance facility supporting the transition to a CWS system in Karachi and Sindh's secondary cities could be initiated at relatively short notice given the platform of SDSSP and forthcoming Multitranche Financing Facility (MFF) under Sindh Cities Investment Improvement Program (SCIIP). The latter aims at achieving rehabilitation and expansion of piped water supply and sewerage drainage networks through investment in water supply and wastewater management improvement in participating cities of Sindh.

Table 15: CPS Support to Brown Environmental Issues

"Brown" Environmental Issues	Impact of CPS
Water supply, sanitation, and hygiene	– Focal area 3.1 (Supporting Pakistani cities and town centers) seeks to improve urban water supply and sanitation services, particularly in large and secondary cities of Sindh. The positive impact could be enhanced by promoting a transition to continuous water supplies for these cities. – Focal area 2.3 (Provincial financial management and service delivery improvement) could be used to scale up the Punjab Community Water Supply Project, particularly by communicating the importance of hygiene and conserving water through women leaders.
Indoor air quality	– No direct support in draft CPS 2009–13. This is a focal area for other development partners in the country.
Urban air quality	– Focal area 3.1 (Supporting Pakistani cities and town centers) could potentially support improvements in urban air quality in big cities through improving public transport system (including focus on institutional changes in the public transport subsector e.g., buses run on CNG), and by introducing mass transit options for selected high-volume corridors such as Lahore and Karachi.
Industrial effluents and emissions	– Focal area 3.1 (Supporting Pakistani cities and town centers) could become platforms for private sector CETPs for industrial estates, enabling the cost-effective treatment of effluents, and opening up the export industry to markets with WTO+ environmental regulations. Further investigations would enable selection among bubble and yardstick competition, or other arrangements allowing one or more CETPs to operate efficiently. – Changes in government policy are a precondition.
Solid and hazardous waste	– Focal area 3.1 could effectively enhance competitiveness of cities by helping build partnerships between city district governments, municipal administrations, union councils, and communities to collect, sort, transfer, and dispose off solid waste on properly managed landfill sites.

CETP = combined effluent treatment plant, CNG = compressed natural gas, CPS = Country Partnership Strategy, WTO = World Trade Organization.
Source: Asian Development Bank, 2007.

Table 16: CPS Support to Green Environmental Issues

"Green" Environmental Issues	Impact of CPS
Agriculture, soils in croplands	– Focal area 1 (improving the productivity of water resources) will directly address the issue. – Focal area 3.2 can also contribute to more sustainable agriculture.
Upland watersheds (deforestation, soil erosion)	– No direct support in draft CPS 2009–13. However, investment in renewable energy options under focal area1 could help reduce pressure on dwindling fuelwood supplies, a major factor in the over-harvesting forest resources.
Rangelands	– No direct support in draft CPS 2009–13.
Wetlands	– No direct support in draft CPS 2009–13.
Biodiversity	– No direct support in draft CPS 2009–13.

CPS = Country Partnership Strategy.
Source: Asian Development Bank, 2008.

F. Conclusions and Recommendations

1. Conclusions

a. Environmental Management in Pakistan

156. **Conclusion 1.** Environmental concerns in Pakistan can be examined in both rural and urban contexts, but the institutional and regulatory framework required for environmental management has not evolved noticeably during the last CSP period. In 2001, the Government decided against making the NEQS operational, arguing that, as part of its pro-private sector development policy, it was not ready to impose another bureaucratic check on the industry sector. In contrast, the Government seemed genuinely committed to decentralization, although the prospect of building the capacities of devolved local governments to equip them as environmental managers was never seriously analyzed to establish whether or not it was practical or feasible.

157. **Conclusion 2.** Private industry in Pakistan has made substantial investments in cleaner production and effluent treatment in advance of any effective enforcement. The rates of return are understood to be high, although a professional cost-benefit analysis of eco-efficiency has not been carried out. While there is some technical economic literature available, it is deficient on several counts. This offers an immediate window of opportunity for assistance. The dissemination of an economic analysis of cleaner production could be a high-profile platform, and provide a basis for scaling up pilot demonstrations.

158. **Conclusion 3.** With mega-projects planned in the power, water, and transport sectors, the lack of capacity for strategic environmental assessment and management is a serious concern. IEEs and EIAs cannot be conducted by experts in isolation. In fact, a correctly conducted EIA requires that public hearings be held at several critical stages during project conception, design, and planning to enlarge both professional and nonprofessional perspectives among the project's stakeholders. ADB's support to the development of environmental information systems and environmental monitoring and management will contribute to CPS focal area 4 (effective implementation for development effectiveness and results).

b. Potential Environmental Benefits and Implications of CPS

159. **Conclusion 4.** Overall, the CPS can potentially contribute to environmental enhancement as well as protection. CPS focal area 1 centers on reforms and investment in infrastructure and services in energy, transport and irrigation sectors. The subcomponent for improved efficiency and productivity of existing irrigation infrastructure and reliability of water resources would play a key role in controlling water-logging and protecting arable lands from salinity and sodicity.

160. One of the intended key energy sector outcomes under the CPS is to assist the Government through both public and private funding to provide sufficient energy to meet national demand and achieve energy security. In this regard, the Government's infrastructure plans such as for high dams and energy network would be critically reviewed against the core values and principles established by the World Commission on Dams, which calls on multilateral and bilateral funding agencies to ensure that any dam-building options for which financing is approved emerge from an agreed process of ranking alternatives. It has also emphasized the need (i) to accelerate the shift from project-based to sector-based financing; (ii) to increase, in particular, financial and technical support for effective, transparent, and participatory needs and options-based assessment; and (iii) to finance nonstructural alternatives.

161. ADB has prepared renewal energy projects for Government's approval and validation. These grid-connected run-of-river projects in NWFP, Punjab and the Northern Areas could be eligible for co-financing under the Clean Development Mechanism (CDM) and ADB's Asia Pacific Carbon Fund (APCF). On the other hand, plans for coal-fired thermal power would need to be comprehensively reviewed, particularly for the local and regional air pollution that will be a likely impact. Plans for highways should emerge from assessments of the environmental footprints of all connectivity options, and reviewed particularly for their impact on drainage, heightened flood risks, and the potential severance of human and animal communities.

162. **Conclusion 5.** Pakistan Resident Mission's PRM's in-house capacity for environmental analysis needs to be upgraded in view of the challenges of environmental sustainability associated with policy- and program-level support. Moreover, the Government's plans for mega-projects in the energy and transport sectors funded by foreign direct investment flowing in from the growing East Asian economies is another reason to upgrade environmental analysis capacities. Finally, ADB has moved into programmatic support, which has potentially wider ecological implications than area-specific projects, and for which it must be sufficiently equipped.

2. Recommendations to Ensure Environmental Sustainability in CPS

163. **Recommendation 1.** From environmental perspective CPS's "energy sector interventions need to focus on "improving energy efficiency" and "improving the reliability of energy services" while being careful on the concept of energy security that entails a broad based environmental and social impacts. Both entail a mix of supply- and demand-side approaches and interventions for energy sector reforms, but are capable of delivering economic and environmental benefits above the baseline.

164. **Recommendation 2.** Support policy reforms for operationalizing the NEQS and mainstream environmental monitoring and management capacities within those key federal agencies responsible for energy and transport planning and implementation, and those provincial agencies responsible for water resources planning.

165. **Recommendation 3.** Foster partnerships with the private sector in the area of environmental management systems (EMS), including CET. Develop the capacities of EMS consultants to help industries attain ISO 14001-2004 certification and improve their export competitiveness and upgrade the local environment.

166. **Recommendation 4.** Strengthen environmental analysis and monitoring capacities within PRM. Develop the capacity required to conduct environmental monitoring and analysis and communicate the results clearly.

167. **Recommendation 5.** Capitalize on the valuable ground-level experience gained during project phases to guide provincial policy and program reforms in the natural resources and WS&S sectors.

168. **Recommendation 6.** Strengthen Pakistan's ability to adapt to climate change. Consider providing assistance to reduce, in particular, the vulnerability of the poor, and to protect key infrastructure in the water resources and agriculture sectors in the proposed RETA on climate change and the already initiated country level climate change mitigation and adaptation program.

3. Specific Initiatives

169. **CETPs in Punjab Industrial Estates.** Industries based in Punjab are apt to discharge toxic and persistent waste into fertile croplands, rivers, and groundwater sources. Wastewater treatment facilities are too expensive for most individual units to afford, as a result of which the Government has tried to promote the use of CETPs on industrial estates. The two CETPs set up in Korangi and Kasur were subjected to long delays during implementation, and continue to face operational problems owing to unclear institutional arrangements and regulations. In 2005, the provincial government established the Punjab Industrial Estates Development and Management Company, which has a development fund of Rs.3 billion and oversees seven CETPs across the province. This is an opportunity for ADB to introduce effective, competitive, efficient, and sustainable arrangements for the implementation and management of CETPs. The project investment cost is estimated at $77 million, including taxes and duties worth $3.5 million. The total cost includes physical and price contingencies, as well as interest and other charges during implementation.

170. **CWS in Zones of Karachi and Sindh's Secondary Cities.** Almost 100% of the samples of piped water in Karachi are contaminated at point of entry/use by *E. coli* bacteria of fecal origin.[50] While the provision of an intermittent water supply is standard practice among water utilities, it is less than satisfactory from a health point of view because empty pipes are apt to suck in sewage and other pollutants. Moreover, the uncertainty of supply has led the households installing suction pumps that worsen the contamination. Under the CPS, focal area 3.1 calls for enhancing competitiveness of cities. ADB is already engaged in turning around the water supply and sanitation, and SCIIP is forthcoming to continue the engagement. However the outcome performance indicator in the design and monitoring framework for SCIIP is to enhance the duration of intermittent water supply from 2 hrs to 12 hrs daily. This is another opportunity for ADB to support the conversion from an intermittent to a CWS, zone by zone, in Sindh's secondary cities.

171. **Integrated Solid Waste Management Systems for Upper Sindh Secondary Cities.** Most of the municipal solid waste generated in Sindh Secondary Cities is open dumped within or just outside the city boundaries. The waste is not spread, compacted or covered. Municipal solid waste should be segregated at source. There should be primary collection from the doorstep, and the use of streets for open dumping of wastes should be discouraged. Waste should be transported in covered vehicles, and degradable materials should be processed for composting or power generation. SCIIP envisages sanitary landfill sites, but a sanitary landfill requires a population of around one million people for economical operation. Under this ongoing project ADB can add on support for a proper regional sanitary landfill facility for Upper Sindh secondary cities for final disposal of non-biodegradables.

172. **Capacity Building for Environmental Management System.** This has become a crucial part of establishing and maintaining industry and country competitiveness. Pakistan lags behind in achieving EMS certification, such as ISO 14001, and this has affected the export competitiveness of its industry sector. In 2005, only 42 Pakistani firms were ISO 14001-2004-certified compared with 859 Indian firms and 341 Iranian firms. Pillar (iii) of the CPS focuses on strengthening economic competitiveness and mainstreaming private sector participation. In addition to promoting policy reform to operationalize NEQS, prior investment in cleaner production based on an EMS will be required to reduce waste streams and enable affordable

[50] *Dawn*. 2006. How safe is the water we drink? 2 November.

investment in end-of-pipe treatment. This will require building the capacity needed to deliver EMS certification services. Linkages with a university and technical training institute for EMS training could be established.

173. **Economic Benefits of Cleaner Production and Environmental Management.** This falls under the CPS subcomponent for mainstreaming private sector participation and enhancing urban competitiveness. The CEA recommends carrying out a cost-benefit analysis of cleaner production and environmental management as a significant, high-profile opportunity to demonstrate to industrial enterprises and other stakeholders the economic internal rates of return to cleaner production options. Cost-benefit and sensitivity analyses of a range of selected cleaner production options could be prepared for 16 sectors of industry in Pakistan, based on the validation of environmental audits and demonstrated interventions. Investment packages in cleaner production for typical industrial units could be prepared and made available for targeted dissemination to the industry sector and other stakeholders in 18 months. The estimated cost of this advisory TA is $360,000.

174. **Climate Change Adaptation for Sustainable Land and Water Management.** Climate change caused by rising global temperatures and contributing to extreme climatic events (e.g., droughts and floods) is expected to have an adverse impact on the rural economy. It has implications for the sustainable use and management of water, land, and ecosystems. Forward-looking policies will need to be put in place and implemented to ensure a strategic, proactive response to climate change that benefits the rural economy.

175. The ADB's 2009 pipeline includes a $1,000,000 proposed regional technical assistance (RETA) on climate change for Central Asian Countries including Pakistan. Under the proposed technical assistance, potential outputs envisaged for Pakistan could include improved enabling environment and program development for renewable energy and energy efficiency improvements; (ii) adaptation investment plan for water resources management and sustainable land management; and (iii) Increased government capacity for administration of Pakistan's responsibilities for Kyoto protocol and the UN Framework Convention on Climate Change (UNFCCC).

176. In case of Pakistan, the proposed project can also cover (i) an analysis of the impact of predicted climate changes on water and land use, and their effects on the rural livelihoods of small farmers and other actors along the agriculture supply chain; (ii) a strategy for adaptive measures for the farm and nonfarm rural economy, including an evaluation of coping strategies such as crop insurance, information warning systems, and research into developing crops and cropping systems that are more robust and better able to resist the expected impact of climate change; and (iii) capacity building for the use of adaptation and mitigation instruments for coping with climate change.

177. ADB's Central and West Asia Regional Department (CWRD) that includes Pakistan has initiated preparation of a regional Climate Change Implementation Plan (CCIP) under the mandate given by ADB Management Committee. ADB is intitiating a study "*Glacial Melt and Downstream Impacts on Indus-Dependent Water Resources and Energy"* which is expected to lead to concrete adaptation measures for investments in the water and hydropower sectors in Pakistan and Afghanistan. Information generated on glacial retreat and impact on loan-related downstream river basins will be of practical importance to ADB climate change interventions in Pakistan.

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APPENDIX 1: KEY ENVIRONMENTAL INDICATORS FOR PAKISTAN

	1990	2001	2005	2006	2007
Water					
Water resources per capita (m^3)		1160.14	1077.53	1073.61	1054.59
Access to improved water supply (proportion of households, urban and rural).	53	69	66	66	66
Access to basic sanitation (proportion of households, urban and rural).	30	45	54	60	58
Energy					
Energy intensity : total primary energy consumed (Btu) per GDP in $ PPP	5234.9	5334.6	5326.1	-	-
Carbon Dioxide Emissions (million metric tons)	95.1(1997)	104.5	121.5		
Health					
Under-5 mortality rate (per 1,000 live births)	140	105	100	-	-
Children suffering from diarrhea (proportion in the last 30 days)	26	12	16	12	11
Number of Vehicles using CNG	500	280,000	700,000		
Agriculture					
Index of crop production per water availability at farm gate (MAF).	0.75	0.72	0.74	-	-
Index of crop production per fertilizer off-take ('000 nutrient tons).	0.04	0.04	0.03	-	-
Biodiversity					
Protected area by type (proportion of land area).	9.1	11.25	11.3	-	-
Forested land including state owned and private forest farmlands, as percentage of total land area	4.8	4.8	4.9	-	-

Btu = British thermal unit, GDP = gross domestic product, ha = hectare, m^3 = cubic meter, MAF = million acre-feet, PPP = purchasing power parity, IUCN = World Conservation Union.

Source: PSLM, 2004-05, 2006-07; PMDGR Report 2005-06 at www.crprid.org;
Energy Information Administration, Country tables Pakistan at
http://tonto.eia.doe.gov/country/country_time_series.cfm?fips=PK#prim.

APPENDIX 2: INSTITUTIONS FOR ENVIRONMENTAL AND NATURAL RESOURCES MANAGEMENT

Judicial
Supreme Court of Pakistan
Lahore, Peshawar, Sindh, and Balochistan High Courts
Environmental tribunals in provincial capitals
Legislative (Federal)
National Assembly, Standing Committee on Environment
Federal Government
Pakistan Environmental Protection Council
Ministry of Environment
Pakistan Environmental Protection Agency
Ministry of Food, Agriculture and Livestock
Ministry of Petroleum and Natural Resources
Alternative Energy Development Board
Ministry of Science and Technology
Pakistan Council for Research in Water Resources
Ministry of Water and Power
Planning and Development Division
Environment Section
Other federal ministries, such as Industries and Communications, with EIA responsibilities
Legislative (Provincial)
Planning and Development Departments
Agriculture Departments
Irrigation and Power Departments
Forestry and Wildlife Departments
Public Health Engineering Departments
Punjab, Sindh, NWFP, and Balochistan Environmental Protection Agencies
Local governments
City district governments
Municipal administrations
Karachi Water and Sewerage Board
Water and sanitation agencies
Private Sector, Civil Society, and the Media
Environment Committee, Federation of Pakistan's Chambers of Commerce and Industry
Environment cells, industries, and industrial Estate associations
ISO 14000, 14001-2004 certification agencies
International NGOs with environmental agendas
National, regional, and local NGOs with environmental agendas
Village organizations with natural resource management agendas
Electronic and print media with coverage of environmental and natural resource management issues

EIA = environmental impact assessment, NGO = nongovernment agency, NWFP = North West Frontier Province..
Source: Asian Development Bank, 2007.