

# **STATE OF THE ENVIRONMENT REPORT FOR PAKISTAN**

**JULY 2002**

**SUSTAINABLE DEVELOPMENT POLICY INSTITUTE**

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**Sustainable Development Policy Institute**

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## Dedication for Omar Asghar Khan

Omar was my childhood friend. I remember him as being full of life and mischief. In a professional capacity, I met him for the first time in the early 1980s. He had resigned from the army and pursued higher studies in economics first at Sussex and subsequently at Cambridge. We met in Islamabad at the first Annual General Conference of the Pakistan Society of Development Economists organized by the Pakistan Institute of Development Economics. Omar was frustrated at the focus and substance of the papers presented. For him social change was not possible until the power structures were questioned and altered.

I met him a year later again and he was fully engaged as a scholar editing a book on the state and society in Pakistan for the Zed Press. He proved himself capable of the rigor of serious scholarship and persevered until the job was done. The book was an important contribution to an important and urgent debate and a vehicle for putting across a vision of social justice. However, Omar was a practical man and a man of action. It was clear that scholarship would not be enough to absorb his energies.

I met him once again in the early 1990s when I returned after having taught abroad for some years. This proved to be the most sustained association I had with him and I saw him in many different contexts. I realized in our first meeting that I was meeting a man who had realized himself. He had founded a development NGO (Sungi or friend), but it was one with a difference. He was emphatic that along with community development work, one also had to challenge the power structures. Hence, Sungi focused on advocacy along with community development work. His contribution to the conceptualization and execution of this model was far reaching.

Another innovation was identifying and working with existing grassroots community organizations that had spontaneously evolved at a time when the prevailing model was to build village or community organizations from scratch. With patient social mobilization, one objective was to transform thinking from welfare to a development approach.

Omar was also among the pioneers of the environmental movement in Pakistan. He played a prominent role at Rio and Sungi became an important member of the IUCN in Pakistan. Among the prominent advocacy issues that he provided a leadership role in were looking at the environmental aspects of large water sector projects like the Ghazi-Barotha hydropower project, the Kalabagh Dam and the Chotiari Dam. Apart from pointing out the importance of taking into account the potential negative environmental consequences, he consistently championed the rights of the poor who were going to be affected. This was consistent with the work he did in the forest sector.

He took on the forest mafia which was denuding Pakistan's forest resources at a rate second only to Afghanistan in the world and denying royalties to the poor who had historically been granted property rights. He understood and advocated that if forests are to be protected, the poor must be given a stake in protecting them. He also took on the fundamentalists who thought that social mobilization work done by Sungi's female staff threatened the social

order. Despite physical assaults on his person, he did not back down and Sungi's work progressed and made a difference.

Omar was torn when the military government offered him the post of a federal minister. He had impeccable democratic credentials and a person who had personally struggled for democracy. While I differed with the choice he made in accepting that post, I knew he was well meaning in the choice he made and confident he would use the position for the public good and not for personal aggrandizement or enrichment. That is indeed how it panned out. Despite having five portfolios, he managed to keep the agenda moving across the board.

As the Minister of Environment, he was always responsive and positive. Among his many initiatives, he managed to get the chief executive of the country to chair the meeting of the Pakistan Environment Protection Council (PEPC), the highest environment policymaking organ in the country; the institution that kept the environmental agenda moving in the country. He used the resources of the Ministry, rather than consultants, to formulate a well designed National Environment Action Plan and had it approved in the PEPC for implementation. He oversaw the participatory formation of a much more enlightened forest policy through several drafts. He re-constituted the National Environment Standards Committee under the leadership of Dr. Pervez Hussan who is dynamic and influential enough to bring on board all stakeholders and carry this work forward. It was Omar's personal interest and power of persuasion that was instrumental in getting a commitment from a very busy man. He had the good fortune to initiate the work on the lead up to Rio+10, after having been an activist at Rio. Included in this was facilitating the writing of this State of the Environment Report. One could go on, but space forces me stop with these examples.

Some were impatient with how much Omar was able to achieve, just as he was impatient when not in government. In government and as a Federal Minister attending cabinet meetings, he understood what the policy constraints were. For a sober man, this was a sobering experience. Thus, he realized that there was no alternative to political mobilization for meaningful social change. He was fully engaged in this difficult work, via the political party he founded, when his life was taken away from him.

It is difficult to say enough that is good about Omar. He was a natural leader and one with a great deal of honesty and integrity. Beyond that, he was courageous, pragmatic, humble, soft-spoken, patient, efficient, disciplined, consistent, sincere, and persevering and so much more. He is one of the very few about whom one can say "he was a prince among men" and his passing away is a great loss to the environmental movement and the nation.

**Dr. Shahrukh Rafi Khan**

## **ACKNOWLEDGEMENTS**

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**PART I**

**Executive Summary (incomplete)**

## **Environmental Trends**

This section of the report provides an overview of present environmental conditions and trends over the past 10 years across a broad range of environmental indicators, giving possible warning of future problems. It relies mainly on various secondary statistical sources to take stock of the state of the environment. To be consistent with the NEAP, it focuses on air, water and land. In so doing, it draws selectively on available data to construct trends only where a benchmark or international/national standards are available. The reason for doing this is to be able to indicate how the environment has changed over time or to demonstrate its state at a point in time, relative to some context. The sources that are likely to damage the air, water or land are assessed first, followed by a review of the state of natural resources. In providing this temporal or contextual overview, the stage is set for the more forward-looking chapters that follow.

### ***Air Pollution***

Auto, industrial and energy emissions are the main source of air pollution. The total number of motor vehicles on the road has increased about five fold (500 percent) over the last two decades, a phenomenal rate of expansion by any account. Emissions in the energy sector increased at an accelerated rate over time, due to a shift from hydel to thermal power generation and a switch from clean (natural gas) to dirty fuels (oil, coal).in the latter category. The other main source of pollution is manufacturing, the manufacturing index showing a three-fold increase over 1980-'81.

### ***Water Availability and Quality***

About 117 MAF of water is available for agriculture, household and industrial consumption, the bulk of it being used in agriculture. Conveyance losses in the canal system and in watercourses are 64 MAF, of which 46 MAF constitutes groundwater recharge. Field application losses amount to 28 MAF. The option of tapping additional water sources is diminishing fast. The focus should shift to water conservation and improving use efficiency.

From being a water affluent country in 1951 with a per capita availability of 5,300 cubic meters, Pakistan is bordering on becoming a water scarce country in 2000, with a per capita availability of 1300 cubic meters. Future projected deficits suggest that the situation will become worse. As finite water resources are recycled more frequently to meet increasing demand, and biological and chemical contaminants are added to them, water pollution will increase, regardless of natural filtration processes.

Water pollution has three main sources: bacterial and organic liquids and solids from domestic sewage; toxic metals, organic, acids and other less toxic but still polluting substances from industrial discharges; and agri-chemical pollution in the form of pesticide and fertilizer run-off from agricultural lands. The growing incidence of salinity also contributes to the deteriorating quality of ground water, with excessive amounts of salt in the water rendering it impotable. Solid waste is another source of water pollution. In Pakistan, an average 50,000 metric tons of solid waste is generated every day of which only 60 percent is collected.

## **Land**

Land-use changes are reviewed over the past two decades, as opposed to the usual post-NCS assessments, because such changes occur slowly and are difficult to detect over a limited time period.

The area under forest has increased from 3.53 percent to 4.55 percent of the total reported area. As we note below, this increase conceals both a change in forest composition and extensive degradation of forest stands. The land not available for cultivation has increased from 27.6 percent to 30.6 percent; in absolute terms, a little over 2.4 million hectares has reverted to this category. While some of this reflects conversion to urban land (currently estimated at about 2 percent of the total area), a reasonable conjecture is that the larger proportion has been lost to soil erosion, desertification, water logging and salinity and soil degradation. The root causes for this are deforestation, poor land-use practices, chemical pollution, water mismanagement and sea incursion. The last alone, according to recent IUCN estimates, has rendered over 0.4 million hectares saline and unfit for cultivation. These factors have contributed, not only to the loss of agricultural land but to its degradation as well, resulting in crop productivity losses.

The largest change has occurred in the culturable waste category. There is little doubt that a growing rural population has reduced the scope for leaving land uncropped for extended time periods. By the same token, cropping intensity increases have been appreciable. Of the total increase in cropped area of 3.15 million hectares, cropping intensity increases alone account for close to 2 million hectares.

## **Biodiversity**

Pakistan was one of the 155 nation states which signed the CBD at the Earth Summit in Rio de Janeiro in 1992. This act signalled its intention to join a global alliance to protect habitats, species and genes, to shift to sustainable modes of resource use and to make the necessary policy, economic and managerial adjustments to guarantee that the benefits to be gained from biological resources are shared equitably across local, regional and global societies.

Pakistan's great habitat diversity, coupled with its location in a transition zone among three zoogeographical regions – the Palearctic, the Ethiopian and the Oriental, and the tremendously varied altitudinal gradients has resulted in a great diversity of biota, although rates of endemism are relatively low.

However, the widespread historic conversion of natural ecosystems to agriculture, the advanced and rapidly accelerating degradation of habitats, and the continuing depletion of populations, has placed under critical threat all natural or modified ecosystems. At least 10 ecosystems of particular value for their species richness and/or unique communities of flora and fauna are threatened with habitat loss and degradation.

The pathways from environmental degradation to biodiversity loss (plant, animal species and micro-organisms) are both direct and indirect. Habitat loss constitutes an indirect route. At source are sector activities, such as industrial and household emissions and effluents, agricultural intensification (chemical input applications), irrigation and drainage practices (water diversions and mismanagement) and energy combustion.

Activities, which cause biodiversity loss directly, are hunting and trapping, fishing, over-exploitation of plants (for medicinal purposes), the introduction of invasive species through trade or natural resource management efforts.

Strengthening biodiversity-economics linkages are an integral part of efforts at both biodiversity conservation and remediation. The Biodiversity Action Plan (BAP, 2000) cites many cases where the market fails to capture adequately the value of biodiversity, or where existing economic policies and incentives lead to the predation of species and/or to the degradation of their habitat.

Protected areas are considered safe havens for biodiversity. However, the extent to which they fulfil their role depends on spatial aspects, ecological integrity and management norms. The allocation of protected areas in Pakistan is inadequate, both in the aggregate and distributionally. Pakistan lags behind other Asian states, including Nepal, Sri Lanka, Bhutan, in terms of the total land area designated for conservation.

### ***Atmosphere and Climate***

Pakistan's physiographic diversity is visible in its high-altitude mountain ranges, its afforested zones, fertile agricultural plains, rocky plateaus, deserts and coastal areas. Climatic regimes are similarly disparate across regions. Temperatures range between 42° C in summer in the central arid plains and -26 °C in winter in the northern mountainous areas. Precipitation varies from an annual average of over 1700mm for the northeastern mountains to a mere 30mm in the south-western plains.

Meteorological data for the period 1931-90 show an inter-temporal increase of 0.5-1°C in annual mean temperatures across the country, with the exception of the monsoon and southeastern coastal belts, where temperatures decreased. Precipitation trends over the same period differ widely for different regions. An increase in monsoon rainfall was seen in the coastal and monsoon belts, and in winter rainfall in the monsoon belt and high western plains of Balochistan. All other regions of the country registered either little change, or decreases in summer and winter rainfall.

Increasing monsoon rains on a base of increasing spring snow-melt have contributed to a higher frequency and intensity of flooding down the Indus River Basin. More floods have occurred in the Indus plain over the past 30 years than over the preceding 70 years.

The latest climate change scenarios, generated by general circulation models (GCMs) for arid and semi-arid Asia show a decline in summer precipitation over the central parts of arid and semi-arid Asia. This includes the Indo-Pakistan subcontinent almost entirely. Because the rainfall over this region is already low, severe water stress conditions – leading to expansion of deserts – are quite possible, with rises in surface air temperature and depletion of soil moisture. In the event of advanced anomalous warming of the western equatorial Pacific Ocean, such as that observed during the El Nino, a higher frequency of intense extreme events (both droughts and floods) across all Asia is possible.

Recapitulating, a worst-case scenario for Pakistan, in particular, is characterized by rising temperature, reduced precipitation, decreasing runoff over the long-term, increased water stress, a growing frequency and intensity of extreme events and sea level rise.

## Development and the Environment

A focus on the environment can not be dissociated with a broader concern for sustainable human development. SHD represents an important transition in development thinking, defining and integrating development, sustainability and equity (DSE) in relation to the three central pillars of sustainable development -- economic, social and environmental. SHD focuses both on inter-generational justice: a concern with protecting the environment for future generations and with intra-generational equity.

Pakistan's development experience has fallen considerably short of the exacting criteria of SHD, with severely adverse consequences for the environment. The existing state of degradation and pollution is a result of the failure to mainstream environmental activities. More critically, development has been mismanaged, defined by a paradigm which limits the beneficiaries to a limited subset. Also, modernization, in and of itself, contains impulses for degradation; for instance, when economic opportunity and mobility depreciates the value of the resource base for communities drawing their sustenance from it, or when national legal and regulatory systems over-ride traditional, community-based resource management – in fact, are misused to exploit such resources unsustainably.

Also, Pakistan's performance on its social indicators does not compare well with the average performance for middle income countries. Not surprisingly, Pakistan was relegated from the medium to the low human development category in 1999. Also, these indicators mask rural-urban differences, where the access to and quality of rural services and infrastructure tends to be far below those available in urban areas. Further, in the latter case, enclaves of prosperity co-exist in stark juxtaposition to the surrounding sea of poverty.

Lapses from sustainable human development, leading to the secular deterioration in Pakistan's environmental health, are evident from several key indicators. Roughly 38% of Pakistan's irrigated land is waterlogged and 14% saline. The annual rate of deforestation ranges from 2.5% - 3%. CO<sub>2</sub> emissions are increasing annually at the rate of 8%-10%. And an estimated 250 million gallons of untreated water out of Karachi is dumped into the Arabian Sea every day, causing great harm to both humans and the ecology.

A consequence of this is a phenomenon referred to as the poverty-environment nexus. It describes a downward spiralling relationship between poverty and environmental degradation. In the first place, poverty increases the vulnerability of the poor to degradation. Second, by restricting choices and entitlements for the poor, it turns them into potential predators of natural resources. However, the converse of this is that limited choices also create an impetus for nurturing resources and using them in a sustainable manner. A credible construct that contextualizes the poverty-degradation relationship is probably a blend of the two. In other words, poverty does not necessarily induce degradation but if it does, this reflects ineluctable responses rather than deliberate acts.

Development which empowers the few, population growth and the growing scarcity of natural resources combine to create a situation known as 'resource capture.' One consequence of resource capture is 'ecological marginalization', where such appropriation forces resident communities to migrate to marginal areas. Population growth compounds the problem. It is an outcome of social sector neglect and a factor which, subsequently, makes inroads into the benefits of growth.

One aspect of ecological marginalization is accelerated intra-rural migration. In the NWFP land hungry rural populations have moved into marginal lands, into erosion prone hill areas and into fragile semi-arid areas which have traditionally served pastoral groups and their herds. This has resulted in conflicts over land access and in more intensive use and degradation.

Another manifestation of rural population pressure is rural to urban migration, represented by the rate of urban population growth, presently in excess of 4%. Growing populations are straining the capacity of the urban environment to absorb the wastes and emissions they produce. In turn, the unassimilated pollutants emanating from poor sanitation, lack of clean water, industrial, energy and transport emissions have exposed such populations to health hazards. An additional push factor in rural areas is the growing land concentration induced by the commercialization of agriculture, which has rendered small farmers share croppers and tenants landless, thus forcing them to migrate.

Selective instances of sector vulnerability are: a) *Water pollution*: Although water pollution caused by organic and chemical discharges is widespread, its impacts are predominantly on the poor, a result of the skewed distribution of sewage, sanitation and piped water facilities, both across the rural-urban divide and in poor urban slums; b) *Deforestation*: Historical pressure on natural resources and ambiguously defined property rights, overlain with rigid and increasingly corrupt management, have contributed to rapid deforestation. Community management traditions, already fragile, have eroded further with new opportunities for employment and out-migration. The situation contains the seeds of conflict, with communities forced to act as predators, rather than as guardians of the commons; c) *Agricultural Land Degradation*: Excessive use of fertilizers and pesticides has given rise to water pollution and soil degradation. Also, a combination of inadequate O&M, and low water charges have contributed to the waterlogging and salinity problem. Small and landless farmers are the worst affected. Cropland degradation tends to affect more the health and nutrition status of the poor and lowers their productivity. Even in cases where the poor are healthy, labor productivity can be low, due to increased time being allocated to less productive activities, such as fuelwood collection. Also, as fuelwood becomes scarcer, animal dung is substituted as fuel, resulting in soils not being replenished.

Taken to its extreme environmental degradation can create insecurity and, if not mediated carefully, to conflict. The link between environmental degradation and insecurity is seen primarily from the vantage point of the poor. Conceptually, environment security is shown as a part of the human security paradigm. It is embedded in the notion that resource conflicts (actual and potential) are a direct outcome of development processes which degrade these resources and deny people access to them. Here we present a case study of forestry conflict in Dir as an illustration of a wider problem affecting forest-dependant communities in locations as diverse as Kaghan, Gilgit (Fairy Meadows) and Nathiagali.

**Part II**

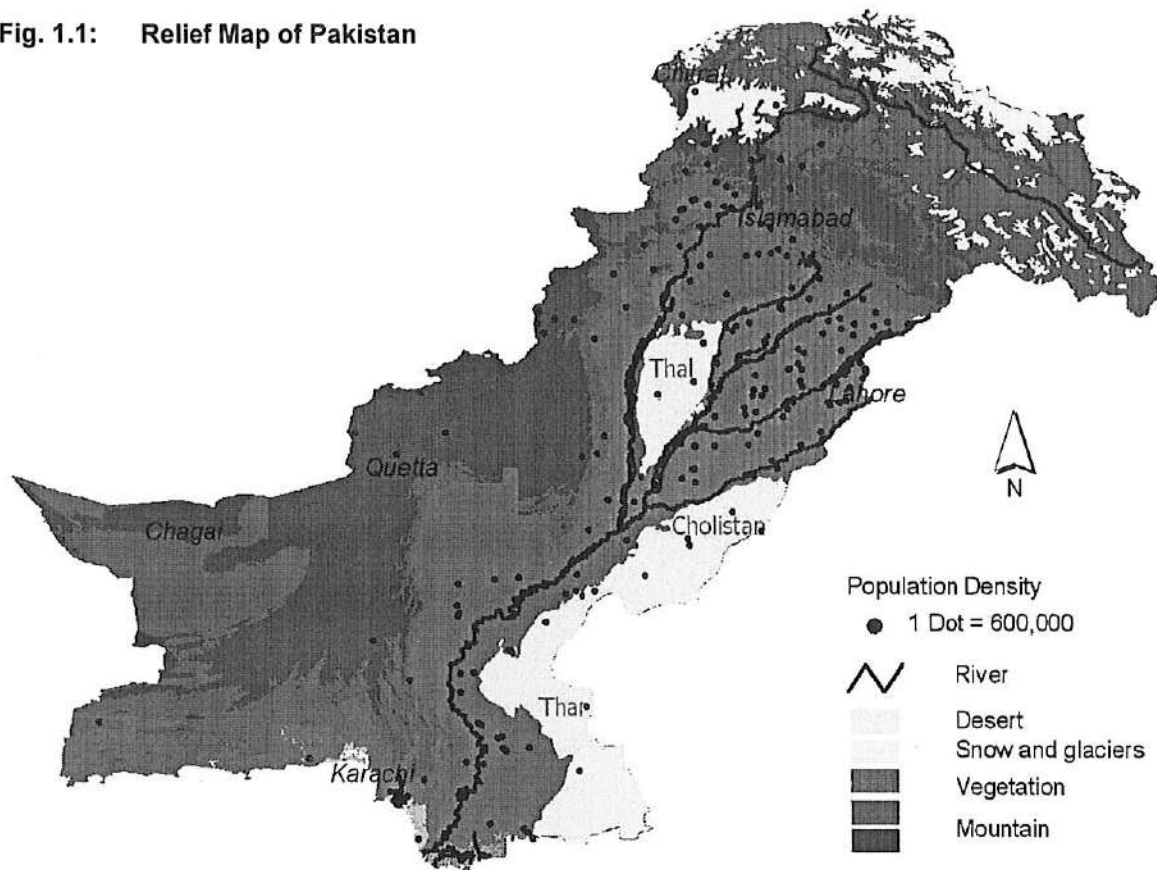
**Pakistan's Environment: An Overview of Major  
Environmental Developments and Trends**

# 1 Major Environmental Trends

## 1.1 Pakistan

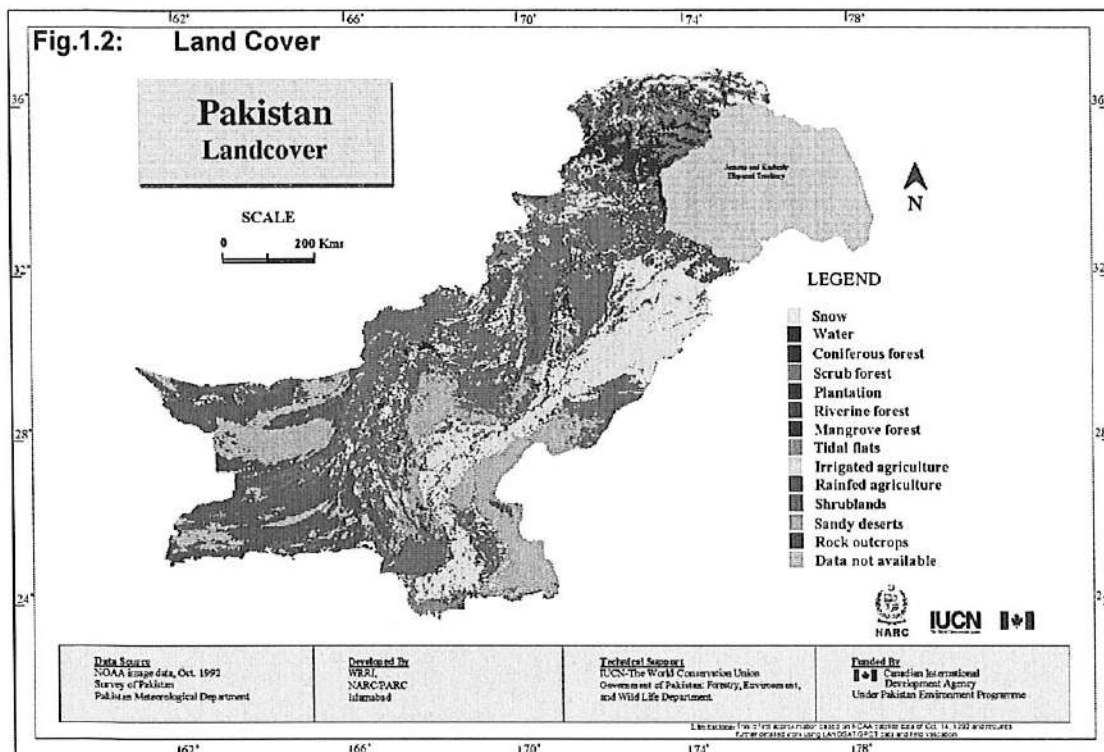
Pakistan consists of a rectangular mass extending northeast to southwest over about 88 million hectares. Mountains and foothills on the north and west cover about half its area. The remaining half comprises the Indus Plain towards the east, intersected by the Indus River and its tributaries. The country is largely arid, with three-fourths receiving an annual precipitation of less than 250 mm and 20 percent of it less than 125 mm. Only about 10 percent of the area in the northern Himalayas and the Karakorum mountain ranges receive rainfall between 500 mm and 1500 mm. Of the country's total area, 24 percent is cultivated, of which about 80 percent is irrigated. Forests and grazing lands cover about 4 percent, and about 31 percent is not fit for agricultural use – close to 2 percent is under urban cover.

Fig. 1.1: Relief Map of Pakistan



With its dramatic geological history, broad latitudinal spread and immense altitudinal range, Pakistan supports a wide array of ecosystems. However, any description of the natural ecological zones of Pakistan must be qualified by the statement that these zones have been affected so widely by human activity that very few truly natural habitats remain. Roberts (1991) has provided an initial classification of terrestrial ecosystems into 18 distinct ecological zones, with nine major vegetative or agro-ecological zones. These range from the permanent snowfields and cold deserts of the mountainous north to the mangrove forests of the Indus delta and the Arabian Sea coast. Pakistan's fauna is rich and varied: affinitive to three faunal regions - the Palearctic region west of the Indus, the Oriental region east of the region and the Ethiopian region.

Although Pakistan is making efforts towards industrialization, agriculture continues to be its economic backbone, contributing 25 percent to the national income, up to 70 percent of its exports and employing over half the work force. Much of Pakistan's industry is agro-based (textiles, sugar, leather, edible oils). Major exports include cotton products (cloth, yarn and raw cotton), readymade garments, leather, synthetic textiles, carpets and rugs. Imports comprise machinery, petroleum and its products, chemicals, edible oils, transport equipment, grains and pulses, iron and steel and their manufactures, chemical fertilizers and drugs. Pakistan maintained a respectable annual GDP growth rate of 5 percent over the period 1972-00. However, over a relatively shorter period, 1991-00, this growth rate fell to 3 percent.



Per capita income was \$511 in 1998 placing Pakistan in the category of low to middle income countries. Its social and human indicators are unenviable, below those of most developing countries. Poverty, overpopulation and illiteracy combine to create widespread malnutrition and disease, unemployment and low productivity. Pakistan's human development index (HDI) stood at 0.498 in 1999 ranking it 127<sup>th</sup> out of 150 countries and placing it in the low human development category (HDR, 2001). By recent count, close to 34 percent of the population lives below the national poverty line. Access to land, water and shelter is highly skewed. Not only is there a marked disparity between the rich and the poor in urban areas but also rural access to schools, hospitals, piped water and roads compares unfavorably with its urban counterparts. In turn, this is a source of health hazards, declining productivity and environmental degradation.

## 1.2 The State of the Environment Report

In October 2001, the Sustainable Development Policy Institute, Pakistan, contracted with the United Nations Environment Program, Regional Resource Centre for Asia-Pacific (UNEP RRC.AP), Thailand and the South Asia Cooperative Environment Programme

(SACEP), Sri Lanka to prepare a State of the Environment (SoE) Report for Pakistan. In addition to producing a policy relevant report, a related objective is to strengthen environmental assessment and reporting capabilities in Pakistan. The report includes a national overview of the major environmental developments and trends by environmental resources (land, water, forest, biodiversity, atmosphere and climate, coastal and marine resources etc.) over the past decade, the socio-economic driving forces and, identifies and addresses five priority/key issues in a pressure-state-impact-response (P-S-I-R) framework.

Environment conservation issues attracted national attention in the early seventies, primarily as a result of two global initiatives: the 1972 UN Conference on Human Environment and the World Conservation Strategy, formulated jointly in 1980 by the UNEP, the Worldwide Fund for Nature (WWF) and the World Conservation Union (IUCN). In keeping with this spirit, the 1973 Pakistan Constitution added the environment to its list of subjects for concurrent jurisdiction, the Urban and Environment Affairs Division was established and the government began to explore the potential for developing its own conservation strategy in 1982. The National Conservation Strategy (NCS) was launched ten years later in 1992 and presented the same year at the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro.

The NCS was the first comprehensive effort to address environmental concerns in Pakistan. It provided an environmental baseline, articulated core areas of concern, drew up an institutional and legal framework to address them and proposed a Rs.150 billion funding plan. New measures were launched, both as an outgrowth of the NCS itself and through supporting programs, such as the World Bank funded, Environmental Protection and Resource Conservation Project (EPRCP). The key legal initiatives included two environmental protection acts (The Pakistan Environmental Protection Ordinance, 1983 and its improved version, the Pakistan Environmental Protection Act, 1997). Environmental protection agencies were established at the federal and provincial levels to monitor pollution and to assist departments and agencies in enforcing pollution controls. Capacity building efforts included setting up environmental units in key government departments (Ministry of Environment, Planning Commission) and strengthening the country's environmental policy research capacity. In addition, several projects for watershed rehabilitation, sustainable industrial development, protected areas management, wetlands preservation, and solid waste management were launched.

The NCS process itself was innovative, a model of participatory strategy development and stakeholder networking. It also provided the impetus for a number of flagship policies and programs such as the reconstituted NWFP Forestry Policy, a schedule for voluntary compliance with national environmental quality standards (NEQS), irrigation system management reforms and community based urban sanitation efforts.

Unfortunately, environmental outcomes over the past decade fell far short of the expectations generated by these policies and programs. Most environmental indicators trend downwards. While it could be argued that the outcomes would have been worse in the absence of such initiatives, no counter-factuals exist to support these arguments. Fundamentally, deteriorating environmental conditions are a source of concern per se, irrespective of their rate of decline. It was with this concern in mind that the World Bank commissioned SDPI to undertake a strategic review of the NCS, in particular, and environmental policies, in general, to identify the causes of environmental degradation,

assess why the NCS failed to address them and define the elements of a more focused environmental strategy for Pakistan. The review informed and complemented IUCN's mid-term review of the NCS, which followed shortly after. Both provided inputs into the GOP's National Environment Action Plan (NEAP).

This section of the report provides an overview of present environmental conditions and trends over the past 10 years across a broad range of environmental indicators, giving possible warning of future problems. This is followed by an analysis of the underlying socio-economic causes. Specifically, the attributes of sustainable human development (SHD) are examined and Pakistan's development performance assessed in the light of SHD criteria. The analysis provides both a background and a context for the NEAP and is guided by it. It states as its primary objective:

*"to initiate actions and programmes for achieving a state of the environment that:*

- *Safeguards public health*
- *Promotes sustainable livelihoods, and*
- *Enhances the quality of life of the people of Pakistan*

*The NEAP will focus on taking immediate measures to achieve a visible improvement in the rapidly deteriorating quality of air, water and land, through effective cooperation between the government and civil society."*

### **1.3 Environmental Overview**

This overview relies mainly on various secondary statistical sources to take stock of the state of the environment.<sup>1</sup> To be consistent with the NEAP, it focuses on air, water and land. In so doing, it draws selectively on available data to construct trends only where a benchmark or international/national standards are available. The reason for doing this is to be able to indicate how the environment has changed over time or to demonstrate its state at a point in time relative to some context. The sources that are likely to damage the air, water or land are assessed first, followed by a review of the state of natural resources. In providing this temporal or contextual overview, the stage is set for the more forward-looking chapters that follow. The following documents, published fairly regularly, are the main information sources:

- *Compendium of Environmental Statistics*<sup>2</sup>
- *Pakistan Economic Survey*
- *Agricultural Statistics of Pakistan*

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1 An important source in this regard is the *Compendium of Environmental Statistics* published by the Federal Bureau of Statistics in 1998. For a useful account of the shortcomings of this Compendium in particular and Pakistani environmental data in general, refer to Banuri and Khan (2001, pp. 39-46). In assessing this Compendium in a regional context, ADB (1999) noted that data on greenhouse gases and ozone depleting substances, on the global, regional and local level, water resource use, water quality, forests, flora and fauna, coastal environment and solid waste management needs improvement. Only data on sanitation was deemed as satisfactory among the various categories considered.

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Pakistan is handicapped in not having a strong information technology base for data processing, modeling and analysis. Dated information on the environment handicaps researchers and hence policy makers. Also, many indirect inferences have had to be made regarding pollution and degradation, especially when it comes to inter-temporal assessments. Our main recommendation is that the Ministry of Environment ensure that the relevant agencies collect, at least, the minimum set of statistics included in this overview each year. The Federal Bureau of Statistics should compile these annually and report them in an *Annual Compendium of Environment Statistics*. Some excellent suggestions on the development of environment statistics are provided in ADB (1999).

### 1.3.1 Air

#### Air Pollution

Auto, industrial and energy emissions are the main sources of air pollution. Table 2.1 shows that the total number of motor vehicles on the road has increased about five-fold (500 percent) over the last two decades, a phenomenal rate of expansion by any account. Motorcycles and rickshaws, due to their two-stroke engines, are the most inefficient in burning fuel and contribute most to emissions. Fortunately, rickshaws have only doubled in numbers, but motorcycles and scooters numbers have gone up six-fold in the last two decades.

Coal, another primary source of emissions, has three main uses, as a fuel source in power generation, brick-kilns and households. Fig.2.3 shows that consumption of coal was steady until the 1995-97 period.<sup>3</sup> Between 1994-95 and 1995-96, its consumption in the power sector (thermal energy production) jumped ten-fold (1000

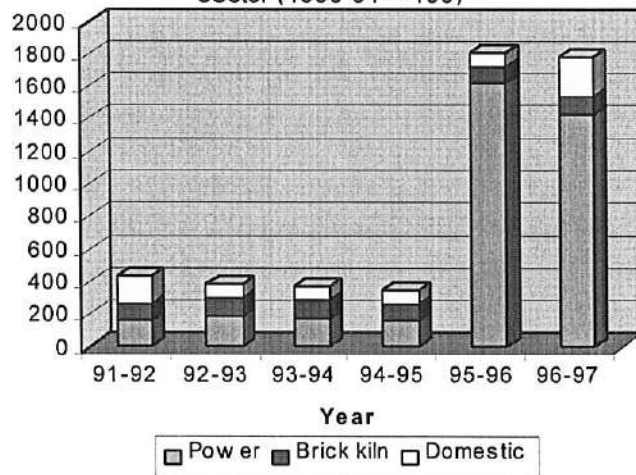
**Table 1.1** Motor vehicles on the road (1980 = 100)

Year	Vehicle type		
	Motor Cycles/ Scooters	Rickshaws	Total
1980 (000s)	286 = 100	32 = 100	682 = 100
1981	113	105	111
1982	131	108	124
1983	147	113	138
1984	180	116	167
1985	202	118	189
1986	228	120	211
1987	243	121	227
1988	261	123	245
1989	284	126	270
1990	311	129	292
1991	335	132	310
1992	397	145	361
1993	434	158	389
1994	467	167	414
1995	506	176	445
1996	549	185	477
1997	598	195	513

Source: GOP (1998: 151)

Note: Base year number of motor cycles/scooters, rickshaws and total vehicles on the road in thousands were 287.6, 32.0 and 682.2 respectively.

**Fig. 1.3:** Consumption of indigenous coal by sector (1990-91 = 100)



Source: GoP (1998, p.130).

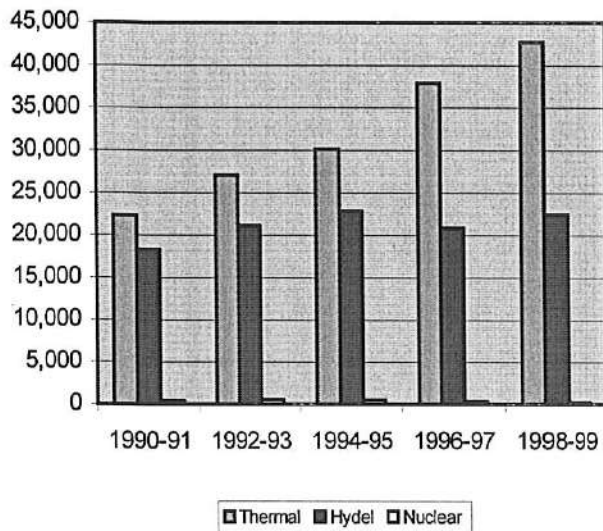
Note: Base year consumption values were 24,603 3,025,520 and 3,785 tonnes for power, brick kiln and domestic respectively.

<sup>3</sup> The use of coal for brick kilns stayed steady throughout. This is partly because rubber and leather wastes are now being utilized as fuel. This is a cheaper but even dirtier source of fuel.

percent).<sup>4</sup> Between 1995-96 and 1996-97 it trebled for domestic use. In general, emissions in the energy sector have increased at an accelerated rate over time. As Figs.2.4 and 2.5 show, this is the result both of a shift from hydel to thermal power generation and, in the latter category, a shift to dirty fuels (oil, coal) as a result of emerging natural gas supply constraints.

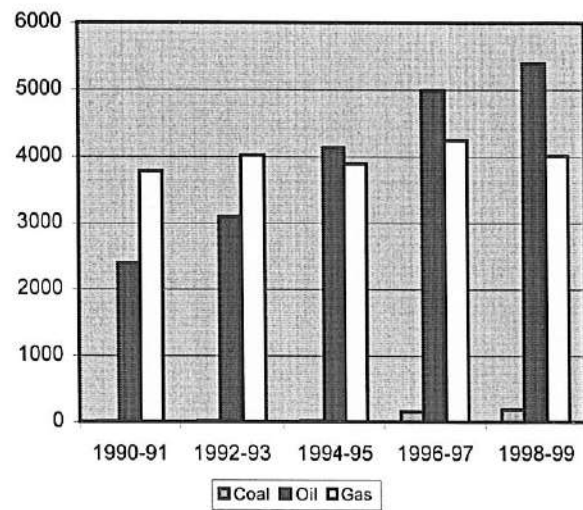
The other main source of pollution is manufacturing. A manufacturing sector index shows that from a base of 100 in 1980-81, manufacturing increased about threefold to 270.5 in 1999-00.<sup>5</sup>

**Fig. 1.4: Electricity generation by type (GWh)**



Source: Pakistan Energy Yearbook, 1995, 1999

**Fig. 1.5: Thermal energy generation by fuel source (000' TOE)**



Source: Pakistan Energy Yearbook, 1995, 1999

### 1.3.2 Water

#### **Water Availability: Demand-Supply Balances**

The mean value over 72 years of water availability at the rim stations (that is entering the Indus Basin within Pakistan) is about 139 million acre-feet (MAF). This period takes account of both wet and dry cycles. Of this 104 MAF is diverted to the canal system, while 35 MAF represents excess flows to the sea downstream of Kotri (NCS, 1992). However, this figure is disputed and many experts estimate releases below Kotri at 10 MAF. Further, the emerging view is that after canal diversions downstream of Kotri are taken into account, very little of this water actually reaches the sea.<sup>6</sup> Not surprisingly, this has reduced average outflows to the Arabian Sea until they are well below volumes required to sustain the Indus delta ecosystem.<sup>7</sup> There is evidence of extensive sea incursion, which has degraded the coastal mangroves, the spawning grounds for shrimps, prawns and a range of sea life. Also, about one million acres of agricultural land has become saline, rendering it unfit for agriculture (IUCN, 1997).

4 Government of Pakistan (1998, p. 140). Government of Pakistan, (1999, p. 8) shows that between 1993-94 and 1998-99, the use of coal in thermal power generation increased by 57 percent. The budget 2001-2002 has provided incentives for the use of coal in the cement industry. Thus industrial use is likely to surge in the near future.

5 Government of Pakistan, Statistical Appendix, (2001, p. 32).

6 It must be emphasized that one is talking about annual mean outflows, which smooths out inter-seasonal flow fluctuations.

7 Experts put this at 35 MAF (IUCN, 1997).

About 117 MAF of water (rain, canal) is available for agriculture, household and industrial consumption, the bulk of it being used in agriculture. Conveyance losses in the canal system and in watercourses are ostensibly high, at 64 MAF. However, a significant proportion of the loss constitutes groundwater recharge; 46 MAF is the cited figure (NCS: 1992: 38). Field application losses amount to 28 MAF.

Demand-supply imbalances with regard to irrigation water are likely to widen in the future. The irrigation system is supply constrained (*warabandi*) while farmers demand for more water, reflects the potential for cropping intensity increases. Competing demands are also emerging in the households and industry sector. From being water surplus in 1951 with a per capita availability of 5,300 cubic meters, Pakistan is bordering on becoming a water scarce country in 2000, with a per capita availability of 1300 cubic meters (GOP, 1998). Future projected deficits suggest that the situation will become worse. As finite water resources are recycled more frequently to meet increasing demand, and biological and chemical contaminants are added to them, water pollution will increase, regardless of natural filtration processes.

On the face of it, two choices present themselves. The first is tapping additional groundwater sources. Conservative estimates place this at 5 MAF. A more optimistic figure (according to experts in the Ministry of Power and Water Resources) is 15 MAF, based on the presumptive sweet water overlays over the brackish groundwater zones. But this option of more groundwater is becoming less viable. As far back as 1992, there was evidence of a dropping water table in 14 of the 45 canal commands; reflecting the excess of extraction over recharge. Since then tubewell installation has increased rapidly (from 199,700 in 1981 to 484,000 in 1996), suggesting a further lowering of the water table and over a wider area.

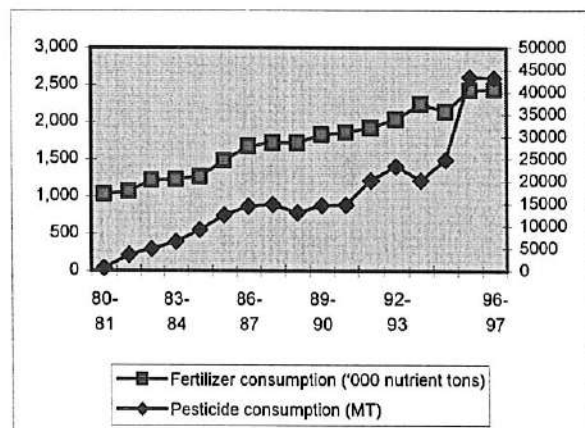
Water conservation strategies aimed at reducing field application losses and harnessing scarce water offer better prospects and embrace water loss reduction, use efficiency, rainwater harvesting and water recycling. In the agriculture sector, one possible thrust could be rehabilitating the irrigation system and restructuring its management (water distribution by autonomous and decentralized bodies, farmer-based management at the tertiary irrigation level). Also, technical and economic (pricing) measures to encourage water conservation in households and industry could be considered.

### Water Pollution

Water pollution has three main sources: bacterial and organic liquids and solids from domestic sewage; toxic metals, organic, acids and other less toxic but still polluting substances from industrial discharges; and agri-chemical pollution in the form of pesticide and fertilizer run-off from agricultural lands.

An important source of water pollution is run-offs from chemical insecticides and fertilizers into water bodies. Figure 2.6 indicates that, with 1980 as the base, pesticide consumption in Pakistan had

Fig. 1.6: Consumption of chemical fertilizers and pesticides



Source: Gop (1998, pp. 94-95, 97)

increased 67 fold by 1996-97<sup>8</sup> Incentives in budget 2001-02 will encourage further consumption. Such incentives have also been provided to chemical fertilizers, the consumption of which more than doubled (rose 136 percent) over the same time period.

The irrigation run-off feeds into surface water and also seeps into sub-soil water, as crops do not utilize all the chemicals. Tubewells and pumps draw this up in turn as a source of drinking water. A survey by the Public Health and Engineering Department (Punjab) found 72 percent of the samples collected from wells and tube wells throughout Punjab to be biologically and/or chemically contaminated<sup>9</sup>. The growing incidence of salinity also contributes to the deteriorating quality of ground water, with excessive amounts of salt in the water rendering it impotable.

Untreated industrial effluents, containing large amounts of toxic chemicals are dumped into municipal sewers and into open lands close to cities, from where they seep into the ground water. The major polluting industries are fertilizer, paper and board, sugar, cement, leather and textiles. While industrial pollution trends have been flat, reflecting the depressed state of industry over the past ten years, relatively, per unit effluents are high. Table 2.2 is drawn from a study conducted by the Sindh EPA and indicates the industrial pollution levels by the measures above for major industries in Pakistan, including, chemical, textiles, tanneries, sugar and fertilizer. The effluents are significantly above NEQS on all counts including BOD, COD, TSS and TDS. Thus for example, for the chemical industry, which not surprisingly has the highest effluents, the highest reading of BOD and COD was over 120 times higher than NEQS. However, even for the textile industry, the highest reading was over 100 times the NEQS. Similarly, for the fertilizer industry, readings were 65 times the NEQS for TSS and for the sugar industry readings were 5 times higher than the NEQS for TDS.<sup>10</sup> These effluents also flow into rivers and into the sea, with disastrous consequences for inland and coastal fisheries. In fact, chemical/metallic toxins are overtaking rapidly biological contaminants as a source of water pollution.

Only multi-national companies tend to treat their wastes to commonly accepted standards. National companies are prone to disposing their wastes in the most convenient way, making little or no efforts to institute process controls, waste recycling or end-of-pipe treatments. While no systematic or national level survey has attempted to measure the source, volumes and characteristics of industrial pollution site-specific data does give an indication of the gravity of the problem.

Solid waste is another source of water pollution. In Pakistan, an average 50,000 metric tons of solid waste is generated every day. Municipalities collect only 60 percent of this waste. Also, of the 8,000 tons or so of excrement produced daily, just under 50 percent are deposited by the

**Table 1.2: Industrial Effluents**

	BOD (mg/L)	COD (mg/L)	TSS (mg/L)	TDS (mg/L)
<b>Chemical</b>	1400-9800	2300-18640	950	38000
<b>Tanneries</b>	800-1680	1020-2367	298	9104
<b>Textile</b>	800-8500	1610-16500	1900	9680
<b>Sugar</b>	100-1100	200-1896	2850	17300
<b>Fertilizer</b>	400-610	860-1650	9720	-
<b>Oil and ghee</b>	460-1470	1260-3280	576	15462
<b>NEQs</b>	80	150	150	3500

**Source:** Taken as is from the Government of Pakistan (2001).

**Note:** BOD = Biological Oxygen Demand  
COD = Chemical Oxygen Demand  
TSS = Total Suspended Solids  
TDS = Total Dissolved Solids

8 The negative impacts of pesticides on health and the environment have been well documented. For example, refer to Khan (1997, pp. 260-261).

9 Sustainable Development Policy Institute. 1995. Nature, Power, People: Citizen's Report on Sustainable Development 1995. Islamabad.

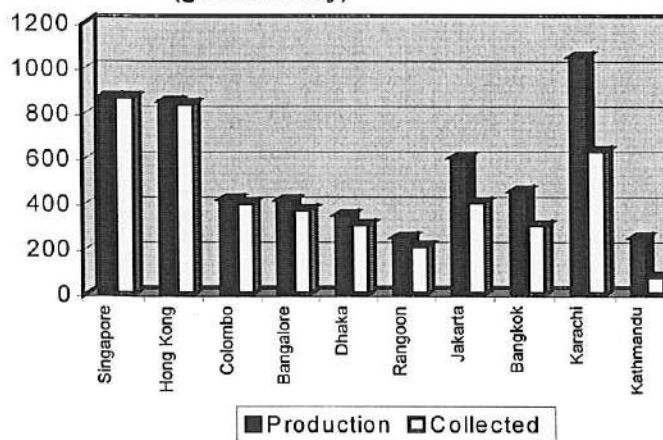
10 This source also indicates that TDS levels in Manchar Lake are 14 times higher than considered safe for fish.

roadside, or are incorporated into solid waste. Whatever is collected is dumped in the open or, more frequently, burnt. Commercial, industrial and hospital wastes – and some consumer goods – include chemical pollutants such as heavy metals or poisonous or highly inflammable organic solvents, which are classified as ‘hazardous’ or ‘toxic’.

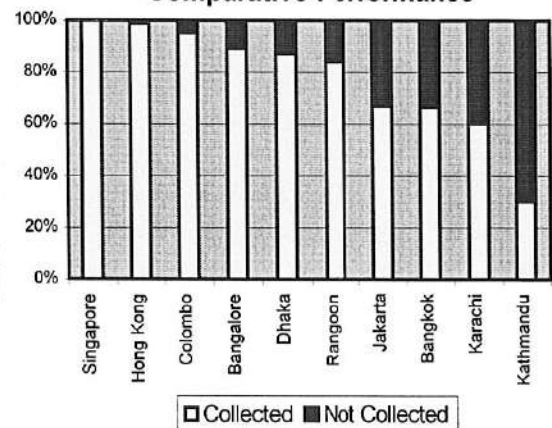
Such wastes are disposed off untreated as normal liquid or solid waste into drains; water bodies or in open dumps without any special precautions. In general, there is a lack of provision of space for waste collection bins and dumping sites, municipal authorities lack manpower and vehicles for waste collection and disposal and make little or no efforts to instill a civic sense in the neighborhoods they serve. The problem is partly rooted in the disjuncture between policy making and implementation. While policy and planning is conducted at the federal level, actual implementation is entrusted to provincial and local bodies. The lack of coordination between the three tiers, coupled with continuous funding shortfalls, contribute to the inadequacies of the system. Also, the system, such as it is, rarely serves low-income settlements. In fact, the solid waste collected in upper or middle class areas of cities is dumped in the slums and city peripheries, either in landfill sites, or is thrown directly into watercourses. The poor areas of the city are generally the worst served by garbage collection services, or not served at all. The resulting problems are smells, disease vectors and pests attracted by garbage and overflowing and clogged drainage channels.

The ill-planned agglomeration of squatter settlements makes waste collection a difficult problem, even when civic amenities are extended to these areas. The housing density and

**Fig. 1.7-A: Comparative Data on Solid Waste (gm/head/day)**



**Fig. 1.7-B: Solid Waste Collected-Comparative Performance**



Source: Compendium of Environmental Statistics, GOP, 1998

narrow winding streets do not allow vehicles to pass through. Also, with O&M costs being unaffordable (since the government sets inflexible standards) the structures tend to deteriorate rapidly.

The figures above reveal that on a cross-country comparison of major cities, Karachi ranks very poorly in terms of both waste generation and percent of waste collected.

Surface water salinity tends to remain well within acceptable limits both for agriculture and household use varying from 60 mg/l in the upper reaches to 375 mg/l in the lower reaches of the Indus. Salinity concentrations are high at the confluence of the Chenab and Ravi rivers (207 – 907 mg/l) due to the drainage effluents from various contiguous irrigation projects.

### 1.3.3 Land

#### Land-Use Changes

Land-use changes are reviewed over the past two decades, as opposed to the usual post-NCS assessments, because such changes occur slowly and are difficult to detect over a limited time period. Also, an effort has been made to embed the inter-temporal comparisons in a common base so that the changes reflect

environmental impacts and are not distorted by inert additions to the reported area, as is evident in the Table 2.3 The bar graph indicates changes in percentage terms.

Table 1.3: Land Use Changes

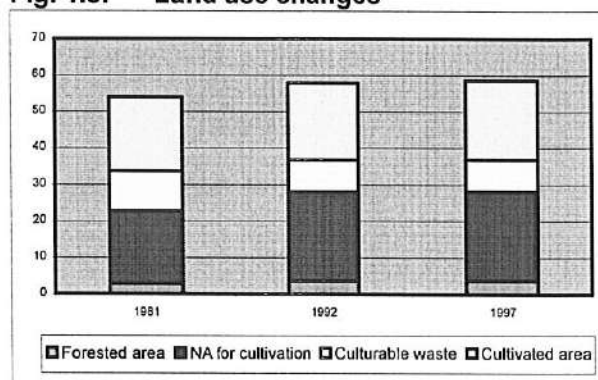
	1982 (1)	1992 (2)	1997 (3)	(3) – (1)
Total Area	79.61	79.61	79.61	
Reported Area	57.91	57.87	58.51	0.6
Forest Area	2.81	3.47	3.62	0.81
Not available for cultivation	21.96	24.48	24.39	2.43
Culturable waste	12.72	8.96	8.91	-3.81
Cultivated Area	20.42	21.06	21.59	1.17
Cropped Areas	19.78	21.72	22.93	3.15

Source: GOP, 1998

The area under forest has increased from 3.53 percent to 4.55 percent of the total reported area. As we note below, this increase conceals both a change in forest composition and extensive degradation of forest stands. The land not available for cultivation has increased from 27.6 percent to 30.6 percent; in absolute terms, a little over 2.4 million hectares has reverted to this category. While some of this reflects conversion to urban land (currently estimated at about 2 percent of the total area), a reasonable conjecture is that the larger proportion has been lost to soil erosion, desertification, water logging and salinity and soil degradation. The root causes for this are deforestation, poor land-use practices, chemical pollution, water mismanagement and sea incursion. The last alone, according to recent IUCN estimates, has rendered close to one million acres saline and unfit for cultivation. These factors have contributed, not only to the loss of agricultural land but to its degradation as well, resulting in crop productivity losses.

The largest change has occurred in the culturable waste category. There is little doubt that a growing rural population has reduced the scope for leaving land uncropped for extended time periods. By the same token, cropping intensity increases have been appreciable. Of the total increase in cropped area of 3.15 million hectares, cropping intensity increases alone account for close to 2 million hectares.

Fig. 1.8: Land use changes



#### Deforestation

Data on the state of forest resources is limited, although with GIS technology, such information should be available readily on an annual basis. The data above showing an increase in forest cover is encouraging, because anecdotal accounts made one fear that there was actually a decline. Otherwise, having a forest cover of 4.57 percent is a dismal performance.

The disaggregated data presents a less encouraging picture. Excluding plantations, the total area of primary forest, scrub, riverine and mangrove forests covers about 4 percent of the country. If scrub forests are excluded, the total area of 'tall tree' forest falls to just 2.4

million hectares (2.7 percent), of which 2 million hectares have sparse cover (patch forests with less than 50 percent cover). More specifically, more than half of the remaining mangrove forests, more than two-thirds of the remaining riverine forests and more than nine-tenths of the remaining coniferous forests have less than 50 percent canopy cover. Good quality (greater than 50 percent cover) 'tall tree' forest in Pakistan covers less than 400,00 hectares. The remaining forests, fragmented and degraded as they are, are disappearing rapidly (BAP: 2000).

This is substantiated by a rigorous forestry study, the Provincial Forest Resource Inventory (GoNWFP, 2000), carried out in four divisions of the NWFP. About 53 percent of the provincial area was surveyed, which included over 90 percent of the province's forests. These also constitute the bulk of Pakistan's primary forests. Satellite imagery (the Landsat Thematic Mapper) was used for forest stock assessment and evaluation of forest conditions.

The study showed that only a relatively small area of 21 percent had a sufficiently high canopy cover of more than 50 percent. In addition, 75 percent of the dense forests are located above 2000 meters. These forests, while rich in biodiversity, are not utilizable. Unfragmented forest patches (100 hectares) are found in forests below 2000 meters, in only 3 of the 7

**Table 1.4: Domestic output and imports of major forest products**

Year	Domestic output		Imports	
	Timber (‘000 cu. meters)	Fuelwood (‘000 cu. meters)	Rough or square wood (‘000 Rs.)	Fuelwood or charcoal (‘000 Rs.)
1989-90	255	422	76,018	-
1990-91	221	851	84,105	12
1991-92	232	259	108,004	102
1992-93	371	320	175,675	450
1993-94	187	516	259,789	187
1994-95	338	346	257,431	166
1995-96	481	315	402,360	2,670
1996-97	310	247	797,668	2,350
1997-98	216	274	727,533	4,498
1998-99	205	270	1,076,797	-

Source: GOP (2000, PP 176, 658-59)

surveyed districts. Again, high standing timber volumes are found only in the over-aged and inaccessible high hill forests. In the lower open forests, the average density is only 85.49 cubic meters per hectare (cbm/ha), compared to the 446 cbm/ha in the high hill forests.

The secular decline in the outputs of major forests products, reported in Table 2.4, appears to support the direct evidence. Thus, timber yields peaked in 1995-96 and, subsequently, more than halved by 1998-99. Similarly, firewood extraction has shown a declining trend. Further supporting evidence is provided by imports of timber and fuel-wood. These jumped sharply in 1995-96 and stayed high subsequently. Imports of fuel wood and charcoal between 1994-95 to 1995-96 increased 16-fold and imports of wood (rough or squared) went up more than four-fold between 1994-95 and 1998-99. The increase in imports reflects not only a secular increase in demand but an offset for declining indigenous availability as well.

### **Land Available for Cultivation**

As we indicated above, the land available for cultivation has reduced by about 3 percent over a 15 year period (1982-97). But the problem of soil quality deterioration is of even greater concern. The NCS provided an initial land capability classification for 1988. Since there is no recent soil quality data to compare with these benchmark figures, soil quality changes can only be assessed indirectly. One way of doing this is to juxtapose these benchmarks with the key degradation agents and observe their trends.

Two aspects are of note with respect to soil quality, namely, topsoil loss and changes in its composition.

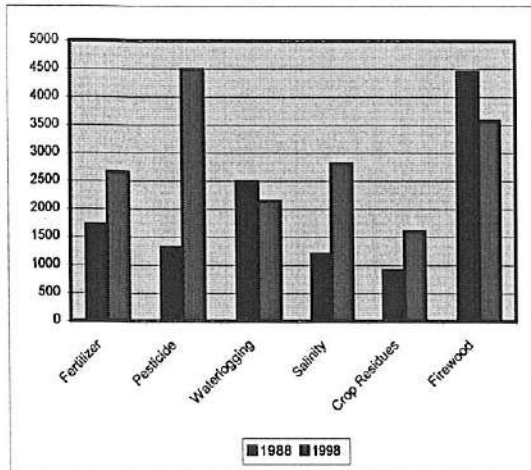
**Table 1.5: Soil degradation agents**

	1988	1998
<b>Fertilizers (000 n.tons)</b>	1720.2	2659.3
<b>Pesticides ( MT)</b>	13070	44870
<b>Waterlogging (0-5 metres) – pre-monsoon – mill. ha.</b>	2.31	2.46
<b>Salinity (cultivated area-Class I-IV soils) – '000ha</b>	1197	2803.8
<b>Crop residues (dung cake) --10000 tons/yr</b>	8993	15967
<b>Firewood from domestic sources -- 00 cu mtrs</b>	4450	3570

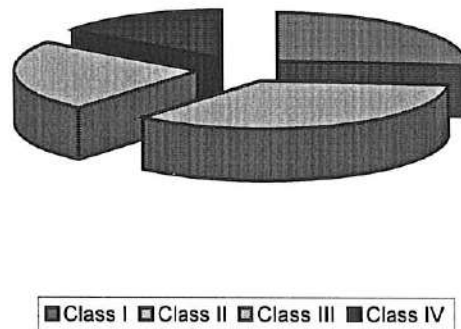
Various GOP sources

Factors contributing to the former are water erosion, flooding and wind erosion. In turn, these are rooted in deforestation, loss of vegetative cover and poor agronomic practices. However, the causal links are stretched here and it would be unsafe to go beyond the qualitative observation that all three have contributed to considerable topsoil loss over time. The adverse effects of flooding are exacerbated by reservoir construction. While dams increase flooding intensity, they also retain sediments, reducing the soil enrichment normally associated with floods.

**Fig. 1.9: Soil degradation agents**



**Fig. 1.10: Soil classification (NCA, 1998)**



Changes in soil composition lend themselves better to data-based inferences as their sources are easier to quantify, such as water logging and salinity, chemical input use and organic matter depletion.

As Table 2.5 shows, over the period in question, the use of fertilizers and pesticides has gone up by, respectively, two to three-fold.<sup>11</sup> The waterlogging-salinity nexus is interesting.<sup>12</sup> The numbers for waterlogging show little change over time. Water tables appear to have stabilized, initially due to the Salinity Control and Reclamation Programs (SCARP) and more recently as a result of the rapid increase in the number of private tubewells installed (indicated above). In fact, water tables in many canal commands (14 of 45 in 1992) have fallen to the extent that the government is considering seriously the need to monitor and impose regulatory controls on extraction. In contrast, salinity in cultivated areas appears to have doubled, with its adverse

11 In the first place, the units for all the agents have been brought within a common range, so that trends can be observed.  
 12 The waterlogging figures are the average for June and October (in October, the water-table is higher, reflecting the combined impact of the monsoons and snow-melt).

implications for soil quality.<sup>13</sup> Partly the reason for this could be that the soil survey in 1998 was more extensive, covering the entire area under cultivation (20 million hectares) as opposed to 13.6 million hectares in 1988, so the full salinity impact may not have been captured. However, relative to the 33 percent increase in areal coverage, salinity increased by 100 percent.

Waterlogging and salinity affect about 30 percent of irrigated agricultural lands. At present, only about 27% of the average annual salt inflows of 33 million tons brought in by the Indus river and its tributaries are washed out of the system. Added to this are another 28 million tons of salt mobilized by fresh groundwater tubewells (Halcrow: 2001:3). As mentioned, various salinity control and reclamation (SCARP) schemes introduced in the sixties and supplemented by private tubewells have controlled the problem to an extent. However, leaching salts below the root zone or relocating them elsewhere is no substitute for integrated drainage management which flushes them out of the system entirely. Present drainage facilities are both flawed and inadequate and have been unable to cope with the saline effluents, the National Drainage Program (NDP) notwithstanding.

The use of crop residues (dung cakes, straw) in fuel consumption comes at the expense of soil nutrient replenishment. Its use as a domestic fuel source has doubled over 10 years. Crop residues are substituting increasingly for firewood, with the latter's availability having actually fallen over the comparable period.

#### **1.3.4 Biodiversity**

##### ***The Convention on Biological Diversity (CBD)***

Pakistan was one of the 155 nation states which signed the CBD at the Earth Summit in Rio de Janeiro in 1992. This act signalled its intention to join a global alliance to protect habitats, species and genes, to shift to sustainable modes of resource use and to make the necessary policy, economic and managerial adjustments to guarantee that the benefits to be gained from biological resources are shared equitably across local, regional and global societies. The CBD was signed by Pakistan in 1992 and ratified by the Cabinet in 1994. In addition, Pakistan is also signatory to the following international conventions governing biodiversity and has taken important conservation initiatives to comply with them:

- Convention on International Trade in Endangered Species (CITES)
- Convention on the Conservation of Migratory Species (NCCW)
- Convention on Wetlands of International Importance (RAMSAR)

##### ***Biodiversity Richness of Pakistan***

Pakistan's great habitat diversity, coupled with its location in a transition zone among three zoogeographical regions – the Palearctic, the Ethiopian and the Oriental, and the tremendously varied altitudinal gradients has resulted in a great diversity of biota. Up to 188 mammal species have been reported, of which three are endemic and there are a number of endemic and near-endemic sub-species. Of the 666 species of migratory and resident bird species recorded, one-third has Indo-Malayan affinities, and the remaining Palearctic. There are 174 listed species of reptiles and amphibians, of which 40 species are endemic. Pakistan has 177 native freshwater fish, predominantly South Asian in origin. In the invertebrate category, there are about 360 butterfly species, with high rates of endemism and about 2,000 species of insects.

<sup>13</sup> The salinity data is only for agricultural soils in the Class I-IV range. Also the soil survey in 1998 was far more extensive, covering the entire area under cultivation (20 million hectares) as opposed to the 13.6 million hectares in 1988. (Agricultural Statistics of Pakistan, 2000)

Over 5,600 species of vascular plants have been described, including both native and introduced species. There is high species diversity and the flora includes elements of six phytogeographic regions. Four monotypic genera and 400 species are endemic to Pakistan. In the category of fungi, there are 847 genera and 3,383 species.

Within the last 400 years, at least four mammal species are known to have disappeared from Pakistan. Also, the latest "IUCN Red List of Threatened Animals," (IUCN, 1996) lists 37 species and 14 sub-species of internationally threatened or near-threatened mammals as occurring in Pakistan.

**Causes of Biodiversity Loss**

The widespread historic conversion of natural ecosystems to agriculture, the advanced and rapidly accelerating degradation of habitats, and the continuing depletion of populations, has placed under critical threat all natural or modified ecosystems. At least 10 ecosystems of particular value for their species richness and/or unique communities of flora and fauna are threatened with habitat loss and degradation.

The pathways from environmental degradation to biodiversity loss

(plant, animal species and micro-organisms) are both direct and indirect. Habitat loss constitutes an indirect route. At source are sector activities, such as industrial and household emissions and effluents, agricultural intensification (chemical input applications), irrigation and drainage practices (water diversions and mismanagement) and energy combustion.

Table 1.6: Endangered species

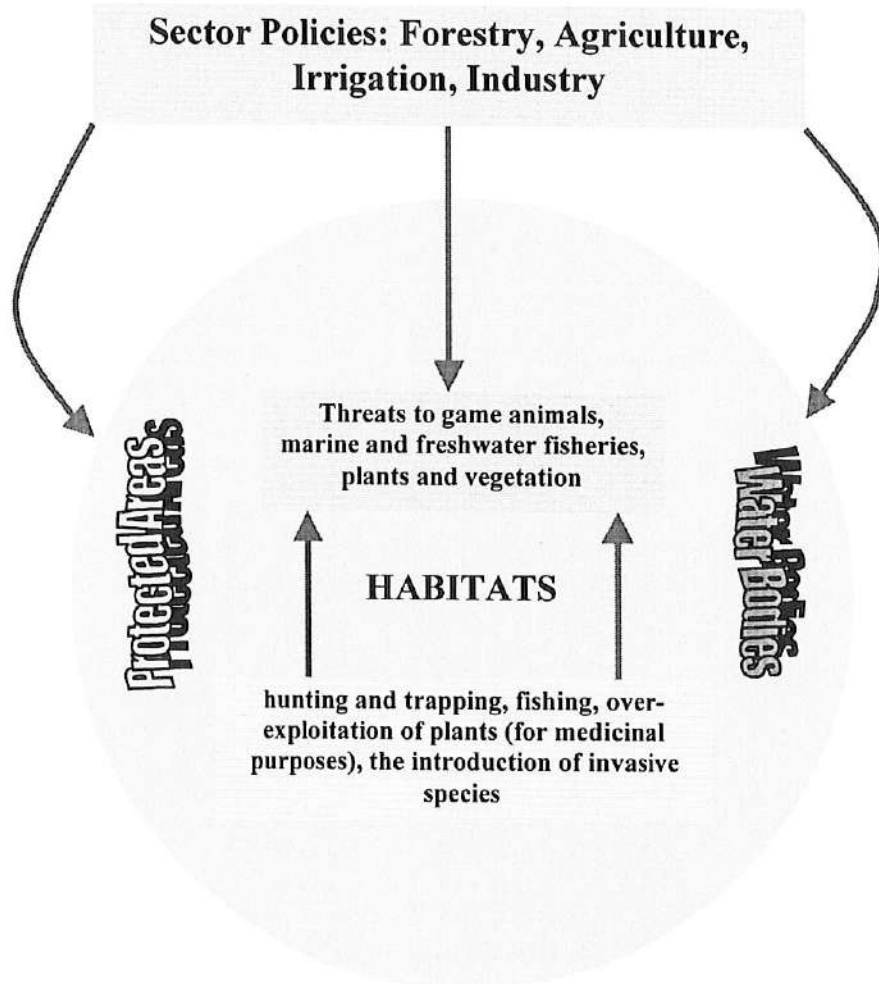
	Mammals	Birds
<b>Extinct</b>	Tiger Swamp deer Lion One-horned rhinoceros Asiatic cheetah Indian wild ass Hangul	
<b>Internationally threatened</b>		
<b>Critically endangered</b>	Balochistan black bear Chiltan goat	Lesser florican
<b>Endangered</b>	Snow leopard Indus river dolphin Urrial Wooly flying squirrel	Siberian crane Great Indian bustard

Source: IUCN Red List, 1996

Note: Mammals: 37 species and 14 sub-species threatened or near-threatened  
 Birds: 25 threatened and 17 near-threatened  
 Reptiles: 7 threatened and 3 near-threatened

Activities, which cause biodiversity loss directly, are hunting and trapping, fishing, over-exploitation of plants (for medicinal purposes), the introduction of invasive species through trade or natural resource management efforts. Sector activities (agricultural and industrial) can also contribute directly to biodiversity loss. For instance, extensive planting of high-yielding hybrid varieties has displaced indigenous crop genes, and the use of chemical inputs has harmed soil microorganisms, invertebrate fauna and wildlife. A simple problem analytic is presented above.

Fig.1.11: Problem Analytic



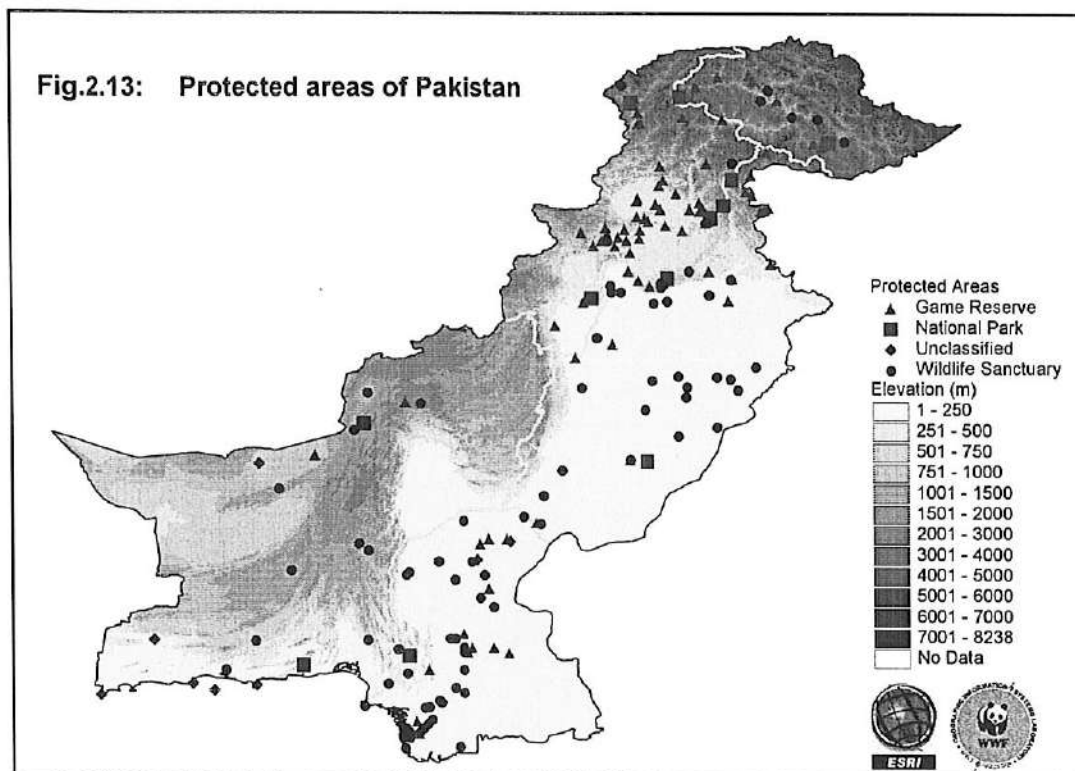
### ***The Economic Causes of Biodiversity Loss***

Strengthening biodiversity-economics linkages are an integral part of efforts at both biodiversity conservation and remediation. The Biodiversity Action Plan (BAP, 2000) cites many cases where the market fails to capture adequately the value of biodiversity, or where existing economic policies and incentives lead to the predation of species and/or to the degradation of their habitat.

- Sector Economic Policies: Intervention failures tend to reflect pricing distortions.
- Market failure occurs when the market is unable to monetize environmental degradation or biodiversity losses.
- Both are rooted in institutional failure (political/administrative resistance to getting prices right or instituting environment/biodiversity friendly incentives/penalties)

### Protected Areas

Protected areas are considered safe havens for biodiversity. However, the extent to which they fulfil their role depends on spatial aspects, ecological integrity and management norms. The allocation of protected areas in Pakistan is inadequate, both in the aggregate and distributionally. At first sight, the overall number of sites (225) and the percentage of



the country considered protected (11.25 percent) is impressive. This figure, however, includes sites established without a basis in legislation. If only established under provincial and territorial wildlife acts and ordinances are considered, then their number drops to 200 areas: 14 national parks, 97 wildlife sanctuaries, and 89 game reserves. If one only considers national parks and wildlife sanctuaries as areas that afford protection to biodiversity in a more comprehensive manner than game reserves do, then the overall number of protected areas is further reduced to 111. The corresponding percentage of protected land then drops from 11.25 percent to 6.5 percent. In that case, Pakistan lags behind other South Asian states, including Nepal, Sri Lanka, Bhutan, in terms of the total land area designated for conservation.

Currently listed protected areas are also distributed unevenly across the country. The majority of the areas are concentrated along the Indus Valley. Likewise there exists considerable provincial and territorial disparity in their distribution. For example, while over 16 percent of Punjab is protected under one of the three main PA categories, approximately only 6 percent of the NWFP and less than 6 percent of Balochistan are formally protected. It is however, in these regions that much of Pakistan's remaining biodiversity is concentrated (EcoNexus: 1999).

Another anomaly is that the designated PAs include 100 percent of the Federal Territory, which can not be justified on any ecological criteria. The mismanagement of these protected areas, another overriding concern, is addressed in more detail later. However, it

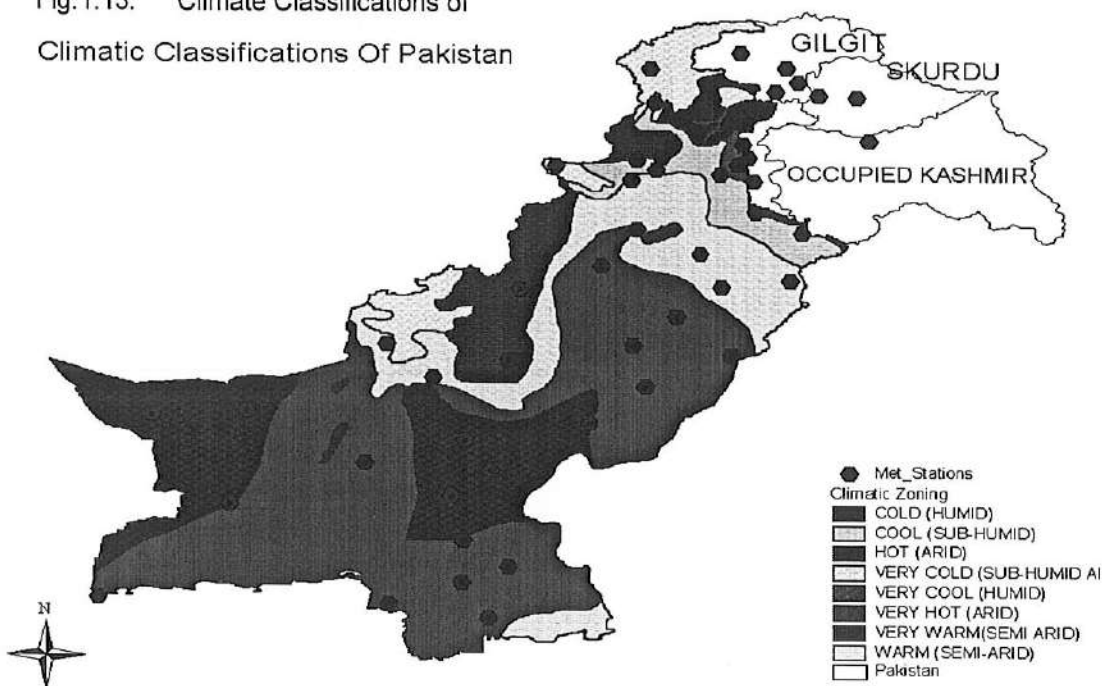
is appropriate to cite the case of the Kirthar National Park upfront, which is currently under a mining threat by Premier, an international oil company. The provincial wildlife act has been amended to suit its convenience.

### 1.3.5 Atmosphere and Climate

Pakistan is located in South Asia at 24° to 37° north latitude, and 61° to 76° east longitude. Its different regions display immense climatic and physiographic diversity. Predominantly, however, it is an arid country: of its total area of 88 million hectares, three-quarters falls where plants lose more moisture through evapotranspiration than is compensated for by rainfall. In fact, roughly half of this arid zone is best described as desert-like; particularly its western and southeastern parts, which have as little as 25mm of average annual rainfall, and temperatures that rise frequently above 40 °C in May and June. For several species of indigenous flora and fauna, these conditions represent the extremes of their temperature and water tolerance limits; their survival in these arid and desert ecosystems is, therefore, highly vulnerable to the slightest climatic change in an unfavorable direction.

Pakistan's physiographic diversity is visible in its high-altitude mountain ranges, its afforested zones, fertile agricultural plains, rocky plateaus, deserts and coastal areas. Climatic regimes are similarly disparate across regions. Temperatures range between 42° C in summer in the central arid plains and -26 °C in winter in the northern mountainous areas. Precipitation varies from an annual average of over 1700mm for the northeastern mountains to a mere 30mm in the south-western plains. In general, the northern mountainous and sub-mountainous areas are colder and wetter than the southern areas of the country. Most of the country's annual precipitation occurs during the summer monsoon period from July to September. Smaller amounts of rain fall over winter, from eastward-moving, extra-tropical depressions.

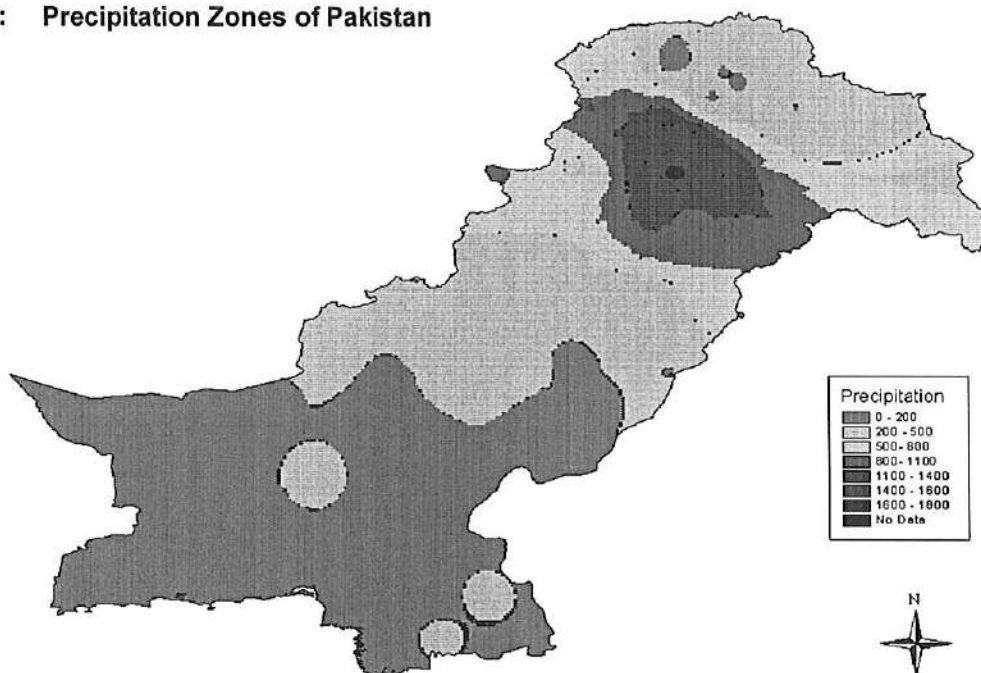
Fig.1.13: Climate Classifications of  
Climatic Classifications Of Pakistan



### Climate Change

Meteorological data for the period 1931-90 show an inter-temporal increase of 0.5-1°C in annual mean temperatures across the country, with the exception of the monsoon and southeastern coastal belts, where temperatures decreased. Precipitation trends over the same period differ widely for different regions. An increase in monsoon rainfall was seen in the coastal and monsoon belts, and in winter rainfall in the monsoon belt and high western plains

Fig.1.14: Precipitation Zones of Pakistan



of Balochistan. All other regions of the country registered either little change, or decreases in summer and winter rainfall.

Increasing monsoon rains on a base of increasing spring snow-melt have contributed to a higher frequency and intensity of flooding down the Indus River Basin. More floods have occurred in the Indus plain over the past 30 years than over the preceding 70 years. Records for the last 100 years show that 7 of the 10 highest peak floods in the Ravi river occurred in the last 25 years. Arguably, however, climate change is not the only responsible factor; erosion caused by deforestation has contributed equally by increasing runoff in the Himalayan mountains and foothills.

The recent global preoccupation with climate change has special relevance for Pakistan in terms of the expected secular and cyclical impacts. In relation to the former, the primary concerns are with crop stress, water availability. The latter relates to an increasing incidence and severity of droughts and floods. The distinction between Pakistan's contribution to global warming and the impacts climate change is likely to have on its economy and its people is an important one. It can help focus policy priorities and ensure that Pakistan does not get sidetracked in a global dialogue which continues to be mitigation-centered.

### Climate Change Scenarios for Pakistan

The latest climate change scenarios, generated by general circulation models (GCMs) for arid and semi-arid Asia are presented in Table 2.7. Although area-averaged annual mean precipitation is projected to increase in most parts of Asia, a decline in summer precipitation is likely over the central parts of arid and semi-arid Asia. This includes the Indo-Pakistan subcontinent almost entirely. Because the rainfall over this region is already low, severe water stress conditions – leading to expansion of deserts – are quite possible, with rises in surface air temperature and depletion of soil moisture. The largest reductions (precipitation reduced to  $<1 \text{ mm day}^{-1}$ , 60 percent decline in soil moisture) are simulated in the arid regions of Pakistan.

**Table 1.7: Mean annual temperature and rainfall for Asia**

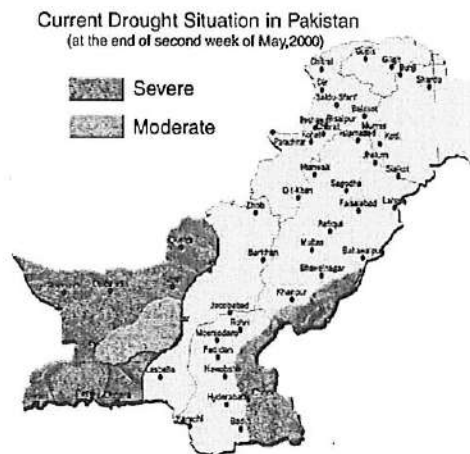
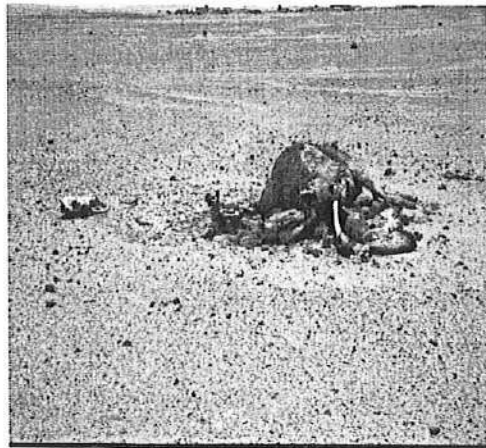
Decade of	Area-averaged annual mean warming		Area averaged annual mean rainfall	
	Without sulfate aerosols	With sulfate aerosols	Without sulfate aerosols	With sulfate aerosols
2050	3	2.5	7	3
2080	5	4	11	7

Source: IPCC, third Assessment Report-Working Group II, 2001

already low, severe water stress conditions – leading to expansion of deserts – are quite possible, with rises in surface air temperature and depletion of soil moisture. The largest reductions (precipitation reduced to  $<1 \text{ mm day}^{-1}$ , 60 percent decline in soil moisture) are simulated in the arid regions of Pakistan.

Drought disasters are more frequent during years following El Nino Southern Oscillation (ENSO) events.<sup>14</sup> At least half of the severe failures of the Indian summer monsoon since 1871 have occurred during El Nino years. In the event of advanced anomalous warming of the western equatorial Pacific Ocean, such as that observed during the El Nino, a higher frequency of intense extreme events (both droughts and floods) across all Asia is possible.

In fact, an increasing frequency and intensity of extreme events are likely to be the result



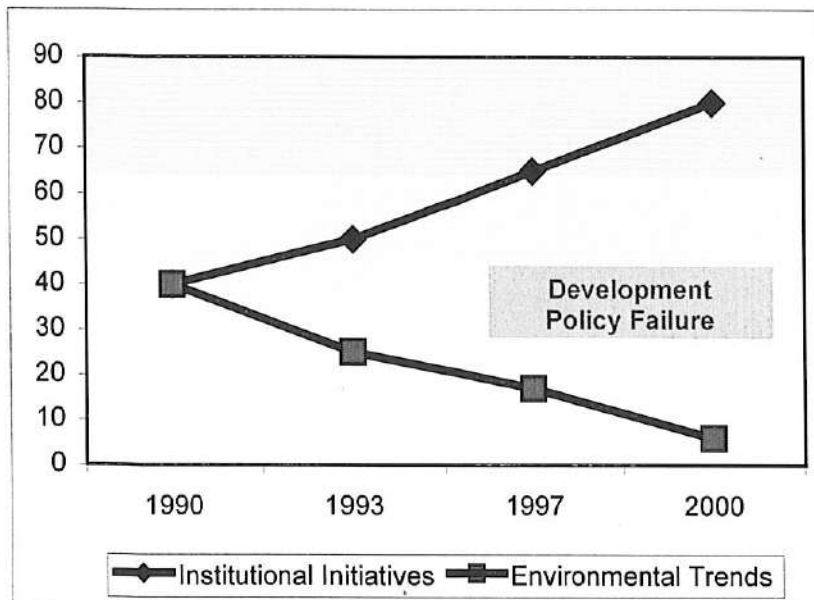
of an interaction of diverse climatic factors: rising temperatures, the more frequent onset of El Nino and glacial melt. Some mountains in Asia have permanent glaciers that have vacated large areas during the past few decades, resulting in increases in glacial runoff. As mountain glaciers continue to disappear, the volume of summer runoff will eventually be reduced, as a loss of ice resources. Because the melting season of snow coincides with the summer monsoon season, any intensification of the monsoon is likely to contribute to flood disasters in the Himalayan catchments, especially in the western Himalayas, where snowmelt runoff is higher.

<sup>14</sup> The El Nino climatic phenomena originates in the Southern Pacific Ocean and is associated with extreme events in the shape of droughts. It's South Asian extension is referred to as the ENSO.

Recapitulating, a worst-case scenario for Pakistan, in particular, is characterized by rising temperature, reduced precipitation, decreasing runoff over the long-term, increased water stress, a growing frequency and intensity of extreme events and sea level rise.

## 2. Development and the Environment

The preceding review section pointed to a growing gap between the various institutional measures taken over the past ten years and the worsening environmental trends, as represented by the stylized composite indicator in Figure 2.1. In this chapter we attempt to



explain this growing divergence in terms of development policy failure at a more generic level.

It is now well accepted that a focus on the environment is within the broader context of a concern for sustainable human development (SHD). An important issue that SHD addresses is how environmental abuse threatens the human security of the vulnerable. Its manifestations are widespread: industrial

effluents and emissions, auto emissions, chemical agricultural (insecticide and fertilizer) run-offs and municipal wastes. Air emissions also come back down as acid rain and destroy water bodies and the land they serve. Effluents, emissions, and hazardous and other wastes poison the food chain, threatening humans and other species.

Sustainable human development represents an important transition in development thinking. It is an embracing concept, which defines and integrates development, sustainability and equity (DSE) in relation to the three central pillars of sustainable development -- economic, social and environmental. In doing so, it extends the definition of sustainable development, as originally formulated in the Brundtland Commission report, and stated as, 'meeting the needs of the present generation without compromising the needs of future generations.'<sup>1</sup> Simply put, SHD means development which is efficient, equitable and sustainable in terms of resource use, resource access and resource resilience. The term "resources" is used in its generic sense and refers to capital, human and environmental resources. When such conditions are violated, environmental degradation and pollution are one among its many adverse consequences.

The imperatives of SHD are inter-generational justice, a concern with protecting the environment for future generations and intra-generational equity -- ensured through social and economic empowerment which, among other things, is a prerequisite for sustainable livelihoods. This refers to the ability of communities to extract a living from the environment in a manner which does not degrade it, as well as to cope with the environmental excesses engendered by unsustainable development. Essentially a people-

<sup>1</sup> This section is a synthesis of Munasinghe's (see bibliography) rich paper on the subject. However, while he describes DSE as an integrating theme for the key aspects of sustainable development, he stops short of defining the outcome of such integration. The term proposed by Shahrukh Rafi Khan, 'sustainable human development', appears a fitting definition, capturing the richness of the analysis.

centered theme, it requires policy interventions to strengthen communities coping and management capabilities. It also brings to the fore the need to use appropriate technologies.<sup>2</sup>

## 2.1 Does Pakistan Match These Criteria

Pakistan's development experience has fallen considerably short of the exacting criteria of sustainable human development, with adverse consequences for the environment. The table below illustrates some of the shortfalls.

Table 2.1: The Absence of Sustainable Human Development (SHD)

The Common Elements	The Three Pillars of Sustainable Development		
	<i>Economic</i>	<i>Social</i>	<i>Environmental</i>
<i>Development/Efficiency</i>	<p>Macroeconomic instability (fiscal deficits, current account imbalance, exchange rate overvaluation)</p> <p>Sector price distortions (industrial protection via tariffs and licenses, input and output price subsidies, varying degrees of state intervention in industrial production, utilities service delivery, internal and external trade)</p>	<p>Low social sector allocations (education, health, water supply and sanitation, income generation and employment)</p> <p>Poor outreach of poverty reduction schemes, politically influenced entitlements and misappropriation of funds</p>	<p>Policy neglect and low allocations for natural resource conservation and the use of environment-friendly technologies</p> <p>Failure to internalize environmental effects (perverse incentives encouraging extraction rather than conservation, unable to enforce/comply with environmental quality standards governing emissions and pollution)</p>
<i>Equity</i>	<p>Tax policies favoring the affluent (regressive indirect taxes, agriculture income tax exemptions)</p>	<p>Minimum provision for grassroots participation and empowerment of disadvantaged groups in the formulation and implementation of policies and development programs</p> <p>Centralized decision-making and governance provides little space for social capital to develop or articulate itself</p>	<p>Degradation and pollution impact disadvantaged groups adversely (ecological marginalization, urban industrial and vehicular pollution, household fuel consumption, sanitation and waste disposal)</p>
<i>Sustainability</i>	<p>Degradation of physical infrastructure (industrial, municipal, transport and utilities)</p>	<p>Lack of resilience in political systems (military coups frequently replacing elected governments)</p> <p>Withering away of informal legal and social systems thanks to modernization ('panchayats', 'jirgas', traditional support networks and resource management practices)</p>	<p>Degradation – irreversible in many cases -- and increased vulnerability (deforestation, rangeland degradation, biodiversity loss, coastal zone erosion, air, soil and water quality deterioration)</p>

The failure of SHD defines two descending pathways to degradation, direct and indirect. The direct path is rooted in an extractive development process. The indirect path tracks through social inequity and injustice. This condition increases the vulnerability of the poor to degradation. In turn, the poor are driven to prey upon the environment. The process sets into motion a vicious, downward spiral referred to as the poverty-environment nexus. In its extreme form, the environmental insecurity engendered can give rise to conflict.

<sup>2</sup> Development Alternatives, India, are the foremost exponents in the use and dissemination of such technologies

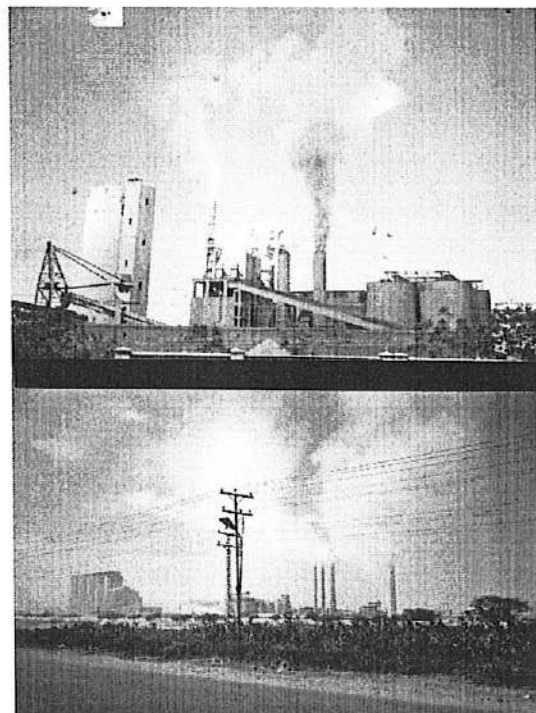
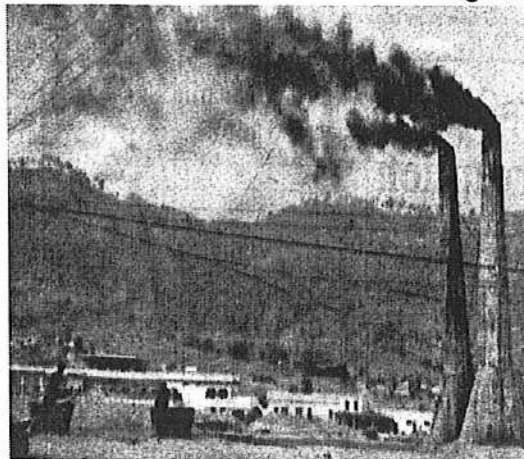
## 2.2 The Direct Path: An Institutional Vacuum

The existing state of degradation and pollution is a result of the failure to mainstream environmental activities within the development process. (Jalal: 1993: 9).<sup>3</sup> At some risk of generalization, one can define this process as highly resource, capital and technology intensive. Not only does the prevailing development paradigm emphasize extraction at the cost of conservation; at the same time it limits the beneficiaries of such development to only a subset of the possible universe. Also, modernization, in and of itself, contains impulses for degradation; for instance, when economic opportunity and mobility depreciates the value of the resource base for communities drawing their sustenance from it, or when national legal and regulatory systems over-ride traditional, community-based resource management – in fact, are misused to exploit such resources unsustainably.

When such development takes place in the absence of democratic and decentralized governance, environmental problems are compounded. State institutions tend, at best, to be insensitive to the importance of community property rights and empowerment and, in general to the need for public space to facilitate the growth of social capital. At worst, they are hostile to decentralized initiatives, viewing them as a threat to their sovereignty. This is unfortunate as, traditional community practices offer considerable hope for sustainable environmental management and can reduce the state's fiscal and administrative burden. Similarly, an aware and motivated civil society can play an active role in environmental conservation. India's environmental NGOs and coalitions are a telling example of this. Their success rate in integrating environmental concerns in economic policies and management is impressive.

### 2.2.1 The Environmental Consequences

**Fig.2.1: Industrial Emissions**



Lapses from sustainable human development, leading to the secular decline in Pakistan's environmental health, are evident from several key indicators. Selective findings from the previous section are reproduced.

<sup>3</sup> Specifically, this refers, not to the management of the environment per se but to the management of development activities within the assimilative capacity of the environment.

Roughly 38% of Pakistan's irrigated land is waterlogged and 14% saline. The annual rate of deforestation ranges from 2.5% - 3%. CO<sub>2</sub> emissions are increasing annually at the rate of 8%-10%. And an estimated 250 million gallons of untreated water out of Karachi is dumped into the Arabian Sea every day, causing great harm to both humans and the ecology. Water toxicity, triggered by the rural-urban interface, has begun to reach alarming proportions. While not fully documented, its debilitating health effects have begun to manifest themselves with increasing frequency, especially in the proximity of large cities and towns. Recent data indicates that over one million acres of fertile, arable land in the Indus delta has become saline and unusable. The retention of freshwater flows by large dams has allowed salt-water incursion on a large scale, a problem likely to be exacerbated by sea-level rise induced by global warming.

### 2.2.2 Quantifying Environmental Losses

Two attempts to quantify environmental losses raise serious concerns about the sustainability of economic growth. Using extremely conservative assumptions, World Bank economists, Brandon and Hammond (1995) estimate that environmental degradation results in the loss of about 4 percent of GDP every year, thus offsetting considerably the conventionally measured GDP gains. The breakdown of the GDP loss includes annual health impacts of water pollution (\$759 million) and air pollution (\$301 million), and the loss of agricultural production due to land degradation (\$300 million).

Fig.2.2: Industrial Effluents



Effluent on its way to Nallah Dek



Lahore

Another way of interpreting the same data is in terms of the net savings rate of the country – after accounting not only for the depreciation of physical capital, but also the degradation and depreciation of “natural capital”, accounting for energy and mineral resource depletion, net deforestation and emission impacts. A low savings rate means the lack of adequate resources for investment and

growth. The Environment Department of the World Bank (1997) estimates the “genuine savings rate” for Pakistan in 1997 to be only 2.5% of GDP. (Banuri and Khan: 2001).

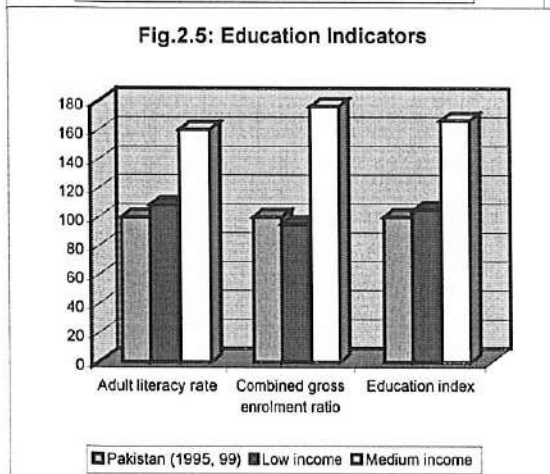
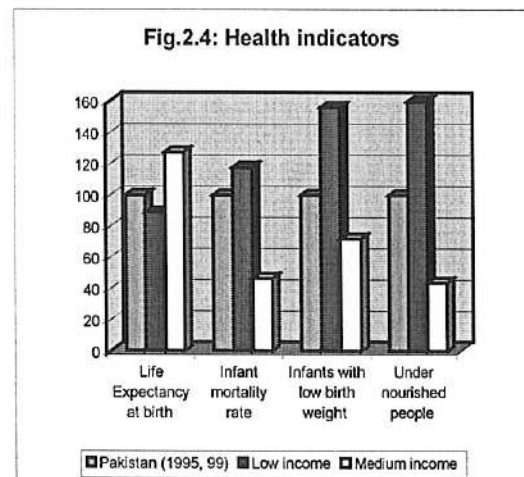
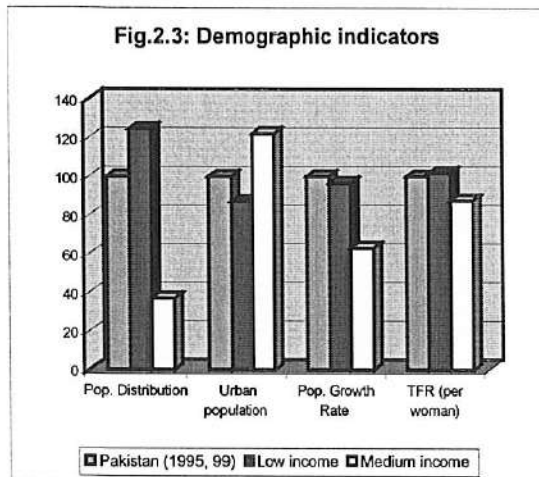
### 2.3 The Indirect Path: The Poverty-Environment Nexus

Unsustainable development processes do not only degrade the environment, but inherent in them are anti-poor biases, which make poor people especially vulnerable to the effects of degradation and pollution. There are two aspects to this. One, development policies force the relocation and concentration of poor communities to marginalized areas (urban slums, degraded rural and mountain areas) and, two, the government does not provide them with the

means to combat or develop a resilience against the effects of degradation and pollution. This is evident in the neglect of the social sectors. Poor communities deprived of education, health, clean drinking water, sanitation and employment opportunities tend both to suffer the effects of and contribute to environmental degradation. It is important to note, however, that the damage communities inflict upon the environment reflect the absence of choices and the development-induced erosion of sustainable management traditions and practices.

### 2.3.1 Social Sector Neglect

Despite impressive GDP growth, averaging in excess of 5% over the past three decades and ensuring a steady increase in per capita income<sup>4</sup>, the effect of growth on poverty reduction is more ambiguous.<sup>5</sup> The proportion of the population below the poverty line fell from 46% in 1984/85 to 40% in 2000/2001 (World Bank: 2001). Less clear is whether the improvement in consumption poverty was accompanied by a reduction in the absolute number of people falling below the poverty line. Pakistan did not perform well by another measure of poverty, namely, income inequality -- as represented by the Gini coefficient. From .43 in 1984-85, the coefficient decreased to 0.31 at present.



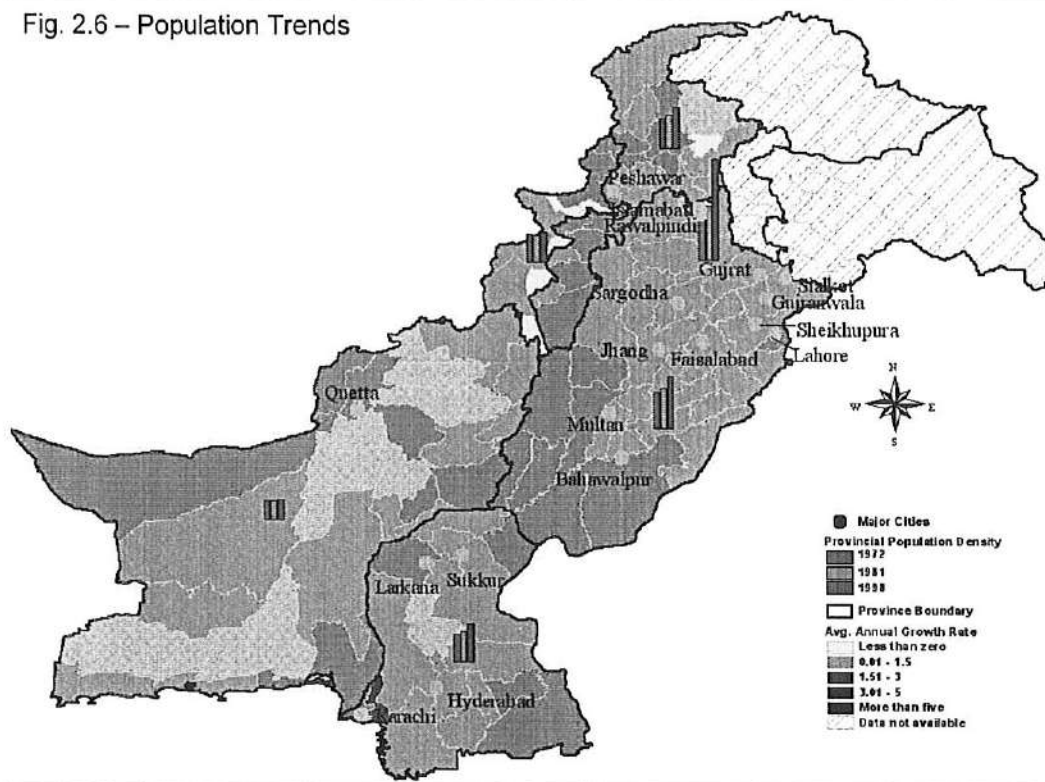
Pakistan's performance on its social indicators does not compare well with the average performance for middle income countries.<sup>6</sup> Not surprisingly, Pakistan was relegated from the medium to the low human development category in 1999. In this context, it is little comfort to know that its social indicators fare better than or are equal to the average for low income countries. Also, these indicators mask rural-urban differences, where the access to and quality of rural services and infrastructure

- 4 Currently assessed at \$511 in real terms and at \$1,834 in purchasing power parity terms.
- 5 Poverty is a multidimensional term. Consumption poverty refers to the extent to which the private consumption of individuals or households falls below the 'poverty line', the minimum acceptable standard of private consumption. Another important dimension focussing on human development, a term which captures improvements in education, health, water and sanitation and the provision of sustainable livelihoods.
- 6 The indicators are shown as indices with Pakistan's performance as the benchmark

tends to be far below its urban counterpart 7. The consequences of low social sector development on the environment are reviewed below.

### 2.3.2 The Effects of Population Growth: Ecological Marginalization

Fig. 2.6 – Population Trends



Development which empowers the few, population growth and the growing scarcity of natural resources combine to create a situation known as ‘resource capture.’

Resource capture occurs when population growth combines with a decline in the quantity and quality of renewable resources and the spread of market incentives to encourage powerful groups to alter the distribution of resources in their favor. Resources are, in effect, appropriated by elites, increasing environmental scarcity among poorer or weaker groups as a result. The manner in which this is done is through conversion of land from customary tenure to formal land titling. Groups experiencing this scarcity are then often ecologically marginalized as they migrate to rural or urban areas that are ecologically fragile. The resulting high population densities in the receiving areas, along with the migrants’ lack of capital and knowledge of how to protect local resources, act to generate further environmental damage and chronic poverty. As scarcities of resources such as forests and urban land worsen their prices increase which leads to more acquisitive behavior, in effect creating a self-perpetuating cycle. (Gizewski and Homer-Dixon: 1996: 9, 10).

This phenomenon of resource capture marginalizing poor communities is probably most visible in forestry practices and is represented by the juxtaposition below.

7 The social sector data is compiled from the UNDP, Human Development Report, 2001

**2.7: Environment-Poverty Effects****2.8: Poverty-Environment Effects**

Ecological marginalization exhibits itself in two ways primarily. First, land hungry rural populations in the NWFP have moved into marginal lands, into erosion prone hill areas and into fragile semi-arid areas, which have traditionally served pastoral groups and their herds. This has resulted in conflicts over land access. Consequently, low-quality pasture is now used more intensively and pastoralists herds, forced to graze post-harvest crop residues, are not fertilizing agricultural land as much as before. As resources come under pressure from increasing numbers of land-poor and landless rural people, traditional management, tenure and rights systems face collapse. Thus, grazer rights are being encroached upon, tree rights are subsumed under land rights, leading to deforestation and land clearing and state lands are under constant threat from farmers, loggers and fuelwood collectors. The refugee influx in NWFP and Balochistan has aggravated the problem further.

**2.9: Stagnant water in a low income settlement****2.10: Waste disposal practices in a low income settlement**

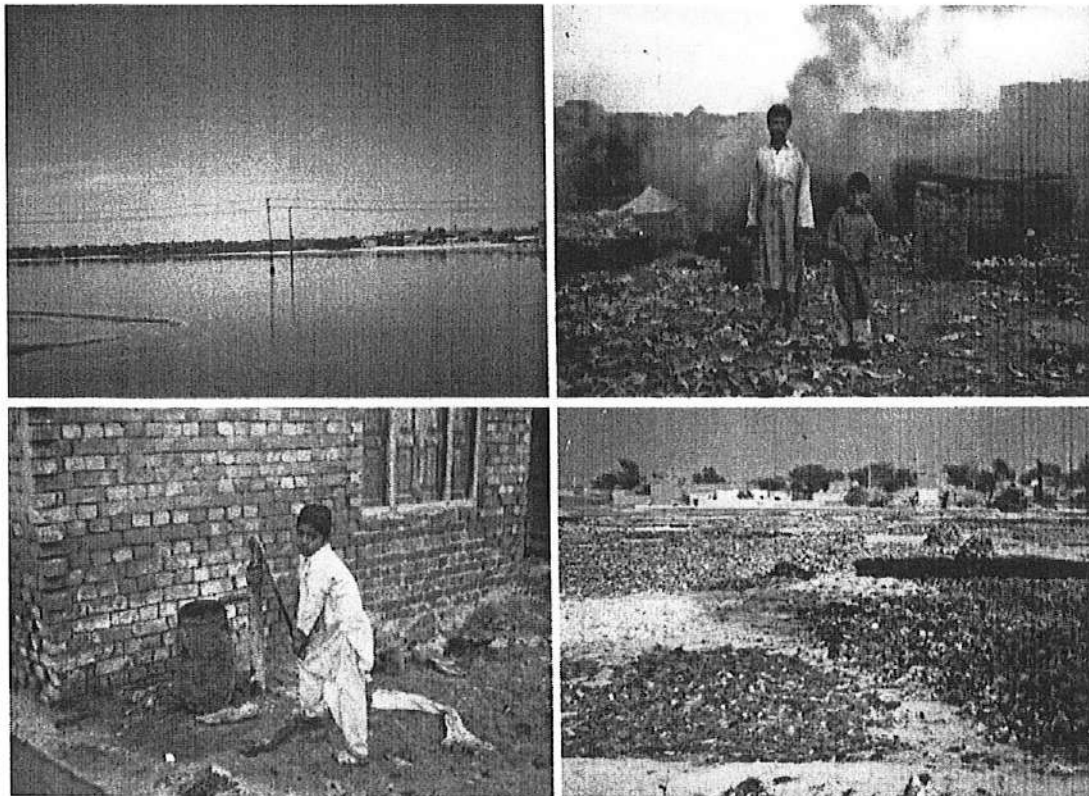
Second, rural population pressure induces migration to urban areas, contributing to urban population growth, presently in excess of 4%. Growing populations are straining the capacity of the urban environment to absorb the wastes and emissions they produce. In turn, the unassimilated pollutants emanating from poor sanitation, lack of clean water, industrial, energy and transport emissions have exposed such populations to health hazards. An additional push factor in rural areas is the growing land resumption, encouraged by commercial agriculture, which has rendered small farmers share croppers and tenants landless unemployed, forcing them to migrate.

### 2.3.3 Sector Impacts and Vulnerability

This sub-section highlights sector vulnerabilities. The effects of degradation and pollution on the marginalized populations are specially destabilizing because of their limited choices. Consequently the potential for social instability and conflict is high.

*Water Pollution:* Although water pollution caused by organic and chemical discharges is widespread, its impacts are predominantly on the poor, a result of the skewed distribution of sewage, sanitation and piped water facilities, both across the rural-urban divide and in poor urban slums.

Fig.2.11: Sources and Effects of Water Pollution



In the older parts of cities, which are prone to in-migration, sewage infrastructure is both poorly designed and corroded, which results in the mixing of raw sewerage and drinking water. Thus, even piped drinking water in poor urban localities is highly contaminated. Where it is not available, residents are compelled to use groundwater accessed through dug wells and shallow hand pumps. Such water also contains bacterial and chemical impurities, as does the water flowing through streams and rivers, which is used for drinking and washing.

In rural areas, the poor depend on rainwater which accumulates in ponds, in rivers and springs, as well as on ground water extracted through dug wells and hand pumps. The absence of modern sanitation and prevalent evacuation practices results in water contamination. In peri-urban areas, where rural migrants tend to concentrate, on-site run-off as well as from proximate industrial and residential areas contributes to water pollution.

The country generates an average 50,000 metric tons of waste every day. Municipalities collect only 60 percent of this waste. . The poor areas of the city are generally the worst served by garbage collection services, or not served at all. In fact, the solid waste collected in upper or middle class areas of cities is often dumped in the slums and city peripheries, either in landfills or thrown directly into watercourses. The resulting problems are smell; disease vectors and pests attracted by garbage and overflowing and clogged drainage channels.

Compounding the problem is the fact that there is a chronic lack of health facilities to deal with the effects of water pollution. The absence of adequate nutrition and lack of education and overcrowded housing increase vulnerability to disease. A telling statistic is that infant mortality continues to remain high, even though most demographic indicators have improved, a result of infants' high rate of exposure to waterborne diseases. Trapped in a vicious cycle, those who are the most disadvantaged are ultimately made more so.

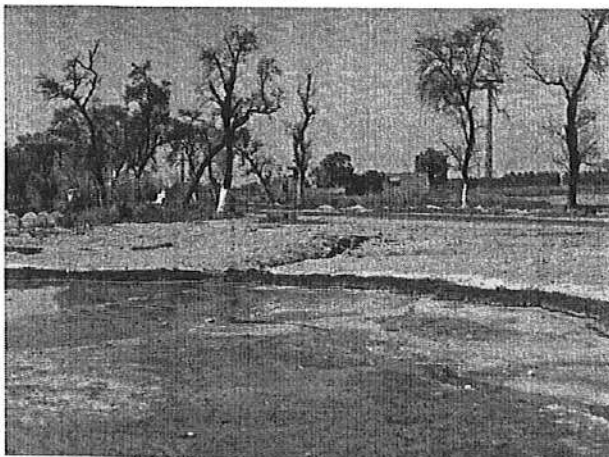
**Deforestation:** Historical pressure on natural resources and ambiguously defined property rights, overlain with rigid and increasingly corrupt management, have contributed to rapid deforestation.

The root cause of deforestation lies in forest management practices, which have focused more on economic than on environmental utility. Such practices also work against communities. Colonial governments had originally weakened community rights to the use of forest resources. Usufruct rights continued to remain but were heavily proscribed. Community management traditions, already fragile, were eroded further with new opportunities for employment and out-migration.

Weak property rights and increased fears of expropriation by influential groups fuel insecurity about future earning streams, especially in an inflationary environment and, in general, give rise to concern about the free rider problem, namely, that forests will disappear no matter what the community might do (Inayatullah: 1996). Even in privately owned forests (guzaras) "right holders may see in regeneration a reintroduction of state property rights, which may stifle even natural regeneration." (Azhar: 1993). The situation contains the seeds of conflict, with communities forced to act as predators, rather than as guardians of the commons.

While there is little doubt that under the presently hostile management and tenure regimes, communities are showing a propensity to raid forest resources, their activities pale in

**Fig.2.12 – Soil Pollution**



comparison with the activities of the 'timber 'mafia', driven by rising timber prices. The timber trade also demonstrates a distinct anti-community bias; while communities are entitled to a substantial share of revenues (royalties) from the logging in 'guzara' forests, active collusion between the 'mafia' and the forest department results in appropriation of the bulk of these royalties (Knudsen: 1995)

*Agricultural Land Degradation:* The Green Revolution strategy of agricultural

development was premised upon a sufficiency of both land and water. Major irrigation schemes (fed by Mangla and Tarbela) were launched to harness this water and to apply it at the extensive margin. The intensive application of water and chemical inputs to high yielding dwarf varieties enhanced crop yields in wheat, rice, cotton and maize to a remarkable degree. However, the strategy has also raised questions regarding its longer-term viability. The evidence is beginning to show that the country's agriculture resource base, comprising both land and water, has been mined unsustainably. The drainage system has not been able to cope with the irrigation practices, creating serious problems of water logging and salinity (Faruquee et al: 1996)

Environmental impacts stemming from input subsidies are even more pronounced and wide-ranging. They include irrigation water, electricity, pesticides, fertilizer, seed, and machinery. Excessive use of fertilizers and pesticides has given rise to water pollution and soil degradation. A good review of these effects is in Banuri (1998) and Khan (1999). A combination of inadequate O&M, and low water charges have contributed to the waterlogging and salinity problem. Soil degradation affects the health and nutrition status of the poor and lowers their productivity. This can happen directly through lower yields per unit of labor or land because of poor soil quality and, indirectly, through the reduced physical capacity of labor to produce because of malnutrition and poor health. Even in cases where the poor are healthy, labor productivity can be low, due to increased time being allocated to less productive activities, such as fuelwood collection. As a result of deforestation, family members have to go further afield to collect fuel, which takes time away from farming. Also, as fuelwood becomes scarcer, animal dung is substituted as fuel, resulting in soils not being replenished. (Malik, 1999).

## **2.4 Environmental Insecurity and Conflict**

Taken to its extreme environmental degradation can create insecurity and, if not mediated, to conflict. The link between environmental degradation and insecurity is seen primarily from the vantage point of the poor. Conceptually, environment security is shown as a part of the human security paradigm. It is embedded in the notion that resource conflicts (actual and potential) are a direct outcome of development processes which degrade these resources and deny people access to them. Potential flashpoints are beginning to emerge across a wide front: poor communities residing in "katchi abadis" (low income settlements), who are exposed to excessive amounts of air and water pollution; forest dependant communities in the Northern Areas and the NWFP, facing the depredations of the timber mafia and the refugee influx; provinces upstream and downstream of the Punjab, facing the threat of irrigation water shortages; the increasing incidence of droughts and floods. The litany is long and one which the government can ill-afford to ignore. Here we present a case study of forestry conflict in Dir as an illustration of a wider problem affecting forest-dependant communities in locations as diverse as Kaghan, Gilgit (Fairy Meadows) and Nathiagali.

## The Dir Forestry Case Study: Contractors Versus Communities

*The situation is epitomized by the leader who proclaims he will not permit one square meter of national territory to be ceded to a foreign invader, while allowing hundreds of square miles of topsoil to be eroded away each year.*

**Unknown source**

The primary forests in the Northern Areas and the NWFP have many important economic uses and are a source of livelihoods for communities. In addition, many ecological and environmental benefits and imperatives are associated with them. The data shows a rapid decline in both areal coverage and the quality of forest stands. Such deforestation has led to a spate of onsite and downstream ravages such as biodiversity loss, erosion and erosivity, flooding and dam sedimentation.

The management system, designed for a specific purpose, has been unable to cope with these changes. The conflicting interests of commercial loggers, private developers, government and military agencies, hunters and impoverished communities has placed it under relentless strain. The forest department tends to choose the path of least resistance, coming down with a heavy hand on the disempowered communities and colluding for personal gain with vested interests. Officials have become increasingly vulnerable to outside economic inducements, as opportunities for financial and professional betterment become hostage to fiscal insolvency.

Dir-Kohistan presents a situation where the misappropriation of royalties has led to outright conflict. Interestingly, even recourse to the legal system has produced no redress, even when decisions ostensibly favored the communities.



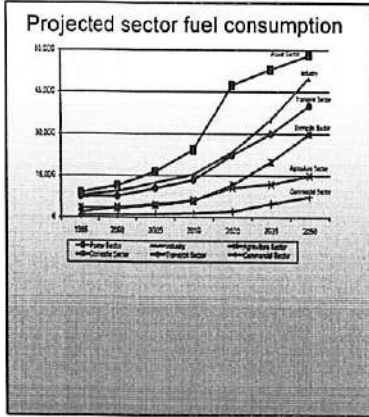
After independence, Dir-Kohistan's rich forests were declared state property and the communities were promised a 15 percent royalty in the income from the forests. Commercial logging began on a large scale. Initially, this was done through contractors, who cut more trees than the legal limit, did not share the proceeds and went so far as to disallow communities their traditional subsistence rights. Discord began as early as the 1970s, erupting into outright violence, when authorities resorted to force and shot dead a number of community leaders. This led to the abolition of the contractor system, which was replaced by the Forest Development Corporation (FDC). The community share of the royalties was increased to 60%. This was an enormous windfall, provided the communities were given their due share. However, very little of this windfall filtered down to them.

Growing resentment against the government, the FDC and the contractors finally came to a head in the early 1990s. Village youth banded together to form the "Kalkot Youth Welfare Society (KYWS)." They set up a manned check post to stop all movement of timber outside the valley and both the written and spoken rhetoric became hostile. The government attempted to diffuse the situation initially. It set up an Inquiry Committee in 1997 to investigate the community's grievances. The findings of the committee vindicated the community's stance and advised redress but the district administration failed to act upon its recommendations. Encouraged by its moral victory, the KYWS took its resistance to a new level. A smuggler was shot dead at the check post by the community guards, new check posts were set up and the society organized peaceful marches and sit-ins, first locally in Shringal, Dir and Timergarah and eventually in the provincial capital, Peshawar. However, no resolution of the problem is in sight. The provincial and district governments have adopted a hostile stance, accusing the communities of taking the law in their own hands. An uneasy stalemate prevails at present, with a real risk that the situation will escalate into large-scale conflict.

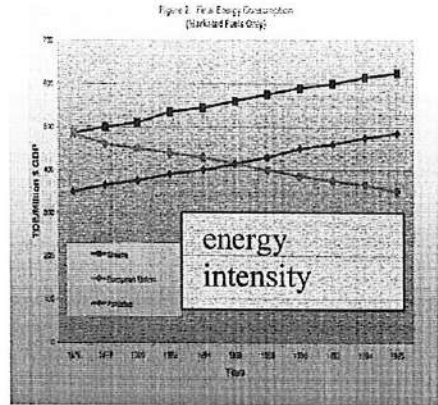
**Part III**

**Key Environmental Issues**

## PRESSURE



**Table 1.**  
2 fuel substitution



**Average concentration of Ambient air pollution in suburban Karachi at different times of the day**

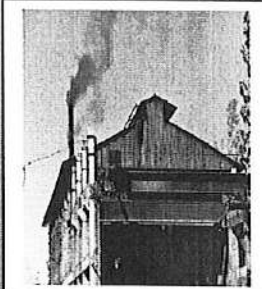
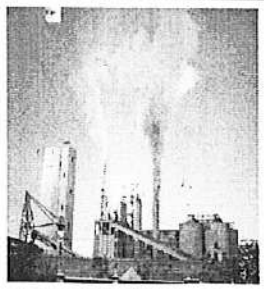
Time	Ozone (ppb)	SO <sub>2</sub> (ppb)	CO (ppm)	PM <sub>10</sub> (ug/m <sup>3</sup> )
00:15	7.52	1.04	0.59	137.66
10:30	10.75	1.48	0.45	173.62
14:15	20.09	1.35	0.41	251.80
Average	9.89	1.29	0.51	174.13
Maximum	20.36	4.69	0.77	251.84
Minimum	4.62	0.73	0.14	115.31
WHO guidelines values	47-66	35-52	9.0	90-150

**Reported Cases ARI) in the Punjab Province**

Year	Children (Under five years)	All age groups
1998	837,693	2,826,000
1999	1,024,004	3,304,000
2000	1,536,514	4,989,000

**Blood lead levels (ug/dL) in a study population of Peshawar, Islamabad and Chak Shahzad**

Sites/Cities	Number of Males	BPbL Male ug/dL	Number of Females	BPbL Female ug/dL
Peshawar	3074	21.2 + 8.15	126	16.8 + 4.81
Islamabad	101	23.05 + 2.8	129	22.5 + 3.90
Chakshahzad	88	3.22 + 0.19	82	1.49 + 0.10



### RESPONSES

Acts,  
Epa  
Epos  
tribunals

Strategies  
NCS  
NCS

### GAPS

Policy Failure

### RECOMMENDATIONS

Wave of the Future  
Improving Energy Efficiency  
Time Profile

## A. NEAP

### 1. Air

#### 1.1 Introduction

Generically, air pollution is caused by fuel combustion in various sectors: domestic use, power generation, transport and industry. The problem is aggravated by meteorological conditions and a combination of population density and urbanization. Air pollution results in several problems, such as health hazards, especially for women and children, adverse effects on agriculture, livestock, building material and structures, cultural and archaeological monuments. While air pollution is considered generally to be an urban phenomenon, it is becoming a rural problem as well with the penetration of transport and expansion of industry and the growth of brick kilns. Air pollution monitoring and control efforts are both inadequate and tend to be urban-centered.

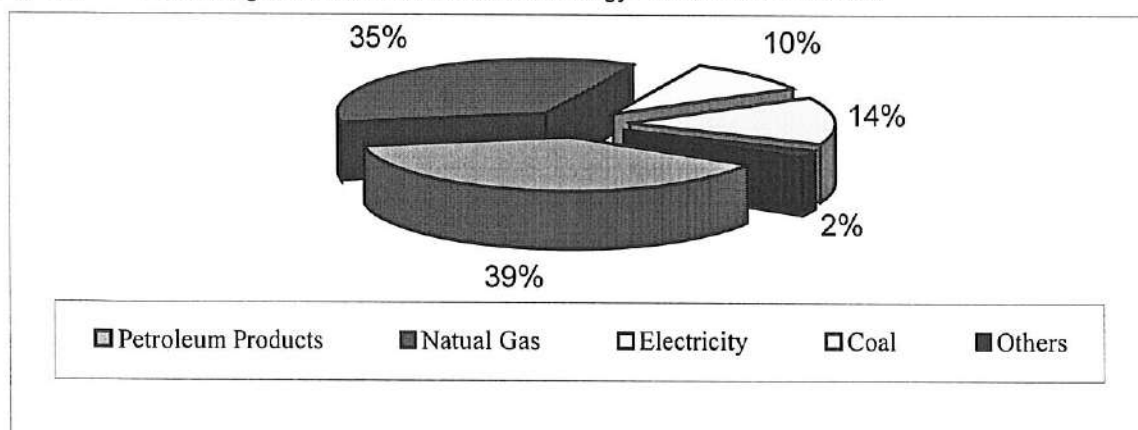
#### 1.2 Pressure

The key factors contributing to air pollution in Pakistan are: a) rapidly growing energy demand; b) high energy intensity (a measure of energy inefficiency) and; c) an expected change in fuel composition, based on recoverable reserves.

##### 1.2.1. Energy Demand Projections

The energy system in Pakistan is traditionally a demand based one. The level, structure, and evolution of this demand is derived from the level of economic activity and the intensity of energy use at the sector level. (Hagler Bailly, 1997). The distribution of energy sources is presented in Fig.1 below:

Fig 1.1: Percentage Shares of Commercial Energy Delivered in 1992-93<sup>1</sup>



Energy sector studies suggest that if energy demands continue to grow at the currently estimated rate of about 7% per annum, Pakistan will need annual energy investments of about 6%-8% of GDP during the decade, as opposed to the historical average of about 4% of GDP. Load forecasting studies undertaken by the Water and Power Development Authority

1 Source: Ashfaq Mahmood, National Conservation Strategy, Energy, National Conservation Strategy Secretariat, Islamabad, 1998

(WAPDA) indicate that, over a span of 24 years, power demand will increase to between 4.8 to 5.8 times its present level. (Hagler Bailly, 1997)

Table 1.1 shows the projected energy demand by sector. Fuel consumption is expected to increase six-fold by the year 2050. The domestic sector is the major energy-consuming sector (55%), followed by industry (22%), transport (18%), and agriculture (2%).

Table 1.1: Projected sector fuel consumption

	1996 <sup>2</sup>	2000	2005	2010	2020	2035	2050
Power Sector	8,925	11,400	16,500	24,300	47,400	53,000	58,000
Industry	7,729	9,400	12,500	15,500	23,500	35,000	50,000
Agriculture Sector	1,800	3,700	4,700	6,200	10,700	12,000	15,000
Domestic Sector	3,365	3,300	4,500	6,000	11,700	20,000	30,000
Transport Sector	7,494	7,600	10,500	13,500	22,500	30,000	40,000
Commercial Sector	888	950	1,200	1,500	2,150	5,000	7,500
Total	30,201	36,350	49,900	67,000	117,950	155,000	200,500

Source: Khan et al, 2001

### 1.2.1.1 Households

The household sector clearly is the largest single energy-consuming sector in the country. Biomass fuels; fuel-wood, crop residue and dung account for 95% of energy consumed by households in rural areas, with the share dropping to 56% in urban areas: however, this figure conceals its disproportionately high concentration in the low-income settlements. Biomass combustion is a major source of indoor air pollution and affects primarily the health of women and children. In this context, the expected switch to conventional fuels as a result of depleting biomass stocks will be an encouraging development.<sup>3</sup>

### 1.2.1.2 Transport

Increasing prosperity and population growth in developing countries have resulted in accelerated growth in vehicle numbers and kilometers traveled. Pakistan is no exception. The total road length measured at 94 thousand kilometers in 1981 has increased to 232 thousand kilometers in 1998, an overall increase of 147%. The number of vehicles has increased almost precipitously, from 0.8 million to about 4.0 million within 20 years, an overall increase of more than 400 % (see overview section, table 2.1.)

Road transport consumes 47.2% of the total petroleum products produced and imported. Lead compounds are added in petrol to increase the efficiency of car engines and to reduce engine knock. The high lead content in petrol ends up being released into the environment. On average, it measures about 0.35 gram/liter, which is very high by US and many European standards (0.00 – 0.15 gram/liter). Two other factors contributing to high emissions are the

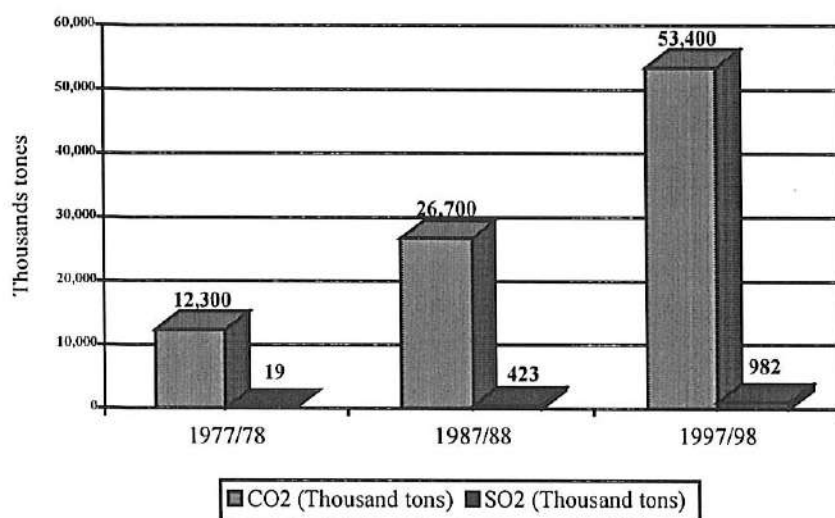
3 There are some 1,435 million standing trees with total wood weight of 210 millions or an average of 2.4 tones per hectare. The consumption of wood in 1990-91 was about 32 millions tones. A gap of about 10 million tonnes exists between annual growth and demand which raises issues of sustainability.

predominant use of diesel (in about 72% of the vehicles driven) and fuel use inefficiency. (S.R Khan et. al. 2001).<sup>4</sup>

### 1.2.1.3 Industry

Industrial activity without adequate air emission treatment or control is one of the major causes of deterioration of ambient air quality. It has not been possible to assess the magnitude of industrial air pollution as there is little available information available. However, Figure 1.2 illustrates the problem reasonably well.

Fig 1.2: Estimated air pollutants from industry.



Industrial discharges have increased significantly over the past twenty years. Emissions of carbon dioxide and sulfur dioxide has increased by a factor of four and five hundred, respectively

### 1.2.1.4. Ozone Depleting Substances (ODS)

In Pakistan, the ODS are used mainly in deep freezers, refrigerators, car air-conditioners, foam, fire extinguishers and solvents. The country does not produce any ODS, importing all of its requirements. The total consumption of ODS in 1995 was 3,188,5 tonnes. This translates into an annual per capita consumption of roughly 0.018 kg. Twelve ODS were identified in use in 1999. The most common among them in descending order were CFC-12, HCFC-22, CFC-11 and carbon tetrachloride (MELGRD, 2001).

### 1.2.1.5 Others

For a developing country like Pakistan, urbanization has also been one of the significant factors contributing to environmental degradation in general and air pollution in particular. The number of cities with a population of over one million increased from three in 1981 to seven in 1998. Air pollution in the urban centers, particularly in the larger cities, has assumed alarming proportions. Open burning of solid wastes, including plastic bags, is a common practice both in the urban and rural areas and is compounded by the biodegradation of such wastes. Methane produced from decomposition of municipal and industrial waste is estimated

<sup>4</sup> The price of diesel is highly subsidized which creates little incentive to conserve or switch to cleaner fuels

to contribute 338,000 tonnes/year of methane (Hagler Bailly, 1997). Another significant source of air pollution in the country, especially around suburbs of major cities, is brick manufacturing. Large quantities of coal, leather and rubber wastes are used as fuel in brick kilns, which emit quantities of ash and other pollutants in the air. Emission levels worked out on the basis of energy consumption and emission factors indicate that emissions of carbon monoxide and sulfur dioxide from brick manufacturing exceed those from most industries (TTSID, 1995)

### 1.2.2 Fuel Substitution

Inter-fuel substitution trends indicate a move towards high emitting fuels. This is likely to continue, based on diminishing reserves of the less polluting energy sources, such as natural gas and hydroelectricity. The status and prognosis with regard to fossil fuel reserves is shown in table 1.2.

Table 1.2: Fossil fuel reserves as on June 30, 1996<sup>5</sup>

(Million gigajoules)

Fuel	Original Recoverable Reserves	Cumulative Production	Balance Recoverable Reserves	Production Per Year	Depletion Time (Year)
Crude Oil	3309	2005	1309	125	10.5
Natural Gas	25116	9383	15736	622	26
Coal	10527			80	

Source: Energy Wing, GOP, 1998

The original gas reserves had already fallen from 25.12 billion gigajoules to 15.74 billion gigajoules as a result of cumulative production. At an yearly production rate of 62 billion gigajoules, the reserves are likely to be exhausted by the year 2026 (Beg, 2000). While oil reserves are forecast to last for the next ten years, they were not very significant to start with and Pakistan has been meeting the bulk of its oil requirements through imports, which it is likely to continue doing. In fact, imports notwithstanding, electricity production is moving rapidly towards thermal energy and in this category towards oil as a fuel source (See Overview: Figures 2.4 and 2.5).

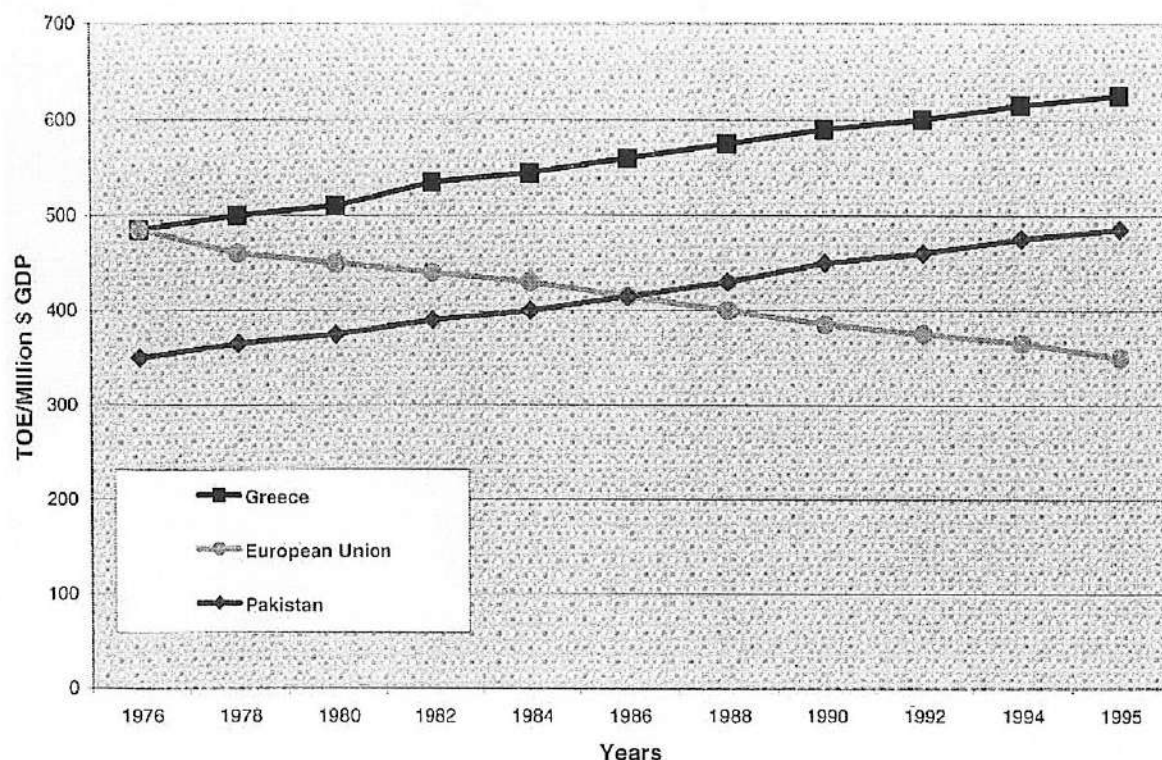
Another potential energy supply source is coal. The country has recoverable reserves of about 184 billion tons as of June 1996, 95 % of which consist of the recently discovered coal in the Thar region. The coal is of a low-grade quality with very high sulfur content and, therefore, its emission potential is high. The overview section alludes to a rising trend in coal use, both for thermal power generation and in households. The future tendency will be to tap the extant large coal reserves, as cleaner fuel sources diminish.

### 1.2.3 Energy Inefficiency

Pakistan is an energy deficient country but uses the commercial energy at its disposal in a highly inefficient manner. As Figure 1.3 shows, Energy intensity levels (a measure of energy inefficiency) for Pakistan converged to the European average in 1985, with the comparison becoming distinctly unfavorable in 1995.

<sup>5</sup> Source: (Energy Wing, GoP, 1998)

Fig.1.3: Energy Intensity



Some of the factors contributing to high-energy intensity are:

- transmission and distribution losses in power generation (an average 25% over the past 20 years)
- tariff concessions on imported, second-hand machinery
- fuel price subsidies on diesel
- an ageing vehicle fleet (50% over 10 years old), which is primarily diesel powered (75%)
- indigenization and relative inefficiency of vehicle production
- rapid penetration of new appliances (air conditioners, refrigerators, heaters) in private homes

Another point to note is that not only is energy inefficiency in developing countries a source of concern per se but its impacts are highly localized, impacting predominantly on the poor.

### 1.3 State

Industry is the largest emitter followed by the transport sector. However, the share of the power sector in total emissions has increased in recent years, as a result of its growing dependence on petroleum products, specifically furnace oil. The domestic sector's contribution to total emissions has remained constant over time in absolute term but declined relative to other sector i.e. industry, transport and power. (Hagler Bailly, 1997)

### 1.3.1 Emission of Air Pollutants by Sector

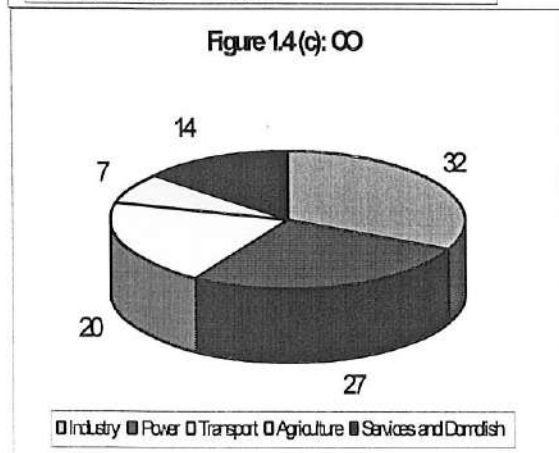
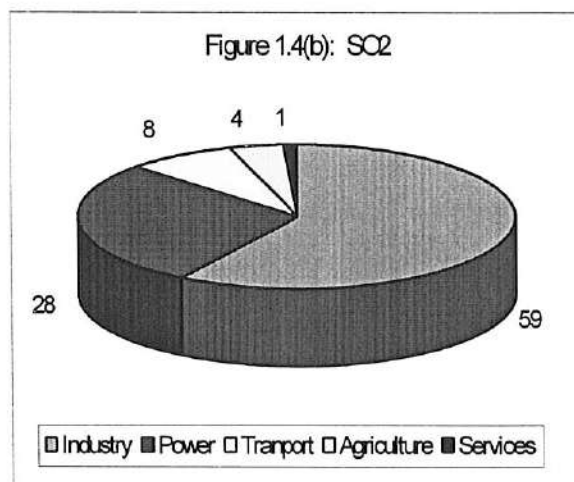
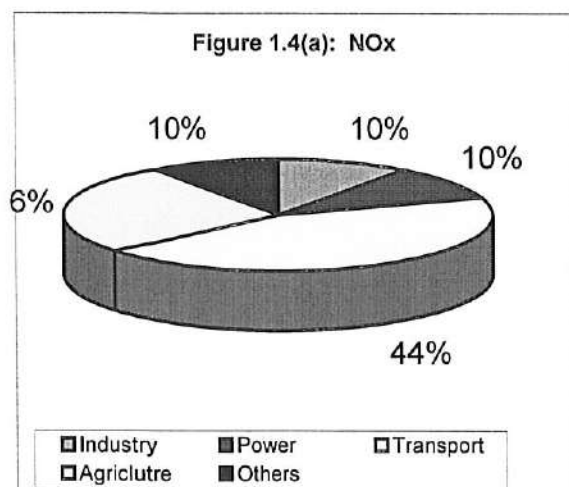
Table 1.3 shows the rapid pace of the increase in air emissions over two decades between 1977-78 and 1997-98 across the major commodity producing sectors.<sup>6</sup> Thus, for example, the average increase in sulphur dioxide across all the sectors was twenty-three fold over these two decades. Similarly, nitrogen oxides increased twenty-five fold in the power sector and carbon dioxide increased an average of four fold.

Table 1.3: Estimated air pollutants from various economic sectors  
(Thousand tonnes)

Sector	1977-78			1987-88			1997-98		
	CO <sub>2</sub>	SO <sub>2</sub>	NOx	CO <sub>2</sub>	SO <sub>2</sub>	NOx	CO <sub>2</sub>	SO <sub>2</sub>	NOx
Industry	12308	19	N.A	26680	423	N.A	53429	982	N.A
Transport	7068	52	N.A	10254	57	N.A	18987	105	N.A
Power	3640	4	3	11216	95	na	53062	996	76
Domestic	16601	5	N.A	24054	16	N.A	39098	40	N.A
Agriculture	845	5	N.A	4490	28	N.A	6368	40	N.A
Commercial	1726	11	N.A	2587	13	N.A	4261	25	N.A

Source: Taken as is from Government of Pakistan / IUCN (1992, P. 82)

Note: N.A = Not applicable  
CO<sub>2</sub> = Carbon dioxide  
SO<sub>2</sub> = Sulphur dioxide  
NOx = Nitrogen oxides



The sectoral distribution of these emissions is shown in Fig.1.4. During 1995 - '96, SO<sub>2</sub>, NOx and CO<sub>2</sub> emissions were about 1.1 million tons, 540 thousand tons and 92 million tons, respectively (GOP Energy Wing, 1998).

Table 1.3 desegregates industry emissions. Sugar, cement, iron and steel, refining and petrochemicals are the highest emitters.

<sup>6</sup> Note the numbers for 1997/98 are projections based on actual increases between 1997/78 and 1987/88.

Table 1.3: Industrial Emission Levels.

(000 tons)

Sector	CO <sub>2</sub>	SO <sub>2</sub>	CO	NO <sub>x</sub>
Iron & Steel	3,939.96	15.02	0.73	0.61
Cement	4,156.34	55.04	50.82	5.27
Glass, Ceramics	153.03	0.87	0.80	0.14
Refining, petrochemicals	696.51	8.77	8.17	0.88
Chemicals	1115.28	0.37	1.07	0.87
Textile	1,343.27	2.45	2.94	1.10
Pulp and paper	631.42	1.94	2.15	0.57
Sugar refining	5,887.02	0.81	173.64	0.16
Leather and footwear	49.65	0.14	0.15	0.04
Food, bev. and tobacco	1,154.55	2.08	2.45	0.93

Source: TTSID, October, 1995

Hydrogen sulphide (H<sub>2</sub>S) emissions occur mostly in gas field where the gas is processed for removal of sulfur. The emissions range between 25 to 35ppm, whereas 5 ppm is considered the permissible exposure limits.

### 1.3.2 Greenhouse Gas Emissions (GHGs)

Pakistan's per capita emissions are far below the global average. As such they are more a source of national rather than global concern because of their localized impacts. However, efforts to record greenhouse gas (GHG) emissions reflect Pakistan's commitments to the United Nations Framework Convention on Climate Change (UNFCCC), to which it is a signatory (see Part IV-2). The two main GHG emissions are methane and carbon dioxide, with a combined total of 237,541 Gg. in 1995. The primary source of methane emissions is agriculture, consisting of enteric fermentation in livestock and anaerobic decomposition in rice paddies. Both constitute about 80% of total methane emissions.

### 1.3.3 Ambient Air Quality

#### 1.3.3.1 Air Quality

Table 1.5 presents estimates of ambient air quality in major cities in the Punjab for 1996. Relative to WHO safety levels, the amount of sulphur dioxide (SO<sub>2</sub>), carbon monoxide (CO) and Ozone (O<sub>3</sub>) in the atmosphere are well below danger levels. On the other hand, NCS data shows carbon monoxide levels in Karachi and Lahore exceeding considerably WHO recommended levels. Data regarding particulate matter in the atmosphere is more uniform. The estimates (both total suspended solids (TSP) and PM<sub>10</sub>) are well above safety levels across all the major industrial cities in the Punjab.<sup>7</sup> Table 1.4 shows that essentially the same is true for suburban Karachi during different times of the day.<sup>8</sup>

Given the fuel mix and efficiency standards in Pakistan, which are far below those in industrial countries, it is difficult to accept findings which indicate that, conversely, ambient

7 Note GoP/UCN (1992) mentions that CO of 8-30 ppm and 6-40 have been recorded in Karachi, but no source is cited.

8 Ibid. Study by the PEPA/EPD/JICA, July 2000 was cited to show that particulate matter in Lahore, Rawalpindi and Islamabad was 6.4 times higher than WHO standards.

air quality is much better. More reliable data is needed to arrive at clear conclusions. The emission trends, per se, suggest caution in developing a false sense of security with respect to ambient air quality. In metropolitan cities of Pakistan an accurate assessment of ambient air quality is difficult because of dearth of reliable information and data on environmental parameters and the differences in the data collection methodologies adopted by various research organizations. Also, due to the absence of monitoring facilities, pollutant concentrations have never been checked on a continuous basis.

Table 1.4: Average concentration of major ambient air pollution in suburban Karachi at different times of the day

Time	Ozone (ppb)	SO <sub>2</sub> (ppb)	CO (ppm)	PM <sub>10</sub> (ug/m <sup>3</sup> )
00:15	7.52	1.04	0.59	137.66
10:30	10.75	1.48	0.45	173.62
14:15	20.09	1.35	0.41	251.80
Average	9.89	1.29	0.51	174.13
Maximum	20.36	4.69	0.77	251.84
Minimum	4.62	0.73	0.14	115.31
WHO guidelines values	47-56	35-52	9.0	90-150

Source: Based on Government of Pakistan (1998, pp.178-181).

Notes: SO<sub>2</sub> = Sulphur dioxide  
 TSP = Total suspended particulate matter  
 O<sub>3</sub> = Ozone  
 CO = Carbon monoxide  
 PM<sub>10</sub> = Particulate matter having size up to 10 microne (respirable dust)  
 ppb = Parts per billion  
 ppm = Parts per million  
 ug/m<sup>3</sup> = Parts per million microgram per cubic meter

Table 1.5: Ambient air quality of major cities in the Punjab (1996)

City	SO <sub>2</sub> (ppb)	NO <sub>x</sub> (ppb)	CO (ppm)	TSP (ug/m <sup>3</sup> )
Islamabad	28.5	148.5	1.55	520
Rawalpindi	30.7	74.7	1.83	709
Lahore	44.6	156.6	2.82	895
WHO Guideline Values	35-52		9.0	150-230

Source: Pak-EPA/JICA, March 2000

Notes: SO<sub>2</sub> = Sulphur dioxide  
 TSP = Total suspended particulate matter  
 CO = Carbon monoxide  
 NO<sub>x</sub> = Nitrous oxide  
 ppb = Parts per billion  
 ppm = Parts per million  
 ug/m<sup>3</sup> = Microgram per cubic meter

In 1993 the EPA, NWFP carried out air quality monitoring over a 48 hour period at a few sites in Peshawar, Kohat and Mingora (Swat). The range of average concentrations (ug/m<sup>3</sup>) for SO<sub>2</sub>, NO<sub>2</sub> and dust were found to be 1-5, 38-156 and 1290- 640 (Khan et al, 1998). Comparison of these results with the generally accepted air quality standards showed the dust level to be ten times higher than the limit value (WHO/USA standards). The Pakistan Council for Scientific and Industrial Research (PCSIR), monitored CO concentration in the air for a twelve hours period at sixteen sampling points along the main roads in Peshawar. The range of average CO concentration was found to be 11 - 17 ppm, compared to the WHO tolerance limit of 9ppm. At certain sampling points, CO levels were observed in the range 40 - 100 ppm during peak hours.

The content of lead in petrol is proportional to the release of lead into the environment. In Pakistan, presently, the lead content in petrol (Premier Plus) is 0.35 gram/liter which is very high compared to maximum lead content of 0.00 – 0.15 gram per liter in USA and many European countries. Regular, Super Premier and HOBC are reported to have lead content of 0.42, 0.63 and 0.84 gm/liter, respectively (Lovei, 2000 and Hagler Bailly, 2001) Various studies have been reported on lead levels in ambient air sites and dust fall in Peshawar, Rawalpindi, Lahore and Karachi.<sup>9</sup> The reported lead levels (micrograms/cubic meter) were:

Karachi (1980–‘81)	0.13 – 11.24
Peshawar (1994–‘95)	0.21 – 7.79
Lahore (1993–‘94)	0.15 – 8.36
Lahore (1999–‘2000)	0.89 – 7.85
Rawalpindi (1999–‘00)	0.71 – 10.00

These are high levels compared to the WHO permissible levels in ambient air based on an annual average gives a range of 0.5 to 1.0 ug/m (Shigeta, 2000)

## 1.4 Impacts

Air pollution is the source of several problems such as adverse health impacts on citizens, especially senior citizens and children, effects on vegetation, building material, structure, livestock, agriculture and visibility. Epidemiological data collected in developed countries suggest that air pollution affects both death and illness rates and generates high social costs, associated with premature death and deteriorating quality of life. While not many studies have been carried out in Pakistan on health impact assessments, the few that have been are quite detailed with regard to their quantitative and explanatory content.

### 1.4.1 Health Impacts

The health impacts of air, water pollution and productivity losses from deforestation and soil erosion were monetized at \$1.71 billion, or 3.3 percent of GNP, in the early 90s (ADB, 2001). The losses attributed to air pollution, in terms of health care costs, are in the region of \$500 million per year.

#### 1.4.1.1 Acute Respiratory Infection (ARI)

ARI and other lung diseases are related directly to polluted air. In the Punjab province, the incidence of ARI is increasing rapidly. A survey of 18 common disorders in the province indicates that ARI is the third most common disease among children after diarrhoea and dysentery. The number of reported ARI among children almost doubled from 837,693 in 1998 to 1,536,514 in 2000.

9 Khan, 1991; Shigeta, July, 2000; Compendium on Environment Statistics Pakistan 1998; Government of NWFP, 1994.

Table 1.6: Reported Cases ARI) in the Punjab Province

Year	Children (Under five years)	All age groups
1998	837,693	2,826,000
1999	1,024,004	3,304,000
2000	1,536,514	4,989,000

Source: PED, PECC/SDPI, 2001

Other respiratory diseases, such as asthma, are linked to air pollution. A health survey was carried out in Peshawar in 2000 to study the health impacts of air pollution. 479 residents (male and females between 30–40 years) were selected, around brick-kilns (158 sites), heavy traffic (63 sites) and control sites (158). The report findings were that that 33% and 31% of residents around brick-kiln sites and heavy traffic sites, respectively, suffered from asthma, compared to 13% residents of the controlled sites (GTZ-NWFP, EPA, 2000)

The health impacts of air pollution are also evident from media reports of public complaints lodged with provincial environmental protection agencies (EPAs). Last year, a survey report revealed that dwellers of Babri Banda Town (Kohat, NWFP) living around an old cement plant (installed in 1983) were experiencing lung and chest ailments and respiratory problems, caused both by the emission of poisonous gases and dust from the plant and blasting in the nearby mountains. Another survey, published last year, reported numerous health problems faced by people of Nawabshah (Sindh province), due to smoke and emissions from several industries operating within the town itself. Doctors at the Medical College Hospital, Nawabshah reported an increase in the number of patients with symptoms of asthma, bronchitis, ulcer and skin diseases (Pakistan Journal of Medical Science, 1992; Journal of Pakistan Medical Association, 1990; 1995)

#### 1.4.1.2 Blood Lead Levels (BPbLs)

Lead pollution is one of the most serious health hazards and, as demonstrated by several studies worldwide, poses a special risk to children. Experimental and epidemiological evidence indicates that lead is a neurotoxin and impairs brain development in children -- and at levels hitherto considered safe. Children in developing countries with dietary deficiencies are particularly susceptible. According to the 1998 population census, 43.19% of Pakistan's population comprises children below the age of 15.

Blood lead levels (BPbLs) were studied in 900 healthy school children (boys & girls) in some cities in Pakistan. The results are tabulated below:

Table 1.7: Blood Lead Levels (ug/dL) in study Population of Peshawar, Islamabad and Chakshahzad

Sites/Cities	Number of Male	BPbL Male ug/dL	Number of Female	BPbL Female ug/dL
Peshawar	3074	21.2 + 8.15	126	16.8 + 4.81
Islamabad	101	23.05 + 2.8	129	22.5 + 3.90
Chakshahzad	88	3.22 + 0.19	82	1.49 + 0.10

Source: PJMR, 31(2) 1992; JPMA, 45(8) 1995

The children were below 15 years of age and belonged to lower income families. The overall mean BPbLs (micrograms per deciliter) in the three cities were found to be 22.8 +/- 3.30, 19.00 +/- 6.48 and 2.30 +/- 0.19 (rural site). The BPbLs of children at Peshawar and

Islamabad were higher than that observed for children at Chakshahzad, a rural site with comparatively less traffic activity. However, the BPbLs at Peshawar and Islamabad are considerably higher than the acceptable levels of 10 micrograms per deciliter.

A joint study of the Agha Khan University and Medical College and Karachi University estimated the mean BPbLs for males, females, soldiers and school children residing in the metropolitan area. These measured at 34.4, 31.8, 29.9 and 38.2 ug/dl, respectively. These are considerably higher than the acceptable BPbLs of 10 ug/dl. Over 90% of the children studied had BPbLs higher than 25ug/dl, which can cause irreversible mental impairment. Another study, also carried out on a segment Karachi's population in the Denso Hall area, where traffic activity is high, showed high lead concentrations in urine. that a high concentration of lead was excreted in urine of people. Excessive lead concentration of this kind can pose serious kidney problems.

Two studies on metal concentrations in the air in the Quetta area and their possible health impacts on a segment of population in Quetta, were carried out by the University of Balochistan. Metals levels were estimated from depositions on tree leaves, along thirteen major roads of Quetta city. The results compiled from questionnaire responses and chemical analyses showed a strong association between high lead (and some other metals) levels and heart and respiratory diseases, anemia, blood pressure, ENT, gastrointestinal and skin diseases (Zaidi et al, 1997)

#### *1.4.1.3 Visibility, Vegetation, Building Material/Structure*

Fog reduces visibility causes economic loss and creates health problems. For the past few years, winter fog in Lahore during the months of December and January, has become a recurring phenomenon. It can last as long as three weeks, especially in calm wind conditions. Excessive emissions and the presence of particulate matter in the air are the main contributing factors and are sourced in increased fuel combustion (such as furnace oil, diesel oil, wood and coal), in addition to the enhanced use of petrol for transportation in and around the city. Visibility problems for pilots due to emissions from brick-kilns around Quetta airport area have been reported. Orders issued to close them down are under judicial review. Traffic problems have also been reported on main road in Bucheki area (about 80 kilometers from Lahore), caused by reduced visibility, due to dust and husk emissions from 35 rice mills in the area.

Investigations carried out in Lahore and Karachi on vegetation around air polluting industries and on roadsides have shown negative impacts of atmospheric pollution on the plants in the surrounding areas. Pollution stress due to emissions from automobiles indicated a general decrease in chlorophyll and protein content in most of the plant species examined (Iqbal and Qadir, 1990).

Over the years the space surrounding Badami Bagh, outside the historical Lahore Fort (rebuilt in sixteenth century with its origins as far back as AD 1025) has become a massive parking lot (see Part IV-5). The fort is constantly ringed on all sides by smoke emitting vehicles. Reportedly, prolonged emissions from vehicles over the years has caused extensive damage to the walls and facades of the various building within the fort.

## 1.5 Responses

### 1.5.1 Institutional Responses

Air pollution is one of those complex environmental problems where control through reduction at source is considered most desirable and the only way to prevent adverse health and other damaging impacts. Once emitted into the atmosphere, unlike other matrix/media, the recycling or re-use of the emitted products from air is almost impossible. There is no dearth of acts, regulations, policies and strategies designed to combat air pollution. The legislative agenda, in particular, is comprehensive.

#### 1.5.1.1 Legislation

- The Pakistan Penal Code, 1860 (update of the pre-partition British code)
- The Factories Act, 1934
- The West Pakistan Prohibition of Smoking in Cinema Houses Ordinance, 1960
- The Motor Vehicles Ordinance, 1965
- The Motor Vehicles Rules, 1969
- Punjab Local Government Act, 1996

*Pakistan Environment Protection Act, 1997 (PEPA 97)*: The Pakistan Environment Protection Act, promulgated in December, 1997, is an improvement over the 1983 Environmental Protection Ordinance, and reflects extensive and prolonged consultations with all stakeholders. The PEPA is a single comprehensive law which provides for the protection, conservation, rehabilitation and improvement of the environment, for the prevention and control of pollution and promotion of sustainable development. The Act covers air, water, soil and noise pollution, including hazardous waste disposal and vehicular pollution. Section 11, sub-section (1) prohibits strictly emission of any air pollutant in an amount, concentration or level of which is in excess of the National Environmental Quality Standards (NEQS). Section 15, sub-sections 1 to 3 pertain to the regulation of motor vehicles (see Box ).

#### **PEPA 97 Section 15, Regulation of Motor Vehicles**

##### Sub-Section (1)

Subject to the provisions of this Act and the rules and regulations made thereunder, no persons shall operate a motor vehicle from which air pollutants or noise are being emitted in an amount, concentration or level which is in excess of the National Environmental Quality Standards, or where applicable the standards established under clause (g) of sub-section (1) of section 6.

##### Sub-Section (2)

For ensuring compliance with the standards mentioned in sub-section (1), the Federal Agency may direct that any motor vehicle or class of vehicles shall install such pollution control devices or other equipment or use such fuels or undergo such maintenance or testing as may be prescribed.

##### Sub-Section (3)

Where a direction has been issued by the Federal Agency under sub-section (2) in respect of any motor vehicles or class of motor vehicles, no person shall operate any such vehicle till such direction has been complied with.

Section 16, empowers environmental protection agencies (EPAs), both federal and provincial, to issue environmental protection orders (EPOs) to violators directing them to take any measures that the agencies may consider necessary for the mitigation and prevention of pollution.

Under PEPA 97, the following rules and regulations have been finalized in consultation with stakeholders, and notified:

- National Environmental Quality Standards (Self Monitoring and Reporting by Industries) Rules, 2001.
- Provincial Sustainable Development (Procedure) Rules, 2001.
- Provincial Sustainable Development Fund (Utilization) Rules, 2001.
- Pollution Charge for Industry (Calculation and Collection) Rules, 2001.
- Composition of Offences and Payment of Administrative Penalty Rules, 2000.
- Environmental Samples Rules, 2001.
- Hazardous Substances Rules, 2000.
- Pakistan Environmental Protection Agency (Review of IEE/EIA Regulations, 1998).
- National Environmental Quality Standards (Environmental Laboratories Certification Regulations), 2000.
- Sector specific EIA guidelines have also been developed by Pak-EPA, for major thermal power stations, oil and gas exploration and production, major chemical and manufacturing plants and industrial estates.

#### 1.5.1.2 Strategies

*The National Conservation Strategy (NCS):* Preventing and abating pollution, increasing energy efficiency, and management of urban wastes are among the fourteen core program areas of the NCS. With regard to air pollution control, specifically, the NCS emphasizes the need to: a) promote energy conservation in industry and transport; b) site industries appropriately to minimize pollution impacts and; c) introduce clean fuels, upgrade refineries, set up vehicles tune-up stations and compressed natural gas (CNG) stations.

*Provincial Conservation Strategies:* The Sarhad Provincial Conservation Strategy (SPCS) and the Balochistan Conservation Strategy (BCS), refine further the NCS cores areas according to the needs and requirements of the provinces. Some of the proposed initiatives are: brick-kiln conversion, energy conservation, networks of meteorological stations, atmospheric environmental services and monitoring.

*The National National Environmental Action Plan (NEAP):* In the last meeting of Pakistan Environmental Protection Council (PEPC) in February, 2001, the council approved a national environmental action plan (NEAP), developed by the Ministry of Environment, Local Government and Rural Development. The plan reflects a renewed commitment to the environment and focuses on taking immediate measures in four priority areas of concerns to achieve a visible improvement in the quality of air, water and land. (see also Part II – 1). The program for the control of vehicular pollution, industrial emission and indoor air pollution would be developed by the federal EPA, in which a special “ Program Unit “ for clean air has already been established.

### 1.5.1.3 International Conventions and Treaties

Pakistan has signed the following international treaties pertaining to air emissions:

- United Nations Framework Convention on Climate Change, 1992.
- Vienna Convention for the Protection of the Ozone Layer, 1985.
- Montreal Protocol on Substances that Deplete the Ozone Layer, Montreal, 1987 and amendments.

### 1.5.1.4 Program and Project Initiatives

Project initiatives aimed at encouraging energy use-efficiency or curbing emissions provide important demonstration effects. These projects have been launched in the hope of a quick take-up. However, as seen above, the scope for this is constrained by an institutional and policy climate that seems to be lagging. Pilot projects should, ideally, inform policies but, as yet, there is not sufficient evidence that this is happening.

*Fuel Efficiency in Road Transport Sector Project (FERTS):* The FERTS project, executed by MELGRD and ENERCON and funded by GEF/UNDP, aims to reduce emissions at source by improving the fuel efficiency of road transport vehicles. Ten demonstration tune-up centers in major cities of the country have been established. Also, 36 training workshops for 800 mechanics and 20 workshops for 443 workshop owners have been organized. Special studies have also been carried out in collaboration with the provincial EPAs, NGOs and other stakeholders.

*Introduction of Alternative Fuels, CNG:* As part of the clean air program more than 100,000 vehicles have converted to compressed natural gas (CNG) and CNG stations set up in the country. The Canadian International Development Agency (CIDA), has supported experiment, motivational and incentive programs to convert auto-rickshaws to CNG, in the cities of Quetta, Karachi and Lahore.

*Establishment of Cleaner Production Centers (CPCs):* Cleaner production centers in the petroleum and leather sectors are functioning with the assistance of UNIDO and NORAD. The CPCs are promoting the adoption of ISO 14,000 and will also support environment friendly in-house practices, cleaner fuels, process improvement/substitution and the use of improved technologies.

*Urban-Industrial Environment Protection (UIEP) Program in NWFP:* The UIEP program consists of studies and pilot projects are to be executed by NWFP-EPA, with the technical assistance of GTZ. The program focus is on achieving emission reductions in vehicles, brick kilns and industries. A vehicle emission testing station (VETS) equipped with BOSCH emission testing analyzer and with a capacity to test up to 10,000 vehicles per year for opacity and carbon monoxide was established on the Grand Trunk road near Peshawar city. In addition, four mobile vehicle emission testing (MVET) teams were also set up to carry out on the spot testing of vehicular emission on city roads.

*Pollution Monitoring and Inventories Projects:* Over the past few years, the Environmental and Space Sciences Division of SUPARCO has conducted studies on atmospheric pollution. Data on some of the major air pollutants and aerosols is being collected through regular and round the clock measurements. The ADB funded Asia Least-Cost Greenhouse Gas

Abatement. Strategy (ALGAS), completed in 1998 and the first comprehensive national project on climate change, compiled an emissions inventory for Pakistan, identified emission options and developed a long-term emissions reduction program.

*Measures for Control of Industrial Emissions:* A number of innovative plant level and institutional measures have been initiated such as:

- Revised and more realistic national environmental quality standards (NEQS) have been issued. The standards specify limits for industrial gaseous emissions and effluents and for emissions of sulfur dioxide and nitrogen oxides from power plants operating on coal and oil.
- Under PEPA 97 Section 6(1)(i) a self-monitoring and reporting (SMR) system has been introduced after exhaustive consultations with the representatives of industry. Based on the notified self-monitoring and reporting rules, 2001, a self-monitoring and reporting tool (SMART) has been developed by Pak-EPA, with technical assistance from the Sustainable Development Policy Institute (SDPI). A pilot-phase program for SMART demonstration and testing has already been completed with 50 industrial units (Khwaja, M.A, SDPI, 2001)
- 
- Under PEPA-97, section 16, EPAs in the country have issued 235 environmental protection orders (EPOs) and several show cause notices to polluters.
- Two Environmental Protection Tribunals, one each in Lahore and Karachi have been established to hear and decide environmental cases submitted by the public as well as appeals against the orders of EPAs.

These innovative measures need to be supported by implementation mechanisms which will ensure effectiveness and transparency.

## 1.5.2 Policy Failure

### 1.5.2.1 Energy Policies

In contradistinction to the prevailing acts, regulations and environmental conservation strategies, policies have tended to lag behind. In fact, energy policies -- either by default or through intent -- have both encouraged wasteful consumption and favored high emitting fuels. The salient features of the policy are summarized below:

Table 1.8 Energy Sector Price Distortions

	Electricity	Natural Gas	Petroleum Products
Relative Prices			Gasoline price almost twice the price of diesel and kerosene  Grading of gasoline encourages adulteration (premium with normal)  Price of high speed furnace oil (HSFO), used extensively in industry and power sectors, 15% lower than less emitting LSFO
Production Costs	Commercial users, bulk supply and fertilizer	Commercial and industrial users cross-subsidising	

	producers cross-subsidizing residential and agricultural users (flat rate) of electricity. The weighted average price of electricity below the long run marginal price.	residential users and fertilizer producers. The weighted average price of natural gas below the long run marginal cost.	
Incentives			Lack of tariff incentives to import fuel efficient cars  Low tariffs on heavy duty diesel vehicles
Administrative			Use of leaded petrol which precludes use of catalytic converters

Clearly distortions including below cost pricing, relative price differentials, absence of incentives and administrative slack are responsible for prevailing high emission levels. The low gas and electricity prices to residential, agricultural and selective industrial consumers prevent consumers from conserving energy. While Pakistan has taken initial steps towards rationalizing energy pricing, the persistence of distortions and the associated emission scenarios suggest that it still has far to go before such emissions can be stabilized.

Institutional measures such as privatization, should be accompanied by enforced standards for environmental protection. In reality, the government's Private Power Policy, appears to be focusing on increasing the supply of conventional energy, by attracting private capital for thermal power generation.<sup>10</sup>

A number of regulatory agencies (NEPRA, PPIB, PEPCO) have been set up to oversee energy pricing, investment and privatization of WAPDAs thermal generation, transmission and distribution functions. Others institutional initiatives are on the anvil in the oil and gas sectors. However, the frailty of these institutions is reflected in the present private power imbroglio, in the delays in corporatizing WAPDA and in the mixed signals emanating from NEPRA regarding electricity tariffs.

### 1.5.2.2 *Macroeconomic Policies*

Traditionally, industrial protection, provided through trade restrictions (tariffs, quotas), industrial licensing and other administrative controls on investment, provided the protectionist slack for using inefficient, high emission generating technologies. Partly, this was contributed to by low energy prices and disregard of environmental concerns. The trade and industrial reform program, which includes the elimination of quotas, tariff reductions and relaxation of industrial licensing requirements, has removed many of the constraints to industrial energy use efficiency. Concurrently, privatization also creates an impetus for energy efficiency, through increased competition and use of improved technology. Exchange rate liberalization, has contributed to

<sup>10</sup> An attractive bulk power tariff of US Cents 6.5/kWh (for first 10 years of project life) has been offered to IPPs (Independent Power Producers) for sale of electricity to WAPDA/KESC with indexation mechanism for fuel price, US & Pakistan inflation, exchange rate, O&M cost etc. Besides, fiscal incentives, standardized security package (including Implementation Agreement, Power Purchase Agreement & Fuel Supply Agreement) is a vital part of the package. (Energy Wing, GoP, 1998) In order to implement the private power policies, the Private Power and Infrastructure Board (PPIB) was set up to provide one-stop operation for the approval of power project.

raising imported energy prices, while the attempt to achieve budgetary balance has been accompanied by the reduction of subsidies, including those on energy. However, if sector policy distortions continue to persist, they can undermine the impacts of economy wide reforms. In addition, the institutional dimension relating both to energy use and emissions is no less critical than the need for complementary price measures.

### 1.5.2.3 Emissions Policies

The track record of environment specific policies aimed at addressing market failure is not too good either. The norm has been to rely on command and control policies, which are weakly enforced because of deficient implementation capabilities. Recently efforts are being made to replace these with voluntary, market-based pollution charges. The consultative process (between the government, NGOs and industry) followed in determining these charges bodes well for implementation and also reflects the failure of the government's traditional enforcement approach. In addition, the emissions problem is also an outcome of bad zoning – where proximity to urban residential areas, combined with urban pollution from mobile sources, leads to high emission concentrations.

Other measures/regulations aimed at addressing vehicles emissions such as the Motor Vehicle Ordinance (1965) and the Motor Vehicles Act (1969) are not complied with, even in the most rudimentary way, due to lack of resources and corruption. It provides little comfort to know that the average vehicle in Pakistan, which is over 15 years old, emits 20 times more hydrocarbons, 25 times more carbon monoxide and 3.6 times more nitrous oxides than the average vehicle in the US. (NCS, 1992).

## 1.6 Recommendations

### 1.6.1 Tapping the Renewable Energy Potential: The Wave of the Future

Fuel consumption trends for Pakistan indicate a configuration dominated increasingly by dirty fuels (oil, coal), as gas and hydel resources begin to be depleted. The importance of developing renewable energy can not be emphasized enough, both to address pollution concerns and to meet growing energy shortages. Renewable technologies such as mini-hydel dams, wind turbines and solar panels are particularly relevant in the Pakistani context. It is imperative that such options begin to be explored immediately given their high development costs and the long lead times required to gain institutional acceptance.

The potential for renewable energy with the exception of mini and micro hydel power generation has largely remained unutilized. Tables 1.9 and 1.10 illustrate the present take-up of various options, the associated financial costs and their mitigation potential.

Table 1.9: Utilization of renewable resources

Type	Number	Capacity
Biogas Plants	4165 <sup>11</sup>	624750 CFT/day
Solar Plants	20 <sup>12</sup>	438 kWp
Wind Mills	2 <sup>13</sup>	24 kWp

Source: Energy Wing, GOP, 1998

11 150 cubic feet of gas per plant per day

12 Installed capacity ranges between 0.45 to 57 kWp

13 Installed capacity of 12 kWp

Table 1.10: Renewable Options: Mitigation Potential and Cost Effectiveness

	Estimated Investment Cost of Option (US\$/typical size)	Estimated GHG Emission Reduction, Tonnes of CO <sub>2</sub> equiv./yr	Cost Effectiveness, US\$/t of CO <sub>2</sub>	Benefit/Cost Ratio
Mini-micro Hydro, 2MW	2,000,000	11,665.00	-5.05	1.46
Photovoltaic, 1 MW	1,535,000	3,403.00	69.82	0.46
Wind Power Generation, 15 MW	19,330,000	43,753.00	68.47	0.46
Solar Water Heater	394	1.71	-12.39	1.82
Waste to Energy Generation, 5 MW	8,150,000	20,480.00	-1.88	2.40

The estimated renewable energy potential by source is given below.

#### 1.6.1.1 *Hydel*

Estimates of small hydro potential still to be exploited range between 1,000 to 1500 MW.<sup>14</sup> In Chitral District alone, the potential is estimated to be about 600 MW.

#### 1.6.1.2 *Solar*

Data gathered from 5 large and 32 small observatories indicates excellent solar potential. The country receives about 1.5 quadrillion KWh of solar energy per year. Interestingly, Pakistan's total electricity production in 1996 amounted to only about 0.003 percent of this. Clearly, solar technologies can contribute substantially to alleviating future energy needs. (Rahim, 1996). Pakistan can generate over 27,000 GWh of electricity -- 10% of the electricity needs in 2018 and using less than 0.35 percent of its land area. It also means an annual reduction in CO<sub>2</sub> of over 41 million tones.

#### **Solar project**<sup>15</sup>

The pilot solar power system set up by an American firm, World Water Corporation, has yielded encouraging results. The system, set up in the suburbs of Quetta, is a trendsetter in providing sustainable methods for pumping drinking and irrigation water, lighting and communications in arid and semi-arid areas of Balochistan and in similar terrain in several parts of Pakistan.

#### 1.6.1.3 *Wind*

Wind power is well suited for various coastal locations in the Balochistan province, for rural areas in the province of Sindh and in the Northern areas characterized by scattered, isolated hamlets with populations of less than fifty households. Dispersed energy systems like wind power plants in such areas are a viable option. It is conservatively estimated that the annual

<sup>14</sup> Mini hydro project ranges between 100 kw to < 5,000 kw while micro hydro is < 100 kw

<sup>15</sup> Source: Business Recorder, February 23 2000

wind energy potential for Pakistan is in the range of 2000 to 3000 MW (Ali Khan, 1998). Recently, a demonstration project of 15 MW has been set up in Pasni, Balochistan to promote wind energy.

#### 1.6.1.4 *Waste*

Methane produced from decomposition of municipal and industrial waste is estimated to contribute 338,000 tonnes/year of methane. A demonstration project for generation of about 5 MW for the city of Lahore from municipal solid waste is under process.

### 1.6.2 *Improving Energy Efficiency*

Renewable energy is still in its infancy in Pakistan. While it will take considerable political will and financial resources to harness and utilize this resource, measures to improve energy efficiency are relatively more viable. However, because of the limited additionality that this recourse offers, it is imperative that both options be seen as complementing rather than competing with each other.

#### 1.6.2.1 *Electricity*

Thermal power plants presently account for 75% of fuel oil consumption in the country. Most are equipped for dual fuel firing, and switching from fuel oil to gas can be accomplished in a short time with minimum expense. Another potential source of energy saving is reducing losses in electricity transmission and distribution (T&D). Such losses presently average 26.00%, against the internationally acceptable levels of 15%.

#### 1.6.2.2 *Industry*

The industry sector offers considerable scope for energy efficiency gains. Boilers in textile, fertilizer and food processing and other industries account for 35% of the total energy consumed. About 50% of the total boilers are imported second hand and, according to a recent study, almost 75% of boilers in the country operate at less than 70% efficiency. A report indicates that energy efficiency in the industry sector can be improved by about 20% for thermal energy and 15% for electricity (Hagler Bailly, 97).

#### 1.6.2.3 *Transport*

The transport sector is the second largest energy consuming sector after industry. Improved engine maintenance such as engine diagnostics and tuning can result in savings of up to 60% in fuel use. A number of vehicle maintenance practices such as wheel alignment and balancing, break adjustment, and timely replacement of tires can contribute to about 12.00% in fuel savings. Other options assessed for this sector include improved engine and vehicle maintenance, and use of improved engine design.(Hagler Bailly, 1997)

#### 1.6.2.4 *Household Savings*

The growth rate of electricity consumption in the residential sector alone is estimated at an annual average of over 10%. Electric appliances being marketed in Pakistan typically consumes 25% more energy than high efficiency appliances currently being marketed in other countries. Studies conducted in selected residential and commercial buildings indicate

that electricity demand for lighting can be reduced by up to 17.00% using available technologies. Moreover, buildings are often inadequately insulated which also places additional strain on appliances. Improvements in design can contribute to about 45.00% reduction in air-conditioning loads, while maintaining comfort levels.

### 1.6.3 A Proposed Time Profile for Energy Conservation and Substitution Measures

#### 1.6.3.1 *Short term measures*

- Periodic testing of vehicles for emissions.
- Full scale implementation of the self-monitoring and reporting /SMART program for industry.
- Improvement in fuel quality.
- If located within municipal limits, mandatory closure of (i) coal fired brick kilns; (ii) steel melting units without pollution control equipment and (iii) stone crushing units.
- Expansion of the natural gas distribution system to areas not yet covered.

#### 1.6.3.2 *Medium term measures*

- Mandatory low emission engine technologies.
- Phasing out of two-stroke engines.
- Reduction in diesel use through (i) reduction of price differential between diesel and petrol; (ii) further promotion of CNG, including in public transportation; (iii) increase in taxes on diesel vehicles used for personalized transport.
- Mandatory installation of catalytic converters
- Improved traffic management.

#### 1.6.3.3 *Long term measures*

- Shifts from personal cars to railways, public transport and mass transit system.
- Introduction of low emission technologies, such as hybrid cars and fuel cell powered vehicles
- Upgrading of road transport infrastructure and networks
- Institution of bicycles lanes and routes.
- Improved urban planning to minimize travel distances.
- Implementation of pollution charge system for industry
- Closure of industries with high pollution levels, located within municipal limits.
- Zoning of industrial activities
- Enforcement of EIA regulations
- Shift to cleaner fuels and technologies in industry.
- Promotion of efficient wood cooking stoves.
- Reduction in disparity of price between natural gas and PLG
- Promotion of bio-gas plants and renewables.

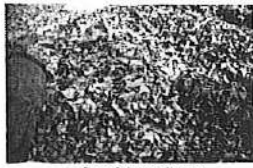
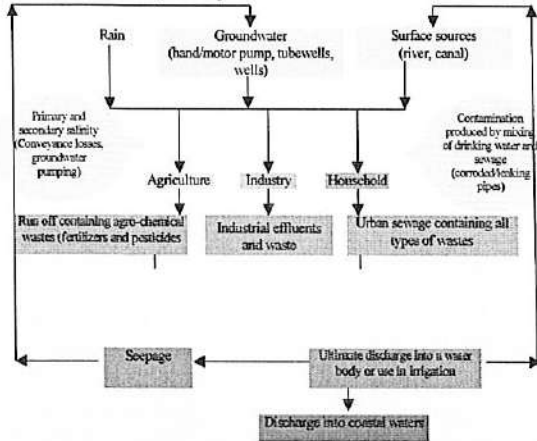
# State of the Environment: PAKISTAN

## Water Availability and Quality

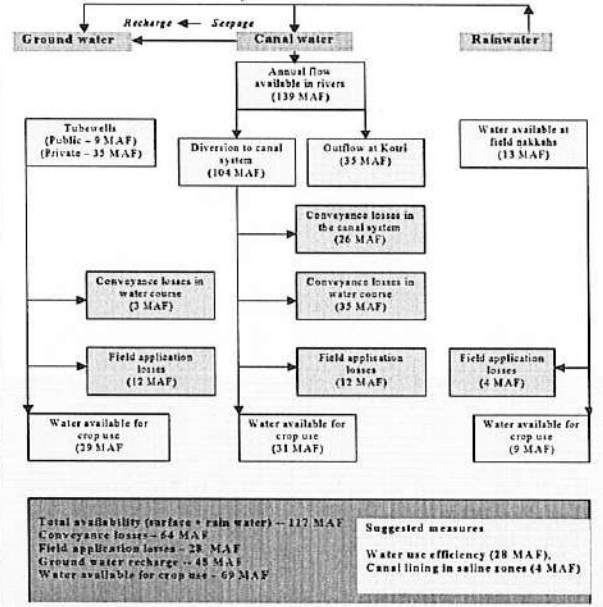
### MAJOR SOURCES OF WATER

River water (104 MAF)  
 Groundwater (46 MAF)  
 Rainwater (13 MAF)  
 Flood runoff (4 MAF)

### PRESSURE - Quality



### STATE - Availability



### IMPACT

### RESPONSES

### RECOMMENDATIONS

## 2. Water

### 2.1 Introduction

The three main water sources in Pakistan are river water, groundwater and rainfall, measured at an annual average of, respectively, 104, 46, and 13 MAF. Flood runoff from the Western mountains adds to the supply an additional 4 MAF or so and either drains into the Arabian Sea or remains within closed basins in the Balochistan region. In addition, there are non-renewable aquifers mainly around Quetta, Balochistan, but these are being depleted rapidly. The Indus river and its tributaries (Jhelum, Chenab) are the primary water sources, providing irrigation and drinking water and replenishing the groundwater supply.

The bulk of the river and groundwater is used for agriculture. The vast irrigation infrastructure (dams, barrages, canals) have regulated water supply and smoothed out seasonal variations (excess water stored during the *kharif* season is released during the *rabi* period). However, it has also given rise to a host of environmental problems. Outflows to the sea have been reduced to a trickle, putting the delicate and resource rich Indus delta ecosystem at grave risk. Also, over time, the collapsing infrastructure and absence of good drainage has created severe problems of waterlogging and salinity.

Water pollution is on the rise, manifesting itself in a variety of health problems ranging from the common water borne diseases such as diarrhea and typhoid to the more recent incidents of fluoride poisoning. The source of water contamination are industrial, household and agricultural (chemical) effluents. The process of water pollution is characterized increasingly by a rural-urban interface. Also, the pollutant composition is showing an increasingly higher content of chemical as opposed to biological contaminants. Competing demands of agriculture, households and industry are beginning to transform Pakistan from a water surplus to a water scarce country. This also contributes to water pollution as well, as finite water supplies are recycled more frequently to meet growing demand.

The nature of the problems present clear institutional and policy choices. Briefly, the focus needs to shift from attempts to store and increment water supply to water conservation and use efficiency.

### 2.2 Pressure

#### 2.1 Water Availability

##### 2.1.1 Water Demand Scenario

Emerging demand-supply imbalances have resulted in growing pressure on water resources. Population, urban and economic growth are and will continue to be the key forces driving the demand for water, and reflect both sector and structural aspects. At constant per capita consumption, the sector

Table 2.1: Population projections

(Millions)

	1998	2001	2010	2025
Population	130.6	141.0	173.3	221.0
Rural	88.1	92.4	101.5	106.5
Urban	42.5	48.6	71.8	114.5

Source: South Asia Technical Committee of Global Water Partnership, 2000

Table 2.2: Sector demands

(MAF)

	2000	2010	2025
Irrigation	113.6	125.5	154.4
Non-irrigation			
Industry	1.18	1.47	1.84
Households			
Rural	0.81	1.86	3.24
Urban	3.10	5.60	10.24
Total	118.69	134.43	169.72
Available	104	104	104
Deficit	7.15	30.43	65.72

Source: Water Resources Strategy Study, Halcrow, 2001

requirements of agriculture, households and industry are increasing. In structural terms, economic and urban growth has led to higher per capita needs. Table 2.1 presents a population growth and distribution scenario, as it is likely to be the key factor affecting future sector and per capita demand for water. The projected sector demands are presented in Table 2.2. The demand for irrigation water is based on crop production increases required to meet the food and export needs of a growing population.<sup>1</sup> The presently estimated deficit is about 15 MAF. Over the next 25 years this is projected to increase nine-fold. Obviously, this is an extreme scenario and does not allow for mitigating factors such as netting out return flows in the non-irrigation use category, water conservation and efficiency measures, and on the supply side, tapping additional groundwater in saline zones. However, it is unlikely that this will address adequately the emerging deficits.

### 2.1.2 *Groundwater*

The rate at which groundwater is being mined (extraction in excess of recharge) is increasing. As far back 1992, there was evidence of a dropping water table in 14 of the country's 45 canal commands (NCS: 1992). Since then tubewell installation has increased rapidly from 199,700 in 1981 to 484,000 in 1996 (an increase of 250 percent).<sup>2</sup> While this is beneficial where water tables are high, in unaffected areas such as parts of the Punjab, the growing scarcity of groundwater has raised calls for restraining legislation on its extraction.<sup>3</sup> Similarly, natural aquifers outside the Indus Basin are under threat. Prominent evidence of this are the deep aquifers around Quetta, in Balochistan province. The transition from subsistence agriculture to water-intensive horticulture has led to unsustainable use of this non-renewable resource. Not only is it reducing Quetta's drinking water supply but the increasing incidence of tree stunting caused by water deprivation has raised concern that horticulture too will, eventually, become unviable.

## 2.2 *Water Quality*

### 2.2.1 *The Pollution Cycle*

The overview, Part II-1: 2.3.2, describes the sources of water pollution in detail. This section examines briefly the interface between these sources.

None of the three major consuming sectors of water: agriculture, industry and households/municipalities have adequate wastewater disposal systems. As a result, the effluent/run off contaminates water bodies/reservoirs creating serious health and environmental problems. Not only are the poor more vulnerable to their impacts, they also contribute heavily to water pollution. While water pollution has many sources, touches a number of sectors and has regional ramifications, the problem has only just begun to be documented. Detailed data on total wastewater discharge is available only for some major cities in the country.

A survey conducted by the Federal Environmental Protection Agency (EPA) shows that tanneries located in Kasur and Sialkot were discharging effluents with chrome concentrations ranging between 182-222 mg/liter (Shuja: 1998:2) against standards of 1mg/liter prescribed in the national environmental quality standards (NEQS). These effluents also flow into rivers

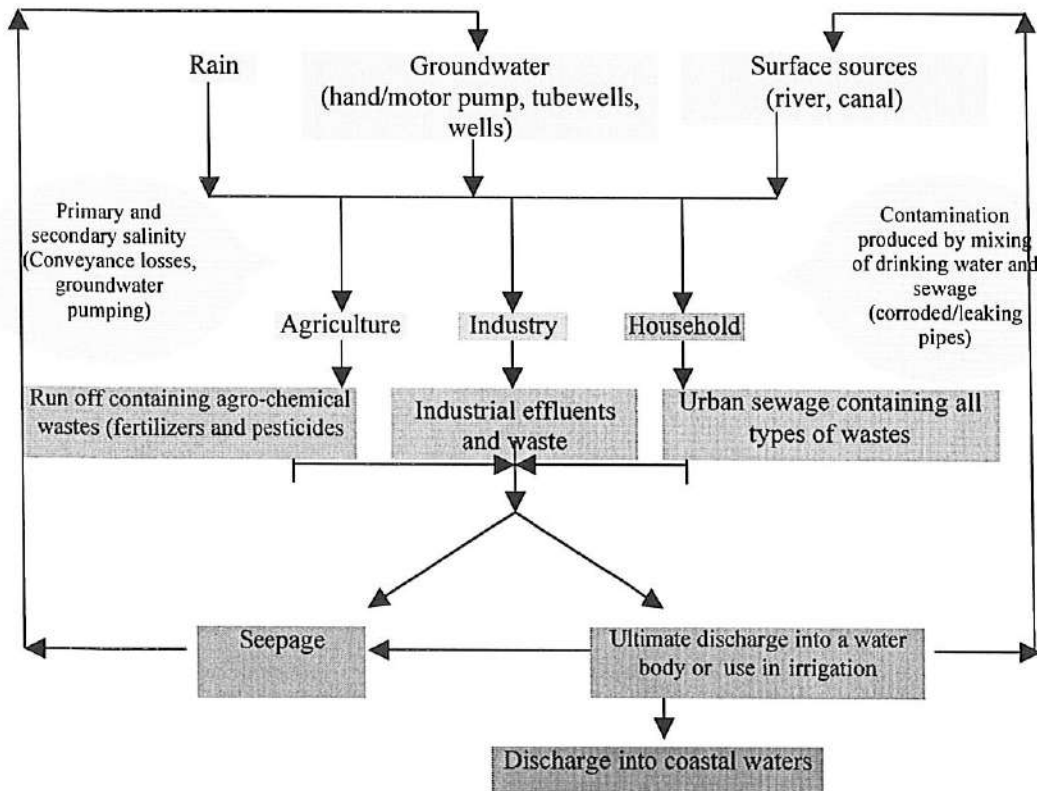
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1 The projections do not assume any improvements in water-use efficiency, with system and conveyance losses remaining unchanged over the projection period (between 30 – 35 MAF).  
2 Government of Pakistan (1998, p. 90).  
3 S.R.Khan, et al, 2000

and, eventually, into the sea, with disastrous consequences for inland and coastal fisheries. A loss of about 5000 tons/year in fish catch has been recorded in the River Ravi. Water quality deterioration occurs at each stage of the supply-disposal-supply cycle. At each successive step, the pollutant loads increase in the form of bacterial and organic liquid and solid wastes, toxic metals and acids and chemical pollutants in the form of pesticide and fertilizer run-off. In peri urban areas sewage water is used for irrigation. Adverse health impacts result when vegetables that are eaten raw, are watered with municipal discharges carrying toxic chemicals.

The schematic presents a simple water contamination cycle

Fig. 2.1: Water Contamination Cycle



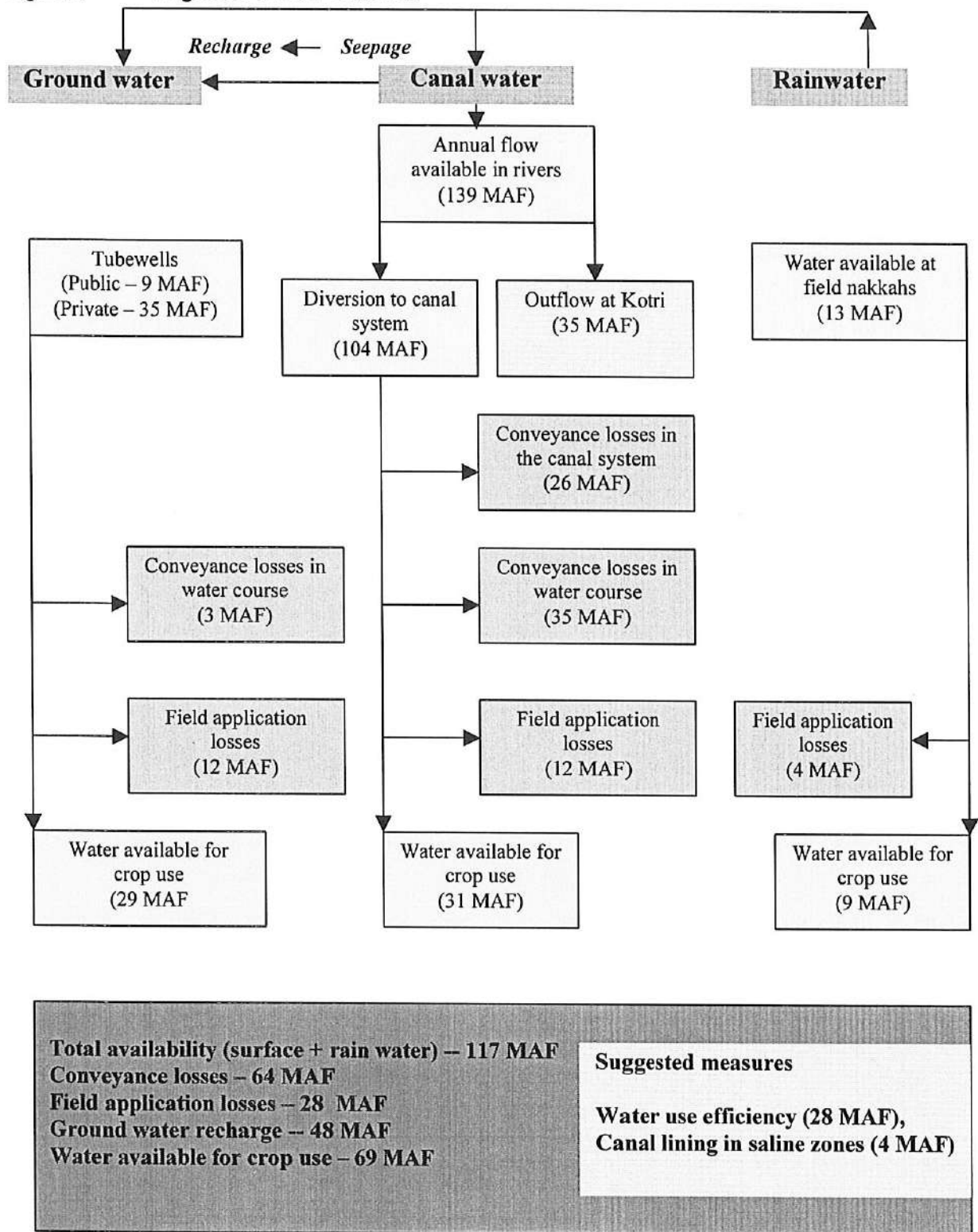
### 3. State

#### 3.1 Water Availability

##### 3.1.1 Agriculture

Figure 2.2 represents the water balance for Pakistan synthesizing the text in Part II-1: Overview of Major Environmental Developments and Trends (Section 2.3.2). Essentially, this is a static representation, which does not allow for leads and lags and abstracts from the fact that water, like money, is a non-fungible resource in as much as it is recycled and serves multiple users as it flows through the system.

Fig.2.2: Irrigation Water Balance



### 3.1.2 Access to Drinking Water

Access to drinking water is skewed across the rural-urban divide, as well as across income groups. About 85% of urban residents living in the planned localities have access to piped water supply. This figure reduces to 50% in the low-income settlements (*katchi abadis*).

Supplemental water sources in these areas are community taps, hand pumps, dug wells and water trucked in by vendors. Groundwater is the primary source of urban drinking water, except for the cities of Karachi, Hyderabad and Islamabad. The rural areas, too, depend primarily on groundwater, except in saline zones where irrigation canals are the main source of domestic water. Only about 53% of the rural population has access to drinking water from public water supply sources. The remaining population depends on water from streams, canals, ponds or springs, which is untreated and unsafe for human consumption (Halcrow: 2000: 3).

The average per capita consumption of water varies widely across cities, depending on availability. It is estimated respectively at 225, 303 and 162 litres per day for the cities of Karachi, Lahore and Faisalabad. However, these averages mask large differences, reflecting unequal access, high rate of leakage and differential water pricing. For instance, in Karachi, the variation in daily water consumption ranges from 336 liters per capita in high income areas to 63 liters in the 'katchi abadis.' This inequity is compounded by a pricing mechanism (flat rates) which encourages wasteful use of water, such as sheet-irrigating lawns and washing cars. Also there is an inverse relationship between water pricing and ability to pay. Flat rates for the affluent areas are as low as Rs.35 – Rs 150 per month, as opposed to upto Rs.500/- per tanker charged by private vendors in low income settlements.

## 3.2 Water Quality

### 3.2.1 *Poor sewage and sanitation*

In the older parts of cities, prone to continuous in-migration, sewage infrastructure is both poorly designed and corroded, which results in the mixing of raw sewage and drinking water. Where piped water is not available, residents resort to groundwater accessed through dug wells and shallow hand pumps -- as mentioned above. Such water contains bacterial and chemical impurities, as does the water flowing through streams and rivers, which is used for washing. Poor sanitation and sewerage are also typically synonymous with the absence of proper waste disposal. Dumped close to the sources of water, disease-causing pathogenic substances seep into the ground from where they find their way into the water supply. Also, the poor tend to settle in the low-lying urban areas, which are affordable but prone to flooding, water pollution and disease.

In rural areas, the poor rely on rainwater that accumulates in ponds, in rivers and springs, and on ground water extracted through dug wells and hand pumps. The absence of modern sanitation and prevailing evacuation practices are a source of water contamination. In peri-urban areas, where rural migrants tend to concentrate, on-site run-off as well as from proximate industrial and residential areas contributes to water pollution.

**Wastewater Disposal Issues in Faisalabad**

Faisalabad is an unplanned city with no separation between residential and industrial areas, which causes industrial and household effluents to intermingle. Effluent disposal is built around natural drainage and old existing channels, which eventually discharge into the river Chenab. The soil in and around Faisalabad tends to be plastic, limiting seepage but creating overflow problems. The drainage system is extremely dilapidated. Sullage and storm water drains are dysfunctional and pipe corrosion results in seepage into the freshwater system. In addition, poor communities tend to pump water out of gutters for household use. There are no price or regulatory provisions for in-house or end-of-pipe treatment of industrial effluents. The lack of interdepartmental coordination exacerbates problems. For instance, road construction has not been dovetailed with the WASA Master Plan, resulting in the creation of troughs, which have become depositories of stagnant water. The present preoccupation is with development rather than consolidation. A classic example of this is that water supply to the new townships continues to be routed through the old city network and which there is no plan to rehabilitate, regardless of the additional demands that it has to sustain.

The emphasis on development schemes, neglect of rehabilitation, limited O&M funding, low cost recovery and high establishment allocations are a familiar municipal syndrome. One of its manifestations is the inability to perceive problems beyond the city confines, a problem aggravated by the vertical orientation of departments. Thus wastewater is sold under contract to outlying farmers and drains into the Chenab. However, there are no regular arrangements to test or treat this water. Any interventions, worth the name are sporadic and donor driven. For instance, JICA has financed the construction of oxidation ponds for wastewater treatment. This is unpopular with farmers who prefer to buy water untreated, while the high value of residential land makes such investment expensive.

The intrusion of urban wastewater into the canal irrigation and river systems is a problem that is likely to become more severe in future as residential and industrial expansion continues apace and municipal budgets shrink in real terms. Clearly, interventions at this level are beyond the pale of the project. However, there is scope for promoting interdepartmental coordination, advocacy and awareness campaigns and the institution of water quality and health monitoring systems.

**3.2.2 Ambient Water Quality**

Various estimates have been made over the years with regards to water quality. Tables 2.3 and 2.4 report on four such estimates across various water bodies in the country, including the Ravi and Kabul rivers, Warsak Lake and the Hadyara Drain. Potable water quality, assessed against WHO standards, fails to meet all the specified criteria, confirming anecdotal evidence of extremely high pollutant loads. In fact, in some cases the parameter values exceed even industrial effluent standards. By the same token, the inclusion of Hadyara Drain reflects a social reality – in a water constrained situation combined with an illiteracy overlay, poor communities are not above pumping water out of such drains for drinking and household use.

**Table 2.3: Water quality of various water bodies across various locations with reference to NEQs**

	Temp (°C)	Fecal coliform	PH	TDS (mg/L)	TSS (mg/L)	BOD (mg/L)	COD (mg/L)
<b>Ravi (1996)</b>							
Range	16-29	2.4X10 <sup>3</sup> –6.2X10 <sup>10</sup>	7.1-8.93	125-2080	70-1270	1.5-410	6.4-2130
Average	20.13	3.2X10 <sup>9</sup>	7.64	626.96	326.93	109.58	297.26
sd	3.75	1.4X10 <sup>10</sup>	0.58	548.92	301.35	156.94	459.86
n	27	27	27	27	27	27	27
<b>Hadyara Drain (4/1998)</b>							
Range	20-29	TNTC – 4.1X10 <sup>5</sup>	7.1-7.3	790-1145	100-520	150-225	340-490
Average	23.5	-	7.25	987.5	290	173.33	473.67
sd	3.27	-	0.08	159.43	176.52	27.33	187.73
n	6	4	6	6	6	6	6

Continued.....

<b>Warsak Dam</b>							
Low water (9/92)	20	1800	7.7	760	600	0.5	23
High water (6/93)	21	0	7.5	190	820	0.4	20
<b>Kabul River</b>							
Low water (10/92)	20	1800	6.3	150	220	7.7	110
High water (7/97)	26	4	7.4	360	390	5.0	96
<b>NEQs (PEPA standard)</b>							
	40	zero <sup>@</sup>	6-10	3,500	150	80	150
<b>WHO Standards</b>							
	12	zero	6-10	500	5	0	0

Source: Based on Government of Pakistan (1998, PP.228-240). NEQs taken from SDPI / TTSID (1995, p.28).

Notes: NEQs = National Environmental Quality Standards  
PEPA = Pakistan Environmental Protection Agency

sd = Standard deviation  
pH = Power of hydrogenion  
TSS = Total suspended solids  
COD = Chemical oxygen demand  
@ = Based on WHO (1996) guidelines.

n = Sample size  
TDS = Total dissolved solids  
BOD = Biological oxygen demand  
TNTC = Too numerous to be counted

On all WHO counts (including temperature, pH content, total dissolved solids and biological oxygen demand), the water is unsafe. In relation to NEQS standards, the counts for total suspended solids (TSS), the counts are way above the NEQS across the board and for chemical oxygen demand (COD), they are above the NEQS for Ravi and the Hadyara Drain.

Table 2.4: Concentration of toxic metals in various water bodies

	Zn (mg/L)	Cu (mg/L)	Pb (mg/L)	Mn (mg/L)	Cr (mg/L)	Fe (mg/L)	Cd (mg/L)	Hg (mg/L)	NO <sub>3</sub> (mg/L)	NO <sub>2</sub> (mg/L)
<b>Hadyara drain (1998)</b>										
Range	0.1-0.15	0.1-0.3	BDL	0.1-0.5	BDL	0.7-4.0	na	Na	na	Na
Average	0.28	0.17		0.02		2.28				
sd	6	6		6		6				
n										
<b>Ravi (7/1997)</b>										
Range	na	BDL-1.7	BDL-1.1	0.2-2.0	BDL-1.29	Na	BDL-0.008	BDL-0.0026	na	na
Average		0.79	0.63	0.92	0.61		0.006	0.002		
@		0.52	0.39	0.60	0.44		0.002	0.001		
sd		9	9	9	9		9	9		
n										
<b>Warsak (10/1992)</b>										
Low water (10/1992)	0.007	0.011	0.0	na	0.0	na	na	na	3.34	0.0
High water (6/1993)	0.048	0.005	0.012	na	0.074	na	na	na	1.09	0.0

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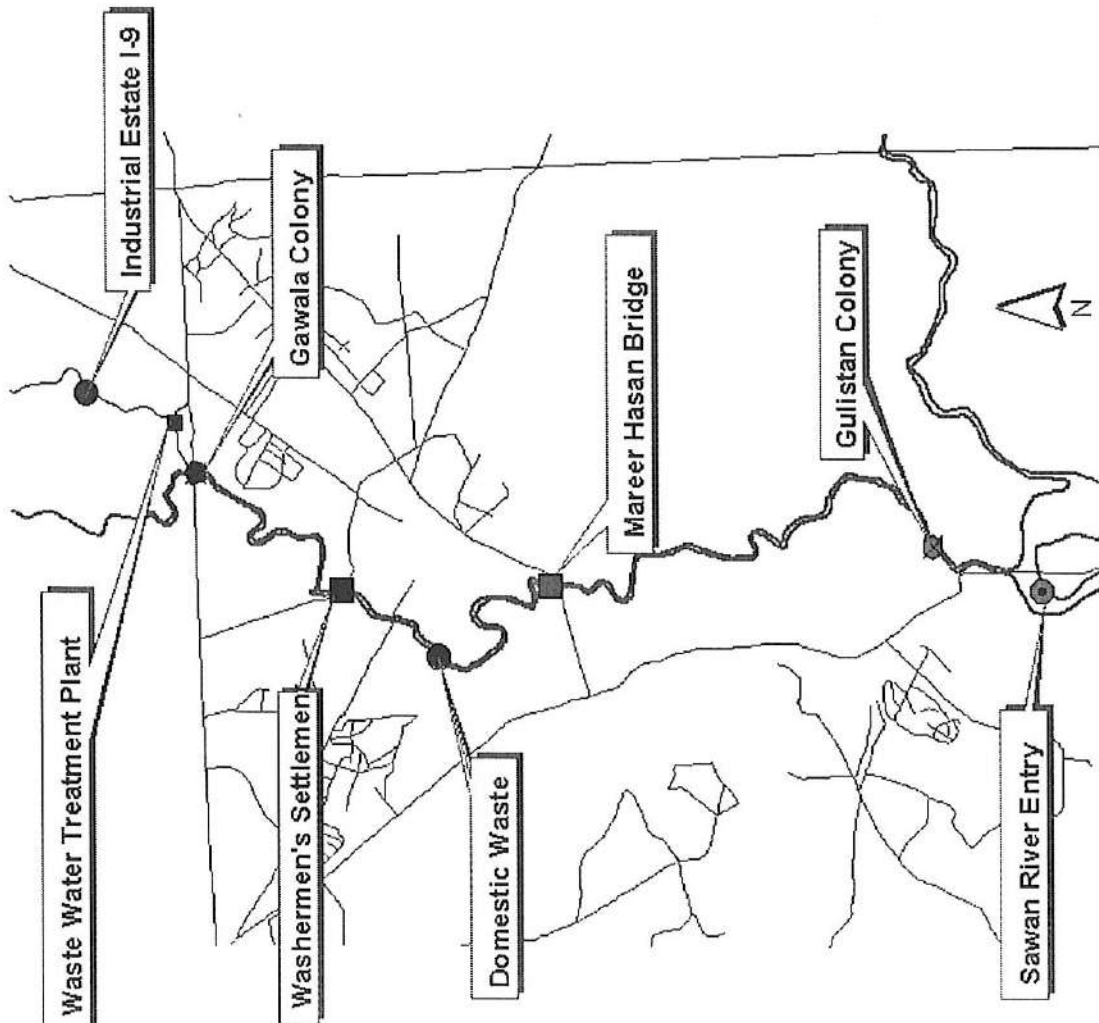
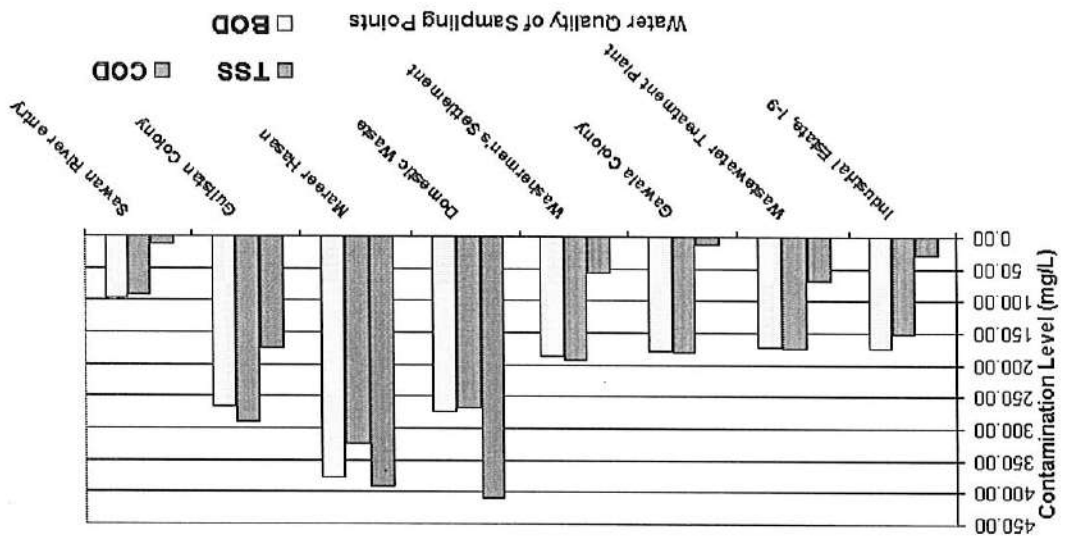
<b>Kabul</b>										
<b>Low water</b>	0.182	0.091	0.229	na	0.036	na	na	na	1.27	0.079
<b>(10/1992)</b>	0.026	0.121	0.009	na	0.097	na	na	na	1.27	0.101
<b>High water</b>										
<b>(7/1997)</b>										
<b>WHO guidelines</b>	3.0	2.0	0.01	0.5	0.05	0.3	0.003	0.001	50.0	3.0
<b>(1993)</b>										

**Source:** Based on Government of Pakistan (1998, pp. 232-239)

**Notes:** @ = averages for sites where parameter is above detection level  
 Ca = Cadmium BDL = Below detection level Hg = Mercury Zn = Zinc  
 NO<sub>3</sub> = Nitrate Nitrogen Cu = Copper NO<sub>2</sub> = Nitrite Nitrogen Pb = Lead  
 Mg/L = Milligram per litre Mn = Manganese Cr = Chromium  
 sd = Standard deviation  
 Fe = Iron n = Number of cases na = Not available

The concentration of toxic metals is reported in Table 2.4. On most counts for which data were available (including lead, manganese, chromium, cadmium and mercury), the presence of toxic metals in the river Ravi was considerably in excess of WHO mandated safety guidelines. The primary source of toxic metals are the untreated industrial discharges into water bodies. The river Kabul and Warsak Lake contained chromium above safety standards and this was also true for lead for the river Kabul.

Industrial flows are also a problem in coastal areas. Ingested by fish, they become unsuitable for human consumption and they also contribute to declining fish catches. Probably, the major cause for the latter is unsustainable fishing practices, which has depleted the basic stock but chemically induced mortality is a contributing factor as well.



### 3.2.3 Water logging and salinity

*Water logging:* As indicated in the review section (2.3.3), water logging appears to have stabilized over time, initially under the impetus of the Salinity Control and Reclamation Programs (SCARPs) and more recently as a result of groundwater mining.

Table 2.5: Water-table depths

<i>Water-Table Depth (meters)</i>	<i>Quality of Water</i>	<i>Area Affected (hectares)</i>	<i>Share of Gross Canal Command Area<sup>1</sup> (percent)</i>
1.0	Sweet	121,862	0.70
1.0	Sweet/Saline	321,862	1.95
1.5	Sweet/Saline	5,300,000	12.90
3.0	Sweet/Saline	8,866,397	53.70

Source: NCS Secretariat Estimates, 1992

Note: 1. This represents the surveyed CCA (13.6 million ha.).

In effect, no single yardstick can be used to measure waterlogging. In the first instance, this yardstick will differ according to the crop grown; for instance, rice and sugarcane can thrive in water-tables above 1 meter while, for cotton, the water table needs to be much deeper. There are other criteria as well, such as, water quality, soil type, and precipitation/evaporation ratios. Additionally, water tables rise with the monsoons and fall in the 'rabi' season, which is reflected in the cropping cycle.

Abstracting from the above, we assume 0-1 meter as being the lower limit of the critical range for water-logging. The total area with the water table going up to this level lies just above 320,000 hectares, or 1.95% of the CCA. In the case of approximately 120,000 hectares of this area, the water table is sweet. Hence it can be used to grow high-delta crops or phytophreatic trees and grasses. The saline/disastrous water-table zone constitutes 200,000 hectares or just 1.2% of the Gross CCA. Sindh suffers most from this form of land degradation, with 5.1% of the area surveyed thus affected. (see table 2.6)

WAPDA has adopted the higher figure of 1.5 meters as its criteria for vulnerability. By their reckoning, about 12.9% (2.54 million hectares, 1979) of the Indus Basin falls in this category. However, two-thirds of the surveyed area, with water table within 6 feet depth is that of strongly salt-affected soils which have never been cultivated and are outside the CCA. As such, only 480,000 ha of non-saline cultivated land in the CCA is moderately to severely water logged.

By WAPDA's higher criteria (1.5 meters) the incidence of waterlogging in Sindh has increased while it has fallen in the Punjab, as can be seen in table Table 2.6 below:

Table 2.6: Water table depth under 5 feet (by province)  
(Million hectares)

<i>Province</i>	<i>1979</i>	<i>1989</i>	<i>1998</i>
<i>Punjab</i>	1.22	0.57	0.59
<i>Sindh</i>	1.19	1.60	1.74
<i>NWFP</i>	0.03	0.04	0.03
<i>Balochistan (Pat Feeder)</i>	0.05	0.1	0.09
<i>Pakistan</i>	2.49	2.31	2.46

Source: Seventh Five-Year Plan Proposals (1988-93). Report of the Technical Committee on Drainage and Reclamation, 1987

Note: The figures represent the pre-monsoon situation.

*Salinity:* The Indus Basin is faced with a considerable salt balance problem. Compared to an estimated annual salt inflow of 33 million tons brought in by the Indus river, the outflow is estimated at 16 million tons. This means a net addition of 17 million tons, of which only about 2.2 million tons is deposited in a series of evaporation ponds. The remainder accumulates in the soil profiles of irrigated lands and its underlying strata and aquifers. In addition the Indus Basin overlays large salt formations. As long as these salts remain below the reach of crops and trees, they do little harm. They become a problem when they are mobilized, either through a rising water table or the pumping of saline or sweet groundwater. (Haider et al, 1999)

The Overview Section, Part II-1: 2.3.3 provides estimates of salinity. Table 2.7 measures the distributional impacts of salinity. Across provinces, some 10.4% of the surveyed (including both cultivated and uncultivated) area in Sindh is affected by salinity, compared to 5.6% in the Punjab.

Table 2.7: Extent of salinity in cultivated areas

	(thousand hectares)			
	<i>NWFP</i>	<i>Punjab</i>	<i>Sindh</i>	<i>Total</i>
<i>A. Total area (cultivated and uncultivated)</i>	9,100	20,600	9,200	38,900
<i>B. Salt affected area within the CCA</i>	32	1,512	1,151	2,695
<i>C. Salt affected area outside the CCA</i>	17	1,512	959	2,132
<i>B as a percentage of A</i>	0.2%	5.6%	10.4%	5.5%

Source: Agricultural Statistics of Pakistan, 2000

Note: CCA = Canal commanded area within the Indus Basin

Apart from its structural composition, arguably, the single most critical factor affecting salinity at present is the unregulated use of groundwater and, as mentioned earlier, groundwater mining is becoming a serious problem. Keeping in mind that even sweet groundwater with its TDS content of 1000 ppm is considerably more saline than surface water, the continuous process whereby it is drawn down and recycled results in a build-up of surface and profile salinity. Also, the sub-surface movement of groundwater leads to encroachment in less saline groundwater zones by brackish groundwater through up-coning or lateral movement.

The lack of contiguous drainage infrastructure makes it difficult to flush accumulated salts out of the system. The 52 SCARPs implemented over the past 40 years have not addressed the problem adequately. While they have lowered the water-table and reduced salinity levels in some areas, the problem has resurfaced elsewhere. The Left Bank Outfall Drain (LBOD), a component of the National Drainage Program (NDP) represents the first effort to build contiguous drainage in the Indus Basin. It appears not to be functioning because of a dysfunctional outfall to the sea and an incomplete collector system for the effluents. The Right Bank Outfall Drain (RBOD) is yet to be constructed and Punjab does not have an outfall system yet. So the present system is a hybrid, which is also a part of the problem. It consists of: a) evacuation to the sea – albeit sporadically; b) mixing with canal and river water and; c) discharge into evaporation ponds.

#### 4. Impacts

The major impacts are classified as:

- Ecosystem degradation
- Health Impacts
- Loss of soil productivity
- Impact on aesthetic values

##### 4.1 Health Impacts

There is no systematic data linking health impacts with diseases. Case/spot/site studies are our best source of information. The nutrition health vulnerability linkage.

The diseases associated with the organic and chemical contaminants found in table 2.8.

Table 2.8

Organic	
Coliform	Diarrhea, dysentery, gastroenteritis
E-coli	Diarrhea, dysentery, gastro-enteritis
Nitrates, nitrites	Cyanosis, blue baby
Chemicals	
Cadmium	Kidney damage, anaemia, bone softening
Mercury	Nervous system impairment, kidney damage, gum inflammation, diarrhea
Lead	Diarrhea, anaemia
Arsenic	Diarrhea, melanoma, often fatal
Chromium	Diarrhea, liver function impairment, possibly fatal
Zinc	Diarrhea,
Fluoride	Bone deformities, teeth discoloration

# Land



## Pressure

- Population Growth
1. Unsustainable agricultural practices
  2. Change in land use practices
  3. Overgrazing
  4. Forest Degradation
- Natural Pressures
1. Rains
  2. Floods
  3. Winds
  4. Droughts

## State of Land

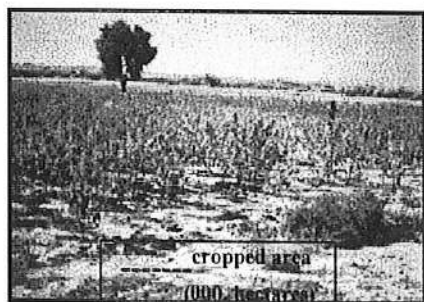
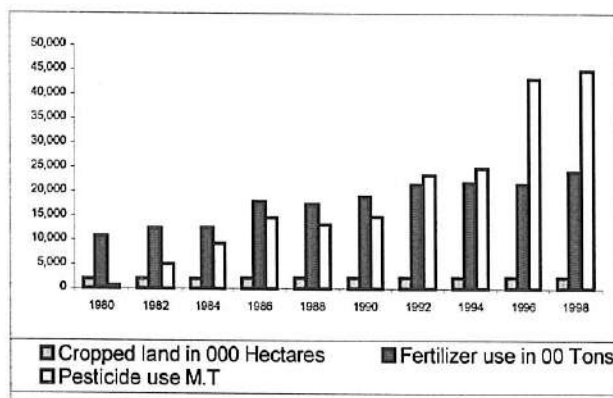
1. Water erosion
2. Soil erosion
3. Wind erosion
4. Salinity and sodicity
5. Water logging
6. Low soil fertility
7. landslides
8. Desertification
9. Deforestation

## Impact

1. Loss of fine topsoil
2. Depletion of organic matter
3. Socio-economic impacts

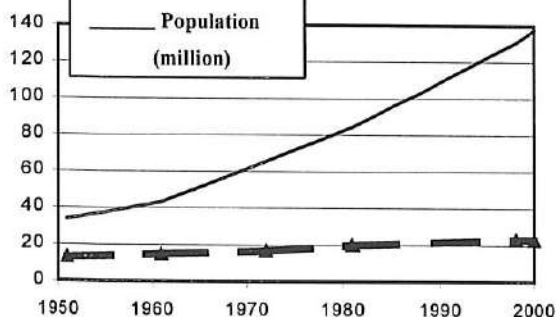
## Responses

1. National Conservation Strategy, 1992
2. National Master Agricultural Research Plan, 1996
3. National Conservation Strategy Mid Term Review, 2001.
4. National Environment Action Plan.
5. Agricultural Policies
6. Signatory to the United Nation Convention to Combat Desertification.



## Gaps

- Lack of an exhaustive information based on different dimensions of soil.
- Lack of economic analysis of soil erosion issues.
- Lack of coordinating agencies.
- Lack of national land use plan.



## Recommendations

1. Population Control.
2. National Land Use Plan.
3. Organic Farming
4. Environmental restoration activities.
5. Investment in erosion control measures.



### 3. Land

#### 3.1 Introduction

Land resources are finite, fragile, and non-renewable. They include soil, which is mainly important for agriculture; land cover, which is important for the environment; and landscape which are an important component of human habitat and welfare. Besides forming a basis for plant and animal life support systems and agricultural production, land aids in the preservation of terrestrial biodiversity, regulation of the hydrological cycle, carbon storage and recycling, and other ecosystem services. It acts as a store of raw materials and a basis for human settlement and transport activities (FAO, 1995). Pakistan comprises 79.61 million hectare (ha) of land, of which 59.28 million has been surveyed. Of the total reported area approximately 22.96 million ha was cropped area till 1999-2000, 2.36 million ha was under forest, 24.5 million ha was not available for cultivation, while 9.30 million ha was not cultivated (GOP, 2001; FAO, 2001). The cropped area registered about 19 percent increase from 1980 to 1997-98, i.e., about one percent each year, while it decreased from 23.04 million ha in 1997-98 to 22.96 million ha in 1999-2000 (GOP, 2001, GOP, 1998). The recent trends are more or less in line with the situation forecasted in Pakistan National Conservation Strategy (NCS) Paper that country is approaching its physical limits (GOP-IUCN, 1992). An important factor contributing towards this situation is land degradation. Land degradation leads to a significant reduction of the productive capacity of land. Human activities contributing to land degradation include unsuitable agricultural land use, poor soil and water management practices, deforestation, removal of natural vegetation, frequent use of heavy machinery, overgrazing, improper crop rotation, and poor irrigation practices. Natural disasters, including droughts, floods, and landslides also contribute to it. The extent of land degradation in Pakistan is shown in table1. The flow diagram shown in Figure 1 summarises the causes of soil degradation in Pakistan and leads to identify major pressures.

The Pressure-State-Impact-Response (PSIR) (figure 2) is a convenient representation of the linkages among the pressures exerted on the environment by human activities (pressure box), the change in state of stocks or quality of the natural resource (state box), and the response to these changes as society attempts to release the pressure by instituting environmental and economic programmes and policies (response box) (OECD, 1993). The interchanges among these form a potential continuous feedback mechanism that can be monitored and used for analysing the success or failure of the process. The PSIR framework has been slightly modified to assess the state of land in Pakistan. For the convenience of discussion, in this report "forest degradation" and "agricultural and rangeland degradation" are discussed in separate sections.

Table 3.1: Extent of land degradation in Pakistan

Land degradation	Area affected (million ha)
Water erosion	11.17
Salinity and sodicity	5.32
Wind erosion	4.76
Flooding	2.55
Nutrient degradation	2.22
Water logging	1.55
Pounding	0.94

Source: Ahmad and Mahmood, 1998

Fig 3.1: Causes of land degradation and their relationship, Pakistan.

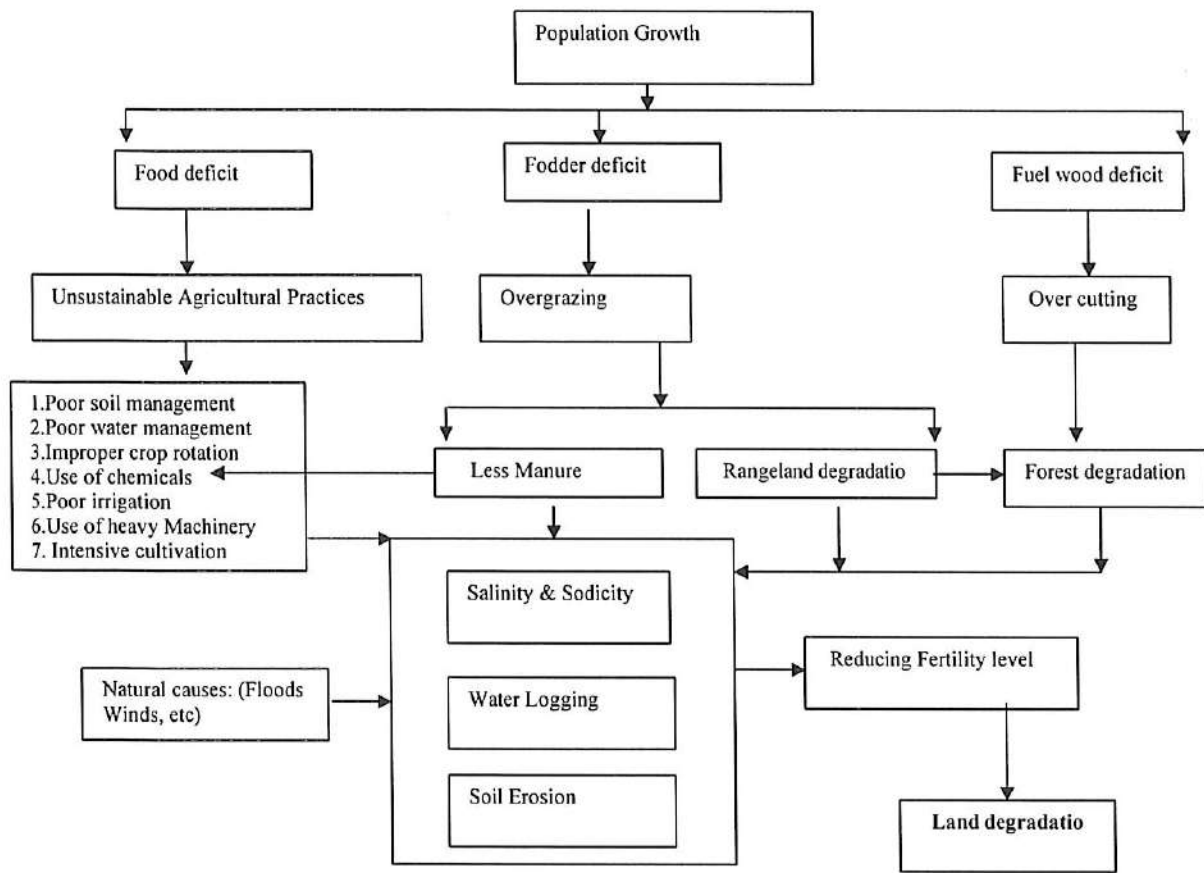
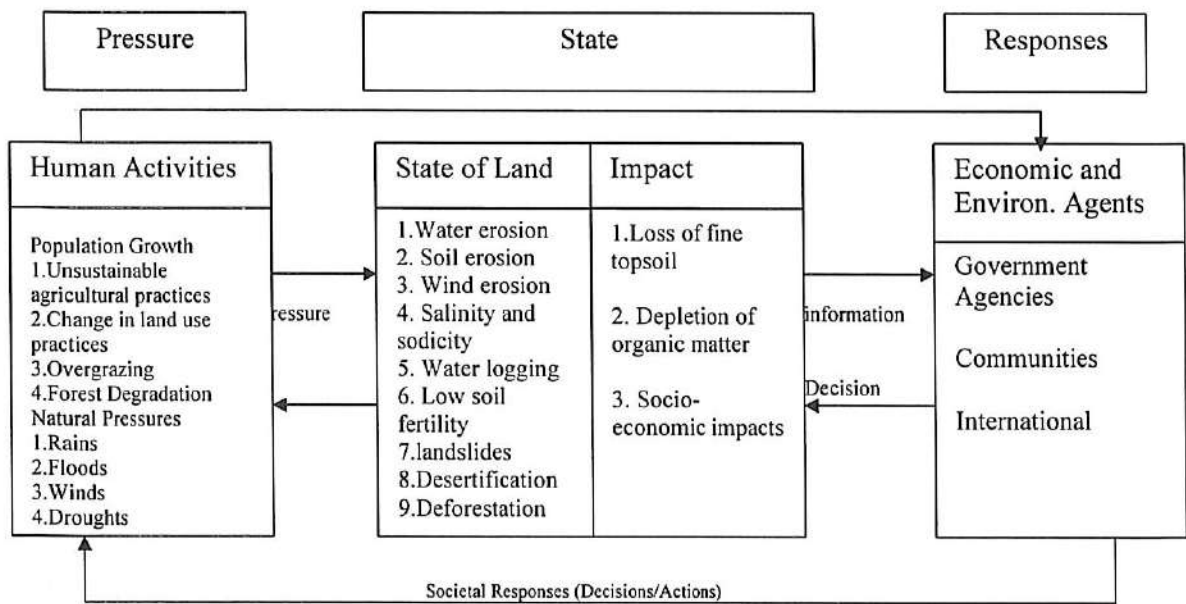


Fig 3.2: Pressure State Response Framework of Land Resources in Pakistan



## 3.2 Agricultural-Land and Rangeland Degradation

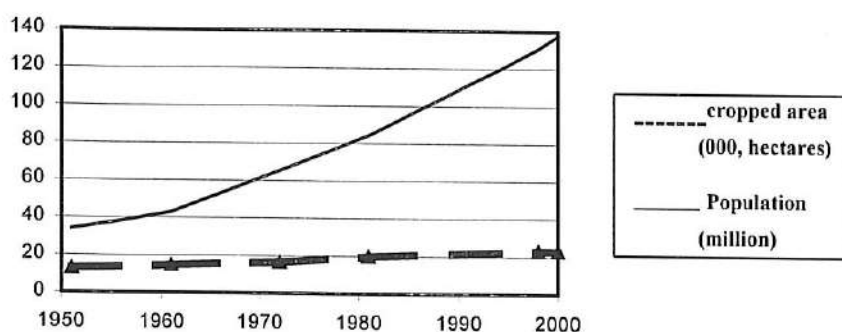
### 3.2.1 Pressure

Pressures behind degradation problems vary across the country. As is evident in figure 1, population growth, along with natural pressures as major pressures on land resources.

#### 3.2.1.1 Population Growth

Today Pakistan is the seventh most populous nation in the world with about 140 million inhabitants. Given present trends and the absence of an effective population policy, the population will likely to exceed 200 million by 2010 (UNDP, 2001). The impacts of rapid population growth are pervasive. Food, fodder and fuelwood deficit leads this growing population to use land resources unsustainably and contributes to land degradation. In Pakistan during 2002 food is needed for some 97.00 million more people than in 1961 (GOP, 2002). The trend during the decade 1951-2000 showed population growth reaching ahead of cultivated land in Pakistan (Figure 3).

Fig 3.3: Change in population and total cropped area



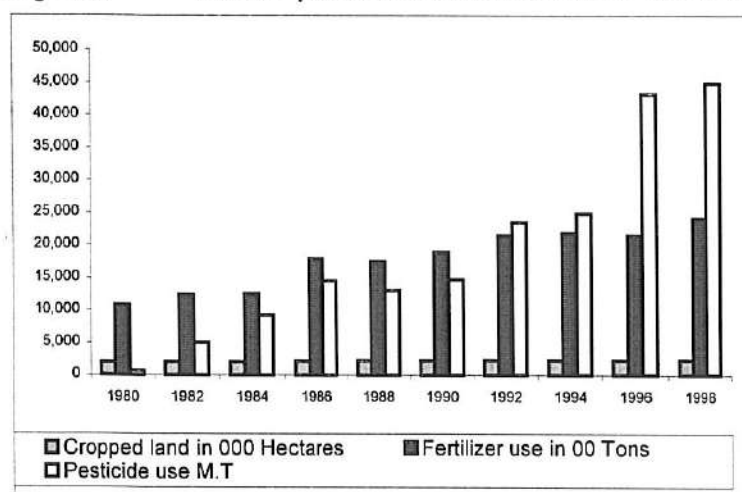
Source: Government of Pakistan 2002

#### 3.2.1.2 Unsustainable agricultural practices

Rapid population growth leads to subdivision of rural agricultural holdings, which decreases the amount of cultivated land per rural inhabitant. This in turn leads to intensive and unsustainable agricultural practices. The agricultural land is subject to ever-greater intensification of use through double and multiple cropping to produce more food from scarce land for an ever-increasing population. Indiscriminate and imbalance use of chemicals inputs (fertilisers, pesticides, and herbicides) has further accentuated the decline in soil fertility. Impressed by "Green revolution", and in a quest to produce more, there has been an upward trend in application of fertilizers and pesticides. Hence over a period of 17 years (1980-1997), the consumption of pesticides (both imported and manufactured locally) increased from 665 MT to 44,872 MT. Thus in 1997 the volume of pesticides being used was almost 67 times greater than what was used 17 years ago. This indiscriminate use of pesticides does not only have environmental and health hazards but also costs a lot in terms of foreign exchange. Similarly, fertilizer off take was increased from 1,079 thousand nutrient tonnes (NT) to 2,412 thousand NT during a period between 1980-1997 (Figure 4) (GOP, 1998). Here it is pertinent to mention that most of the fertilizer, in Pakistan is applied without any soil analysis. This indiscriminate use of fertilisers is affecting the soil nutrient balance as well as soil fertility adversely. Figure 4 clearly indicates that over last two

decades the cropped land was over exposed to fertilisers and pesticides contributing to the problems of land degradation.

Fig 3.4: Use of pesticides and fertilizers on cultivated area over time.



Source: GOP, 1998.

Use of heavy machinery and intensive tillage practices for multi-cropping are destroying the fine topsoil of the lands leading to reduced fertility. The trend to sow the cultivatable area more than once is increasing. During the last ten years (between 1990 to 2000), area sown more than once got increased from 5.71 million hectare in 1990 to 6.41 million hectares in 2000 (GOP, 2000).

### 3.2.1.3 Over grazing

To meet the nutritional requirements of a rapidly growing human population buffaloes, cattle, sheep and goat play an important role. Animal protein is a part of balanced diet and an important source of energy. According to FAO statistics for Pakistan, animal products contributed 429.4 calories per capita per day in year 2000. This is almost double than what was being contributed by animal products in 1980 (Table 2). Similarly protein obtained from animal products per capita per day in year 2000 was 22.2 gram. This amount was 14.4 gram in the year 1980 (FAO, 2002). The increased availability of animal products is dependent on livestock population, which in turn is dependent on pastures and rangelands for fodder and feed.

Table 3.2: Role of animal products in supply of energy and protein in Pakistan

Year	Animal Product	
	Calories/capita/day (number)	Protein/capita/day (Grams)
1970	273.6	13.9
1980	273.6	14.4
1990	335.5	17.8
2000	429.4	22.2

Source: <http://apps.fao.org/page/collections?subset=nutrition>

There was an increase in buffaloes, cattle and goats population during last decade (1990-2000). During the same period the population of sheep declined slightly (Table 3) (GOP, 2000). However, the burden on pastures and rangelands remained unabated as the increasing livestock population has no other way but to largely count on already depleted forests, and on rangelands which are already shrinking due to growth in human population with a need to

allocate more area for crop production, house building and industrial development. Since the animal production system in rangelands operates on low input basis, therefore the problem of increase in grazing pressure is getting worse over the period of time. The decline in vegetation cover due to grazing pressure is accelerating erosion and desertification of rangelands. Many desirable species are replaced by undesirable grass and shrub species as result of heavy grazing pressure. Since the grazing lands are “cost free” and with no individual accountability, therefore, there is very little control over grazing. The situation is further worsened by the frequent movements of nomadic and transhumant pastoralists, resulting in severe grazing of the major migration routes by passing bands of sheep and goats.

Table 3.3: Livestock population (number in millions)

Year	Buffaloes	Cattle	Goats	Sheep
1990-91	17.8	17.7	37.0	26.3
1992-93	18.7	17.8	40.2	27.7
1994-95	19.7	17.8	43.8	29.1
1996-97	20.8	20.8	42.6	23.7
1998-99	22.0	21.6	45.8	23.9
1999-00	22.7	22.0	47.4	24.1

Source: Government of Pakistan 2000.

#### 3.2.1.4 Land use change

Land use practices are changing as a result of a growing population. Land use changes are generally conscious, volitional responses by humans or human societies to change in biophysical or societal conditions. However, when we talk of land use changes in PSIR framework, it is not only a response indicator. Some land use changes constitute a driving force or pressure for changes in the state of environment. Land degradation problems are directly related to land-use practices, particularly agricultural expansion and intensification. Agricultural expansion can lead to forest and rangeland degradation. Development work, particularly the construction of roads irrigation canals, and water reservoirs has also contributed to soil erosion, water logging and salinity and sodicity. The land system particularly in and around major urban areas is affected by solid waste disposal. Toxic and hazardous industrial waste that is disposed of on land surrounding industrial towns (such as Kasur or Sialkot) or in water bodies without any treatment renders much of the land in an uncultivable position. More land is being taken for agriculture, but at the same time, the most fertile lands are being turned into non-agricultural use such as urban areas, industries, road construction, etc. Major cities have expanded, encroaching upon prime agricultural land.

#### 3.2.1.5 Natural Pressure

About 80% of the country is arid and semi-arid, nearly 12% is sub humid and the balance 8% is humid, with two distinct seasons – summer and winter. The monsoon brings the major portion of rains from July through September in most parts of the country. About 68 million hectare of the country lies in region receiving less than 300 mm of rainfall annually, which makes it susceptible to periodic draughts. The above mentioned climatic phenomenon, often aggravate land degradation, or even trigger it off, by forcing marginalized populations to extract more from the land in order to survive (GOP, 2002a). The major natural pressures in Pakistan which act as predisposing factors for land degradation, are:

For water erosion:

- monsoonal rains of high intensity;
- steep slopes of the northern areas (mountain and hill lands);
- soils with low resistance to water erosion (e.g. silty soils, vertisols).

For wind erosion:

- semi-arid to arid climates and sporadic periods of droughts;
- high rainfall variability, with liability to drought spells;
- soils with low resistance to wind erosion (e.g. sandy soils).
- an open cover of natural vegetation.

For soil fertility decline:

- strong leaching in humid climates;
- soils which are strongly acid, and/or with low natural fertility.

For waterlogging:

- alluvial plains or interior basins which restrict outward drainage of groundwater.

For salinization:

- semi-arid to arid climates with low leaching intensity;
- plains and interior basins which restrict outward drainage of groundwater;
- soils which are naturally slightly saline.

For lowering of the water table:

- semi-arid to arid climates with low rates of groundwater recharge.

In some cases, these natural pressures are of sufficient intensity to give rise to unproductive land without human interference. Examples are the naturally saline soils which occur in some interior basins of dry regions, or areas of natural gullying ('badlands'). Such conditions have been referred to as problem soils. With respect to land degradation, the key feature is that land shortage in the region has led to the widespread agricultural use of areas with natural hazards. These are the passive, or predisposing, conditions for land degradation. Problem soils require special care in management, and failure to give such care leads to land degradation.

Water and wind erosion are among the important causes for reduced land productivity. Windstorm in southern parts of the country and torrential monsoon rainfall in northern parts are important causes of soil erosion. The monsoon rains not only create water gullies, but also cause land sliding in the mountainous areas of Pakistan. Thus leaching away the fine topsoil layer. Floods that occur either due to melting of mountain glaciers and or monsoon rains are responsible for water erosion as well as the loss of vegetation cover thus reducing the soil fertility.

The current drought in Balochistan, Sindh, and southern Punjab is estimated to have affected 2.2 million people and 7.2 million head of cattle (GOP, 2002a). The consequences are large-scale migration. Such ecological migrants in their struggle to survive often make the most destructive users of vegetative cover and water supplies, severely depleting the resources of reception areas. It also results in changed land use patterns and eventually leading to land degradation.

### 3.2.2 State

Pakistan is one of more than 100 countries of the world being affected by desertification, which is resulting in environmental degradation, loss of soil fertility, biodiversity and reduction in land productivity (GOP, 2002a). The most important causes for reduced land productivity are water and wind erosion, salinity and sodicity, waterlogging, flooding, and loss of organic matter (Tables 1,4,5, and 6). According to the government's Report on the Pakistan National Conservation Strategy<sup>1</sup>, 17 percent of surveyed soils (which include most of the soils usable for agriculture, forestry, or ranching) are affected by water erosion, 7.6 percent by wind erosion, 8.6 percent by salinity and sodicity, and 8.6 percent by flooding and ponding; whereas about 96 percent suffer from "less-than-adequate" organic matter. These problems often occur simultaneously and produce synergistic impacts on agricultural productivity. Soils can suffer from both water and wind erosion, and poor organic-matter content is universal, reducing the potential productivity of the lands.

Table 3.4: Area affected by water erosion

Degree of Erosion	Province					Pakistan
	Punjab	Sindh	NWFP +FATA	Baluchistan	N.A.	
	1000 hectares					
Slight (sheet & rill erosion)	61.2		156.3		180.5	398
Moderate (sheet & rill erosion)	896.8		853.8	1,805.0	25.8	3,581.4
Severe (rill, gully, and/or stream bank erosion)	588.1	58.9	1,765.1	829.6	504.2	3,745.9
Very Severe (gully, pipe, and pinnacle erosion)	357.9	-	1,517.0	-	1,571.6	3,446.5
TOTAL	1,904.0	58.9	4,292.2	2,634.6	2,282.1	11,171.8

Source: IUCN, 1993.

Table 3.5: Area affected by wind erosion

Degree of Erosion	Province					Pakistan
	Punjab	Sindh	NWFP +FATA	Baluchistan	N.A.	
	1000 hectares					
Slight	2,251.4	295.0	13.1	36.0	-	2,595.5
Moderate	279.1	70.2	3.8	143.6	-	496.7
Severe to very severe	1,274.0	273.8	19.6	100.9	-	1,668.3
Total	3,804.5	639.0	36.5	280.5	-	4,760.5

Source: IUCN, 1993.

1 Government's report on NCS is the only source of country wise land degradation statistics so far, even Ministry of Environment (without acknowledging though) used the statistics quoted in NCS report for its "National Report of Pakistan on the Implementation of UN Convention to Combat Desertification (NNCCD)" that was submitted to UNCCD Secretariat in April 2002.

Table 3.6: Area affected by salt

		Punjab	Sindh	NWFP	Total Indus Plains
1000 hectares					
Total Command Canal Area (CCA):		7,891	5,351	320	13,562
Within CCA:	Salt Affected Area	1,614	1,532	14	3,160
	Percent	20.4	28.6	4.3	23.3
Outside CCA:	Salt Affected Area	1,129	1,019	502	2,650
	TOTAL	2,743	2,551	516	5,810

Source: GOP, 1988.

### 3.2.3 Impacts

The impacts of land degradation are mainly or closely related to environmental degradation. The impact of land degradation varies among different geographical regions of Pakistan. The northern mountains are the major source of water for the country's two major reservoirs: Tarbela and Mangla Dams. However, due to heavy soil erosion, these reservoirs are silting up, thus reducing the capacity of power generation and availability of irrigation water. Barani lands are subject to heavy soil erosion, primarily due to improper land use by crop cultivation, livestock grazing, and illegal removal of vegetation cover. Deserts have acute problem of shifting sand dunes and salinity. The irrigated areas are infected with twin menace of water logging and salinity. Underground water resources in western dry mountains of Baluchistan are shrinking due to overexploitation of the meagre quantity of water for horticulture and crop cultivation. The productivity of rangelands is hampered by heavy livestock pressure. The arid coastal strips and mangrove areas are under increased environmental stress from reduced fresh water flows, sewage and industrial pollution and over exploitation of other natural resources.

The loss of vegetative cover from the northern mountain ranges results in vast amounts of soil erosion in the steep mountain slopes in the catchment areas that receive the intense monsoon rains. The loss of valuable topsoil results in reduced level of soil fertility. It is estimated that a loss of soil at the rate of 5 tonnes/ha is equivalent to the loss of 75 kg/ha of organic matter, 3.8 kg/ha of nitrogen, 10 kg/ha of potassium, and 5 kg/ha of phosphorus (Carson, 1992). The loss of organic matter and soil nutrients in turn lowers the quality of fodder and agricultural produce. Some 40 million tons of soil is brought into the Indus Basin annually as a result of water erosion and about 11 million hectares of land is affected annually (GOP, 2002a). Additionally, soils transported downstream increase sedimentation and silting of the entire irrigation system, especially in the Mangla and Tarbela dams, reducing their storage as well as power generating capacity. It is estimated that in North Western Frontier Province and Azad Jammu Kashmir, flooding and erosion of fertile soils from upland watersheds and the resulting siltation in reservoirs and irrigation works causes an estimated annual loss of Rs. 2.3 billion (GOP, 2002a). Lastly land degradation also results in flash floods, which destroy upstream riverside infrastructure, prohibit cultivation in the summer season, and bury fertile topsoil under infertile sediment.

A major factor leading to water logging in cultivated areas is excessive percolation from the canal system, which raises the water table. The cultivation of high delta crops on highly or moderately permeable soils, obstruction of natural drainage channels through the construction

of buildings and roads, inefficient disposal of excessive rainwater etc, all add to water logging problems. The total waterlogged area in Pakistan, with a water table depth of 5-10 feet, is about 11 million hectares (GOP, 2202a). Water logging often results in secondary salinity, which also depletes soil fertility. At present about 2.8 million hectares of farmland is affected by salinity and sodicity. Water logging, salinity, and sodicity reduce the drainage capacity of soils which results in lower soil fertility, decline in crop yields, and loss of biodiversity.

Wind erosion is a common phenomenon in the deserts of Thal, Cholistan, and Tharparker, and along the Makran coast. A major factor contributing to wind erosion in these areas is the overgrazing of livestock on rangelands and the removal of vegetation for use as fuelwood. As vegetative cover is depleted, sand dunes 0.5 to 4 meter high, are shifted by the wind, covering railway tracks, roads, and croplands. An estimated 3 to 5 million hectares are affected by wind erosion which removes about 28% of total topsoil (Shafqat, 2002).

Pakistan is one of the countries affected by the drought conditions prevailing in certain parts of south and central Asia. An estimated number of 42 million people have been affected and the extent of damage has been estimated at over one billion dollars. Worst hit are the 32 districts of the country, which rely on seasonal rains for crop irrigation. The wheat crop in these districts has been damaged by 70 percent and millions of domestic and farm animals have died. Effect of water scarcity in Sindh have not only threatened crop yields, they have even resulted in lowering the supply of drinking water to urban areas including Karachi. Similarly in the case of the Balochistan province, in many cities, including its capital, Quetta, the water level in wells is dropping by about 30 cm/year, affecting the discharge of borewells supplying drinking water to these cities (GOP, 2001a).

As land productivity levels decline and crop yields fall, people dependent on the natural resources base find it increasingly difficult to survive. This reinforces the trend in rural urban migration, resulting in growing urban slums, rising level of poverty, adding to congestion, pollution and often removing more prime agricultural land from production.

### 3.2.4 Responses

#### 3.2.4.1: *Reports and Studies: Setting priorities*

To address the major issues of land degradation and low agricultural productivity, among others, following reports/detailed studies have been completed in the past which describe the strategies and priorities established within the framework of sustainable development plans and/or priorities:

- i) Punjab Barani Commission Report, 1973 (PBCR)
- ii) National Commission Report on Agriculture, 1988
- iii) Forestry Sector Master Plan, 1992 (FSMP)
- iv) National Conservation Strategy, 1992 (NCS)
- v) Sarhad Provincial Conservation Strategy, 1996 (SPCS)
- vi) Balochistan Provincial Conservation Strategy, 1996 (BPCS)
- vii) National Master Agricultural Research Plan, 1996 (NMARP)
- viii) National Conservation Strategy Mid Term Review, 2000 (NCS-MTR)

The PBCR recommended measures for the development of rain fed agriculture and uplift of the poor masses through education, research, and development of technology, and manpower. The 25 years FSMP has formulated action programmes to address policy objectives. FSMP has given strategies for conserving soil and water reserves and protecting watersheds, strategies for improving rangelands and increasing forage production and strategies for people participation. It also gives programmes for sand dune stabilisation and strengthening research in these areas. The NCS, Pakistan's premier environmental policy was adopted in 1992 with the following core areas; maintaining soils in croplands, increasing irrigation efficiency, protecting watersheds, supporting forestry and plantation, and restoring rangelands and improving livestock. The SPCS is a sustainable development action plan for Pakistan's North West Frontier Province and represents a significant milestone in the effort to implement NCS. Treatment of the fundamental social problems that are the underlying cause of environmental degradation and conservation, rehabilitation, and sustainable development of natural resources are among its specific objectives. The NMARP was schemed to encompass all agricultural research being conducted in Pakistan by national, provincial, or any other public agricultural research organization. The NMARP was based on national, provincial, and regional research priorities that reflected national agricultural policy goals of food/fibre security and one of its objectives was to avoid unnecessary duplication of research among agricultural research institutions. The impacts, achievements, failures, and prospects of the NCS were reviewed in a mid term review, that was carried out by independent team of local and foreign experts in May-June 2000. The review team admitted that environmental awareness has been raised and stressed on finding a mechanism to translate environmental policies into actions.

#### 3.2.4.2 *Action Plans*

The NCS provides a broad framework for addressing environmental concerns in the country. NCS along with the other reports and studies led the way to formulation of various plans to address the issue of land degradation.

*National Action Plan to combat desertification (GOP, 2002a):* The latest initiative is National Action Programme (NAP) to combat desertification. It was envisaged in accordance with the guidelines provided by UNCCD secretariat and CCD conference and after close consultation with various international organizations and stakeholders. This plan is prepared keeping in mind the peculiarities of various agro-ecological regions of Pakistan. Pakistan has the following major agro-ecological regions (Plate 1)

- Indus delta
- Southern irrigated area
- Northern irrigated plain
- Barani lands
- Wet mountains
- Northern dry mountains
- Western dry mountains
- Dry western plateau

The strategy adopted to combat desertification in Barani areas accentuates the following proposed activities:

- Education of farmers to take up sound agro-forestry practices.

- Allotment of state land to those who commit to bring a minimum of 50% of allocated lands under tree crops.

Create an effective extension service to motivate farmers to take up soil conservation programmes.

To cope with high water table and steady accumulation of salts in the Indus plain the following approach has been devised:

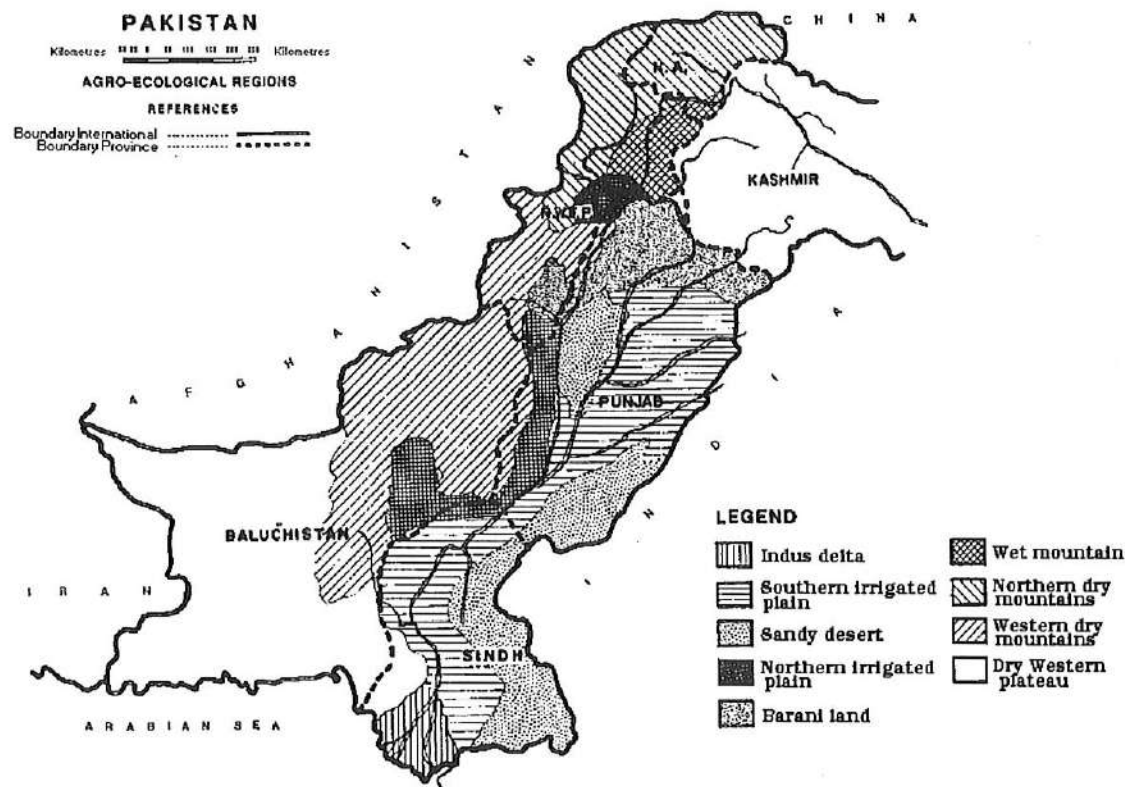
- Integration of the on-going activities and produce comprehensive information on nutrient status and their management in the soils of this region.
- Improving credit facilities for subsistence farmers and provision of subsidies, grants and loans to encourage prospective investors for tree growing.

To combat soil erosion in perimetric regions of sandy deserts the plan propose to strengthen existing infrastructure and its visible extension especially protected walls to control wind erosion and to support sand dune stabilization. The plan also stresses the need for local trainings for enhanced agricultural production, improved grazing practices, vegetation rehabilitation program, livestock increase, and infrastructure maintaining and monitoring.

For dry mountains the following priority has been planned:

- Identification of promising drought resistant cultivars of fruits and vegetables and wheat, sorghum, millets and other auxiliary crops.
- Cost effective water harvesting and soil conservation technology package for the local communities while utilizing the present water resources in the area.

Plate 3.1: Agro-ecological regions of Pakistan<sup>2</sup>



2 Source: <http://www.fao.org>

Under NAP the government has a plan regarding redistribution of assets, especially state owned land with view to speed up poverty reduction efforts in rural Pakistan. The government has launched a programme of accelerated distribution of state owned land to small farmers. The distribution of about three million acres of available land will be fully supported with the provision of infrastructure, technical packages and other possible inputs to combat desertification (GOP, 2002a).

*National Environmental Action Plan (NEAP):* Till mid term review of NCS, different organizations within and outside the ministry of environment, local government, and rural development implemented environmental projects but the approach was fragmented. After the MTR of NCS, the Ministry developed a National Environmental Action Plan which focuses on four core areas viz. clean air, clean water, solid waste management, and ecosystem management. The issue of land degradation is being dealt under solid waste management. NEAP is being implemented with the assistance from UNDP. The ministry has initiated NEAP-support programme with the development objective of environmental sustainability and poverty reduction in the context of economic growth. This programme is focusing on "ecosystem management and natural resource conservation" among others.

*Institutional measures taken to address the issue of land degradation:* Being focal point of UNCCD the ministry of environment, local government, and rural development is responsible for optimal usage of existing resources for combating desertification and land degradation in Pakistan. The ministry is the headquarter of National Coordination Committee on Desertification (NCCD). This is an inter-ministerial and inter-department body. In addition to the provincial technical departments of agriculture, irrigation, livestock, soil conservation, and forestry, the following agencies are engaged in research and development activities aiming at halting land degradation and desertification control in the country.

*National and provincial entities:* A number of national and provincial institutions deal with land degradation issues to a lesser or greater degree.

- Pakistan Agricultural Research Council (PARC) consisting of Crops Research Institute, Rangeland Research Institute, Land Resources Research Institute and Water Resources Research Institute] works for development of desert reclamation techniques, reclamation of saline and waterlogged areas , soil and water conservation and ground water management.
- Arid Zone Research Centre (AZRC) Quetta with institutions at Umar Kot (Sindh), Bahawalpur (Punjab), and D.I.Khan (NWFP) works for soil and water conservation techniques through drought tolerant varieties and improvement of rangelands by planting shrubs.
- Pakistan Forest Institute, (PFI) Peshawar is focusing on dryland afforestation, selection of grasses, shrubs for improvement of rangelands, and raising of drought tolerant plants.
- Pakistan Council for Research in Water Resources (PCRWR) with a directorate of Desertification Control in Bahawalpur is involved in assessment mapping and monitoring of desertification and improved methods of rainwater harvesting.
- Pakistan Environmental Protection Council (PEPC), an integral part of Ministry of Environment, Local Government and Rural Development Coordinates and supervises enforcement of the Pakistan Environmental Protection Act; and approves national environmental policies and ensure their implementation within framework of a national conservation strategy as may be approved by the Federal Government from time to time.

- Water and Power Development Authority (WAPDA), with a directorate of watershed management in Rawalpindi focuses on watershed management.

The Murree-Kahuta Development Authority (MKDA), Agency for Barani Areas Development (ABAD) Rawalpindi, Cholistan Development Authority (CDA) Bahawalpur, Sindh Arid Zone Development Authority (SAZDA) Hyderabad, provincial "Forestry Research and Extension Agencies" in all provinces, Departments of Soil, Agronomy, Plant Breeding, Forestry, and Animal Husbandry in all Agricultural Universities, and Cholistan Institute of Desert Studies, Islamia University, Bahawalpur are involved in research and extension services to combat land degradation and desertification at provincial levels.

*NGOs:* Non-governmental organizations are playing a major role in raising awareness about environmental issues. Some of the NGOs which are involved actively in addressing the issues of land degradation and desertification are listed here (in alphabetical order):

- Agha Khan Rural Support Programme (AKRSP), Gilgit.
- Baan Beli, Sindh.
- Balochistan Rural Support Programme.
- National Rural Support Programme (NRSP), Islamabad.
- Pakistan Institute of Environment Development Action Research.
- Sarhad Rural Support Corporation.
- Society for Conservation of Protection of Environment (SCOPE), Karachi.
- Sungi Development Foundation, Abbotabad.
- Sustainable Development Policy Institute (SDPI), Islamabad.

All of the above listed NGOs are implementing various projects on natural resources conservation and are assisting the ministry of environment through their research oriented policy advices.

*International conventions and treaties on soil conservation:* To join international efforts for conservation of natural resources, Pakistan has become signatory to many international Conventions/Protocols/Agreements. The relevant ones are:

- Agenda-21,
- UN Framework Convention on Climate Change (UNCCC)
- Montreal Protocol on Ozone Depleting Substances (ODS)
- Convention on Biological Diversity (CBD)
- Global Environmental Facility (GEF)
- Commission on Sustainable Development (CCDs)
- Convention on Persistent Organic Pollutants (POPs)
- Convention on the Control of Trans boundary Movement of Hazardous Wastes and their Disposal and;
- UN Convention to Combat Desertification and Drought.

*Environmental Laws:* The Pakistan Environmental Protection Act, 1997, to provide for the protection, conservation, rehabilitation and improvement of environment, for the prevention and control of pollution, and conservation of natural resources. The Act particularly focuses on implementation of Pakistan Environmental Protection Council's policies, enforcement of National Environmental Quality Standards, introduction of EIA/IEE review procedures/system, regulatory regime for hazardous substances/wastes, resource generation through establishment of Provincial Sustainable Development Fund and levy of Pollution

Charge and providing appellant forum for environmental cases. The following series of actions were taken to operationalize its provisions:

- National Environmental Quality Standards (Self-monitoring and Reporting by Industries) Rules, 2001
- Environmental Samples Rules, 2001
- Provincial Sustainable Development Fund (Procedure ) Rules, 2001
- Provincial Sustainable Development Fund (Utilization) Rules, 2001
- Pollution Charge for Industry (Calculation and Collection )Rules, 2001
- Composition of Offences and Payment of Administrative Penalty Rules 2000
- Hazardous Substances Rules, 2000
- National Environmental Quality Standards (Environmental Laboratories Certification) Regulations, 2000
- Pakistan Environmental Protection Agency (Review of IEE/EIA Regulations, 2000)

While the two regulations viz. Environmental Laboratories Certification Regulations and Review of IEE/EIA Regulations are in place, all the other rules are being notified (Ministry of Environment Web page <http://www.environment.gov.pk/Report.html>).

### *3.2.5 Policy Failure*

Issues of land degradation are largely addressed through Ministry of Environment, Local Government, and Rural Development, which defines “environment” as “land”, “air”, and “water”. The word “environment” was unfamiliar to people of Pakistan even after promulgation of the 1983 Environmental Protection Ordinance. Pakistan Environmental Protection Council, an apex body for setting up environmental policies, met for the first time after 9 years since the ordinance became effective. Even the rules to operate 1983 Ordinance could not be formulated in 13 years span till it was replaced with a new act of parliament in 1997. Environmental institutions at the federal level and provincial levels were too weak to enforce the laws. Environmental awareness was non-existent and whatever efforts exerted made a little change due to increasing population and low literacy rate. In the way a decade passed without happening a significant event in the environmental history of Pakistan since 1983 Ordinance promulgated (GOP, 2001a). This situation along with the aftermaths of “green revolution” had drastic affect on land resources consequently land degradation kept on unabated.

The NCS that was prepared in 1992 may be termed as a turning point and an important response for mitigating the impacts of growing pressures on natural resources. The report depicted the gloomy portrait of Pakistan's deteriorating resources and gave a plan to integrate the environmental concerns into virtually every aspect of Pakistan's economic life. It had three overriding objectives: a) conservation of natural resources; b) sustainable development; and c) improved efficiency in the use and management of resources. The International Union for Conservation of Nature (IUCN) has done a mid-term review (MTR) of the NCS in 2001, to set guidelines for decision-making about the future needs in Pakistan. The gist of the MTR is that the NCS, as a document was commendable. On account of its prescience and potential, it earned recognition on international level. However, it was not implemented with an effective approach. If the NCS was both a process and a product, the product (i.e. the document) rapidly took precedence over the process (i.e. the multi-stakeholder participatory approach etc.,). Over a period of time, the document became less relevant to new opportunities and constraints. The implementation was marred by the discontinuation of several effective processes and by the lack of any effort to get rid of the hurdles in the way (Shahzad, 2002).

It is not only with the NCS, almost all of the studies and reports on environment (land, air, water) conservation were nicely worded and were commendable documents but those words could never get translated into effective actions due to lack of political will or due to a tendency to maintain status quo.

The crucial flaw in efforts to address the issue of land degradation is the fact that there is no good information base on different dimensions of the land resources. Like other South Asian countries, whatever information and data are available on land degradation are either patchy or location or topic specific. Some of the data gaps are lack of detailed mapping of soil structure at the district level; lack of current information on loss of soil due to wind erosion, Salinization, and soil pollution, and magnitude of soil erosion and fertility losses by spatial location, type of cultivation, and land use categories. Comprehensive studies are required to cover as many dimensions of the soil problem and as many agro-ecological zones as possible so that acute soil issues can be addressed.

Another lacuna is lack of thorough economic analysis of soil erosion issues. Such an analysis is needed to justify investment in soil conservation measures. Pakistan's NCS envisaged an investment of Rs. 150 billion over the ten years period for its implementation. The MTR of the NCS revealed that the actual investment of Rs. 77 billion was realized in 14 core areas over 9 years period. Although it does not show a bright situation in general, yet, the neglect of land degradation issues is evident through the fact that for "Core Area 1" "Maintaining Soil in Croplands", only 33% of the allocated investment was spent in last nine years, i.e., against an allocation of 20887.156 million rupees, only 6956.678 million rupees were spent (GOP, 2001a). Through economic analysis of soil erosion issues would provide the rationale to revisit our national priorities for investing in sustainable development and environmental conservation.

Important institutions working to address the land degradation issues have already been listed in previous section. There exist a National Master Agricultural Research Plan to avoid unnecessary duplication of research among agricultural research institutions. However, this plan is never implemented in true spirit. A common forum for different institutions working on various aspect of land is lacking. Consequently allocation of work among different institutions to monitor and assess different aspects of land degradation is not possible and most of the institutions are conducting their work in complete isolation.

Lack of coordination and harmony is not only specific to different institutions working on land resources. It also prevails at much higher levels among various ministries. Ministry of Environment, Local Government, and Rural Development in its "National Report on The Implementation of UNCCD" clearly reported that "The Government has launched a program of accelerated distribution of state owned land to small farmers" (GOP, 2002a). In practice the Ministry of Food, Agriculture and Livestock floated a proposal of "Corporate Farming Plan" (CAF) and got it approved from Cabinet. According to which the state owned land would be sold out or leased out to the corporations interested to do industrial farming. There would be no upper ceiling for land holdings and the machinery imported for such activity would be exempted from import duty. CAF does not support distribution of land among small farmers rather it would encourage unsustainable agricultural practices as every investor would be tended to do intensive cultivation and indiscriminate use of chemical inputs would be a must for intensive cultivation. Moreover, exempting agricultural machinery to be used in corporate farming from import duty would encourage mechanization thus further deteriorating the land quality.

### 3.2.6 Recommendations

- There is severe population pressure on available farmland and as a result unsustainable agricultural practices are being adapted to meet the food requirements for this increasing population. Likewise, livestock have put immense pressure on forests and rangelands leading to soil erosion. Therefore, population control naturally remains a crucial and overriding concern.
- A thorough study/survey is required to assess the degraded land. Without an accurate figure on land degradation, none of the policy measures can be successful.
- Policies to minimise unsustainable use of land should also be formulated. This implies using the land according to its capability. A national land use plan should be prepared for this purpose.
- Fundamental changes in management are needed to sustain soil nutrients in the long run. These will require soil analysis to determine the status of nutrients before applying any chemical fertilisers. For areas of increasing acidity, use of limestone as soil restoration measure may be effective. Programmes are urgently required to use organic fertilisers and farmyard manures to replenish soil nutrition status.
- Factors leading to soil erosion should be thoroughly studied and specific programmes must be designed to protect the soil when it is most vulnerable to erosion. For instance to minimise soil erosion during monsoon season, zero/minimum tillage, mulching, hedgerows, and green land cover may be adapted.
- Soil degradation can be greatly lowered by efficient management of watershed using integrated soil fertility management systems in combination with alternative land uses such as agro forestry, horticulture, pasture management, community forestry etc.
- Off-farm employment can be promoted through environmental restoration activities such as afforestation, management of degraded lands, agro forestry, horticulture, and so on.
- From an economic perspective, soil erosion has high environmental costs and therefore there is a need to invest more in erosion control measures to achieve true economic benefit. The monetary value of environmental and economic damage from erosion represents the potential benefits from soil conservation measures hence there is a dire need to invest more in control of soil erosion. However, even if more resources are somehow allocated, unless population is reduced and the economy can provide sustainable economic alternatives, the efforts to control soil degradation will not be worthwhile.

## 4 Forests

Figure 1 represents an amended form of OECD (1993) Pressure-State-Impact-Response framework. The major pressures and their impacts on the condition of forests are discussed in the following sections

### 4.1 Pressure

#### 4.1.1 Population Growth

An important factor contributing to diminishing forest resources is population growth. The population of Pakistan was estimated to be 140.5 million in 2001 and continues to grow at an annual rate of 2.4% (GOP Population Census, 1998). Due to this increased population the pressure on forests and forest products is increasing. This is evident in the fact that despite a heavy rate of deforestation, 300,000 tons of wood, pulp, paper, and other by-products were imported in the year 2000-01 (CRCP, 2001). Using relevant growth parameters of demand and supply developments and excluding inaccessible areas, (25% of the total forest cover) total forest stocks that existed in 1995 would be completely consumed sometime between the year 2015 and 2025 (PFRI, 2000).

#### 4.1.2 Unsustainable forest management practices

During both the colonial and post independence periods, entrepreneurs took over and commercially exploited large forest tracts to satisfy the demands of a growing rural and urban population. Also, with the development of canals, thousands of hectares of riverine, scrub, and forestland in the Indus plains were cleared for agriculture. The deforestation process was underpinned by On top of it a complex system of ownership and land tenure which led to unsustainable forest management practices and to rising tensions between landowners and right-holders and the Forest Departments. This is especially so in the case of guzara<sup>1</sup> forests in Hazara, where the affected stake-holders feel that the Hazara Forests Act, 1936, has led to the "bureaucratization" of private forests. The act was designed by the British to centralize the management of forest resources in Hazara, one of the most forest-rich areas of the NWFP. The underlying premise was that the villagers could not be trusted to look after the forests themselves, and that Government supervision was necessary. Conversely, owners and right holders objected to the red tape and delays involved in obtaining approvals of grant of trees and disbursements of their shares of sale proceeds of timber. An additional source of resentment was the actual or perceived discrimination in recognizing rights, which was attributed to an alliance between the Forest Department and the large forest tract owners.

#### 4.1.3. Energy Requirements

Energy requirements of the growing population exert increasing pressure on forests. In all, forests provide 3.5 million cubic meters of wood, which is one third of national energy requirements (GOP, 2001). More than 75 percent of all households in Pakistan rely upon wood for cooking and heating (RWEDP, 2000), with the dependence reaching 80 percent in rural areas (Figure 2).

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1 Guzara literally means "subsistence". When forests were reserved for government ownership and management in Hazara at the time of first settlement of land ownership in 1872, sizeable patches of wooded lands close to habitations were set aside to meet the bona fide domestic needs (timber for house construction, fuelwood, fodder) of the local communities. Such forests were designated as guzara forests.

Fig 4.1. Pressure State Response Framework of forestry sector in Pakistan.

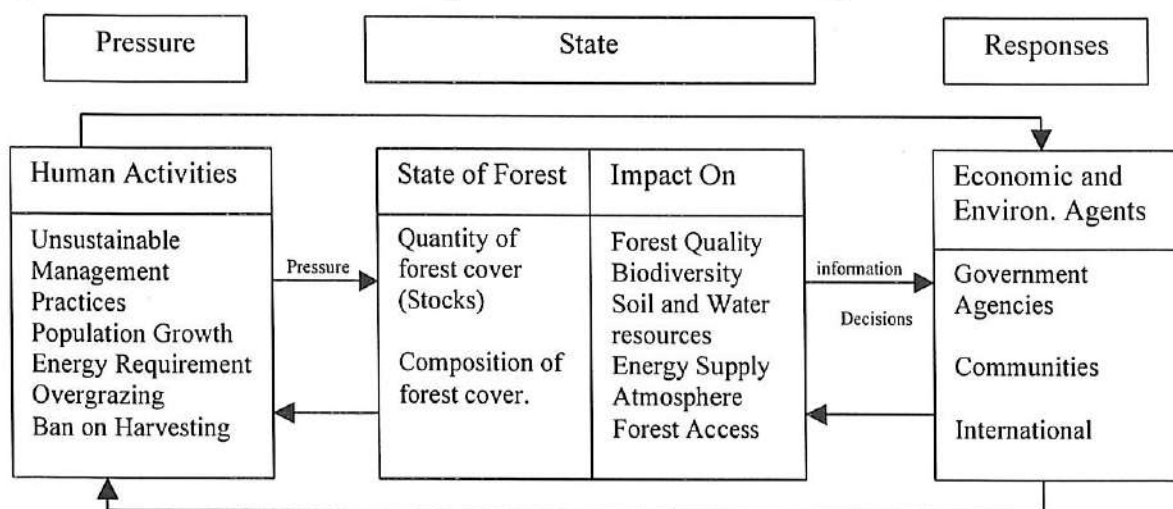
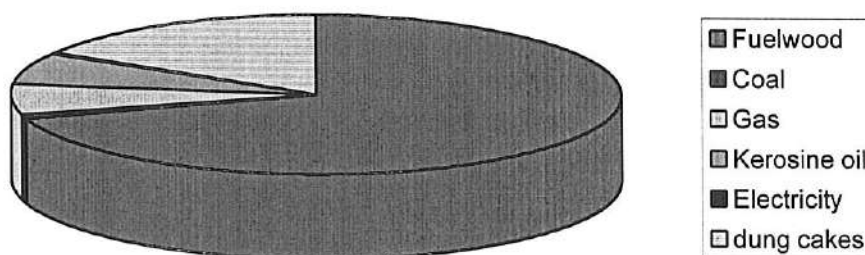


Fig 4.2. Different sources of fuel energy for cooking purposes.



Source: GOP, 1997

#### 4.1.4. Over Grazing

Much of the forest area is used as grazing land for livestock, whose numbers have been increasing over the years (Table 1). The pressure of livestock on forests varies with geographical region. In particular, the productive forests of the NWFP are the most exposed to over grazing by cattle, sheep, and goats (see table 2 for the growth in numbers). In the northern divisions of the NWFP, 82% of forest area is affected by over grazing and 43% of the grazing is taking place within forest stands on very steep to even precipitous slopes posing threats to slope stability (PFRI 2000).

Table 4.1. Livestock population in Pakistan (000 heads)

Livestock	1992-93	1994-95	1996-97	1998-99	1999-00
Cattle	17779	17848	20802	21592	22004
Sheep	27668	29065	23668	23938	24084
Goats	40225	43764	42650	45775	47426

Source: GOP, 2000

Table 4.2. Change in livestock population of NWFP over 1986-1996 (000 heads)

Livestock	1986	1996	Change %
Cattle	3285	4237	29
Sheep	1599	2821	76
Goats	2899	6776	134

Source: GOP, 2000

#### 4.1.5 Ban on timber harvesting

The ban on commercial timber harvesting, which was imposed after the floods of 1992, remained in place for nine years. The ban was imposed with a view to protect the natural environment and to regulate atmospheric conditions. However, evidence surfaced from around 1995 onward, which reported large-scale illegal timber harvesting in almost all regions of NWFP, including Malakand and Upper Swat. This highly unsustainable timber harvesting continued where there was no restriction of demarcation or work plans by forest department. Some even say that it increased compared to the pre-flood period (Geiser, 2000). A known fact is that lorry-loads of timber, illegally cut in northern Pakistan, were sent to Afghanistan, to reappear in Pakistan, but now declared as Afghanistan sourced.

##### Box-4.1 Timber Mafia

The glimpse of timber harvesting by timber mafia despite the ban can be had from the example of removal of illicitly cut timber in 1998. On April 28, 1998, Government of NWFP called upon the Prime Minister to lift the ban on commercial timber harvesting, and at the same time (arguing that forestry is a provincial subject) ordered the NWFP Forest Department to relax the ban from October 1998 to end of February 1999 to allow the removal of "illicitly cut timber" in the Indus Kohistan region. During the ban relaxation period about 1.4 million cubic feet timber worth billions of rupees was transported from Kohistan and Hazara under the guise of removing the windfall and dried trees. Where as a high level survey of forest department reported the presence of only 0.8 million cubic feet windfall and dried timber in Kohistan area. Which means that about 0.6 million cubic feet standing trees were chopped off and smuggled to downward country (Daily "The Nation" 14.11.1999, "Dawn" 22.12.99) in order to increase the profit which ran into millions of rupees.

Royalty payment to the local right-holders stopped too as a result of the timber-harvesting ban. Illegal harvesting, though, continued, but no royalties were deducted for the state or the locals. In addition, royalty payments are still due for timber cut in the pre-ban period<sup>2</sup>. This situation encouraged the local communities to get compensated by using the forest resources unsustainably. On top of it due to delayed disbursements, many right-holders agreed to sell their royalty rights to the contractors/ local elites on much less value than the actual value of the royalty share. It did not only lead to a lack of ownership (and interest) of local communities in forest resources but also reduce the local pressure of communities on illegal harvesting.

## 4.2 State

Considerable debate exists over the precise area under forests in Pakistan (UNCED, 1992). Partly, the problem is a definitional one, represented by a less than perfect correspondence between legally demarcated forest under the administrative control of the provincial forest

<sup>2</sup> It is a serious issue in Dir and Kohistan.

departments (FD) and the situation on the ground, as it relates to both tree cover and its condition. In other words, officially designated "forest areas" while substantial tree cover may be found on lands classified differently.

Partly, forest statistics differ substantially. Land use data, including forest areas reported by the Forestry Sector Master Plan (FSMP) Project, 1993, with the help of satellite imagery and covering the whole of Pakistan, shows that Pakistan has 4.2 million ha covered by forests and trees, which represents 4.8 percent of the of the total land area. The Pakistan Forest Resource Institute (PFRI, 2000) questions this figure on methodological grounds. GOP figures show forest area increasing over time, from 3.46 million ha in 1990 to 3.66 million ha in 1999. In contrast, according to the recently released FAO released report, "State of Forests, 2001," the total forest area of Pakistan (sum of natural forests plus forest plantation) decreased from 2.75 million ha in 1990 to 2.36 million ha in 2000. This translates into an annual rate of deforestation of -1.5% over the last ten years. . Similarly, the Asian Development Bank claims that forest cover dropped from 3.6% of the total land in 1990 to 3.2% of the total land in 1999.

Forest depletion has emerged as one of the key environmental issues for Pakistan, which is accompanied with many other environmental effects such as landslide, soil erosion, floods, soil degradation, and displacement of people. Conservation of the forest resources is not only important to protect other resources such as water, soil, flora and fauna, but also to ensure the sustainable livelihoods of people who depend, directly or indirectly, on it through agriculture, animal husbandry, and logging.

According to the FAO's Forest Resources Assessment Project, 2000, 3.1 percent surface area of Pakistan is under forests (Table 3)<sup>3</sup>. The per capita forest area is well below the world average of 1 percent. In terms of its contribution to GDP forest sector contributions have declined from 0.33 percent in 1989-90 to 0.07 in 1999-00 (Figure 3). Due to lack of any precise figures on area under forests, it is difficult to reflect the current stocks of forests in Pakistan. However, PFRI (2000) that covered four divisions and 21 Districts of NWFP reflect the trends of the state of productive forests in NWFP<sup>4</sup>. In PFRI study area only a relatively small area of 21 percent has sufficiently high crown coverage of more than 50 percent. Only 28 percent (191,672 ha) of the total PFRI forest area is located on sites below the 2000m-altitude level of which only 18 percent (36,135 ha) is in a fairly good condition (PFRI, 2000).

It was also reported that the largest part of the timber volume was concentrated in old trees with high diameters growing in the uneven-aged or in mature forest stands in high altitudes. Nearly all of the stands containing high volumes were located above 2000m and most of these stands were hardly accessible. Only 12 percent of all surveyed forest stands were found on flat to only fairly steep terrain and are -from an accessibility point of view- suitable for intensive or social forest management with the primary objective of wood production. The forests in the PFRI areas are subject to a continuous process of degradation. The percentage of areas with deep soil is decreasing with declining crown coverage. Simultaneously, the proportions of areas where only rocks are found are increasing. Being less exposed to human interference and maintaining their natural structure the conditions are significantly better for the high-hill forest region (PFRI, 2000).

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3 The same figure is reported by The World Bank Group (<http://www.worldbank.org/data/>) as well as by The Asian Development Bank.

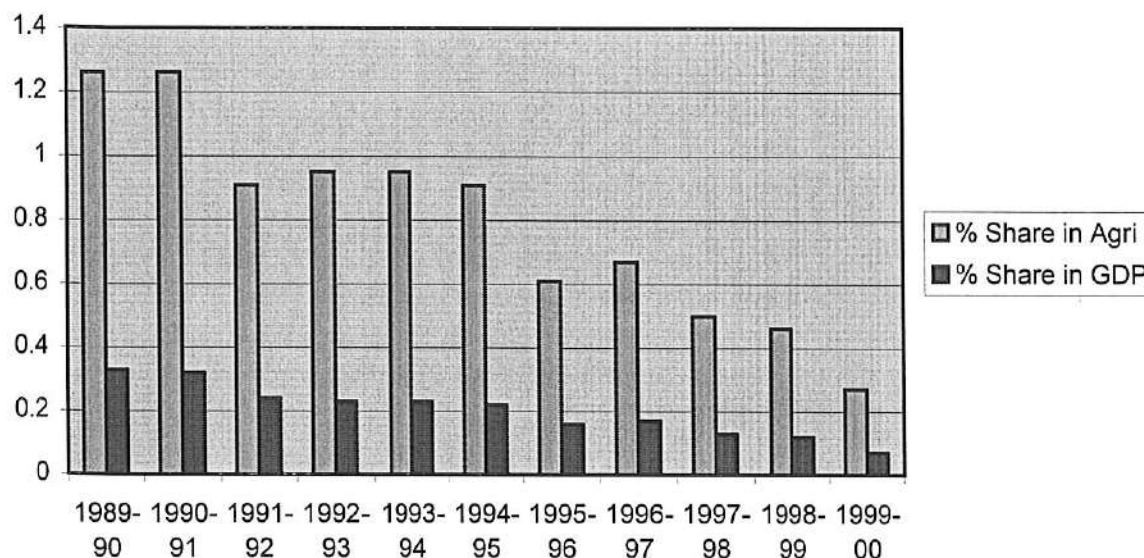
4 Of the country's four provinces NWFP has the largest area of productive forests.

Table 4.3. Forest Resources 2000

Land Area <sup>5</sup> (000 ha)	Total Forest (000 ha) (natural forests + forest plantation)	Percentage of land area (%)	Wood volume <sup>6</sup> in forests (m <sup>3</sup> /ha)	Wood biomass <sup>7</sup> in forests (t/ha)
77087	2361	3.1	22	27

Source: State of forests 2001, FAO

Fig 4.3. Share of forestry in value added of agriculture sector (Base= 1980-81)



Source: GOP, 2000.

The rangelands<sup>8</sup> of the country are subject to serious overgrazing. 80% of the total 4.8 million ha of rangelands in NWFP have been classified as degraded. Widespread free grazing has led to a large imbalance between the carrying capacities and stocking densities of rangelands. For instance rangelands in Hazara Division of NWFP, known to be capable of supporting 548,000 adult animals were stocking 1.6 million animals or nearly three times capacity in 1995 (ADB, 1995).

Similarly state of fuelwood in the national energy balance also remains very crucial. Fuelwood continue to be the major source of household energy in Pakistan. Ninety percent of rural population and 60 percent of the urban population use fuelwood for their household needs. The trees on 29 million ha of rangelands and the 330 million trees on 19.3 million ha of farmlands contribute greatly to meeting the fuelwood demand in Pakistan (RWEDP, 2000). However, our resources are highly insufficient to meet the wood and wood product demands thus import of wood and wood products have become a salient feature of our trade. The value of such imports increased from Rs. 2627 million in 1989-90 to 4551 in 1996-97 (Figure 4) which is a burden on our debt-ridden economy. Our import volume for wood and wood products was US\$ 137.040 million in the year 2000 (Figure 5 and Table 4).

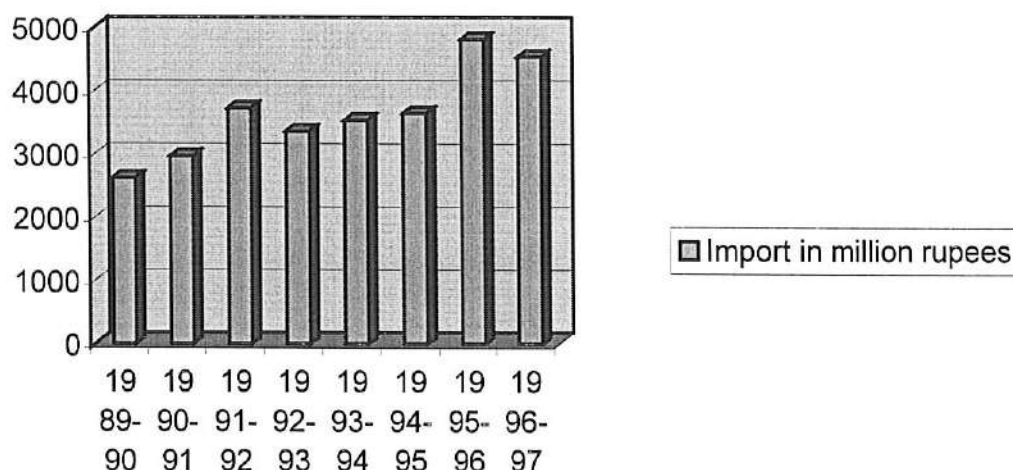
5 The land area figure refers to the total area of a country, excluding areas under inland water bodies.

6 Wood volume refers to total volume over bark of living trees above 10 cm diameter at breast height.

7 Biomass refers to aboveground mass of the woody part (stem, bark, branches, twigs) of trees (alive or dead).

8 Rangelands include forestlands producing forage.

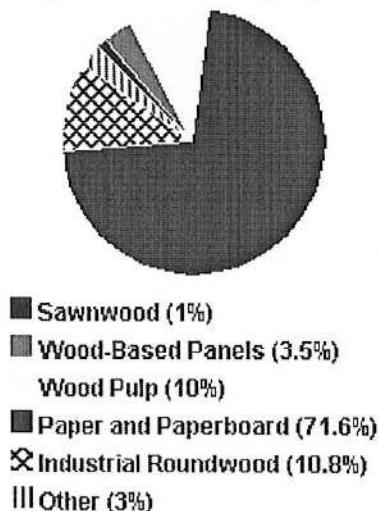
Fig 4.4: Import of wood and wood product from 1989-90 to 1996-97



Source: Government of Pakistan, 1998

Fig 5. Wood and wood product import in Pakistan during year 2000.

Import Value: US \$137,040,000



Source: [http://www.fao.org/forestry/fo/country/index.jsp?lang\\_id=1&geo\\_id=36](http://www.fao.org/forestry/fo/country/index.jsp?lang_id=1&geo_id=36)

Table 4.4. Production, trade and consumption of forest products, 1998

Fuelwood			Industrial roundwood			Sawnwood			Wood-based panels			Pulp for paper			Paper and paper board		
00m <sup>3</sup>			000m <sup>3</sup>			000m <sup>3</sup>			00m <sup>3</sup>			00 tonnes			000 tonnes		
P	I	C	P	I	C	P	I	C	P	I	C	P	I	C	P	I	C
30715	0	0715	2329	135	2462	1051	53	1104	109	18	127	199	36	235	513	135	648

Source: FAO State of Forests 2001.

Key: P= Production, I= import, C= Consumption

### 4.3 Impacts

The forests in Pakistan have three important functions: protection of natural environment, regulation of atmospheric conditions, and production of goods. All three can be ensured by maintaining a balance between sustainable production and sustainable consumption of the forests. Present trend of indiscriminate consumption of forest resources is unsustainable..

This fact is evident from PFRI report that says; "The use of wood to meet firewood consumption in PFRI study area exceeded sustainable supplies by about 4 million m<sup>3</sup> annually. If the harvesting continued unabated at the rate assessed in 1995, wood stocks would get completely consumed between the year 2015 and 2025 (PFRI, 2000)". This is not all, it is further reported that wood utilization is not restricted to easily accessible sites, but is practiced nearly everywhere. 45% of the wood utilization is done on places definitely unsuitable for this purpose with very negative effects on the structures of these forests (PFRI, 2000). SDPI conducted a study for ADB quite recently and it was observed that in most cases, trees with smaller diameters are harvested because of ease in transportation. This causes an abnormal age class distribution within the stands and directly leads to bole damage or indirectly promotes the spreading of diseases (Suleri, forthcoming). The ongoing trend of deforestation is having a negative impact not only on production and protection functions of the forest but also on the sustainable livelihood of those who live in and around the forests.

#### 4.3.1 Impact on forest stocks

There are two major impacts of various human activities (pressures) on forest stocks in Pakistan. The first impact is deforestation or reduction in quantity, while the second impact is forest degradation which embodies changing qualitative composition and age structure of the forest stocks. The data and estimates from independent sources show that the growing stocks of forests have decreased over the period. The World Bank Sources report an annual deforestation rate of 1.1 percent. FAO statistics reveal an annual deforestation rate of 1.5 percent, whereas ADB reports that deforestation rate for different regions of NWFP (the main hub of productive forests) ranges from 1.4 percent to 8.8 percent per year (WB, 2001; FAO, 2001; ADB, 2001).

#### 4.3.2. Impact on biodiversity

Another conspicuous impact of deforestation is on the flora and fauna. Deforestation leads to loss in habitat, breeding places, and food sources of different animals. It also adversely impacts on ecosystem diversity, resulting into loss of genetic diversity and species diversity. Various plant species (four monotypic genera and 400 species) are endemic in Pakistan (SOE, forthcoming). Several more are considered threatened as a result of deforestation and increasing pressure on their use. The deforestation is not only a threat for flora, but fauna is also being adversely affected. Loss of pastures results in reduction in population of rodents, rabbits, and other herbivores (grazing animals), thus eventually the population of carnivores (meat eaters) who use herbivores as their food source is decreased. Out of 167 mammal species, three are endemic and there are a number of endemic and near-endemic sub-species. Similarly, reduction in mangrove forests adversely impact the aquatic species such as green turtle, various species of fish, and preying birds. Out of 172 listed species of reptiles and amphibians, 40 species are endemic. The same trend is true for birds and arthropods.

#### 4.3.3. Impact on soil and water usage

The negative consequences of uncontrolled forest exploitation are ever more obvious. They include serious soil erosion and sedimentation, desertification of once-productive upland areas, the silting up of waterways in the plains (making them more prone to flooding), and marked scarcities of fuelwood and building timber (creating an economic burden on low-income communities). A thin canopy of trees with virtually no regeneration, sever erosion, and low organic matter content of soil, characterize most of the degraded forest of NWFP and

northern areas of Pakistan. The occurrence of floods and landslides as a result of deforestation has affected not only the degradation of land but also human lives and property. On top of it, there is also a serious damage to irrigation networks, crops, and transportation and communication systems and utilities due to floods. The decline in tree cover has already resulted in a large reduction in watershed and reservoir efficiency. Except for a small head pond with daily storage capacity, Pakistan's important Warsak Reservoir - built in 1960 - is now completely silted up. The water's silt burden has caused serious wear on all rotating parts of the reservoir's hydroelectric generating station, and the main powerhouse structure is suffering from alkali-aggregate reaction (WAPDA, 1994). Efforts at watershed management should lengthen the life of more recent projects, such as the Mangla and Tarbella Reservoirs; yet reports indicate that, even in these cases sedimentation is occurring at a rate which could render them inoperative in as little as thirty five years.

#### 4.3.4. Impact on energy supply

The above-mentioned processes have major implications for the availability of water for irrigation and power generation. Indeed, some experts predict large deficits of water and electricity in the future, with considerable impact on agriculture and the economy. According to the World Bank, while less than 10 percent of Pakistan's hydroelectric potential has actually been exploited, further development is heavily constrained by silting (Imran and Barnes, 1990). Nevertheless, projected stagnation in growth of supplies of natural gas Pakistan's chief energy source by the year 2026 (Beg, 2000) - is likely to heighten demand for electricity. Energy supplies are unable to meet the energy demands and the country has already experienced serious load shedding due to electricity shortfalls<sup>9</sup>.

#### 4.3.5. Impact on the atmosphere

The burning of forest fuelwood has changed the local atmosphere, particularly in rural areas of the country where fuelwood is the main source of cooking and heating. Due to burning fuelwood and deforestation, the concentration of carbon dioxide (CO<sub>2</sub>) in the atmosphere has increased. The increase in CO<sub>2</sub> in the atmosphere has added to the greenhouse effect and, as a result, the amount of radiant energy has also increased, thereby warming the local climate. The burning of fuelwood has also estimated considerable amount of other pollutants such as TSP, HC, NO<sub>2</sub>, and SO<sub>2</sub> into the atmosphere (SOE, forthcoming).

#### 4.3.6 Impact on forest access

As a result of deforestation, the distance travelled by rural people to reach the forest has increased considerably. In order to meet their fuelwood requirements and to graze their cattle, people living around forests in NWFP and northern areas of Pakistan are forced to use also remote and very steep areas, where most of the well-stocked forests remain, despite apparent transport hazards. Most of the time fuel wood collection is the responsibility of the women and children. Thus deforestation is putting their lives in risk and making their day-to-day life difficult.

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<sup>9</sup> Load shedding occurs when managers of an electricity grid deliberately reduce the flow of electricity to some parts of the grid because total electricity demands across the grid exceed total supply.

## 4.4 Responses

Pakistan's forest policies are tied to its British colonial past. At the time of independence, the policies, procedures, and structures that administered the new nation's forests were largely left intact. For decades, the only reference point for dealing with new problems has been referring to the 1927 Forest Act. Over the past half century, however, the population of Pakistan has nearly quadrupled. Today demands of the nation's forest resources are expanding rapidly, with almost 2.5 percent population growth and 4.2 percent industrial expansion. Pakistan now recognizes that there is a large group of stakeholders that need to be involved in forest policy development and management. In this context it is trying to bring the necessary changes in its policies of natural resources management.

### 4.4.1. Forestry Sector Legislation:

It is a proven fact that none of the policy initiative, or the policy in itself can be successful and effective without a legal cover. Government of Pakistan introduced various legislations from time to time to govern the forestry sector. Important legislations governing forestry sector in Pakistan are enlisted below.

- a) Statutes<sup>10</sup>
  1. Balochistan Forest Regulation 1890
  2. Balochistan Wildlife Protection Act 1974
  3. Cattle Trespass Act 1871
  4. Cutting of Trees (Prohibition) Act 1975
  5. Forest Act 1927
  6. Islamabad (Preservation of Landscape) Ordinance 1966
  7. Kohat Mazri Control Act 1953
  8. Land Reforms Act 1977
  - 9.
  10. NWFP (Conservation and Exploitation of Certain Forests in Hazara Division) Ordinance 1980
  11. NWFP (Sale and Sawing of Timber) Act 1996
  12. NWFP Forest Development Corporation Ordinance 1980
  13. NWFP Forestry Commission Act 1999
  14. NWFP Hazara Forest Act 1936
  15. NWFP Protection of Trees and Brushwood Act 1949
  16. NWFP Wildlife (Protection, Preservation, Conservation and Management) Act 1975
  17. Pakistan Environmental Protection Act 1997
  - 18.
  - 19.
  20. Punjab Development of Damaged Areas Act 1952
  21. Punjab Forest (Sale of Timber) Act 1913
  22. Punjab Wildlife (Protection, Preservation, Conservation and Management) Act 1974
  23. Sindh Wildlife Protection Ordinance 1972
  - 24.
  25. West Pakistan Firewood and Charcoal (Restriction) Act 1964
  26. West Pakistan Goats (Restriction) Ordinance 1959
  27. Draft NWFP Forest Ordinance

<sup>10</sup> Statutes: A law expressly enacted by Federal Government.

28. Draft Punjab Forest Act
  29. Draft Balochistan Forest Act
  30. Draft Azad Jammu and Kashmir Forestry Act
- b) Rules<sup>11</sup>
1. Hazara Management of Waste-lands (Guzara) Rules 1950
  2. Hazara Protected Forests (Community Participation) Rules 1996
  3. Hazara Reserved Forests (Community Participation) Rules 1997
  4. NWFP Forest Produce River Transport Rules
  5. NWFP Forest Produce Transport Rules 1975
  8. Draft NWFP Forests Management (Community Participation) Rules
  9. Draft NWFP Protected Forests Management Rules
  10. Draft NWFP Management of Wasteland (Guzara) Rules
  11. Draft NWFP Forest Produce Transport Rules
  12. Draft NWFP Forest Produce River Transport Rules.

It is pertinent to mention here that existing laws are punitive in nature, and while providing penalties for contravention of their provisions do not contain incentives for compliance. The draft NWFP Forest Ordinance also does not contain any such incentives, which are recommended in the NCS, FSMP, and forest policies of the Punjab and NWFP. Until 1996, the legislations governing forestry sector were meant for policing the forests. They viewed people as the prime threat to the forests, and have attempted to exclude groups other than government from decision-making. The concept of community participation was introduced in forestry laws for the first time in 1996 through the Hazara Community Participation Rules which provide for Joint Forest Management (JFM) of protected forests. Similar rules for reserved forests were prescribed in 1997.

#### 4.4.2. Strategic Plans and Policies

In response to increasing pressure on forest resources, government chalked out different strategic plans and policies both at national as well as provincial levels. Some of the government plans and policies on forest resource development are as follow.

- The Pakistan National Conservation Strategy (NCS), approved in 1992, recognizes the need for the Provincial Forest Departments to associate local people in protection and management of forests. Indeed, community participation is a vital element of NCS implementation in all the 3 core programme areas relating to the forest sector — supporting forestry and plantations; protecting watersheds; and restoring rangelands and improving livestock quality.
- The Sarhad Provincial Conservation Strategy (SPCS) and the Balochistan Conservation Strategy (BCS) also recommend community-based management of forests (GONWFP, 1996).
- The Forestry Sector Master Plan (FSMP) (1992 – 2017) calls for greater participation of local people at every level of planning, as well as an extended role for the private sector. It also recommends that the existing Forest Act 1927 be updated and revised to make it less prohibitive and punitive, and participatorier. It suggests that new provincial legislation be enacted to encourage people's participation in policy formulation and management of forest rangelands and watersheds (GOP, 1993).

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11 Under the provision of an act/ordinance, rules are made for the elaboration of that specific act/ordinance.

- The Perspective Plan 2001-2011 adopts community participation through decentralization as one of the overriding principles governing the proposed strategy to tackle problems of deforestation and damaged ecosystems. The plan reaffirms Government's commitment to continued implementation of the FSMP, and mentions forests as one of the areas on which conservation efforts will be focused.
- The National Environmental Action Plan, approved by the Pakistan Environmental Protection Council in 2001 also provides for participation of the private sector, NGOs and citizens groups in execution of projects at the local level.
- After the floods of 1992, Timber harvesting ban was imposed to provide interim relief to the forests and allow the forest department to develop alternate, safe, and sustainable harvesting system. In this connection a PFRI study was conducted in northern NWFP to provide maps and basic data on the distribution and condition of the forest resources in NWFP (PFRI, 2000).
- The draft National Forest Policy mentions improved livelihoods of the people as its fundamental goal. The policy calls for involvement of local communities in implementation of projects, management of forests and protected areas, protection and sustainable management of mangrove and riverine forests, and implementation of social forestry programmes.
- The Punjab Forest Policy Statement 1999 states the Provincial Government's intention to involve stakeholders in management of forests and watersheds and to encourage private sector investment in forests through joint forest management, joint ventures, long-term leases and suitable incentives.
- The NWFP Forest Policy 2001 includes the participation of local communities and promotion of private sector investment among its cardinal principles. The policy also recommends revision of forestry legislation to provide for joint forest management.

#### 4.4.3 Major Community Forestry Initiatives

In the recent history of forestry in NWFP, a range of innovative projects began to shape thinking and create precedence for action. These projects have generated a lot of interest in alternative approaches to forest management, which may provide models for increasing sustainability and productivity in future. Some of the results have already been reflected in policy. Social forestry is a case in point. All contemporary policy documents, at least in principle, now identify social forestry as a key means to achieve sustainable forest management (SFM) (Ahmed and Mahmood, 1998).

##### a) Kalam Integrated Development Project (KIDP)

KIDP was started in 1981 with Swiss assistance, and its fourth phase came to an end in 1998. The main aim of the project was to "improve the socio-economic conditions of the population in the project area (Kalam and Behrain) through people's participation in forestry, agriculture and village development, taking into consideration the ecological, social, economic and institutional sustainability of all means and activities at all levels". This project developed a new approach to timber harvesting in protected forests by training local people to work as small contractor crews for the FD. As a result, not only better timber output and less forest damage, but also improved local income generation was expected. In addition, KIDP fostered afforestation in protected forests. A key part of the project was the formation of community-based organizations (CBOs) thus helping the communities to organize themselves for collective action. The effectiveness of "people's check-posts" established by communities to check illegal extraction of timber under KIDP gave the communities a sense of ownership in natural resource management and a confidence that collaborative approach works. Due to the

timber ban, however, the small contractor system had to be stopped (Geiser, personal correspondence).

**b) The Malakand and Dir Social Forestry Project (SFPMD)**

SFPMD was started in 1987 with Dutch assistance and operated up to 1997. The project sought to reforest the denuded hillside and marginal farmlands, raise the standard of living of local communities, and build the extension capacity of the local forestry agency. The activity focused primarily on private and communal property. A key part of the project was the village land-use planning process (VLUP), involving step-by-step approach for preparing an action plan. Project planners focused on participatory planning and community consensus building (method now being accepted by DFFW). It is widely accepted that the project has fostered great capacity and confidence among the provincial forest department staff to implement social forestry strategies (Poffenberger, 2000).

**c) The Siran Forest Development Project (SFDP)**

GTZ initiated this social forestry project for natural resource management (NRM) on self-help promotion in NWFP in 1992. Project was aimed at the participation of local communities along with FD officials and social forestry project staff to form joint forest management committees (JFMCs) to ensure forest protection and regeneration. JFMCs comprised user groups, interest groups, and forest department officials. SFDP is the first project in Pakistan to implement joint forest management (JFM) in Pakistan. Under JFM local people in the vicinity of state-owned forests are involved in the management of forests. This is backed by legal rules. FD shares powers with local people who are granted access to state forests to harvest specified forest products (firewood, timber, fodder, and medicinal plants). Before preparing joint management plans, needs of the people were assessed and responsibilities were divided among the community and FD through an agreement. It was the success of the SFDP, that encouraged the government to introduce Hazara Protected Forest Rules, 1996. The project was closed by the donors because the Government was not willing to make the required governance and institutional changes which were required to achieve the real participation of local communities at grassroots level.

#### **4.4.4 Forestry Projects implemented by provincial forest departments**

To ease out pressure on Pakistan forestry sector, quite a few projects were initiated mainly with the help of Asian Development Bank as well as The World Bank. Some of the important projects include:

**a) NWFP Forestry Sector Project (NWFP FSP)**

The FSP commenced in 1996 with the help of a loan from ADB while the Government of Netherlands provided a grant for consultancy, capacity building and farm forestry. The NWFP government also contributed. Various FSP components has to address the institutional capacity of the DFFW, legal reforms for social forestry, resource mapping and management planning, physical development work including afforestation/reforestation, rehabilitation of rangelands, and farm forestry. It also aims to provide/upgrade physical office facilities and community infrastructure schemes (ADB, 1995).

**b) Punjab Forest Sector Development Project (PFSDP)**

The Punjab Forest Sector Development Project was initiated in 1995 with assistance of the World Bank. The project included expansion of farm forestry throughout Punjab, rehabilitation and improved management of existing forest resources including scrub forests

and range-lands of the Pothwar and Thal areas; and transfer of forest nurseries to the private sector and elimination of seedling subsidies (World Bank website).

#### c) Sindh Forestry Development Project (SFDP)

The ADB sanctioned the Sindh Forestry Development Project in 1992 with the objectives of: (1) increasing output of fuelwood and small timber resources; (2) strengthening existing institutions through training and research; and (3) rehabilitating degraded forests and intensifying management of forest resources. The project placed strong emphasis on social forestry, providing assistance to selected rural communities and farmers in the form of seed and seedlings, technical advice, and training for raising nurseries. The project also envisaged that the feasibility would be explored of (1) leasing out selected state forest lands (riverine or irrigated plantations) to farmers, and (2) joint ventures between the Forest Department and private sector companies, particularly industrial wood-based industries (ADB website).

#### 4.4.5. Reforestation

Expanded reforestation remained a national priority in the new forest policy initiatives. During spring and monsoon seasons of 2000, 149.9 million saplings (Spring 94.6 and Monsoon 55.3 million) were planted against the target of 196 million saplings (GOP 2001). The shortfall of 46.1 million saplings has been attributed to reduce allocation of funds, removal of subsidy on planting stock in Punjab, lack of adequate nursery stock and adverse climatic factors.

#### 4.4.6. Institutional Reforms

To ensure the effectiveness of the participatory and sustainable natural resource management process, in NWFP forestry sector project, the field interventions were to be supported by institutional reforms in provincial forest department (FD). In the course of 1999 FSP made some moves with institutional reforms<sup>12</sup> (Hussain and Khan, 2000). FSP, together with the Institutional Transformation Cell (ITC), a joint Dutch-Swiss-assisted project, devised a set-up to improve decision making and ownership of the institutional reforms in FD, making use of existing experiences and proposals generated by other projects. Thematic working groups were established which developed a number of proposals between March and June 1999. The proposals were submitted to an internal department Support Group chaired by the Secretary of department of forestry, fisheries, and wildlife (DFFW). Decisions surpassing the competence of DFFW were referred to the Steering Committee chaired by the Additional Chief Secretary. At the same time the new forest policy was prepared and adapted in 1999. Moreover, the new forest act was drafted, a forum the provincial Forestry Round Table was set up, and recently members of the Forest Commission were nominated.

#### 4.4.7. Pakistan's signature on international conventions and treaties

Pakistan has signed various international conventions and treaties related to the conservation of forests and biodiversity, as shown in the Table 5.

<sup>12</sup> This paragraph is aimed to record the sequence of events as they occurred and does not discuss the merits and de-merits of these institutional reforms.

Table 4.5. International Conventions and Treaties Related to the Conservation of Forests and Biodiversity

Convention	Major Objectives	Major Obligations
Convention on Biological Diversity	Ensure conservation and sustainable use of biological resources	Prepare and implement national strategies for the conservation of biodiversity.
The Framework Convention on Climatic Change	Stabilising greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic (human-induced) interference with the climate system	The Convention is based on sharing the burdens of coping with climate change.
Convention to Combat Desertification	Combat desertification	Prepare national action plan and implement programmes for poverty alleviation.
Convention on the International Trade in Endangered Species of Wild Fauna and Flora	Protect and regulate the trade in wild fauna and flora and their products	Protect all species threatened legally and regulate trade.
Convention on Wetlands of International Importance especially Waterfowl Habitat	Prevent the loss of wetlands	Conservation and sustainable use of migratory stocks of wildfowl.
World Heritage Convention	Protection of world heritage	Conserve and protect the places declared as world heritage.

#### 4.5. Policy Failures

The societal responses of Pakistan to mitigate the impacts of different pressure factors on forestry sector cannot be underestimated. However, if good strategies, plans and policies alone were the criteria for success, the forestry sector in Pakistan would have developed by leaps and bounds. One has to admit that it is the effective implementation of the recommendations contained in these strategies, plans and policies that has been lacking in the past, and it is this aspect which the Federal and Provincial Governments must address in future.

The Forests Act 1927 has effectively served its primary purpose of protecting and conserving government forests. However, along with the NWFP Hazara Forest Act 1936 it is punitive in nature and does not provide any incentives for compliance with its provisions. Moreover non-involvement of stakeholders in management has fostered apathy, even dissatisfaction. Feelings are even stronger among owners and right-holders in guzara forests, who dislike what they consider to be excessive "bureaucratic" controls. The things have not changed in the proposed NWFP Forest Ordinance which is as punitive in nature as the previous laws are.

Moreover, provision of existing laws relating to resource access and tenure, particularly the reserved/protected/guzara/ forest system and recognition and exercise of private rights in such forests, have been retained. In view of the importance of the issues involved, it is strongly recommended that detailed evaluation studies be conducted on the efficacy of existing forestland tenure system as well as on impact of the moratorium on timber harvesting.

On planning front our government agencies still look at FSMP as a reference point. Here it must be kept in mind that FSMP presumption was very much for increasing government capacity. It is not an operational planning document. PFRI study that was conducted with improved ground resolution satellite images and an intensive terrestrial inventory, have already challenged the accuracy of data and statistics provided in the earlier studies about forestry resources in NWFP. There is a sheer need to reassess the area under forest cover in Pakistan utilising the latest technology and accompanied with intensive terrestrial inventory. Otherwise any future planning based on the Government of Pakistan's current claim that forest cover in Pakistan is increasing would not be successful.

In 1995 "GTZ study" of the forest sector recommended the creation of the Forest Commission. The Commission was to be supported by the Forestry Round Table. To kick off the process the GoNWFP constituted a high level Forestry Steering Committee that came up with the first Action Plan in February 1996. Contrary to the primary objective of creating effective platforms for the interface between the key stakeholders i.e. Forest Commission and Forestry Round Table the FSP transferred the control of the process into the folds of the Forest Department under the pretext of ownership. This move took the process away from its key objectives and as a result the Forest Policy, though sounding progressive, remains a piece of paper with the Forest Department that continues to enjoy power and control over the forestry resources. This is the reason that the NWFP forest policy more or less perceived as a "donor driven.

New Forest Ordinance is in draft stage, and is widely criticised for maintaining the powers of forest department. Civil society groups have serious reservations about the draft ordinance. They term the whole process of ordinance preparation as a non-consultative one and oppose FD staff being designated in the ordinance as a uniform force bearing arms, and the perceived enhancement of their police powers, on the grounds that this goes against the intent of the forest policy that enshrines the principles of participatory social forestry. They also object to the proposed discretionary powers of forest officers to revoke a community-based organization/JFM agreement, on the grounds that it would result in uncertainty and insecurity among different JFMCs/CBOs (Suleri, forthcoming). Government of NWFP tried to ignore these objections and was in a hurry to promulgate this ordinance before 10<sup>th</sup> September 2001, when an ADB review mission was due. It indicates that when it comes to responding to the pressure on forestry sector versus responding to the pressure of donors and international lending institutes, the later gets first priority from our government agencies.

Regarding different forestry projects, one can assess the problem at the implementation end. NWFP FSP is being assisted by ADB with a loan of US\$ 26.95 million. However, according to the ADB review mission of March 2001, an overall physical progress of 20 percent has been achieved against elapsed loan period of 76% (Suleri, forthcoming). Final results of the PFSDP are also not very encouraging and most of the stakeholders are dissatisfied with the project interventions (Punjab Economic Research Institute, 2001, Impact Evaluation of Punjab Forest Sector Development Project). Similarly in SFDP, the most innovative element

of the project- provision of credit on a pilot basis for private sector participation in development of reserved forests- was dropped at the time of mid term review of the project in 1996.

Reforestation is the major focus of many projects and plantation is considered as the success criteria of reforestation campaigns. Most of the times the target achievement is assessed on the basis of number of saplings planted in a particular year and no consideration is given to the post plantation survival rate (say one year after plantation).

Different community based forestry projects lack post project sustainability. Participatory and integrated approaches to forest management tend not to be sustainable in the absence of an enabling institutional environment. In general, federal, provincial and local level institutions are not sensitised to community concerns, both at the policy and implementation levels. At the very outset, forest officials are reluctant to concede their powers which refers to their capacity to influence the outcome of social processes. They lack confidence in the ability of "untrained locals" to manage their resources. The attempts to safeguard department prerogatives also preclude integrated approaches to conservation and the culture of corruption and collusion- which is antithetical to conservation- has become deeply ingrained.

The ongoing institutional reform process in NWFP forest department, which is meant to cater these enabling environments, is also being criticised by different stakeholders. Many stakeholders do realise the importance of -Forestry Commission, Forestry Round Tables, Forestry Steering Committee but are critical to the procedures adopted and the working of these institutions. Moreover the FD has conveniently avoided in forging an effective linkage between the Devolution of power plan and the Sectoral Reform Process that was underway much before the inception of the Devolution plan of current government itself. One was expecting that FD would take a lead in bringing in the learning of the reform process into the devolution itself through the platform of FSP. Rather than being proactive unfortunately the FD by choice remained reactive to date for obvious reasons of protecting their power base to the maximum possible extent. They have been successful in remaining at the Provincial level and decentralizing the most impotent functions to the district level. With a departmental mindset that is opposed to any kind of collaborative management principles, it would be naive to expect from the FD to live the reform process in true spirit.

On international level, Pakistan is signatory to many treaties and conventions related to the conservation of forests and biodiversity. However, most of the time our negotiators ratify the treaties without understanding their implications and very little efforts are made at official level to implement those treaties in true spirit.

#### **4.6 Recommendations**

The analysis of situation presented in previous sections has made it easy to assess the impact of societal responses to different pressures on forestry sector in Pakistan (Figure 1). Table 6, reflects that most of the responses are either insufficient or not implemented properly and the state of forests in Pakistan is continuously deteriorating. So much so, that the reform process initiated in NWFP itself is exerting the pressure on forestry resources as independent studies have shown that this project is accruing its benefits to the notables and privileged among the community members thus forcing the marginalized and poor sections to exploit the forest resources unsustainably. Hence one can conclude that different legal/institutional/ and policy reforms taken from time to time alone are not the answer to the pressures being faced by our

forestry sector today. "Good" laws and policies would enable the action to be taken, but political and administrative will to take requisite action is a must. The will would be created by an attitudinal change- perhaps even a change of mind-set- in the officials who are the actual implementers of forest policies and laws. To help strengthen political will, it is also necessary to motivate people to cooperate in realizing the objectives of forestry sector plans, policies and laws. This in turn can be achieved through adopting a participatory bottom-to-top approach which would enhance involvement of all sections of society in sustainable forest management. There is a need to generate large-scale employment in the forestry sector through involving people in forest management, protection, plantation, harvesting, and transportation. Concomitantly, supplementary incomes can be generated for rural farm families through community, leasehold, and private forestry. In this context, it should be realized that generation of income and employment are more important than government revenue alone and forestry should be an instrument of sustainable forest management policy rather than its objective otherwise the pressure of human activities on Pakistan forest sector would keep on building and according PFRI estimates one would find that between year 2015-2025 there would be no forests left in Pakistan

Table 4.6. An assessment of societal responses to different pressure factors on Pakistan forestry sector.

Pressure	Response	Result	Recommendations
Unsustainable management practices	Laws	None of the laws were able to address the problems of forest land-tenure system or issues of royalties for a sustainable management of forestry resources.	To address this issue in new legislation.
Population Growth	Different policies and planning	None of the policy initiative was successful in checking the rapid depletion of forest resources	Policies are designed on a false assumption that forest cover is increasing. There is a need to reassess the area under forest cover. On top of it one need to break the status quo in implementing agencies.
Energy Requirements	Different laws and policies	Fuelwood is still the major fuel used for cooking and heating purposes	Promotion of cheap and easily available alternative fuels and sources of energy. Promotion of farm forestry.
Overgrazing	Laws and policies	No improvement	Sustainable management of rangelands. Promotion of farm forestry.
Ban on Harvesting	Laws	Increase in illegal logging	Impact assessment of this policy.
Reform Process	Policies and planning, laws	Stakeholders are not satisfied, benefits are not equally distributed	Enhance transparency by promoting participation and consultative in the process.

# State of the Environment: PAKISTAN

## Ecosystems: Biodiversity and Protected Areas

### PRESSURE

- Conversions of natural ecosystems to agriculture
- Extensive logging activities by "timber mafia"
- Expansion of urban landuse
- Release of industrial effluents in river catchments
- Hunting, trapping and fishing to an alarming extent
- Introduction of exotic plant species through trade or resource management efforts
- Mismanagement, weak economic and environmental policies

### IMPACT/STATE

- Habitat loss anticipated by extensive agricultural activities, use of chemicals has harmed soil microorganism, invertebrates and fauna
- Release of industrial effluents into Indus river has disturbed the whole marine ecosystem
- Woody biomass declining at the rate of 4.6% per year
- Forest resource depletion in NWFP was 52% between 1967 and 1992

### RESPONSES

#### Policy

- Forestry Sector Master Plan 1992
- The Pakistan National Conservation Strategy 1992
- Biodiversity Action Plan for Pakistan, 2000
- Conservation Plan for Pakistan's Wetlands 1991

#### Programmes

- Environmental education
- Poverty alleviation programmes
- Controlled agricultural practices
- Industrial waste reduction programmes
- Reclamation of water logged and saline areas

### RECOMMENDATIONS

- Population control to reduce pressure on natural resources
- Highly organised agricultural practices
- Forest management through community participation
- Raised public awareness about forest conservation by informal channels
- Improved information exchange procedures
- Improved monitoring procedures
- Forest research should focus on basic issues of forest conservation at local level

## 5. Ecosystems: Biodiversity And Protected Areas

### 5.1 The Convention on Biological Diversity (CBD)

Pakistan was one of the 155 nation states which signed the CBD at the Earth Summit in Rio de Janeiro in 1992. This act signalled their intention to form a global alliance to protect habitats, species and genes, to shift to sustainable modes of resource use and to make the necessary policy, economic and managerial adjustments to guarantee that the benefits to be gained from biological resources are shared equitably across local, regional and global societies. The CBD was signed by Pakistan in 1992 and ratified by the Cabinet in 1994.

Pakistan is also signatory to the following conventions governing biodiversity:

- *Convention on International Trade in Endangered Species (CITES), 1976*
- *Convention on Migratory Species of Wild Animals, 1987*
- *RAMSAR Convention, 1978*: Nine of the Indus Valley's wetlands were designated as wetlands of international significance at the time of ratification of the RAMSAR Convention

It also participates in the UNESCO, Man and Biosphere Programme and, to date, it has designated the Lal Sohanra National Park (Bahawalpur) as a biosphere reserve.

The Biodiversity Action Plan (BAP) is a first attempt to meet the planning requirements of the CBD.<sup>1</sup> It rolls into one the three types of plan called for under the Convention (the country study, national strategy, and action plan), but it is primarily a strategic framework, which offers guidance on key directions for the future.

### 5.2 Pakistan Country Setting

Pakistan consists of a rectangular mass extending northeast to southwest over about 88 million hectares. Mountains and foothills on the north and west cover about half its area. The remaining half comprises the Indus Plain towards the east, intersected by the Indus River and its tributaries. The country is largely arid, with three-fourths receiving an annual precipitation of less than 250 mm and 20% of it less than 125 mm. Only about 10% of the area in the northern Himalayas and the Karakorum mountain ranges receive rainfall between 500 mm and 1500 mm. Of the country's total area, 24% is cultivated, of which about 80% is irrigated. Forests and grazing lands cover about 4%, and 34% is not fit for agricultural use - about 2% is under urban cover. (Khan and Naqvi: 1999)

#### 5.2.1 Biogeography and Biodiversity Richness of Pakistan<sup>2</sup>

With its dramatic geological history, broad latitudinal spread and immense altitudinal range, Pakistan supports a wide array of ecosystems. However, any description of the natural ecological zones of Pakistan must be qualified by the statement that these zones have been so widely affected by human activity that very few truly natural habitats remain. Roberts (1991) has provided an initial classification of terrestrial ecosystems into 18 distinct ecological zones, with nine major vegetative or agro-ecological zones. (see map below). These range from the permanent snowfields and cold deserts of the mountainous north to the mangrove forests of the Indus delta

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<sup>1</sup> A first draft of the BAP was prepared and circulated for comments in October 1997. In August 1999, the Pakistan Environment Protection Council endorsed the BAP.

<sup>2</sup> For more details see, BAP: 1999

and the Arabian Sea coast. Its fauna is rich and varied: affinitive to three faunal regions - the Palearctic region west of the Indus, the Oriental region east of the region and the Ethiopian region.

Up to 167 mammal species have been reported, of which three are endemic and there are a number of endemic and near-endemic sub-species. Of the 662 species of birds recorded, one-third has Indo-Malayan affinities, and the remaining Palearctic. There are 172 listed species of reptiles and amphibians, of which 40 species are endemic. Pakistan has 177 native freshwater fish, predominantly South Asian in origin. In the invertebrate category, there are about 360 butterfly species, with high rates of endemism and about 2,000 species of insects.

Over 5,600 species of vascular plants have been described, including both native and introduced species. There is high species diversity and the flora includes elements of six phytogeographic regions. Four monotypic genera and 400 species are endemic to Pakistan. In the category of fungi, there are 847 genera and 3,383 species.

**Table-1: Critically Threatened Ecosystems in Pakistan (BAP: 2000)**

ECOSYSTEM	CHARACTERISTICS	SIGNIFICANCE	THREATS
<b>Indus delta and coastal wetlands</b>	Extensive mangroves and mudflats Inadequate protected area coverage	Rich avian and marine fauna Diverse mangrove habitat Marine turtle habitat	Reduced freshwater flow from diversions upstream Cutting mangroves for fuelwood Drainage of coastal wetlands
<b>Indus river and wetlands</b>	Extensive wetlands	Migratory flyway of global importance Habitat for Indus river dolphin	Water diversion/drainage Agricultural intensification Toxic pollutants
<b>Chagai desert</b>	A desert of great antiquity	Many endemic and unique species	Proposed mining Hunting parties from the Gulf
<b>Balochistan juniper forest</b>	Huge and ancient junipers	Largest remaining juniper forest in the world Unique flora and fauna	Fuelwood cutting and overgrazing Habitat fragmentation
<b>Chilghoza forest (Sulaiman Range)</b>	Rock outcrops with shallow mountain soils	Important wildlife habitat for several species at risk	Fuelwood cutting and overgrazing Illegal hunting
<b>Balochistan sub-tropical forests</b>	Mid-altitude forests with sparse canopy but rich associated flora	Very few areas now remain Important wildlife habitat	Fuelwood cutting and overgrazing
<b>Balochistan rivers</b>	Not connected with the Indus river system	Unique aquatic fauna and flora with high levels of endemism	Water diversion/drainage Overfishing
<b>Tropical deciduous forests (Himalayan foothills)</b>	Extend from the Margalla Hills National Park east to Azad Kashmir	Perhaps the most floristically rich ecosystem of Pakistan	Fuelwood cutting and overgrazing
<b>Moist and dry temperate Himalayan forests</b>	Important forest tracts now becoming increasingly fragmented	Global hotspot for avian diversity; important wildlife habitat	Commercial logging Fuelwood cutting and overgrazing
<b>Trans-Himalayan alps and plateaux</b>	Spectacular mountain scenery	Unique flora and fauna; center of endemism	Fuelwood cutting and overgrazing Illegal hunting Unregulated tourism Habitat fragmentation

### 5.3 Critically Threatened Ecosystems and Species

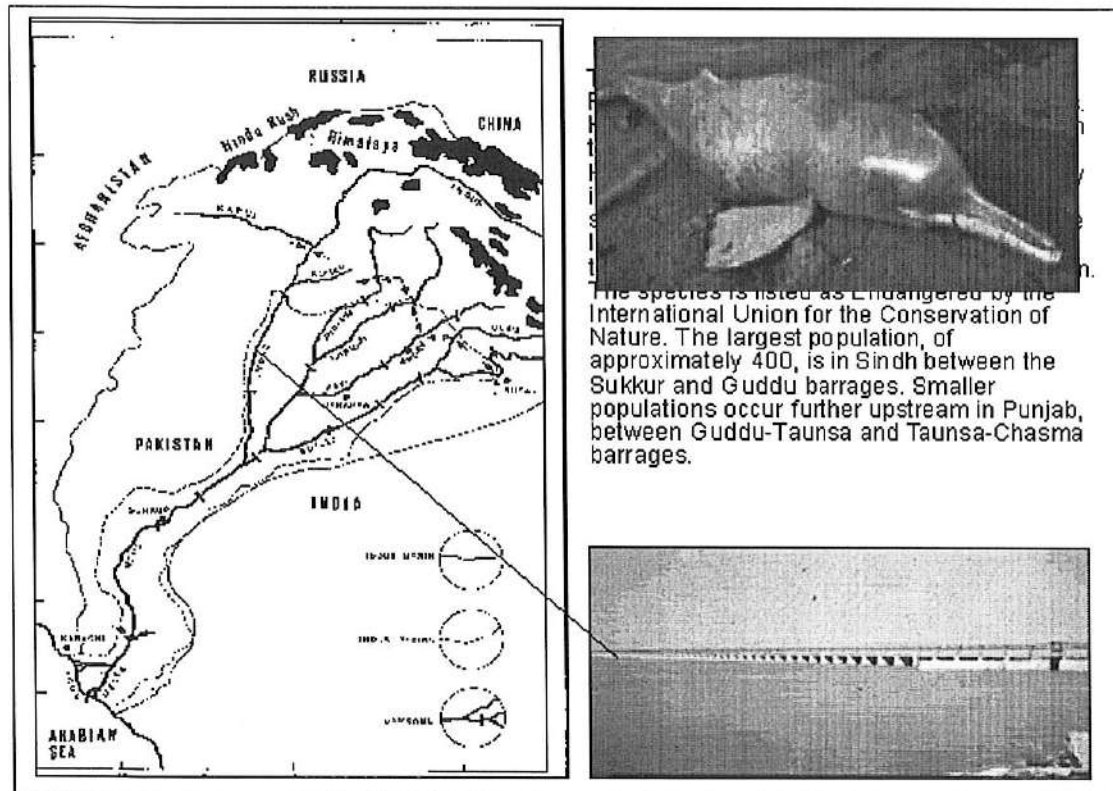
The widespread historic conversion of natural ecosystems to agriculture, the advanced and rapidly accelerating degradation of habitats, and the continuing depletion of populations, has placed under critical threat all natural or modified ecosystems. At least 10 ecosystems of particular value for their species richness and/or unique communities of flora and fauna are threatened with habitat loss and degradation.

#### 5.3.2 Extinct and Threatened Species

The IUCN Red List of Threatened Animals (IUCN: 1996) lists 37 species and 14 sub-species of internationally threatened or near-threatened mammals as occurring in Pakistan. The critically endangered mammals are the Balochistan black bear and Chiltan goat. Endangered animals include the snow leopard, the Indus river dolphin, the markhor, the urial and the wooly flying squirrel. A critically endangered bird is the lesser florican while the Siberian crane and the great Indian bustard are listed as endangered. In addition some 500 plant species are believed to be nationally rare or threatened.

Crucially, these are indicator species – the proverbial tips of the iceberg -- in that the risk to them is indicative of the loss, fragmentation or degradation of the habitats and ecosystems in which they reside. It would not be difficult to site these threatened or endangered species in the 10 most critically affected ecosystems tabulated above. The inserts show two such linkages. In the case of the Indus dolphin, the barrage – one among many spanning the Indus river – illustrates how river fragmentation occurs, disturbing the dolphin's habitat and its breeding cycle. The second insert shows

#### 5.4 Causes of Biodiversity Loss



The pathways from environmental degradation to biodiversity loss (plant, animal species and micro-organisms) are both direct and indirect. Habitat loss constitutes an indirect route. At source are sector activities, such as industrial and household emissions and effluents, agricultural intensification (chemical input applications), irrigation and drainage practices (water diversions and mismanagement) and energy combustion.

Activities, which cause biodiversity loss directly, are hunting and trapping, fishing, over-exploitation of plants (for medicinal purposes), the introduction of invasive species through trade or natural resource management efforts. Sector activities

(agricultural and industrial) can also contribute directly to biodiversity loss. For instance, extensive planting of high-yielding hybrid varieties has displaced indigenous crop genes, and the use of chemical inputs has harmed soil microorganisms, invertebrate fauna and wildlife.

**Another example of the indicator species-habitat degradation link.**

#### 5.4.1 The Economic Causes of Biodiversity Loss

Strengthening biodiversity-economics linkages are an integral part of efforts at both biodiversity conservation and remediation. The BAP cites many cases where the market fails to capture adequately the value of biodiversity, or where existing economic policies and incentives lead to the predation of species and/or to the degradation of their habitat.

Intervention failures tend to reflect pricing distortions. Examples are subsidies on energy and irrigation water, pesticides and fertilizer, which, among other things, are a source of air and water pollution and land degradation. Counter measures include getting prices right (eliminating subsidies) or

providing conservation-friendly incentives.

Another instance of intervention failure is high discount rates which favor present rather than future consumption. The degradation tends to be most pronounced when such rates coincide with low biological growth rates, for instance, in the case of primary forests.

Market failure occurs when the market is unable to monetize environmental degradation or biodiversity losses. Two prominent examples of these are the extensive logging activities by the 'timber mafia' in the Northern watersheds in disregard of the resident losses to biodiversity and the downstream consequences, and industrial effluents, which pollute water bodies and harm aquatic life and vegetation. In the former case, high market prices for timber, low fines and penalties, and the royalty system combine to create perverse incentives to degrade. The latter case reflects the absence of charges for downstream water penalties as a constraining factor. Another way of putting this is a dichotomy between social and private costs and benefits. would produce the desired results.

The term market failure also includes missing markets. This is the case with species loss where global conservation imperatives are not reflected in economic inducements. Conversely, as in the case of biopiracy ('neem', 'basmati' rice) multinationals present threats to indigenous biodiversity.

## 5.5 Status of Protected Areas in Pakistan

Chapter 1 gives spatial and physical details of protected areas in Pakistan. Here we examine their legal and institutional aspects.

Under current provincial and territorial legislation, only three categories of protected areas may be established: wildlife sanctuaries, national parks and game reserves. Any area of land that is Government property, or over which the government has proprietary rights, may be declared a game reserve, including privately owned lands.

A wildlife sanctuary provides for the strictest form of protection. Wildlife sanctuaries are established as undisturbed breeding habitat for the protection of wildlife. National parks are established to protect and preserve flora and fauna in their natural state. Since they are also established to provide for public recreation, education and research, access is permitted subject to certain restrictions. Game reserves are established primarily as controlled hunting areas; they afford no protection to habitat, merely regulate hunting.

**Table 1:** Listed Protected Areas of Pakistan  
(as of February 1997)

Classification *	By Province/Territory/Area						Number	% of Designated Protected Areas	% of Total Area Under Protected Area Status Classification**	Hectares and % of Country's Land Surface		
	AJK	BAL	FED	NWFP	NA	PUN				Hectares	%	
Game Reserve	8	7	1	39	9	18	14	96	42.29	39.25	3,552,817	4.42
National Park	1	2	1	3	2	2	1	12	5.29	24.79	2,244,337	2.79
Wildlife Sanctuary		15	1	3	5	37	35	96	42.29	30.67	2,775,264	3.45
Unclassified		7		3			4	14	6.17	N/A	N/A	N/A
Wildlife Park				3				3	1.32	0.002	1,948	0.002
National Park/Nature					2			2	0.88	4.60	415,400	0.51
Crane Refuge				1				1	0.44	0.06	5,180	0.006
Wilderness Park					1			1	0.44	0.59	51,800	0.064
Private Game Reserve							1	1	0.44	0.002	1,550	0.002
Wildlife Refuge				1				1	0.44	0.04	3,774	0.004
<b>Totals</b>	<b>9</b>	<b>31</b>	<b>3</b>	<b>53</b>	<b>19</b>	<b>58</b>	<b>54</b>	<b>227</b>	<b>100</b>	<b>103.0</b>	<b>9,052,070</b>	<b>11.248</b>

These areas include 6 Ramsar Sites and 1 Biosphere Reserve (Lal Suhanra National Park in Punjab Province)

AJK = Azad Jammu and Kashmir  
BAL = Balochistan Province  
FED = Federal Territory  
NWFP = North West Frontier Province  
NA = Northern Areas  
PUN = Punjab Province  
SIN = Sindh Province

\* Only four of these classifications (game reserve, private game reserve, national park and wildlife sanctuary) are provided for in existing legislation.

\*\* Area of unclassified categories is not recorded and thus was not included in the calculation of the total area of the country under protected area classification.

Source: National Council for the Conservation of Wildlife, Islamabad, Protected Areas Data Base

### 5.5.1 Protected Area Management Issues

Numerous management issues beset Pakistan's protected areas, limiting their effectiveness and undermining their long-term viability. These are identified as:

#### 5.5.1.1 *Ecological*

Many of the existing protected areas were established somewhat haphazardly, often in the absence of comprehensive ecological criteria for their selection. The need for habitat integrity, with its complement of migration corridors, spawning beds and water recharge areas gave precedence to species preservation, hunting value and tourism.

#### 5.5.1.2 *Economic*

Like elsewhere, Pakistan's protected areas are also the focus of land and resource use conflicts and encroachments on their territory. Industrial pressures, such as exploration for oil and natural gas, receive the most publicity. This situation is further exacerbated by a growing population which, in the absence of any meaningful economic opportunities, is understandably placing increasing demands on the natural resources found within the protected areas in order to survive.

#### 5.5.1.3 *Social/cultural*

Varied patterns of land ownership and resource-use persist to this day. The effective resolution of the issues pertaining to land ownership and community involvement is integral to the successful planning and management of protected areas.

#### 5.5.1.4 *Legal and Policy*

The existing legislative base is limited in terms of the number and types of protected areas provided for. Also, existing legislation tends to be more honored in the breach than in the observance. From a policy perspective protected areas appear to be a low level concern in overall national policy development and resource allocation processes.

#### 5.5.1.5 *Institutional/Organizational*

Difficulties arise from the split administrative responsibilities, specifically, the split between wildlife and forestry departments at the provincial and territorial level. This gives rise to both inter-departmental tensions and duplication of responsibilities. The endemic under-funding constrains professionalism, whether it be staff, infrastructure, equipment, planning or research.

Elements of these constraints are encapsulated in the case of Kirthar National park (see box). However, despite the obstacles, there are success stories, which illustrate that it is possible to function in an institutional and policy vacuum. The management precepts adopted also inform policy makers. One such example is the Torghar National Park community initiative.

**THE KIRTHAR NATIONAL PARK**

*"If I am to expect others to respect my life, then I must respect the life I see, no matter how strange it may seem to mine."*

Albert Schweitzer (humanist)

The Kirthar National Park, the first and largest national park in Pakistan, forms the core of a complex of protected areas in the region. It is distinct in being the first of its kind in Pakistan to be included in the United Nations List of National Parks and Equivalent Reserves. Kirthar's defining features are its outstanding natural beauty, its species diversity and its cultural heritage. Due to the devoted efforts of the Sindh Wildlife Department and IUCN, impressive successes have been achieved in species preservation. For example there are substantial and documented increases in populations of threatened species such as the *ibex* and the *urial*. Kirthar is also home to various archaeological sites like the tombs at Taung and the Rannikot fort, and supports a human population (estimated between 10,000 and 15,000 people) with strong tribal traditions.

*The Legal Dimension*

Shell-Premier, and, more recently, Premier are bent upon making inroads into the national park area for commercial gain. It has secured a no objection certificate from the federal government under Rule 17 of the Pakistan Petroleum (exploration and production) Rules, 1986.

The Sind Wildlife Protection Ordinance, 1972, section 15, authorizes the government to notify any area of outstanding scenic merit and natural interest to be a national park. The provisions of the act ban the firing of guns, felling, and breaking up of land for cultivation and mining. The intent of these provisions is to protect indigenous species and habitats. The provisions have both a direct and indirect aspect. Firstly, they ban mining explicitly. Second, in as much as exploratory and production activities are likely to disturb and damage local fauna and flora, they violate again the provisions of the act. An EIA also falls within the ambit of this law in as much as it precedes and can lead to the act of exploration and mining itself.

Environment and ecology are on the concurrent list in the constitution of Pakistan. If the federal government has not deemed it necessary to pass any legislation in respect of national parks and wildlife sanctuaries, and the provincial government has passed such legislation, then all government functionaries, federal or provincial, must abide by it. Accordingly, the exploration license issued under Rule 17 of the Pakistan Petroleum (exploration and production) Rules, 1986, is illegal, as no federal authority can issue an exploration license in violation or disregard of laws of the land, whether federal or provincial.

This brings us to the issue of resolving apparent conflicts with federal law. Where a subject is on the concurrent list, conflicting statutes allows a provincial act to be struck down by federal legislation. However, a legal expert engaged by IUCN has determined that there is no such conflict, especially as there is no extant federal legislation on national parks. As such the provincial wildlife act takes precedence over administrative decisions, such as those taken under the Pakistan Petroleum (Exploration and Production) Rules, 1986.

*The Present Status*

The government may, for 'scientific purposes' or for the 'betterment' of the national park, allow prohibited acts. This particular clause is being manipulated adroitly by Shell-Premier. It commissioned the University of Melbourne to complete a baseline survey of Kirthar National Park, ostensibly aimed at documenting its biodiversity resources. However, no socioeconomic survey of the area was carried, or the local communities taken into confidence. The Baseline Survey provided legitimacy for an EIA, which was carried out in violation of the Sind Wildlife Act. EIAs can hardly be construed as scientific activities. Rather than being inspired by a dispassionate quest for scientific knowledge which, by

definition, is incrementally acquired, they are more prone to ease the path for subsequent exploration by oil and gas companies. The record is replete with cases where EIAs have been distorted to suit the interest of the companies which employ them. It comes, then, as no surprise that the Dumbur Block, where gas reserves have been identified, is to be denotified, establishing an undesirable precedent for the other protected areas in Pakistan

#### *The Development Argument*

When the law is so unequivocally clear on the issue, why then have Shell-Premier pressed on with the NOC and exploration. "Development" is an argument bruited frequently. Thus, with dwindling gas supplies, Kirthar offers the prospect of new and huge reserves. Natural gas, a direct and indirect energy source, is considerably less polluting than coal or oil. Further more, gas would substitute for biomass and slow down deforestation. Infusions of foreign capital are likely to have ripple effects triggering investment in other areas. In the park area itself, the company would provide critically needed jobs, social services and infrastructure. Finally, there are mining technologies on the shelf that would minimize adverse environmental and social impacts.

While such arguments have merit, the decision making processes which underpin them deserve closer attention. Predictably, these are top-down and highly centralized, as evident in the following facts:

- First, no effort had been made to consult or elicit the consent or participation of the local tribal communities. An off-hand rejoinder by Hagler-Bailly to a question along these lines was that local communities caused much more damage than environmentally sensitized oil and gas companies.
- Second, alternatives such as community managed tourism have not been examined from a social, cultural and environmental sustainability perspective. Given our existing systems of governance, there is strong likelihood that the gas, ancillary and social facilities within the park will collapse once ownership reverts to the government?
- Third, it is unlikely that new gas connections would be provided to the remote -- or even adjoining -- rural areas, as in the case of Sui. The real beneficiaries would continue to be affluent urban communities, industries and energy plants already on the national grid.
- Fourth, the political dynamics continues to support the headlong quest for more energy, in continued deferment to institutionally difficult considerations surrounding energy use efficiency (conservation, loss reduction) and renewables options.

It is not an unreasonable premise that most of the benefits of gas exploration and production in the national park will accrue to the oil and gas companies, to affluent urban consumers, to industries, to corrupt officials within the government and to the consultant community. Effectively, this gives the lie to the development argument and is, in reality, greed masquerading as development.

#### *What Needs To Be Done*

The Sind Wildlife Ordinance should be upheld firmly. This includes both exploratory and mining activities, as well as EIAs associated with them. The national park-to-total area ratio compares unfavorably with neighbouring countries such as India, Nepal and Sri Lanka, and should be maintained at a minimum. Quid pro quos which entail denotification of park areas for the promise of local development and conservation stand on dangerous ground. Once an area is denotified, the mandatory provisions regarding its upkeep are also thrown out. There are also potentially undesirable ripple effects. If the door is opened in Kirthar, access to other protected areas in Pakistan will not be long in coming.

The need for amending the Wildlife Ordinance, principally to rid it of its exclusionary mindset, certainly does exist. Participatory management principles should become a part of the law. However, by the same token, the ordinance needs to block out potential escape clauses such as "betterment" and "scientific research", which are being wilfully misinterpreted for commercial gain.

Premier-Shell needs to be reminded that it has five other concessions in Sind outside park areas which are ethically and legally less contentious. The importance of this can not be underscored enough. Problems like land erosion and deforestation are minor compared to the pollution which occurs when natural gas begins to be extracted, such as water contamination, gas flaring and pipeline explosions. The promise of modern technology is not enough. If developed countries can have their fair share of lapses and accidents, the likelihood of such accidents occurring in the third world countries is magnified, given their weak governance and institutional capabilities.

Pakistan is signatory to many multilateral environmental agreements, including the Convention on Biodiversity. The sanction for exploration activities in Kirthar violates these commitments and sends the wrong signals to the donor community and international environment NGOs. Most important of all, the Pakistan National Council of the IUCN has requested the government to rescind the exploration license to Premier-Shell. As IUCN is bound by the consensus decisions of the Council, one hopes that it will reinforce and strengthen this consensus.

## 5.6 Approaches to Biodiversity Management *(to be done)*

### **Torghar National Park**

- Pictures
- Brief Write-up on Management

#### The Elements of a Strategy

- The Economics Dimension – An Integrated Approach
- Protected Area Systems Plans
- Policy
- Community Initiatives
- International Conventions
- Research and Documentation
- Monitoring

**Part III**

**Additional Issues**

# **1. Women and the Environment**

## **1.1 Introduction**

Women through their reproductive function have been defined as nurturers, a role which then encompasses the responsibility of provision of food. In subsistence economies, where the entire dependence of daily existence is on natural resources, women have played the dual role of not only nurturing their families but the environment as well. The well being of the former is heavily dependent on the well-being of the latter.

However, with industrialization and globalization, growth centered economic development models have been imposed destroying indigenous sustainable development practices, which had been practiced over many centuries by communities, especially women. Patriarchy has been strengthened by imposing mechanization of agriculture, shifting power to men by portraying them as the operators of technology and hence major producers, leading to the marginalization of women from this role. In the meanwhile, dual economies of subsistence and industrialization continue to exist. While the latter continues to practice unsustainable levels of extraction, as well as polluting the existing resources, women are forced to continue their role as nurturers at the household level, extracting what meager natural resources are left. The result is that patriarchy and globalization have severely eroded women's role as care takers of the environment.

The massive migration of people resulting from capitalist agriculture, and environmental disasters have led to further degradation and polluting of our cities. Women, torn from their social support have to exist in these new malfunctioning systems, truly victims of the development and environmental crisis. The ultimate irony is that in this new scenario they are considered as a contributing element to unsustainable environmental practices.

## **1.2 Status of Women in the Pakistani Society**

It is only by understanding where the women of Pakistan stand with respect to some of the most critical indicators of development including health, education, social rights, and economic independence can one truly understand the deep rooted interconnection between women and sustainable environment.

With 67% of the Pakistani population still rural based, there is a high degree of dependence on the bio-mass subsistence economy. Women have to manage the household economy, which includes primary responsibilities of procurement of food, and water for family members and household animals, fetching wood as fuel, stitching bedding and clothing, building and maintaining mud homes, taking care of the elderly, children, as well as their spouses. In essence women are the pivot for all productive and reproductive functions responsible for maintaining life. However, being responsible does not mean that they have the right to be independent decision makers of their own lives.

The first right is of course the right to life itself, which is accorded grudgingly to women. According to the 1998 census data, of the 13 million Pakistanis, 48% were women.<sup>1</sup> The basic reason for the lesser percent of women in the population is lack of care (which includes

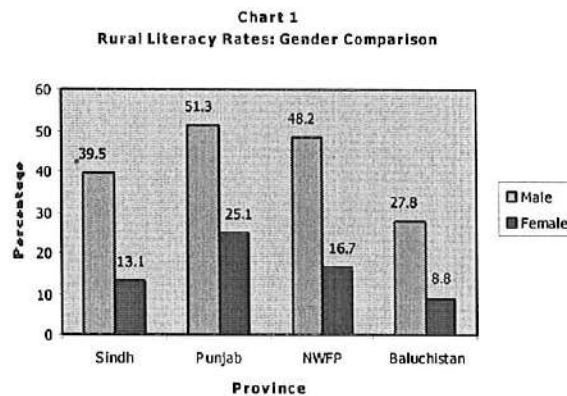
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1 Federal Bureau of Statistics, Economic Affairs and Statistics Division, Government of Pakistan. *Pakistan Statistical Yearbook 2001*. Federal Bureau of Statistics, Economic Affairs and Statistics Division, Government of Pakistan, 2001.

medical care, nutrition, and general care) provided to the girl infant, leading to death of the child in its first year of birth. This is one of the most important indicators which suggests, that while women are used extensively as almost bonded labor in their families, they are not considered either a 'valued' social or economic asset. Their voice is left unheard in all economic and social decisions.

The Green Revolution is a system developed by universities and research institutions in the industrialized countries, and had to be learned by the farmers in the South. A patriarchal culture resulted in the dissemination of knowledge from men in the North to men in the South. An entire body of knowledge held by women learnt through centuries of working on land, not only by growing, but gathering food and seeds from the natural habitat in the ecosystem were lost.

In the current dynamics, where education and documented scientific knowledge is given precedence over indigenous knowledge systems, academic achievement is a tool for excluding all those who are not part of this system. Pakistan's literacy level as a whole is very low (47%). This factor alone has been a major factor in marginalizing and demeaning the role of the rural population's in economic development programs. Segregated data by gender and urban rural sectors indicates that rural women especially, have gained nominally from the westernized education systems (Charts 1&2). Hence, the almost negligible participation of women in mass education has led to their further discrimination. The new knowledge systems have come in written forms, often in languages which marginalize local languages. Patriarchal values severely limit women's mobility, not allowing them to move in wider communities which can be easily accessed by uneducated men.



The result is that women are often unable to understand any other language except the local dialects spoken in their community. Hence, based on their inability to read, write or to have an understanding of other (modern) systems, believe in their own unworthiness as dynamic social, economic and political change agents. This belief of unworthiness has undoubtedly been extended to their roles as natural resource managers.

A second issue of critical importance is the health status of women. Health indicators for women are abysmal. Pakistan with an infant mortality rate of 90 per thousand live births, and 126 per thousand for mortality rate under-5 years of age, ranks highest for these indicators in

South Asia.<sup>2</sup> Data has shown that malnourishment is the underlying problem behind high mortality rates among mothers and children.<sup>3</sup>

More food is provided to the male child, and the result is not only malnourished girl children but on attaining adult status, stand in a very precarious position physically to take on the burden of motherhood. The system of marrying off girls at a young age is still quite prevalent. According to the 1998 census, comparative data for men and women in the age group 15-19 years show that nearly 10% of girls in this category were married while only 3% percent males were married.<sup>4</sup> In the next age range (20-24 years), 30% women were married, in comparison to only 15% males.

In addition, reproductive rights of women are severely curtailed. In other words, the right to make decisions over their own body and body functions has been culturally held almost entirely in the hands of their spouses. Women are unable to put a stop to the numerous pregnancies they go through, facing acute dearth in terms of medical, nutritional and emotional needs.

These indicators are important on a number of accounts. One, that women's low nutritional status has a depilating impact in their ability to take on the numerous paid and unpaid tasks which the system extracts from them, both in the urban and rural sectors. Second, an undernourished woman is by no means capable of fighting the toxic chemical pollutants found extensively in our urban and rural areas. Her body is not only incapable of fighting them, but tragically passes toxins to the fetus, and through mother's milk, to the children she rears. Lastly, it is important to point out that the high population rate of Pakistan has put a strain on natural resources. (Although, no doubt the major extraction of these resources is being carried out as a result of industrialization). However, due to inequitable distribution of resources, the poor are left to fend for themselves. Women being on the lowest rung of the vulnerable, pay the primary cost of a large family size, and are forced to misuse many of the Nature's resources.

### **1.3 Development Policies: Impact on Women's Lives and the Environment**

#### **1.3.1 Mechanization of Agriculture, Women and the Environment**

The intensification of poverty and its impact on women due to environmental degradation have been a byproduct of, first, the introduction of capitalist systems of agricultural production through the green revolution technologies, and second, the trade liberalization impetus in the 1990s, as urged by the International Monetary Fund (IMF) and the World Bank conditionalities. The cut down on subsidies to the agriculture sector, along with the increasing energy prices have played havoc with all, but especially small farmers. In just over a period of the last 10 years, DAP and diesel prices have gone up by 173% and 241.6%, respectively.

With more and more emphasis on cash crop for exports, there is a push toward growing less food for consumption, and more for the market. Increased agriculture land used for cash crop

2 *Ibid*, p. 161.

3 *Ibid*, p. 167.

4 Federal Bureau of Statistics, Economic Affairs and Statistics Division, Government of Pakistan. *Pakistan Statistical Yearbook 2001*, p 27.

cultivation means increased use of water, pesticides and fertilizers, leading to increased water logging and salinity, shortage of water, environmental pollution through chemicals, all of which has led to extensive damage of the ecosystem. The result on daily lives of women, especially in the rural areas are deepening food crisis, scarcity of natural resources needed for subsistence living such as fuel wood, and water. In addition, livelihood guarantees have receded, forcing women to seek increased work. In essence women's work, paid and unpaid has increased immensely. Their independence as food producers and resource managers has been eroded severely.

For example, with increased prices in inputs women claim that they are unable to grow certain vegetables as diesel costs make it impossible for them to access water.<sup>5</sup>

The result is that many small farmers lease out agriculture land. The lease money is a pittance (Rs 1,500-2,000/acre/year). First, the money goes directly to men. Second, once the money is gone women have no access to even the security of shelter and possibility of harvesting wheat from it which would have ensured food security for the family.

It is important to note that in Pakistan, property is owned almost solely by men and "only about 7-9% of rural land is genuinely owned by women."<sup>6</sup> Existing in a patriarchal culture, women waive their property rights in favor of their male family members.<sup>7</sup> This loss of control over property rights is one critical reason for women not being economically and socially independent citizens. In general men will take decisions on land independent of women, for instance either for mortgaging or leasing land.

The intense dearth of water has been another reason behind less and less independent sowing by women. In addition, with vegetables more prone to pest attacks, there is greater sense of reluctance on part of women to maintain vegetable gardens. Another issue is that with the introduction of hybrid seeds, the widespread system of preserving seeds from one harvest to the next has become less and less common as well making seeds very expensive for women to access for growing only for family consumption. The number of needy has grown immensely. Women complain that what they sow gets picked by others and it is difficult to keep guard all the time.

Landlords have become quite zealous in ensuring that women do not sow vegetables in between the cash crops, as has been their practice. Caretakers of landlords' land will patrol all cultivated land to ensure that no other crops than assigned by them have been sown even in small patches.

Less access to common lands in places has reached such margins that even the number of livestock maintained by women is decreasing mainly because they have no land on which to grow grass for their animals. In addition, with the rising dearth of natural resources less and less benefits are being derived from keeping animals. For instance, with less fodder available, the quantity of milk from animals is decreasing. Expenses as well as extortion levels of landlords has increased to the extent that if there is excess milk, it is all sold as people are unable to meet all their needs, especially food.

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5 Pesticide Action Network (PAN) Asia and the Pacific and Asia Forum on Women Law and Development (APWLD). "Empty promises . . . empty stomachs: impact of Agreement on Agriculture and trade liberalization on food security." PANAP and APWLD, 2002, p.142.

6 Simi Kamal. "Property ownership and control by rural women: effects of the interplay of formal and customary laws." *Pakistan Journal of Women Studies: Alam-e-Niswan*, Vol. 4, 1997, p.1.

7 Ibid.

As was narrated by a *hari* woman:<sup>8</sup>

“Gone are the days when we had butter from milk. We used to have so much *desi ghee* that it was used all year not only for our daily consumption but also stored in big containers . . . We fight like animals for a morsel of food which is obvious; if the stomach is empty the mind will not work. . . . What else is greater suffering than hunger; if your clothing is torn you can make do with a patch on it, but if your stomach is torn with hunger the same solution cannot be applied.”

According to women mechanization has led to some tasks becoming easier, but their wages have decreased, which means that they have to search for more work to augment their income. In addition, increased cost of agricultural inputs means that families are getting into a cycle of debt, mortgaging land, and facing eviction. The end result is that more and more people including women are working as farm labor.

Women participate in cotton picking in large numbers. However, women suffer from nausea, vomiting, dizziness, respiratory problems, rash and other skin diseases as part of carrying out this work. The economic incentive of this work is clear, but there is no doubt that they are also pushed into it by their male members. A woman had shared information that if she did not go for picking her husband would force her to go, a view, which was shared by many of her fellow companions. The presence of pregnant women in the fields, even to the very last days of their term further augments the presence of such a structure. Very young girls accompany their female family members for cotton picking. According to women, “we start picking cotton nearly as soon as we can start walking with our mothers.” Women prefer to work on other peoples fields as then it guarantees payment. In the end the left over cotton on branches is gathered and used for making household quilts and the wood is used for fuel wood which is said to sting their eyes at the time of the use.

Apart from increase in paid work, women have had to bear the impact of modern agriculture on women in different ways. For instance “previously because of the quality of wheat, *chapatti* (unleavened bread) use to remain soft till the evening. So it was possible for the housewife to work well ahead of time, prepare meals and get on with other work.”<sup>9</sup>

It is common for groups of women to wash household clothes and utensils by the sides of the watercourses passing through villages. Similar activity takes place by the gush of water coming from tube wells. This process has a two way impact. On one hand the water is contaminated with pesticides and has an adverse impact on women’s health. At the same time, women themselves wash pesticide soaked clothes in these water courses which are again a source of contamination and vice versa soap used by them is an added source of pollution.

Other unsustainable practices which have increased the load of work on women is the extensive irrigation system demanded by hybrid seeds. There has been a practice of installing tube wells and hand pumps. These are putting immense pressure on ground water resources and are expected to seriously affect the long-term water availability. In desert areas of Balochistan, Sindh and Punjab women walk many miles for water. This is especially true for periods when drought sets in.

8 Noor Shah. A tale of two eras: through the eyes of a peasant woman. *Challenge Special Supplement*, November 2001, p. 12.

9 Naila Hussain. *Poisoned lives: effects of cotton pesticides*. Shirkat Gah, 1999, p. 55.

In drought prone areas, where there is lesser vegetation available, children allow their animals to graze on saplings. This further erodes the environmental condition, leading to further climatic disasters with the passage of time.

In summary, capitalist agriculture production has strengthened the concept of private property, decreasing land available for food crops. Women's lack of land ownership, and limited social standing have not been able to practice traditional methods of farming which had catered to the food security needs of their families. Environment is balking under the strain of chemical intensive farming and unsustainable exploitation of natural resources.

### 1.3.2 Women in the Cycle of Migration and Trade

The past few decades, as a result of mechanized agriculture has seen many thousands migrating from the rural environment to the urban areas, in search of a livelihood. Women, who are part of the migrants from the rural to the urban areas, exchange one set of hardships for another. A migrant population from Bangladesh has also joined the local population. Many of them are victims of modern export-oriented agriculture in their own countries. Women, under the double impact of modernization, and lack of control over their own lives, are sold or sent for work not only away from their communities but the country as well. These women, in their new abodes face abuse at many levels. In addition, a large exodus of Afghan refugees have been flocking the cities of Pakistan, for more than two decades. All these refugees, either of war, or chemical agriculture, find their way to the cities

It is now estimated that nearly half of Karachi's population lives in squatter settlements.<sup>10</sup> The situation is reflective of not only Karachi, but of the other cities as well. The largest squatter settlements are the closest to the industrial sectors.

The filth which is dumped in our cities is abundantly strewn in the uneven lanes of the squatter settlements. Open sewerage systems make residents extremely vulnerable to disease. Malaria, tuberculosis and respiratory and skin diseases are rampant in these areas. The high level of chemical toxicity as a result of industrial pollution is more than responsible for many of the ailments afflicting the lowest income brackets, in the urban squatter settlements. Given the extreme restriction put on women's mobility, very few have the opportunity to go out in open spaces, even the ill-kempt parks in our cities. With no real access to clean air, they face further pollution from burning wood as fuel in their kitchens.

Some Pushtoons *abadis* in Karachi are on top of hills, and accessing them is difficult. Pregnant women climb up and down these rough paths, some going down to deliver and come back the next day. Many of the Afghan *bustis* rare nothing but props put up on poles covered with tattered clothing.

A number of squatter settlements habited by Bengali women can only be described as inhuman. Many are living around the Karachi port, in areas where there are huge electric high transmission poles. The land is marshy, almost a swamp, an infested bed for mosquitoes and other insects. No water and no electricity are of course norms for all squatter settlements with these being no different.

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10 Tayyaba J. "Khan.Karachi's katchi life". *The News on Sunday:Kolachi*, June 23, 2002.

It is the migrant workers who face some of the worst working conditions. For instance, in certain squatter settlements many small sheds have been converted into informal units as prawn cleaning processing units, housing anywhere from 70-100 women and children. Although similar sheds are present in other parts of the city, their cleanliness, and ventilation levels, though certainly not ideal are much better than those utilizing almost entirely a Bengali women workforce. These can be considered nothing short of a nightmare with retching stench of prawns and their waste, polluted water and melting ice blocks. Little ventilation is available in the sheds, which are gloomy and full of flies. Women are seated on small stools to avoid getting their clothes wet from the running water from the ice block, but to little avail. Their hands bear the mark of the stings from peeling prawns. With long working hours (3:00 am to noon or later) they have no option but to earn the meager amount they can make, having few contacts or access to better paid jobs and working environment. It needs to be pointed out that the 'cleaned' shrimps from these sheds are all heading only for the export market.

Apart from working in the fisheries sector, many types of work is carried out by home-based women workers in the squatter settlements. This work force, suffering male dominance at home is allowed little mobility, forced to accept the highly low paid piece rate work generated by increased informalization of the formal sector. These women become self monitors through the nature of piece rate, working like machines to deliver batches on time. They suffer their dirty, fly-ridden abode day in and day out.

It may seem that women from middle class sections fare better. With respect to amenities this is of course true. The residential areas of the middle class are further away from the acute pollution emitting from the industrial areas. However, when it comes to noise pollution, as well as fighting ones way through masses of men, trying to access public transport systems, women are the easiest prey.

It is the middle and lower income literate women who are entering a mobile work force, pushed by increased cost of living resulting from structural adjusting programs, trying to earn enough to meet daily needs of their families. They have to constantly fight against an ongoing oppressive behavior of males, but with little means to change their circumstances. Women are exposed to chemicals in factories, or the informal units operated in the informal sector which then has no adherence to any safety standards.

In essence, the development policies led by economic growth models have not benefited either the most vulnerable communities. Up rooting them from rural communities, they have been thrust into the informal sector in the urban areas. Women have suffered the most. With inadequate access to the most basic needs of life such water, food and health care, they face the twin impact of ineffectual development policies and patriarchal values which take away from the dignity of existence.

## **1.4 The impact of environmental degradation on women**

### **1.4.1 Pesticides in the Rural Environment**

Pesticides alone have been severely criticized for the immeasurable damage to the ecosystem. The impact of these toxic substances is on human health (of both present and future generations) as well on all forms of life; soil degradation resulting in loss of soil fertility and damage to the soil structure; and loss in biodiversity.

About 2.6 million women pick cotton from the nine major cotton growing districts of Pakistan.<sup>11</sup> However, women are exposed to pesticide residue not only can at the time of picking but at many different levels of pesticide preparation and crop planting processes. Major routes of exposure to pesticides are the respiratory system and the skin.

The impact of pesticide poisoning includes various cardiovascular, neurological, hematological, ophthalmologic, respiratory diseases. Pesticides are responsible for inhibiting the enzyme cholinesterase (ChE) level in blood which can result in different neurological problems.<sup>12</sup> "The physiological differences in women's bodies (more fatty tissue, thinner skin, and lower kidney functions) make them more vulnerable to pesticide exposure than men. During pregnancy, pesticides can cross the placenta and affect the developing fetus."<sup>13</sup> A major concern has been the disruption of the endocrine system during the fetal development stage in the womb. Changes in the developing brain can alter behavior patterns and endocrine function; and changes to the developing testes or ovaries can affect sperm or egg quality and quantity.<sup>14</sup>

Studies have shown that women cotton pickers exposed to pesticide residue exhibit dangerously low levels of ChE inhibition. In a study, of 88 cotton pickers only one was out of danger. Controlled studies show that non-cotton picking in women have normal levels of ChE activity in blood.<sup>15</sup>

In the villages of Pakistan, children with mental retardation and physically stunted growth are not an uncommon site. Scientific reasons for their retardation have not been determined. However, chronic exposure of women to pesticides cannot be ruled out as a source of impairment. The task of looking after the physically and mentally impaired falls on women's shoulder and it is no mean task. Moving grown children is a physically difficult, maintaining their daily hygiene next to impossible with no proper washing facilities.

In addition, literature has shown that intentional fatal poisoning from pesticides has been reported for two major groups: women and youth.<sup>16</sup> In Pakistan, similar findings have been verified.<sup>17</sup> Pesticide bottles are more than often stored at home in the 'safe keeping' of women, which allows them to make use of this poison more easily than others. The high rate of mental, physical, sexual and emotional abuse of women has been cited as a reason for women taking their own lives.

Animals are a critical asset for women in rural areas, which they use in times of need to generate additional income. Reports of animals, birds and poultry suffering death and disease are common. In addition, pesticide residue poisoning from animal meat, vegetables, and milk as part of the food chain have been documented.

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11 Government of Pakistan, UNDP/FAO and The Global IPM Facility. *Pesticide policy reform for food security in Pakistan*. Government of Pakistan, UNDP/FAO and The Global IPM Facility , p. 15.

12 Tahir, Seema. *Pesticide Effect on Human Health in Pakistan*. Food and Agriculture Organization, 2000.

13 Tenaganita and Pesticide Action Network (PAN) Asia and the Pacific. *Poisoned and silenced: a study of pesticide poisoning in the plantations*. Tenaganita and Pesticide Action Network (PAN) Asia and the Pacific, 2002, p. 7.

14 Ibid, p.5.

15 Tahir, Seema. *Pesticide Effect on Human Health in Pakistan*, p. 25.

16 Hoek, W. Van Der et al. *Pesticide poisoning: a major health problem in Sri Lanka*, *Social Science and Medicine*, 1997, pp 495-504

17 Azra Talat Sayeed. *Poison in the lives of women farmers, Sindh*. A study conducted for Oxfam, Sindh, 1999.

In actuality, pesticide poisoning creates a tragic loop of environmental degradation through poisoning of our water courses, lands, animals, food chain, and then affecting humans again. The role of chemical pollution of our water systems and then further contamination has been illustrated through the Pollution Loop illustrated in other parts of this report (p. 15).

#### 1.4.2 Environmental Degradation in the Urban Areas

According to a report, "Pakistan holds one of the largest stocks of obsolete pesticides in the World."<sup>18</sup> A research project has identified approximately 1700-2000 tons of obsolete pesticides, located in 100, 20, 18, and 150 stores located in Punjab, Sindh, Balochistan and NWFP provinces, respectively. A survey of sites has shown that one third of the pesticides belong to the group of extremely and highly hazardous category.

According to the report,<sup>19</sup>

"a number of the stores are situated in highly populated residential areas . . . . Some of the stores are normal, simple residential houses, transferred into pesticide stores. Most of the store houses are damaged, the roofs are broken, and the floors are not sealed. In a number of stores the pesticides are lying outside the storehouses in the open, with access to the public."

Further, the report provides details of stores in Lahore, Bahawalnagar II where the stores are next door to residential houses. These stores contain highly lethal chemicals such as DDT, and Endosulfan. Based on the storage condition of the pesticides, it is more than probable that with wind and rain, the pesticides could have dispersed over a wide area. Due to unsealed floors, overtime the pesticides could have seeped into the ground water. It needs to be remembered that for many of these storehouses, the piles have been in place for nearly 20 years.

Given the discussion in the previous section on pesticides and rural women, it is unnecessary to review the impact of these pesticides stored in the urban environment. However, it is critical to remember, that unlike wide open spaces in the rural areas, the population density in the urban areas, especially in the squatter settlements is very high. It is women and children who stay in residential quarters the longest and hence would be exposed for a greater length of time each and every day to the fumes of pesticides in the air.

Our cities with respect to environmental degradation have much to bear. For instance, according to a news report, "Thousands of tons of Phenol a known carcinogenic agent, (categorized as a highly dangerous toxic and hazardous chemical declared by WHO), is dumped into the Arabian Sea by various industrial units."<sup>20</sup> Not only that but more than 300 million gallons of untreated industrial and domestic effluents are dumped into the sea every

18 Deutsche Gesellschaft fur Technische Zusammenarbeit (GTZ) GmbH and Environmental Protection agency, Government of NWFP. *Safeguarding and disposal of obsolete pesticides in NWFP/Pakistan*. Peshawar, GTZ, 1999, p.7.

19 Wolfgang A Schimpf. "The actual situation and problems with obsolete pesticides in Pakistan." Deutsche Gesellschaft fur Technische Zusammenarbeit (GTZ) GmbH and Environmental Protection agency, Government of NWFP. *Safeguarding and disposal of obsolete pesticides in NWFP/Pakistan*. Peshawar, GTZ, 1999, p.8.

20 Samina Iqbal. Environment update; *Dawn* Feb 20, 2002.

day.<sup>21</sup> Numerous details have appeared in newspapers regarding chemical pollution spread by different industries in various cities.<sup>22,23,24</sup>

Sewage and toxic matter pollution in the Karachi Port includes toxic waste by bioaccumulation of DDT, PCB and various metals and oil. Distortion of aquatic life and reduced reproduction of fish and shrimp are added impacts.<sup>25</sup> There are many fisher folk villages around the coastal areas of Sindh and Balochistan. Fish is one of the main source of food as well as income for women. Further chemical pollution through fish and sea water is putting children at risk.

Added to chemical pollution, there is air pollution. It is estimated that nearly one million vehicles are on the road in Karachi.<sup>26</sup> With respect to solid waste the situation is just as bad. Karachi alone produces daily 10,000 metric tons of solid waste. Of this nearly 60-70% is left unattended in the city.<sup>27</sup> The situation is not much different in Lahore.<sup>28</sup>

The situation sketched here is alarming for human life as well as the environment. Women with greater thinner skin possess a greater vulnerability towards chemicals and all other effluents. A study in the *Lancet* has indicated that women living within 3 kilometers of hazardous waste landfills sights have a forty percent greater risk of conceiving a child with a chromosomal birth defect, such as Down's syndrome.<sup>29</sup>

Coupled with biological factors are others such as malnourishment, pregnancies, often providing breast feed to infants, physical labour, and mental stress coping with poverty as well as, violence present in their lives as a daily occurrence, both at the household level as well as in the streets.

It is believed that the level of air pollution in Karachi and Lahore is 20 times more than standard of the WHO. Lead and carbon has been named as primary sources of air pollution in Karachi. In a survey conducted by the Aga Khan Community Health Sciences at the Aga Khan University, Karachi shows that of 400 children 322 in the age groups 3-5 years, lead blood had more than the critical 10 micrograms per deciliter.<sup>30</sup> The children's sample was from the city's center as well as the outskirts and a number of low income areas. Results indicate that nearly 80 percent of children in Karachi have blood levels above the critical level.

Lead can lead to respiratory diseases, and more lethally damage the brain impacting mental abilities. Implications are severe for our coming generations at both social and economic level. Caring for the mentally impaired falls solely on the shoulders of women, and is a severely tasking job at emotional, physical and economical levels.

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21 Samina Iqbal. Environment update; *Dawn* Feb 27, 2002.

22 Aamir Kabir. Marine Pollution along coastline. *Dawn* Jan 14, 2002.

23 Samina Iqbal. Environment update; *Dawn* May 1, 2002.

24 Samina Iqbal. Environment update; *Dawn* May 8, 2002.

25 Aamir Kabir. Marine Pollution along coastline. *Dawn* Jan 14, 2002.

26 Samina Iqbal. Environment update; *Dawn* April 10, 2002

27 Samina Iqbal. Environment update; *Dawn* Feb 27, 2002.

28 Samina Iqbal. Environment update; *Dawn* April 10, 2002.

29 Samina Iqbal. Environmental Update Feb 6, 2002.

30 Mubina Agboatwalla et al. Alarming lead levels in Karachi air. *Dawn, Health and Environment*, August 8, 2001. .

### 1.4.3 Women and Climatic Disasters

As has been much emphasized in the literature, natural disasters can no longer be viewed as 'natural'. Global warming is a direct result of globalization, with increased felling of forests required to meet the unsustainable consumption patterns. It is expected that weather extremities such as droughts, storms and floods will rise.

Increase in global temperatures will impact the River Indus by increasing water loss due to evaporation. This will dry out soil; reduce vegetation and crops, and dry rivers leading to expansion of deserts. The flow of Indus is projected to fall by 43%.<sup>31</sup>

The decade of the 90s has been one of the worst in terms of natural calamities which have hit Pakistan. The early 90s saw floods in the Punjab, Sindh and Balochistan. In addition, Sindh has had to bear a cyclone and an earthquake in the last few years. Sindh and Balochistan have been hit with drought for a number of years now.

The destruction of the Indus Delta Mangrove, one of the worst environmental disasters are being faced in Pakistan.<sup>32</sup> Mangroves prevent soil erosion, reduce flooding and are a physical barrier against intensity of cyclones. A number of factors are responsible for the destruction of mangrove forests including population pressures, deposition of sand, over exploitation of fuel wood, timber and animal fodder, and effluent waste from Karachi City. About 37 percent of land is devoid of plantation due to intense cutting and grazing.<sup>33</sup> However, the major reason is the reduced fresh flow of water into the river Indus. Dams and irrigation schemes in the 20<sup>th</sup> Century have reduced the flow of fresh water. The non release of water in the river downstream Kotri for about 5 years has destroyed agricultural land, livestock and fisheries, resources on which millions of people of the Indus Delta depend for their livelihood. As a result valuable varieties of fish, shrimp population, and honey production are being affected.

It is estimated that almost a quarter million people have been displaced in search of food and water.<sup>34</sup> Fishing communities which have been part of the coastal environment for many centuries are being forced to migrate to other areas.

The long term impact of these calamities on communities is disastrous, especially women. Irreparable loss of children and spouses is faced. Sources of livelihood are lost due to long term degradation of agriculture land and loss of livestock.

Loss of homes, conversion into environmental refugee status, warding off snakes, scorpions and other life which has been disturbed by the calamity are constant worries. Women as primary caretakers of children and the elderly become the primary wardens. In addition, loosing utensils, edible items, have to worry about fulfilling their role as food providers. Normal water sources become contaminated adding a further burden on existence. A flooded terrain does not allow women to seek relief as normal practice is to use the fields at night. Finally, the burden of starting to rebuild after the storm has been spent falls primarily on women.<sup>35</sup>

31 Samina Iqbal. Environment update. *Dawn* Feb 6, 2002.

32 Samina Iqbal. Environment update. *Dawn* March 27, 2002

33 *Dawn* May 31, 2002.

34 Amir Kabir: Indus Delta under threat by advancing sea. *The News*, July 30, 2001,

35 Azra Talat Sayeed. *Evaluation of the flood emergency assistace provided by Oxfam.* Oxfam, 1996.

In rural areas people have scarce resources, with literally a handful of utensils, beds, and clothing. In times of wide spread disaster, everybody is facing severe hardships and the ability of the community to help is direly strained. The most vulnerable, that is widows, women with disabled spouses, and the elderly suffer the most.

The caste system is well entrenched in our rural environment. In the end, women from the lower castes bear the double burden of community discrimination, as well as the patriarchal bias in their own households. For instance, in a village in Thatta, a patriarch named the widow and daughters of his brother as recipients of aid to widows.<sup>36</sup> As a result many other widows and needy in the village were left out.

Drought conditions make it impossible to grow food crops or vegetables. Indigenous plants which are used as a source of nourishment become less in number and it is the girls who suffer as they go hunting for them in search of food.<sup>37</sup> In drought conditions, food scarcity further erodes the ability of women to access food, as they are the last to eat in the household. However, their burden of work is increased mainly due to lack of water in the vicinity.

### 1.5 Women's Resilience

The above information throws light on the immense strain which women bear coping with adversaries on many fronts. Their daily life is of struggle. It indeed speaks of their emotional stability which helps them to keep on performing their many productive and reproductive tasks, trying to sustain life.

There is no dearth of examples where women have been the first to take initiative in trying to save their environment by performing simple life sustaining tasks. For example, water is a first priority for women and in order to meet this lifesaving need women have over time evolved simple strategies to save and store as much as they can within their limited resources. In drought prone areas, there is a practice of water harvesting through small storage tanks called *tankas*<sup>38</sup>. These *tankas* are used to catch and store water from rainfalls.

In order to access some means of food, and income, women in nearly every household will maintain poultry which is used as a source of eggs. Generally poultry meat is used for serving guests rather than household consumption

Manure is collected and stored on a daily basis, which is then used at appropriate time as fuel as well as for covering their mud homes. Collecting earth and then making mud out of it is another work which they do. Cutting off shrubs and trees to cover the roofs of their homes is part of the chore which they carry out as part of sustaining their own and their family's lives. Every few months the courtyards and walls of their homes are repaired. These jobs are kept aside during the intense farming seasons, especially during wheat harvesting and cotton picking.

Storage containers for wheat are made out of mud on the homestead, stocking wheat for the coming season. If seeds are preserved, then every month (usually kept track by the

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36 Azra Talat Sayeed. *Evaluation of the Sindh cyclone project:2000. Oxfam Pakistan, 2000.*

37 Azra Talat Sayeed. "Drought evaluation situation in Thar desert, Sindh." Save the Children UK, and Novib, 2001.

38 Allah Nawaz Samoo. *Rainwater-harvesting: case study of rainwater reservoirs in Tharparkar.* Threep Rural Development Program, Tharparkar Sindh,

appearance of the crescent) seeds are taken out for an airing and exposure to the sun, and then stored back. Clusters of garlic bulbs are generally hung inside their rooms for seed preservation.

The use of medicinal plants is common and used for various purposes ranging from healing simple wounds to contraception. For instance, neem seeds are commonly suggested and used for increasing hair growth. Turmeric is used for healing wounds, onions to ward off a heat stroke, and seeds of certain plants for contraception.

Many plants and fruits from trees are used as part of the daily household food supply. It is indeed these practices which allow them to survive on a daily basis, as they are unable to access the available products in the cash economy system.

The income from farm land activities such as picking of various vegetables and lentils, and cotton picking is used toward family expenses including food, medicines and clothes; more than often this money is never handed over as most daily workers and sharecroppers are paying off a never ending cycle of debt.

An additional investment which they make is in acquiring animals such as cows, sheep and goats. These are considered a security for leaner times or sudden needs in the family at which point they are sold. Sometimes, depending on the economic status of the family, animals are also butchered for a wedding or other occasions, in most cases most unwillingly. A daily activity is of cutting grass, and preparing animal feed.

Cutting of specific crops such as wheat and rice are carried out on the basis of payment in kind. It is more than obvious that women will give first preference to this payment versus payment in cash. Payment in kind ensures long term food security. So cotton picking and rice threshing seasons occur at the same time, and women prefer to carry out rice threshing, although they will also ensure that they participate in cotton picking as well.

Apart from farm based activities, women will engage in numerous other activities which allow them to generate additional income for their household. Depending on the raw material a particular region will yield, women in date palm cultivation areas use the straw from the trees to make *chabis* (baskets for keeping bread or other goods). It is a tedious task, they collect the straw, use it in raw form or dye it, and then weave it make the final output. All in all, they sell it at less Rs 30 to middlemen in the community.

With growing poverty, women are engaging in producing more and more products which are not necessarily from natural resources. For instance, it is common for middle men to take wool and crochet thread to women, and get shawls, sweaters and other accessories made from them. Women in Punjab, in the Gujranwala, Sialkot area are an integral part of the football production industry. Much of this money is used for enhancing the quality of life of their households and little for their own personal use.

Older women will recant more sustainable practices than younger ones. The use of animal dung as fertilizers was a given norm. In addition, multiple cropping patterns were a major activity in which women were participating. Eating sugar cane while working on the fields used to be a practice and a source of energy while working long hours. However, in these times of "all for export" very little sugar cane is grown for domestic purposes, to the extent that brown sugar (*gur*) is unavailable for household consumption.

Women in the rural environment know their priorities. That they have less power, and are accorded no space to voice their demands is another issue. If given a chance, they are more than capable of asking for and managing their resources to the best interests of all. It is indeed with the drive of a highly ecologically and economically exploitative system, that women have lost control over sustainable management of resources.

An example is of a village based women's organization in Tando Mohammad Khan. A NGO had been working with the women. It was observed that the daily diet of the villagers was of unleavened bread and green chilies, day after day. Women identified lack of water as a reason for not growing vegetables in their courtyards and requested hand pumps. By installing one hand pump per neighborhood, more than six households were able to grow their own vegetables, making use of a combination of indigenous and hybrid seeds, organic fertilizer and no use of pesticides. The organization is composed of women from five neighborhoods, of different religions and castes. Some of the women Hindu and Muslim castes had no experience of vegetable gardening, and they willingly set to learn from an older couple. Amma Rahima and her husband supervised preparation of land, water installation, sowing and then maintenance of the plants. It was interesting to note that although women from each neighborhood had selected different vegetables for sowing (so that they could exchange with each other) every neighborhood sowed *gawar pahli* (french beans). The reason identified was its abundant growth, and nutritional base. A woman with numerous young children wanted water melons. These are sound indicators of how women know their own and their children's needs. If given the opportunity she is capable of making entirely rational choices, work in cooperation irrespective of their caste or religion, going above many of the petty divides which are imposed on us by cultural values.

Today five flourishing gardens rich in a number of vegetables and fruit bear testimony to the ability of women to voice and achieve their demands, and take care of their families and their immediate environment.

Similar examples of fighting against environmental degradation are seen on the urban scene. An example is of middle class group of women in Karachi, who with few funds at hand but plenty of determination were able to organize their neighborhood and create a clean and safe environment for themselves. They were faced with garbage dumps in the neighborhood, no street lights, and a neglected park which was accumulating sewage water. They took matters into their own hand, and fought at various levels of government administration and judicial system, and won their case through the Supreme Court. The result was a clean green park, well lit streets and a safe environment. The Karachi Administration Women's Welfare is a prime example of what women can do if they put their minds to it.

There are other examples of women from middle class families who in face of water scarcity in their area demanded water from the concerned authorities and succeeded. No doubt, in both cases these were mostly educated middle class women who were able to pit their will and knowledge of the system against a highly male dominated class conscious society.

## **2 Global Environmental Issues**

### **2.1 Introduction**

The previous chapters look at environmental problems of domestic origin. Pakistan is also affected by global environmental influences, known as such because of their universal impacts. More often than not, their genesis may be traced to the actions of a small part of the world. Climate change, ozone depletion and persistent organic pollutants (POPs), for instance, are making their presence felt worldwide, but are the outcome of near-sighted economic and environmental policies in a few industrialized nations.

Pakistan's involvement in global environmental issues has both a passive and active aspect. First, as indicated, it suffers the adverse impacts of events beyond its control. The second aspect relates to its role in global efforts to address these problems - usually in the form of international treaties signed after extensive negotiations. Pakistan's participation in such treaties often reflects a careful balancing act. The desire is to attract foreign investment through compliance, while guarding against having to make excessive commitments.

Industrialized-country vested interests tend to prevail at these negotiations, and developed countries need to give careful thought to how these can meet their own development objectives. Pakistan is considering acceding to the Kyoto Protocol on climate change. It has to make sure that the financial incentives linked with the Protocol encourage mitigation projects which lead to sustainable development in the country. The Montreal Protocol, meanwhile appears to be bringing about improvements in Pakistan's industrial sector.

### **2.2 Ozone Depletion**

Pakistan ratified the Montreal Protocol in 1992. The Protocol, which has 172 signatories, aims to avert further damage to the ozone layer by phasing out most ozone depleting substances (ODSs) completely by 2010. Since industrialized countries have already succeeded in an almost complete ODS phase-out, the emphasis has shifted now to reducing ODS consumption in developing countries. The Montreal Protocol has sanctioned grants to developing countries with ODS consumption of less than 0.3kg/capita, to help them shift to cleaner technologies. The prospect of modernizing its industry proved to be a compelling incentive for Pakistan to ratify the Protocol.

Pakistan consumed an average of 2,464 tonnes of ODS between 1995 and 1998, roughly 0.018 kg per capita (MELGRD, 2001). Annex 2.1.1 shows the consumption of various ozone-depleting substances in Pakistan over 1995-99.

#### **2.2.1 Pakistan and ODS Imports**

Pakistan's ODS consumption derives from imports; no ozone-depleting substances are produced in Pakistan. The ODSs are used mainly in deep freezers, refrigerators, car air-conditioners, foam, fire extinguishers and solvents. Around 11,000 small units in Pakistan use CFCs, with the air conditioning manufacturing industry accounting for 23 percent of the total consumption. The bulk of legal ODS imports are from the US, Spain, India, China, Korea, Holland, France, Japan and Italy (Asghar Nadeem, pers. comm.). While ODS consumption in non-Article 5 countries (developed, with high per capita ODS consumption) has been phased out entirely, they have an extended deadline for ceasing ODS production.

In addition to the import of ozone depleting substances, an unfavorable situation in the country is its reliance on the import of equipment that uses ODSs.

As bans are being phased in, equipment that uses CFCs has become redundant in developed countries, and they have begun to export this to developing countries.

**Table 2.1.1: ODS Phase-out Deadlines for Pakistan**

Controlled Substance	Phaseout Deadline
CFCs	Jan 1, 2010 (freeze in 1999)
Halons	Jan 1, 2010
Carbon tetrachloride	Jan 1, 2010
HCFCs	Jan 1, 2040
Methyl Bromide	2015 (freeze in 2002)
Methyl Chloroform	2015

Source: Adapted from Ministry of Environment, 2001

Developing-country industry finds this arrangement profitable at present, since the equipment is available at lower cost than non-ODS based equipment, but will find this economically unfeasible in the future, when ODSs will be scarce and expensive, or

unavailable altogether. Appliances containing ODSs, such as refrigerators, are also being smuggled into the country, particularly from Afghanistan.

### 2.2.2 ODS Phase-Out In Pakistan

By ratifying the Montreal Protocol, Pakistan has committed itself to a rigorous phase-out schedule (see Table Annex 2.1.2) In compliance with the protocol targets, it has phased out 400 tonnes of ODS, and frozen its consumption of CFCs at the average consumption level of 1995-97. The government is required to reduce the use of ODSs by 50 percent by 2005 (Mahmud, 2000).

As per the Protocol, Pakistan is an 'Article 5' country, consuming less than 0.3 kg of ODS per capita. As such, it is eligible to seek grants for ODS-reducing activities from the Multilateral Fund, established by the Protocol's signatories. The Fund meets the incremental capital and operating costs of switching over to non-ODS technology in Article 5 countries. It has provided \$11.2 million to Pakistan for this purpose to date, through two of its implementing agencies, the World Bank and UNIDO. The funding covers 23 projects in different stages of implementation and will collectively phase out 1346 tonnes of ODS in the country (MELGRD, 2001). All the ongoing projects are industrial in nature; there are 12 projects in the refrigeration industry, 9 in foam and 2 in solvents (*ibid.*). Annex 2.1.2 shows the amount of ODS reduction that will ensue from each project. Table 4(below) shows the substitutes being used for ODSs.

**Table 2.1.2: ODS Substitutes in Pakistan**

ODS	Substitute*
CFCs	
Halons	
Carbon tetrachloride	
HCFCs	
Methyl Bromide	
Methyl Chloroform	

Information to be provided by the Ozone Cell, MELGRD

### 2.2.3 Institutional Responses

The Ozone Cell was established at the Ministry of Environment, Local Government and Rural Development (MELGRD) in 1996. The Cell implements projects of the Multilateral Fund, lays down regulations relating to ODS imports, and raises awareness on ozone depletion issues.

**Regulation of ODS Imports:** Upon MELGRD's advice, the Ministry of Commerce introduced an import authorization/licensing system in 1998 to regulate and monitor imports of ODSs in the country. In 2000, the Ministry issued a statutory notification in this regard that prohibits the import of certain types of second-hand compressors, air-conditioners and refrigerators to the country. It also issued a public notice restricting the import of ODS chemicals. Importers were allocated ODS import quotas using their 1999-2000 imports as a baseline quantity. Those with no past history of ODS import, however, were barred from future imports. Importers were also required to furnish data relating to their imports both to the Ministry of Commerce, and the MELGRD. The government recently increased the import duty on CFC compressors used in air-conditioners and refrigerators, from 10 percent to 35 percent (UNEP, 2001).

By and large, importers are abiding by these regulations although illegal imports of banned appliances still continue.

**Awareness Raising:** At present, the Ozone Cell is involved in raising awareness on ozone depletion. It is targeting industries mainly, since the bulk of national ODS consumption derives from their imports. The general public is another targeted audience, although on a smaller scale. Newsletters and leaflets have been distributed among the public to encourage them to purchase non-ODS-containing appliances. The Cell has designed wall calendars carrying information on ozone depletion in both English and Urdu and distributed them among industrialists, ODS importers, environmental agencies and schools. In addition, it has held 17 seminars, for the chambers of commerce and industry, technical institutes, and schools and colleges.

The Ozone Cell has achieved greater success in its awareness-raising efforts with the industry. In order to convey its message more effectively to the average consumer, it should induct the help of journalists, and NGOs could play an important role.

### 2.3 Persistent Organic Pollutants (POPs)

Persistent organic pollutants (POPs) are synthetic, carbon-based chemicals that have been produced and released in vast quantities over the past 75 years and share four characteristics: high toxicity, persistence, a special affinity for fat, and a propensity to evaporate and travel long distances (WWF, 1999). Their chief use has been in boosting food production, but they are now notorious for the risks they pose to animal and human health. POPs that have been classified as particularly toxic are: the pesticides aldrin, chlordane, DDT, dieldrin, endrin, heptachlor, mirex and toxaphene; industrial chemicals hexachlorobenzene and PCBs; and unintentional by-products of incineration: dioxins and furans. Due to their ability to travel, POPs are now ubiquitous, and have been detected in regions of the world where they have never been used, e.g., the Arctic, and remote islands in the Pacific (*ibid.*). Their presence worldwide and the health problems they are creating make them a compelling global issue. For developing countries, though, this issue has another severe, more direct aspect; until recently, industrialized nations were exporting massive amounts POPs to the South in the form of pesticides, which has led to death and disease among agricultural workers. Fortunately, Southern governments have started tightening controls, but more work needs to be done.

### 2.3.1 Exposure to POPs in Pakistan

The use of persistent organic pollutants (POPs) in developing countries and their export by developed countries, where they are banned due to health hazards, has become an important international issue. In Pakistan POPs are in widespread use. Some are used as pesticides in agriculture. They are also used in the production of certain electrical equipment. According to a 1998 UN report, as many as 500,000 Pakistanis suffer annually from poisoning due to the use of these chemicals; about 10,000 of such cases prove fatal. (Rashid: 2000).

**Agricultural Use:** Pesticides use in Pakistan's agriculture dates back to the mid-1950s. At that time, large quantities of dangerous chemicals – several being POPs which are now banned – were imported from reputable companies. Their use continues in the country, although on a smaller scale. While some are imported legally, others are smuggled in, or are manufactured locally. Between 1994 and 1998, shipments amounting to 204,248 lbs of the highly toxic POP, Endosulfan, were made from US ports to Pakistan (<http://www.sare.org/htdocs/hypermil/html-home/41-html/0488.html>).

Large stockpiles, amounting to over 5,000 tonnes of obsolete and expired pesticides from as far back as the 1970s, are scattered in 1,935 dumps over 41 districts in the country (Greenpeace, 1998). The bulk of these are banned POPs known as organochlorines (Table 2.1.3 shows stockpile data for Karachi). The drums and containers have corroded with time and the pesticides are making their way into the soil and groundwater.

**Electrical Equipment:** Electrical equipment is another repository of POPs, particularly transformers and capacitors, which use polychlorinated biphenyls (PCBs) in their production. When this equipment deteriorates, PCBs can leak into the ground. In Pakistan, damaged transformers lie untended in large numbers in WAPDA warehouses. While no studies have been carried out yet to prove that leakages have seeped into groundwater and soil, safe disposal of old equipment is a desirable precautionary measure.

**Table 2.1.3: List of Organochlorine Pesticides stored at Malir Stockpile, Karachi**

Pesticide Name	Location	Quantity
<i>Liquid Pesticides</i>		litres
Dieldrin 20 percent	Malir City	25.00
Dieldrin	Main Store at Malir	96.00
Heptachlor	Malir City	8600.00
Kalthene (Kelthane?)	Malir City	10422.00
Kelthane 40 percent	Malir City	300.00
Thiodan 35 percent	Malir City	6832.50
<b>Total</b>		<b>26275.501</b>
<i>Solid Pesticides</i>		kilograms
BHC 12.5 percent	Provincial store at Malir	20000.00
Sevidol 8.8 percent (contains BHC)	Provincial store at Malir	90.72
<b>Total</b>		<b>20090.72</b>

Source: Assistant Director, Plant Protection, Dept of Agriculture, Karachi, 1992, in: Greenpeace, 1998

Note: Kelthane or dicofol could contain DDT

**By-Products:** Dioxins and furans are highly toxic POPs that are emitted during incineration of substances, such as medical waste and plastics. Again, no studies have been conducted in the country to estimate such emissions.

### 2.3.2 The Transmission Channels and Toxic Effects of POPs

Toxins present in agricultural chemicals work their way through the soil and groundwater into the food chain, eventually lodging in the fatty tissues of higher organisms. Organochlorines are sold under a variety of trade names in the country. Endosulphan, which belongs to this group of chemicals, is a widely used pesticide in the Punjab. Its adverse health effects are known to include birth defects and cancer (Habib, 1996). Most farmers are very vulnerable to the adverse effects of pesticide use since, being illiterate, they cannot read the precautions on pesticide containers. Extension workers are not always properly trained, and often give farmers contradictory or wrong advice. In a study conducted among cotton-growing villages of the southern Punjab, 88 percent of the women cotton-pickers surveyed said they were unaware of the hazards caused by pesticides and the need for protection measures (Hussain, 1999).

**Fig. 2.1 1 Pesticide Stockpile at Malir**



Taken from Greenpeace, 1998

#### **The Growing Use of POPs:**

Pesticides use in Pakistan's agriculture has accelerated rapidly. Consumption was fairly

restricted in the 1980s – valued at Rs.162 million, while the pesticide business was under government control. Over the following years, however, when pesticide import, sale and distribution were transferred to private hands (see Annex 2.1.3 for pesticide policy), consumption rose five-fold. By 1997, multinational companies succeeded in bringing consumption up to Rs.9,904 million worth (see Annex 2.1.4 for pesticide consumption data). By 1993, as much as 25 percent of the country's cultivated area was being sprayed with insecticides. Roughly 90 percent of the insecticides used are on cotton (Habib, 1996), but they are also used on tobacco, potatoes, onions, maize, sugarcane, rice, wheat and fruit orchards.

**Detection in Food:** Persistent organic pollutants have been used so widely in that they have begun to be detected in food and groundwater samples. In the cotton-growing district of Faisalabad, soil and shallow groundwater have been contaminated by dangerous insecticides (Ahad and Khan, 1999). Similarly, a high percentage (40 percent) of samples of fruit and vegetables from Mardan and Islamabad were found to be contaminated by residues; in 12 percent of these samples, eight pesticides exceeded the maximum residue limit. During 1981-84, the National Institute of Health (NIH) conducted a study on food contamination, in which it discovered the presence of 23 out of the 25 pesticides it tested for. The food samples were collected from local markets and included meat, fish, poultry, grain and cereal products, vegetables, fruit, oil, fat and shortening. The results are given in Annexes 2.1.5A and B.

### 2.3.3 Institutional Responses: The Status of Implementation

Pakistan has imported banned pesticides worth about Rs.3.047 billion from multinational companies (Beg: 1993, in: Kazmi *et al*, 1998). Earlier, imports were vetted against the Prior

Information Consent list (prepared jointly by UNEP and FAO). The chemicals included: dieldrin, DDT, heptachlor, hexachlorobenzene (BHC), paraquat and parthion methyl. A list of the companies allowed to import these chemicals into the country is given in Annex 2.1.6.

Firms which manufactured or imported pesticides were required to abide by the Agricultural Pesticides Ordinance, 1971. This was amended in 1994, when twenty-three pesticides, including several organochlorines, were de-registered and their import was banned (Annex 2.1.7). Offenses under the Agricultural Pesticides Ordinance of 1971 are deemed non-bailable and subject to severe penalties. However, while the Ordinance is comprehensive, it is somewhat ineffective. This is partly due to relaxations in pesticide import policy the Government made in 1988. One of these was that if a pesticide was registered in some other country, it could be imported to Pakistan without going through a local registration process.

Despite current bans, and strict penalties and sentences for violations, the fact that several pesticides are being sold illegally in Pakistan today reflects the poor implementation of existing laws. The following issues need to be addressed:

- The banned POP pesticides dieldrin, DDT, BHC and heptachlor are being sold openly in markets (Greenpeace, 1998). Wellgreen Pvt. Ltd. and Burma Shell are believed to be the probable sources of heptachlor and dieldrin sales, respectively (Greenpeace, 1998).
- Banned pesticides are smuggled in from China, India, Afghanistan and Iran. In 1997, 5,000 kg of DDT were smuggled across from India (Rashid, 2000).
- Theft of pesticides also occurs; the local pesticides business, sometimes with the cooperation from government functionaries, steals obsolete or dumped pesticides, and repacks and markets them. Thus, huge amounts of banned pesticides are selling under different labels.

The enormous uncleared pesticide stockpiles, which have accumulated since the 1950s, are now a source of groundwater and soil pollution. The Plant Protection Department has estimated that it would now cost roughly \$200 million to dispose safely all Pakistan's pesticide stockpiles, excluding the cost of groundwater cleanup. However, the results could be achieved much more cheaply by using landfills, transportable incinerators or cement kilns.

#### 2.3.4 Promising Initiatives

**Legislation:** Pakistan and other developing countries support the total elimination of POPs, as enshrined in the Stockholm Declaration. The declaration bans POP production and use, commits governments to identifying and cleaning up stockpiles of pesticides, and provides developing countries with the resources to meet these obligations. Pakistan is likely to sign this treaty soon; with the matter currently awaiting cabinet approval.

**Awareness Raising:** Non-government organizations (NGOs) have played a major role in publicizing the harmful effects of POPs and lobbying the government to participate in international negotiations on POPs. Of note are the Sustainable Development Policy Institute (SDPI) and the Society for the Conservation and Protection of Environment (SCOPE).

**Prevention and Cleanup:** The following initiatives are underway:

- The government has approved a transformer reconditioning workshop in Sukkur. The expected cost of the workshop Rs.2.4 million (Glavan, 2000).
- Bayer, the manufacturing company of Gusathion, covered the costs of its incineration in the NWFP.

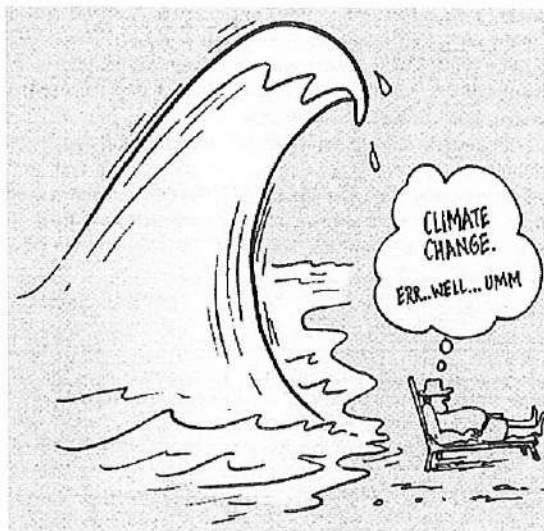
- The Dutch government has shown interest in disposing of 2,000 tonnes of expired pesticides in the country (Kazmi et al, 1998), and support for this project is expected from leading German, Swiss, French and US multinationals – the principal suppliers of pesticide to Pakistan. The expected cost is \$3-4 million. However, some of those involved in this proposal feel the issue would be better managed, at much lower cost, through using indigenous expertise and technology in the country.

## 2.4 Climate Change

### 2.4.1 Global Negotiations – The Kyoto Protocol

Most scientists agree that climate change is caused by changes in atmospheric composition brought about by anthropogenic activities in industrialized nations. Fossil fuel combustion, in particular, has added large quantities of carbon dioxide to the atmosphere. Revised predictions by the IPCC suggest that global warming could increase by as much as 5.8 °C over the next 100 years, a far grimmer scenario than envisioned originally.

Developed and developing countries are grappling with the problem. Since the western industrialized countries rely heavily on carbon-based fuels, they find the prospect of major CO<sub>2</sub> emissions cuts unacceptable. Progress at international climate negotiations has been incremental, and it is only very recently that some consensus has been achieved on the Kyoto Protocol, which embodies the current climate negotiations and debate. However, this consensus was achieved by compromising some of its original targets, such as a 5.2 percent cutback in emissions from 1990 levels, to be achieved by the year 2012. The Kyoto Protocol proposed the market-driven 'Clean development Mechanism', an incentive to encourage developing countries to participate in emissions reductions. Emissions trading and Joint Implementation between Annex-1 countries are other means of transacting emission rights. Finally, an adaptation fund is to be created to help developing countries adjust to the extreme and secular impacts of climate change.



Experts felt the proposed 5.2 percent reduction was both too little and too late and that emission cuts greater than 50 percent below 1990 levels were required to arrest global warming effectively in the near future (Hadley Centre, 1999). Unfortunately, this 5.2 percent target is likely to be watered down even further, with a large proportion of the reduction not occurring at source but through 'sinks' contribution. Thus industrialized countries can use afforestation and reforestation activities to help them meet their reduction targets.

Countries like the US find even the 5.2 percent – or less - cut unacceptable. The US has refused to ratify the Kyoto Protocol, insisting that developing countries commit to quantifiable emission reductions. The Kyoto Protocol is likely to come into force even without US participation, but this spares a major emitter. The challenge now is to finalize the Protocol in such a way that it does not lose its *raison d'être*.

Pakistan is participating in international negotiations on the Protocol, but does not intend to accede soon. If and when it eventually does, it will need to take informed decisions about whether or not to participate in the Clean Development Mechanism.

### 2.4.2 Pakistan's Commitment to Climate Change Action

Pakistan signed the United Nations Framework Convention on Climate Change (UNFCCC) in 1992, and ratified it in 1994. By doing so, it committed to taking steps towards climate change mitigation and reduction of national vulnerability. The government has set about the task systematically, beginning with studies undertaken by various national policy research institutes, consulting firms and government departments. These are being coordinated by the MELGRD.

The "Fuel Efficiency in the Road Transport Sector" is one such project. Several ongoing deforestation projects, both government and donor implemented, are serving to reduce atmospheric carbon dioxide concentrations. In addition, a number of demonstration mitigation projects are underway or on the anvil. Table 2.4 presents details of these studies and projects.



Source: Agarwal et. al, 1999

**Table 2.1.4: Climate Change Studies and Projects in Pakistan**

Studies on Climate Change	Prospective Mitigation Projects
Climate Change in Asia: Pakistan, 1994, funded by the ADB.	Appliance Labeling and Standardization Program (Residential Sector).
The National Greenhouse Gas Emissions and Sinks Study, 1996, funded by GTZ.	Investment Fund for Energy Efficiency
The Asia Least-Cost Greenhouse Gas Abatement Strategy, 1998, ADB funded.	Wind Power Project at Pasni
Climate Change Impact and Adaptation Assessment, 1998, UNEP funded, and	Dissemination of Improved Feed Technologies.
The Pakistan National Communications to the UNFCCC (to be submitted this year).	Introduction of Solar Water Pumps in the Agriculture Sector

### 2.4.3 Pakistan's Greenhouse Gas Emissions

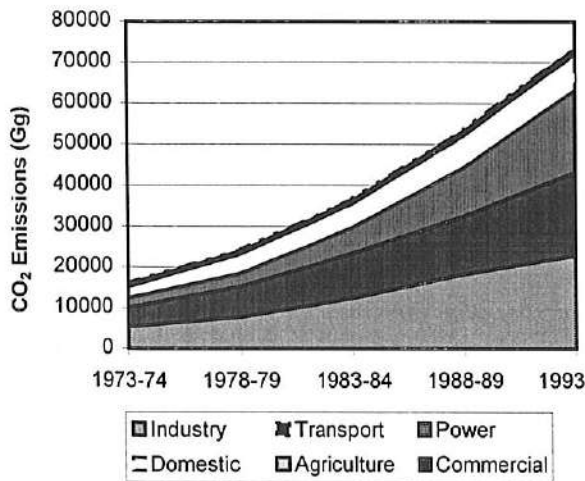
Pakistan's main greenhouse gas emissions are methane and carbon. Between them, they totaled 237,541 Gg (CO<sub>2</sub> equivalent) in 1995. Figures 2.1.2 and 2.1.3 show, respectively, the country's per capita emissions trends, and its per capita emissions relative to those for some other countries.

**Emissions Sources:** The energy sector accounts for 82 percent of Pakistan's CO<sub>2</sub> emissions and

almost 100 percent of CO, NO<sub>x</sub> and NMVOC emissions. The three largest energy consuming and emitting sub-sectors are industry, power and transport. In 1990, they accounted for 25.5 percent, 23.8 percent and 22.5 percent, respectively, of total emissions (see Figure 2.1.4). Methane emissions data is presented in Figure 2.4.1.3.

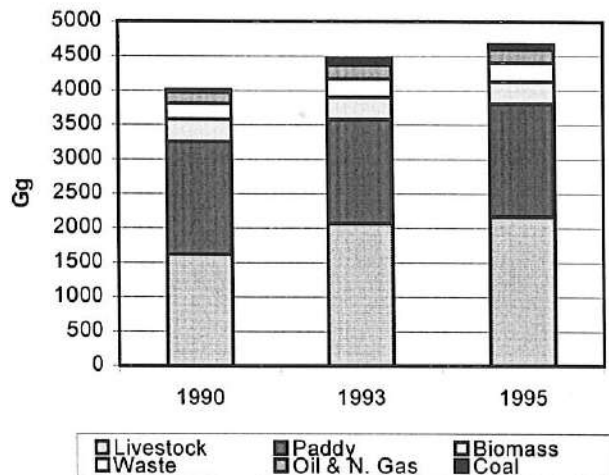
Agriculture accounts for nearly 80 percent of the country's methane emissions. Of this, 75 percent derives from enteric fermentation in livestock, and the rest from rice paddies. Smaller amounts of methane are emitted from biomass burning, waste dumping, production and transmission of natural gas, and fugitive emissions from coal mining.

Fig 2.1.2: Sector Emission Trends



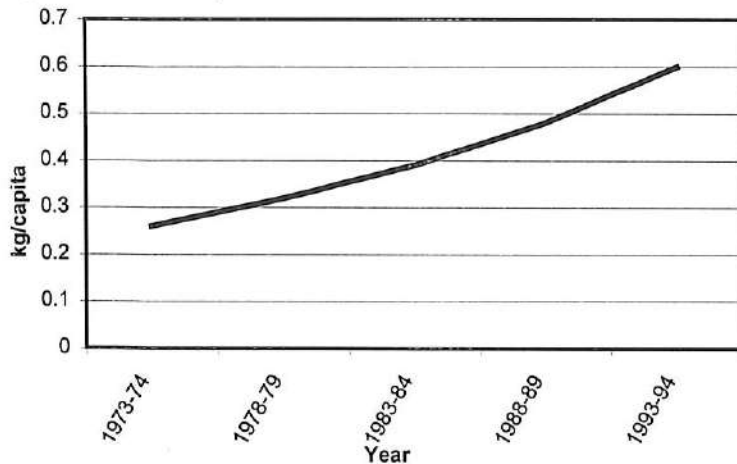
Source: Hagler Bailly Pakistan, 1997

Fig 2.1.3: Methane Emissions



Source: Hagler Bailly Pakistan, 1997

Fig. 2.1.4: Per Capita Emission Trends

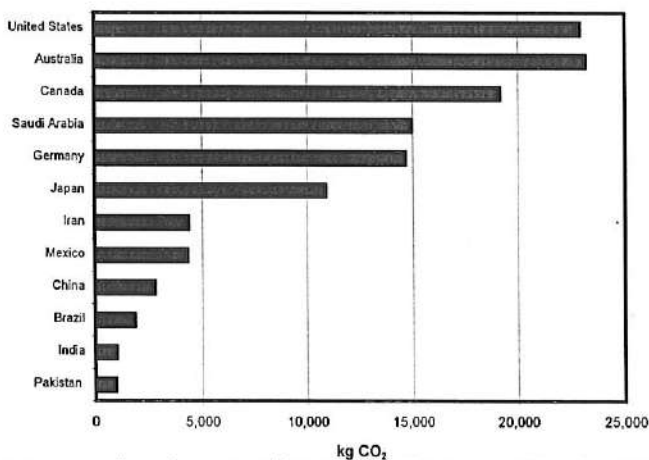


Source: Khan and Iqbal, 2000

**Per Capita Emissions:**

Pakistan has not acceded yet to the Kyoto Protocol. The possibility is increasing that it will do so, largely in the hope of securing financial support. While Pakistan has every reason to subscribe to mitigation objectives, its per capita emissions relative to other countries demonstrate that it has very little global rationale for doing so.

Fig. 2.1.5 Per Capita Emissions, 1995  
Per Capita CO<sub>2</sub> Emissions for 1995



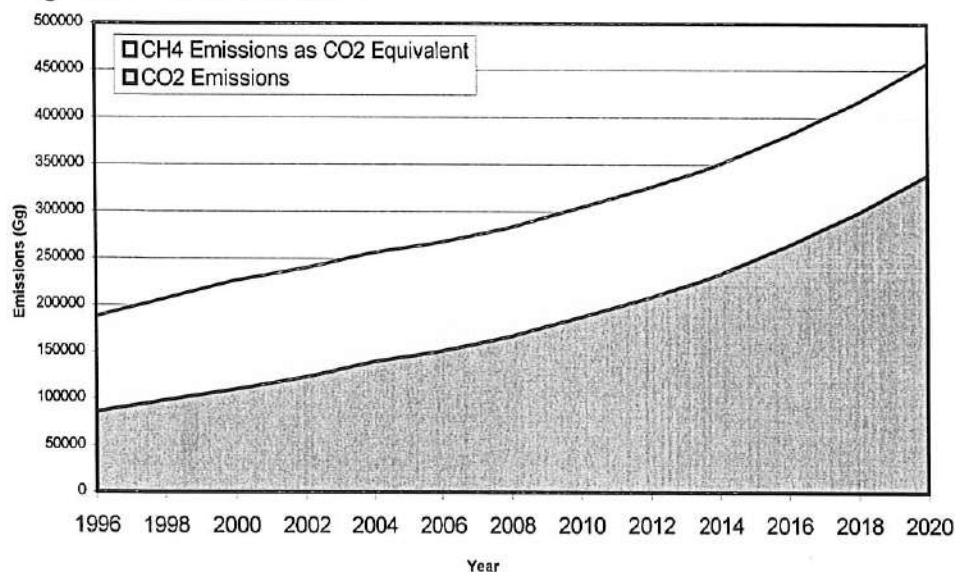
Source: (<http://www.geocities.com/RainForest/3621/WENCO2.HTM>)

increased CO<sub>2</sub> emissions are expected to be mostly from the energy sector.

**GHG Emission Forecasts:**

Pakistan's projected per capita emission levels for 2020 are 1600 kg. While greatly increased over the 1995 level, they are still much lower than the current per capita emissions of most developed and some developing countries. The combined emissions (carbon dioxide and methane) are forecast to increase to 500,000 Gg in the next twenty years (see Fig.2.1.6). The expected increase is attributed entirely to an increase in CO<sub>2</sub> emissions, with methane emissions projected to stay constant over this period. The

**Fig 2.1.6: Total Emissions**

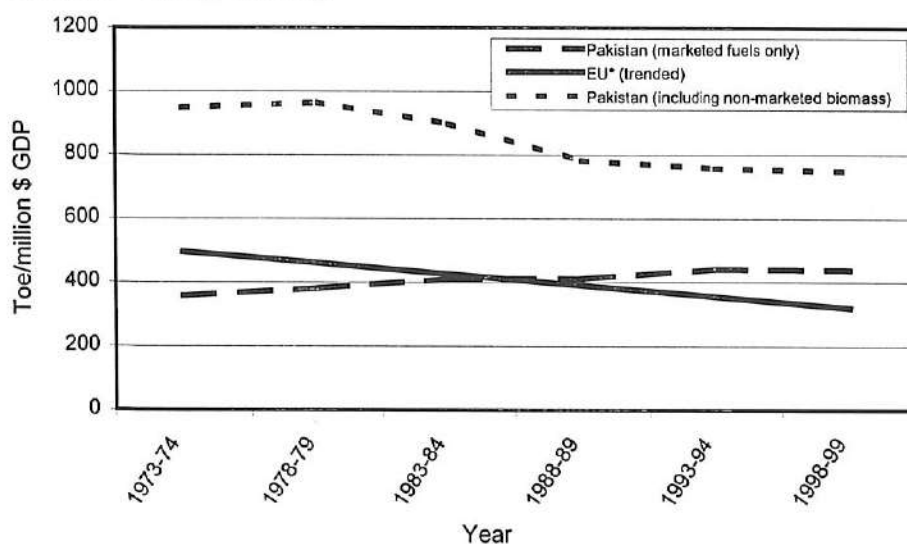


Adpated from Hagler Bailly Pakistan, 1997

### 2.4.4 Why Should Pakistan Mitigate

Global warming does not constitute an adequate reason for Pakistan to curb its emissions since it contributes relatively little to it. However, the domestic grounds for emissions cuts are demonstrated more convincingly. Vehicular and industrial emissions cause health problems in Pakistan's cities and industrial areas. This reflects the inefficient use of energy (Fig. 2.1.7), as well as combustion of the more polluting fuels.

**Fig. 2.1.7: Energy Intensity**



**Prioritizing Mitigation Options:** Mitigation options fall traditionally in the category of sources and sinks. As indicated, there are health and environmental grounds for achieving energy efficiencies and using cleaner fuels. Similarly, widespread deforestation is a source of soil erosion, land degradation, biodiversity loss, flooding and community displacement. Reforestation and afforestation programs not only reduce community vulnerability, they also lower atmospheric greenhouse gas concentrations.

Mitigation options need to be in line with the sustainable development concerns of the country. The Asia Least-Cost Greenhouse Gas Abatement Strategy (ALGAS) prioritized mitigation options according to incremental cost criteria and CO<sub>2</sub> equivalent emissions abated (see Annex 2.1.7). The risk is that an exclusive focus on global warming tends to produce agendas which lack national ownership. Further, there is a need to preserve low-cost options for the future when per capita emissions in developing countries begin to converge towards the global average.

Table 2.1.5 reprioritizes the ALGAS options in the light of sustainable development criteria. Here, the cost-benefit calculus has been expanded to include issues of health, equity, inter-generational concerns, environmental conservation, and an enabling institutional environment.

**Table 2.1.5: Alternative Ranking of Mitigation Options**

	Incram. Cost	Potent. CO <sub>2</sub> Equiv. Abated	Cons./ Biodiv. Conser.	Health	Equity	Instit. Viability	Ranking
Substitution of Oil & Coal with Natural Gas	2.4	238.3	2	1	2	1	B I
Reduction in Gas T&D Losses	-1.4	130.9	2	2	2	1	C II
Reduction in Electricity T&D Losses	-13.2	128.4	2	2	2	1	C II
Improvements in Engine Design	11.6	106.6	2	1	1	2	B I
Cogeneration	-27.6	105.8	2	1	2	1	B I
Methane Reduction From Paddy Fields	0.02	92.8	1	2	2	1	B I
Rangeland Improvement	0.6	80.2	1	2	1	1	A I
Energy Efficiency Improvement in Tubewells	-15.2	77.5	2	2	2	2	D II
Energy Efficiency Improvement in Tractors	-7.8	73.0	2	2	2	2	D II
Agroforestry/Social Forestry	-0.4	73.0	1	2	1	1	A I
Forest Protection in Coniferous Forests	-0.2	73	1	2	2	1	B I
Watershed Plantation	0.3	63.4	1	2	1	1	B I
Waste Heat Recovery Systems	-4.2	53.7	2	2	2	2	D II
Improved Engine Maintenance Practices	-5.3	51.6	2	1	2	2	C II
Energy Efficient Fans	-20.7	42.0	2	2	2	2	D II
Energy Efficient Lighting systems	-21.9	36.8	2	2	2	2	D II
Plantation on Agricultural Lands	-0.6	27.4	1	2	2	1	B I
Methane Reduction From Paddy Fields	-45.9	26.1	1	2	2	2	C II
Enhanced Natural Regeneration in Coniferous Forests	-3.1	26.0	1	2	2	1	B II
Energy Efficient Boilers	-10.5	25.7	2	1	2	2	C II

Source: Khan and Iqbal, 2000

Ranking: S=Success, F=Failure, A=Most Adoptable, D=Least Adoptable, I=High Incremental Cost, II=Low Incremental Cost.

The figures above indicate undesirably

#### 2.4.5 The Adaptation Imperative

The IPCC Third Assessment Report has predicted significant climate change for Asia, with current general circulation models (GCMs) predicting an annual mean warming of about 2.5 °C per decade in the 2020s and about 4 °C in the 2080s (IPCC, 2001). The models also predict a decline in annual mean precipitation over the central parts of arid and semi-arid Asia. Higher temperatures could increase snowmelt; together with, possibly, more intense monsoons, the risk of floods would increase. (IPCC, 2001).

The sector impacts, both immediate and long-term, are expected to be pervasive. In the agriculture sector, climate change could decrease yields and bring about spatial shifts in crop-growing zones, disrupting the livelihoods of communities. As a forewarning of the growing intensity of extreme events, the recent droughts in Balochistan and in the Thar and Cholistan, wiped out entire livestock populations and triggered large-scale migrations of communities. With regard to water resources, climate change impacts are predicted to add to the demand-supply deficit of 20 MAF by 2050 by an additional 3 MAF (SDPI, 1997), with adverse impacts on agriculture, domestic and industrial water use, and energy generation. Biodiversity is also likely to come under threat; for instance, the degraded mangrove forests in the coastal areas are likely to be threatened further by sea-level rise. Finally, climate-related changes in disease vectors pose a health threat, especially to poor communities already unable to cope.

Apart from the nature of the impacts expected, Pakistan's vulnerability to climate change stems in large part from the existing socioeconomic stresses it faces. Had the country been at a higher stage of development, it would have been better equipped to withstand adverse changes in climate. This also limits the financial resources the government can allocate to climate change mitigation and adaptation.

At one level, it is important to identify and strengthen the ability of communities to cope on their own. There is evidence that they are doing so already. However, the evidence also shows that communities are able to cope better when the effects of climate change are gradual rather than sudden. In this context, governments should steer clear of large and ill-conceived infrastructure projects, such as dams and sea walls aimed at storing more water or stem sea water incursions. The priority should be on providing policy support to community to facilitate sustainable livelihoods.

Extreme events are a different proposition; the damage is so vast that there is no substitute for large financial infusions, both for relief and rehabilitation. Also, early warning systems can reduce the hardships communities suffer. Probably, the most critical need is for the government to improve the infrastructure for redress so as to be able to cope effectively when climate change impacts become more frequent and destructive.

## **2.5 Conclusion**

Pakistan must deal with global environmental problems in addition to the many domestic ones it faces. These add to existing stresses in the country's economy, by affecting agriculture, industry, human health and other key sectors. Thus climate change will affect agricultural productivity and water availability, as well as necessitate adaptation measures to enable vulnerable communities to cope with the more frequent droughts and floods that have been predicted. Ozone depletion, in the absence of strict controls on ODS consumption, would eventually have resulted in an increased incidence of skin-related and other diseases in the country, while the import and use of thousands of tonnes of toxic pesticides in the country over the past five decades has already led to numerous cancers, birth defects and deaths.

In addition to direct effects, however, global environmental issues can also potentially affect countries profoundly in terms of the efforts being made to solve them, such as through negotiated treaties and protocols. For example, international pressure, or perhaps the need for foreign direct investment, may well compel Pakistan to accede to the Kyoto Protocol on climate change eventually, when a new set of issues will evolve from its participation in the

market-based Clean Development Mechanism (CDM). This mechanism, however, according to some Southern analysts, is not likely to promote long-term development in the South.

The long absence of a global treaty banning the export and consumption of persistent organic pollutants has been sorely felt in the developing world, no where more so than in Pakistan, where imported toxic pesticides exist in large stockpiles, and are still available in the market. Government bans on several of these have reduced their consumption, but the stockpiles pose a particularly big problem, since pesticide leakage into soil and groundwater is endangering the health of communities living nearby. Pakistan may receive international support for having the stockpiles cleared once it signs the Stockholm Declaration, which it is likely to do very soon.

The cut-down of ozone depleting substances under the Montreal Protocol is one global endeavor that has not yet had adverse repercussions in Pakistan. This is chiefly because the Multilateral Fund is covering the costs of switching to non-ODS-based technology in industry. However, a potential future problem exists. Bans on ODS-based equipment abroad mean that the same equipment is being sold to developing countries, where they are not yet banned, at rates slightly cheaper than clean technology. This is happening in Pakistan, and will prove highly uneconomical in the long-run, since the equipment will become redundant once ODS consumption is totally stopped. Pakistan also needs to tighten controls against smuggling of ODS-based equipment.

Coping with global problems is a long and complex process involving both international interaction and domestic measures. In dealing with issues of this nature, Pakistan first and foremost requires sound research on the direct effects that these issues will have domestically. It can then use this information to negotiate its best long-term interests in the international arena, as well as strengthen or alter domestic policies as necessary. Domestically, institutional capacity needs to be built to bring about policy change and enforcement, including tighter controls against smuggling. The government is the main player here, but non-government organizations, too, have important roles to play in influencing policy and boosting awareness.

## Annex 2.1.1

## ODS Consumption by Substance in Pakistan (tonnes)

Substance	1995	1996	1997	1998	1999
<b>Annex A, Group I</b>					
CFC-11	695	655	572	531	550
CFC-12	1,191	893	625	665	870
CFC-113	268	152	82	-	-
CFC-114	0.5	-	-	-	-
CFC-115	3	2	2	1.6	3
<i>Sub-total</i>	2,157.5	1,702	1,281	1,197.6	1,423
<b>Annex A, Group II</b>					
Halon 1211	7	2	5	5	5
Halon 1301	-	-	-	-	-
Halon 2402	-	-	0.1	-	-
<b>Annex B, Group II</b>					
Carbon tetrachloride - CTC	559	508	668	100	513
<b>Annex B, Group III</b>					
Methyl chloroform	128	52	29	20	25
<b>Annex C, Group I</b>					
HCFC-22	337	246	276	484	628
<b>Annex E</b>					
Methyl bromide	-	-	93	-	-
<b>TOTAL</b>	<b>3,188.5</b>	<b>2,510</b>	<b>2,352.1</b>	<b>1,806.6</b>	<b>2,594</b>

Source: MELGRD, 2001

## Annex 2.1.2

## Ozone Depleting Substance (ODS) Phase out Projects

Sector/ Project		ODS Depletion (metric tons)
<i>Refrigeration</i>		
1.	Pak Elektron Ltd (PEL) Lahore	68
2.	Riaz Electric Co. Ltd. Lahore	48.20
3.	Cool Industries (Pvt.) Ltd.	117.60
4.	Singer Pakistan Ltd.	17.80
5.	Kold Kraft Ltd.	11.50
6.	Hirra Farooq's (Pvt.) Ltd.	31.20
7.	Shadman Electronic Industries Private Ltd.	17
8.	Mumtaz Engineering Co. Lahore	14
9.	Pakistan Air-conditioning Engineering Co. Lahore	21
10.	Dawlance Private Limited	37.90
11.	Refrigerators Manufacturers Company Pakistan Ltd. (Philips)	32.31
12.	United Refrigeration Industries Ltd.	96
<b>Sub-total</b>		<b>512.51</b>
<i>Foam</i>		
13.	Synthetic Products Enterprise (Pvt.) Ltd.	13.60
14.	Razi Sons, Karachi	60
15.	Thermoware Industries Terminal Umbrella Project	105.65
16.	Master Group of Industries	205.50
17.	United Foam Industries (Unifoam)	28.60
18.	Saleem Automotive Industries Ltd.	2.50
19.	Jaguar Industries Karachi	40
20.	Thermoware Industries Umbrella Project	239.60
21.	Diamond Group of Industries	64.10
<b>Sub-total</b>		<b>759.55</b>
<i>Solvents</i>		
22.	Treet Corporation Hyderabad	50.67
23.	Treet Corporation Lahore	23.61
<b>Sub-total</b>		<b>74.28</b>
<b>TOTAL</b>		<b>1346.34</b>

Source: Ministry of Environment, 2001 (2001)

## Annex 2.1.3

**Pesticide Policy, Usage and Impact in Pakistan**

Period	Pesticide Policy	Usage
1954	First time import of pesticides.	Increase
1954-65	Introduction of high yield varieties and free distribution of pesticides through public sector.	Increase
1966-74	Price raised from a flat rate of 0.25/litre to 75 percent subsidized price. 1971 first pesticide ordinance promulgated.	Increase
1970s	Shift in research policy; IPM projects initiated.	Decrease
1975-79	50 percent subsidy on emulcifiable concentrate/wettable powder and 75 percent subsidy on granules, 35 percent distribution by the public sector and 75 percent by the private sector.	Increase
1980-85	Complete withdrawal of subsidy except in Balochistan. Complete distribution by private sector except in Balochistan. 1985 Pakistan adopts FAO's International Code of Conduct on the Distribution and Use of Pesticides.	Decrease Increase Overall rise
1986-91	Complete withdrawal of subsidy in all provinces. Complete distribution by private sector.	Increase Decrease Overall rise
1991	1971 Ordinance amended, allowing pesticide imports under generic names and without going through a local registration process, if a pesticide is registered in some other country.	Increase
1992-93	Duty and surcharge exemption on pesticides and herbicides	Increase
1994	Banning of 21 environmentally hazardous pesticides.	Decrease
1995	Liberalization of import and registration laws.	Increase
1997	1971 Ordinance amended to strengthen provisions for punishment of pesticide adulterators.	Decrease

Source: Hussain, 1999

## Annex 2.1.4

## Consumption of Pesticides in Pakistan

Year	Imports (MT)	Production (MT)	Total (MT)	Value (million Rs.)
1980	n.a.	n.a.	665	39
1981	n.a.	n.a.	3677	213
1982	3552	1448	5000	320
1983	4875	1713	6588	629
1984	6081	3132	9213	2256
1985	8270	4260	12530	2249
1986	8834	5665	14499	2978
1987	8019	68229	14848	3259
1988	6256	6816	13072	2334
1989	6869	7738	14607	3642
1990	4802	9941	14742	4581
1991	6157	14056	20213	5536
1992	6619	16748	23439	6554
1993	6128	14151	20279	5384
1994	10693	14176	24869	5808
1995	20134	23239	43373	7273
1996	24151	19068	43219	9987
1997	31036	13836	44872	9904

Source: MINFAL, 1997

## Annex 2.1.5-A

**Pesticide Residues ( $\mu\text{g}/\text{kg}$ ) in meat, fish, poultry, dairy products, oil and fats**

Commodity	HCH	BCH	DDE-pp	DDT-op	DDT-pp	Aldrin	Dieldrin	Endrin	Methyl Parathion	Malathion
Poultry	94	86	720	277	632	Traces	253	-	384	-
Eggs	7	11	194	23	143	-	19	-	82	-
Mutton	57	31	607	97	205	-	95	-	942	-
Beef	54	51	961	234	241	-	160	-	537	-
Milk	120	44	473	Traces	180	-	137	Traces	323	-
Butter	42	Traces	298	318	484	-	474	Traces	318	905
Cheese	32	39	284	75	118	-	77	-	145	-
Oil (Veg)	-	-	194	82	218	-	99	-	120	-
Oil (Veg) Hydrogenated	64	4	189	8	112	-	81	-	286	-

Heptachlor, DDD-op, ethion, endosulfan and diazinon were not found in these samples.

Source: National Institute of Health, 1984, in Hussain, 1999

## Annex 2.1.5-B:

Pesticide Residues ( $\mu\text{g}/\text{kg}$ ) in cereals, vegetables and fruit

Commodity	HCH	BHC	DDE-pp	DDT-op	DDT-pp	Aldrin	Dieldrin	Endrin	Methyl Parathion	Malathion
Wheat	22	34	38	48	102	19	20	-	-	-
Rice	13	16	34	19	30	-	10	-	80	-
Maize	13	21	30	50	90	-	24	-	120	1416
Gram	153	21	27	12	25	4	16	-	48	10
Moong	144	14	37	16	27	-	10	17	88	-
Mash	22	30	39	20	41	23	9	44	124	-
Masoor	14	25	48	52	105	-	16	-	154	-
Potatoes	1	1	13	3	5	-	5	-	13	-
Tomatoes	3	3	13	4	4	-	4	-	6	-
Onions	6	-	13	3	4	7	-	20	8	-
Radish	1	-	14	5	10	-	13	67	12	-
Carrot	2	4	24	8	17	25	5	20	4	15
French beans	8	5	20	6	30	-	8	-	14	-
Spinach	5	3	40	200	30	-	5	-	10	-
Pumpkin	3	3	26	12	20	-	11	-	20	-
Cucumber										
Peas	4	2	15	5	12	Traces	12	4	25	-
Apricot	7	3	22	8	6	-	12	-	44	-
Mango	7	3	9	3	3	-	8	-	18	Traces
Oranges	3	3	16	6	7	-	9	-	30	Traces
Apple	3	2	12	4	Traces	Traces	10	-	17	-

Source: National Institute of Health, 1984, in Hussain, 1999.

The following insecticides were found only in some products.

Heptachlor	Wheat	Traces	Endosulfan	Gram	Traces	Diazinon	Wheat	32
	Gram	Traces		Carrot	10		Gram	Traces
	Lentil	14					Peas	20
	Radish	3					Onion	450
	Pumpkin	Traces						
	Onions	10						
	Oranges	Traces						

## Annex 2.1.6

**Companies Importing Hazardous Chemicals\* to Pakistan**

Rhone Poulenc	Data Universal
R.B. Avari and Co.	Farm Service Syndicate
Chemdyes Agro Chemicals	Arrow Trading
Agricides	Albert and Co.
Pakistan Burma Shell	National Chemicals
Ciba Geigy	Agricultural Chemicals and Dyestuff
Rhom and Hass Asia Inc.	Paradise Impex Corporation
ICI Pakistan	Karachi Termite
Jaffar Brothers	Progressive Associates
Nichimen Corporation	A.G. Services and Supplies
FMC Corporation	Mehboob Ally and Co.
Industrial Commercial Services Heochst	

Source: Bhagwandas, 1993, in: Kazmi *et al*, 1998

Note: \* dieldrin, DDT, BHC, paraquat and parthion methyl

## Annex 2.1.7

**Banned Pesticides in Pakistan, 1994**

S. No.	Pesticide	S. No.	Pesticide
1.	BHC*	12.	Dichrotophos
2.	Binapacryl	13.	Dieldrin
3.	Bromphos ethyl	14.	Disulfoton
4.	Captafol	15.	Endrin
5.	Chlordimeform	16.	Ethylene dichloride + Carbontetrachloride
6.	Chlorobenzilate	17.	Heptachlor*
7.	Chlorthiophos	18.	Leptophos
8.	Cyhexatin	19.	Mercury compound
9.	Dalapon	20.	Mevinphos
10.	DDT	21.	Propergite
11.	Dibromochloropropane + Dibromochloropropene	22.	Toxaphene
		23.	Zineb

Source: Government of Pakistan, 1994

Note: \* Banned in 1997

## Annex 2.1.8

## Summary Report for National Greenhouse Gas Inventories, Gg (1993-94)

	Greenhouse Gas Sources and Sinks									
	CO <sub>2</sub> Emissions	CO <sub>2</sub> Removals	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>2</sub>	CO	NMFOC	SO <sub>2</sub>	Halocarbons	
									P	A
<b>Total National Emissions and Removals</b>	94,571.9	-	2887.9	36.9	410.257	732.130	656.879	775.462	3.098	-
<b>1 Energy</b>	76,775.2	-	278.1	0.606	409.908	706.126	34.273	764.487	-	-
<b>A Fuel Combustion Activities</b>	76,775.2	-	4.1	0.606	409.513	705.534	30.191	755.574	-	-
1 Energy Industries	21,600.9	-	0.9	0.052	75.715	6.552	0.014	260.778	-	-
2 Manufacturing Industries & Construction	24,895.9	-	0.5	0.214	60.479	67.794	3.504	375.351	-	-
3 Transport	18,584.4	-	1.9	0.170	172.758	592.150	11.786	94.521	-	-
4 Other sectors	12,090.6	-	0.8	0.171	100.561	39.038	14.888	24.925	-	-
<b>B Fugitive Emissions from Fuels</b>	-	-	274.0	-	0.395	0.593	4.082	8.913	-	-
1 Solid Fuels	-	-	47.2	-	-	-	-	-	-	-
2 Oil and Natural Gas	-	-	226.7	-	-	-	-	-	-	-
3 Ozone Precursors and SO <sub>2</sub> from Refining	-	-	-	-	0.395	0.593	4.082	8.913	-	-
<b>2 Industrial Processes</b>	11,269.6	-	-	-	-	15.750	622.606	10.975	-	-
A Mineral Products	4,350.3	-	-	-	-	-	578.115	2.430	-	-
B Chemical Industry	2,990.5	-	-	-	-	15.750	9.370	1.850	-	-
C Metal Production	3,928.8	-	-	-	-	-	-	-	-	-
D Other Production	-	-	-	-	-	-	35.121	6.695	-	-
E Production of Halocarbons & Sulfur Hexafluoride	-	-	-	-	-	-	-	-	-	-
F Consumption of Halocarbons and Sulfur Hexafluoride	-	-	-	-	-	-	-	-	3.098	NA
<b>3 Solvent and Other Product Use</b>	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
<b>4 Agriculture</b>	-	-	2,507.9	29.916	0.349	10.254	-	-	-	-
A Enteric Fermentation	-	-	2,093.0	-	-	-	-	-	-	-
B Manure Management	-	-	191.8	-	-	-	-	-	-	-
C Rice Cultivation	-	-	222.6	-	-	-	-	-	-	-
D Agricultural Soils	-	-	-	29.907	-	-	-	-	-	-
E Prescribed Burning of Savannas	-	-	-	-	-	-	-	-	-	-
F Field Burning of Agricultural Residues	-	-	0.5	0.010	0.349	10.254	-	-	-	-

Continued.....



## Annex 2.1.9

## Mitigation Options Ranked by Incremental Cost

Greenhouse Gas Mitigation Option	Average Incremental GHGs Mitigation Cost, \$/tonne CO <sub>2</sub> -equivalent	Potential CO <sub>2</sub> -equivalent abated, million tonnes	Cumulative CO <sub>2</sub> -equivalent reduced by mitigation options, million tonnes
Improved feed for livestock (MNB)	-45.9	26.1	26.1
Cogeneration	-27.6	105.8	131.9
Commercial plantations	-23.9	10.0	141.9
Energy efficient lighting systems	-21.9	36.8	178.7
Energy efficient fans	-20.7	42.0	220.7
Energy efficiency improvements in tubewells	-15.2	77.5	298.2
Reduction in electricity T&D losses	-13.2	128.4	426.5
Energy efficient motors	-12.5	5.3	431.8
Energy efficient refrigerators	-11.2	7.8	439.4
Energy efficient boilers	-10.5	25.7	465.1
Riverain forest plantations	-10.4	17.0	482.2
Waste-to-energy generation	-10.3	2.2	484.4
Energy efficiency improvements in water heaters	-9.2	2.5	487.0
Energy efficiency improvements in tractors	-7.8	72.8	559.7
Reforestation in coniferous forests	-7.6	21.8	581.5
Improved engine maintenance practices	-5.3	51.6	633.2
Solar water heaters	-5.0	4.4	637.6
Waste heat recovery systems	-4.2	53.7	691.3
Enhanced natural regeneration in coniferous forests	-3.1	26.0	717.3
Mini-micro hydel plants	-2.1	1.0	718.4
Reduction in gas T&D losses	-1.4	130.8	849.2
Plantations on agricultural land	-0.6	27.4	876.6
Agroforestry/social forestry	-0.4	276.4	1152.9
Forest protection in coniferous forests	-0.2	73.0	1225.9
Methane reduction from rice paddy fields	0.02	92.8	1318.7
Watershed plantation	0.3	63.4	1382.1
Rangeland management	0.6	80.2	1462.3
Improvements in vehicle maintenance	0.7	23.4	1485.7
Wind power generation systems	1.3	1.5	1487.2
Improvements in building design	1.9	9.8	1496.9
Substitution of oil and coal with natural gas	2.4	238.3	1735.2
Improvements in engine design	11.6	106.6	1841.8
Solar photovoltaic systems	28.3	0.6	1842.4

Source: ADB, 1998

### **3 Trade and Environment**

#### **3.1 Emergence of the Trade-Environment Paradigm**

International trade is becoming an increasingly important driver of economic development, as it has been expanding at almost twice the pace of total global economic activity for the past 15 years. Although average global income now exceeds \$5,000 US per person a year, 1.3 billion people still survive on incomes of less than a dollar a day (IISD, 2000). The world has also seen, as a result of increasing trade, enormous environmental change generating heated debate on trade and environment.

The emerging trade-environment paradigm, which took shape during the last few decades, consists of many intertwined and crosscutting elements. Product oriented environmental standards emerged primarily out of scientific research and they form the basis of national and regional environmental laws to regulate production and process methods. Concerted efforts are underway to harmonize process and production methods worldwide. The standards, as embodied in various eco-labeling schemes and environmental management systems (ISO-14000), aim to reduce the effluent and emission levels generated by production processes.

Biodiversity concerns have also played an important role in standards formulation. In particular, many components and additives banned in industrial nations are still used in developing countries. Crop production for exports, based on chemical-intensive monoculture, can result in soil and water quality deterioration and crop biodiversity loss. Trade related standards are enshrined in various multilateral environmental agreements (MEAs). The important ones are:<sup>1</sup>

- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), 1975
- Basel Convention on the Control of Trans-Boundary Movement of Hazardous Wastes and their Disposal, 1992
- Convention on Biological Diversity, 1993
- Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade (PIC), 1998
- Cartagena Protocol on Biosafety, 2000

#### **3.2 North-South debate**

The North-South debate revolves around environmental standards of various kinds, which either can acquire a trade restrictive dimension, or enhance the scope of trade. Northern industrialized countries are concerned about relaxed production and environmental standards in developing countries, which produce occupational and embodied health hazards and localized environmental pollution. The aim is to eliminate this "social and environmental subsidy" and to push for upward harmonization of environmental standards through various trade restrictive measures, such as emission, technology and performance and product standards.

The overall effect of all these standards is to force producers, traders and consumers to consider the environmental impact of the economic decisions they take; in other words, they must begin to internalize the external environmental costs in their calculations.

Developing country producers and exporters view environmental regulations as trading obstacles -- variants of trade policy measures, such as tariffs, quotas and farming subsidies which protect

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1 Source: IISD' handbook on Trade and Environment.

domestic industries and restrict market access for southern products. The tendency to lump environmental regulations with direct and indirect export restrictions may or may not have merit. However, the south's sensitivity has an intrinsic rationale. Reflecting differences in pollution and emission baselines, environmental standards should accommodate differences in assimilative capacity of the physical environment to sustain industrial activities.<sup>2</sup> Also, the institutional and awareness constraints limit the ability to comply with/enforce environmental regulations. Thus, rather than type-casting the south as an irresponsible bad guy, a more constructive approach would be to accept its willingness to take appropriate measures, provided institutional constraints are recognized and adverse economic spin-offs are minimized.

### 3.3 Trade-environment linkages

Trade flows and trade liberalization have at least four types of physical and economic impacts on environment and development: product effects, technology effects, scale effects and structural effects. Product effects occur when the traded products themselves have an impact on the environment or development. Subsets of product effects, sometimes termed "technology effects," are associated with changes in the way products are made depending on the technology used. Scale effects are manifested in expansion of the level of economic activity, which essentially creates additional wealth. Structural effects are related to changes in the composition of a country's economy, causing it to produce more of the goods it makes well or has in abundance, to trade for those it does not (IISD, 2000).

#### 3.3.1 Trade-environment linkages in Pakistan

The trade-environment linkages in Pakistan can be viewed in the light of industrial development pattern pursued by policy makers over the last two decades. The SMEs in Pakistan, particularly those companies operating in international markets, singularly followed the path of production increase through imported technologies that enabled the Pakistanis industrialists to increase production to a level of export surplus. The used machinery, primarily from Europe and the U.S.A., imported during the time of no environmental control regime (see Box 3.1). Also, the lack of environmental legislation at that time resulted in poor environmental control and monitoring equipment in industries.

#### Box 3.1: The Case of dumping Chlor-Alkali plant

There is no documented evidence about the polluting nature of these second hand imported industrial units but growing industrial pollution that resulted in increased environmental and health problem has raised considerable alarm in the country. In 1995, a Danish company tried to dump a polluting mercury based chlor-alkali plant by selling it to a Pakistani company at a throwaway price. To save the huge cost of disposing the obsolete equipment in Europe, DS Industries of Denmark sold a second-hand, mercury based chlor-alkali plant to a Pakistani company at a throwaway price. The agreement by the importer to install and operate the plant in Pakistan (even for a day) enabled the Danish company to have the equipment declassified from hazardous waste to industrial machinery, and thus to escape the provisions of the Basel Convention (Bina, 1995).

Later, on the evaluation of the EIA by Greenpeace and the Earth Resource Center, Exeter, UK forced the local company to replace the mercury cell technology with a less harmful, membrane cell technology at additional cost. At a policy level, the NGOs involved in the protest called for a complete ban on transfer of obsolete and hazardous technologies in order to enable countries to develop environmentally sound production processes.

The industrial sector illustrates the diversity of linkages between trade and environment. It embraces the gamut of product, technology, scale and structural effects. The environmental impacts have a two-fold dimension.

2 Implicitly invoking the aphorism that, "what is sauce for the goose should be sauce for the gander," the south alludes to unsuccessful attempts at harmonizing standards, intra-north, for instance, among the EU countries.

**Negative effects:** Negative, product effects are evident in the use of substandard and unbranded chemicals and dyestuffs, particularly azo dyes. Most of the colorants (dyestuffs) are frequent skin sensitizers and are regarded as carcinogens. For example, Cadmium, used extensively in textile processing, is an indestructible and harmful heavy metal and is not permitted in materials as an additive.

Obsolete technology in textile processing and tanneries wastes energy and water. Significantly, as an attempt to reduce capital costs, almost 50 percent of the total boilers are imported second hand. According to a recent study, out of approximately 4,500 boilers currently in use in industry, 3,342 or almost 75 percent, operate at less than 70 percent efficiency (Bailey, 1997). This is also the case for private sector-based thermal power plants.

Scale effects manifest themselves in the increasing discharge of wastewater, contaminating water and soil and threatening aquatic life. The growth of export products, majority of which also happens to be environmentally sensitive, is an important factor in this regard. The export profile of Pakistan is heavily tilted in favor of textile and related products, capturing almost 80 percent of the export share. Over the past few years, the share of value added textile goods (which undergo considerable chemical-based processes) is steadily on the rise, which in turn poses a threat to physical and human environment. The export of leather and carpets products also faces the same situation.

The adverse structural effects relate to the growth of processing units (textile and tanneries being the major players) over the past two decades with its attendant demand for fresh water, the best transferring agent in processing. In the Kharianwala area of Faisalabad (the hub of textile industries), the underground water level has decreased from 10-15 feet to 200-250 feet as a result of excessive pumping of ground water by these newly established textile-processing units.

**Positive effects:** But there are positive environmental offsets as well. Benign product effects are embodied in the improved exportable products. For instance, in textiles, alternative dyestuffs are replacing increasingly toxic dyes such as sulphur black or azo-dyes. The increasing scale of operations has made possible the introduction of a range of the latest environment friendly technology in cement and textile industries. For instance, the introduction of thermosole<sup>3</sup> dyeing machines and reverse osmosis plants have generated economic efficiency as well as ecological gains (also see Box 3.2).

**Box 3.2: Energy conservation at Mohammad Farooq Textile Mills**

Mohammad Farooq Textile Mills, vertically integrated textile mill with 25,000 spindles in spinning with 300 looms and full range of finishing departments, reduced its energy consumption over 35 percent from 1980 to 1988. This was primarily achieved through induction of imported processing machineries and installation of heat exchanger for energy recovery and proper insulation. The expansion plan of the company, which is expected to increase production by four times, entails only doubling energy consumption, thus reducing energy consumption per unit by 50 percent (ENERCON, 1988).

### 3.3.2 The Cost of Compliance

In recent years, the focus of the debate has been shifted from contradictions between trade and environmental policies to exploring the scope of the complementarities between trade liberalization, economic development and environmental protection. Though it's hard to estimate the exact magnitude of the damage, some recent estimates suggest that huge investment will be needed to correctly. Table 1 (Annex 4.2.1) shows that complying with the national legislation will cost major industrial units of the country about US\$ 1.9 billion in the

3 Thermosole dyeing machines is considered better than traditionally used Jiggers and Jets.

next 8 to 10 years (Mahmood, 1998). The upper bound estimate for the cost of inaction in dealing with environment degradation in Pakistan was \$4.36 billion in 1996; over half of Pakistan's export earning that year (De Silva et. al, 1998).

Major mitigation costs are not so costly as it is considered usually and there is additional potential available to convert these options into business opportunities.<sup>4</sup> A study at SDPI estimates the associated cost and benefits of pollution mitigation in textile and leather sector. It builds a strong case for mitigation on the premise that these industries are highly damaging to the environment and human, plant and animal life. The study shows that the mitigation cost at the macro level of reducing the pollution load by up to 90 percent are much smaller than commonly considered to be the case. It estimates mitigation cost for textile processing to be Rs.2,598 billions, which amounts to 0.11 percent of GNP in 1996-97. The stakeholder dialogue indicates that industry is ill informed regarding the about environmental standards setting, currently underway in OECD countries (Khan et. al, 1999).

**Box 3.3: Environmental Income of a tannery: A Chrome Recovery Plant<sup>5</sup>**

A chrome recovery plant can become the environmental income of a tannery. 25-30 percent of the chrome that goes into the wastewater can be reused. Preliminary estimates of the economic viability of chrome recovery and reuse in tanneries suggest that the cost recovery can be achieved in 6 to 7 months for most tanneries. This assumes 95 percent chrome recovery, which is very much within feasible range. The capital cost of such a plant, for a tannery processing around 12,000 kg of hides per day, is around U.S.\$20,000.

Banuri explored prospects and mechanisms for a transition to sustainable development in Pakistan and the effect of international trade on such prospects with focus on global cotton commodity chain. The paper examines the nature of governance system in the textile industry and underlying implications of switching to clean production technologies. It argues that the responsiveness of individual actors in a production chain to changing incentive structure is linked closely to the nature of governance in the chain. The cost of transition will fall disproportionately on the manufacturers (Pakistani textile manufacturers), while the benefits of changing consumer preference will accrue to mass retailers (Western companies) who have a comparative advantage in labeling, packaging, advertising, and certification and inspection (Banuri, 1998).

The market driven Northern standards such as eco-labeling schemes and environmental management systems are unlikely to prove a smooth sail for export oriented local industries, say textile, which operate in specific but different local conditions. The lack of institutional framework to deliver solutions of most pressing needs of these companies, the incapacity of companies to live up to environmental demands of buyers, financial constraints and absence of coherent policies at the national level spell out the reality that the reliance on market based instruments alone is not the way out. The dynamic nature of companies, like living organism, is nurtured not only by market forces but also by the culture, social norms and economic activities of the society, manifested in behavior of those who operate these companies. It does not rule out the functionality of international standards but speak out the importance of built-in mechanism of environmental compliance at the local level through sustainable development.

4 One of several examples of securing market niches is that of Century Textiles of Bombay, the largest textile company in India. When its products gained Öko-Tex certification, it was able to raise prices by 8-10 per cent and increase market access by 10 per cent (SIDA: 1998).

5 Source: Environmental News, September, 1999.

### 3.4 Institutional Measures

The negative linkages between trade and environment are rooted in low prioritization of environmental issues as reflected in governmental policies, poor corporate behavior and little environmental consciousness. Environmental sensitivity, as a result of globalization and trade liberalization, has increased manifold over the past few year. At the international level, there is expressed realization that watertight compartmentalization of trade and environment issues cannot address the problem and there is a need to develop new synergies.

Many initiatives have been undertaken in Pakistan as discussed in Part V, which include the Environment Protection Act of 1997, the National Environmental Quality Standards, sector specific environmental policies, and establishment of 'polluter pay principle' through a pollution charge regime. However, this is not sufficient to meet the ever growing demands of the Western consumers; the need of the time is to integrate industrial and trade policies with environmental objectives i.e. tying up environmental compliance with trade driven benefits.

A series of environmental measures that can be synthesized into industrial development and integrated in the national conservation strategy can play a vital role in blending trade and environment issues in Pakistan. A very healthy development in Pakistan is the formulation of sector-oriented policy as in the case of sugar and pulp and paper industries. A similar initiative for export-oriented sectors such as leather, textile and fisheries can generate a very strong basis for trade driven environmental policies. A guideline for environmental conformance based on international standards is reckoned to be the best strategic tool for growth potential.

#### 3.4.1 Standardization of chemicals

Hundred of thousands chemicals are used in different industrial process, mostly substandard in quality and detrimental for health and the environment. The use of azo dyes, particularly those with carcinogenic amines has not only potential environmental and health hazards but has also affected textile and leather export. More than 10,000 different dyes are available in the market. Approximately 70 percent of all dyes used in the textile industry are azo dyes. There are about 2,000 different azo dyes, of which approximately 200-300 may fall under the ban by the Western countries<sup>6</sup>.

The following measures are required to offset such potential damages and to facilitate the exporters:

- A ban on azo-dyes
- Standardization of dye manufacturing and other industrial chemicals
- Provision of the Color Index (CI) number and generic name
- A written proof that azo dyes will not split off any carcinogenic amines
- A material data safety sheet providing information about the carcinogenic nature and occupational health hazards

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6 Any product with azo dyes that may split off any one of the 20 carcinogenic amines (See Annex 4.2.1) is not prohibited in these countries.

### 3.4.2 Water conservation

Integration of water conservation in industrial process can be an important component of trade related environmental policy. Though it is a non-product related Production & Process Method (PPM) issue, but given the scarcity of the fresh water and other environmental implications, the export companies can use it as an effective tool of marketing strategy. A sector oriented environment policy defining the limits of fresh water use in industrial processes will increase the environmental activities and compliance within the given resources of these companies. It will further generate a positive link between trade activities with environmental management. The implementation of demonstration projects under Environment Technology Program for the Industry (ETPI) in a tannery, textile mill and paper mill has shown hydraulic load reduction by 30-40 percent (Azher, 1999).

### 3.4.3 Green credits

Investment on environmental technologies such as air emission control devices and waste treatment plants is considered unproductive in economic accounting; therefore financial institutions hesitate to pump money in financing such activities and place high financial risk on them. A recent study "Establishment of Green Credit Lines: Lending and Monitoring Procedure" has explored the feasibility of establishing a green credit lines for those companies which are either profitable or have the prospects of capitalizing market share through environmental management such as ISO 14000. The initial estimate of the proposed green line is around US\$ 10 millions to justify the involvement of some of the banks and other financial institutions. However, the source of funding and the actual inflow of cash are still not clear. The report has proposed grant funds and collection of levy on all industrial units, which is quite unlikely as industrial units are already in dire financial crisis and they would be reluctant to support any initiative that cost them money. Government funding in collaboration with international donors, in establishing such credit windows would help industries in incorporating environmental considerations in their decision making processes.

### 3.4.4 Import policy

Also measures such as reduction in custom duty on purchase of pollution abatement equipment, income tax relief for using these equipment and the most favored tax treatment to indigenous pollution control technology are needed to offset inaction. The inclusion of a comprehensive package for air emission and wastewater treatment plants in environment policy will provide the much-needed boost to industries.

## Annex 4.2.1

**Table 1: Summary of Environmental Capital Costs by Major Industrial Sectors<sup>1</sup>**

Industry Sector	No. of Units	Environmental Unit Cost US\$ (millions)	Total Environmental Package Cost US\$ (millions)
Leather			
Medium Mills	150	1.25 M/tannery	188
Large Mills	50	1.88 M/tannery	94
Paper Sector			
Medium Mills	10	3.0 M/mill	30
Large Mills	3	5.0 M/mill	15
Sugar			
Medium Mills	15	1.25 M/mill	19
Large Mills	10	2.5 M/mill	25
Fertilizer			
Large Mills	5	6.25 M/mill	31
Textile Sector			
Medium Mills	50	0.60 M/mill	30
Large Mills	25	1.25 M/mill	31
Edible Oil Sector			
Medium Mills	10	0.4 M/mill	4
Large Mills	5	0.6 M/mill	3
Other 14 Sector			
Medium Mills	250	1.25 M/mill	312
Large Mills	125	2.5 M/mill	312
Combined Environmental Facilities at the Industrial Cluster Level			
Small Clusters	20	12.5 M/mill	250
Medium Clusters	10	25.0 M/mill	250
Large Clusters	5	60.0 M/mill	300
Total Cost			1984

1 Source: Mahmood Ahmed, "Implementing ISO 14000 in Pakistan--The Industry's Perspective", Environmental News, Dec. 1998

## **4 Human Settlements**

### **4.1 Introduction**

Urbanization in itself is not detrimental to the environment. Concentration of population and economic activities, resulting from urbanization, offer opportunities for providing environmental infrastructure and health services cost-effectively in addition to other services. Urbanization also provides opportunities to effectively internalise environmental costs since concentration of economic activities reduces transaction costs associated with service delivery.

However, urbanization generates several environmental pressures, too. Countries unable to utilize the opportunities and reduce pressures through integrated environmental, economic and physical planning find that mismanaged urbanization poses enormous environmental and economic problems which become increasingly difficult to solve over time. Pakistan is one of many developing countries which has been unable to manage urbanization to the advantage of its people and the environment.

### **4.2 Population Growth**

According to the 1998 census, about 32.5% (said to be on the low side. The projected rate is 45.4% for 2010, attesting to the high rate of urbanisation) of Pakistan's population lives in metropolitan or urban areas. Some commentators have concluded from this data that the urban population is likely to be higher in both absolute and percentage terms than the census suggests. Many suggest that the 'real urban population is closer to 50%'.

During 1981-98, the urban population increased at the rate of 3.46% compared to 2.24% for rural areas (see table 1). The number of cities with a population over a million people increased from three in 1981 to seven in 1998. Towns and cities with a population above 100,000 increased from 29 in 1981 to 50 in 1998. Overall, towns and cities with a population above 5,000 increased from 371 in 1981 to 452 in 1998 (see table 2).

Reasons for this are related to how municipal limits are defined, and to what extent satellite towns and other irregular settlements are included as part of the main city. The current trend of an urban population increasing faster than the total population is likely to continue. This in turn will have enormous political and social implications for the environment in the urban areas as well as the whole country.

Table 4.1: Population and Population Growth 1941-1998<sup>1</sup> (In Thousands)

Census Year	Population (Total)	Urban	Rural
1941	28,282 (100%)	4,015 (14.2%)	24,267 (85.8%)
1941-1951 Growth (p.a.)	1.80%	4.14%	1.36%
1951	33,816 (100%)	6,026 (17.8%)	27,790 (82.2%)
1951-1961 Growth (p.a.)	2.43%	4.85%	1.82%
1961	42,978 (100%)	9,679 (22.5%)	33,299 (77.5%)
1961-1972 Growth (p.a.)	3.67%	4.75%	3.33%
1972	65,321 (100%)	16,591 (25.4%)	48,730 (74.6%)
1972-1981 Growth (p.a.)	3.05%	4.37%	2.58%
1981	85,254 (100%)	23,827 (28.3%)	60,426 (71.7%)
1981-1998 Growth (p.a.)	2.61%	3.46%	2.24%
1998	130,580 (100%)	42,458 (32.5%)	88,121 (67.5%)

 Table 4.2: Urban Population Distribution 1951-1998 (by size of urban places)<sup>2</sup>

Population Size	Number of Places/Population Distribution %				
	1951	1961	1972	1981	1998
Million and above (#) (%)	1 (17.7)	2 (33.2)	2 (33.7)	3 (38.8)	7 (49.7)
500,000-999,999 (#) (%)	1 (14.3)	-	3 (15.7)	5 (14.5)	3 (4.9)
200,000-499,999 (#) (%)	2 (8.0)	2 (18.5)	4 (6.0)	4 (4.5)	13 (9.1)
100,000-199,999 (#) (%)	6 (14.9)	5 (7.3)	9 (6.7)	17 (9.9)	27 (8.6)
50,000-99,999 (#) (%)	6 (6.7)	5 (7.3)	22 (8.8)	34 (9.5)	62 (10.0)
25,000-49,999 (#) (%)	23 (13.9)	30 (11.5)	44 (9.5)	62 (8.7)	111 (9.1)
10,000-24,999 (#) (%)	53 (12.9)	76 (11.7)	145 (13.3)	166 (11.3)	182 (7.2)
5,000-9,999 (#) (%)	75 (9.2)	104 (8.0)	104 (4.7)	80 (2.6)	52 (1.0)
4,999 and below (#) (%)	41 (2.4)	72 (2.3)	53 (0.9)	17 (0.2)	11 (0.1)
Total (#) (%)	208 (100)	304 (100)	387 (100)	388 (100)	468 (100)
Population (thousands)	6,019	9,654	16,591	23,827	42,458
Intercensal Increase (%)	60.4	71.9	43.7	78.2	

1 Based on Preliminary results of the 1998 census produced by the Urbanisation Research Programme (URP) reproduced in the *Herald (Special) Lifestyle Edition, June, 2001*.

2 Ibid.

### 4.3 Environmental Problems in Urban Areas

Of all the factors that have influenced the living environment, urbanization has been one of the most significant for developing countries like Pakistan. Urbanization completely changes a society and reorganizes its economy. It requires institutional structures, infrastructure, social services and organizational practices that are strikingly different from the requirements of rural societies. Public welfare and economic growth in urbanizing societies depends upon the realization of these imperatives<sup>3</sup>.

The State in Pakistan has been unable to address these imperatives. By all accounts, the state of the environment in the urban areas is at a critical stage (see box 1). The major environmental problems in urban areas are the pollution of water, air, land and noise pollution. The problems are compounded by the fact that Pakistan is in the transition phase where risks resulting from the process of modernisation combine with traditional risks in creating complex health problems for urban dwellers (see figure. 1).

#### 4.3.1 Water Pollution

Water pollution in urban areas results primarily from uncontrolled release of domestic, agricultural and industrial effluents. The three main sources of pollution are: (i) bacterial and organic liquids and solids from domestic sewage; (ii) toxic metals, organic loads, acids, and other less toxic but equally polluting substances from industrial discharges;

Box 4.3.1: Institutional mechanisms and policies

and (iii) chemical pollution in the form of pesticide and fertilizer run-off from agricultural lands. All three sources cause contamination of both surface and ground water supplies and, by getting into the food chain, can cause serious damage to human health.

A majority of the health problems in urban areas are a consequence of water-borne diseases. The seriousness of this situation can be gauged from the fact that diseases of a gastro-intestinal nature account for 25.30% of the cases seen at public hospital and

3 Qadeer, M.A., *Imperatives of Urbanization and Urban Policies in Pakistan*, Pakistan Institute of Development Economics, Twelfth Annual General Meeting, 14-16 December, 1996. Islamabad.

dispensaries in Pakistan (NCS, 1992). Furthermore, around 60% of infant deaths can be linked directly to infectious and parasitic diseases, resulting from contamination of water by human excrement. The excreta from urban areas is approximately 8,000 tonnes a day. Karachi alone discharges over 350 million gallons of sewage each day while Lahore discharges close to 300 million gallons. An estimated 4,160 tonnes of urban excreta (52%) is disposed in sewers, while the remainder is thrown over ground (streets and alleys), deposited into waterways or incorporated in solid waste (NCS,1992). Major cities dispose of their largely untreated sewage into irrigation systems and other water bodies without regard to their assimilative capacity.

Other sources of pollution in urban areas are industries such as manufacturers of chemicals (pesticides), textiles, pharmaceuticals, cement, electrical goods, glass and ceramics, pulp and paper board, leather tanning, food processing, electroplating and petroleum refining. To date, no systematic study has been carried out to assess the sources, volumes and characteristics of industrial pollution in urban areas. However, a 'partial picture' of the situation emerging from limited surveys and other investigations shows the seriousness of the situation. Most industries in Pakistan do not manage their wastewater effluents through process controls, waste recycling or end-of-pipe treatment. In Kala Shah Kaku industrial area near Lahore, the various chemical industries, tanneries, textile companies, steel re-rolling mills, and others discharge effluents containing hydrochloric acid and high levels of organic matter directly into streams and canals. The two largest industrial areas in Sindh, SITE (Sindh Industrial Trading Estate) and LITE (Landhi Industrial Trading Estate), discharge large quantities of organic matter, heavy metals, oils and greases directly into local rivers and streams.

In Korangi industrial area, where LITE is located, 35 tonnes of suspended solids , 376 tonnes dissolved solids, 2 tonnes of ammonia and 1.4 tonnes of arsenic oxide, among other chemicals are discharged into the city's already polluted harbour each day (see table 3).

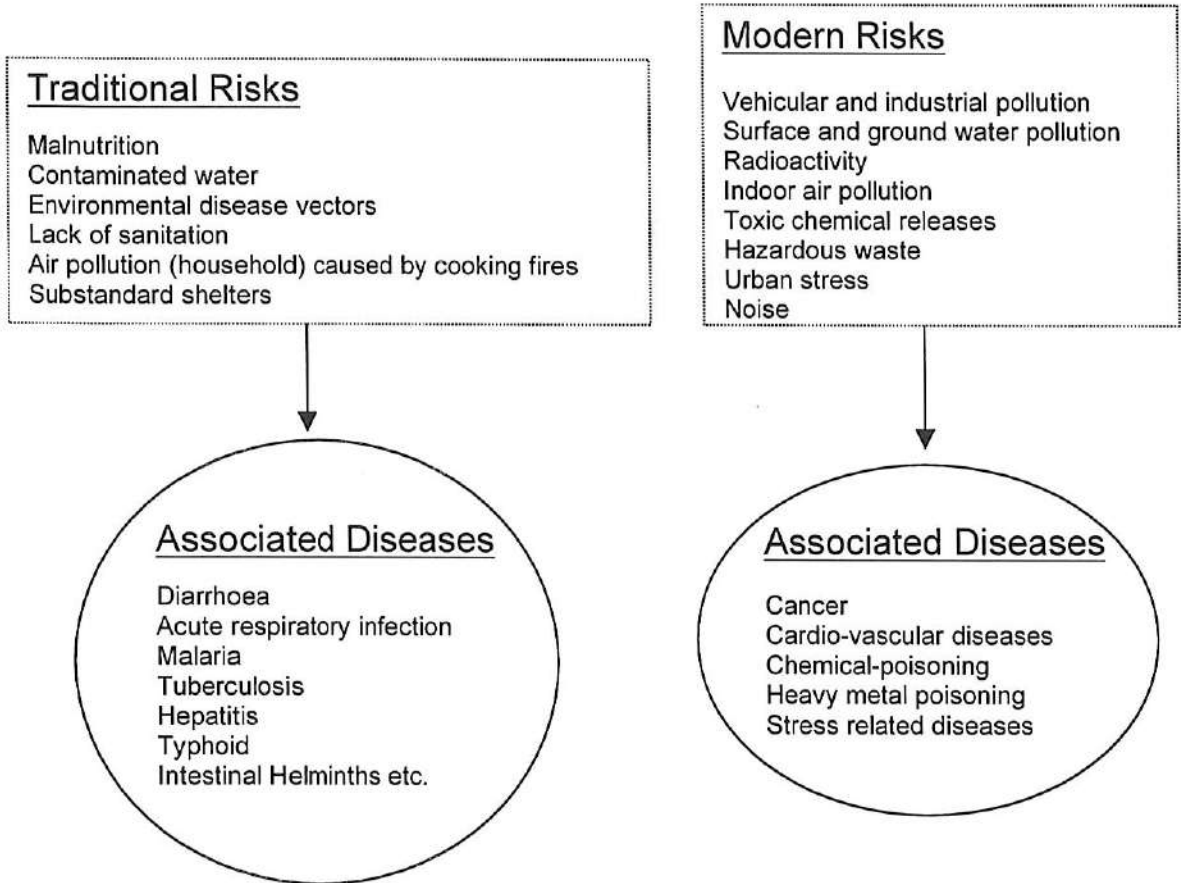
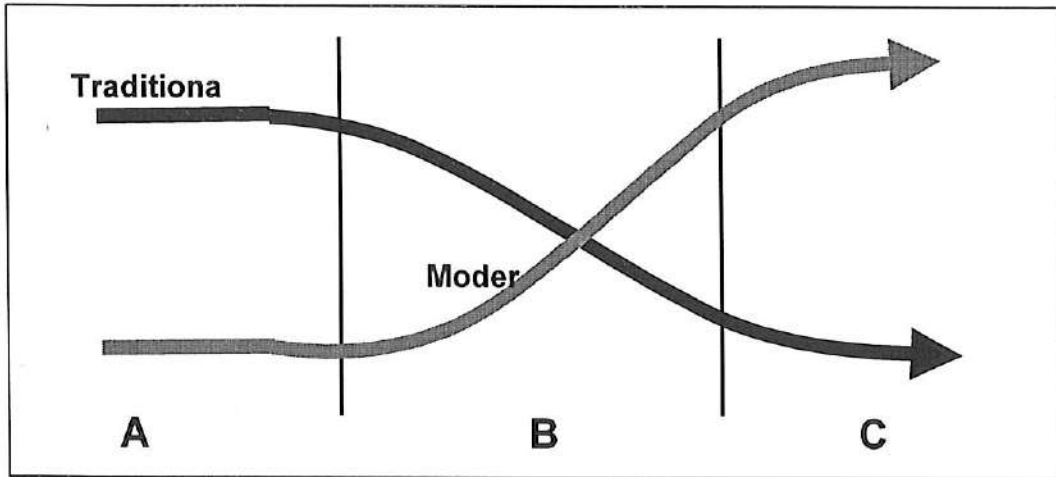
#### 4.3.2 Air Pollution

Air pollution in the urban centres, particularly in the larger cities has assumed alarming proportions. The main sources of air pollution are industry, power generation units, transport, and domestic energy use. In the popular imagination, the prime source of air pollution are industries. However, by volume, air pollutants from industries represent less of a threat to human health than do vehicular emissions. Currently, there are over 4 million vehicles in Pakistan. The condition of a large number of these vehicles – many of them are very old and badly maintained – aggravates the situation. It has been estimated that the average Pakistani vehicle emits 20 times as much hydrocarbons, 25 times as much carbon monoxide, and 3.6 times as much nitrous oxides in grams per kilometre as the average vehicle in the US (NCS, 1992). As such, air pollution along busy roads and narrow streets of the main cities should have a order of magnitude greater than would be predicted from the number of vehicles on the road.<sup>4</sup>

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4 Khan, M.A., Problems and Prospects of Urban Environmental Management in Pakistan, Pakistan Institute of Development Economics, Twelfth Annual General Meeting, 14-16 December, 1996.

Fig 4.3.1: Risk Transition in Pakistan<sup>5</sup>



<sup>5</sup> Khan, M.A., Problems and Prospects of Urban Environmental Management in Pakistan, Pakistan Institute of Development Economics, 12th Annual General Meeting, December 14-16, 1996.

Table 4.3.3: Toxic Substance Concentration in Effluents of Sample Industries, Karachi<sup>6</sup>

Type of Industry	COPPER	CADMIUM	ZINC	NICKLE	LEAD
<b>Suggested Standard</b>	<b>1.00</b>	<b>0.10</b>	<b>5.00</b>	<b>1.00</b>	<b>0.50</b>
Food Processing	0.43	0.03	0.24	0.27	0.23
Oil Mill	0.03	0.03	2.19	0.65	0.48
Beverage	0.09	0.04	2.06	0.41	0.04
Textile	0.02	0.05	5.30	0.51	-
Tannery	0.30	0.15	7.00	1.14	1.80
Chemical-Alkali	0.14	0.03	0.22	1.18	0.66
Paint Manufacture	0.07	0.94	0.48	0.20	3.88
Shipyards	0.28	0.10	1342.50	0.74	11.75
Cement	0.33	0.33	2.66	1.00	0.79

#### 4.3.3: Land Pollution

The main causes of land pollution are industrial effluents and solid waste from municipal and industrial sources. In cities like Karachi and Lahore typically one-third of solid waste is collected while the rest is disposed of on land (streets, lanes and open spaces). Solid waste from small industries like electroplating and other units is normally dumped on land or in waterways. Disposal of medical waste is another hazard. In Pakistan, approximately 250,000 tonnes of hazardous waste is generated annually which can be categorized into infectious chemical and radioactive waste. Around 10-15% of medical waste is considered infectious<sup>7</sup>. A large number of poor families (including Afghan refugee children) are engaged in scavenging of municipal solid waste in major cities (over 100,000 persons are involved in this occupation in Lahore alone). The health hazard associated with un-collected solid waste as well as solid waste which remains at collection point for days before being collected, also poses great potential health risks.

#### 4.3.4 Noise Pollution

Noise pollution is associated with industrial and construction processes; recreation, advertising and religious activities that make use of loud speakers; and noise resulting from various modes of transport used, i.e. motor vehicles, railway engines, airplanes. While there are laws governing the use of loud speakers or noise associated with road transport, there is no legislation to deal with noise emanating from railway engines, airplanes or industrial units. Moreover, where laws do exist, these have been infrequently and arbitrarily applied.

6 Based on EEC report to Environment and Urban Affairs Division, GoP, reproduced in: Khan, M.A., *Problems and Prospects of Urban Environmental Management in Pakistan*, Pakistan Institute of Development Economics, Twelfth Annual General Meeting, 14-16 December, 1996.

7 GoP, *Pakistan National Report to Habitat II*, Ministry of Environment, local Government and Rural Development, June 1996.

#### 4.4 Causes of Environmental Degradation

##### 4.4.1 Inadequate Policy/Incentive Systems

Environmental problems in urban areas flow from a divergence between social and private benefits and costs. A profit-seeking agent is likely to take advantage of the "free" waste disposal services offered by water, air and land and use the cheapest available fuel(s) which is also the most polluting. As there is weak implementation of legislation, the profit-seeking individual/industry will continue their environmentally degrading practices till the alternative becomes more costly, i.e. pollution charges, fines, public image, or possible law suits. In Pakistani cities the costs of pollution are borne almost exclusively by those who do not benefit from the pollution-creating activities. This problem of externality is compounded by the 'growth first' strategy which successive governments in Pakistan have pursued at the expense of environmental protection requirements.

##### 4.4.2 Inappropriate Pricing of Resources and Services

Low prices for water and other inputs to households, industry and businesses can (and do) lead to overuse of these resources. Additionally, inappropriate pricing of urban services results in inefficient allocation and inequitable allocation of such services. Since environmental costs of production are external to the industries, they do not form part of the price of goods and services produced. This in economic terms leads to excess demand for the product/service, without factoring in costs of providing that product/service.

##### 4.4.3 Institutional Constraints

In Pakistan there is a power imbalance between the Centre (Federal Government) and the various (provincial) local agencies and authorities. Constitutionally, the higher level of government (Federal) is meant to formulate policies and strategies, which the local agencies in the provinces are meant to implement (see box 2). In reality, these roles are often blurred and the powers of the local agency/departments are often appropriated by the Federal Government (Agencies). The level of coordination between different Federal and local, intra-provincial and inter-provincial coordination is also highly unsatisfactory. Often related agencies are unaware of what other agencies/departments are doing, resulting in duplication of work and wastage. These problems are made worse by the

Box 4.3.2: Metabolic flows (input-output ratio)

poor technical skills of personnel and severe shortage of (financial) resources – which are often just enough to meet the administrative expenses of the department/agency.

#### 4.4.4 Enforcement of Policies and Legislation

One of the main problems in Pakistan – as in many other developing countries – is the non-enforcement of the law. Substantial legislation dealing with environmental protection exists in Pakistan. Over time new legislation has been enacted to cover new developments and thinking. On the ground, however, existing legislation has had little impact. A drive through any of the main cities will show the extent to which domestic garbage and industrial and commercial waste is disposed of on the roadside. Vehicles, both public and private, pollute the environment with excessive emissions of hazardous smoke and ear-busting horns in the presence of legislation and law-enforcement personnel. Moreover, there is lack of adherence to land-use legislation where changes to houses and other built structures are made without prior approval and without consideration of the consequences. Illegal increase in floor area, street encroachment, and violation of building laws are common irregularities which cause traffic congestion and increase pollution.

In essence the enforcement of legislation is hampered by inherent deficiencies in the law, such as absence of proper definitions, lack of quantified limits and standards, and non-availability of implementation tools.

#### 4.4.5 Problem of Perception

Government policies and actions as regards urban areas are determined in large measure by the perception of the public and public officials about the nature and extent of environmental problems and their likely solutions. This perception is linked directly to the quality and quantity of relevant information available to make an informed choice/decision. Since the level of such information is generally low, the decisions reached are often inappropriate or may worsen the problems.

In the past, the tendency has been to address urban environmental problems through application of government policies and programmes. With the passage of time and ‘non-results’ of many of these government initiatives, it has started becoming clear that no matter how resourceful a government, it cannot solve the problems without establishing a partnership with other concerned (non-state) actors in urban areas (see box 3).

**Box 4.3.3: The Hyderabad Development Authority's (HDA) Incremental Housing Schemes**

The HDA's Incremental Housing Scheme began in 1987. It has adopted the strategy of the land-grabber informal development pattern. Unserviced plots are given to the poor at a price they can afford without any cumbersome procedures. On-site screening processes of the applicants make speculation of these plots difficult if not impossible. The owners are to pay for services over a ten-year period. *De jure* tenant rights will only be given after all services have been developed and paid for (see fig 2). The HDA has developed income generation programmes and advisory service for housing and a loan scheme for both these activities whose concept and procedures are compatible with the culture and repayment capacity of the residence. In addition, it has motivated the people to form organizations to finance and manage the development of, and to maintain and operate, services and collect revenue for this purpose. As such the HDA has managed to overcome most of the constraints the formal sector faces in making land infrastructure and credit available to low and lower-middle income groups and at almost no additional overheads and costs.

Source: Habitat II: Pakistan NGO Country Report, 1995

**4.5 The Way Forward**

- Innovative solutions are invariably premised on a partnership between public, private and non-profit organizations (NGOs, CBOs) and individuals (see box 4). There is need to institutionalise the role of these actors in the decision-making process, leading to involvement in actual implementation.
- One of the reasons EPAs and other related agencies have failed to address the environmental problems of urban areas is that their mandates, structure and capacity are not consonant with the requirements of urban centres. Urban management institutions thus need substantial structural changes as part of a process of institutional reform. Structural changes need to relate to:
  - making the planning process more participatory, transparent and forward looking;
  - increasing the capacity to monitor and implement decisions and legislation effectively;
  - generating funds by carrying out service functions and from fines and dues;
  - assuming the lead role in coordinating all environmental protection related activities of state and non-state actors without becoming hegemonic.

Moreover, these reformed environmental agencies should take the lead by setting priorities, formulating appropriate mechanisms for integration of environmental considerations into the development planning process, and supporting other state and non-state actors by enhancing their capacities for implementation and enforcement.

**Orangi Pilot Project (OPP), Institutions and Programs: A case study****Brief situational analysis**

- Poor peoples housing (known as Katchi Abadis- the informal sector) are everywhere in Pakistan. In Karachi, a port city and commercial centre of Pakistan, about 60% of the total population of 12 million, lives in Katchi Abadis. Here, the middle man (the land supplier) subdivides government and some private land and sells it to the poor. In the process he pays bribes of cash and choice plots to government functionaries.

- Provision of a housing unit is not a problem in this area. People build their houses incrementally—building component-manufacturing yards in the settlement provide construction material on credit. Initially, the land supplier (a resourceful person having links with politicians, government departments and private operators) arranges transport (i.e., bus routes) and water supply through tankers. As the settlement expands, so does the need for water supply, sewage disposal, schools and clinics. People set up micro enterprises in their homes for livelihood. They try to lobby with the government for facilities but due to lack of or adhoc government response, soon undertake self help initiatives.
- In 1980 when OPP started work in this area, it observed people's initiatives with regard to provision of sewage disposal, water supply, schools and clinics, as well as the government's negative response. As a strategy, OPP decided to strengthen people's initiative with social and technical guidance.
- OPP programs demonstrate that at the neighbourhood level, people can finance and manage facilities like sewerage, water supply, schools, clinics, solid waste disposal and security. The government's role is to compliment the people's work by providing larger facilities like trunk sewers and treatment plants, water and water mains, colleges/universities, hospitals, solid waste disposal and land fill sites.
- The component-sharing concept clearly shows that sustainable development can be managed through government-people partnership using local resources.

### Organisation

Orangi Pilot Project (OPP), as an NGO, began work in 1980. Orangi, situated in the periphery of Karachi, is a Katchi Abadi with a population of one million. In 1988, the success of its five basic programs of low cost sanitation, housing, health, education and credit for micro-enterprise led to OPP being upgraded to three autonomous institutions:

- OPP-Research & Training Institute (RTI) manages the low cost sanitation, housing, education, research and training programs.
- OPP- Orangi Charitable Trust (OCT) manages the micro enterprise credit program.
- OPP -Karachi Health & Social Development Association (KHASDA) manages the health program.

Each institution has its separate board of directors and mobilises its own funds. Development is self financed by the people. OPP institutions provide social and technical guidance and credit for micro enterprise. OPP institutions replicate their programs by strengthening partner NGOs/CBOs and government agencies instead of setting up their own offices.

### Approach and strategy

- Encouraging and strengthening community initiatives and evolving partnerships with government for development using local resources.
- The methodology is action research and extension. It involves analysing outstanding problems of the area, people's initiatives and bottlenecks in implementation. The process of action research and extension education evolves viable solutions promoting participatory action. In short, developing low-cost advice package and guiding community organization for self help and partnership with government.

### Programs/Activities

*Low-Cost Sanitation Program:* enables low-income families to finance, manage and maintain sanitary latrines in their homes, underground sewerage lines in their lanes and secondary sewers. The government is responsible for providing main sewers and treatment plants. OPP-RTI facilitates partnerships by providing social and technical guidance to both the community and the government. The program has extended to all of Orangi and to 111 other settlements in Karachi and seven cities covering a population of more than 1.5 million. In Orangi alone, 93,113 houses have invested Rs. 84.4 million in secondary lane sewers and sanitary latrines with the government investing Rs. 60.3 million in main disposals.

*Low-Cost Housing Program:* enables improvement in building components and construction techniques through action research, provision of credit and technical guidance to building component manufacturing

yards, training of youths and masons and mobilization of house owners. Each year more than 2,500 houses in Orangi benefit from this program.

*Education Program:* improves the physical condition and academic standards of private schools in Orangi through start-up grants, credit disbursement and facilitation of teachers training. So far, 504 schools educating more than 100,000 children have been supported.

*Health Education and Family Planning:* supports the local Orangi clinics set up by the people by supplying vaccines, family planning components and training of vaccinators/traditional birth attendants (TBAs). So far, 156 clinics, 179 vaccinators and 455 TBAs have been supported.

*Micro Enterprise Credit Program:* supports small family businesses set up by the people in their homes by providing credit. The program has expanded to 12 cities and more than 50 villages. So far, Rs 148 million has been disbursed as credit to support 7,469 units with 93% recovery rate. The program has led to nationwide partnerships to support similar initiatives and influence government policy.

### Some dynamics of work

- Emergence of
  - a. peoples, NGOs/CBOs and government partnerships at the neighbourhood level focusing on local resources
  - b. people's local networks for water and sanitation in Karachi and
  - c. national networks for supporting community initiatives.
- Institutional development of many NGOs/CBOs in Orangi, Karachi, 17 other cities and in at least 50 villages.
- Trends in government to
  - a. focus on addressing the problems of poor with participation
  - b. shift policy from pure provider to sharing responsibilities
  - c. accept people's development initiatives.
- One of the most crucial needs is to integrate environmental considerations in urban planning processes. This would require three elements:
  - a) A comprehensive information collection and analytical framework for incorporating environmental concerns into development activities;
  - b) Establishing mechanisms for reconciling varied and often conflicting interests and initiatives of different agencies;
  - c) A cyclical process of policy review and analysis with a view to continually improving upon earlier policies and strategies.
- Implementation and enforcement of existing environmental laws is crucial to making a success of an integrated urban environmental management strategy. Since most urban problems are local in nature, it is the local agencies and actors which need to be strengthened to deal effectively with urban environmental issues. The Federal agencies should take the lead – in conjunction with other concerned actors and provincial agencies – to formulate policies, regulations and standards.
- Improve existing infrastructure (i.e. avoid resorting to taking expensive loans for technologies and systems not suited to the urban conditions and requirements of Pakistan) and apply low-cost (appropriate) technology wherever possible.

Figure 4.3.2

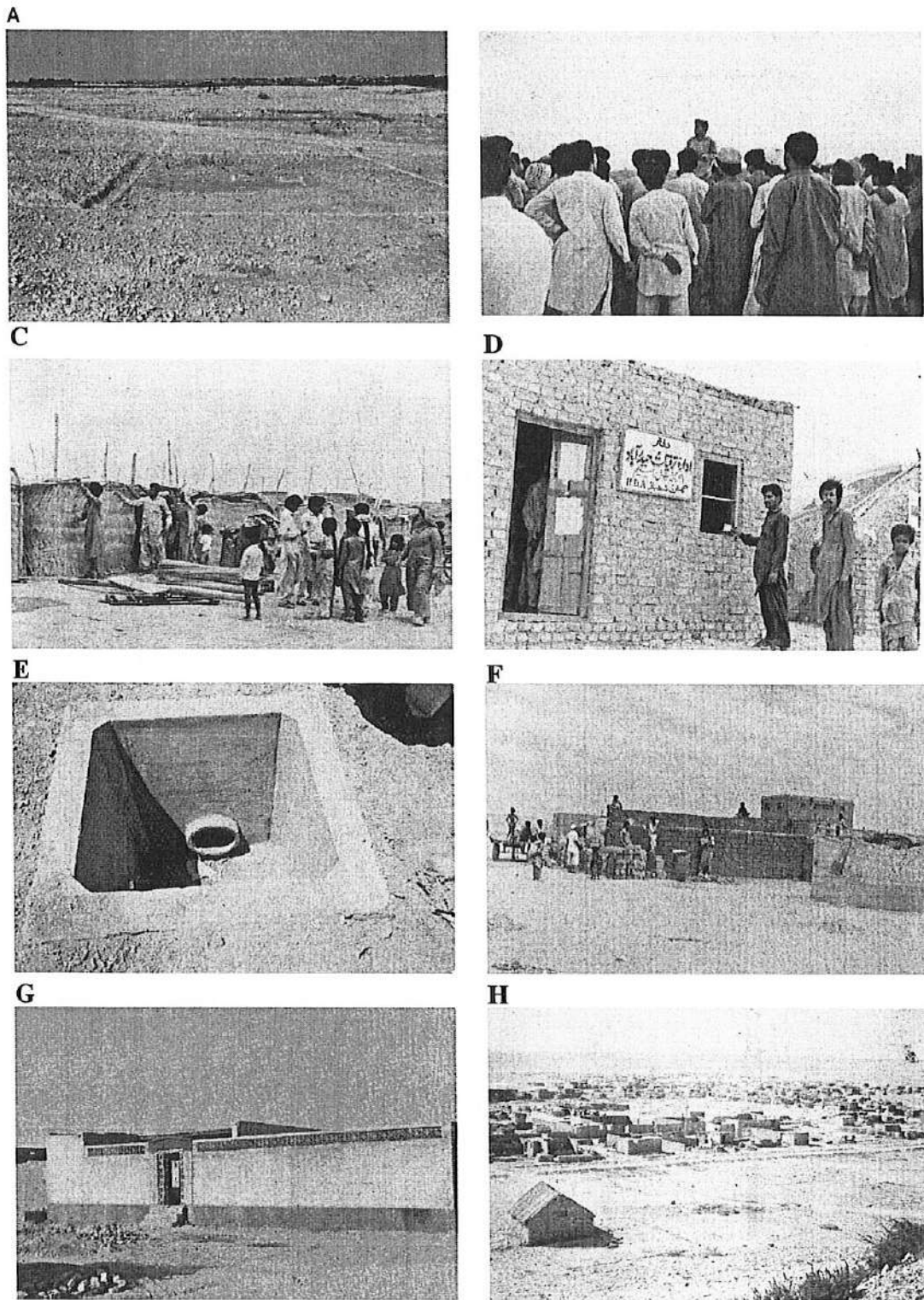


Figure 4.3.4

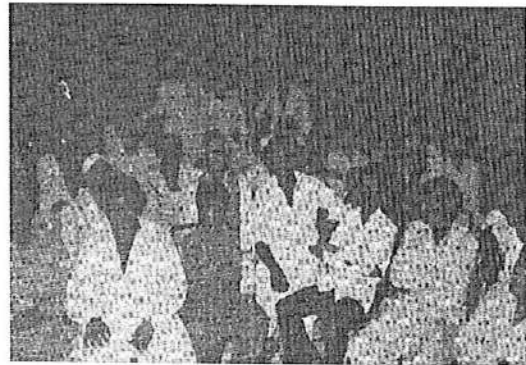
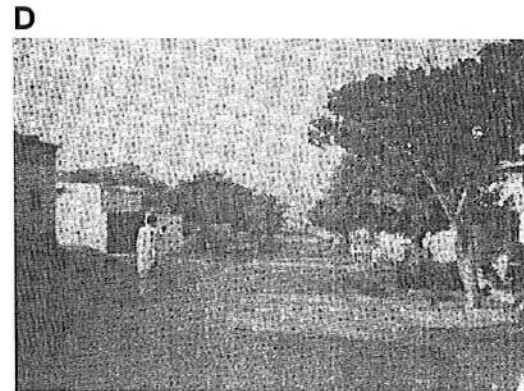
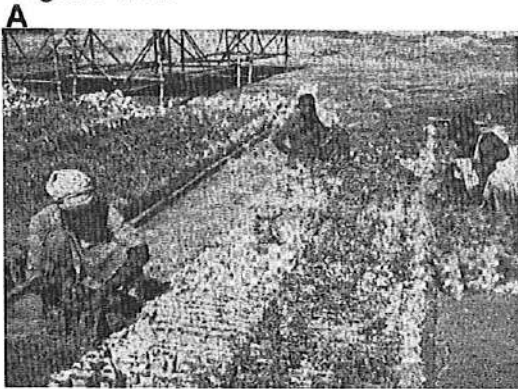


Figure 4.3.5



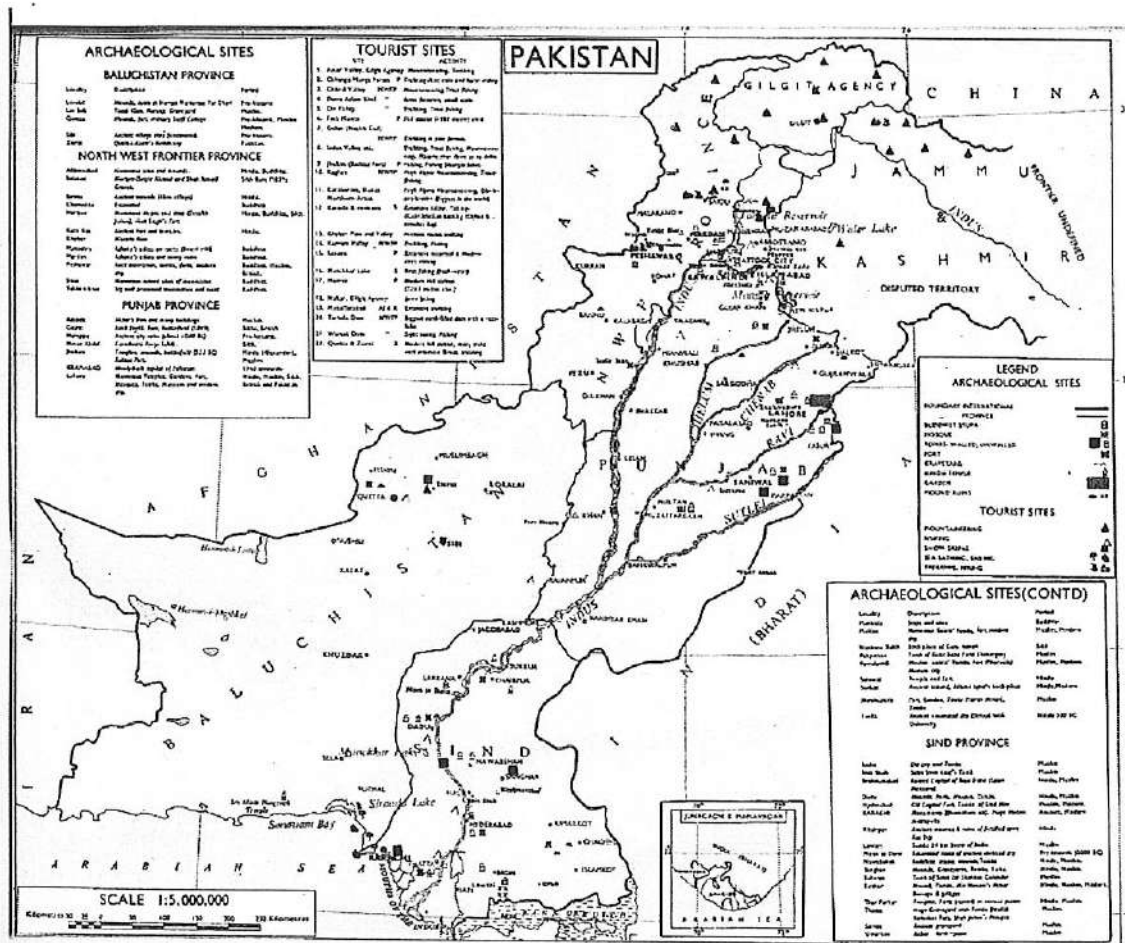
## **5 National Heritage**

### **5.1 Introduction**

A people without a recognizable past are poor indeed, regardless of how many modern riches they may possess. Pakistan, fortunately, is rich in terms of cultural heritage. The physical/built heritage includes features, such as archaeological remains, monuments, settlements, buildings and transport routes. This reflects Pakistan's central location as the cradle of three great civilizations: the Indus, the Gandhara and the Hindu civilization.

The Indus civilization dates back to 8000 years B.C. It was spread over what is now Sindh and Balochistan and includes Mehargarh, Kot Diji and Rahman Dheri in Dera Ismail Khan. The Gandhara civilization dates back to the first century B.C. The area is roughly coincident with the present North-West Province of Pakistan with Taxila, Swat and Charsaddah (old Pushkalavati) as its three notable hubs. The Hindu civilization dates back to 321 B.C. and covered the entire area of Pakistan. Hindu sites and monuments are to be found in all parts of the country.

Pakistan's history also spans many periods of which the Islamic, Sikh and British are the most prominent. The Islamic period started from the 7<sup>th</sup> century and lasted till the 9<sup>th</sup> century. It influenced the entire subcontinent, as well as some neighboring countries. And its legacy is to be found in the mosques, madrassahs, tombs and gardens constructed by Muslim rulers all over the subcontinent. The Sikhs established their empire in the Punjab in 1707 which lasted about a century. Gurdawaras and residential buildings built by Sikhs are spread over the Punjab. The subcontinent came under British influence in 1757 but present-day Pakistan was part of the British Empire for almost a century. Evidence of this can be seen in its colonial architecture: residential bungalows, educational institutions, churches and railway stations are still visible and in relatively good condition.



A map of archeological sites & monuments in Pakistan

Unfortunately, throughout history, Pakistan's heritage has been the victim of human depredations and natural catastrophes. Cities like Mohenjodaro and Harappa were destroyed by natural calamities. Invaders from Central Asia destroyed Hindu and Buddhist sites and monuments. Hindus and Sikhs ravaged Muslim sites, especially when the Sikhs regained Lahore in 1764. The Muslims, in turn, destroyed Hindu religious sites. The British, were not far behind. Converting Jehangir's tomb into a coal depot and ordering the demolition of the Taj Mahal to reclaim land for agriculture are some examples of the British disregard for the subcontinent's heritage.

The official attitude has not been much different. In 1998, the Punjab government demolished the water reservoir of the historic Shalamar Gardens outside Lahore to widen the road. The reservoir was listed on UNESCO's World Heritage list. The absence of legal protection has left many sites exposed to public vandalism. Many historical buildings have lost their originality owing to poor restoration work.

**5.2 The Causes of Degradation**

As mentioned the causes of degradation fall into two categories: natural and anthropogenic.

5.2.1 Natural

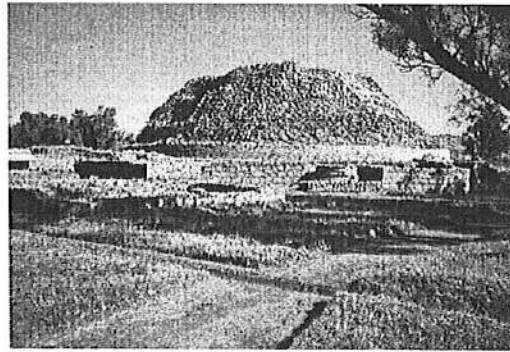
Several climatic, environmental and other natural factors have caused deterioration of historical buildings and monuments in Pakistan. These can be classified under:

*Water logging:* Mohenjodaro is in the grip of water logging and salinity, due to a rise in the sub-surface water level. Mitigation measures include protective spurs, a circular drain, tube wells and a pumping station. Problems with electricity bills hinder operation of these facilities. In May 2001, the government formed a National Fund to save Mohenjodaro. The governments of Japan, Netherlands and the US have contributed \$1.05million towards this fund.

*Wind, rain and vegetation:* In desert areas, the monuments are exposed to sand and dust-laden winds. This has an abrasive effect on the building materials. Rain erodes the exposed building material while vegetation on the structure causes severe damage. The several inserts are examples of the effects of such natural calamities.



A Scene from Mohenjodaro



Dhamarajika Stupa (Taxila), in ruins



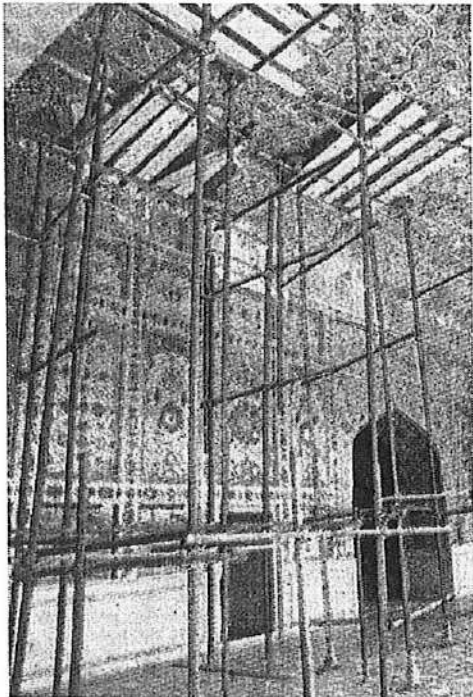
A temple in Katas (Salt Range), Decaying



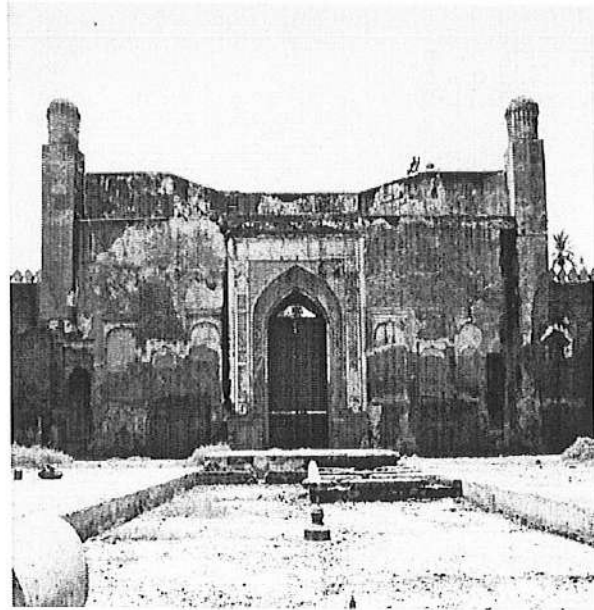
Mir Chakar's Fort in (Sibi), wind/sand erosion



Eroded tomb of Maharaja Sher Singh (Chah Miran, Lahore)



Sheesh Mahal (Lahore), averting imminent collapse



Jehangir's tomb (Lahore), dilapidated condition

### 5.2.2 Anthropogenic

Many anthropogenic factors are involved in the loss of our national heritage. These include, lack of legal protection, scarcity of resources, industrial and urban waste, vandalism, political rivalries, religious intolerance and theft/smuggling. Lack of funds, material and trained personnel are the main reasons for the government being unable to protect and conserve sites. Poverty is a factor, too. Poor people remove valuables and sell them for a pittance and use the bricks to construct houses. Intrinsicly, the problem is rooted in unethical practices by individuals and entities for commercial gain. Finally, the quality of restoration work is often poor, with restorers compromising the original style by superimposing their own preferences.<sup>1</sup>

#### **Raj Haveli**

Raja Haveli was built in 1872 by Sultan Jehandad Khan, a local chief of the Gakkhar tribe. The Haveli was a complex, which included a stately residence, guest house, gardens and a mosque. It was located on the banks of the Khanpur Dam near Taxila, in the North-West Frontier Province of Pakistan. Raja Haveli was an extremely valuable cultural asset, an example of an isolated rural residence constructed partly in stone. It illustrated vividly the indigenous domestic architecture of this region and was an amalgam of several new forms, materials and life-styles introduced in the mid-nineteenth century, following the annexation of Sikh territories by the British.

<sup>1</sup> An example of this is the restoration of the tomb of Baha'ud Din Zakariya in Multan.

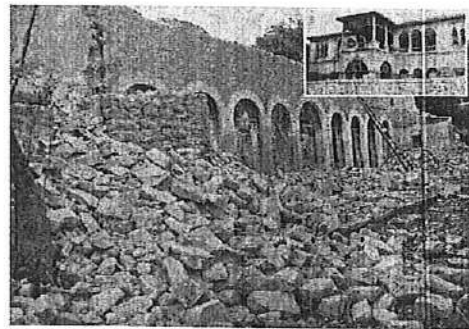
The property, along with the surrounding land, was acquired by the Water and Power Development Authority (WAPDA) as part of the Khanpur Dam Project. In 2000, WAPDA demolished the structure despite efforts from the previous owners and some concerned citizens, notably SDPI, of Islamabad to conserve this culturally valuable property.



A view of Raj Haveli, demolished by WAPDA in 2000



A Hindu temple, destroyed in retaliation for the destruction of Babri mosque in Ayodhya, India



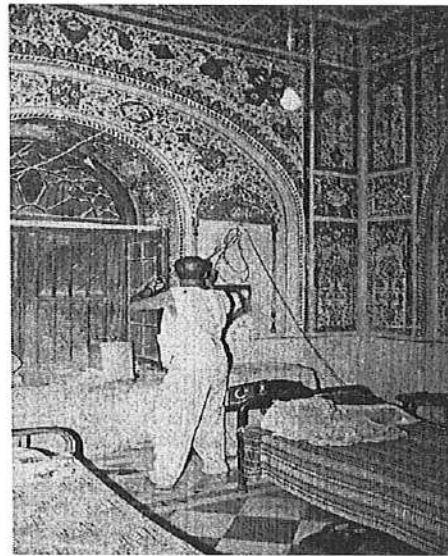
A building of the British period in Karachi, demolished recently by the Pakistan army. Inset – the building before demolition

### 5.2.3 The effects of urbanization

Rapid urbanization has engulfed many heritage sites. By way of example, Bagh Sardaran in Rawalpindi has given way to residential housing and commercial buildings. A similar fate has befallen the Tehsil of Sikhs and the Gurdwara of Bhai Munna. In particular, sites that are not registered (mapped/listed) are the most vulnerable. Of all the metropolitan

cities, Lahore and Karachi are the most visibly affected. In Lahore, the historic Badami Bagh, has been converted into a bus station. Angiri and many other gardens of Mugal era have disappeared completely. Shalimar Bagh has lost most of its gardens and a part of its south-western portion has been lost to commercial encroachments. At least two corner kiosks (burj) have been incorporated into private buildings. The Sarv Wala Maqbara is threatened by buildings raised in close proximity to it, as legislation forbidding the construction of property within a certain distance of heritage sites has been ignored.

*Poverty and Homelessness:* UNESCO has listed Rohtas Fort, south-west of Rawalpindi, as a World Heritage site. The site has been badly vandalized by locals who have removed the bricks to build their houses. Once, as many as 40 families were residing in Sardar Sojan Singh Haveli (Rawalpindi), built at the turn of the nineteenth century. They were evicted and given alternative accommodation and compensation. The haveli is now surrounded by residential housing and is not accessible by road. The wooden doors and windows, iron grilles, mosaics and many other valuables have been removed and sold at throwaway prices.

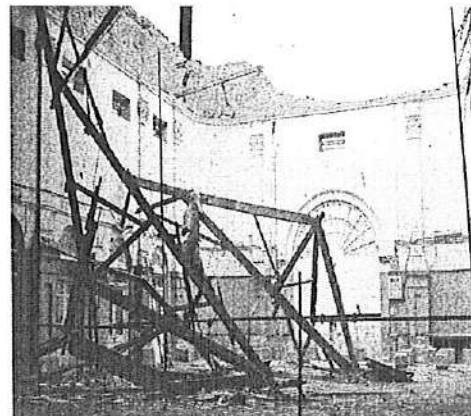


Sardar Sajan Singh Gurdwara in Rawalpindi

*Neglect, Mismanagement and Misuse:* Public neglect reflects lack of awareness and socio-cultural attitudes. The lack of attention by the government is rooted in financial constraints and the scarcity of trained professionals. The Salt Range in the Potohar Plateau is a case in point. It has remnants of the Hindu, Buddhist and Muslim civilizations. However, with the sole exception of Kalar Kahar, this rich heritage is neglected, including the site where Alberuni calculated the diameter of the earth. A treasury of tombs, temples and forts have disappeared completely leaving a pile of stones and a story to bear to witness to a lost legacy.



A century old Khaliqina Hall in Karachi



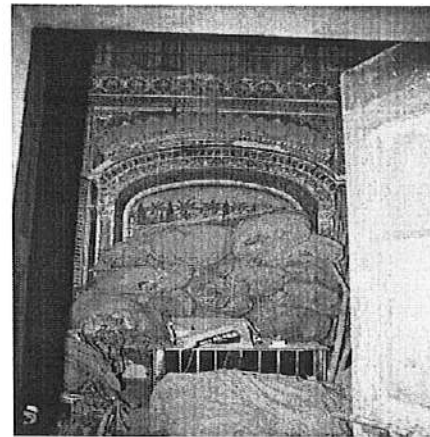
Much later....!

Admittedly, it is an onerous job to conserve and maintain Pakistan's invaluable cultural wealth spread over a vast area, so large in magnitude and so unique in its problems. Restoration is even more labour and cost-intensive when this wealth is exposed to numerous social, natural and environmental hazards. Differences in climate, material used and the traditional apathy of the common man complicate the situation. The problem is further compounded when a comprehensive countrywide archeological survey is not done; the listed sites are not documented; and skilled workers are not available for the conservation, protection and rehabilitation of archeological sites.

Several heritage buildings are under the occupation of the police and other government departments. These are used for residential and official purposes. The Lahore Fort, for instance, has been converted into a jail. A *gurdawara* in Bagh Sardaran, Rawalpindi, is being used by the police as a dormitory.



Haveli Bagh Sardaran: Office of the Federal Investigation Agency



Maintenance of official records

*Theft and smuggling:* Theft and smuggling are a major threat to our heritage. Numerous pieces of great archeological value have been excavated illegally, stolen or smuggled out of the country. UNESCO's World Heritage Committee (24<sup>th</sup> session, December 2000),



Restoration of Jahangir's tomb in Lahore

while reviewing the state of Taxila's conservation, observed the need to strictly control illegal excavation and trafficking in sculptures. The Committee has requested Pakistan to implement the recommendations of the International Council on Monuments and Sites (ICOMOS). In order to save the numerous physically-dispersed remains of Taxila, the committee requested the State Party to consider nominating the site for the "List of World Heritage in Danger" at its next meeting.

*Misguided Conservation Efforts (Lahore):* The turrets of Darbar Saheb at Kartarpur and the dome of the Nila Gumbad have lost their original character, colour and shape. Wazir Khan's

Mosque has lost its original flowers and creepers. The original temper and disposition of the Badshahi Mosque has been distorted due to over-emphasis. Many parts of the Lahore Fort have been reconstructed in complete disregard of its original character.

### **5.3 Protection, Conservation and Rehabilitation Efforts**

Pakistan turned its attention to the conservation of its archaeological sites and monuments after signing the International Council on Monuments and Sites (ICOMOS). But progress has been slow.

*Federal Ministry of Minorities, Culture, Sports, Tourism and Youth Affairs:* The Federal Ministry of Culture is responsible for protecting, conserving and rehabilitating archeological sites and monuments. For this purpose, the Ministry has two allied departments: the Federal Department of Archaeology and, for religious shrines, the auqaf departments.

The total budget of the Ministry for the fiscal year 2000-01 was Rs.138 million. The present government imposed a cut of Rs.100 million on this. A further 10% cut was imposed the following year. Note that this ministry also deals with minorities, tourism and sports in addition to culture. Not surprisingly, only Rs. 1.67 million has been allocated for conservation and related activities. The government is considering a proposal to hand over the archeological sites and monuments to the provincial governments.

The Punjab and the NWFP governments also have departments of archeology. These departments work under the Antiquities Act, 1975. This Act was promulgated to protect our cultural heritage. Under this Act, 391 monuments and sites are declared as protected. But only meager resources are available for their conservation.

*The Department of Archeology:* The budget of the Department of Archeology for the year 2000-2001 is Rs.20 million. The plan is to undertake conservation of 50 selected sites and continue excavations at Banbhore, Al-Mansura, Khairpur and other areas in Sindh and NWFP. Budgetary allocations for special repair projects are annexed.

The department has discovered 2000 sites recently, while conducting a countrywide survey of historical sites and monuments. The Antiquities Act, 1975, however, does not protect these sites. In addition to several others, which lie undocumented, they should also be brought within the ambit of the act.

*UNESCO World Heritage Program:* UNESCO's World Heritage program has listed five sites in Pakistan as world heritage sites and taken the prime responsibility for their conservation and protection. These include the archeological ruins of Moenjodaro, the Buddhist ruins of Takht-i-Bai and Sahr-i-Balol, Taxila Fort, the Shalamar Gardens in Lahore and the historical monuments of Thatta. For the current fiscal year, the government of Pakistan contributed Rs500,000 for the conservation/preservation of these sites/monuments.

*National Fund for Cultural Heritage:* The National Fund for Cultural Heritage (NFCH) was established in 1994 by the Parliament through an Act titled the National Fund for Cultural Heritage Act (Act VIII of 1994). The primary objective of the Fund is to raise awareness and promote the conservation of national heritage of Pakistan through various means, including financial and technical assistance. The Fund has also developed a website [www.heritage.gov.pk](http://www.heritage.gov.pk) and conducted research studies on a few sites and monuments.

*Non-government and private organizations:* Several non-government, private and voluntary organizations are working to conserve our cultural heritage. The important ones include the Pakistan Heritage Society, Anjuman-a-Memaran, The Heritage Foundation, Institute of Architects and the Lahore Conservation Society. *A list of these organisations is attached as Annex II*

### **Recommendations**

- A National Heritage Conservation policy should be developed. Conservation activities should be recognized and made a distinct part of national, regional and local policy planning.
- A comprehensive archeological survey should be conducted and all the heritage sites and monuments listed and declared as protected antiquity under the Antiquities Act, 1975.
- The documentation of historical monuments and sites should be done both before and during the restoration operation so that the historical and archaeological evidence is preserved.
- A criterion for selecting and grading heritage resources should be developed.
- The Department of Archaeology should be strengthened by providing, adequate funds and sufficient trained personnel.

- Awareness and sense of pride in the monuments and sites should be inculcated by including them in educational curricula at various stages.
- Information media should educate the masses to care for the relics of the past and arouse a sense of participation.
- A website may be developed to create awareness, provide information, and promote tourism and also to raise funds. Research in this area and its publication should be supported.
- Involvement of local concerned public group is essential for protection and preservation of cultural heritage.
- International and national private donors must also be encouraged to participate in funding of conservation efforts.
- The existing legal framework should be re-examined with a view to strengthening it if necessary.
- Sites and museums should have supporting literature and guides to enhance understanding of their cultural significance. This will be useful for publicizing the cultural heritage and encouraging public involvement in conservation. It will also boost tourism. However, the policy for promotion of tourism should not conflict with conservation policy and efforts.
- The provinces should be involved in the conservation and protection of our cultural heritage.

**Annex I****Repair projects with budgetary allocations**

	<b>Name of the Monument</b>	<b>Amount (Million Rs)</b>
(a)	Jehangiris Mausoleum (Gateway, walkways and Side walls)	Rs 3
(b)	Restoration of Sang-e-Badal Flooring of Jehangir's Mausoleum	Rs 3.4
(c)	Restoration of Red Sand Stone Facades of Jehangir's Mausoleum	Rs 2
(d)	Preservation/Restoration of Diwan-e-Khas, Diwan-e-Aam and Side Walls in Lahore Fort	Rs 2
(e)	Preservation/Restoration of Western Dalans of Jehangir's Quadrangle in Lahore Fort	Rs 1
(f)	Restoration and Development of four anonymous Tombs, Lal Mahra Sharif, D.I. Khan	Rs 0.5
(g)	Master Plan for Preservation and Restoration of Shalamar Garden, Lahore	Rs 2
(h)	Preservation and Restoration of Wah Gardens	Rs 2.5
(i)	Conservation of Umerkot Fort and Development of Museum	Rs 1

## Annex II

### **List of private, voluntary organization working on heritage conservation**

#### **Pakistan Heritage Society**

Pakistan Heritage Society is based in Peshawar. Projects of the Society include excavations at Akra, Bannu District, a listing of protected monuments in Pakistan by Rafiq Mughal; and documentation of monuments of the Salt Range in association with the University of the Pennsylvania, Art History Department.

#### **The Heritage Foundation**

#### **Anjuman-a-Mehmaran**

The Anjuman was founded in 1986 to save the built environments and architecture of Pakistan and to promote skill development, educational programs and networking to share the experiences and knowledge.

#### **Institute of Architects**

The Institute was established to regulate healthy conduct and practice amongst architects, as well as to promote and disseminate knowledge of the art and science of architecture, and to improve the quality of the man-made environment.

#### **Lahore Conservation Society**

In 1983, Lahore Conservation Society was established to conserve the built heritage and the environment of the old Lahore city. Its functions include include, protection, conservation and improvement of buildings, creating public awareness, sponsoring research and documentation, monitoring conservation activities, networking for cooperation to protect the buildings against environmental degradation and pollution.

Additional Issues-Cross Cutting Institutional Themes

## **Conclusions and Recommendations**

**PART V**

**Annexes**

**Acronyms, Abbreviations and Symbols**

ABAD	Agency for Barani Areas Development
ADB	Asian Development Bank
AKRSP	Aga Khan Rural Support Program
ALGAS	Asia Least-cost Greenhouse Gas Abatement Strategy
ARI	Acute Respiratory Infection
AZRC	Arid Zone Research Center
BCS	Balochistan Conservation Strategy
BHC	Hexachlorobenzene
BPbL	Blood Lead Level
BPCS	Balochistan Provincial Conservation Strategy
CAF	Corporate Agriculture Farming
CBD	Convention on Biological Diversity
CCA	Command Canal Area
CCD	Conference on Combating Desertification
CFCs	Chloroflourocarbons
CH <sub>4</sub>	Methane
CNG	Compressed Natural Gas
CO	Carbon monoxide
CO <sub>2</sub>	Carbon dioxide
CPCs	Cleaner Production Centers
CSD	Commission on Sustainable Development
DDT	Dichlorodiphenyl trichloroethane
EIA	Environmental Impact Assessment
EPA	Environment Protection Agency
EPB	Export Promotion Bureau
EPD	Environment Protection Department, Punjab
ETPI	Environment Technology Program for the Industry
FAO	United Nations Food and Agriculture Organization
FERT	Fuel Efficiency in Road Transport Sector Project
FSMP	Forestry Sector Master Plan
GEF	Global Environment Facility
GHG	Greenhouse Gas Emissions
GHGs	Green House Gases
GOP	Government of Pakistan
HCFC	Hydrochlorofluorocarbons
HDIP	Hydrocarbon Development Institute of Pakistan
IEE	Initial Environmental Examination
IISD	International Institute for Sustainable Development
IMR	Infant Mortality Rate
ISO	International Organization for Standardization
IUCN	International Union for Conservation of Nature
JICA	Japan International; Cooperation Agency
LPG	Liquid Petroleum Gas
MAF	Million Acre Feet

MEAs	Multilateral Environmental Agreements
MELGRD	Ministry of Environment, Local Government & Rural Development
MKDA	Murree Kahuta Development Authority
MT	Metric Tones
MVET	Mobile Vehicle Emission Testing
MW	Mega Watt
NCCD	National Co-ordination Committee on Desertification
NCS	National Conservation Strategy
NCSMTR	National Conservation Strategy-Mid Term Review
NEAP	Environmental Action Plan
NEPRA	National Electrical Power Regulatory Authority
NEQS	National Environmental Quality Standards
NGOs	Non-governmental Organizations
NIH	National Institute of Health
NMARP	National Master Agricultural Research Plan
NMVOC	Non-Methane Volatile Organic Compounds
NO <sub>x</sub>	Nitrogen oxides
NOx	Oxides of Nitrogen
NRSP	National Rural Support Program
NT	Nutrient Tones
NWFP	North West Frontier Province
ODS	Ozone Depleting Substance
OECD	Organization of Economically Developed Countries
Pak-EPA	Pakistan (Federal) Environmental Protection Agency
PARC	Pakistan Agriculture Research Council
PBCR	Punjab Barani Commission Report
PCBs	Polychlorinated biphenyls
PCRWP	Pakistan Council for Research on Water Resources
PCSIR	Pakistan Council for Scientific and Industrial Research
PECC	Population and Environment Communication Center
PED	Population and Environment Digest
PEPA 97	Pakistan Environmental Protection Act. 1997
PEPC	Pakistan Environment Protection Council
PEPCO	Pakistan Electric Power Company
PFI	Pakistan Forest Institute, Peshawar
PM	Particulate Matter
POPs	Persistent Organic Pollutants
ppb	Parts per billion
PPM	Production & Process Methods
ppm	Parts per million
PSIR	Pressure-State-Impact-Response
SCOPE	Society for Conservation of Protection of Environment
SDPI	Sustainable Development Policy Institute
SM&R	Self-Monitoring and Reporting
SMART	Self-Monitoring and Reporting Tool
SMEs	Small & Medium Enterprises
SPC	Specific Program Component
SPCS	Sarhad Provincial Conservation Strategy
SUPARCO	Pakistan Space and Upper Atmosphere Research Commission
TOE	Tons of Oil Equivalent

TSP	Total Suspended Particulate Matter
TTSID	Technology Transfer for Sustainable Industrial Development.
ug/dl	Microgram per deciliter
ug/m <sup>3</sup>	Microgram per cubic meter
UIEP	Pak-German Urban Industrial Environment Protection
UNCCC	United Nations Convention on Climatic Change
UNCCD	United Nations Conference on Combating Desertification
UNDP	United Nation Development Program
UNIDO	United Nations Industrial Development Organization
VETS	Vehicle Emission Testing Station
WAPDA	Water and Power Development Authority
WAPDA	Water and Power Development Authority
WHO	World Health Organization

### List of Reviewers

#### **Matiullah Khan, Ministry of Health, Government of Pakistan**

- The chapter on solid waste is mentioned in the index at page 97 but is not present in the text.
- The chapter on solid waste should address the hospital waste issue as well.
- The chapter on water is mentioned in the index at page 63, but is missing in the text
- The chapter on global issues should precede the chapters about Pakistan (in this report the global issues have been discussed at the end).
- Noise pollution should also be discussed in detail {there is only one paragraph on noise pollution in the chapter on Human settlements, page 127} (section 4.3.3.4)
- The environmental health/health issues related to environment should be discussed in “Part III; Key National Environmental Issues”.
- The food security and food safety issues are very pertinent and they should be discussed in detail in Part III; Key National Environmental Issues.

#### **Atta-ullah Jan, Ministry of Water and Power, Government of Pakistan**

Part II, III, IV and V of the subject reported received with your above reference have been studied and our comments on Para Nos. “2.3.2” and “2.3.6” of part-ii, which are related to “WATER”, are as under: -

- The facts mentioned in the two paras are incorrect and disregard of the ground realities.
- Data has been utilized with incorrect assumptions, to arrive at unrealistic results.

The two paras have been modified as under: -

#### **1. Para No. 2.3.2 (Part-II) Water Availability: Demand – Supply Balances**

The mean value of 72 years (1922-94) of water availability from the Western rivers (Indus, Jhelum & Chenab) at the rim-stations (that is entering the Indus Basin within Pakistan) is about 144.3 Million Acre Feet (including 5.3 MAF average diversions of NWFP gauged/un-gauged canals above rim-stations). Over 18 years post Tarbela period (1977-94) an annual average of over 38 MAF escapes below Kotri to sea. This water could be effectively harnessed and efficiently utilized through new irrigation projects, however, in the river system it is concentrated in about 70 days of summer only. No crop can be sown and taken to maturity in this short period. Kharif crops need some water before the start of surplus flow and some water after the monsoon ends. This needed water can only come from new major storages.

With the passage of time, the quantum of irrigation water presently available will go on declining due to sedimentation of the on-line reservoirs at Tarbela, Mangla and Chashma. It is anticipated that by the year 2010 the gross storage lost of on-line reservoirs due to sedimentation would be of the order of 5.94 AF which is more than the original capacity of Mangla (5.88 MAF). Thus the country is in need of a storage dam urgently.

Under Water Apportionment Accord (March 1991) about 117.35 MAF of water (including 3 MAF for the un-gauged civil canals of NWFP) has been allocated for agriculture, house hold and industrial consumption, the bulk of it being used in agriculture. At present the irrigation system of Pakistan is utilizing about 105 MAF of surface water at canal head level to irrigate an area of about 36 million acres.

The losses from the canal system, comprising of the Main & Branch Canals and the Distributaries and Minor is estimated to be about 25 MAF a major part of which (75 percent) is the ground water recharge. The water loss in conveyance in the watercourse of the system would amount to 35 MAF, about half of which constitute groundwater recharge. If all the water courses in the system numbering over 100,000 are improved 15 MAF of water can be conserved, but its sustainability will be dependent on continuous effective maintenance of the related farmer managed system. Experience to date has been disappointing which shows that most of the water courses already improved have reversed to the original condition due to neglected maintenance.

Field observations have brought out that water for leaching the salts is necessary and there does not appear to be any scope of conserving water from what is applied to the fields.

The lining of canals in saline groundwater areas, though difficult and costly in the perennial systems, could perform the twin function of water supply expansion and drainage requirement reduction. The ultimate potential for water saving by lining, considering the saline groundwater area could be about 9.0 MAF. In the fresh groundwater areas the lining will be counter productive as most of the recharge will be curtailed with due consequence for sustainability of this source.

It can thus be appreciated that the ultimate salvage potential in the Indus Plains, would be about 24 MAF. Further, sustainability of the salvage will be highly doubtful particularly in view of disappointing experience on the recently improved water courses.

Annual recharge to ground water system of the Indus Plain from Irrigation, rivers & rainfall is estimated around 55 MAF out of which about 48 MAF is within the command areas of Indus Basin Irrigation System (IBIS). Presently about 39 MAF groundwater extraction per annum is being made in the IBIS. Usable ground water in the Indus plain aquifer outside IBIS has almost been fully exploited with an estimated annual extraction of about 7 MAF.

Extensive use of fresh groundwater in the IBIS, without attendant drainage has started causing very serious problem of soil salinity/sodicity. Coupled with reduced surface water availability particularly in tail reaches of canal commands, this practice may not be sustainable in the long run.

Extensive mining of existing aquifers and fractional availability of developable fresh groundwater strongly suggest the need for additional surface supply which can only come from storages.

A better strategy is to construct surface storages both for water and power and to find ways and means to reduce water losses on sustainable basis and improve water use efficiency in the IBIS commands. In the case of agriculture, one possible thrust could be on rehabilitating the irrigation system and restructuring its management (water distribution by autonomous and decentralized bodies, farmer-based management at the tertiary irrigation level). Also, technical and economic (pricing) measures to encourage water conservation in households and industry should be considered.

Demand-supply imbalances are likely to widen in the future. The irrigation system is supply driven (warabandi). Farmers demand for more water, reflecting acreage and cropping intensity increases. These can be matched by regulated supply and increasing efficiency of water use.

Competing demands are also emerging in the households and industry sector. Form being a water affluent country in 1951 with a per capita availability for irrigation of 5650 cubic meters. The bare minimum water requirements to avoid being a 'Water Short Country' is 1000 cubic meters. As such in

the year 2012, Pakistan will have reached the stage of water storage. To conserve and utilize at least the available water additional storage dams are necessary, both for replenishing the lost capacity of the existing reservoirs and to save water escape into the sea.

As in future finite water resources are recycled frequently to meet increasing demand, and biological and chemical contaminants are added to them, water pollution will increase, regardless of natural filtration processes, and uses would to be controlled through monitoring.

## **2. Para No.2.3.3 (Part-II) Water availability and quality**

Under water Apportionment Accord (1991) about 117.35 MAF of water is allocated for agriculture, household and industrial consumption, the bulk of it would be used in agriculture. About 38 MAF surface water annually is going to ea below Kotri which can be effectively harvested by new storages. Conveyance losses in the canal system, watercourses and field applications, are about 60 MAF which represents a loss rate of 57 percent. Making more water available by reducing system losses, is necessary

After accounting for recharge to the fresh ground water areas the ultimate salvage potential in IBIS is estimates around 24 MAF. However sustainability of this quantum, particularly in farmer managed system, will have to be insured' through standing arrangements for proper O&M of the water courses. It would entail irrigation system rehabilitation and management restructuring.

From being a water affluent country in 1951 with a per capita availability of 5650 cubic meters. Pakistan is bordering on becoming a water scarce country in 2000, with a per capita availability of 1400 cubic meters. Future projected deficits suggest that the situation will become worse by the year 2012.

As in future finite water resources are recycled frequently to meet increasing demand and biological and chemical contaminants are added to them, water pollution will increase regardless of natural filtration processes and would need to be controlled through monitoring

Water pollution has three main sources: bacterial and organic liquids and solids from domestic sewage: toxic metals, organic acids and other less toxic but still polluting substances from industrial discharges: and agri-chemical pollution in the form of pesticide and fertilizer run-off from agricultural lands.

Growing incidence of salinity also contributes to the deteriorating quality of ground water, with excessive amounts of salt in the water rendering it impotable.

Solid waste is another source of water pollution. In Pakistan an average 50,000 metric tons of solid waste is generated every day of which only 60 percent is collected.

- It is suggested that Ministry of Environment, Local Government and Rural Development, GOP, be advised to replace the two paras with the above "Modified Paras" in the subject report.

**Dr. Shakeel Ahmad Khan, Ministry of Food, Agricultural and Livestock**

- We appreciate the preparation of "State of the Environment Report" as it addresses the critical issues of environment including water, soil and biodiversity, which are of paramount importance from agricultural standpoint. The report also covers the impact of increased use of fertilizers and other chemicals (pesticides and others) and how these are contaminating environment including

soil, water and air. The report has successfully highlighted the current state of affairs in this regard. However, no specific strategies or measures have been proposed to encounter these problems.

- Report no doubt has mainly focused on soil, water and biodiversity, which are largely concerned with agriculture sector. In addition report has dealt with industry and pollution thereby which literally affects the agricultural production system. However, the report writers altogether forgotten the Ministry of Food and Agriculture and other agricultural institutions dealing with agriculture and not a single reviewer for State of the Environment was from agriculture sector. Therefore, Ministry of Food, Agriculture and Livestock considers it extremely important to be part of such initiatives in the area of environment. As environmental degradation has a serious bearing not only on the farming communities but it also matters for the sustainable growth of the agriculture sector and food production for whole of the country.
- Food production and food security the main focuses of agriculture sector has also been identified by the report as a major area of concern for environment conservation. The report says “the poor state of food security leads to an extra burden on our natural resources including the clearance of forests for food production and intensive cropping extensive food production. An annual growth population rate 2.6 percent requires policies to enhance food production. As a result, the use of fertilizers pesticides and heavy farm machinery has increased manifold posing a threat to the environment” (page 71). This clearly indicates that no success can be achieved without proper involvement of Agriculture sector at every level in the area of environment improvement efforts for sustainability of natural resources. However, Institutional Recommendation “in the report also lacks any role or possible interaction with agriculture sector institutions, which need to be added and given due importance and weight.
- The National Agricultural Research System (NARS) under MINFAL is also aimed at increased food production through breeding of high yielding crop varieties, development of measures for controlling pest and diseases, improved crop and soil management practices. It is therefore, very important that such packages of technologies should be developed which has be capacity to take care the environmental aspects. This will be only possible if the NRSM is involved in the area of environment and may be given a mandate regarding environment to be taken care by them while performing their regular functions activities.
- Ministry of Food, Agriculture and Livestock has institutions on the natural resources focusing on issues related to soil, water and biodiversity. The MINFAL also deals with regulatory and quarantine aspects of agricultural inputs materials. It is therefore proposed that in ----- MINFAL may be involved in such exercises.

**Dr. Muhammad Pervaz, Hydrocarbon Development Institute of Pakistan**

- Executive summary of the report is required to added.
- Pakistan energy Yearbook is required to be included in the list of regular published documents at page 10.
- Pakistan with 2/3 of sedimentary basin area (827,268 sq. km), has a vast oil and gas potential thus the statement like: “Exhaustion of crude oil reserves earlier than 2011 and natural gas by 2026” is not correct. The statement is based on 1999 data of proven reserves with the assumption of no new discoveries. Therefore, this point should be clearly indicated in the report.
- The statement “the percentage contribution in methane emission to global warming in Pakistan is 46%” needs verification (page 49).
- The report is weak in editing
- This is an important document as such the information data submitted to UNEP will have significant socio-economic impact on Pakistan. It is therefore, proposed that the draft report and comments may be discussed in a meeting of key ministries/organizations and stakeholders before submission to UNEP.

**Nasir Hayat**, Ministry of Minorities, Culture, Sports, Tourism and Youth Affairs

I am directed to refer to your letter No. 5(8)/2001- SO(Legal), dated April 17, 2002 on the subject mentioned above and to say that this Ministry agrees with the recommendations proposed in the State of the Environment Report of Pakistan

**Deputy Director**, Environment Protection Department 4-Lytton Road Lahore

- Certain key pollutant parameters be selected (e.g. SO<sub>2</sub>, NO<sub>2</sub>, PM for air and BOD<sub>5</sub>, COD, TSS fecal coliform for water) and annual results be reported which indicate improvement or worsening of the environment at reference location selected for this purpose. These environmental indicators will provide an objective evaluation of the State of Environment.
- The report must include targets for the next year and discuss the achievement attained on past year targets and suggests measures/programme to achieve the unattained targets.

**Shafiq Ahmed Khoso**, Environmental Protection Agency, Government of Sindh

**Part I**  
**EXECUTIVE SUMMARY**  
Comments

Executive summary of the Report in question is found missing (could be under process). The issue may please be looked into while incorporating the Executive Summary into the Final Report which may please be examined/reviewed properly, before its conclusion.

**Part II**  
**PAKISTAN'S ENVIRONMENT: AN OVERVIEW**

**Overview of Major Environmental Development and Trends**

- **Overview: State of the Environment Report (Page 8)**
  - Pakistan (Page 8) Comments: No Comments.
  - The State of the Environment Report (Page 8) Comments: No Comments
  - Environmental Overview (Page 10)
    - Air (Page 11) Comments: No Comments
    - Water (Page 12)  
Water Availability: Demand-Supply Balances (Page 12)  
Comments:
      - On page 13 it is said, "A better strategy is to find out ways and means to reduce water losses and improve water use efficiency". EPA Sindh is of the opinion that beside these two steps i.e. 1. reduce water losses and 2. improve water use efficiency, possibility of treating the wastewater and promoting reuse of treated water may also be explored/looked into.

- Likewise on page 14 it is said, “The major toxic metals (in the ground water) include lead, manganese, chromium, cadmium and mercury”. EPA Sindh has come to know (through UNICEF) that arsenic in higher concentration has been found in the groundwater of Nine Districts in Sindh and similar situation also exists in Punjab. This latest information may be incorporated in the Report.
- Again on the same page (i.e. page 14) it is said, “Municipalities collect only 60% of solid waste” This para needs to be elaborated. It talks about solid waste which means industrial waste, hazardous waste and municipal waste. Collection and final disposal is very poor even in Karachi. According to the civic bodies here in Karachi, they have capacity to collect only 30% of the domestic solid waste generated in the city. As far as industrial waste is concerned, there are hardly any means for its collection. Situation in other cities of the province is almost same that of Karachi and no collection efforts are being carried at villages which cover and comprises considerable area and population.

#### *Land-use changes: (Page 16)*

##### Comments:

- On page 16 it is said, “The area under forest has increase from 3.53% to 4.44% of the total reported area”. EPA Sindh is of the opinion that trees have been cut frequently and especially due to increase in poverty, people usually take over the forest land and mostly clean the forest and retrieve the wood for its selling and thereafter use the land for cultivation to make their livelihood. Such land sometime become disputed as it goes in the hands of the illegal occupants. Resulting, the forest cover is continuously depleting. Definition of forest land according to the relevant Department is the land or portion of land which is owned by Forest Department having trees or without them. This issue may please be checked/re-examined.

#### *Biodiversity (Page 19)*

##### Comments:

- On page 22, areas protected under PA, in percentage in each province catering three provinces has been mentioned without mentioning Sindh. This matter may please be looked into.
- On page 22, it is said “Kirthar National Park is currently under a mining threat by Premier.” EPA Sindh is of the opinion that this statement appears to the harsh, it needs to be suitably worded, as KNP is not under any sort of threat it is under certain development activities, without compromising on the environment.

#### *2.3.6 Summary (Page 26, 27, 28)*

##### Comments:

- Topic titled “Air pollution, Water Availability and Quality, Land Bio-diversity, Atmosphere and Climate” have again been reproduce (page 26, 27 and 28 is just repetition of previous pages making report unnecessarily voluminous). Repetition of any matter may be avoided.

### **Development and Environment**

- ***Sustainable Human Development (Page 31)***

- Does Pakistan Match These Criteria (Page 31) Comments: No comments.
- The Direct Path (Page 32) Comments: No comments.
- The Indirect Path (Page 34)

##### Comments:

On page 38 paragraph 1 & 2, various problems such as poor sewage disposal and improper design of sewage and drinking water network pertaining to fragile infra structure etc, have been discussed. EPA Sindh would like to add that all these problems probably are due to lack of proper Mater Planning, lack of management in the country. Through this Report it may be suggested to put in place Master Plans for4 each city and ensure strict implementation of relevant building bylaws.

- Environmental Security and Conflict (Page 39) Comments: No comments.
- Summary  
Comments

Pages 41, 42 and 43 is just repetition of previous pages making report unnecessarily voluminous, therefore, the repetition may be avoided.

### **Part III**

## **KEY NATIONAL ENVIRONMENTAL ISSUES**

### **Air (Page 47)**

#### Comments

On page 49three tables have been shown. On table titled “**RESPOSNES, Pakistan Environmental Protection Ordinance 1997**” has been written, which is an incorrect statement. The name of the ordinance is Pakistan Environmental Protection Ordinance 1983. In 1997, the Pakistan Environmental Protection Act was passed. The error may be corrected.

- **Energy Source (Page 51)**  
Comments

Statement on page 51 is “The emphasis has consistently been on the use of conventional source of energy and policy makers have ignored the possibilities of utilizing alternative renewable technologies.” EP A Sindh is of the opinion that it is not the matter of ignorance by Government. However, there could be certain issues hampering adoption of this option by the government. The writer must have highlighted those issues with definite proposal to convince Government for adopting the said option. The statement tin question appears to be harsh and may please be suitably amended.

### **Water (Page 63)**

#### Comments

This section has been found blank. Either the informative material is under process or otherwise, however, the issue may please be looked into and while publishing the Final Report the matter of this particular section may please be examined/reviewed properly and thereafter it may be incorporated in the report.

### **Land Resources (Page 65) Comments: No comments**

### **Ecosystem: Biodiversity and protected Areas (page 83)**

#### Comments

- A table title “Another example of the indicator species-habitat degradation link” on page 90 is found blank which may please be filled with the requisite information.

- On page 92 (under heading Kirthar National Park), it is said, “Accordingly the exploration license issued under the Rule 17 of the Pakistan petroleum 9exploration and production) Rules 1986, is illegal, as no federal authority can issue an exploration license in violation or disregard of laws of the land, whether federal or provincial” EPA Sindh is of the opinion that the case was filed with High Court of Sindh, Which gave its verdict in favour of the project disposing off the petition. This statement appears to be opinion of the writer, however, keeping in view the possible legal implications, opinion of the Federal Law Department and Ministry of Petroleum, GOP< may please be sought and thereafter, the statement in question may be suitably amended.
- It is again said, “benefits of exploration and production in the national park will accrue to the oil and gas companies, to affluent urban consumers, to industries, to corrupt officials within the government and to the consultant community.” The statement in question is not agreed. The writer some how has tried to plead the one sided opinion of NGOs and bleak picture has been shown and tried to blame Government.
- On page 94, after changeling Premier, it is said, “The promise of modern technology is not enough”. EPA Sindh is of the opinion that development for econ9omic benefit of the country is beneficial for raising standard of life of general public, and should not be jeopardized. Te development should be carried out properly without causing significant adverse impact to environment. EPA Sindh does not support the idea of voluntarily going back to the past due to this aspect.

In view of the above, it is recommended that pages 92,93 and 94 displaying anti government message without actually defining the issue of KNP should be examined properly in consultation with Chief Secretary, Sindh (who headed that committee to allow Premier to proceed with for the said activity), Ministry of Petroleum and Natural Resources, GOP< Advocate General Sindh (who pursued the High court Case on the issue). This may be appreciated that this decision was not taken in isolation, instead the consultative process, through various meeting under Chairmanship of Chief Secretary Sindh, Was carried out and public hearing was also held prior issuance of NOC and all formalities were observe. The Consultant may be directed to incorporate all the relevant steps taken by the Government. Keeping in view of above opinion it is suggested that unnecessary on sided arguments may be deleted.

### **Sold Waste (Page 97)**

#### **Comments**

This section has been found blank. Either the informative material is under process or otherwise, however, the issue may please be looked into and while and while publishing the Final Report the matter in this particular section may please be examined / reviewed properly and thereafter it may be incorporated in the repot.

### **Part IV**

#### **ADDITIONAL ISSUES**

### **Global Environmental Issues: (page 99)**

#### **Comments**

On page 106 (under heading g AWARENSS RAISING) it is said, “NGO’s have played a major role in publicizing the harmful effects of POPs and lobbying the government to participate international negotiation on POPs. Of note are SDPI and SCOPE.” EPA Sindh is of the opinion that some how we are advocating the work of certain NGOs on POPs without assessing it. The purpose of the Report in question probably is not to project anybody or to advocate one sided opinion but to portray the factual position. Hence these statements may be deleted.

**Trade and Environment: (Page 113) Comments: No comments**

**Human Settlements: (Page 121)**

Comments

- On page 125, a table titled "Institutional mechanism and policies" which is found blank, may please be filled properly before publishing the final report.
- On page 127 (under heading "Causes of Environmental Degradation") it is said "*As there is no legislation – or if there is, it is not enforced*". From this statement, it appears as if the law is deliberately not being enforced. However the statement is not agreed, as the PEPA 1997 pertaining to the protection and conservation of environment, prevention of pollution and sustainable development is a comprehensive law and is under the implementation process. The statement in question to be replaced by the better one describing the ground reality.
- On page 128 (under heading "Institutional constrain") a table titled "metabolic flows (input-output ratio)" is found blank which may please be filled with the requisite information.
- On page 129 under heading "The Way Forward" it is said, "*One of the reasons EPAs and other related agencies have failed to address the environmental problems of urban areas is that their mandates, structure and capacity are not consonant with the requirements of urban centers.*" EPA Sindh does not agree with this statement, it appears to be harsh and needs to be suitably amended as the EPAs are partially successful in attending to the environmental issues. Although the implementation process of the PEPA 1997 is slow, however, the other stakeholders especially industry and Transporters Associations have been dragging their feet behind in complying with NEQS, minutes of the PEPC meetings are self explanatory. It should be appreciated that Government through PEPC opened the doors of dialogue with other stakeholders to avoid form any inconvenience at later stage instead of taking decision in isolation. How come such decision be the failure. EPAs do follow the decisions of PEPC as per the PEPA1997.

### **National Heritage**

Comment

- On page 136, it is said, "*Destruction of Sommath's idol is one example*". This statement has religious sentiment therefore, should be deleted.
- On same page in para-2, "*Demolition of Shalamar Garden by Mian Shabaz Sharif in 1998*" has been mentioned. This statement needs to be suitably amended.
- On page 138, it is stated that WAPDA took certain land of graveyard which was used for their project. Such like statemtns shold be suitably amended as the objective of the report is not to target anybody.
- On page 143 under heading "Non government and private organization", several NGOs working on cultural heritage has been praised with list of NGOs appended to the report. EPA Sindh is of the view that as the object of the report is not to project any body and in fact the purpose is to portray the true picture, therefore this entire heading along with ANEXX 4.4.2 should be deleted.
- At the end of the page 143, statement that law enforcing agencies (police ) have failed to save that monuments, might be correct to some extent. However, it should be suitable amended to avoid conflict.

**Part V**  
**INSTITUTIONAL RECOMMENDATIONS (PAGE 149)**

**National Conservation Strategy (NCS) Review: Comments: NO comments (Page 150)**

**Pakistan Environmental Protection Act 1997 (PEPA-97)**

**Comments**

- “Annex A”, “Annex B”, “Annex C”, “Annex D”, “Annex E”, “Annex F”, “Annex G”, “Annex H”, “Annex I”, “Annex J”, “Annex K” and “Annex L” quoted on pages 151 to 160 are found missing, therefore, may be added in the final report.
- On page 153, it is said, “*Pak EPA has been empowered under section 7 to ....*” These powers mentioned in the Report have now been delegated to Provincial EPAs, therefore, the statement legally incorrect to be corrected. In this regard the notification of M/O ELG&RD could be seen.
- Table under heading “Rules and Regulations for Implementation of NEQS” on page 154 should be corrected as Rules namely NEQS, Provincial Sustainable Development Funds (both for procedures and utilizations), Pollution Charge, Env. Sample, EIA/IEE Regulations are notified in 2001, therefore called Rules 2001 and not the Rules 1998.

**Abdur Rauf Kasi, Office Of The Director General Environmental Protection Agency, Quetta**

Kindly refer to your office letter No. F. NO. 5(8)/2001-SOL)Legal dated 17<sup>th</sup> April 2002 regarding the captioned subject.

Ministry of Environment deserves compliments of the highest order for formulating the maiden draft “State of the Environment Report of Pakistan”. It would be appropriate to suggest that SDPI should give an exclusive presentation of the aforementioned report “at least” to the all the Provincial / Federal EPA’s in order to solicit their suggestions also.

With kind regards

**Syed Asad Sibtain, Ministry of Environment , Local Government And Rural Development  
Government of Pakistan**

- SDPI clearly admits that secondary statistical sources have been utilized for this report. It is pointed out that SDPI should have consulted and discussed these issues with organizations and institutions which generated these statistical figures. In this way, some figures could have been verified and then established clearly.
- There is a long list of Reviewers given in the report. It is suggested that SDPI should provide the comments of Reviewers to the Ministry of Environment, LG&RD, being the focal point for this exercise. Federal Bureau of Statistics must also be made a Reviewer. The views/comments of various Reviewers would enable the Ministry of Environment, LG&RD to get an overall picture of the State of Environment in the country.
- All the Natural Resources are scattered at the provincial level, therefore, views of the Provincial Line Departments and Provincial Governments are very essential. SDPI should have consulted the Provincial governments and their Line Departments while preparing the State of Environment Report.

- SDPI must also provide copies of the STATE of Environment Report to the Ministries of Finance, Food and Agriculture, Industries, Water and Power Science & Technology and Planning and Development Division etc. for their views and comments.

**Akhtar Jan**, Ministry of Environment, Local Government And Rural Development  
Government of Pakistan

- Chapter on Water contains no information. The Consultants should draft this Chapt and then circulate for comments /views.
- The Chapter on Biodiversity is very weak and needs to be further beefed up.
- There are 15 (fifteen) National Parks in Pakistan and the report gives information on only two National Parks, i.e. Kirther National Park and Torghor. Information on National Parks is required to be beefed up.
- Information on Sold Waste is nil which needs to be beefed up and then this Chapter should be circulated for comments/views.
- There is no mention about combating Desertification and drought and therefore a separate Chapter should be added in the report on it an circulated for comments/views.
- Response of Pakistan on various Chapters of Agenda 21 is required to be added in the report & circulated for comments/views.
- Reports should mention implantation status of all Conventions of which Pakistan is a Party.

**Imran Habib Ahmed**, Ministry of Environment, Local Government And Rural Development  
Government of Pakistan

#### Comments

- The report is a good attempt, but at best can be described as an NGO input and basically seems like an advocacy of certain issues. For Example the section on Kirtahar National Park is written with an NGO perspective and does not portray the entire picture, and one is not really sure, how can such a politically sensitive issue be included in a national report.
- The linkages with the government's devolution plan and its impact on natural resource management has not been undertaken. Even though relatively new, but this devolution exercise will have a major impact on natural resource management and needs to be captured in the report.
- The Poverty – Environment nexus needs to be written with the perspective of current policy. The government has signed major agreements on poverty reduction, there are poverty reduction strategies agreed by GOP with donor agencies that need to be highlighted and their impact on environment policy, governance and other cross-sectoral issues examined.
- One is not clear as to what the chapter on Sustainable Human Development is trying to achieve. This is not an academic exercise to articulate the development jargon. This chapter needs to look at the various policy instruments being undertaken by the government, and their environmental impacts. The government has undertaken very bold initiatives, for example as mentioned above in reducing poverty, in the economic policy area, in the IT field and so on. All such initiatives have environmental impacts and need to be looked at.
- Pakistan's State of Environment Report need to be a carefully thought out exercise, portraying the success and highlighting the areas that Pakistan would need support. I think since it is an official GOP submission, it has to carry a certain amount of balance in portraying our successes viz-a-viz the failures. There is no shortage of literature or studies being done by the donors' etc, analyzing these issues. While one can not be totally oblivious of such exercises, but one needs to be clear

about the difference between an international GOP submission as the national state of environment report and domestic exercise aimed at improving current state of affairs. Furthermore, the difference between an academic exercise and an implementation report of such kind needs to be understood.

### Specific Comments on Climate Change Section

- Is the Section on UNFCCC drafted as an implementation status? The objective is not clear and one does not understand its flow. Why are we discussing global negotiations issue here and what is the rationale for bringing in the issue of acceding to Kyoto Protocol here?
- The section needs to benefit from the discussion on Rio conventions organized by the Ministry in collaboration with IUCN on May 7<sup>th</sup>. Both the Ministry's WSSD cell and IUCN actively participated and the authors of the study should be given access to the proceedings in order to rewrite this section.
- In terms of input to the report, the section has prepared text on Pakistan's implementation of UNFCCC for the national report on WSSD, elements of which can be used for this report also.
- The chapter on energy needs to be carefully screened in light of current GOP policy. Enercon as the main energy conservation agency of the government should be giving its input to the text and figures cited in the report.

**Dr. Sabir Mehmood**, Ministry of Environment, Local Government And Rural Development National Environment Conservation Centre (Enercon), Government of Pakistan

### Part-III

#### KEY NATIONAL ENVIRONMENTAL ISSUES

##### Air

- In the list of "PRESSURES" following may be added: -
  - Poor Agriculture Water Pumping Efficiency.
  - Inefficient use of Energy in all sectors of economy – not just industry & transport. Other sectors include, buildings power, agriculture etc.
- In the list of "Responses" Following may be added under "Programmes":-
  - UNDP/GEF/ENERCON funded "fuel Efficiency in Road Transport Sector" (FERTS) Project.
  - Energy Conservation Loan Fund (ECLF) for the purchase of Energy Efficiency equipment, which has already been established.
- On page-57 Para 1.4.5 may be added: -
  - *Agriculture*  
Agriculture Sector consumes about 11% of the total fuel consumption and accounts for 10% GHG emission. Demonstration projects conducted by ENERCON show energy savings of 10% in Agriculture Tubewells Retrofits, and 18% in Agriculture Tractors Retrofits. The investment in this option is highly const effective.
- The report already seems out dated as the information produced is obsolete and the references are as old as 1996-7. Repairing to data published in 96-97 cannot be termed as current for use in State of Environment Report 2002.
- Review committee is also out dated – e.g. Mr Aziz Qureshi is referred to as Chief Environment, Mr. Asif Shuja Khan is mentioned as DG-EPA PUNJAB, and there is no consistency in the presentation of eh reviews. Further more there is serious lack of coverage – e.g. there is no one covering energy, emissions, solid waste, international conventions etc. No real stakeholders are

involved in the reviewers list. Report is using projected data where actual is available. All energy references are from year books, 1999 where as year book 2000 and 2001 are also available.

- Section 1.4.3- Specially needs complete re write.
- Section 1.6.2 talks about “20 such systems are lying unutilized” where as fact is they have long age been given to wapda.
- No comments on drafting, structure and the functionality of the report, which are far for that which can be expected for such an assignment.

**Sardar Naseer Tareen, SUSG - GAsia**

### **Ecosystems: Biodiversity And Protected Areas**

First and foremost, being of our direct concern, Torghar never acquired the status of “National park” (page 95). It is a community Managed Program independent from the Government.

Secondly, we understand that this report is mainly addressed to the government institutions and that, therefore, this chapter does not mention the non-governmental incentives at work in the country. Yet, rather than concurrent, these could be seen as complementary and both sides could learn from each other’s experience. Furthermore, the domains where government has failed to intervene should be enlightening for further policies.

The recommendations on the first page of this chapter are mainly focused on Forest and agriculture. Balochistan, which is one of the most targeted provinces in the chapter, still bears a lot of uncultivated lands and grazing is an important part of the economy. The recommendations should also be adapted to these areas.

More emphasis could be made on sustainable use, as itself to be the most adequate response to biodiversity depletion in many cases. Environment is very intricately linked with the people and only a limited number of areas can be declared as Wild life Sanctuaries or National Parks.

Table 1 of this chapter titled “Critically Threatened Ecosystems in Pakistan”, Chaghi desert is mentioned but it does not comprise the underground trade of reptiles. The ecosystems could also include Chaghi’s Wetlands (Zangi Nawar) one of the most important in Pakistan. Chaghi is also a route for Demoiselle Crane and Houbara Bustard. Furthermore, none of the categories comprise those areas where mammals are concerned; although the next sub-chapter (4.3.2) is mainly focused on them.

Finally, a small detail but which is confusing: on 4.4, it is said that “only three categories of protected areas may be established” while the following figure (“list protected Areas of Pakistan”) shows ten of them.

## **Part II**

### **PAKISTAN'S ENVIRONMENT: AN OVERVIEW**

- Over view of various environmental resources has been provided. It is better if overview on coastal and marine resources could also be provided as identified in the guidelines.
- Significant Environmental Issues (SEI) have been pointed out. The classification of these issues is not according to the classification mentioned in the guidelines. The SEI has to be classified as national physical resources, national ecological resources, human economic development, human quality of life values etc.
- The SEI has not been prioritized into three categories as described in the guidelines. These are most urgent, next degree at urgency, and less urgent but still significant.
- The chapter "Development and Environment" though is nicely drafted but seems inconsistent with the requirements of the part II.

## **Part III**

### **KEY NATIONAL ENVIRONMENTAL ISSUES**

- The guidelines identify the need to address five priority key issues in this part. The first draft SoE report identifies four key national environmental issues (air, water, land resources, and ecosystems: biodiversity and protected area).
- The P-S-I-R analytical framework is provided for air and ecosystems but the same is missing for land resources. Also the issue of water, included in the list of contents is missing from the main report.
- The case study of "Kirthar National Park" given in the key issue of biodiversity on pages 83-85 provides only the view point of SDPI. It needs to be redrafted.

## **Part V**

### **INSTITUTIONAL RECOMMENDATIONS**

- This part is provided as part IB "Conclusions and Recommendations" in the guidelines. This part should summarize the salient finding, conclusions and recommendations of the report.

### **General Comments**

- As per the MoU the M/o ELG&RD has to facilitate a national review process of the first draft SoE report. Please identify the key stakeholders at the national level to whom a copy of the draft report could be sent for obtaining their feedback.

- Repetition of following paragraphs has been observed:
  - Under heading No. 2.3.3. "Land/land Use Changes" (write-up) on page-16 is repeated under heading "Land" on page-27.

- Under Heading No. 2.3.4. "Biodiversity", sub heading "The convention on Biological Diversity (CBD)", five lines and sub-heading "Biodiversity Richness of Pakistan" three lines on page-19 are repeated under heading "Biodiversity" on page-27.
- "Climate Change" on page-24 is repeated under heading "Atmosphere and climate" para No. 2 onward on page-28.
- The topic 3.3.1 under headin "Social Sector neglect" on page no.35 does not seem to be appropriate. It may properly be recorded as "Negligence of Social Sector.
- The heading "Green House Gases" on page-55 may be changed as "Green House Effect" and the formula for Hydrogen Sulphide is HS whereas it is printed as H<sub>2</sub>S which may be corrected.
- Data on population is based on preliminary results of the 1998 Census. Since final result have been released, the same may be updated as also other data given in the report.
- The publication on "Compendium on Environment Statistics of Pakistan, 2001" is under preparation in FBS and data up to 2001 will be given in it. This publication once finalized will be sent to the M/o Environment, Local Government and Rural Development for their use.

**Syed Azmat Ali** , Ministry of Defence, Government of Pakistan

- The report under review covers climate and diverse disciplines of climatic related fields. However, the climate change as such has been reviewed in the report without looking into the impacts and adaptation strategies of climate change of our region. Thought, living with climate, adjusting to its extremes and changes has been one of the most important aspects, of survival, growth and development of mankind on earth. Many a times the climate, involves devastation and destruction in the process and its inherent zeal, spirit for adventure and quest for greener pasture, let it into adapt to new as well as to changing environment.
- To assess the impact on water resources, Agriculture and forestry play a vital role for building up socio economic base line. Also the climate change may be extended to include health, industry and energy sectors.
- Accurate assessment of the Climate Change impact is the pre-requisite for the adaptation strategies, which requires to be adapted in the region.
- By and large the Climate Change will profoundly, though slowly, affect the main socio economic sectors in the county. These changes adversely affect both directly & indirectly, e.g. in case of decreased precipitation as an out come of Climate Change, the net overtime capacity of Indus basin water system will decrease affecting the availability of water for even domestic use. This in turn will reduce the crop area and crop productivity. Coupled with temperature change, the boundaries of potential areas of the major crops will shift and their growing season length will be reduced with all the associated consequences.
- Commenting on the structure of the report is worth mentioning that it may include the Executive Summary, as indicated in the index of the report.
- Maps and tables, which have been mentioned in the report were not included for the analysis by PMD. It is therefore, proposed that under the present situation of the evolving Climate Change Scenarios, the figures, maps and tables may be included in the report.
- While going through the report, it has been observed that some material has been extracted from the study on "Climate Change Impact Assessment and Adaptation Strategies for Pakistan" carried out under the collaborative efforts of PMD< UNEP, Ministry of Environment and other sectors by a study team comprising of has not been appropriately acknowledged.

## **Part II**

### **PAKISTAN'S ENVIRONMENT: AN OVERVIEW**

- Overview of various environmental resources has been provided. It is better if overview on coastal and marine resources could also be provided as identified in the guidelines.
- Significant Environmental Issues (SEI) have been pointed out. The classification of these issues is not according to the classification mentioned in the guidelines. The SEI has to be classified as national physical resources, national ecological resources, human economic development, human quality of life values etc.
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## **Part III**

### **KEY NATIONAL ENVIRONMENTAL ISSUES:**

- The guidelines identify the need to address five priority key issues in this part. The first draft SoE report identifies four key national environmental issues (air, water, land resources, and ecosystems: biodiversity and protected area). The report in addition to these four key issues identify four additional issues (global environmental issues, trade and environment, human settlements, and national heritage). It is felt that the report has concentrated on the areas identified in the NEAP-SP while identifying key national environmental issues. The air or water etc are not the national environmental issues. These are instead the major areas of concern.
- The P-S-I-R analytical framework is provided for air and ecosystems but the same is missing for land resources. Also the issue of water, included in the list of contents is missing from the main report.
- The case study of "Kirthar National Park" given in the key issue of biodiversity on pages 83-85 provides only the view point of SDPI. It needs to be redrafted.

## **Part V**

### **INSTITUTIONAL RECOMMENDATIONS**

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Secondly, we understand that this report is mainly addressed to the government institutions and that, therefore, this chapter does not mention the non-governmental incentives at work in the country. Yet, rather than concurrent, these could be seen as complementary and both sides could learn from each other’s experience. Furthermore, the domains where government has failed to intervene should be enlightening for future policies.

The recommendations on the first page of this chapter are mainly focused on Forest and agriculture. Balochistan, which is one of the most targeted provinces in the chapter, still bears a lot of uncultivated lands and grazing is an important part of the economy. The recommendations should also be adapted to these areas.

More emphasis could be made on sustainable use, as it has proven itself to be the most adequate response to biodiversity depletion in many cases. Environment is very intricately linked with the people and only a limited number of areas can be declared as Wildlife Sanctuaries or National Parks.

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