



Generating Global  
Environmental Benefits - GEB

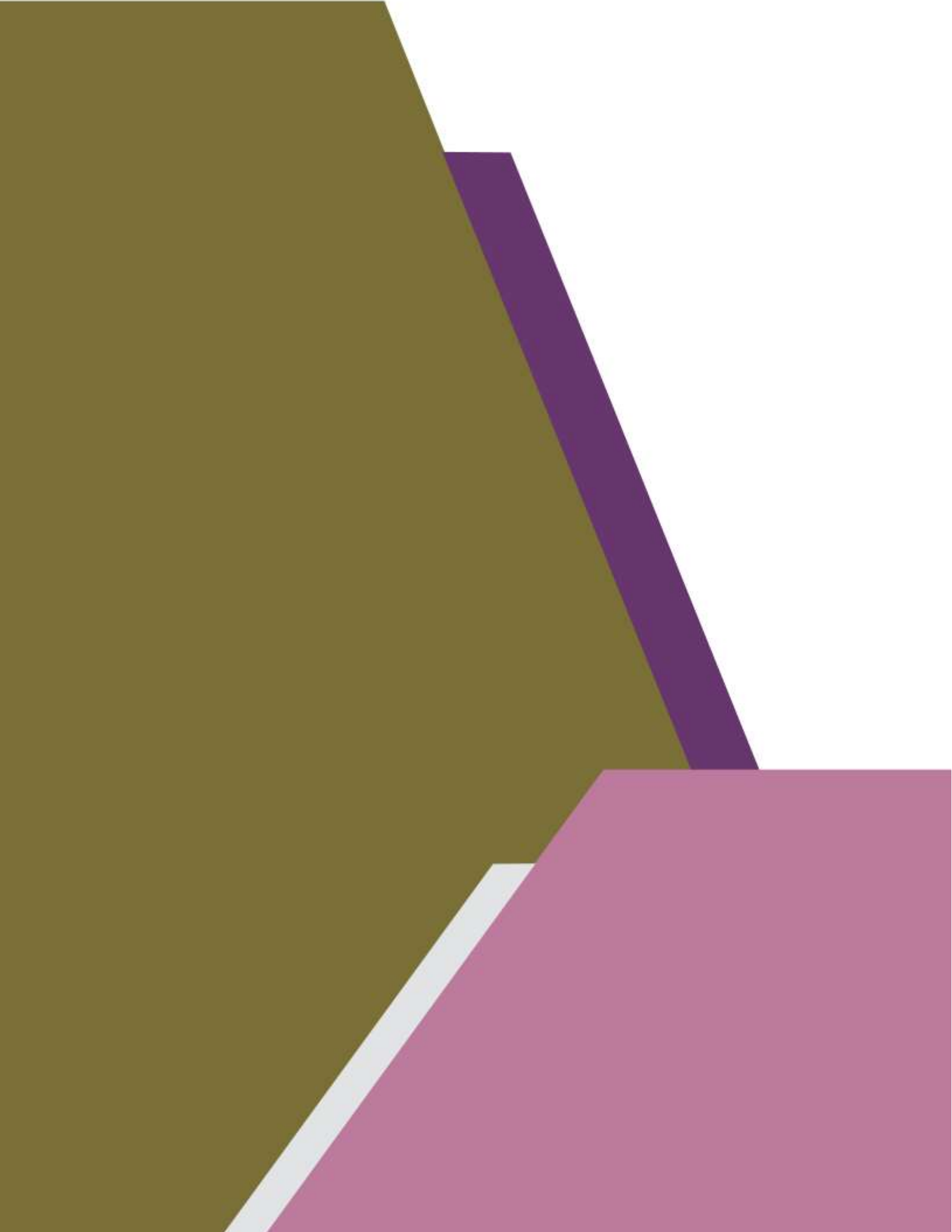
# REVIEW OF THE CURRENT SYSTEM OF GENERATION, COLLECTION AND COMPILATION OF ENVIRONMENTAL INFORMATION IN DIFFERENT SELECTED PAKISTANI DEPARTMENTS



A study conducted by GEB project that briefly analysed the prevalent system of collection, generation and analysis of environmental data as well as identified areas of improvement

***GEB - A Joint Initiative of United Nations Development Programme (UNDP)  
& Ministry of Climate Change (MoCC)***





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## **Background**

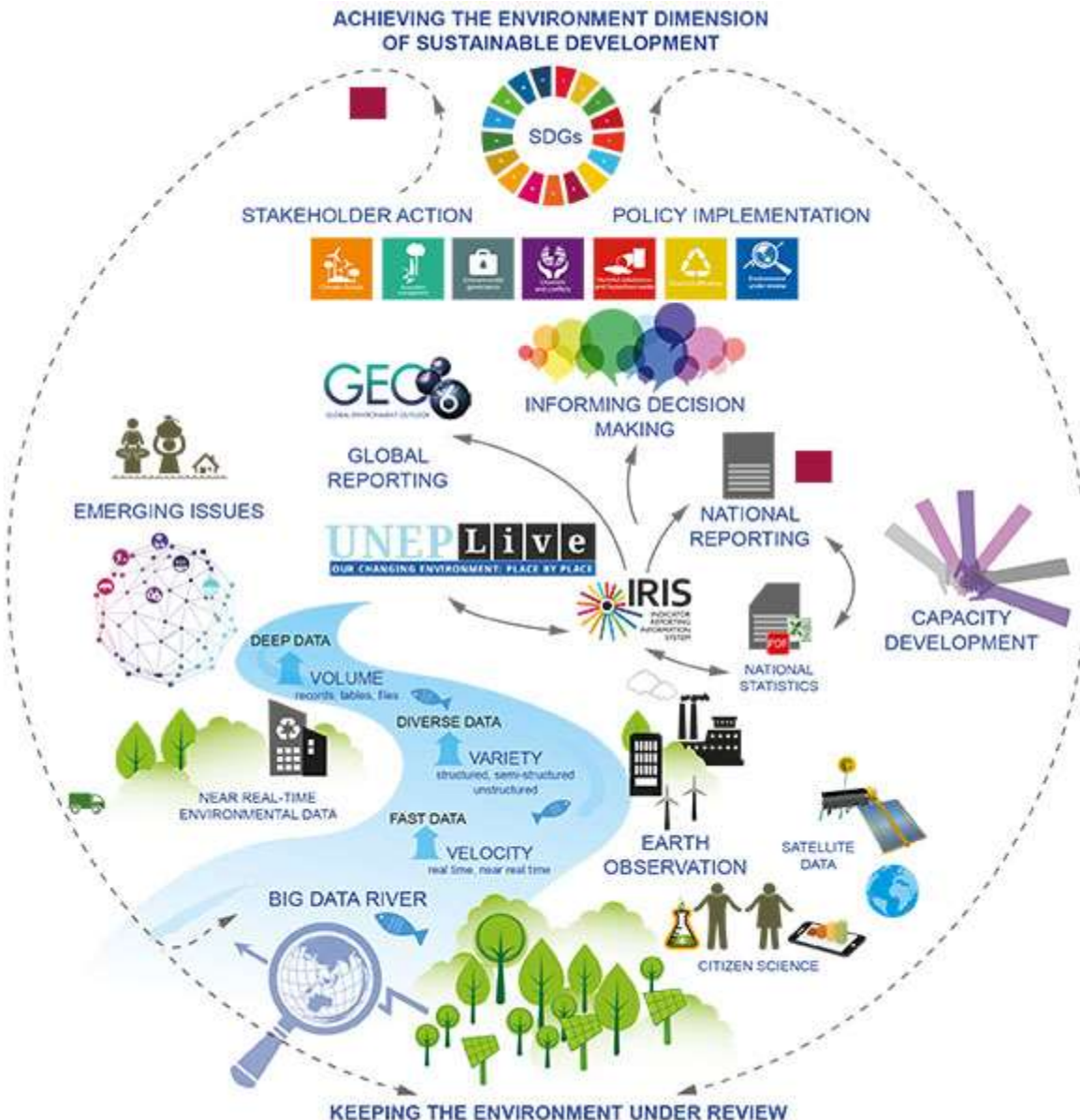
To effectively address environmental challenges, they must be well understood. To help facilitate the sharing of knowledge on the environment, it is needed to engage stakeholders in order to assess environmental trends to inform policy action. The many issues the planet faces today range from how to sustainably manage dry land areas to understanding the source and scale of marine litter in the deep sea.

One of main goals of GEB project is to empower stakeholders to implement the environmental dimension of sustainable development by providing data and information that brings clarity and transparency to the main concerns facing the planet. The Global Environment Outlook, UN Environment's major integrated environmental assessment report series, and tracking of the Sustainable Development Goals indicators play a central role. Through clear assessment of the environment, governments, non-governmental organizations, and the general public are better informed about the issues the environment is facing today, the success and failures in addressing these issues, and most importantly, provide options for action to make sure that the problems of today will have solutions by tomorrow.

This is powerful information that can inform the development of robust environmental policies and help in achieving the goals of the 2030 Agenda on Sustainable Development.

In order to keep the environment under review, GEB project aims to bridge the gap between the producers and users of environmental information, empowering policymakers and other stakeholders to act on the latest science. The Global Environment Outlook Report of UN Environment Program is a series of assessments that provide a comprehensive picture of how the environment affects human well-being. The sixth Global Environment Outlook (GEO-6) sets the stage for implementation of the 2030 Sustainable Development Agenda and will help shape national, regional, and global efforts to achieve the Sustainable Development Goals.





In a historic move in September 2015, 193 UN Member States adopted the 2030 Agenda for Sustainable Development, including the 17 Sustainable Development Goals (SDGs). The success of the 2030 Agenda domestically will require a clear institutional apparatus to lead the coordination and facilitate the implementation and monitoring of the SDGs. Ensuring a vibrant institutional framework will be critical for a country to ascertain whether the SDGs can successfully be mainstreamed into national and sub-national policies and integrated across sectors. Lack of institutional clarity, roles and responsibilities among governmental agencies engaged in the 2030 Agenda may challenge its implementation. While national political commitment and leadership are key, given the governance structures of most countries, responsibility for actual implementation lies with local institutions. This is not new and has been the challenge that many countries have faced as they work to achieve global agendas such as the

Millennium Development Goals (MDGs) and the climate change commitments when there is a decoupling of national vision and strategies with local actions and priorities. For instance, in some countries, while reducing maternal mortality was a broad unambiguously stated national priority, budget allocation at local levels did not follow the same prioritization. The large scope of the SDGs, with new areas and various cross-cutting issues, will require institutional collaboration, innovation and incentive systems that facilitate action and accountability across sectors as well as across government levels. Some countries already have institutional and coordination structures and are adapting them to effectively support SDG implementation. Others are establishing new institutional and coordination frameworks to better support SDG implementation.

## **1. Environmental Information and Their Sources in Pakistan**

Like any other country, environmental data and information play a key role in the preparation and implementation of plans, programmes and projects in Pakistan not only by the government but also by the private sector, multilateral organizations as well as NGOs and other interest groups. They also serve as a tool in monitoring and enforcing compliance with regulations/standards and environmental policies. While providing an important instrument for policy integration, they also assist in informed decision making. Consequently, it has become imperative to deliver essential and reliable information on priority environmental issues to decision makers, and ability to harmonize with international standards and classifications. This handbook has therefore, been designed to develop an efficient system of data and information on environment that could meet the growing demand of various governmental agencies, environmentalists and general public for data on various aspects of environment in Pakistan. In order to improve environmental statistical system and information the Government of Pakistan has launched a three pronged strategy under its National Environmental Information Management System (NEIMS) project to streamline the development of a national compendium of environmental statistics, provincial/regional environmental profiles and the national state of environment reports on a regular basis. Some important issues here are that what should be the contents of these three entities, how they should be organized and what framework should be followed therein. In this connection, the compendium is usually defined as a well-organized compilation of statistics, tables, and charts, accompanied by brief explanatory notes on the information. State of the Environment (SOE) report on the other hand is a textual or narrative interpretation of environmental information. It attempts to give explanation of environmental problems, the reason for their occurrence and what is being done about these. The compendium and the SOE are different publications. —The compendium is a simple characterization while the SOE is 80 percent explanation and 20 percent data. In contrast, the Provincial/Regional Profile is to provide an outline of environmental information related to a Province/Region. It should include the statistical information and explanatory notes and also highlight significant environmental problems of the Province or region which may vary for example in Khyber



Pakhtoonkhwa and Northern Areas problems related to mountains and glaciers may be more important whereas for Sind and Baluchistan problems of marine environment may be more significant. Production of all three types of documents mentioned above, demand development of an information system, whereby data is collected, compiled, processed and analyzed for appropriate interpretation in the relevant document.

A study commissioned by the Government of Pakistan on National Environmental Sustainable Indicators has proposed ninety two core indicators (NEC Consultants, 2008). . Unlike primary and analyzed data that may be organized according to media or economic sector, indicators preferably need to be organized by environmental issue. This is where a framework is needed to classify the indicators according to some logical structure of driving force or cause or pressure, effect (impact and state), and remedy (Response), which forms the basis for the preparation of the State of the Environment reports. For example, the pressure on the environment is caused by the application of pesticides and one result of this is an impact on the levels of pesticides in groundwater. In this case the primary state indicators are the levels of chemical residues in groundwater. These are monitored by measurement against agreed quality standards. The response to increasing levels of chemical residues in groundwater is to use the financial instrument of taxation to modify the levels of pesticide use that are responsible for the pressure (Hardi & Pinter 1995). The framework is also helpful in distinguishing among different types of indicators in terms of their usefulness at different stages of the decision making process. State indicators for example, can help in the identification of problem and pressure indicators provide the causal relationships while response indicators assist in analyzing the adequacy of response and are helpful in policy evaluation. The ninety two core indicators proposed for Pakistan in various themes under Pressure-State-Impact-Response framework.

The database and information system development, which is a major task of National Environmental Information System (NEIMS), is necessary to support the preparation and updating the three documents mentioned earlier i.e. Compendium of Environmental Statistics, Provincial/ Regional Profiles and the State of the Environment Reports.

The main objectives of this database/ information system are:

- a) Generation, rationalization, harmonization and integration of standardized data and information to support the production of the three documents
- b) Incorporation of means to access and the use of existing data derived from many different sources and disciplines into a rational system.
- c) Development and use of a core or critical data-set and indicators for use in the above documents

- d) Use of indicators, assessment methodologies and tools to enhance capacities at the national and provincial/regional level and where necessary, at the local level

## **2. State of the Environment Report**

The need for issuing periodic state of the environment reports has been globally recognized at both national and international levels.

### **2.1. International Recognition of SoE Need:**

The Rio Declaration in its principle 10 points towards the responsibility of the government to inform the citizens of the state of environment at different levels, adoption of participatory approach and the process of informed decision making. Some other principles of Rio Declaration indicate the broad areas of policy and programmes, which among others should form the substance of the report. In consonance with Rio Principles, Agenda 21 (UNDESA, 1992) also highlights the need for periodic assessment of the state of environment at national, regional and global levels. This assessment is particularly crucial to the needs and work of the United Nations Commission on Sustainable Development, the main function of which is to monitor the progress in the implementation of Agenda 21. Agenda 21 also calls for enhancing the understanding of the changing environmental conditions and the human dimension of the causes and consequences of environmental change, which falls within the scope of SoE. National Requirements: Besides the Rio Declaration and Agenda 21, Pakistan Environmental Protection Act 1997 (GOP, 1997).....under clause (6d) the functions of Federal EPA mentions that it will “*Prepare and publish an annual National Environment Report on the state of the environment*”. While under clause (4f) the functions of Environmental Protection Council mentions that it will “*consider the National Environment Report and give appropriate directions thereon*”.

### **2.2. Objectives of the State of Environment Report:**

A state of the environment report fundamentally discusses: the status and trend in the quality of the natural resources and environment

- The relationship between the status and change in environmental quality and human
- Activities society’s response to these changes
- Issues which reflect environmental policy challenges

The state of environment report is therefore much more than a purely scientific study, an explanation or, as may be the case with some governmental reports, a justification for governmental policies. Nor it is a prescription for the maladies of the future. It is primarily a comprehensive document prepared with the best available tools to be used by the decision

makers, the scientists as well as the public and produced, among others, with the following objectives in view:

- a. To inform the public, Government and the concerned organizations about the state of environment in respect of both the prevailing human condition and the status of the natural resources in a consistent and comprehensive manner
- b. To provide information, on the basis of empirical evidence, on the various stresses placed on the human condition and the natural resource base;
- c. To assist in the process of informed planning by presenting information in a comprehensive and easily understandable framework that facilitates analyses of cause – effect relationships and forms the basis for policies, strategies and action plans;
- d. To illustrate and review environmental policies, strategies and action plans undertaken at the national, and where applicable, at sub-regional and regional levels including the economic, social, institutional and technological aspects;
- e. To indicate, as far as practicable, gaps in the present state of knowledge and information, and the need for new information as well as well as for investment on research and development for improving the data base.
- f. To improve public understanding about the state of the environment in order to encourage a better informed public debate and to strengthen the role of major groups including business and industry.
- g. To promote precautionary approach in the implementation of environmental policies and programmes.

It may also be stated here that a state of the environment report may turn out to be an exercise in futility if its credibility comes under question. Currently, although important, environment may not be a significant factor in the political process. However, with increasing awareness of its being a determinant of quality of life, it will gain in importance in the context of politically significant issues, which could create the possibility of emergence of a credibility gap between what is stated in the report and the commonly perceived situation. It is, therefore, important that a state of the environment report reflects national consensus. In summary the characteristics of SoE report are that it should respond to fundamental questions relating to sustainable development, facilitate policy formulation and decision making and reflect national consensus. Framework and Format: Although there is some variation in the formats of SoE reports, basically the most widely accepted framework for state of environment reporting is the Pressure-State-Response (PSR) framework. Human activities exert Pressure or Stress (Pressure box) on the environment and change its quality or status (State box). Society responds to these changes

through environmental, general, economic and sectoral policies (the societal response box). The nomenclature driving force – state – response is also used instead of Pressure – State – Response.

## **Key Environmental Issues and Challenges**

In recent years Pakistan has experienced impressive real GDP growth accompanied by a sharp decline in poverty. However, human wellbeing is critically dependent on the continued availability of essential ecological services and natural resources. Pakistan's environment and natural resources are increasingly polluted and under stress. Pressing environmental concerns facing the country relate broadly to the management of scarce natural resources (green issues), pollution and waste management (brown) and issues pertaining to the potential vulnerabilities to natural hazards and climate change. Pakistan's natural resources are increasingly under stress due to a rapid population growth and environmentally unsustainable practices. Renewable fresh water resources are fast depleting pushing Pakistan into the category of water stressed countries. Freshwater flows in Pakistan's rivers have been substantially reduced by water diversion for agricultural irrigation in recent decades. Canal irrigation, due to low levels of efficiency has resulted in salinization, thus adversely affecting crop yields. An excessive and improper use of pesticides is destroying the natural biotic balance in agriculture soils and reducing the diversity of invertebrate fauna. The reported decline in the area under the natural forest cover has implications for essential ecological services, irrigation, and for biodiversity. Mangroves, the traditional breeding grounds for commercially important sea life, have also declined. Similarly, Pakistan's arid and semi-arid rangelands are extensively degraded, due to large increase in livestock grazing. The trends and prospects for the future vary greatly depending on climatic conditions and social responses. Pollution due to a lack of effective management has emerged as a major environmental concern in Pakistan. Over the years Pakistan's growing energy consumption needs have resulted in its increased reliance on the imported fossil fuels. Its progress towards energy efficiency has been modest due to weak technical and institutional capacities. Measures such as conversion of vehicles to cleaner fuels (CNG), no lead gasoline and low sulphur diesel have been implemented but remain insufficient to prevent deteriorating in ambient air quality in the urban areas due to increasing vehicle numbers and their hazardous emissions. Indoor air pollution is a major cause of widespread chronic bronchitis and other respiratory infections in rural households and poor urban households that depend on biomass for cooking particularly in winters. Industrial discharges (of toxic and persistent pollutants) are contaminating some of the country's best soils and water resources. Solid waste dumped on low-lying land or burnt pollutes groundwater or generates dust and carcinogenic pollutants with adverse health implications. The disposal of untreated urban sewage is contaminating fresh water sources for downstream users. Poor sanitation and hygiene and lack of access to safe drinking water supply are contributory factors to high rate of diseases such as diarrhea in the country. Pakistan also faces environmental challenges from natural hazards including floods, earthquakes, droughts, and cyclones. Pakistan is a flood prone country, while earthquakes and droughts are recurring phenomena in susceptible regions. Cyclones cause significant damage in the coastal



areas as well as destroy standing crops several hundred kilometers inland. Additional environment challenges due to climate change are expected to directly impact on Pakistan's economy. A rise in temperatures can cause more droughts and reduce crop productivity while increased flooding can damage irrigation infrastructure.

## **1. Policy and Institutional Framework**

Pakistan's overall macro policy framework takes into account environmental considerations to an extent by setting targets as well as allocating resources for environmental programs. Sector-specific policies generally do not accord due consideration to the environmental implications of the development projects. Despite a fairly adequate environmental legislation (Pakistan Environment Protection Act, 1997) and related policy frameworks together with supporting institutional mechanisms in Pakistan, there are various policy, legislative and institutional gaps. The environment impact assessment (EIA) guidelines are not adequate to ensure effective appraisal of large infrastructure projects such as dams and mega water projects. A major challenge associated with the large infrastructure projects would be to address resettlement and compensation issues in the absence a resettlement policy. It is critical that the existing environmental legislation be reviewed and updated to align with the new growth and development strategy. Effective enforcement of environment rules and regulation requires delegation of necessary authority to the public institutions such as Environment Protection Agency (EPA) both at federal and provincial levels and more importantly building up their environment management capacity

## **2. Key Priorities for Action**

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

### **i. Access to basic sanitation and safe water for all**

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

## **ii. Achieving energy efficiency**

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

## **iii. Checking urban air pollution**

Urban air quality can be improved through reduction in vehicular emissions by developing national and city specific transport polices for improved traffic management, implementation of emission control regulations and monitoring. The iii implementation capacities of federal and provincial agencies need to be strengthened for operational enforcement of environmental quality standards (NEQS).

## **iv. Improving agriculture productivity**

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

## **v. Public-private partnerships for cleaner production and the treatment of industrial effluents**

Successful experience of selected industries in promoting cleaner production and effluent treatment needs to be scaled up and underscores the need for building public sector support to private sector-driven initiatives. High-priority measures should include demonstrating the economic returns to cleaner production as well as above mentioned operationalization of NEQS. In addition, investment is required for institutional development and organizational strengthening and human capacity in the priority environment areas to fill existing gaps.

# **3. Current Status of Data Availability and their Shortcomings in existing system**

A large number of governmental and Semi-governmental organizations as well as NGOs are involved in the collection, compilation, storage, dissemination and analysis of environment and environment-related sectoral information and data in Pakistan. Examples of such data are those on land-use which are usually collected by the Ministry of Food, Agriculture and Livestock,

which also maintains data on fertilizer and pesticide use. Data and information on land degradation is maintained by several organizations, such as Soil Conservation Departments, Soil Survey of Pakistan as well as Agriculture and Irrigation departments. Water resources related information is compiled by Ministries or Departments responsible for development of water resources. Statistics on forests, flora and fauna is the responsibility of Inspector General of Forest and Provincial Forest Departments, which also have detailed statistics on protected areas. The data on marine environment is maintained by several organizations depending on the scope of the information, for example oceanographic data is compiled by the National Institute of Oceanography, Maritime Security Agency as well as port authorities and harbor departments. Information on marine fisheries is usually the responsibility of Department of Fisheries while marine pollution aspects are covered by Environment Protection Agencies. Published environment related information in Pakistan comes primarily from Government Departments particularly the Ministry of Environment, and Environmental Protection Agencies. In addition a vast spectrum of areas such as atmosphere, water, land use, energy, flora and fauna, biodiversity, streams flow, glaciers and natural hazards are covered by other government departments. Moreover, environmental research organizations and researchers are also important contributors. Among research organizations again Governmental research organizations like Pakistan Council for Research in Water Resources, National Wildlife Council, Hydrocarbon Research Institute and Pakistan Agricultural Research Council provide some examples of research organizations, which generate useful environmental information and data within their own sphere. NGOs are also making important contribution to environmental data and information. In this connection publication of Provincial Conservation Strategies and in some cases provincial State of Environment reports of IUCN in Pakistan are very important contributions to environmental information at the provincial level. Environmental data collection process in human settlements is somewhat more complicated where several management agencies are involved on the same or different aspects. These agencies include land survey, land records and public health departments, municipalities, public works departments, development authorities, civic organizations and NGOs. Moreover, in most cases ad hoc specific surveys are the basis for assessing the gravity of environmental pollution. These surveys primarily concerning air or water pollution in urban centers, record data at a few selected stations and may have been collected by the EPAs, universities or research organizations. In the national, provincial or local context, the data compiled by each agency varies according to its own policies and objectives. There is also a variation in definitions and classification even on the same sectoral aspects when data and information is collected by two different government agencies. For example there is a considerable variation in land use data of land revenue department and that of Space and Upper Atmosphere Research Commission (SUPARCO). One is assembled from revenue records and the other is extracted from satellite images. Moreover, the methods and procedure for measurements of data are not the same creating discrepancies in the final information collected. In case of ad hoc surveys on pollution for example, no attempt is made to compute an aggregate index. So far not much progress has been made in the country on developing standardized

concepts, definitions and classifications for statistical variables that describe environmental issues and can be compiled by a central agency. Much work also remains to be done in promoting regular collection and processing of data in an integrated manner, and for analyzing the data needs of users in the field of environment. Although a large number of sectoral data are collected regularly as specified above it is rare that those data are coordinated, and standardized for publication in the form of aggregate environmental compendium. Hopefully, the ongoing efforts under NEIMS project of the Ministry of Environment will lead to the standardization and promote coordination among various government agencies in the development of national environmental data base and information system.

#### **4. Compendium of Environmental Statistics**

Compared with social, demographic, and economic statistics, the development of environment statistics in Pakistan is still in its infancy. The first Compendium on Environment Statistics was prepared in 1998 under the Technical Assistance of Asian Development Bank. It was revised in 2004 (GoP, 2005). No doubt it is a very good initial effort but still much of the data in the compendium is in the form of primary or raw data and it has no information on indices and little information on the indicators identified in the study commissioned by the Ministry of Environment (NEC Consultant, 2008). In addition the Compendium needs to have a balanced coverage of physical environment media (e.g., land, air, water), biological media (e.g., biodiversity), and economic sector (e.g., human settlements, industry, energy) to show trends more readily. Much of the information presented in the compendium is on demographic and socioeconomic indicators. The coverage of biological indicators of water quality, and water pollution in rivers and heavy metal levels in lakes is poor; no data on marine pollutants originating from the coast; little data on pesticide use on arable and crop land; and gaps in air quality data concerning estimates of national carbon monoxide and hydrocarbon emissions, lead emissions, CFC usage, and urban air quality. Data on population exposure to noise from traffic, airports, and other sources are deficient. Wastewater treatment information is also needed to give the number of households connected to sewage schemes, capacity of treatment systems, and degree of treatment prior to disposal. Chemicals and hazardous waste data are missing in terms of specifying volumes and sources (household, industrial, construction sites etc). Data on ecosystems and biodiversity are also sparse. Organization of the Contents: It is important to organize the contents of compendium of environmental statistics into essentially three parts. Part I should be a summary of important ecological indices (to be developed if not already developed) as well as selected environment indicators. As stated earlier 92 indicators have already been proposed by the study commissioned by the Ministry of Environment (NEC Consultant, 2008). Part 2 should be a compilation, with brief explanatory notes, of core environment indicators and statistics so arranged that they show a logical matrix of cause, effect, and remedy (as has been explained in the Pressure- state-response framework PSR format of the SOE given in the section of SoE) and further organized under headings identifying key environment issues. The environment issues may, in turn, be grouped according to physical environment media (e.g.,

land, air, water), biological media (e.g., natural and agricultural biodiversity), or economic sector (e.g., human settlements, industry, energy) to show trends more readily. Much of the information should be presented in the form of charts or diagrams. Part 3 can include a compilation of supporting statistics mostly in tabular form (e.g., resource and environment physical account). For now, core indicators will have to be identified or developed in a supply-driven fashion, i.e., relying on whatever data are available to develop the indicators. As such, the indicators may not yet adequately reflect the nature of the environment issue or management objective that such indicators are supposed to show over time. Nevertheless, a more demand-driven approach may evolve, whereby data collection becomes tailored to supply information for the key indicator. Part 3 can include a compilation of supporting statistics mostly in tabular form (e.g. tables showing environmental interactions and resource and environment physical account).

### **i. Physical Environment Land-Related Issues**

The first level of data reflecting land-related problems concerns land use. Land use describes the utilization of land for crops, pastures, forests and woodlands, wasteland and wilderness areas. Although the data on pastures and cropland are available, no data exist for wilderness areas in Pakistan. This lack prevents assessing the current situation properly, especially considering the loss of habitat for its precious species as a problem and also about soil erosion due to inappropriate land use. Land degradation is observed to be a major problem in Pakistan therefore data on land quality assumes special importance here. A good parameter for judging the trend in land quality is land or soil capability. It is recommended that data on land productivity be collected and included in the compendium as well as provincial environmental profiles. To understand or predict the changes taking place in land use, data on the movement of population are very important. However, such data are not available in Pakistan and may be included in future in the population census. In terms of interrelationships this section should also have data on agriculture i.e information on area under principal crops; performance of crop production; use of agricultural inputs; consumption of pesticides province/ region wise and their effect on soil. There should also be a section on natural disasters providing information on frequently occurring natural disasters; recent natural disasters in Pakistan; major earthquakes; number of drought-prone districts and damages due to droughts. Information on mining should also be included giving data on number of mines, production of minerals, mining machinery and consumption of explosives in mining.

### **ii. Water-Related Issues**

Foremost on the list of water-related issues is the availability of potable water. Satisfactory data for total availability of renewable water resources and water withdrawal rates should be made available sector wise. Data on surface water quality and quantity be given; the presence of coli form in water is a well-accepted index that should also be included. Data on groundwater consumption need to be generated in the light of acknowledged problems such as the lowering of



water tables, land subsidence, and saltwater intrusion. Among related statistics information on rainfall performance during the last 20 years; and its relationship to water flow in streams and ground water resources may be included. Because most urban sewage is being dumped into the sea and in view of the occurrence of oil spills, data on marine pollution are important to relate it to the carrying capacity of coastal water. Natural disasters like floods and cyclones are common and need to be cited as major environmental concerns. A record of the time and types of disasters and, more often than not, the number of deaths caused by water related natural disasters (though the accuracy of the data is not always ensured) is important along with the number of people injured and affected. Without these data, it is difficult to estimate the extent of success in protecting people against such natural disasters.

### **iii. Biological Environment**

The Section on Biodiversity should be divided into three sections - flora, forests and fauna. The section on flora should include statistics on plant species of Pakistan and the Provinces/regions, those which are rare, vulnerable, endangered and extinct. It should also have tables on measure undertaken for the conservation and protection of flora like the establishment of protected areas such as Biosphere Reserves, Botanical Gardens and Gene Banks etc. Information on agro biodiversity should also be added. The section on forests should give information on percentage of forest area to total geographic area (province-wise). Deforestation is a major problem faced by Pakistan. Fortunately, area under forest is monitored regularly in the country. Good data exist for productive forest areas and fuel wood production. Data on average annual reforestation are also maintained; however, data on forest quality are not easily available. Areas classified as forest area may be already degraded forest and some indication of the quality of the forest is necessary. Some indices also have to be devised for assessing the condition of the mangrove swamps, coral reefs, and sea grasses. The data sets on fauna or wildlife (large animals) should include the major bio-geographic habitats in Pakistan, estimated number of species in various regions, national parks and wildlife sanctuaries and reserves. Habitat loss is not well recorded. The data on the factors that threaten wildlife are also needed. Figures on trade in mammal skin are important for the same reason. It is also important to collect data on trade involving wildlife, which includes trade in live primates and reptiles, mammal skin, and Hobara Bustard. However, wildlife in forests does not consist of just large animals. Data on other forms of wildlife like plants and their diversity, insect habitants and so on, as well as on ecology are needed.

### **iv. Atmospheric Data**

The data on atmosphere needs to be divided into four sections. The first section on ambient air quality should give the air quality data in major cities and compare these to the standards and may relate this to impact on human health. Air quality data are still difficult to obtain and it is desirable that gaps be filled soon. In addition, worldwide estimates of emissions are of uneven quality. The problem is further aggravated by the fact that data are often collected and analyzed

on an ad hoc basis. The next section on Noise should give information on the ambient noise standards; average noise levels in various metropolitan cities and effects of noise pollution on human health. The following section should be on the greenhouse gases giving information on the key greenhouse gases and the share of Pakistan in global green house emission. In order to derive interrelationships, between energy, industry and greenhouse gas emissions, it will be appropriate to include here a section on energy and industry to give information on installed capacity of utilities; electricity generation and actual power supply position, different fuels consumption in Pakistan and their production as well as statistics on renewable energy resources. On industries, it will be useful to give information on the number of registered industrial establishments in Pakistan and the status of pollution control in various categories of industries.

#### **v. Socio - Economic Indicators and Data**

Population-related data are essential to assess the existing and predicted pressures that will be exerted on the environment. Although the collection of environment statistics is a relatively new task for nations, the collection of socioeconomic information has a much longer history. Basic demographic data have been collected through population census. . Hence, it does not come as a surprise that complete data exist for population growth; labor force distribution of the population by age; birth and death rates; life expectancy; fertility rate; infant, child, and maternal mortality rates, and so on. It would be important to compare infant mortality rate and expectation of life at birth with safe water supply and sanitation. Environmental degradation is often closely related to the deterioration of human health. Hence, health statistics form an important part of environment statistics. Accessibility of the basic infrastructure facilities is another aspect of environment statistics that should not be underrated. Lack of a proper sanitation system leads to water pollution; therefore, countries will need to collect data on health and access to infrastructure facilities. The current status of health and infrastructure statistics shows that much needs to be improved on this front. Information on the percentage of the population with access to health services and records on people affected by major diseases like malaria and cholera are also needed and adequately maintained. In terms of human settlements it would be important to include information on housing, slums and basic facilities, number of households, their size, number of rooms per housing unit, water supply system and toilet installation by rural and urban, and homeless population. Pakistan faces the problem of energy shortage, and it is looking for more efficient ways to produce and consume energy. Such problems can be studied from the available data on production, consumption, and trade of energy, but time series data are not available. The most crucial energy problem faced by the country is the accelerated use of nonrenewable fossil fuels. To address this concern, data on coal and oil reserves are needed. The production of uranium and nuclear energy might be very small for some of the countries, but no information on uranium is available. Pakistan does not have data on a nuclear reactor under construction either. For the rural areas, the principal energy source is biomass based fuels. It is observed that some data are available on the shortage of fuel wood, which is indicative of the

seriousness of the problem. However, systematic data collection on sources of fuel wood and their trends is not done. Such data will be useful for analyzing the fuel shortage problem. Waste disposal is becoming a major problem for Pakistan. However, data on waste generation is sketchy. For example, no data on annual municipal waste or industrial waste generation is collected on regular basis. Likewise data for hazardous waste are not maintained. Although, the disposal of hazardous waste is a more difficult task, but data on the generation of other waste is also very important as it will give some idea of the size of the problem of waste generation and disposal.

## **vi. Framework of the Compendium**

The contents and framework of the compendium should be continuously refined to accommodate contemporary issues and concerns. For example, the present compendium on Environmental Statistics of Pakistan has four sections – socio economic activities and natural events, environmental impacts of socio economic activities and natural events, responses to environmental impacts and inventories, stocks and background conditions. In name the various heading refers to pressure-state-Impact-response framework but the themes included within this framework do not fit them. For example, the response section describes climate, temperature, rainfall, pressure and wind, which is state and not response. Response actually is policies and strategies, laws, regulations, environmental expenditures, institutional aspects etc. Similarly, the Impact Section includes themes like population growth etc. which are to be included under pressure rather than impacts. The framework and thematic coverage therefore needs completed revision. A possible format is suggested in annexure 2. Based on indicator's study some of the possible tables that could be added to the compendium are given in the second section of this Handbook. In terms of overall qualitative assessment of the data on core environment statistics presented in the compendium of environmental statistics of Pakistan, the criteria for evaluation are mainly depth and specificity of coverage. The presentation of data related to the atmospheric environment clearly shows that inventories of greenhouse gases are missing and ozone-depleting substances have not been presented in any detail. Water availability is the most crucial problem of the country, but the data have not been presented in an adequate manner - in terms of either availability across sources or demand across sectors. Data related to forests is also scanty. Rate of deforestation is not presented. The data on number of species, endangered species, etc., are not adequately presented. Coastal and marine problems have not provided any data related to either pressure factors or status. Basic data related to the very important urban problem of sanitation has not been reported. Data related to municipal solid waste disposal have not been presented. In the case of all four areas of core environment statistics—atmospheric, aquatic, terrestrial, and urban environment—wherever data presentation is inadequate, it is not clear from the compendiums whether data do not exist or whether there were problems in accessing the data. It is therefore suggested that while improvements are incorporated in the compendium, it will also help if NEIMS project could start publishing missing data and information on individual themes

of vital importance to the country such as Forests and Biodiversity, Climate Change and Energy, Land Resources, Glaciers and Water Resources and solid waste etc.

**Chapter-3****Environmental Management in Pakistan**

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

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

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

**1. Key Stakeholders in the Environment Sector**

The four main categories of stakeholders for environment sector in Pakistan's are (i) government, (ii) private sector, (iii) civil society, and (iv) household. The most influential stakeholders within the government are finance, economic, and development policy institutions, particularly economic coordination committees, and project approval forums, such as central or provincial development working parties. Their decisions on resource allocation, pricing, and mega-projects have an enormous impact on the environment. Federal ministries and provincial departments with sector-specific mandates are also influential in such decision making. Less effective are ministries and departments assigned supportive, thematic, or coordination roles,



such as the Ministry of Environment. Among the least influential are agencies with direct responsibility for environmental management, including the federal and provincial environmental protection agencies. As noted above, the superior judiciary has begun to take an interest in environmental matters. Appendix 2 lists the salient apex institutions concerned with the environment. 98. The way in which line departments, corporate bodies, and the private sector operate also has a significant impact on the environment and on the health of a country's citizens. Most public departments, for instance, focus on new projects at the expense of maintenance. On the other hand, the rural support programs that were initiated in Pakistan in the 1990s, and are now operating in almost every district, seek active community participation in development and maintenance. Some multinational and national corporations and their industrial units have strong environmental codes and effective pollution abatement practices: Bristol-Myers-Squibb has installed a modern waste treatment plant at its factory in Korangi, Karachi, that treats waste to standards beyond those required by the NEQS. Other corporations merely pay lip service to good practices, most ignore the environmental consequences of their actions, and yet others are deliberately neglectful. Leadership, organizational culture, sector-wide practices, and economic incentives and disincentives are some of the factors that account for these differences. 99. As demonstrated by the overwhelming response to the 2005 earthquake, civil society organizations are active all over Pakistan. Most are local, informal, and unregistered, but more than 50,000 NGOs are registered under different legislative acts. Most NGOs are welfare organizations, while a minority is oriented around the concept of participatory development focusing on education, health, social welfare, human rights, gender, and democracy. A few have explicit missions, such as environmentally sustainable development or rights-based advocacy. There are a dozen or so apex environmental NGOs in Pakistan. 100. Apart from NGO activities, a substantial number of community-based organizations have partnered with donor-funded environmental projects, created community-level awareness of environmental issues, and implemented commendable pilot projects in forestry, solid waste management, agriculture, irrigation, small physical infrastructure development, and other related sectors.

## **1.1. Governmental Institutions**

Natural resources are managed at different levels of government in accordance with their placement in the federal and provincial jurisdiction in Pakistan. The provinces have delegated some responsibilities to local bodies and other provincial agencies. Each department and agency patrols its sector boundaries.

### **1.1.1. Governmental Institutions at Federal Level (Historical Overview)**

There has been a dramatic increase in the world's awareness of its worsening environmental problems since the United Nations Conference on the Human Environment held in 1972 in Stockholm, Sweden.<sup>7</sup> The conference is a major landmark in the efforts of nations to collectively protect their life and support base on the earth. This increased awareness was a result of an

improved understanding of the importance of natural resources to sustain and continue development. It declared environmental protection as a common concern of the entire mankind. As a result, environmentalism has become a universal phenomenon, which has led to the birth of thousands of environmental organizations. In Pakistan, the reaction to the world's growing understanding of environmental issues included the establishment of the Environment and Urban Affairs Division (EUAD) in 1974 within the Ministry of Housing and Works.<sup>8</sup> EUAD has responsibility for national environmental policy formulation and for administration of national environmental impact assessment procedures, which it mainly undertook through limited review of federal projects and is reported to Ministry of Environment. In 1983, Pakistan Environment Protection Council (PEPC) and Pakistan Environment Agency (PEA) were established, while Provincial Protection Agencies (PPA) were planned in 1984 and established in 1987.<sup>9</sup> Since then many institutional policy and regulatory developments have taken place at the federal and provincial levels. It also includes creation of the Ministry of Environment. The PEPC was created with responsibility for control of pollution and preservation of the living environment. PEPC consists of the President as Chairman but in 1994 an amendment was made in the ordinance to provide for the Prime Minister or his nominee to be the head of the council. The council was reconstituted after enactment of Pakistan Environment Act 1997. PEPC is an apex statutory body. The Chief Executive is the chairperson of the council and the Federal Minister for Environment, local government and rural development as its vice chairperson and governors of all the provinces are its members besides others. The council is represented by trade and industry, leading NGOs, educational institutions, experts, journalist and concerned ministries.<sup>10</sup> A National Conservation Strategy (NCS) was developed in response to the World Conservation Strategy (WCS) launched by International Union for Conservation of Nature and Natural Resources (IUCN) in 1980 and formulated in 1992. The NCS emerged after almost a decade of discussion and analysis, and has served as the de facto environmental policy of Pakistan, which describes the environmental situation existing in Pakistan and recommends actions in order to redress the aggravating environmental degradation to facilitate sustainable utilization of natural resources. Government announced National Environmental Quality Standard (NEQS) in August 1993 to be applicable to all new industrial units to adopt more environmental friendly inputs and machinery in the industrial processing.<sup>11</sup> NEQS is aimed to specify upper and lower permissible limits for industrial effluent and emissions. It is also applicable to municipal discharge from the sewerage. NEQS has been provided the legal cover through Pakistan Environmental Protection Act, 1997 to control over industrial pollution in the country. The government has also committed itself to achieve Millennium Development Goals (MDGs) as adopted by the UN member states in the year 2000. Each of the goals has a number of targets which are measured by several indicators. For example the MDG target for "land area to be protected for the conservation of wildlife" is 12 percent by 2015. Pakistan already has 11.3 percent of its area under protection for conservation of wildlife. Thus, it is very likely that this target can be met, to enhance in terms of quality and quantity, by 2015.<sup>12</sup> The MDG target for forest cover is 5.7 percent by 2011 and to 6 percent by the year 2015.<sup>13</sup> In Feb. 2001, the National Environmental Action Plan (NEAP) was

approved to follow the strategy of NCS, which narrows the government's policy focus on the environment to four core programs: clean air, clean water, waste management and ecosystem management. A comprehensive program has been launched to support implementation of NEAP. The United Nations Development Program has been supporting the implementation of this initiative through the NEAP sporting program (NEAP-SP). In 2007 this program entered its second phase.<sup>14</sup> It proposes a wide range of technical, institutional regulatory, social and economic intervention in terms of different projects. These programs may strengthen the institutional and technical capacity of relevant government institutions. Despite the continued efforts to arrest environmental degradation, the quality of environment in the country continues to deteriorate resulting in pollution, land degradation, deforestation, water depletion and loss of biodiversity. The Mid Term Review (MTR) of NCS, undertaken in 2000, admits that achievements under NCS have been primarily awareness raising and institution building rather than actual improvement of environment and natural resources.<sup>15</sup> It is also noted that NCS influence on linkages to economic and social issues is limited and some key elements of sustainable development such as climate change, sustainable livelihoods, are missing in NCS. But NCS has contributed very significantly to the political economy of conservation and sustainable development in the country.<sup>16</sup> Furthermore, environmental challenges facing Pakistan have been amplified over the years owing to a number of factors including rapid increase in population, increased urbanization and growing poverty.<sup>17</sup> The population of Pakistan has experienced a rapid growth in the past. It was increased from 32.5 million in 1947 to 132.4 million in 1998, 142 million in 2001, and 159.2 million in 2004 and is expected to reach 228.8 million in 2025 and 295.0 million in 2050.<sup>18</sup> This fast population growth has led to environmental degradation of an irrevocable nature. Environmental degradation is fundamentally linked to poverty in Pakistan. It combined with a rapid increasing population and growing urbanization, is leading to intense pressure on the environment. Urbanization process has affected all parts of the country and all sizes of human settlement in one way or another but the intensity of impact are most critical in the large cities. There are indications that several large cities in Pakistan not only face the traditional environmental problems such as lack of sanitation, chronic shortage of services, polluted air and water, disappearing open spaces and recreational areas, traffic congestion but newly emerging problems are adversely taxing the capacity of the surrounding ecosystem to sustain the growing population. One major problem of urbanization in Pakistan is the eating up of cultivated area by concrete structure of ever expanding cities.<sup>19</sup> These factors called for comprehensive national environmental policy to handle the conditions emerged in the past. Therefore, The National Environmental Policy (2005-15) was prepared. The formulation of the policy was one of the major achievements during 2005-06. The policy aims to improve the quality of life of people of Pakistan through conservation, protection and improvement of the country's environment and effective cooperation among government agencies, civil society, private sector and other stakeholders. The country's first ever Environmental Policy addresses the sectoral issues such as (a) water management and conservation, (b) energy efficiency and renewable resources, (c) agriculture and livestock, (d)

forestry and plantation, (e) biodiversity and protected areas, (f) climate change, air quality and noise pollution (g) and waste management. The policy also addresses other cross-sectional issues such as (a) population and environment, (b) gender and environment, (c) health and environment, (d) trade and environment, (e) poverty and environment, (f) environment and local government.<sup>20</sup> To address the various challenges mentioned above the government is implementing various policies and programs; many of which have come out of the NEAP of the Ministry of Environment. Under the NEAP-SP, Green Industry Program was launched in the year 2006, for the promotion of Self Monitoring and Reporting, to make the industries responsible for systematic monitoring and reporting of their environmental performance.<sup>21</sup> Ministry also created the National Environmental Information Management System (NEIMS) to promote the national capacity for decision making in managing and utilizing environmental information under NEAP-SP.<sup>22</sup> The Poverty Reduction Strategy Paper two (PRSP-2) released in early 2009, while PRSP-1 was circulated in 2003 to recognize the linkages between environment and poverty, its targets include; integration of the principles of sustainable development into country policies and programs and reversing the loss of environmental resources.<sup>23</sup> Government of Pakistan has also declared 2009 as the National Year of Environment. It is encouraging to note that Pakistan's overall policy framework takes into account environmental consideration to an extent by setting targets as well as allocating resources for environmental programs.

### **1.1.2. Governmental Institutions at Provincial level**

Different government agencies and departments have been established to deal with various areas of environmental pollution. These agencies have the power to form expert advisory body, issue permits and license allowing companies or factories to pollute in a limited mandated manner.<sup>25</sup> The provincial institutions are concerned primarily with resource augmentation and conservation. The major natural resource management and protection responsibilities for forests, agriculture and water lie at the provincial level, even though these authorities are often overwhelmed by federal projects. The examples of these organizations are Water and Power Development Authority (WAPDA) of Pakistan, Geological Survey of Pakistan (GSP), Pakistan Forest Institute (PFI), Soil Conservation Department, Irrigation Department, Wildlife Department, Industry and Mineral Departments, Pakistan Agricultural Research Council (PARC) and Provincial Forestry and Livestock Departments etc. Many of these institutions carry out surveys, monitoring and research work of great relevance to environmental protection. Provincial Environmental Protection Agencies (EPAs) have also been established in all four provinces, which focus on industrial and urban pollution problems. EPA Punjab established in 1987 is very effective and has a large administrative and professional staff. EPA Sindh established in 1989, NWFP in 1992, and Baluchistan in 1995, AJK in 2005, and NA in 2007 can also mobilize the local resources, improve the local economy and promote sustained development. Environmental sections have been established in all planning and development departments of provincial governments, for environmental screening of the projects, as counterpart of PAKEPA which

include Capital Development Authority, Islamabad, City District Government, Lahore, Karachi, Quetta, Peshawar, Faisalabad, Sukkur, Rawalpindi and Multan.<sup>26</sup> In urban areas, environmental responsibilities rest with the provincial Public Health Engineering Departments, with industrial pollution control being the responsibility of the provincial EPAs. Municipal governments have responsibility for solid waste disposal and for sewage handling and treatment. Environmental institutions at local government level under Local Government Ordinance, 2001 were established. In this connection district environment offices have been established and most of the implementations of PEPA, 1997 have been devolved to local governments. The provincial governments, in exercising its responsibility for legislation and financing, must provide the requisite support to the local governments to deliver improved sanitation services.

## **1.2. Non-Governmental Institutions**

Governmental functionaries must shift from the government functionaries to people's institutions and local communities motivating and organizing them to promote self sustained growth without causing undue harm to the environment. The program of environmental safeguard is so vast in scope that it needs utilization of every available effort whether it is by a government functionary, local body, Nongovernmental Organizations (NGOs), or an ordinary citizen. NGOs have primarily been formed by citizens and independent activists who are motivated by their anxiety over environmental threats to the human species and other living being. Some experiences in Pakistan reveal that NGOs can be quite effective in slum up-gradation schemes within urban areas. In Pakistan the term NGOs became well known only in 1990s but existed in Pakistan since independence in 1947. Pakistan has thousands of small non-profit, NGOs. So, there is a wide range of NGOs working on different subjects in different parts of Pakistan, and they have an extremely important role to play in creating community organizations.<sup>27</sup> It is very difficult to estimate the number of NGOs working in Pakistan. Because NGOs can be registered under five different laws, with registration offices in different provinces and with a general lack of systematic updating, only rough estimates are possible. According to Planning and Development Division, about 8,500 NGOs are registered in the country. Approximately 6,000 of them come under the Voluntary Social Welfare Agencies Act. The remainders are registered under the Companies Ordinance, the Societies Registration Act, the Trust Act, or the Charitable Endowment Act. By province 50% were in Punjab, 39% in Sindh, 6% in NWFP, 3% in Baluchistan and 2% in others. Of the total, 70% were located in urban areas and 30% in rural areas.<sup>28</sup> In general NGOs are poorly developed and relatively ineffective in developing countries. Nevertheless, they have the ability to undertake many of the functions of government more effectively and efficiently such as in welfare field. However, environmental NGOs are not well developed in Pakistan, and lay important role in environmental management, but for permanent gains emphasis environmental advocacy is in their infancy. None of the national groups have yet established a strong advocacy capacity, although their membership comprises competent professionals. Still grassroots NGOs with a focus on environment and conservation



are active in various cities, small towns, and villages. Throughout the world, the conservation movement originated by NGOs and the implementation of conservation is directly related to the strength and viability of such groups. Environmental NGOs have two main functions: transmitting information to their members and acquaintances about the state of the earth and the threats to its health, and transmitting to the government the sense of popular concern about the quality of the environment and the health of the resource base. Environmental NGOs have also been a major source of innovative thinking about how resources should be managed and the environment protected. Thus they serve both as distant early warning systems and as a source of alternate development approaches that should be encouraged and facilitated. The NGOs are playing a vital part all over the world and a great deal has been done by such organizations in Pakistan, but still a lot has to be done in the environmental field.

## **2. National Environmental Institutions**

### **2.1. Pakistan Environmental Protection Agency (Pak-EPA)**

Pakistan Environmental Protection Agency was created with thin staff and meager resources under the 1983 Ordinance. This department is responsible for pollution control. After enactment of 1997 Act, the functions and responsibilities of the department enhanced and this department was strengthened technically and logistically to meet the environmental challenges. Pak-EPA also provide technical support to the Ministry of Environment.

### **2.2. Center for Energy Conservation (ENERCON)**

ENERCON was created in 1986 to serve all energy conservation activities, including policy formulation. ENERCON soon thereafter began its activities as the Government's implementing body for the National Energy Conservation Plan. Under the plan, ENERCON was charged with a wide range of responsibilities including: (i) formulating energy conservation programmes in all the main energy consuming sectors (ii) planning and initiating energy conservation actions nationwide; (iii) outlining policy guidelines to support energy conservation initiatives; (iv) developing a comprehensive data base on opportunities for energy conservation; (v) supporting training activities on energy conservation applications; (vi) undertaking field research and pilot demonstration activities on specific energy conservation options and technologies; and (vii) monitoring the implementation of conservation programs by other public and/or private sector entities. ENERCON has been successful in building up a capability for collecting data, undertaking various forms of field research to identify energy saving opportunities and initiating a number of activities (e.g. information dissemination and outreach, training etc.) to raise public awareness. ENERCON has been able to "identify" opportunities that would yield over Rs. 3500 million in energy savings, and also to implement a series of specific energy conservation measures as targeted technical services to enable end-users in key sectors to realize about one third of the potential savings. ENERCON's comprehensive approach to energy conservation-

which targets all sectors of the economy- is unique among developing countries: it applies a dynamic combination of strategies, including technical assistance, awareness campaigns and financial incentives. This approach has contributed to the success of ENERCON's field research and pilot demonstration activities and has made Pakistan's energy conservation efforts a model for other developing countries.

### **2.3. Pakistan Forest Institute**

The Pakistan Forest Institute, Peshawar (PFI) is a national organization mandated for training and research in forestry and allied disciplines, for the conservation and management of natural renewable resources in the country. It was established in 1947 and at present is functioning as an attached department to the Ministry of Environment, Local Government and Rural Development, Islamabad. For these reasons, it has got an international recognition as well as a forestry institution of regional importance. Since its inception, the research activities of PFI remained focused mainly on applied research and development of technology packages for the promotion and scientific management of natural renewable resources. In this regard a major break through has been achieved in dry-zone afforestation techniques, biological rehabilitation of degraded lands, rehabilitation of waterlogged and saline areas to increase their productivity and combat desertification.

### **2.4. National Council for Conservation Of Wildlife (NCCW)**

This organization was established in July 1974 and is working under the guidance of Inspector General of Forests formulate appropriate policies for the conservation of wildlife, coordinate implementation of the policies by the Provinces and liaison with International Agencies and non-Government Societies for conservation of wildlife. NCCW tried to fulfill its functions efficiently, during the last one and half year. The department gets policy guidelines from the Council headed by the Minister with representation of civil society and provincial wildlife department. NCCW coordinates the efforts of Provincial Wildlife Departments for wildlife conservation. In addition, it also fulfills the obligations of conventions and protocols to which Government of Pakistan is a signatory.

### **2.5. Zoological Survey Department**

Zoological Survey Department was established in 1948 and is now functioning as an attached department of the Ministry of Environment, Local Government and Rural Development with the objectives to obtain information on distribution and population dynamics of faunal species; set up and maintain standard zoological collections for reference; set up Zoological Museum for reference in provinces with emphasis on the fauna of the region; undertake research on the ecology, biology, physiology and biochemistry of important marine animals; advise the

government on all zoological matters including conservation, management, export and import of wildlife; and impart wildlife education and create public awareness about wildlife conservation.

## **2.6. A.H. National Centre for Rural Development and Municipal Administration**

Akhtar Hameed Khan National Centre for Rural Development and Municipal Administration (AHK NCRD & MA) was established as a federal training and research institution in the year 1979. It was declared as an attached department of the Ministry of Local Government and Rural Development in 1988 and was re-named as Akhtar Hameed Khan National Centre for Rural Development & Municipal Administration (AHK NCRD & MA) in the year 2000 in recognition of invaluable services rendered by Late Dr. Akhtar Hameed Khan for the cause of community development, strengthening of civil society and socio-economic empowerment of the poor and marginalized people living in informal settlements in Pakistan. The main functions of this Institution is training and research in the field of Local Government, Rural Development, and allied disciplines i.e. Training Courses; Conferences, Seminars and Workshops; Research; Liaison with International Agencies and Organizations; Policy Support to the Ministry; Collaboration with Provincial Local Govt.& Rural Development Academies.

## **2.7. Local Government**

The Government is in the process of introducing a new local government system with the objective of devolution of power to the grass roots level. The proposed Local Government Plan integrates the rural with the urban local governments on the one hand, and the bureaucracy with the local government on the other, into one coherent structure in which the district administration and police are answerable to the elected chief executive of the district. Citizen monitoring through elected representatives, the civil society's involvement with development, and a system of effective checks and balances, completes the hard core of the political structure and system of the Local Government. The Local Government design is based on five fundamentals: devolution of political power, decentralization of administrative authority, deconcentration of management functions, diffusion of the power-authority nexus, and distribution of resources to the district level. It is designed to ensure that the genuine interests of the people are served and their rights safeguarded. The new system will create an enabling environment in which the people can start participating in community welfare and be the masters of their own destiny. Financial resources will be distributed to local governments through formula-based provincial fiscal transfers and decentralization of specified taxation powers. Prescribed lists of taxes will be finalized within the framework(s) of provincial fiscal transfers to districts. This will enable the Local Government to effect credible development and service delivery. Local Governments will be formed at three levels: District, Tehsil and Union Council. Each will comprise its Nazim and Naib Nazim, its elected body, and its administrative structures. To involve people more actively in community development, grass root organization like the Village Councils and Citizen Community Boards

are envisaged. Among the government departments, environment is envisaged to be one at the district level to take care of environmental issues at the local level.

## **2.8. Agha Khan Rural Support Programme**

Besides public sector's rural development programmes, the NGOs, CBOs and private sector is being encouraged to participate in the rural uplift programmes. The Agha Khan Rural Support Programme (AKRSP) and National Rural Support Programme (NRSP) are the two main NGOs driven programmes funded by the donors. AKRSP initiated its innovative rural development schemes in 1982 in the villages of Gilgit and Ghizer districts of Northern Areas to improve quality of life of villages in programme area through income generating opportunity like agriculture, social forestry and livestock. More than 3500 village organizations and 2300 women's organizations have been formed. Out of 2000 infrastructure schemes, 1700 have been completed. The projects have benefited 100,000 households. There was remarkable success in many areas. From the environment point of view, some 15 million forest plants have been provided to communities in northern areas, while village organizations themselves have planted 8 million trees, established 1500 forest nurseries and 1300 village forestry specialists trained. Over one million fruit trees were also planted and about 55000 kanals of new land has been brought under cultivation. Agriculture yield of cereal, fodder, and potato seed has been improved. The key to AKRSP's approach is the community mobilization through broad based coalition of all those village residents whose common interest is best served by forming a multi-purpose development organization.

## **2.9. National Rural Support Programme**

The National Rural Support Programme (NRSP) was registered as a Limited Company in 1991 to foster a country-wide network of community organizations at the grassroots level and enable them to plan, manage and implement their development plans on their own. The main objective of the programme is to reduce intensity of poverty and improve quality of life. NRSP is working in 21 Districts of Pakistan and consists of biggest partnerships, involving the government, NGOs, banks and donors. One of the key areas is natural resource management. Some 1,483 infrastructure schemes have been completed which benefited 39153 households. NSRP has facilitated in forming 7,339 community organizations having 167,819 members.

## **Setting Policy Priorities**

### **1. The Economic Consequences of Environmental Degradation**

Pakistan's environmental problems are a concern, not just because of the intrinsic virtues of promoting responsible environmental stewardship, but also because of the economic consequences of environmental degradation. Using conservative estimates this Chapter finds that the mean annual cost of environmental degradation is approximately 6 percent of GDP. The costs are of a similar magnitude to the recent growth performance recorded in the National Accounts. The implication of this continuing degradation is that despite record GDP growth rates many development indicators continue to show limited improvement.

The mean estimated annual cost of environmental and natural resource damage is about 365 billion Rs. per year or 6 percent of GDP. This figure is an approximation and is based on those parameters for which reasonable estimates are available. The highest cost is from inadequate water supply, sanitation and hygiene (Rs. 112 billion) followed by agricultural soil degradation (Rs. 70 billion) and indoor air pollution (Rs. 67 billion). Urban air pollution (particulate matter) adds another Rs. 65 billion. The estimated cost of lead exposure is about Rs. 45 billion. Rangeland degradation and deforestation cost are the lowest at about 7 billion Rs. in total. These low estimates are somewhat misleading and reflect the lack of data that has led to partial estimation of values and the already low productivity of these resources. To guard against overstatement, the estimates are based on conservative assumptions and therefore represent the lower bounds of damage. They also omit several important categories of loss - most notably fisheries and coastal zone degradation. As a consequence calculations of the relative share of damage must be interpreted with the utmost caution since the magnitude of total damages is unknown since the impacts of natural resource degradation have been underestimated.

Since water supply, sanitation and hygiene issues dominate the costs it is tempting to argue that policy efforts should focus on this sector. But this would be premature and does not necessarily follow from these findings. To determine the optimum sequence of interventions, expected policy benefits need to be compared with the anticipated costs. The aggregate estimates provided in this Report are the first step in addressing this issue. The next task is to identify and rank the returns from various policy investments. In practice policy priorities are guided by the need to accommodate diverse and often conflicting objectives. The information provided in this chapter is a useful complement to the process and provides a rational and transparent basis for decision making.

## 2. Economic Growth and the Environment

Economic growth is the main vehicle for promoting development and reducing poverty in a sustainable way, so it could be argued that environmental degradation is the inevitable price to pay for economic success. This is typically justified in terms of an empirical regularity termed the Environmental Kuznets Curve which shows that as countries develop, pollution intensity increases at first and then declines. It would be misleading to assume that this empirical finding implies that environmental neglect is an economically prudent development strategy. In many cases prevention or mitigation of damage may be more cost effective than neglect. In the short run environmental interventions may lower profits or utilize scarce public funds, but these costs need to be compared to the associated benefits.

Environmental degradation disproportionately affects the poor and vulnerable, hence interventions that mitigate environmental damage also help to convert growth into broader development benefits. To illustrate the importance of these issues, Figure 2.2 compares the relationship between income and infant mortality in Pakistan to that of other countries in the same income group. Initially infant mortality rates in Pakistan were lower than the average for its income group, but thereafter Pakistan grew much faster than the other countries, but disappointingly it lagged behind on infant mortality. A similar pattern holds for other measures of environmental performance and development. For instance Pakistan's rate of deforestation between 1990 and 2000 has been greater than that of other countries in its income group. What these examples illustrate is that development outcomes are a consequences of policy choices and there is no assurance that a country can simply "grow-out" of environmental problems. Put simply, any given amount of growth can deliver higher development benefits if there are policies in place to address the negative externalities that impede progress, such as impacts on health and degradation of the productive resource base.

## 3. The Costs of Environmental Health Risks

Good health is not only a crucial part of well-being, but contributes directly to economic growth. The most direct economic effect of improved health is in terms of greater productivity and educational outcomes. A healthy population also frees up resources consumed by health care for other productive purposes. Economic growth is the essential first step in poverty reduction, but it brings with it environmental challenges that can impede and constrain the growth process. Air and water pollution, unsafe waste disposal, land degradation and the exposure to agro industrial chemicals are among the leading causes of illness and child mortality in developing countries. All of these hazards are preventable, often through simple and cost effective interventions.

The World Health Organization estimates that environmental health hazards account for over 20 percent of the overall burden of disease worldwide. This is comparable to malnutrition and is larger than all other preventable risk factors. The vast majority of environmental health impacts



are in developing countries where there is a strong correlation between the level of poverty and the environmental burden of disease. The poor are exposed to greater environmental health risks because of the surroundings in which they live, the lack of basic services and their greater vulnerability due to malnutrition and inadequate health care. So poverty and illness reinforce each other, contributing to exclusion and economic deprivation.

#### **4. The Health Effects of Water Quality, Sanitation and Hygiene**

Pakistan is an arid country with low, unreliable rainfall averaging 250 mm a year. Classified as water stressed, the country uses almost all of its available water supplies in most years. Population growth coupled with the demands of industrialization and urbanization are expected to create conditions of absolute water scarcity in a few decades. Water shortages are compounded by water quality problems. Untreated pollutants from industrial, agricultural and urban sources are released directly into water bodies intended for human consumption, with little regard for assimilative capacity of eco-systems. The result is heavily polluted water around towns and cities and a high incidence of disease, especially among the urban poor.

The links between water quality and health risks are well established. Inadequate quantity and quality of potable water and poor sanitation facilities and practices are associated with a host of illnesses such as diarrhea, typhoid, intestinal worms and hepatitis. Limited by data problems this study focuses on the two most common water related illnesses, diarrhea and typhoid, and estimates that more than 1.6 million DALYs are lost annually as a result of death and disease due to diarrhea, and almost 900,000 as a result of typhoid. Diarrheal and typhoid, mortality in children accounts for the bulk of the losses, reflecting the vulnerability of children to these diseases. The total health costs are estimated at Rs 14 billion, or approximately 1.8 percent of GDP. Striking are the high proportion of costs due to premature child deaths, followed by the mortality impacts of typhoid in the older population.

#### **5. Urban Air Pollution**

With an estimated 35 percent of its population living in cities, Pakistan is the most urbanized country in South Asia. Its cities continue to grow, offering employment opportunities, amenities and facilities not found elsewhere in the country. But rapid urbanization has been accompanied by environmental problems such as pollution, waste management, congestion and the destruction of fragile ecosystems. Urban air pollution remains one of the most significant environmental problems facing the cities. A substantial body of research demonstrates that high concentrations of suspended particulates adversely affect human health, provoking a wide range of respiratory diseases and heart ailments. The most hazardous are fine particulates of 10 microns in diameter (PM10) or smaller. Worldwide, fine particulates are implicated in 500,000 premature deaths and 415 million new cases of chronic bronchitis.

In urban Pakistan, as elsewhere, the major sources of fine particulate pollution are vehicles, combustion of fossil fuels in factories, and power plants. The problem is aggravated by an aging fleet of vehicles in poor mechanical condition and low levels of fuel efficiency. Over the past decade the number of diesel trucks in major cities has increased dramatically, creating an additional source of pollution. Though many cities are adversely affected, air quality monitoring is restricted to the six major cities: Karachi, Lahore, Islamabad, Peshawar, Quetta and Rawalpindi. Ambient concentrations of particulates in these cities lie consistently above World Health Organization guidelines, and are on average two to four times the recommended levels.

Most of Pakistan's urban population lives in cities where air quality is unmonitored. Excluding these cities from the analysis of health impacts would clearly represent a serious omission. To address this problem PM10 concentrations are estimated using a World Bank model of particulate emissions. Two sets of estimates are presented, to capture the potential imprecision of the forecast values.

An exposure-response relationship exists between concentrations of particulates and health outcomes. The health impacts identified in this report are based on epidemiological assessments recommended by the World Health Organization and include chronic bronchitis, mortality caused by a higher incidence of lung cancer, cardiopulmonary and respiratory problems. The annual health effects of ambient particulate air pollution are presented in Table 2.1. Urban air particulate pollution is estimated to cause around 22,000 premature deaths among adults and 700 deaths among young children. The total health costs are between Rs 62-65 billion, or approximately 1 percent of GDP.

## **6. Institutional and Policy Response**

### **a. Evolution of Environmental Concerns and Response**

#### **i. 1947-57: A Period of Environmental Neglect**

During the first decade after independence (1947-57), the Government of Pakistan was totally preoccupied with the formidable problems of restoring normal economic, commercial and communication systems and channels of the new nation, as well as the establishment of new central and provincial government organizations. The government prepared its first six years development programme (July 1951 to June 1957) in great haste and it was incorporated into the Colombo Plan. The programme did not suggest any major administrative changes, economic reform or remedy to environmental concern. It was a hasty grouping of schemes. In later years, the First Five Year Plan (GOP, 1955) of Pakistan (1955-60) tried to initiate the concept of physical planning but it was still limited to housing in general and settlement of displaced families (which had migrated to Pakistan from India after independence) in particular. Colonization of the Thal Desert with the provision of 640 villages and 6 towns under the Thal Development Authority was however a major achievement of this period. The main thrust of

planning was towards sustained economic growth and development of some social services and programmes for inducing modernization in rural life which lagged behind in physical output.

## **ii. 1958-72: Environmental Response through Adhocism**

This period was marked by a considerable expansion in the country's industrial sector, the introduction of the green revolution in agriculture and the completion and launching of mammoth irrigation projects such as the Warsak, Mangla and Tarbela dams and the initiation of the Karakorum Highway Project (from Pakistan to China). Unfortunately no environmental impact assessment studies were conducted for these projects and the general attitude like in the previous period was that of laissez-faire. It was believed that the best form of development would take place under a minimum regulation. Nevertheless the emergence and expansion of environmental problems in the wake of exploitative use of resources and growing population did receive some acknowledgment. Remedial actions, though not in a concerted and systematic manner, were undertaken to combat the growing problem of soil pollution by water logging and salinity. Through SCARP (Salinity Control and Reclamation Projects), a large part of deteriorated land was recovered. Considerable attention was also given to soil erosion. The Federal Government added a soil survey department in the Ministry of Food and Agriculture, while soil conservation departments were established in the provinces. A Forest Research Institute was also created to carry out studies on forest, range and wildlife management. Some actions were also initiated in physical planning, particularly in large cities like Karachi, Lahore and Peshawar. Likewise rural development also received attention through the introduction of local government programmes. Each of these actions related to the improvement of the human environment or resource conservation in one form or another. However, these remained isolated actions and the fundamental premise that the national development should not be wasteful and that resources should be utilized, as a trust for future generations was not recognized. Despite the induction of a system of local government the development process was still controlled by a bureaucratic colonial legacy and the quality-of-life theme did not receive recognition.

## **iii. 1972-to date: Development of Systematic Environmental Response**

The period after 1972 marked a major breakthrough in the changing attitude of both the people and the Government of Pakistan towards environmental preservation. Before 1972, the communication media remained virtually silent and was perhaps blissfully ignorant of the subject of pollution and environmental hazards. By 2000, the newspapers carried numerous stories drawing national attention to the continued environmental degradation. Even a casual reading of the newspapers, particularly the sections dealing with letters from the readers, revealed a growing public awareness about the need to safeguard the environment and control pollution. A random sample would include complaints against the alarming effects of wastes discharged from certain industrial projects, against industrial odours and unbearable noise in residential areas as well as traffic pollution, low quality of drinking water and unsatisfactory sanitation,

deforestation, desertification, loss of biodiversity and coastal and marine pollution. The scientific societies and learned bodies also started holding open forums, seminars and symposia to highlight the environmental problems and issues. In one of its sessions the Scientific Society of Pakistan focused on the plight of the Quaid e Azam Mausoleum (Pakistan's most important national monument) resulting from the onslaught of air pollution in Karachi (Hasan, 1981). The numbers of research papers in the scientific journals of the country dealing with different aspects of environmental problems and issues also increased proportionally. The increasing awareness on environmental degradation also showed visible impacts on the governmental policies and programmes. As stated earlier there were certainly a number of steps taken prior to 1972 in individual problem areas of Pakistan's environment such as waterlogging and salinity, deforestation, siltation, fisheries and wildlife, but the idea that such isolated concerns should be evaluated and coordinated under a broader perspective was one truly significant outcome of the Stockholm Conference on Human Environment.

#### **iv. Progress During 1970s**

The Federal Government in Pakistan took up the issues raised in Stockholm and directed an immediate examination into the steps to be taken to meet the threat to the environment in the country. Subsequently, in November 1972, the Ministry of Presidential Affairs convened a meeting of experts concerned with various aspects of environment. A major outcome of this meeting was the formulation of the Committee on Human Environment to make recommendations. The Committee submitted these in a report in April 1973 (GOP, 1973). The report stressed that the magnitude and complexity of the problem of environmental degradation required urgent attention and needed to be dealt with in a comprehensive manner. It called for a two-pronged approach embracing both long-range preventive and short-term curative measures, so that economic development would not produce a chaotic human environment, poor living conditions, and serious deterioration of the environment. Another major positive development of 1973 was a constitutional mandate for the preservation of the environment. The Fourth Schedule of the Constitution of Pakistan established the concurrent legislative list of subjects for the Federal and provincial legislatures. "Environmental Pollution and Ecology" was included in the concurrent legislative list, which meant that both federal and provincial governments were to have constitutionally mandated responsibilities for the management of pollution and natural resources. This was a significant recognition of the shared governmental responsibility for environmental protection, but it also raised important questions regarding the proper alignment and coordination of these roles and responsibilities. The function of looking after general environmental matters was entrusted to the Ministry of Production, Industries, Town Planning and Agrovilles in 1972 and this federal focal point for general environmental matter was gradually strengthened. However, the Ministry of Science and Technology also looked after many issues dealing with the general environment. A new Environment and Urban Affairs Division was created within the Ministry of Housing, Works and Urban Development in 1975,

and the responsibilities for all general environmental matters were shifted to this Division. It was also to coordinate environmental policies and programmes nationally and internationally. Despite the above developments the environmental input within the national planning throughout the 70s was very small. The response to the growing need for legislation was also negligible. The existing laws such as the Pakistan Penal Code and the Factories Act, the Forest Act, and hunting and water use legislation, had some provisions, and although environmental protection could be premised on these no attempts were made to enforce them. Although a beginning had been made during the decade of the 70s, the country still had a long way to go. In terms of natural resources management and protection, responsibility for forest, agriculture, soil and water rested with the provincial government departments. Some of these institutions had very good traditions. For example the provincial forest departments had established biannual tree planting campaigns. Sixty million saplings were distributed to farmers and other landowners every year at subsidized rates, which increased to 150 million annually in the 80s to encourage farm and linear plantations. The Provincial Soil Conservation Department had also been disseminating contour ploughing, terracing and other soil conservation techniques.

#### **v. Progress During 1980s**

With the dawn of 80s, the Government of Pakistan showed an increased level of awareness through legislative and institutional development and took some preliminary steps for integration of environment and development.

#### **vi. Progress in 1990s**

##### **a. Legislative and Institutional Development**

Considerable progress was made in the 90s on legislative and policy development. The Pakistan Environmental Protection Act of 1997 (PEPA), which superseded the Pakistan Environmental Protection Ordinance of 1983, established the general conditions, prohibitions, and enforcement for the prevention and control of pollution, and the promotion of sustainable development. The Act also established and delineated the powers and functions of the Pakistan Environmental Protection Council (PEPC), Pakistan Environmental Protection Agency (PakEPA), provincial Environmental Protection Agencies (EPAs), and Environmental Tribunals. In particular, the Act created the authority for delegation of environmental management functions to the provincial EPAs. Nothing in the Act prohibited provincial governments from adopting more stringent standards or regulations. National Environmental Quality Standards (NEQS) were established for Pakistan in August 1993. All new industries were to comply with the standards by July 1994 while existing industries had until July 1996 to comply. The NEQS specified end of pipe standards for industrial and municipal effluent and air emissions, as well as smoke and noise standards for motor vehicles. The standards were revised in 1997.

## **b. Development of a National Conservation Strategy**

In terms of policies a landmark feature was the adoption of the National Conservation Strategy (NCS) in 1992 as the guiding environmental policy for Pakistan. NCS contained legal, technical, institutional, and economic recommendations aimed at achieving three broad policy goals: conservation of natural resources, development, and greater efficiency in the use and management of resources. Subsequently a Plan of Action was prepared, which recommended Rs. 19.8 billion in project investments to be implemented over the five year period 1993-98 (GOP, 1993b). The Plan of Action was later included in its entirety as the environment segment of the eighth Five Year Development Plan (1993-98). It proposed a four-component agenda: a) strengthening technical, regulatory and participatory institutions, b) formulating a communication campaign for mass awareness, c) creating a supportive framework of regulations and economic incentives and d) implementing projects in the NCS's fourteen core areas. The policy actions were aimed at strengthening the institutional structure and the projects were designed as remedial actions in the form of restorative and protectionist environmental investments. A Mid-Term Review of achievements, impacts, and prospects made under NCS was undertaken in 2000, which concluded that the achievements under the NCS primarily related to awareness raising and institution building, while implementation was lagging. It recommended that future initiatives should emphasize improvements in implementation capacity. One of the specific recommendations was to “switch the NCS from a top-down and supply-driven approach to a bottom-up demand driven approach” and thereby foster the development and strengthening of local institutions and the empowerment of user groups to build sustainability. This recommendation on a NCS policy shift led to a growing emphasis on the need to develop the capacity of provincial and local governments for environmental management and the need to empower sectoral interest groups and civil society in the decision-making process.

## **vii. Progress in the 21<sup>st</sup> Century**

The turn of the century saw the development of several new policies and plans related to the environment, which culminated in developing and finalizing the National Sustainable Development Strategy (NSDS) of Pakistan. It also witnessed a change in the institutional structure on Environment. Prior to the 18<sup>th</sup> amendment in the constitution, the Ministry of Environment was the lead organization responsible for handling the subject of environment in the Government. Environment, with some other subjects was on a concurrent list dealt by both Federal and Provincial Governments. The 18<sup>th</sup> Constitutional Amendment eliminated the concurrent list leading to the abolition of the Ministry of Environment and its associated subjects were either devolved or assigned to other Federal Government Ministries. However, this process was amended firstly by formulation of a Federal Ministry of Disaster Management and then renaming and evolving it into a Federal Ministry of Climate Change, which was re-designated as Climate Change Division recently. A number of legislative and regulatory measures were also



undertaken to strengthen environmental management in the country. The current institutional, legislative and regulatory set-up and policy environment forms the part of next sections of this chapter.

## **7. Institutional Framework**

### **a. Federal Government Agencies**

The Climate Change Division is the main federal institution responsible for planning activities and formulating policies associated with environmental protection, pollution, and resource conservation. It is responsible for implementing the Pakistan Environmental Protection Act, coordinates the activities of other federal ministries, and acts as the secretariat for the Pakistan Environmental Protection Council (PEPC). It also deals with agreements reached with other countries and international organizations in the field of environment. In addition, the Pakistan Environmental Protection Agency also comes under its administrative control. Three major federal institutions the Pakistan Environmental Protection Council (PEPC), the Pakistan Environmental Protection Agency (Pak EPA) and the environmental cell in the Planning Commission, handle environmental issues.

PEPC, chaired by the prime minister, is the highest environmental policy making body in Pakistan, and has broad supervisory functions with responsibilities for environmental protection and promotion of sustainable development. It supervises implementation, enforcement and administration of national environmental legislation; approves national environmental policies and standards; coordinates the integration of sustainable development into national plans and policies; and provides guidelines for conservation of biodiversity and environmental protection considerations in natural resource management. Members of the council include the federal minister for climate change and provincial ministers responsible for the environment, the federal secretary dealing with climate change, and other federal appointees. Pak-EPA is responsible for framing and implementing regulations to control environmental degradation. It is attached to Climate Change Division, operating as its technical, legal and enforcement arm. Its main functions are the implementation of PEPA-1997 (See section 8.5 for details on PEPA); preparation of State of Environment Reports; formulation, enforcement and revision of NEQS; establishment of ambient standards for air, water and land; coordination of environment control programs nationally and internationally; conduct of environmental monitoring wherever required; conduct of research and development; certification of environmental laboratories; coordination and assistance to all levels of government and community institutions for the safe disposal of waste under NEQS; promotion of environmental awareness and education; and undertaking safeguards from environmental disasters. Pak-EPA is also responsible for establishing guidelines on how implementing agencies should undertake EIA procedures during planning, and for reviewing and sanctioning EIAs of major projects. The federal government has

established Environmental Tribunals (ET) in the Punjab, Sindh, Khyber Pakhtunkhwa and Balochistan provinces under Section 20 of PEPA-1997. (Refer to Section 8.5 for details on PEPA). With the creation of ETs under PEPA, the establishment of all three organs, Pakistan Environmental Protection Council (PEPC) working as legislator, Pakistan and Provincial Environmental Protection Agencies (EPAs) working as executive, and environmental tribunals (ETs) working as courts, the basic system for environmental management was completed. They all have powers to check each other under the established doctrine of the separation-of-powers. After Pakistan ratified a number of Multilateral Environmental Agreements, Ozone and CDM cells were also created. They are housed in the Climate Change Division along with a biodiversity directorate. The Climate Change Division also takes the lead on the promotion of sustainable development. However, it neither has the mandate nor the capacity to handle the economic and social dimension of sustainable development.

Several additional federal agencies and autonomous bodies are involved in environmental development and natural resources management. The role of the Environment Section in the Planning Commission has already been highlighted above in the integration of environmental concerns in development planning. The Ministry of Water and Power and the Water and Power Development Authority (WAPDA) are responsible for the development of water resources. WAPDA also houses an environmental cell. The Ministry of Communications is responsible for enforcing the Territorial Waters and Maritime Act of 1976, which covers some types of water pollution. Other agencies with one or more aspects of environment and natural resources include the Energy Conservation Centre, Pakistan Forest Institute (PFI), National Institute of Oceanography (NIO), National Agricultural Research Centre /Pakistan Agricultural Research Council (NARC /PARC), Alternative Energy Development Board (AEDB), Pakistan Council of Renewable Energy Technologies (PCRET), Pakistan Council for Research in Water Resources (PCRWR), and the National Disaster Management Authority (NDMA).

#### **b. Provincial Agencies**

EPAs have been established in all five provinces to deal with urban and industrial pollution. In addition, an EPA has also been established in Azad Kashmir. After the delegation of functions, the mandate of Provincial EPAs has become very comprehensive and large. They have full authority to handle the environmental management in their respective provinces. Their mandate is to:

- a) Implement Rules and Regulations prepared under PEPA 1997 and additional legislation as per the needs of the Province,
- b) Prepare and implement provincial environmental standards,
- c) Develop provincial systems for the implementation of pollution charges

- d) Conduct research & development for promoting most viable environmental technologies,
- e) Certify laboratories
- f) Involve local governments in the implementation of PEPA 1997,
- g) Promote environmental awareness and incorporate environmental issues in the educational curriculums
- h) Prepare Provincial level Environmental Disaster Management Plans,
- i) Collaborate and coordinate with stakeholders for the effective implementation of environmental policies and PEPA 1997,
- j) Entertain inquiries and complaints raised by stakeholders,
- k) Mobilize national and international financial resources for the environmental projects,
- l) Develop provincial level fiscal programmes and financial incentives for environmental compliance,
- m) Fix pollution charges,
- n) Conduct investigations against polluters,
- o) Assist courts by generating field level environmental data about the polluters,
- p) Establish environmental laboratories,
- q) Implement IEE/EIA Rules and Regulations and Guidelines,
- r) Manage hazardous wastes under the Hazardous Substance (HS) Rules and
- s) Monitor vehicles for controlling air pollution. Environment Sections have also been established in the provincial Planning and Development (P&D) Departments.

These are responsible for reviewing provincial development plans and activities, including screening of projects to determine their effects on the environment and reviewing and sanctioning the completed EIA. Khyber Pakhtunkhwa Province was the first to establish an environment Section, which was instrumental in developing the Sarhad Provincial Conservation Strategy. In other provinces these sections have also prepared or helped in the preparation of provincial conservation strategies, state of environment reports and provincial environmental profiles. The implementation of provincial conservation strategies also rests with these sections. The major responsibility for managing and protecting sectors such as forests, agriculture, and water also lies with the provincial governments in Pakistan. Provincial line departments such as Irrigation Departments, Agricultural Departments, and Forest Departments are responsible for development works and also play a major role in the management of resources and in

environmental protection. Environmental Tribunals (ET), established in provinces, have powers to take decisions in case of conflicts. However, ETs can only award punishments while the responsibility to implement these punishments rests with the EPAs. In most of the cases Environmental Protection Departments (EPD)/EPAs do not conduct any monitoring after the award of a punishment. ETs have no powers to do field monitoring as it is the responsibility of the EPD/EPAs. In most cases, if any Government Agency is involved, EPD/EPAs do not bring the case in the ET.

## **8. Areas of Improvement**

The above discussion demonstrates that after years of experience with policy and institutional and legislative developments, Pakistan's environmental management framework is relatively mature and the Government efforts in this direction need appreciation. However, while designing the initial framework, gaps and shortcomings are bound to remain, which can only be resolved with actual application. This section concentrates on functioning of this framework and its gaps and shortcomings.

### **a. General Shortcomings and Gaps**

A number of studies have discussed institutional and legislative framework particularly with reference to meeting the objectives of environmental governance. Among these the most notable include the mid-term review of National Conservation Strategy (Hanson et al., 2000), the UNIDO Review of Industrial Policy and Environment 2000, The World Bank (2006), the Pakistan Strategic Country Environmental Assessment, an ADB (2006) report on Urban Air Quality Management in Pakistan, the Luken (2008) report on Industrial Environmental Regulation, 1997-2007: Reasons for the Failure of Existing Manufacturing Plants to comply with the NEQS and more recently, a report prepared for the Ministry of Industry on the Evaluation of Industrial Environmental Management in Pakistan (Khan, 2010). The World Bank (2006) study on the institutional performance states, “Key performance constraints are not primarily a consequence of inadequate legislation or insufficient funding, but rather are the result of a few key weaknesses in institutional design combined with low capacity to apply available resources. In particular, the assessment concludes that the lack of guidelines for oversight of environmental authorities delegated from Federal to provincial agencies is an important missing link in the institutional design. While mentioning these key constraints, the World Bank study also notes that opportunities “exist to strengthen current mechanisms for the mainstreaming and up-streaming of environmental concerns, and to support the judiciary and civil society organizations in enforcing environmental commitments.”

The nominal implementation of environmental legislation in the country, according to the Luken' Report was due to two reasons:

- i. The basics of a command and control regulatory programme were not in place nor was there any significant use of complementary measures, such as economic instruments, voluntary programs, and transparency and disclosure; and
- ii. The vast majority of industrial establishments, with some notable and limited exceptions, and the government to some extent, had not accepted the polluters-pays-principle in its letter or spirit. It further pointed out that among other reason, PEPA 1997 and its rules and regulations lacked the specificities for effective implementation. For example, NEQS for wastewater were neither subsector-specific nor area-specific and did not have any relationship with the ambient conditions (Luken, 2008).

The Mid Term Review of the National Conservation Strategy (Hanson et al., 2000) has highlighted the problems of institutional capacity for pursuing the objectives of sustainable development, which it says exist both within and outside the Government. These have been analysed systematically in the review report. It stresses that the major lacuna is in the political commitment. It states, “The original mechanism (of NCS) depended on the leadership of several ministers and the active involvement of the Prime Minister/Chief Executive as chair of PEPC. PEPC, as an apex body, has a legal mandate to formulate environmental policy and also to monitor it. It was to provide guidance on the NCS, but it has not met regularly enough and seems to have abdicated responsibility to the NCS Unit (IUCN, 2002).” The ADB study (2006) referring primarily to air quality, pointed out that Pakistan still lacks a legal framework that can address urban air pollution and provide an integrated and comprehensive air quality management policy for the country. The need for such a legal basis is important in providing a framework for air pollution control. The report adds that it should be carried out with the involvement of concerned stakeholders and firmly stipulating linkages and roles of the national, provincial, and local institutions, so as to avoid overlapping of roles and to ensure coordination and cooperation.

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The report prepared for the Ministry of Industries (Khan, 2010), refers primarily to industrial environmental governance but its findings are applicable equally well to overall environmental governance. It highlighted the following reasons for failures in implementation of environmental initiatives:

- Overall poor governance and rule of law;
- Poor enforcement of legislation;

- Gaps in environmental legislation;
- Ineffective role of Private Sector;
- Lack of consumer demand for products with minimum environmental impacts;
- Overshadowing of Environmental institutions by other stronger institutions; and
- Weak institutional capacities particularly those of Pakistan Environmental Protection Agency (Pakistan EPA) and Provincial EPAs.

#### **b. Problems in Legislation:**

Although the Pakistan Environmental Protection Act (PEPA) 1997 carries substantial improvement over the previous Ordinance, a number of weaknesses have still been identified. One criticism is that it concentrates primarily on aspects related to pollution only or brown issues. Even in brown issues, a major problem is the lack of procedural detail and descriptions of regulatory mechanisms that are normally specified in environmental protection legislation (specifications of mechanisms and procedures are left to the regulations). Omitted from the Act, for example, are detailed procedures for pollution control, EIAs, appeals, and public participation. Even third party rights in EIAs and pollution control have been left undefined. Under the delegation of powers to provincial EPAs, the Act leaves them to be handled through notification in the Government Gazette. Such a mechanism may create problems of subsequent delegation of power to divisional or district officers in the provinces, and may require provincial EPAs to enact their own laws. The Act is broadly applicable to air, water, soil, marine and noise pollution, and handling of hazardous wastes. However, it does not deal directly with some major issues. For instance, there is no provision that directly deals with the soil and marine pollution. It also falls short on many other important issues like control of ozone depleting substances and waste management, the provisions of which have been included in the National Environmental Policy (GOP, 2005). The Policy recognizing shortcomings points out that there is a need to amend PEPA 1997 to provide legal cover to several aspects included in the policy such as soil pollution, ozone depletion, and climate change because the Act does not deal directly with these issues. Some of the aspects that have specifically been mentioned for framing new acts by the National Environmental Policy include the Water Conservation Act, the Clean Air Act and the Pakistan Oil Pollution Act. Besides gaps, PEPA 1997 also conflicts with some existing laws. A case in point is the Canal and Drainage Act, 1873 (CDA), which is still the main Statute dealing with water related issues of the country. This Act mostly deals with the construction and maintenance of the drainage channels and canal navigation but also covers issues relating to environmental pollution. Besides conflicts in the provision, there are certain loopholes in the implementation of these two laws. For example it is not clear if the authorities can still prosecute a person under PEPA 1997 after proceedings have been initiated against him under CDA. This is particularly important if the magistrate or other authorities given the power to decide disputes/



breaches under CDA have absolved such a person. It seems doubtful if the authorities would still be able to move against such a person as he could be protected by the rule against “double jeopardy”. The issue is of even more importance, given that the environmental authorities have the power to issue a number of penalties, including fines, to a person in breach of PEPA (Khan, 2010). Thus there is a need for the harmonization of two Acts. Amendments are needed in PEPA 1997 to take care of the situations outlined in CDA. The Government of the Punjab, after conducting a most comprehensive review of environmental legislation and regulation have also highlighted a number of inconsistencies (GOPb, 2008). These inconsistencies have caused problems while pursuing cases in the Environmental Tribunals and need to be removed.

### **c. Non- enforcement and Cooperation**

Cooperation of stakeholders is extremely important for enforcement of laws and regulation whether in terms of self-monitoring programmes, payments of pollution charges, releases of waste particularly hazardous waste or implementation of environmental protection orders.

#### **i. Cooperation in Self-Monitoring and Reporting Tool (SMART)**

In order to cope with the lack of funding and capacity particularly for monitoring, the Government introduced a Self-Monitoring and Assessment Programme for industries. The response of the industry was not encouraging. Out of 8,000-10,000 industrial units only 113 are registered and reporting under the SMART program. The major reasons for the low level of participation is the lack of trust between environmental authorities and the industry, lack of capacity of Pakistan and Provincial EPAs, limited allocation of resources, and low level of enforcement of environmental legislation in the country. In a survey on this issue, industry representatives stated that the most important reason for not reporting under SMART was that they believed that EPAs would use the SMART information to penalize the firms in the future (Khan, 2010). A second reason stated was that there were no such requirements from the international buyers. To start reporting under SMART, industry representatives requested a written guarantee that EPAs would not start undue inspections and penalize firms on the basis of SMART data (Khan, 2010). Pressure from civil society could play an important role along with reward to reporting industries with incentives.

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

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

**Way Forward**

Capturing the development dividend of growth, calls for complementary policies that address environmental issues while facilitating development. Pakistan has been successful as far as institutional legislative and policy development on environment are concerned. A major positive development was the constitutional mandate for the preservation of environment as far back as 1973. Another major manifestation of environmental concerns was the issuing of the Pakistan Environmental Protection Ordinance 1983. The new legislation created a powerful Pakistan Environmental Protection Council (PEPC). A high-powered Pakistan Environmental Protection Agency (Pak EPA) was also created by the same ordinance in 1984. Promulgation of the Pakistan Environmental Protection Act of 1997 (PEPA), which superseded the Pakistan Environmental Protection Ordinance of 1983 was another landmark achievement. It established the general conditions, prohibitions, and enforcement for the prevention and control of pollution, and the promotion of sustainable development. The Act also established and delineated the powers and functions of the Pakistan Environmental Protection Council (PEPC), the Pakistan Environmental Protection Agency (Pak EPA), the provincial Environmental Protection Agencies (EPAs) and the Environmental Tribunals. With the creation of ETs under PEPA in 1997, the establishment of all three organs, PEPC working as legislator, EPAs working as executive and environmental tribunals working as courts, was completed. They all have powers to check each other under the established doctrine of the separation-of-powers. Despite not being perfect, PEPA 1997 is a basic legislative tool that has empowered the Government of Pakistan to frame and enforce regulations for the protection of the environment. A major positive development on the integration of environment and development was the creation of the Environment Section in the Planning Commission and the Provincial Planning and Development Departments. This helps in environmental screening of public sector projects at the federal and provincial levels and integrates environment in the development planning process. The devolution of the Federal Ministry of Environment in 2011 was a major setback to the cause of environment but fortunately first creating the Ministry of Disaster Management in the same year and then transforming it to the Ministry of Climate Change in 2012 (now Climate Change Division), which also handles the subject of Environment at Federal level, redressed it.

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Although the National Conservation Strategy of Pakistan was completed in 1992, the turn of the century saw considerable progress in environmental policy making and planning in Pakistan. The National Environmental Action Plan (NEAP) was adopted in 2001, and provided an opportunity to strengthen relationships between Federal, provincial and local governments for environmental management. A number of other policies and plans were also formulated including the National Environment Policy as well as sectoral and sub-sectoral policies on poverty, health, water and energy. In spite of the above steps, the environment continues to deteriorate and the implementations of the initiatives remain a challenge in terms of institutional, legislative as well as regulatory or incentive based performance. A number of previous studies have discussed institutional and legislative frameworks particularly with reference to meeting the objectives of environmental governance for which they were created. Among these, the most notable include the midterm review of National Conservation Strategy, UNIDO review of the Industrial Policy and Environment 2000, The World Bank (2006) study - the Pakistan Strategic Country Environmental Assessment, the ADB (2006) report on Urban Air Quality Management in Pakistan, and the Luken (2008) report on Industrial Environmental Regulation, 1997-2007. Many Governmental Policies and reports such as the Environmental Policy of Pakistan have themselves raised pointers in this direction. There is a need in the country to reform the institutional and regulatory framework on the basis of lessons learnt. This will better ensure the improvement of environmental performance and sustainability of Pakistan's economic growth in

future. Pakistan has also been taking steps to meet its commitments in terms of implementing MEAs to which it is party and outcomes of International Conferences such as the Earth and World Summit as well as MDG targets related to Goal 7 on environmental sustainability. However, implementation of an environment and sustainable development agenda cannot succeed in developing countries like Pakistan without developed countries meeting their commitments made at Rio - firstly to enhance the flow of financial resources, secondly to transfer environmentally sound technology at concessional terms and thirdly sharing of information and capacity building to promote sustainable development. The principle of 'common but differentiated responsibilities' invoked at Rio demands early fulfillment of these commitments by the international community.

## **1. Capacity Building for the Environment**

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

### **a. Strengthening of the Linkages among Environmental Institutions**

There is a great need that the Ministry of Environment, provincial environment departments, environmental protection agencies, district and tehsil governments and other relevant government and non-government institutions and organizations at all level must be strengthened by provision of adequate manpower, equipment, infrastructure and financial resources. A comprehensive training of personnel of relevant institutions at the federal, provincial, district and tehsil level must be conducted. Training institutions must be established for them. Regarding the national research the priority areas should be identified and adequate funding should be made available. There is a need to strengthen the relevant research and research related institutions. It is also required to build partnerships between government and NGOs for effective environmental management. After going through the historical development of environmental laws one hopes that environmental condition of Pakistan will be good, but actual situation on ground is much different and environment is continuously deteriorating in the country. Many points emerged after analyzing the development situation and implementation of the environmental legal framework. The main points emerged from the above analysis of the environmental legal framework are:

- a) Lack of comprehensive set of environmental laws,
- b) Lack of adequate formal enforcement procedures and non-availability of the tools of implementation,
- c) Lack of awareness,

- d) Lack of respect for the law, and
- e) Lack of economic incentives.

**a) Lack of Comprehensive Set of Environmental Laws:**

Pakistan is fairly well endowed with incidental environmental legislation. In existing legislation the specific environmental enactments are few and insufficient. Environmental laws mentioned previously clearly indicate the weakness. There should be specific set of laws regarding the environmental pollution and management. For example, a set of laws related to land improvement and protection, a set for air pollution, for water pollution, noise pollution, solid and effluent management, agriculture pesticides and other aspects related to environment.

**b) Lack of Standard:**

Pakistan's environmental legislation suffers from lack of quantified limits and standards, which makes these laws ineffective and difficult to enforce. Most of the laws do not mention quantitative standards for emissions, which require sophisticated tools for determining emissions and effluent levels. By not specifying any standards, the rule leaves enforcement to the whims of the enforcing authority. This acts as an impediment to both regular enforcement and voluntary public compliance.

**c) Lack of Adequate Formal Enforcement Procedures and Non-availability of the Tools of Implementation:**

The environmental laws call for action by government, businessmen, NGO's, local communities and individuals. Laws are useful only when we act upon them. Therefore enforcement procedure and tools of implementation become important. It is necessary to set priorities and then to start implementation. There is shortage of skills in Pakistan to implement the environmental laws because of the deficit of trained personnel like technical staff to assess and monitor emission controls, trained extension staff with government and NGO's, a cadre of environmental social scientists including economists, primary scientific research staff and well trained administrative professionals who combine organizational efficiency with technical knowledge of environmental issues. If Pakistan establishes its priorities and specifies the quality, quantity, and timing of needed technical assistance, then the environmental laws could be implemented. But the financial resources are important to establish priorities. Unfortunately, the financial resources for environmental improvement are severely limited in our country. These constraints have led to substantial shortfalls in both essential technical knowledge and equipment relating to enforcing regulations concerning the sustainable use of natural resources and protection of the environment.

**d) Lack of Awareness:**



Awareness of environmental laws and their importance is lacking amongst the regulators, enforcing agencies, and even the judiciary. For example, the Pakistan Penal Code, the most often used and quoted legislative document for enforcement agencies, has a number of environmental clauses (mentioned previously), yet most enforcement personnel are unaware of these or at least of their environmental dimensions. So, environmental education is very important because the low literacy level significantly limits the speed at which improvement in environmental awareness and activity can be achieved. This lack of awareness has slowed the development of environmental pressure groups, which has proved to be the catalyst for better legislation and enforcement.

**e) Lack of Respect for the Law:**

In our country the respect for the law has been absent for several decades, perhaps this is the result of successive martial laws, which has suspended the most sacred document “the constitution” of the country, in favor of one person. Laws at every level have been suspended by personal whims of authoritarian administrators. The highly stratified society that has emerged over the years has given rise to a feeling that getting away with breaking the law is itself a status symbol. In a setup that abuses the sanctity of the state, no legislative initiative can ever bear fruit. In our society the disrespect for the law has become a way of life. For example, consider the Ordinance of 1965 West Pakistan Regulation and Control of Loudspeakers and Sound Amplifiers, stipulates that no person shall use a loudspeaker in a public place so as to cause annoyance to the residents of the locality. According to the law, uses of loudspeakers are prohibited near offices, courts, hospitals, or places of workshops. Few, if any, adhere to the spirit of the law, which is meant to avoid annoyance to those living nearby. Loudspeakers are used at private gatherings, wedding celebrations, election campaigns, and so on with no regard to the inconvenience caused to others.

**f) Lack of Economic Incentives:**

Regulations are generally inflexible and more costly where many people are involved. Cost of enforcement is increased further because people often try to evade the laws. Thus enforcement entails cost of monitoring plus cost of catching law breakers, prosecuting them, and some times, keeping them in jail. In recent years, however, rising cost of regulations, changing economic conditions, increasing emphasis on input reduction, and many other factors have led to increasing interest in economic incentives as a way of sustaining the environment. Government regulation restricts depletion and pollution only by passing laws, but economic incentives are also important to sustain the environment. Incentives are less expensive than regulation because they save on enforcement cost and are more flexible: producers and consumers decide how to pay for the change to meet the goal, each chooses the least costly way. These incentives basically are of two types: government incentives includes subsidies and many other ways that local, state, and national government can reward or discourage behaviours. By rewarding individuals monetarily, economic incentives help

meet many goals effectively. The second basic economic incentive is privatization, in which environmental resources become the property of individuals. By transferring resources from the commons to individuals or companies that have a vested interest in them, the basic cause of the “tragedy of the commons” is removed.

Despite some success with privatization, it is often less useful than government incentives in solving environmental problems. One problem is that many environmental commons cannot practically be privatized. For example how can we own a part of the atmosphere? Similarly, it is impractical to have ownership of the oceans or rivers. Despite the drawbacks mentioned above, regulations have been successfully used during the last few decades by many industrial nations. Regulations are more useful where there are few violators. Though it would be incorrect to dismiss the law as a source of effective environmental management, it would also be wrong to place sole reliance on legislative measures for ensuring better environmental and resource management. The enlightened use of the law could do much to achieve the objectives. Clearly, considerable scope exists for improving the formal enforcement procedures. Increasingly, people are realizing that simple laws, whether at a local, national, or international level, ultimately will not be sufficient to solve the environmental degradation that the world faces. Many environmentalists believe that a concept known as “Sustainable Development” is needed. Sustainable development focuses on simultaneously making social, economic and political progress to satisfy global human needs, desires, aspirations and potential without damaging the environment. Sustainable development emphasizes equity among different people and nations of the world and equity between one generation and another. We must not leave future generations with a degraded world simply because we wish to enjoy a certain life style in the present. One country should not disproportionately use global resources or cause irrevocable environmental degradation that affects other people or the entire earth. The environmental governance mechanisms in Pakistan are still at early stage and enforcement is weak due to lack of capacity. Environmental institutions, as a group, should continue to survive and prosper because society is very much concerned about the environment, and justifiably so. However, those radical organizations that continue to conduct business in an unprofessional and unethical manner need to be eliminated in the 21st century. Groups who knowingly and deliberately distort facts and provide false information should be treated the same as those who illegally pollute the environment. Hopefully, government will start taking action on this in future.

## Annex-I

**Current Environmental Data and Information Sources in Pakistan**

<b>Environmental Indicators</b>	<b>Source Agencies</b>	<b>Current Status of data availability</b>
<p>1. Average Annual Ambient Concentration of pollutants ( <math>\mu\text{g}/\text{m}^3</math>)</p> <p>1(a).Average annual ambient concentration of pollutants at selected</p>	<p>Pak-EPA, CLEAN Lab, Sector H-8 , Islamabad</p> <p>Collection of this data by Pak-EPA, provincial EPA's and EPA-AJK is mandatory.</p> <p>EPA AJK, ambient air quality data Standards</p>	<p>i). The Pak-EPA measures and provides the annual mean concentrations of air pollutants such as <math>\text{SO}_2</math>, CO, <math>\text{NO}_2</math>, ozone and <math>\text{PM}_{2.5}</math> at different stations in large and selected industrial cities for reporting where the population is exposed to the high levels of air pollutants.</p> <p>ii). PAK-EPA and provincial EPAs have also selected some specific points in the Islamabad, Karachi, Quetta, Peshawar, Lahore and Muzaffarabad for collection and reporting on air pollutants such as <math>\text{SO}_2</math>, CO, <math>\text{NO}_2</math>, Ozone and PM</p> <p>iii). The timing of observations has been indicated as 24 hours, 8 hours and 1 hour for <math>\text{SO}_2</math>, CO and <math>\text{NO}_2</math>. There is option to measure both <math>\text{PM}_{10}</math> and <math>\text{PM}_{2.5}</math> with 24 hours monitoring observations.</p> <p>Ambient air quality data of AJK" on concentration of air pollutants like <math>\text{NO}_x</math>, <math>\text{SO}_2</math>, <math>\text{CO}_2</math>, CO and <math>\text{PM}_{2.5}</math> &amp; <math>\text{PM}_{10}</math> recorded at certain specific points in the cities of Muzaffarabad, Mirpur, and Bhimber.It has also generated scientific data on Noise Level in dB in the same cities but no information on <math>\text{CH}_4</math> and Non-methane. standards(NEQS, WB and WHO):</p>

<p>points of major cities (<math>\mu\text{g}/\text{m}^3</math>)</p>		<p>i).Concentration of pollutants (<math>\mu\text{g}/\text{m}^3</math>) at different sites/ stations/points in Muzaffarabad, Bhimber, and Mirpur.</p> <p>ii.Indoor Air <math>\text{PM}_{2.5}</math> and <math>\text{PM}_{10}</math>(<math>\mu\text{g}/\text{m}^3</math>) in AJK</p> <p>iii). Noise level(dB) in Muzaffarabad, Bhimber, and Mirpur</p> <p>iv. Ozone levels (<math>\mu\text{g}/\text{m}^3</math>) at different sites/stations/points in Muzaffarabad, Bhimber, and Mirpur</p> <p>v). BETX(Benzene) concentration (ppb) measured at different sites/stations/points in Muzaffarabad, Bhimber, and Mirpur</p> <p>v)i. Hourly Field Measurement Data measured at different sites/stations/points in Muzaffarabad, Bhimber, and Mirpur</p> <p>vii. Environmental Quality Standards:</p> <ul style="list-style-type: none"> <li>• Sampling Site Description</li> <li>• Monitoring Results</li> <li>• Particulate matters</li> </ul> <p>Air pollution causes and control average annual concentration of pollutants in terms of <math>\text{SO}_2</math>, <math>\text{NO}_x</math>, <math>\text{CO}</math>, <math>\text{O}_3</math>, measured in ppb and <math>\text{CH}_4</math>, Lead, <math>\text{PM}_{10}</math> measured in <math>\mu\text{g}/\text{m}^3</math> at certain city points of Karachi, Lahore , Quetta and Peshawar</p>
<p>1(b).Average annual ambient concentration of pollutants ( <math>\mu\text{g}/\text{m}^3</math>)</p>	<p>Institute of Environmental Science &amp; Engineering (IESE), NUST, Rawalpindi</p> <p>EPA-PUNJAB</p>	<p>i).The concentration of air pollutants like <math>\text{NO}_x</math>, <math>\text{SO}_2</math>, <math>\text{O}_3</math>, <math>\text{CO}</math>; <math>\text{Lb}</math>, and <math>\text{CH}_4</math> are reported from certain points of the large cities Rawalpindi and Lahore whereas <math>\text{PM}_{10}</math> is measured from different points of the same cities.</p> <p>ii). The concentration units of the pollutants such as <math>\text{NO}_x</math>, <math>\text{SO}_2</math>, <math>\text{O}_3</math> and <math>\text{CO}</math> have been measured in ppb instead of <math>\mu\text{g}/\text{m}^3</math>. However, the units concentration for Lead (Pb), <math>\text{CH}_4</math> and <math>\text{PM}_{10}</math> are measured in <math>\mu\text{g}/\text{m}^3</math>.</p>

2.Regional emissions of pollutants by industry and transport (tones per annum)	<p>i). Climate Bulletin of Pakistan, Pakistan Meteorological Department</p> <p>ii). Pakistan's Quarterly Bulletin Jan.-March, 2010</p>	<p>Annual emissions of air pollutants like CO<sub>2</sub>, SO<sub>2</sub> and NO<sub>x</sub> have been estimated 1997-98 which contribute to the formation of ground level ozone and indirectly to climate change. These emissions are attributed to the economic sectors and usually based on statistics on production in industries using solvents, combustion of fossil fuels in transport, power, and fertilizer use in agriculture as well as domestic and commercial activities at national level.</p>
3. Estimated air pollutants from various economic sectors (thousand tones)	<p>NCS Sector Paper on Energy, National Conservation Strategy of Pakistan Website:  <a href="http://www.enercon.gov.pk/">http://www.enercon.gov.pk/</a></p>	<p>Emission of CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, CO and NM-VOC as greenhouse gases has also been estimated as inventory (In 000' tone) and their shares in total GHG for the years 1994 and 2008 with av. annual growth rate.  Website: <a href="http://www.pec.org.pk/sCoursefiles/Lec6EEC-1.doc.pdf">http://www.pec.org.pk/sCoursefiles/Lec6EEC-1.doc.pdf</a></p> <p><b>Air Pollution causes and control- Website:</b>  <a href="http://www.pec.org.pk/sCourse_files/Lec6EEC-1.doc.pdf">http://www.pec.org.pk/sCourse_files/Lec6EEC-1.doc.pdf</a></p>
3(a).National Environmental Sustainable Indicators	Pak EPA	<p>i) Ambient Air Quality Monitoring Data Six months Mean Value in major cities.</p> <p>ii) Monthly Mean temperatures by major cities.</p> <p>iii) Average annual and monthly rainfall in different areas by major cities.</p> <p>iv) Critically threatened Ecosystems in Pakistan. Scientific and common names of Endemic Flora and Fauna in Pakistan.</p>

4..Estimates of Greenhouse gases	Pakistan Meteorological Department	PMD Data and Climate Bulletin-Greenhouse Gas Inventories for 1994-2008(NEIMS)  PMD PAEC-ASAD(2009)
5.. Estimates of annual emissions of air pollutants	Pakistan Meteorological Department	PMD Data And Climate Bulletin-Greenhouse Gas Inventories for 1994-2008(NEIMS)
6. Pakistan's National Green House Gases Inventories for the year 1994 and 2008 by type	Pakistan Meteorological Department (PMD-2009)	PMD Data and climate bulletin-greenhouse gas inventories for 1994-2008(NEIMS)
7. Number of vehicles using CNG as replacement fuel for petrol/diesel and their share in total number of vehicles	i). Pakistan CNG Association  ii). Hydrocarbon Development Institute of Pakistan(HDIP)	Compendium on environment, 2010 on air quality for urban centers of Punjab
8. Month wise analysis of air quality at Quaid-e-Azam Town, township, Lahore- 2009	Environment protection department, govt. of Punjab, Lahore	Compendium on environment, 2010 on air quality for urban centers of Punjab
09. Climate change indicators by major cities-quarterly report January, 2010	Pakistan Meteorological Department (PMD)	PMD Data and climate bulletin-greenhouse gas inventories for 1994-2008(NEIMS)
10. Climate data record of five major cities of Pakistan	Pakistan Metrological Department	PMD Data and climate bulletin-Greenhouse Gas inventories for 1994-2008(NEIMS)



10(a). Air Quality Data of Major Cities in Punjab- Tabular Report	EPA, Punjab	<ul style="list-style-type: none"> <li>i) Monthly Mean Values of pollutants at different stations 2007</li> <li>ii) State of Air Quality in Urban Centers of Punjab -2008 to Jan., 2010</li> <li>iii) Ambient Air Quality in big cities of Punjab, Jan 2010</li> </ul>
11. Winter (Jan-Mar) season 2010 rainfall	Pakistan Metrological Department	PMD Data and Climate Bulletin-Greenhouse Gas Inventories for 1994-2008(NEIMS)
11(a).Environmental Data and Information	EPA-Sindh	<ul style="list-style-type: none"> <li>i) Motor vehicles registered in Sindh by type- with their Percentage distribution 2005-06</li> <li>ii) Agricultural production –Crop wise charts presentation of areas and yield</li> <li>iii) District wise number of hospitals with their respective number of beds.</li> <li>iv) Province wise Percentage distributions of livestock for the years 1986 and 1996.</li> <li>v) Quality measures of drinking water w.r.t physical, biological and chemical parameters with max and min values compared to WHO standard samples taken from 18 Town.</li> <li>vi) TMA Wise Basic Data on Solid Waste Management System, City, District Government, Karachi(CDGK) Garbage collection and disposal from 18 Towns with transportation cost.</li> <li>vii) Mean monthly temperatures, rainfall, wind speed taken from PMD</li> <li>viii)Concentration of Mangrove habitats and nutrients in Karachi</li> <li>ix) Marine micro-habitat(phytoplankton) species (93)found in coastal water of Karachi</li> <li>x) List of 171 companies who conducted initial environmental examination in last</li> </ul>

		10 years
12.Pre-monsoon season (April-June) 2010 over Pakistan	Pakistan Metrological Department	<p>PMD Data and Climate Bulletin-Greenhouse Gas Inventories For 1994-2008(NEIMS):</p> <ul style="list-style-type: none"> <li>i) Monthly temperatures, rainfall, mean pressure and vapors pressure by major cities of Pakistan.</li> <li>ii) Yearly max and min. temperatures and heaviest rainfall by major cities of Pakistan</li> <li>iii) Province wise percentage departure of rainfall in winter and pre-monsoon</li> <li>iv) Annular solar eclipse visible in Pakistan</li> <li>v) Projected changes in temperature and precipitation in 2080</li> </ul>
13. Environmental Data of Gilgit-Baltistan – By GB-EPA	EPA ,Gilgit-Baltistan	<ul style="list-style-type: none"> <li>i) Monthly Atmospheric and weather conditions of Gilgit Baltistan-2009: Source PMD</li> <li>ii) Indicators on Education, Health, Power, Energy, Roads and communication, Physical planning, housing and drinking water supply</li> <li>iii) Micro biological Water Quality results</li> <li>iv) Population of Gilgit-Baltistan, rural and urban households, MSV</li> <li>v) Availability of sanitation facilities in Gilgit-Baltistan</li> </ul>
13(a). Population under threat due to sea level rise	National Institute of oceanography / marine pollution control department, Karachi	
14. Land cover/land use in Pakistan (000, hectares)	<p>i). Land use atlas of Pakistan, Ministry of Climate Change, 2010</p> <p>ii).Pakistan statistical year book,2010</p>	Province wise Land Use/ Land cover by type with percentage shares

14(a)..Water Quality Monitoring Report of Mirpur, Kotli and Bhimber Towns	EPA-AJK	<ul style="list-style-type: none"> <li>i) Water Quality Analysis ,Samples taken from different locations of Mirpur, Kotli and Bhimber</li> <li>ii) Standards set by PCRWR and WHO 2004</li> <li>iii) Environmental Statistics of AJK</li> <li>iv) Geographical Feature</li> <li>v) Area and Population</li> <li>vi) Forest Statistics</li> <li>v). Veterinary , Transport Statistics Roads and communications</li> </ul>
15. Intensity of soil erosion (area affected ha)	<ul style="list-style-type: none"> <li>i). National Land Use Atlas of Pakistan, Ministry of Climate Change, 2010.</li> <li>ii). Soil survey of Pakistan</li> <li>iii). Pakistan Council of Research for Water Resources (PCRWR)</li> </ul>	Report on Pakistan Agriculture Research Council(PARC)
15(a).Ambient Air Quality Data of AJK	EPA, AJ&K	<ul style="list-style-type: none"> <li>i) Ambient Air Quality Standards(NEQS,WB and WHO)</li> <li>ii) Concentration of pollutants(<math>\mu\text{g}/\text{m}^3</math>) at different sites/stations/points in Muzaffarabad, Bhimber, and Mirpur</li> <li>iii) Indoor Air <math>\text{PM}_{2.5}</math> and <math>\text{PM}_{10}</math>(<math>\mu\text{g}/\text{m}^3</math>) in AJK</li> <li>iv) Noise Level(dB) in Muzaffarabad, Bhimber, and Mirpur</li> <li>v) Ozone levels (<math>\mu\text{g}/\text{m}^3</math>) at different sites/stations/points in Muzaffarabad,</li> </ul>

		<p>Bhimber, and Mirpur</p> <p>vi) BETX(Benzene) concentration (ppb) measured at different sites/stations/points in Muzaffarabad, Bhimber, and Mirpur</p> <p>vii) Hourly Field Measurement Data measured at different sites/stations/points in Muzaffarabad, Bhimber, and Mirpur</p> <p>viii) Environmental Quality Standards</p>
15(c). Climate Bulletin (PMD)	Pakistan Meteorological Department (PMD)	<p>i) Projected Changes in Temperature</p> <p>ii) Green House Gases (GHG)Emissions in Pakistan</p> <p>iii) Energy and Electricity Outlook</p> <p>iv) Pakistan's Monthly Weather Summary</p> <p>v) Samples of Secondary Data Generation</p>
16.Intensity of water logging and salinity (area affected ha in Percentage)	<p>i). Drainage master plan of Pakistan (Volume-II), main report, Water and Power Development Authority WAPDA</p> <p>ii). International Water Logging and Salinity Research Institute (IWASRI), December, 2005</p> <p>iii). National Land Use Atlas of Pakistan, Ministry of Climate Change, 2010</p>	<p>i) Report of Pakistan Agriculture Research Council(PARC)</p> <p>ii). International Water Logging and Salinity Research Institute (IWASRI), December, 2005 and their latest unpublished data</p> <p>iii). National Land Use Atlas of Pakistan, Ministry of Climate Change</p>
16(a).Water Quality Status	Report of PCRWR	<p>i) Physical parameters e.g pH, EC, TDS, Turbidity, Color, Taste and Odor</p> <p>ii) Chemical parameters viz-a –viz alkalinity, bicarbonate calcium, magnesium, sodium, potassium, sulphate and nitrate</p>

		<p>iii) trace elements like arsenic, iron and fluoride.</p> <p>iv) Causes of water pollution</p> <p>v) Water quality standards.</p>
17. Protected areas number, area (ha) and their percentage share	<p>i). Biodiversity, IUCN</p> <p>ii). Forest</p>	<p>i). Biodiversity guide to Pakistan, report prepared by world conservation monitoring centre, 1991</p> <p>ii). Forests and Biodiversity information/data Report</p>
18.Forest types by their area and percentage share 1999-2000	<p>i). Forests &amp; biodiversity information / data report</p> <p>ii). Forestry Sector Master Plan.</p> <p>iii). Pakistan Forest Research Institute, Peshawar</p>	<p>i). Province/Region wise and total area of forests by legal category province wise per capita forest, Percentage change in forest cover, Afforestation during last 10 years (2000-09)</p> <p>ii). Report on Pakistan Agriculture Research Council(PARC) forest area (2007-2008)</p>
18(a). Environmental Issues/Problems and possible supporting datasets, Information, Statistics and Indicators	PARC	<p><b>Agriculture</b></p> <ul style="list-style-type: none"> <li>Province wise irrigated areas for permanent arable crops(in million acres) 2006-07</li> <li>Trends of cropping areas over a period of 50 years</li> <li>Comparative status of livestock (by types and age)censuses 1996 and 2006 with percent variations</li> </ul> <p><b>Forests</b></p> <ul style="list-style-type: none"> <li>Total area under different types of natural forests and provincial/regional distribution of forest areas as percentages of total land areas</li> <li>Changes in Forests types at 5 years interval , 1992, 1997 and 2001(annual Percentage change rate) at Provincial/Regional and national levels</li> </ul>

		<p><b>Fish Production</b></p> <ul style="list-style-type: none"> <li>• Annual production of marine and province wise inland fisheries(000, tonnes)</li> </ul> <p><b>Chemicals</b></p> <ul style="list-style-type: none"> <li>• Season wise consumption of fertilizers</li> <li>• Time series data on consumption and production of chemical fertilizers in Pakistan(000. nutrient tones)</li> <li>• Consumption of pesticides in Pakistan (in 100 kgs) 1977-87</li> <li>• Quantum and Value of Imported Pesticides 1990- 2007</li> </ul> <p><b>Livestock</b></p> <ul style="list-style-type: none"> <li>• Estimated Livestock population (by types of species) over censuses of 1976, 1986, 1996 and 2006 (in Millions)</li> </ul> <p><b>WATER QUANTITY</b></p> <ul style="list-style-type: none"> <li>• Average quantity of surface water (River Indus water inflow)</li> <li>• Province wise proportion of canal water diversion to irrigation (historical data)</li> <li>• Storage capacity of existing large dams( Terbela Dam, Mangla Dam and Chashma)</li> <li>• Summary of glaciers in GB Pakistan- PARC 2005</li> <li>• Water quality standard of water drafted by PCRWR</li> <li>• Water quality of lakes, rivers ,canals and dams (physical biological parameters)</li> <li>• Water and sanitation</li> </ul>
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18(b).Database on forestry, wildlife, protected areas and biodiversity sectors by Arid Agriculture University, Rawalpindi	Arid Agriculture University, Rawalpindi	<ul style="list-style-type: none"> <li>i. Legal Status of Government and Private Forest Areas(000 ha)</li> <li>ii. Province/region wise total land area, forest area and ranged lands with their respective percentages</li> <li>iii. Province /region-wise Percentage change in the forest areas for the years 1997(5 yearly) 2004(10 yearly) with the base year of 1992</li> <li>iv. Percentage Change in the forest by type of vegetation for the years 1992,1997 and 2003-04 for Pakistan and province/region- wise</li> <li>v. Supply and demand of timber and fire wood (mm3)for the year 2003</li> <li>vi. Estimated consumption of fuel wood by households, commercial and industry (desegregated)</li> </ul>
18(c).Agriculture Statistics	Pakistan Agriculture Research Council ( PARC)	<ul style="list-style-type: none"> <li>i) Arable permanent crops of Pakistan</li> <li>ii) Forest Area by province Change in the forest areas</li> <li>iii) Fisheries production</li> <li>iv) Agriculture Statistics</li> </ul>
19. Forest area (2007-2008)	Agricultural Statistics of Pakistan-2007-2008	Area of Forests and range lands by type of vegetation in 2007-2008*(000 hectares)
20. Area of forests and range lands by type of vegetation in 2007-08 (000 hectares)	Agriculture Statistics of Pakistan-2007-08, M/O Food, Agriculture & Livestock (Economic Wing)	Province wise area of forest by type and changes in forest types at 5-years interval (1992-2001)
1.Forests & Bio-diversity Information Data Report	Forest Statistics of Pakistan 2004	<ul style="list-style-type: none"> <li>i) Forest- Land cover of Pakistan Map</li> <li>ii) Wood and wood based Statistics</li> <li>iii) Harvesting age ,rotation age</li> <li>iv) Climate Change and Tree line</li> <li>v) Mangroves of Pakistan</li> <li>vi) Sustainable Forest Management</li> <li>vii)Riverine forest, Deforestation in</li> </ul>

		Pakistan and medicinal plants viii) Ecological Zone in Pakistan ix) Protected area in Pakistan x) Deserts of Pakistan
21. Sectoral share of forestry in agriculture and GDP	Federal Bureau of Statistics	Report on Pakistan Agriculture Research Council(PARC)
22. Area afforested (000 hectares)	Agriculture statistics of Pakistan-2007-08, M/O food, agriculture & livestock (economic wing)	i). Agriculture Statistics, PARC ii). Forest Statistics,2004 iii). Pakistan Forest Research Institute
23. Area and share of plantation/ farm forest in total forest area	i). Forestry Sector Master Plan ii). Pakistan Forest Research Institute, Peshawar	i). Agriculture Statistics, PARC ii). Forest Statistics,2004 iii). Pakistan Forest Research Institute
24. Total area affected by deforestation and its percentage share by province/area	i). Inspector General Forest , ii). Pakistan Environment Protection Agency state of environment report, 2005,	i). Agriculture Statistics, PARC ii). Forest Statistics,2004 iii). Pakistan Forest Research Institute
25. Province/ area wise forest management (area in 000 ha.)	i) Inspector General Forest, ii). Pakistan Forest Research Institute	i). Agriculture Statistics, PARC ii). Forest Statistics,2004 iii). Pakistan Forest Research Institute
26. Total area under protected forests 1999-2000	i). Aerial forest inventory, provincial forest departments, ii). Inspector general forest, iii). Pakistan forest research institute	i. Agriculture Statistics, PARC ii. Forest Statistics,2004 iii. Pakistan Forest Research Institute
27.changes in forest	i) Aerial Forest	i). Agriculture Statistics, PARC

types at 5-years interval (area in 000ha)	<p>Inventory, Provincial Forest Departments,</p> <p>ii) Inspector General Forest,</p> <p>iii). Pakistan Forest Research Institute</p> <p>iv). Agriculture statistics of Pakistan agriculture research council.</p> <p>v). WWF funds for nature</p> <p>vi). Pakistan Ministry of Climate Change</p>	<p>ii).EPA, AJK</p> <p>iii). Forest Statistics,2004</p> <p>iv). Pakistan Forest Research Institute</p>
28.Province /region wise area (ha) under forest by ownership	<p>i) Inspector General Forest</p> <p>ii). Pakistan Forest Research Institute</p>	Agricultural Statistics of Pakistan, 2008-2009,Ministry of Food and Agriculture, Economic Wing , Islamabad
29. Area of forest and rangelands under the control of provincial forest departments by legal categories 1999-2000 (000 ha)	Forest statistics of Pakistan (2004), forest & biodiversity report	Agricultural Statistics of Pakistan, 2008/09 Ministry of food and agriculture, economic wing , Islamabad
30. Livestock density per hectare 2006	Agricultural Statistics of Pakistan, 2008-09	<p>i). Province wise Livestock Population,1960-2006</p> <p>ii). Estimated livestock population by type of animals, 2007-08, 2008-09</p> <p>iii).Agriculture Census Organization, Statistics Division, Government of Pakistan , Lahore</p>
31. Area of rangelands	Forest & biodiversity	

in Pakistan (million hectares )	information report-forestry statistics in Pakistan	
32. Urban sprawl on agricultural land	To be computed on the basis of estimates given in national conservation strategy of Pakistan	Pakistan Statistical year book 2010,
33.Intensity of chemical fertilizer use	Federal Bureau of Statistics	Pakistan Statistical year book 2010
34. Intensity of pesticide use	i). Planning Commission Government of Pakistan  ii). Federal Bureau of Statistics, Statistics Division	i).Medium term development framework, planning commission government of Pakistan, (march 2005)  ii). Pakistan Statistical year book 2010  iii). Agriculture Statistics of Pakistan
35. Arable land availability per capita 2008-09	Federal Bureau of Statistics	Pakistan statistical year book 2010, agriculture statistics of Pakistan
36. Watersheds or catchments areas of major river basins	i). Pakistan water sector strategy, national water sectoral profile, volume 5 (oct 2002),page 53	WAPDA, Lahore PCRWR, Islamabad
37. Freshwater availability	i). Drainage master plan of Pakistan (vol ii), main report (December, 2005) ii). Pakistan Economic Survey (2008-2009) finance division, economic advisors wing, Islamabad,	Water Resources Section, Planning Division  Agriculture, Pakistan Statistical Year Book, 2010
38. Overall water availability	i). Water resources section, planning division,	WAPDA(water Section) water resources section, planning division

	ii). WAPDA (water Section)	Agriculture, Pakistan Statistical Year Book, 2010
39. Ground water availability and consumption and quality	i). National Water policy, January (2004), ministry of water and power, government of Pakistan.  ii). Drainage master plan of Pakistan	Main report of WAPDA and International Water Logging and Salinity Research Institute (IWASRI)
40 .Concentration of physio – chemical and bacteriological pollutants in ground water (mg/liter)	Water quality status, fourth technical report (2004-2005), Pakistan council of research in water resources (PCRWR), ministry of science and technology, government of Pakistan	Report on water quality, Pakistan council of research in water resources (PCRWR), ministry of science and technology, government of Pakistan
41. Concentration of heavy metals in groundwater		Report on water quality, Pakistan council of research in water resources (PCRWR), ministry of science and technology, government of Pakistan
42. Concentration of nitrate, pesticide and faecal coliform in groundwater	Water quality status, fourth technical report (2004-2005), Pakistan council of research in water resources (PCRWR), ministry of science and technology, government of Pakistan	
43. Concentration of physio- chemical and bacteriological pollutants in surface water (mg/litre)	i). Pakistan council of research in water resources (PCRWR), ministry of science and technology, government of Pakistan ii). Pakistan council of scientific and industrial research, ministry of science technology govt. of Pakistan.	Report on water quality, Pakistan council of research in water resources (PCRWR), ministry of science and technology, government of Pakistan

	iii).Public Health Laboratories (PHL) by major cities	
44. Quality of sub-soil water samples of district Rawalpindi, 30 <sup>th</sup> may to 13 <sup>th</sup> June, 2002	Public Health Laboratories (PHL) by major cities	National Institute of Health (NIH), Islamabad
45. Min, max and avg values of water quality parameters (Islamabad, Bahawalpur, Faisalabad)	Pakistan council of research in water resources (PCRWR), water resources research center, Peshawar, ministry of science and technology may 2010	Water quality status, fourth technical report, 2004-05, PCRWR
46. Surface water availability and consumption	i). Water and Power Development Authority (WAPDA) ii). Drainage master plan of Pakistan (vol-II), main report, Water and Power Development Authority and international water logging and salinity research institute	Main report of WAPDA and International Water Logging and Salinity Research Institute (IWASRI)
47.Average annual discharges into the surface water (million gallons)	Pakistan water sector strategy: national water sector profile, volume 5 (October 2002)	Main report of WAPDA and International Water Logging and Salinity Research Institute (IWASRI)
48. Rivers, dams, reservoirs, lakes and drains water quality data 2004	Pakistan council of research in water resources (PCRWR), water resources research center, Peshawar, ministry of science and technology may 2010	i). Water Quality Status, Fourth Technical Report (2004-2005), ii). Technical Reports of Environmental Protection Agencies (EPA), Punjab, Sindh, KPK, Baluchistan, AJK



49. Laboratory test results of wastewater quality in Rawalpindi/ Islamabad	Pakistan council of research in water resources (PCRWR), water resources research center, Peshawar, ministry of science and technology may 2010	i).Water Quality Status, Fourth Technical Report (2004-2005), ii).Technical Reports Of Environmental Protection Agencies (EPA), Punjab, Sindh, KPK, Baluchistan, AJK
50. Concentration of heavy metals in surface water	Pakistan Environmental Protection Agency and Provincial EPAs	i).Water Quality Status, Fourth Technical Report (2004-2005), ii).Technical Reports Of Environmental Protection Agencies (EPA), Punjab, Sindh, KPK, Baluchistan, AJK
51. Concentration of nitrate, pesticide and faecal coli form in surface water	Pakistan Environmental Protection Agency and Provincial EPAs	Water Quality Status, Fourth Technical Report (2004-2005), Technical Reports of Environmental Protection Agencies (EPA), Punjab, Sindh, KPK, Baluchistan, AJK
52. Percentage of population connected to waste water treatment plants in urban areas and oxidation ponds in rural areas	i).Pakistan Environmental Protection Agency and Provincial EPAs ii).Agriculture statistics, Pakistan Agriculture Research Council	i).Technical Reports of Environmental Protection Agencies (EPA), Punjab, Sindh, KPK, Baluchistan, AJK ii).PLSM; Report 2007-08
53. Industrial and sewage discharges into coastal waters (million liter/ day or Maf/year)	Medium term development framework planning commission government of Pakistan(march 2005)	Midterm development framework, planning commission, government of Pakistan, march, 2005, page 364
54. Potential hotspots along the coast	National Institute of Oceanography	Technical Report of National Institute of Oceanography, Karachi
55. Percentage of coastal population connected to waste water treatment	National centre for rural development and municipal administration,	Technical report of national centre for rural development and municipal administration.

plants in urban areas and oxidation ponds in rural areas- future	govt. of Pakistan	
56. Inventory of ecosystems and threats	Biodiversity Action plan of Pakistan, 2000	
57. Important ecosystems under threat by location and area	Pakistan environmental protection agency, state of environment report 2005, draft for consultation, commissioned by PAK – EPA, Ministry of Climate Change, government of Pakistan	
58. Protected area by ecosystem	i. Forestry sector master plan b. inspector general of forest, Ministry of Climate Change	
59. Number of known and endemic plant species in Pakistan and intensity of threat to them	Biodiversity action plan for Pakistan, Ministry of Climate Change, government of Pakistan in collaboration with the world wide fund for nature – Pakistan (WWF-P) and the world conservation union – Pakistan (IUCN)	Biodiversity guide to Pakistan, report prepared by world conservation monitoring centre,1991
60. Rare and threatened species of vascular plants	i).Biodiversity action plan for Pakistan, Ministry of Climate Change, government of Pakistan in collaboration with the world wide fund for nature – Pakistan (WWF-P) and the world conservation union – Pakistan (IUCN),	Biodiversity action plan for Pakistan, Ministry of Climate Change in collaboration with the world wide fund for nature, WWF-Pakistan.

	ii). IUCN red data book	
61. Estimated number of fauna species in Pakistan	Biodiversity action plan for Pakistan, m/o of environment, LG & RD, GoP in collaboration with the world wide fund for nature – Pakistan (WWF- P) and the world conservation union – Pakistan (IUCN)	i).Report on biodiversity of Pakistan in collaboration with the world wide fund for nature – Pakistan (WWF- P) and the world conservation union – Pakistan (IUCN)biodiversity action plan for Pakistan,
62.Rare and threatened species (vertebrates)	i).IUCN red data book ii).Biodiversity action plan for Pakistan, Ministry of Climate Change, LG & RD GoP in collaboration with the world wide fund for nature – Pakistan (WWF- P) and the world conservation union – Pakistan (IUCN)	i).Report on biodiversity of Pakistan in collaboration with the world wide fund for nature – Pakistan (WWF- P) and the world conservation union – Pakistan (IUCN)biodiversity action plan for Pakistan,
63. National parks and wildlife of Pakistan (area in sq. km)	i).IUCN Red Data Book ii).Biodiversity action plan for Pakistan, Ministry of Climate Change, LG & RD GoP in collaboration with the world wide fund for nature – Pakistan (WWF- P) and the world conservation union – Pakistan (IUCN)	i).Report on biodiversity of Pakistan in collaboration with the world wide fund for nature – Pakistan (WWF- P) and the world conservation union – Pakistan (IUCN)biodiversity action plan for Pakistan,
64. Summary of protected area in Pakistan (based on NCCW data 2010)	Forests and Biodiversity information/data Report	Report on biodiversity of government of Pakistan (environment)in collaboration with the world wide fund for nature – Pakistan (WWF- P) and the world conservation union – Pakistan (IUCN)

65. Energy consumption by source (TOE)	Energy conservation centre, Ministry of Climate Change, Islamabad	Pakistan Energy Year Book 2009(HDI) and Previous Editions
66. Fossil fuel consumption in thermal power generation (TOE)	Energy Conservation Centre, Ministry of Climate Change	Energy conservation centre, Ministry of Climate Change Pakistan energy year book, 2009 and previous editions
67. Total fossil fuel proven reserves and their lifetime on the basis of present and future consumption (toe)	Pakistan Energy Year Book 2009(HDI) and Previous Editions	Energy Conservation Centre, Ministry of Climate Change Pakistan energy year book, 2009 and previous editions
68 Total Fossil Fuel Imports (TOE)	Pakistan Energy Year Book 2009(HDI) and Previous Editions	Pakistan Energy Year Book, 2009 and previous editions
69. Total renewable energy production (TOE)	i). Pakistan environmental protection agency, state of environment report 2005, draft for consultation, commissioned by P EPA, M/O GOP.  ii). Pakistan energy year book 2009 (HDI) and previous editions	i). Draft for consultation commissioned by Pak-EPA  ii). State of Environment Report 2005  iii). Pakistan Energy Year Book 2009(HDI) and Previous Editions
70. Energy shortage (TOE)	Pakistan Energy Year Book 2009(HDI) and Previous Editions	i). Draft for consultation commissioned by Pak-EPA ii). State of Env. Report 2005 iii). Pakistan Energy Year Book 2009(HDI) and Previous Editions
71. Energy use efficiency /GDP	Medium term development framework, planning commission, government of Pakistan (march 2005)	i). Planning Commission, Government of Pakistan (March 2005)  -ii). Medium Term Development Framework,
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unit 000 (ToE)	development institute of Pakistan	ii)Pakistan Energy Year Book 2008
73. Total proven reserves of minerals and their lifetime on the basis of present and future extraction (in tonnes)	Geological Survey of Pakistan	
74 Annual extraction of minerals as percentage of proven reserves	i).Medium term development framework planning commission government of Pakistan (march 2005),  ii). Mineral statistics of Pakistan, geological survey of Pakistan – 2003	
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76. Province- wise population by sex and rural urban 1998- census	Population Census Organization	District Census Reports 1998 Pakistan rural and urban census reports, 1998
77. Total rate of rural/urban migration (annual rate Percentage)	Population Census Organization	District census reports 1998 Pakistan rural and urban census Reports, 1998
78. Population living in slum and marginal areas (Katchi Abadis)	i).Katchi abadi policy, Ministry of Climate Change ii).Medium term development framework planning commission government of Pakistan (March 2005)	Medium term development framework planning commission government of Pakistan (March 2005)

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# GEB MANAGEMENT

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