Chapter 16

Environment

Pakistan is faced with serious challenges of environmental pollution, land degradation, water, and air pollution. Freshwater/Industrial pollution is mostly unchecked and may get worse unless economic activity is underpinned with sustainable development. Efforts are underway to attain goals of sustainable social and economic development, ensuring water, food, energy and environment securities, without over-exploiting forests and ecosystems. The Government of Pakistan believes in the creation of opportunities for the present generation without compromising on the potential of future generations to meet their developmental needs. Environment degradation is fundamentally linked to poverty in Pakistan. Approximately less than one-fourth of the country's population, like in most developing countries, is poor and directly dependent on natural resources for their livelihood-whether agriculture, hunting, forestry, fisheries, etc. Poverty combined with a rapidly increasing population and growing urbanization, is leading to intense pressures on the environment. The environment-poverty nexus cannot be ignored if effective and practical solutions to remedy environmental hazards are to be taken. In Pakistan, as elsewhere, environment degradation is both a cause and consequence of poverty. A fragile and damaged resource base is a major cause of poverty as agriculture yields are lower on degraded land, forests are depleted and access to vital livelihood resources declines. The deterioration of environment continues to affect livelihood and health thus increasing the vulnerability of poor to disaster and environment-related conflicts.

Environmental degradation, air and water pollution, ozone layer depletion, deforestation, desertification, vanishing bio diversity and land degradation have resulted in climate change and ecological imbalance. Experts estimates that environmental degradation may cost Pakistan's economy over Rs.365 billion every year of which inadequate water supply, sanitation and hygiene accounts for Rs.112 billion, agricultural soil degradation Rs.70 billion, indoor pollution Rs.67 billion, urban air pollution Rs.65 billion, lead exposure Rs.45 billion and land degradation and deforestation Rs.6 billion. Some other environmental experts believe that the environmental degradation cost must have increased beyond Rs.450 billion.

The challenges in environmental sector include:

- Water and air pollution causing widespread diseases
- Adaptation to the impact of climate change for energy, water and food securities
- Preparedness for adaptation/mitigation due to climate change and to avail opportunities under Clean Development Mechanism (CDM)
- Preparedness for an effective disaster management so as to avoid damage to the environment
- Watershed degradation and deforestation
- Management of solid, liquid, hazardous waste
- Green economy-improved human well-being and social equity while significantly reducing environmental risks and ecological scarcities-initiatives and its impact on Pakistan. Linking natural resource based livelihoods to production of ecosystem services, the green economy can help reduce poverty and enhance environmental sustainability
- Implementation of planned initiative with efficacy to increase forest cover and biodiversity
- Reducing land degradation
- Effluent treatment at source to avoid discharge of polluted industrial and domestic sewage to fresh water bodies and marine environment
- Increasing energy efficiency with focus on conservations measures
- Rapid urbanization and industrialization leading to serious environmental concerns: natural resources depletion resulting from accelerated economic and social transformation.

Strategy to Achieve The Objectives Of Environment Protection

- Achieving MDGs targets, particularly those relating to environmental sustainability under Goal 7

- Implementation of the Action Plan of National Climate Change Policy and adequate sharing of responsibilities at all levels
- In the wake of 18th Amendment , review and amendments in environmental regulation in consultation with federal and provincial Environmental Protection Agencies, civil society and private sector in order to better implement the policies
- Involvement of private sector and NGOs under public-private partnership for effective and efficient conservation and management of natural resources.

The government is also implementing various other policies and programmes, many of which have come out of the National Environment Action Programme (NEAP). In this regard, the National Environment Policy prepared under NEAP serves as an overarching framework for various interventions in the area of the environment. Some key policies and programs that have stemmed from NEAP are: Air and Water Quality Monitoring, Clean Drinking Water for All, Pakistan Wetlands Programme, National Sanitation Policy, Sustainable Land Management to Combat Desertification in Pakistan, Environmental, Rehabilitation and Poverty Reduction through Participatory Watershed Management in Tarbela Reservoir and Energy Efficiency and Renewable Energy etc. Some of the important programmes at the federal level during 2013-14 included as follows:

- Establishing National Multilateral Environmental (MEAS) Secretariat (Islamabad)
- Establishment of Clean Development Mechanism Cell (Islamabad)
- Establishment of National Bio-safety Centre (NBC) Project (Islamabad)
- Sustainable Land Management Project, Phase-1 (Islamabad)
- Development and Implementation of Water and Sanitation Management Information System in Pakistan (Islamabad)
- Establishment of Centre for Sustainable Organization (Islamabad)
- Establishment of Geometric Centre for Climate change and Sustainable Development 2012-2015 (Islamabad) and
- Indoor Air Quality in Buildings (Islamabad).

Millennium Development Goals: Ensure Environmental Sustainability, MDG 7

Under MDG 7, Pakistan aims to promote sustainable development, halve the proportion of people without sustainable access to improve drinking water and basic sanitation, and bring about a significant improvement in the lives of slum dwellers by 2020.

Table 16.1 Status of Indicators-MDG 7

Indicators	Latest National Value	Target	Status
Forest Cover (%)	5.2	6.0	Off Track
Land Area Protected for Conservation of Wildlife (%)	11.6	12.0	On Track
GDP (in 1980/81Rs.) per ton of oil equivalent (energy efficiency)	26,543	28,000	On Track
Sulfur Content in High Speed Diesel	0.6	0.5-0.25	On Track
Proportion of Population with Access to Improve Water Sources	89	93	On Track
Proportion of Population with Access to Sanitation	72	90	Off Track
Proportion of Katchi Abadies Regularized	n/a	-	-

Source: Pakistan Millennium Development Goals, Report 2013.
Ministry of Planning, Development and Reforms.

Progress on MDG 7 is measured against seven indicators: forest cover, land area protected for conservation of wildlife, energy efficiency [GDP (in 1980/81 Prices.) per ton of oil equivalent], sulfur content in high speed diesel, proportion of population with access to improved water sources and sanitation, and proportion of katchi abadies regularized.

Of the seven MDG 7 indicators, Pakistan is on the track to achieve four: Protecting areas for wildlife conservation (11.6 percent against the target of 12 percent, reducing sulfur content in high speed diesel, improving GDP per unit energy (measure of energy efficiency) and improving access to safe drinking water (89 percent against the target of 93 percent). However, it is lagging on access to sanitation; currently 72 percent of the population has access to this facility against a target of 90 percent. Pakistan has also made progress on increasing forest cover, currently it is 5.2 percent but it still short of the 6 percent target. Overall, with four out of seven

indicators are on track, Pakistan is likely to achieve MDG 7 with continued efforts.

Climate Change

Global warming attributed to human activities leading to Greenhouse gas emissions, since the advent of Industrial Revolution of 1750s. As a result, the global climate has been changing at a pace much higher than the natural variability. This human-induced global climate change is having adverse impacts on different socio-economic sectors, particularly in countries situated at lower latitudes and subtropics/tropics. Pakistan is extremely vulnerable to climate change impacts because of its geographical location, high population and low technological and resource base. The projected impacts of climate change include threat to its water security, food security and energy security. It is high time to take stock of country's situation in relation to climate change to visualize measures for achieving sustained economic growth.

The environment strains faced by Pakistan over the last decades have become a major challenge for its citizens and economy. Climate change poses a great threat to gains made in poverty reduction and development. While climate change is a global phenomenon, its impacts is felt more severely by the developing world due to their greater vulnerabilities and lesser capacity to manage the effects of climate change, and similarly, within society, by marginal and vulnerable groups including women and children. Pakistan's emissions of greenhouse gases (GHGs) are much lower than rest of the world. Environmental degradation along with poor home hygiene, lack of basic sanitation and unsafe drinking water has a huge impact on health of the population, particularly children under five.

Major Climate Change Related Concerns of Pakistan

Most serious challenges for Pakistan are the threats to its Water Security, Food Security and Energy Security, owing to possible shifts in weather patterns, both on temporal and spatial scales, in particular increased variability of monsoon, as detailed below:

- Increased frequency and severity of extreme events such as floods, droughts and cyclones
- Increase in sediment flow due to increased incidences of high intensity rainfall events resulting in more rapid loss of reservoir capacity due to siltation
- Rapid recession of Hindu Kush Karakoram Himalayan (HKH) glaciers, affecting the magnitude and pattern of water inflows into the Indus River System (IRS)
- Increased incidences of high altitude snow avalanches and GLOFs (glacial lakes outburst floods)generated by surging tributary glaciers blocking main un-glaciated valleys
- Reduced agriculture productivity in arid and semi-arid regions due to increased heat- and water- stress as well as more frequent and intense floods and droughts
- Abundance of insects, pests and pathogens in warmer and more humid environments, particularly after heavy rains and floods
- Reduced productivity and fertility of livestock due to heat-stress
- Degradation of rangelands and further deterioration of already degraded cultivated areas suffering from water erosion, wind erosion, water-logging, salinity etc
- Adverse impact on power generation capacity due to irregular river flows and more frequent and intense floods and droughts
- Increased health risks Heat Strokes, Pneumonia, Malaria, Dengue, other vector-borne diseases
- Increase in deforestation, loss of biodiversity
- Risks to fragile marine, mountain, and coastal ecosystems
- Increased upstream intrusion of sea water in the Indus delta, adversely affecting coastal agriculture, mangroves and breeding grounds of fish
- Threat to coastal cities like Karachi due to sea level rise and increased cyclonic activity due to higher sea surface temperatures
- Non-availability of adequate, reliable crop and river flow data in line with the requirements of simulation model
- Low adaptive capacity to adverse impacts due to lack of technical know-how and low financial resources.

Situation Analysis

Climate Extreme Events

Climate change will increase the variability of monsoon rains and enhance the frequency and severity of extreme events such as floods and droughts. The back to back floods of 2010, 2011 and 2013, worst drought during 1999-2003, two

cyclones in one month in Karachi/Gwadar coasts in 2008 and increased incidences of landslides, GLOFS (Glacial Lake Outburst Floods) in the northern areas of Pakistan bear testimony to the ugly face of climate change. It is projected that greater precipitation and melting of glaciers would increase waters in our rivers as much as 20 percent initially, suggesting the benefit of increasing capacity for water storage.

Socio-economic sectors

Climate change is affecting almost all the sectors of our economy particularly water resources, energy, health, biodiversity, with a major impact on agricultural productivity. This is due to changes in temperature, adverse effect on land and water resources and enhanced frequency and intensity of natural hazards such as droughts and floods. Dry land areas, such as arid and semi-arid regions are most vulnerable to these changes; such regions are already facing significant water shortages and temperatures are already close to their tolerance limits. The increasing temperatures increase crop stresses (thermal and moisture stresses), change irrigation water requirements, and increasing the risk of pests and diseases. Water demands of the country are met by Indus River System that is fed by glaciers in Hindukush Karakoram ranges which are believed to be receding under influence of climate change and global warming. The melting of these glaciers will result in increased water flows for a few decades followed by reduced river flows as the glaciers get depleted.

Mitigation/Adaptation measures

Despite being a low Greenhouse Gas (GHG) emitter (<1% of global emissions), Pakistan is bearing the brunt of climate change related disasters at a high cost to its economy. It therefore, requires concerted efforts to adapt to the adverse impacts of climate change and relatively fewer efforts to carry out mitigation measures. A number of measures are needed to be taken to address both Mitigation and Adaptation aspects of climate change through enhancing various ongoing efforts and initiating new activities, as described below:

Pakistan's GHG emissions are bound to increase considerably as the country climbs over the development ladder and strives to provide adequate amount of energy to support its growing socio-economic developmental needs. Still, as a responsible member of international community, Pakistan would like to contribute to the global GHG mitigation efforts without compromising on its basic minimum energy and food needs consistent with its socio-economic developmental requirements, energy security considerations, and financial and technological constraints.

State of Environment

Air

Pakistan is a country of 188 million people with average population density of 236 persons per sq. km, which is higher as compared to many other developing countries. The country has very high migration rate to urban centers which has made the cities very congested and has made the civic infrastructure inadequate. Air quality data recorded in cities confirmed presence of high concentration of suspended particulate matter in air (2-3.5 times higher than the safe limit). Oxides of Nitrogen (NOx) is continuously increasing in major cities mainly due to increased number of CNG operated vehicles. Formation of photo-chemical smog and haze is a common phenomenon in our cities.

Most urban citizens rely either on their private motor vehicles or two wheelers or the informal transport sector for urban transport. This has led to a sharp increase in private vehicle ownership. The surge in the demand for private vehicles originated from the increasing affordability on the one hand and availability of vehicle financing from the banking system on the other. Amongst these, diesel vehicles using crude diesel oil and motorcycles and rickshaws are of most serious concern. Due to overloading, faulty injection nozzles and weak engines, diesel vehicles emit excessive carbon (visible smoke) while motorcycles and rickshaws, due to their two-stroke engines, are the most inefficient in burning fuel and thus contribute most to emissions. The number of motorcycles/scooters is growing fastly in Pakistan and has increased by 133.8 percent in 2012-13 when compared with the year 2001-02. Rickshaws have grown by 24.4 percent in 2012-13 (Table 16.2).

The main causes of air pollution are the abrupt increase in the number of vehicles, inefficient automotive technology , use of unclean fuels, uncontrolled emissions of industrial units, emissions of brick kilns, the burning of garbage and the presence of dust. Vehicular emissions in all the major cities of Pakistan are the primary source of air pollution. The transport sector is the largest user of petroleum products. The use of adulterated fuel and poorly maintained vehicles are some of the reasons for excessive and highly toxic emissions from vehicles. Vehicle emissions represent the greatest

source of air pollution in the country reflecting their rapid growth. In terms of numbers, two-wheeled motor vehicles dominate. Vehicular emissions are treated as one of the important sources for total emissions in Pakistan.

Table 16.2 Motor Vehicles on the Roads (000 Nos.)

Year	Total	Motorcycles/Scooters	Rickshaws
2001-02	2561.9	2481.1	80.8
2002-03	2737.1	2656.2	80.9
2003-04	2963.5	2882.5	81.0
2004-05	3146.4	3064.9	81.5
2005-06	3868.8	3791.0	77.8
2006-07	4542.9	4463.9	79.0
2007-08	5126.3	5037.0	89.3
2008-09	5456.4	5368.0	88.4
2009-10	5501.2	5412.1	89.1
2010-11	5558.6	5468.8	89.8
2011-12	6114.5	6015.7	98.8
2012-13	5900.5	5800.0	100.5
Percentage Increase in 2012-13 over 2001-02	130.3	133.8	24.4

Source: National Transport Research Centre.

Brick kilns are another source of pollution in many areas. The use of low-grade coal and old tires in brick kilns generates dense black smoke and other kinds of emissions. The main pollutants from these industries are particulate matter, and sulphur- and nitrogen oxides, which are emitted by burning fuels. The use of coal has increased by 34.3 percent for brick klins in 2012-13 when compared with year 2001-02 (Table 16.3)

Table 16.3: Consumption of coal (000 M/Tons)

Year	Power	Brick Kilns	Household
2001-02	249.4	2577.5	1.1
2002-03	203.6	2607.0	1.1
2003-04	184.9	2589.4	1.0
2004-05	179.9	3906.7	-
2005-06	149.3	4221.8	-
2006-07	164.4	3277.5	1.0
2007-08	162.0	3760.7	1.0
2008-09	112.5	3274.8	0.8
2009-10	125.5	3005.2	-
2010-11	96.5	3003.6	-
2011-12	104.6	3108.0	-
2012-13	63.0	3462.2	-
Percentage Inc./dec. in 2012-13 over 2001-02	74.7	34.3	-

-: Not Available
Source: Hydrocarbon Development Institute of Pakistan.

Like other forms of air pollution, the magnitude of industrial air pollution has not been fully assessed but sporadic surveys have been carried out in the country by some governmental institutions and scientists in a few major cities. The industrial sector in Pakistan is likely to expand further in future due to a liberal government policy. Almost all metropolitan cities have industrial estates, where a cluster of industries of different types exist. Cement, fertilizer, sugar units, and power plants are considered to be the most air polluting industries of Pakistan. Many of these are located either in the rural areas or are in the vicinity of secondary towns. Those located in the vicinity of towns cause urban air pollution. A wide range of small- to medium-scale industries (including steel re-rolling, steel recycling, tobacco curing and plastic molding) cause a disproportionate share of pollution through their use of dirty “waste” fuels, such as paper, wood and textile waste .

Future Projections and Trends

With the existing trends and patterns, if timely measures are not taken, the following key environmental indicators are likely to emerge:

- Population growing from 180 million to 234.4 million by 2025 (United Nations, Department of Economic and Social Affairs, Population Division (2011)), making cities more congested and polluted
- Number of vehicles on roads to increase from 11 million to 35 million further deteriorating air qualities in cities
- As the natural gas deposits are getting exhausted and imported oil prices are shooting up, use of low cost fuel like coal, Refuse Derived Fuel, (RDF) Tyre Derived Fuel etc. will be opted. Burning of low grade fuels could worsen the air quality
- Solid waste generation in the country is expected to enhance from 20 million tons/year to 27 million tons/year adding more heaps of garbage and open dumping sites
- Use of pesticides and industrial chemicals will increase manifolds adding more toxicity to water and soil
- Water pollution load will increase proportionally with rise in population, which could add 25% more pollution to the water bodies. This would increase more hospital admission and elevate health budget.

The following areas for intervention are suggested:

Improving Urban Air Quality

- Level of suspended particulate matter PM10 and PM2.5 shall be brought within limits of Ambient Air Quality Standards. Provincial governments will develop and implement Clean Air Program for their major cities
- Haze and smog formation will be curtailed by tapping sources of ammonia, nitrogen oxides and sulphur oxides emission
- Air quality of all major cities shall continuously be monitored and disseminate to general public.

Water

In 1947, the water availability in Pakistan was 5,650 cubic meter per person, which kept on decreasing, first due to Indus Water Treaty,1960.Secondly, gradual decline in trans-boundary flows into Pakistan which has been alarmingly up to the tune of 10.25 MAF, and, thirdly, exceptional growth in population of the country, all making per capita water availability in Pakistan to as low as 964 cubic meters per year which is creating water deficit and hampering well-being and, at the same time, severely affecting future economic development. The situation is aggravating due to excessive reliance on underground water which is meeting more than 60% of agriculture needs. It is not only resulting in salinity but also contamination of aquifers with heavy traces of fluoride and arsenic. Climate change is also expected to have extreme effects on the glaciers which contribute over 70% of our water resources and may reduce the water availability by 30% to 40%. Furthermore, our productivity per unit of water and land is one of the lowest in the world. In USA and Australia per capita storage is 6,150 cubic meters and 5,000 cubic meters, respectively, whereas Pakistan's storage capacity is only 132 cubic meters per person. Our neighbors, India and China, have reduced the substantial amount of water usage in agriculture sector and have enhanced productivity manifold. Pakistan's productivity per unit of water is 0.13kg/m3 only, one-thirds of India's and one-sixths of China's. Similarly, Pakistan's productivity per unit of land is one-thirds of Egypt's, half of Saudi Arabia's and half of India's. Increasing productivity in water use is critical for our future development. Pakistan's Vision 2025 assigns the highest priority to water resources and seeks a nexus of energy, water and food to ensure that we follow an integrated and holistic approach in development planning. The present government is actively working to minimize the gap by focusing on implementation and delivery. Water is a fundamental right of every citizen and it is the responsibility of the state to ensure supply of clean drinking water to citizens. (Pakistan Water Summit, 2014).

Improving Water Quality

- The fresh water sources will be categorized and protected against pollution
- All major cities will install sewage treatment plants. The treated water will be used for agriculture and horticulture purposes
- Cleaner Production Techniques will be adopted by industries to minimize pollution generation. Federal and Provincial Governments will ensure that at least 70% industrial wastewater be treated before discharge into water bodies
- Wastewater Discharge limits shall be imposed on industry to conserve water and reduce pollution load

- Provincial Cleaner Production Centers will be established to promote waste minimization, recycling and waste exchange
- Investment windows and incentive schemes shall be announced to encourage installation of treatment plants
- Environmental Engineering Industry shall be recognized and encouraged to manufacture treatment plants locally. (M/o Climate Change).

Solid waste

Municipal sewage disposal is a serious environmental problem. An estimated 2 million wet tons of human excreta is annually produced in the urban areas of which around 50% goes into fresh water bodies. About 8% of the total wastewater is treated and rest of the quantity is discharged untreated into water bodies. Industries like; textile, tannery, paper and pulp generate high pollution load but lack in treatment facilities. About 59,000 tons of municipal solid waste is daily generated in the country. Proper solid waste management has never been practiced in the country. No proper land fill or other disposal infrastructure is available. The collected waste is dumped on open spaces and low lying areas. The toxic produced by disintegration of waste seeps into the aquifer and pollutes underground water. Hospitals waste (250,000 tons per annum) contains about 20% infectious waste. Majority of hospitals do not have incineration or other treatment facilities.

Most of their cyclable solid waste such as paper, plastic, metal, glass, rubber, and rugs is collected every morning by the scavengers under very unhygienic conditions. A large amount of local government budget is used for the collection and transportation of solid waste. At present, Pakistan is in the process of establishing sanitary landfills for the safe disposal of solid waste. In the absence of sanitary landfills most of the solid waste collected by the local government is finally burned at dumping sites, adding to the problem of air pollution. Disposal of hazardous waste will also pose a major challenge in the future because hazardous wastes generated by manufacturing, hospitals and health-care facilities, and nuclear power and fuel processing plants are projected to more than double within 10 to 15 years. Industries dispose some of the most toxic and persistent pollutants, including heavy metals and synthetic organic chemicals in to land and water bodies. This indiscriminate disposal of toxic waste by industries is causing contamination of fresh water, ground water, and prime arable land. Open burning of toxic industrial waste at low temperatures is causing carcinogenic pollutants with adverse health implications.

Sanitation

Water and Sanitation issue was put on high agenda after declaring 2008 as an International Year of Sanitation in 2008. In 2010, General Assembly adopted a resolution calling for the " Sustainable Sanitation: The five year drive to 2015".The goal is to raise awareness on issues related to sanitation especially calling to end open defecation, the most dangerous sanitation practice for public health. It also highlights all aspects of sanitation, including hygiene promotion, provision of basic sanitation services, sewerage, and waste water treatment and re -use.

The Government of Pakistan recognizes the importance of providing access to adequate water and sanitation facilities in order to prevent the spread of diseases and epidemics and save both lives and costs. To address the issue, several policies have been formulated that addresses the key concerns related to water and sanitation, as well as safe drinking water which include National Drinking Water Policy, National Sanitation Policy, Clean Drinking Water Initiative and introduced a " Strategy for Rehabilitation and Reconstruction of Water Supply and Sanitation Sector" after the 2005 earthquake.

According to Pakistan Millennium Development Goals Report 2013, access to sanitation facilities are available to 72 percent of the total population while the target is to provide safe sanitation facilities to 90 percent of the total population by 2015.

Solid Waste Management & Sanitation

- Integrated solid waste management system shall be promoted
- Solid waste shall either be converted to RDF or used for Waste-to-Energy
- Cloth bags, paper bags and biodegradable plastic bags will only be allowed
- Pakistan should develop a ten years sanitation strategy with a focus on Open Defecation Free (ODF) country. All provincial governments should target at least two districts for developing a comprehensive approach on ODF, and same approach should be replicated in the areas administrated by the federal government including Islamabad

- Bio-safety regulatory system will be extended to provincial level
- Import, transportation, handling and use of toxic chemicals will be regulated and monitored in accordance with the relevant international treaties
- Excessive use of pesticides and fertilizers will be curtailed through promotion of modern biotech crops
- Dumping of hazardous waste or infectious waste on land or into water bodies or mixing with municipal waste will be declared as crime
- Private sector will be encouraged to install hazardous waste or hospital waste disposal facilities.

Promotion of Green Business

- Provincial environment departments with the help of Chambers of Commerce and concerned industrial associations will mobilize business community to "Go Green". This will increase productivity, conserve energy, introduce new products, create new jobs and enhance export
- Green jobs and Green internship programs will be initiated in the government and non-government organization**.**

Promotion of Green City Charter

- The United Nations Environment Program recognize a city as "Green City" if environmental considerations in energy, waste reduction, urban design, urban nature, transportation, environmental health and water issues are observed
- The Green City concept will be promoted through competition among cities.

Land degradation/deforestation

Land degradation and deforestation is a serious problem globally is the same in case of Pakistan. One of the main factors is population pressure causing land degradation and deforestation. Other major immediate physical causes of ecological degradation include:-

- Excessive falling of trees
- Uncontrolled and excessive livestock grazing and browsing in forest and rangeland thereby damaging the vegetative cover and preventing natural and/or managed regeneration of grasses, shrubs and trees
- Inappropriate cultivation practices in hilly and rain fed farming areas contributing to wind and water erosion
- Inadequate drainage in heavily irrigated area causing water logging and salinity
- Inadequate efforts with regard to watershed protection and management in the catchment areas of reservoirs.

The forests cover about 5.2 percent of the land area of Pakistan but it is still short of the 6 percent MDG target. The low share of the forest area taken in combination with the large population of Pakistan gives only 0.033 hectares of forest per capita compared with the world average of one hectare. Because of the scarcity of wood and its high price, the per capita consumption of wood is estimated at 0.026 cubic meters .Since the supply from domestic resources is less, the gap between supply and demand is met by imports. Rising costs and decreased supply is the most likely future scenario in the wake of increasing population, growing income and demands for forest products. It is estimated that the annual timber requirement of 2 million cubic meters in early 1980s has doubled to about 4 million cubic meters now, while the firewood consumption has also almost doubled from 16.6 million cubic meters to 30 million cubic meters[*].

Linkages Of Forests and Ecosystem with National Economy

Pakistan seeks to attain goals of sustainable social and economic development, ensuring water, food, energy and environmental securities, without over-exploiting forests and ecosystems. Sustenance of agriculture sector and agri-based industries depend upon ample and steady supply of water for irrigation. Other industries which are heavily dependent upon forests and biodiversity, such as pharmaceutical industry, cannot be sustained unless adequate conservation measures are undertaken.

Forests and ecosystems of watershed areas play vital role in regulating quantity and quality of fresh water flowing down from rains, melting of snow and glaciers. Climate change is adversely impacting on forest and ecosystems in multiple ways, both directly and indirectly. Global warming and resulting anomalies in weather systems directly influence on existence, distribution and health of forests, biodiversity and ecosystems. Degraded ecosystems of watershed areas inversely affect quantity and quality of fresh water to downstream reservoirs and irrigations networks, thereby indirectly impacting agriculture and agri-based

[*] National Environment Information Management System (NEIMS 2010).

industries. Diminished river flows result in large-scale disappearance of riverine forests and deltaic mangroves, exposing cities and irrigated tracts to further devastation. Many plant and animal species are under threat of extinction in the wake of accelerating climate change. Economic life and sustainability of infrastructure including human settlements, communication networks, dams and canals also depend on consolidation of forests and ecosystems.

Pakistan emits a total of 309 mt of Carbon dioxide (CO_2) equivalent annually, in which share of Land Use, Land Use Change and Forestry (LULUCF) is only 3% (whereas at global level LULUCF contributes 17-20% in total emissions). By 2020, total national GHG emission is expected to reach 650 mt of Carbon dioxide (CO_2) equivalent, but share of LULUCF will further reduce to 2%.Despite meager contribution of LULUCF in total GHG emissions, there is huge potential for mitigation in forestry and biodiversity sectors through controlling deforestation, forest degradation, conservation, sustainable forest management and enhancement of forest carbon stock. Under the Climate Change Convention and its Kyoto Protocol, forest-dependent communities shall be incentivized and compensated for their service of storing carbon in forests and ecosystems. These intrinsic linkages are sufficient to prove that fixing and achieving most of the targets of economic sector are not justified without integrating them with forests and ecosystems, particularly with the perspective of adaptation to climate change.

Biodiversity Action Plan of Pakistan identifies at least ten ecosystems of particular value for their species richness and /or unique communities of flora and fauna that are threatened with habitat loss and degradation (Table-16.4).

Table-16.4Threats to major ecosystems in Pakistan

Ecosystem	Characteristics	Significance	Threats
Indus Delta and coastal wetlands	Extensive mangroves and mudflats Inadequate protected area coverage	Rich avian and marine fauna Diverse mangroves habitat Marine Turtle Habitat	Reduced Fresh water from diversion upstream Cutting mangroves for fuel wood Drainage of coastal wetlands
Indus River and wetlands	Extensive wetlands	Migratory flyway of global importance Habitat for Indus river dolphin	Water diversion/drainage agricultural intensification Toxic Pollutants
Chagai Desert	A desert of great antiquity	Many endemic and unique species	Proposed Mining hunting parties from the Gulf
Baluchistan Juniper forest	Huge and Ancient Junipers	Largest Remaining Junipers forest in the world Unique flora and fauna	Fuel wood cutting and overgrazing Habitat Fragmentation
Chilghoza Forest(Suleiman Range)	Rock outcrops with shallow Mountain Soils	Important Wildlife habitat for several species at risk	Fuel wood cutting and overgrazing
Baluchistan Sub-tropical forests	Mid-altitude forests with the sparse canopy but rich associated flora	Very few areas now remain important wildlife habitat	Fuel wood cutting and overgrazing
Baluchistan Rivers	Not Concerned with the Indus River system	Unique aquatic fauna and flora with the High levels of endemism	Water diversion/drainage Overfishing
Tropical deciduous forests(Himalayan foothills)	Extended from Margalla Hills National park east to Azad kashmir	Perhaps the most floristically rich ecosystem of Pakistan	Fuel wood cutting and overgrazing
Moist and dry temperate Himalayan forests	Important Forest tracts now becoming increasingly fragmented	Global hotspot for avian diversity important wildlife habitat	Commercial logging fuel wood cutting and overgrazing
Trans-Himalayan Alps and Plateaus	Spectacular mountain scenery	Unique flora and fauna center of endemism	Fuel wood cutting and overgrazing illegal hunting unregulated tourism Habitat Fragmentation

Source: National Sustainable Development Strategy (NSDS), M/o Climate Change

These above stated ecosystems are considered to be of critical concern in conservation. With a widespread conversion of natural ecosystems, agriculture, erosion and rapid degradation of habitats, spread of alien invasive species and the continuing depletion of populations of wild animals and plants, almost all remaining natural or modified ecosystems are now critically threatened.

Strategy to Protect Ecosystems

- Promote the future environment conservation, management and resource use based on a three pronged approach i.e. equitable sharing of benefits of environmental management, increasing community management of natural resources, and integrating environmental issues into socio-economic development planning through the concept of Payments for Ecosystem Services (PES) to achieve sustainable development
- Save the natural resources from depletion and stress, especially water and land , focusing on eco-based interventions especially designed to the varied ecological zones of the country
- Preservation of the diverse wetlands and forests of the country‘s biodiversity
- Develop protected area systems plan for protecting flora and fauna of global significance as well as ensuring that the National Parks of the country are effectively managed
- Take steps towards creation of a gene pool/ bank as a bio-repository that can preserve gene material for the plants as well as forest biodiversity present in the country.

Tasks of Working Group on Forest & Ecosystems

- Review National Climate Change Policy (2012), National Sustainable Development Strategy (NSDS), National Environment Policy (2005), and National Vision 2030 for Forest Biodiversity Conservation
- Review international obligations of Pakistan on forests, biodiversity and ecosystems under Convention on Biological Diversity and its Aitchi Biodiversity Targets (2020), UN Forum on Forests Non-legally binding instrument on all types of forests (NLBI)
- Evaluate constitutional mandates of federal and provincial governments to undertake actions towards achieving the Vision 2025 of forestry and ecosystems sub-sectors
- Propose specific actions, programs, projects (with possible financial implications) to be part of national drive to attain Vision 2025
- Look into options for integrating policy measures for climate change mitigation and adaptation into plans and programs of water, agriculture, energy and industry sectors, with a focus on forests and ecosystem (or LULUCF) towards attaining Vision 2025 in holistic manner.

Activities of Pakistan Environment Protection Agency (Pak-EPA)

EIA Directorate Pakistan Environmental Protection Agency (Pak-EPA) is an attached department of the Ministry of Climate Change and is mandated to enforce the Pakistan Environmental Protection Act 1997 in the Islamabad Capital Territory besides developing the bio-safety regulation aiming at regulating the development, import/export and use of the Genetically Modified Organism (GMO). The following major activities are being undertaken by Pak-EPA:

I. National Bio-safety Centre (NBC) Project:

Pakistan is a party to Cartagena Protocol on Bio-safety (CPB) since, 31st May, 2009. The obligatory implementation system for regulation of Genetically Modified Organisms (GMOs) and their products is in place since 28th April, 2006. National Bio-safety Centre, the secretariat for National Bio-safety Committee (NBC) & Technical Advisory Committee (TAC), are involved in the regulation of modern Biotechnology products in the country. The regulatory system for GMOs and their products is mandatory under CPB and also necessary for avoiding cancellation of GSP plus status granted for Tax free exports to EU countries from Pakistan.

Achievements and Targets of NBC Project:

Physical Achievements:

- National Biodiversity Centre reviewed and processed cases of Genetically Modified Organisms related research, development, import, export and commercialization. So far 292 cases of Genetically Modified Organisms have been received. Out of which 215 cases has been decided by National Bio-safety Committee
- Forty Institutional Bio-safety Committees (IBCs) have been established at different institutional level. All cases are processed by these IBCs with the assistance of National Biodiversity Centre
- Public notices were released in leading Newspapers of the country for information

regarding Genetically Modified Organisms (GMOs). A brochure on "Bio-safety & Genetically Modified Organisms" has also been prepared, approved by competent authority and published

- Environmental experts participated in program "Mahool Zindgi Hai" and others on different (AM & FM) channels of Radio Pakistan and delivered lecture on Bio-safety, Genetically Modified Organisms, their environmental impacts and other related issues
- National Biodiversity Centre approved Sub-committee of Technical Advisory Committee for Field Trial of Genetically Modified Crops" comprising of subject experts for Genetically Modified cotton and corn crops to monitor and evaluate all types of Genetically Modified crops. The committees had conducted 35 field visits of different sites at different locations for their confined field trials on regular basis
- To evaluate the Capacity Building requirements of the National Biodiversity Centre/Technical Advisory Committee's officials & members, eight training seminar / workshops were arranged and many more are in pipeline.

II. Environmental Impact Assessment (EIA) Directorate

EIA directorate issued 59 Initial Environmental Examination (IEE) approvals of 27 Environmental Impact Assessment, 73 petrol pumps and 133 CNG, and 05 Environmental Management Plans from 2000 to date.

- Dealt with Public Complaints regarding, Steel Industries of I-9 and I-10 sector monitoring/ laboratory cases
- Cases received from NEPRA and OGRA were scrutinized
- Monitored catchment area of Bari Imam for replugging of sewerage outlet
- Monitored industrial units "Plaster of Paris" to check the environmental issues regarding the pollution created by industrial units at district Sihala, Islamabad
- Monitored Marble Industries in Sector I-9 to inquire the management of the associated pollution caused, like discharge of waste water, sludge disposal
- Physical monitoring of industrial area I-9/10 to check the status of emission.

Objective/Targets to be achieved during the year

- A Sub-committee comprising of experts, has been notified for the standardization of protocols and materials for Genetically Modified crops detection and quantification and accreditation of the laboratories working for Genetically Modified Organism detection
- The Labeling Criteria and formulation of the Standards for the Genetically Modified Food marketed. The work relating to Standardization/ labeling of genetically modified containing food is in process
- The action/process against the violator of the Pakistan Bio-safety Rules has been started
- Monitoring of the confined field trails of companies involved in the cultivation of the Genetically Modified crops is being done on regular basis.

Institutional Response

Pakistan has already acceded to the United Nations Framework Convention on Climate Change (UNFCCC) and its Kyoto Protocol. As a follow up to these international commitments, the country has undertaken substantial climate related work. It announced and implemented the CDM National Operational Strategy as a signal for country's entry into the global carbon market.

The Prime Ministers Committee on Climate Change also aimed at establishing high-level inter-ministerial linkages and proved to be extremely effective in initiating the country's entry into the global carbon market. The Climate Change Division has also been designated national focal point for UNFCCC and the Kyoto Protocol. The Division has been coordinating with other concerned agencies and institutions on various technical aspects, Mitigation and adaption are two key aspects of policy response to climate change in the country. In terms of mitigation, Pakistan is presently a small GHG emitter but its emission are bound to increase considerably as the country strives to develop and provide adequate amounts of energy to support its growing developmental needs. The country therefore wishes to contribute to the global GHG mitigation efforts without compromising on its basic minimum energy and food needs consistent with its socio-economic developmental requirements, energy security considerations, and existing financial and technological constraints.

In terms of mitigation, the low carbon development scenarios projected for the country under one study (GOP and UNFCCC, 2011) estimates additional

investment costs of mitigation ranging between $8 to $17 billion by 2050, as progressively cleaner coal and a higher percentage of renewable energy technologies are employed. This study also estimated that adaption costs will be too high, ranging from US$ 7 to US$ 14 billion per year. Developing countries like Pakistan do not have the resources to meet such huge adaption costs and need the help of developed countries, who made commitments under the Bali Action Plan to help developing countries adapt to climate change.

Conclusion

The Government of Pakistan is taking significant initiatives in collaboration with International agencies to counter complex issues regarding environmental degradation. This multifarious challenge requires deep and focused research/initiatives in order to address air and water pollution, land degradation and deforestation etc.

Way Forward

- Capacity building/enhancement of climate change related research institutions, government functionaries, media persons, vulnerable communities and other stakeholders should be carried out to apprise them of the issues, their impacts, risk assessment, risk management, adaptation and mitigation measures, etc
- Vulnerability of different ecosystems, geographical areas and communities to climate change should be assessed through reliable analytical tools
- Preparedness for risks and disasters arising from climate change events, particularly from climate extreme events, and development of Early Warning System is imperative to redress the adverse impacts of climate change
- A fund supported by national and international sources should be established under the Climate Change Division to alleviate the adverse impact of climate change, and bolster resilience of the most vulnerable communities.