Chapter 16

Environment

The United Nation's Conference on Sustainable Development (UNCSD) was held in Rio de Janeiro from 20-22 June, 2012 to review the progress on the achievements made in the past 20 years since commencement of the first UN Conference on Environment and Development (UNCED) in 1992 at Rio de Janeiro also known as "Earth Summit" which adopted Rio Declaration to help shape new policies to promote global prosperity reduce poverty and advance social equity and environment protection since uncontrolled development all over the world has seriously put the sustainability of the whole planet at high risk. Such development will cause more harm than good in the long run if not properly planned to be sustained, hence time is ripe to carefully consider all the environmental issues i.e. its protection, renewal and enrichment.

Like other developing countries, Pakistan is also facing environment problems mainly due to demographic growth, lack of public awareness and education, catastrophic mismanagement of water and other natural resources and ill planned urban and industrial expansion. Air pollution, inadequate water supply, sanitation, agricultural soil degradation, deforestation and rangeland degradation are other core environmental challenges. The deterioration of environment continues to affect livelihoods and health thus increasing the vulnerability of the poor to disasters and environment-related conflicts. Poor's are 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 deteriorating environment. In addition, the rise in frequency and intensity of climate triggered natural disasters has added to the burden of managing environmental sustainability. Besides, coastal zone degradation, fisheries productivity loss due to climate is yet to be valued in economic calculations. Therefore, the strategy to realize accelerated GDP growth cannot afford to neglect the environment and climate change impact on the economy.

Pakistan and other countries in the world have increasingly become cautious of environmental degradation. In case of our country, it is facing serious challenges of degradation and pollution of air, water and land. In response to the environment and climate change related policies, number of projects has been funded by Federal and Provincial Governments to improve the capacity of relevant institutions to deal with increasing environmental degradation. The ongoing projects are under implementations in order to address policy measures such as Sustainable Land Management to Combat Desertification in Pakistan, Global Change Impact Study Centre, Establishment of Clean Development Mechanism (CDM) Cell, National Conservation Strategy Resource Center, Establishing National Multilateral Environmental Agreements (MEAs). Secretariat Program, National Awareness campaign on Energy and Environment Conservation, National Bio-safety Centre, etc.

The MDGs have been adopted by the international community as a framework for the development activities of over 190 countries in ten regions; they have been articulated into over 20 targets and over 60 indicators. The Millennium Development Goals (MDGs) are the centerpiece of development efforts of the Government of Pakistan. The MDGs have also been incorporated into the government's important macroeconomic frameworks including the Medium Term Development Framework (MTDF), which covers a five-year period from 2005-2010. The status of the MDGs with reference to environment sector indicators is presented below:

Table 16.1—The MDG targets and achievements

Name of Sector/Sub-Sector	**Year**		**MDG Targets 2015**
	2010-11	**2011-12**	
Forests cover including State and private forests/farmlands **(%)**	5.1	5.2	6.0
Area protected for conservation of wildlife **(%)**	11.3	11.5	12.0
No. of petrol & diesel vehicles using CNG fuel **(thousands)**	2500	2800	920
Access to sanitation (national)**%**	@66	@72	90

Table 16.1—The MDG targets and achievements

Name of Sector/Sub-Sector	Year		MDG Targets 2015
	2010-11	2011-12	
Access to clean water (national)**%**	@87	@89	93
Number of federal air pollution monitoring stations.	1	1	--
Environmental Protection Tribunals.	5	5	--
Fixed Air Quality Monitoring Stations.*****	7	7	--
Mobile Air Quality Monitoring Stations.*****	3	3	--
Analytical Laboratories.*****	5	5	--

Source: Environment Section, P&D Division. * Non functional due to non-funding.
Pak-EPA (M/o Climate Change). @ PSLM Survey 2011-12. Pakistan Bureau of Statistics.

To date, however, sufficient progress has been made on most of the target environment sector indicators while others lag behind. In order to achieve the MDGs targets, it is very important to ensure adequate level of social sector investments, particularly for environment. While the pace of human capital formation seems to be slightly better in urban areas of Pakistan; more resource need to be diverted towards the rural areas, especially for safe drinking water and access to sanitation.

Forest in Pakistan covers 4.224 million hectares, 5.2% of the total land area of 87.98 million hectares which has slightly shown an increase. Over 150,000 ha of former forestlands, since converted for non-forestry purposes have also reduced the forest cover. With the population growth in the country, forests are under increasing demand for watershed regulation and subsistence uses including firewood and grazing.

Pakistan has a network of 225 Protected Areas, covering an area of 9,939,480 ha which is 11.5% of the total land area. Pakistan's network of 225 protected areas (PA) consists of 19 national parks, 99 wildlife sanctuaries, 96 games reserves and 16 unclassified. About 5700 species of flowering plants are recorded in Pakistan.

Energy sector is the top contributor with emission as highest among the direct and indirect Green House Gasses (GHGs). Most of the energy is consumed at the household and at the community level. Stationary sectors are the highest emitter of CH4, of which 98.4% is residential sector at household and community level primarily due to combustion of biomass for domestic purposes. Almost 85% of rural households use wood biomass for cooking. Twenty-five percent of Pakistan's total energy consumption comes from biomass, contributing to 47% of all Green House Gas emission of the country. Almost 100% of biomass energy consumption and consequent emission are at the rural and small urban community level.

Under the Millennium Development Goals (MDG), it is envisaged to halve by 2015, the proportion of people without sustainable access to safe drinking water and to achieve significant improvement in access to sanitation. This translates to increasing water supply and sanitation coverage to 93 percent and 90 percent, respectively by 2015. While the water supply and sanitation programmes are being accelerated, there would be some shortfalls in the achievement of envisaged MDG targets of water supply and sanitation coverage.

Activities by Pakistan Environmental Protection Agency (Pak-EPA).

Monitoring Directorate.

During the period (July-March), 2012-13 ten Initial Environmental Examination reports have been received for review by the agency. Five approvals have been granted while five cases are under process namely: -

i. Initial Environmental Examination (IEE) report of M/s US Embassy Complex, diplomatic Enclave, Islamabad.
ii. Initial Environmental Examination report of M/s Chinese Embassy diplomatic Enclave, Islamabad.
iii. Initial Environmental Examination report of M/s Pakistan Space and Upper Atmosphere Research Commission (SUPARCO), Islamabad.
iv. Initial Environmental Examination report of M/s Capital Enclave, Zone-V, Housing Scheme, Islamabad.
v. Initial Environmental Examination report of M/s National Assembly Secretariat Cooperative Housing Society, Zone-V, Islamabad.

During the same period, no Environment Impact Assessment (EIA) reports have been received primarily due to the post-eighteenth amendment whereby the function of Pak-EPA is restricted to ICT area.

Environmental Impact Assessment (EIA) and Strategic Environmental Assessment (SEA).

The International Union for Conservation of Nature and other partners are jointly implementing National Impact Assessment programme (NIAP) in the country. The program aims to contribute towards sustainable development in Pakistan through strengthening the Environmental Impact Assessment and introducing Strategic Environmental Assessment (SEA) in national development planning. The NIAP is a unique initiative, which intends to use a multi-pronged strategy to improve effectiveness of EIA and introduce SEA in the country. The programme involves interventions at the policy level through introduction of SEA, capacity building at all levels and sectors, development of tools, procedures and mechanisms, improved understanding of impact assessment processes, as Strategic Environmental Assessment (SEA) calls for "integration of the principles of sustainable development into country's policies and programmes."

Legal/Enforcement Directorate:

Pakistan Environmental Protection Agency (Pak-EPA), with the approval of the Ministry of Climate Change and after obtaining consent of the Law and Justice Division, notified a regulation prohibiting manufacturing, import, sale and use of non degradable plastic bags and other plastic products in the limits of Islamabad Capital Territory, effective from April,2013.

This landmark step taken by the Ministry of Climate Change will have long term benefits to control spread of waste plastic bags and enable exporters to comply with the environment friendly packaging demanded in the international market. Many countries in Asia, Europe and America have successfully controlled plastic waste by introducing **oxo-biodegradable plastic technology**. The technology is simple which neither needs alteration in machinery nor in the process. A small quantity of olefin based additive (1-3%) is mixed with the raw material (granules) to develop biodegradable properties in plastic. Plastic bags made with this technology if left in open air or water absorb oxygen; gradually weakens internal bond of plastic material thereby allowing biological degradation to take place. Finally the bag will vanish leaving behind humus (a non-toxic product). The plastics have extensive usage in packaging of food, beverages, cigarette, leather, textile, electrical/mechanical machinery and components etc. Now, it is also being used in agriculture and in forestry for saplings. If use of non-degradable plastic continues, it will create havoc due to poor waste collection in the country. Ministry of Climate Change has also coordinated with the provincial governments to introduce degradable plastics by following the suit.

In 2004, Pak-EPA on the direction of the Pakistan Environmental Protection Council, conducted national study on plastic bags, which revealed that about 55 billion bags were being manufactured and consumed annually in the country with an annual growth rate of 15%. The annual average consumption of plastic bags was estimated at 397 bags per person, i.e. 1 bag per head per day approximately. It was reported that if this trend continued, the consumption of plastic bag will reach to 112 billion by year 2015. The report observed that more than 8000 plastic bag units were operating in different parts of the country. Majority of which were in Lahore (6000), Karachi (1200), Peshawar (300) and Faisalabad (230). About 200,000 people directly and 600,000 people indirectly are associated with this business. The report considered different options to deal with the plastic bags issue, which included complete ban on plastic bags; or introduction of photo-degradable plastic bags; hydro-soluble plastic bags; and ox-biodegradable bags.

The National Assembly of Pakistan also passed a Resolution on 22nd April, 2008 that the government should take steps to ban on the use of plastic shopping bags and instead bring in use the degradable shopping bags. In compliance, the Ministry devised a two-prong strategy to deal with the issue of plastic bags namely:

i. Launch a campaign "Say No to Plastic Bag" aiming at reducing usage of plastic bags and discouraging habit of using excessive quantity of plastic bags.

ii. Introduce technology making plastic degradable so that the waste plastic bags vanish if left un-collected.

The campaign "Say No to Plastic Bag" was run successfully as a result of which large stores Metro Cash & Carry introduced cotton bags with slogan on them "Say No to Plastic Bag" and McDonald's started using paper bags instead of plastic bags. However, due to lack of resources, the campaign could not be continued.

The Ministry of Environment (Defunct) held series of meetings with plastic bag manufacturers association, users and exporters to work out solution to deal with the issue. The consensus reached on oxo-biodegradable gab technology. With a view to promoting this technology in the country, Pak-EPA approached local and multinational companies and users to promote oxo-biodegradable plastic bags in the country. The Lahore and Karachi Chamber of Commerce held workshops on biodegradable plastics to create awareness among entrepreneurs. Because of these efforts, a number of users like; Dawn Bread, KFC, McDonald's, Hyper Star, Sazgar, DHA, ICI Polyester, MENUE etc. have started using oxo-biodegradable plastic bags as part of their social responsibility.

Issuance of Guidelines:

- Pakistan Environmental Protection Agency has also notified Tyre Derived Fuel (TDF) and Refused Derived Fuel (RDF) guidelines in order to save energy effectively and safe use of alternative resources of energy and without compromising on the issue of environmental pollution in the country.

Rawal Lake Contamination:

- The residents of Rawalpindi are supplied drinking water from Rawal Lake, Islamabad and water quality of this water reservoir was drastically contaminated due to certain activities in the catchments of the lake. The health of people was at risk at large; therefore, Honorable Supreme Court of Pakistan took Suo Motu notice of the situation. Pakistan Environmental protection Agency with support of CDA and ICT has got constructed septic tanks at Bari Imam and plugged of sewage point flowing into the water stream/nullah leading to Rawal Lake. Further, Sewage Treatment Plants (STPs) are also being constructed in the catchments area.

Lab/NEQS Directorate:

i. Monitored the Rawal Lake and Bari Imam Area, Rawal Dam catchment area.
ii. Monitored the industrial area of I-9 and I-10 to control the pollution.
iii. Visited several industries Like M/s Engro Polymer, M/s Excide Battery and M/s Syngenta Pakistan Pvt, Ltd. and issued the NOCs for import of non-hazardous chemical.
iv. Prepared the draft Tyre Derived Fuel (TDF) and got approved from the Ministry.
v. Worked on implementation of Euro-II standards for 2 & 3 wheelers.

National Sustainable Development Strategy (NSDS) has been formulated and finalized by Ministry of Climate Change in consultation with a variety of stakeholder groups to achieve goals of sustainable development through climate resilient interventions. NSDS addresses the challenge of establishing the quality of environment as a *public good;* and highlights the role of State in its protection and improvement along with other stakeholders.

The environment section of NSDS enlists detailed strategic goals (briefly given in the ensuing pages) for addressing air and water pollution, land degradation and forestry issues and protection of the country's unique biodiversity. The overall focus is on safeguarding the environment by:-

i. Conserving and enhancing the natural resource base while protecting biodiversity and managing fragile ecosystems through an integrated natural resource management approach.
ii. Enhancing the life support system by addressing air and water pollution and reducing the ecological footprint of growth through strengthening the regulatory framework and community based interventions.
iii. Preparing for climate change and its accompanying uncertainties through comprehensive adaptation and mitigation planning and concrete implementation measures.

Box-1
Green Economy Fuelled by Green Jobs

Pakistan's economy possesses the potential opportunity to grow in a sustainable and cost effective manner. Hence, the concept of Green Economy, still under defining debate at the global level, can become a reality in Pakistan by tackling

the resource inefficiencies within the water, energy and agriculture sectors as well as addressing the damaging trends of unregulated urbanization and rising unemployment. In order to make it politically palatable as well as implicitly sustainable, it is essential that this concept is translated into possible green jobs that can be generated through a shift towards an alternate development pathway.

Trends and Issues: In recent years, areas such as clean and efficient technology, renewable energy, chemical and waste management, biodiversity based business, and sustainable cities, buildings, construction and transport are attracting investments and emerging as the new engines of economic growth. They have also become avenues for creating green jobs.
Green jobs are defined as work in agricultural, manufacturing, research and development, administrative and service activities that contribute substantially to preserving or restoring environmental quality. Specifically, but not exclusively, this includes jobs that help to protect ecosystems and biodiversity; reduce energy, materials and water consumption through high efficiency strategies; de-carbonize the economy; and minimize or altogether avoid generation of all forms of waste and pollution.

A United Nations Environment Program (UNEP) report shows that at global level green jobs are now being generated in some sectors and economies and it is estimated that investment in low-greenhouse-gas energy could well reach $1.9 trillion by 2020. Shifting patterns of investment flows into areas from renewable energy generation to energy efficiency and pollution control projects at the household and industrial level are creating avenues for generation of green jobs. Also, the bulk of documented growth in these jobs has so far occurred mostly in developed countries, along with some rapidly developing countries like Brazil and China.

There is a tremendous scope for such initiatives and creation of green jobs in Pakistan but this potential needs to be strategically identified, economically weighed and then politically owned to ensure its sustainability. One area where Pakistan achieved great success in creating green jobs is CNG industry which has, unfortunately, been also hit by the growing "gas gap" and associated gas shortages.

Following strategic measures are proposed to be taken:

- Implement the commitment made in Vision 2030 to make *"employment and employability, a central theme in economic and social policies"* while aiming for sustainable development.
- Promote green investment and green jobs for the purpose as far as possible by carrying out a scoping exercise for jobs in the various green initiatives already elaborated.
- Encourage the political ownership of sustainable development strategies in the country marketing the creation of new jobs through an alternate economy as an incentive.

Source: Ministry of Climate Change

State of the Environment

Air:

Air Pollution from suspended particulars has shown an alarming increase especially in most urban and industrial areas owing to rising weakly regulated vehicle and industrial emission. This air pollution primarily affects urban areas where the high density of industrial and vehicular emissions is aggravated by low air dispersion. Urban air quality in Pakistan is alarming. The limited information available indicates that concentrations of particulate matter in most cities are already above acceptance levels for human health.

Vehicle, emissions represent the greatest source of air pollution in the country reflecting the rapid growth of vehicles use in Pakistan. Subsequently, motor vehicle emissions account for about 90 percent of total emissions of hydrocarbons (smog and carbon monoxide), all of which have dangerous health implications, especially in densely populated urban centers.

Motorcycles and rickshaws, due to their two stroke (2-strokes) engines, are the most inefficient in burning fuel and contribute most to emissions. 2-stroke vehicles are responsible for emission of very fine inhalable particles that settle in lungs and cause respiratory diseases. The 2-stroke vehicles industry is fast growing in Pakistan and has increased by 138.6 percent in 2011-12 when compared with the year 2001-02. Rickshaws have grown by 22.2 percent while motorcycles and scooters have posted a growth of 142.5 percent over 2001-02, (Table 16.2).

Table 16.2—Motor Vehicles on the Road			(*000 Nos.*)
Year	**Total**	**Motorcycles/Scooter**	**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
Percentage increase in 2011-12 over 2001-02	138.6	142.5	22.2
2012-13(July-March)	5670.5	5550.0	120.5

Source: National Transport Research Centre

The use of coal in the power sector has been decreasing. This may be due to the fact that a number of plants have now been converted to natural gas. Likewise, there has been a reduction in coal usage for domestic purposes. Bricks kilns are another source of pollution in many areas. Use of low-grade coal and old tyres in bricks kilns generate dense black smoke (soot) and other kind of emissions. The use of coal has increased by 20.6 percent for bricks kilns in 2011-12 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	105.0	3108.0	-
Percentage inc./dec.in 2011-12 over 2001-02	-57.9	20.6	-
2012-13(July-March)	60.0	2105.7	-

Source: Hydrocarbon Development Institute of Pakistan
- : Not Available

Indoor air pollution in Pakistan is also very high and poses a serious problem. The use of biomass fuels such as wood, dung and crop residues is quite common in the country. Majority of rural household and a large proportion of urban households rely on these as their primary cooking fuel. Biomass burnt in poorly ventilated homes has severe health consequences, particularly for women, young children and the elderly who are most likely to be exposed to indoor pollutants.

Strategy

- Implement the National Clean Air Act and ensure effective enforcement of the National Environmental Quality Standards on air pollution.
- Establish standards for vehicles at the manufacturing state and promotion of cleaner production technologies.
- Introduce greener fuel options and making them affordable for public. The government is already on this path, but it needs to further these policy initiatives with the active involvement of the private sector.
- Facilitate cost effective inter-city mass transit

systems in major cities through public private partnerships.

- Introduce clean cook-stoves and solar lanterns, especially in rural areas not only to prevent indoor air-pollution but also to save lives, improve health and living conditions.

Water:

Pakistan faces serious deterioration of surface and ground water quality because of unabated industrial, municipal and agricultural pollution. In the absence of a regular surveillance or monitoring program and weak regulatory enforcement, several drains, irrigation canals and rivers have become severely polluted. The indiscriminate discharge of untreated industrial wastewater, municipal sewage as well as unchecked agricultural runoffs is increasingly polluting irrigation system, rivers as well as other aquatic and marine ecosystems. Subsequently this is leading to severe contamination of ground water. Pollution of surface water in major rivers and seawater is also posing threat to aquatic life.

The associated adverse health and productivity impacts are significant, with the poor bearing the brunt. Hence, polluted water is the cause of a rising incidence of water borne diseases such as diarrhea, dysentery, cholera, pneumonic and hepatitis. The situation is worsened by the fact that the poor being most economically disadvantaged are highly vulnerable to these health problems. This is because of their greater exposure to the sources of polluted water, augmented by low nutritional intake, unhygienic and crowded living conditions in urban areas, and lack of access to good and timely medical facilities. The positive nexus that exists between water related illness and income, thus further worsens the situation for poor making this one of the most pressing environmental issues for the country. One of the offshoots of water pollution issue is the sea water intrusion occurring in the southern part of the country, due to low river waste flows in some months, affecting the natural mangrove plantation as well as fisheries in the delta region.

In Pakistan, statistics on access to drinking water is impressive; according to the Pakistan Bureau of Statistics (PBS) report Pakistan Standard Living Measurement (PSLM) 2011-12, access to drinking water to urban and rural population of Pakistan is 92 and 88 percent respectively, with an average of 89 percent. Hence access to the source of drinking water is satisfactory. Access to sanitation in urban and rural population of Pakistan is 97 and 58 percent respectively, with an average of 72 percent.

Strategy:

- Provision of clean drinking water to all within next 5 years through installation of totally suited water filtration plants to be managed through community.
- Facility of filtered potable water should be ensured in every educational institution of the country. Improvement of old sewerage systems in large cities and installation of new sewerage systems on an urgent basis.
- Environmental regulations to curtail pollution must be strictly enforced through effective monitoring.
- Installation of Combined Effluent Treatment Plants at all large industrial estates to ensure treatment of polluted effluents into water bodies.
- Periodic scientific monitoring of water aquifers and drinking water bodies in all cities.
- Ensure minimum water discharge needs for river Indus, as per agreed water accords to address issues relating to sea water intrusion as well as mangrove deterioration.
- Environmental regulations to curtail pollution must be strictly enforced through effective monitoring and incentivisation.

Solid Wastes:

Solid and hazardous wastes is causing great damage to Pakistan's fragile eco-system, due to lack of management and disposal methods. There are six types of hazardous solid waste that have been identified in the Guidelines for Solid Waste Management report. These are agricultural pollutants, hospitals and laboratories, small scale industries, large scale industries, commerce and households as well as unchecked agricultural runoff is also increasingly polluting irrigation systems , streams, rivers as well as other aquatic and marine ecosystems, subsequently leading to severe contamination of ground water including drinking water, pollution of surface water in major rivers and seawater.

Commercial and household plastic bags are another spreading menace in the country. Due to lack of resources and weak planning at the implementation level of local bodies, only about 60 percent of urban solid waste can be transported to final disposal sites,

which generally are open dumping system. In the absence of any operational sanitary landfill system in the country, the rest of the waste blocks the sewer system or spreads all over the cities.

The main issue associated with solid waste is the absence of an integrated solid waste management program at national, provincial and local levels and the present management system's inability to cope at the various stages of waste handling, transport and disposal. Sector-wise source of hazardous waste as given in the table below:

Table 16.4 Sources of Hazardous waste

Sectors	Sources	Types of wastes
Agriculture	Planting area and paint Production/agriculture department, warehouse	Obsolete pesticides, herbicides, insecticides, used chemicals contaminated soils.
Hospitals, Clinical and laboratories	Clinic consulting rooms, Operation theaters, hospitals, Wards, laboratories	Infected human tissues and organs, excreta, blood, sharp instruments, laboratory equipment and tissue cultures drugs etc.
Small scale industries	Metal processing, photo finishing Textile processing, printing, Leather, tanning.	Acids, heavy metals solvents , acids, silver cadmium, minerals acid solvents, inks, dyes solvents, chromium, etc
Large scale industries	Bauxite processing, oil refining petrochemical manufacture, pharmaceutical manufacture, chlorine production	Rig mud, spent catalysts, oily waste, tarry residues, solvents, mercury.
Commerce	Vehicles services and airports, dry Cleaning, electrical transformers, bus stations, workshops, petrol pumps	Oily, hydraulic fluids, halogenated solvents, polychlorinated Biphenyls(PCBs),water management, tyre, plastic etc.
Household	Homes	Used fluorescent tubes, batteries, drugs, cosmetics and vehicles care materials.

Source: National Sustainable Development Strategy, Ministry of Climate Change.

Also there is a growing concern about rising quantities of e-waste (electronic waste e.g. used computers, cell phones, wires, television etc.) in Pakistan. There is, however no current estimate of the amount of e-waste entering the country from various developed countries. There is lack of local awareness about the issue and scant knowledge about e-waste and its harmful effects on health due to lack of technical expertise in this area.

Strategy:

- Develop an integrated solid waste management program to empower local bodies and technical capacity to handle the collection, transport and disposal of solid waste.
- The production and use of polythene (plastic) bags should be strictly prohibited and steps should be taken to research and employ biodegradable alternatives.
- Employ public private partnerships for waste management especially for concentrated urban populations.
- Strengthen the Self- Monitoring and Repotting (SMART) programs, to assist the industry to structure and implement their environmental improvement plan. Its implementation to be made mandatory in the industrial zones as well as hospitals.
- Introduce additional training programs in hospitals across the country for safe and environmentally sound handling, transportation and storage of hazardous chemicals, contaminated equipment and waste generated from the hospitals.
- Promote the concept of shared hospitals waste incineration in big cities.
- Address the issue of e-waste management and regulate laws for e-waste disposal.

- Improve sanitation, hygiene and health through implementation of National Sanitation Policy.

Forest:

The area covered by forests in Pakistan is one of the lowest in the world and within the context of South Asia. Secondly, the forest resources of Pakistan are deteriorating both qualitatively and quantitatively. Most of the forest area is concentrated in the northern part of the country i.e. Khyber Pakhtunkhwa province. Northern Areas and Azad Jammu and Kashmir (AJK) and comprises coniferous and curb forest. The main types of forests in other parts include juniper, chilghoza, scrub riverine and mangrove forests. Irrigated plantations have been raised mainly in Punjab and Sindh provinces.

Pakistan is a mainly dry land country. There is a serious threat of land degradation and desertification in many parts of the country. The situation is further aggravated by scarcity of water, frequent droughts and mismanagement of land resources. World over adoption of Sustainable Land Management (SLM) practices over wider landscape has emerged as an important tool to promote holistic land stewardship by blending SLM practices, technologies, and policies in a way that environmental concerns are integrated in the overall socio-economic well being of the people. The development and implementation of village level land use plans can further help to adopt SLM practices. The coverage, significance, threats and main possible interventions in the land resource regions of Pakistan are described in the following table.

Table 16.5 Land Resources of Pakistan (Significance, Threats and Management Interventions)

Region	Coverage	Significance	Threat	Main SLM interventions
Northern Mounta-ins	Malakand & Hazara Division, Northern area, Murree-khuta Tehsil of Rwalpindi distt.AJK.	Catchment for Tarbela & Mangla discharging water to Indus, produces crops like wheat maize, potato & deciduous fruits	Sheet, rill, & gully Erosion, high rainfall erosivity & soil erodibility, land sliding.	Afforestation, especially on degraded mountain slopes(slopping Agriculture land technology),pasture improvement, soil Conservation, bio-engineering & terrace Maintenance , preserving Biodiversity, especially medicinal plants, off-season Fruits & vegetables cultivation & on-farm water management, water resource development.
Barani Lands	Pothowar, plateau, Northern Gujrat & Sialkot.	Produces wheat, peanut, maize sorghum etc, grazing of large number of livestock.	Soil erosion, drought	Dry land afforestation in gullied and eroded lands, Agro-forestry ,range improvement, soil and water Conservation, rainwater Harvesting, low delta crops and rain fed agriculture ,high efficiency irrigation system & on-farm water management
Irrigated Plains	Canal command area of Punjab, Sindh and Peshawar- Mardan	World's largest contiguous canal network. produces agriculture crops, fruits & fodder for livestock	Salinity, sodicity, Water logging, Floods, industrial pollution	Rehabilitation of saline-sodic and waterlogged soils, Saline Agriculture, improvement of drainage system, agro-forestry & on-farm water management
Sandy Deserts	Thal, Cholistan, Thar & Chagai-Kharan	Grazing by transhuman livestock & produces crops like millet, guara, gram & fodder for goat/sheep	Moving sand dunes, seasonal shortage of forage, drinking water & saline groundwater	Sand-dune stabilization, shelterbelts/woodlots, drylands afforestation, range improvement, rainwater harvesting, biodiversity conservation, low delta crops(date palm, gram pulses etc)and rain fed agriculture, high efficiency irrigation system & on-farm water management
Sulaiman Rod-kohi	Rod Kohi areas of district of D.I khan,	Unique water distribution system.	Un-predicted drought and flash	Soil and water conservation, Rod kohi irrigation improvement, rangeland

Table 16.5 Land Resources of Pakistan (Significance, Threats and Management Interventions)

Region	Coverage	Significance	Threat	Main SLM interventions
	Tank, Bannu, Karak D.G khan Rajanpur, Kashmor, Kohlu, Zhob, Loralai, Sibi & Karachi etc.	produces date palm, mangoes, wheat, maize, cotton and fodder for goat/sheep	floods, deficiencies in water distribution system	improvement, dry land afforestation, agro forestry, biodiversity conservation & on-farm water management
Dry Mounta-ins	Western, Upland Balochistan (except coastal belt) & tribal area/agencies near Bannu district. Northern: tribal areas/ agencies near Kohat & Peshawar districts	Largest region of Pakistan with estimated area of more than 0.3 million km(43% of total area of Pakistan)grazing land used by transhuman and sedentary agro-pastoralists.	Drought, minimum recharge of aquifer, very low vegetation cover and saline groundwater	Dryland afforestation, rangeland improvement, rainwater harvesting/recharging biodiversity conservation, low delta crops and rainfed agriculture, high efficiency irrigation system soil and water conservation/ rehabilitation & on-farm water management
Coastal Region	Gwadar district & southern parts of Karachi, Lasbella Thattha & Badin districts.	Mangrove forests and other coastal biodiversity.	Moving sand dunes in dry areas, saline groundwater, Poor quality soil, mangroves deterioration.	Sand-dune stabilization, shelterbelts/woodlots, afforestation, saline agriculture, management of mangroves, low delta crops(Date Palm etc)high efficiency irrigation system & on-farm water management

Source: National Sustainable Development Strategy, Ministry of Climate Change.

The main causes of deforestation have been outlined as rapid increase in population beyond the carrying capacity of forests, illegal timber extraction by individuals and organized groups, inadequate forest protection measures, forest encroachment through urbanization and agriculture use, arid climatic conditions, over exploitation of forest resources coupled with lack of regeneration, dependence of rural population on wood for fuel and heating, over gazing of land by cattle, forest fires and inefficient use of water.

The government is trying to reverse this downwards trend by taking a number of measures including afforestation, reforestation as well as trying to provide an economic value to the carbon sequestered by forests through emerging market based instruments such as Reduction of Deforestation and Degradation (RDD+) briefly discussed as under:-

REDD+ Potential and Pakistan:

Pakistan has a low forest cover with diversified forest types from coastal mangrove and riverine ecosystem to alpine Chir Pine forests within placed diversified community. There is a decline in overall forest cover in Pakistan, with the amount of forests declining by just under 2 percent in the 1990s, but by more than 2 percent in just five years, from 2000 to 2005. This decline needs to be taken into account to get maximum benefits from REDD+. The government is striving to reverse these negative trends and aiming to increase Pakistan's forest cover to 6 percent by 2015.

The total carbon stock of conifer forests could be estimated as 58 mega tons on the basis of biomass estimations by Asia Least cost Greenhouse Gas Abatement Strategy (ALGAS). On the bases of FAO Deforestation data 1990-2005 and ALGAS, 389 mega tons of carbon potential could be estimated for all types of forests in Pakistan with an estimated annual return of US$ 54 million at a rate of US$ 15 per tonne of carbon credits[1]. Other estimates by Leadership for Environment and Development (LEAD) 2010[2] points to potential earnings of between $94.74 million and $315.8 million per year if deforestation is halted completely. This estimate reflects the limited data available and provides only an indicative estimate. The actual potential could be far greater, depending on the carbon price and the sectors included under REDD+.

Pakistan's efforts with regard to the REDD+ initiative need to be significantly enhanced on a priority basis in order to achieve the global target

[1] Iqbal. K.M.J., and Ahmad. M., (2011) SDPI, Policy Paper Series # 38 September 2011

[2] LEAD (2010) REDD+ Policy Brief 4. LEAD-Pakistan

and meet the basic requirements of REDD+ readiness phase. As Pakistan faces a high rate of deforestation and aims to reverse this trend, the active engagement in REDD+ is a unique opportunity to support this national priority. However, this needs to be driven by a focused strategic plan and supported by scaling up of national technical and institutional capacity to deal with REDD+ mechanism.

Strategy

- Steps will be taken to promote public-private and market oriented farm forestry initiatives along with targeted programs for urban forestry as well as forests in flood plains, drylands, riverine and catchment areas and capturing the potential of women, being the main custodians.
- Mangrove forests in the country to be preserved through GIS based documentation and strict control of urban encroachments.
- Introduce programmes on sustainable forest management and the value of sustainable forestry aiming to sensitize the public and stakeholders at the local, provincial and federal level.
- Strict enforcement of Forest Protection laws in particular to limit and control powerful timber interests.
- Promotion of REDD+ (Reduction of Emissions from deforestation and degradation) program in Pakistan for preservation of forests through private sector led carbon sequestration and carbon credit generation. A clear regulatory process needs to be developed urgently to oversee REDD+ activities in the country especially to ensure rights of forestry stakeholders and indigenous populations.
- Promote land use planning for SLM (Sustainable Land Management) at village, district, provincial and national levels.
- Mainstream Sustainable Land management (SLM) principles and best land use practices as well as technologies into sectoral policies, strategies, programs and development plans.
- Undertake measures to control water logging and salinity in agricultural lands to sustain longevity of productive lands.
- Complete the lining of canals across the country to address a major source for water inefficiency as well as water losses due to seepage while also providing considerable employment opportunities.

Biodiversity Protection

Biodiversity refers to the variety of life, which can be seen in diverse habitats of ecosystems, species and genetic diversity. Sustainability of ecosystems depends to a large extent on the buffering capacity provided by having a rich and healthy diversity of genes, species and habitats. The air we breathe, the water we drink and the soil that support crops production are all products of the complex interactions that occur among various living organisms on earth. These services include cleaning of water, purification of air, pollination, soil formation and protection, crop pest control and the provision of food, fuel, fibers and drugs. Moreover, genetic diversity in domestic species and their wild relatives enables researchers to develop improved varieties of animals and plants for human needs; which serves as an insurance for future food security. In addition diversity in wild plant species is a major medicinal resource in *yunani* (traditional medicine) and 40% of allopathic drugs are originally made from wild medicinal plants. This entails safeguarding all components of biodiversity, ecosystems or habitats, species as well as genetic diversity.

Issues and Trends: With a widespread conversion of natural ecosystems to 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. To date, no systematic and comprehensive assessment with the aim of objectively ranking the biodiversity importance of Pakistan's natural ecosystems has been made. However, based on various reports and the opinions of recognized authorities, Biodiversity Action Plan of Pakistan identifies at least 10 ecosystems of particular value (Table-16.6) for their species richness and or unique communities of flora and fauna that are threatened with habitat loss and degradation. These ecosystems are considered to be of critical concern in conservation.

Table: 16.6 Ecosystems, Characteristics, Significance and Threats.

Ecosystem	Characteristics	Significance	Threats
Indus delta and coastal wetlands	Extensive mangroves and mudflats Inadequate protected area coverage	Rich avian and marine fauna Diverse mangrove habitat Marine turtle habitat	Reduced freshwater flow from diversions upstream Cutting mangroves for fuelwood Drainage of coastal wetlands
Indus river and wetlands	Extensive wetlands	Migratory flyway of glottal 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
Balochistan Juniper forest	Huge and ancient junipers	Largest remaining juniper forest in the world unique flora and fauna	Fuelwood cutting and overgrazing habitat fragmentation
Chilghoza forest (Sulaliman Range)	Rocky outcrops with shallow mountain soils	Important wildlife habitat for several species at risk	Fuelwood cutting and overgrazing illegal hunting
Balochistan sub-tropical forests	Mid-altitude forests with sparse canopy but rich associated flora	Very few areas now remain important wildlife habitat	Fuelwood cutting and overgrazing
Balochistan rivers	Not connected with the Indus river system	Unique aquatic fauna and flora with high levels of endemism	Water diversion/drainage overfishing
Tropical deciduous forests (Himalayan foothills)	Extend from the Margalla Hills National Park east to Azad Kashmir	Perhaps the most floristically rich ecosystem of Pakistan	Fuelwood 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 Fuelwood cutting and overgrazing
Trans-Himalayan alps and plateau	Spectacular mountain scenery	Unique flora and fauna; center of endemism	Fuelwood cutting and overgrazing illegal hunting unregulated tourism habitat fragmentation

Source: National Sustainable Development Strategy, Ministry of Climate Change.

Strategy

- 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 Payment 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 for the varied ecological zones of the county
- Preservation of the diverse wetlands and forests of the country that are repositories 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 genetic material for the plants, animals as well as forest biodiversity present in the country.
- Conserve life support systems, habitats, species and genetic diversity as the assets of making and promote tangibly defined efforts such as doubling of forest cover by 2030, as envisaged in Vision 2030.
- Prepare national lists of threatened species including those which are nationally rare and declining; those which are nationally rare, not declining, but otherwise at risk and those which are highly localized in distribution; and those which are still widespread and common but suffering significant decline.

Climate Change: Institutional Response

Climate change is a global concern and its adverse impacts are likely to affect most of the developing countries. Pakistan is committed to engaging vigorously with international community to find solutions and help the world towards a new era of global cooperation on climate change. Furthermore, developing countries face the dual challenge of addressing the negative impacts of climate change and pursuing sustainable development. The inescapable linkages between climate change and sustainable development were recognized at the global level when the 14th and 15th meeting of the Commission on Sustainable Development (CSD) called for integrating the concerns, as well as opportunities arising out of this interaction. The CSD advocated that the National Sustainable Development Strategy (NSDS) should become the central document to outline a comprehensive development framework that incorporates the needs for future climate adaptation as well as mitigation.

The Ministry of Enviornemnt was the designated national focal point for United Nations Framework Convention on Climate Change (UNFCCC) and Kyoto Protocol but has now recently been transformed into the Ministry of Climate Change that clearly points towards the prioritized importance being provided to this important isssue by the government. The Ministry of Climate Change is now mandated to lead the efforts to address climate challenges in the country while also coordinating with other concerned agencies/institutions on various technical aspects including; The National Energy Conservation Centre (ENERCON); Alternative Energy Development Board; and Pakistan Council of Renewable Energy Technolgies.

Other major relevant organizations in the country working on research in climate change and sea level rise include Pakistan Meterological Department, Water and Power Development Authority (WAPDA), National Agriculture Research Centre (NARC), National Institute of Oceanography (NIO) and Space and Upper Atmosphere Research Commission (SUPARCO) as well as private sector NGO's such as LEAD, IUCN, WWF and SDPI. There are serveral other organizations in the coutry, the mandates and activites of which partly cover climate change related issues and which have either some very relevant climate change related capacities or are pursuing climate change related projects. These efforts need to be continued and enhanced to meet the strategic goals related to climate change.

Pakistan's international commitments regarding climate change finds expression in its national policy frameworks such as the, recently announced, National Climate Change Policy, the Framework for Economic Growth (2011) which lists "Environment and Climate Change" as one of the action matrix, the Medium Terms Development Framework 2010-2015, UN programme on Environment, National Environmental Policy as well as the National Energy Conservation Policy. These documents describe clearly how the government intends to honor its international commitments on climate change.

The Government of Pakistan (GOP) has also made institutional arrangements to handle climate change issues, which among others include the Prime Minister's Committee on Climate Change (PMCCC) and a multi stakeholder and inter-ministerial Core Advisory group on climate change. The PMCCC is an overarching body, which meets about once a year to monitor the climate change related developments taking place globally and within Pakistan and provide overall policy guidance. Global Change Impact Studies Centre (GCISC) serves as the secretariate to PMCCC. The Core Advisory Group, however has been meeting very frequently and playing an active and influential role on climate change matters ranging from overseeing the country's position in international climate negotiation to provide technincal inputs on preparation of the national climate change policy.

Abnormal Climate Patterns Threatening Global Food Crisis

In view of the abnormal climate pattern, the threatening global food crises and anticipation regarding lower production of food grains and rising prices globally in forthcoming times, the government has established National Food Security & Research Division with the function to policy planning in respect of Agriculture to ensure food safety through various programmes. The Ministry has been allocated Rs. 495.000 million during current fiscal year 2012-13 for their development projects to enhance crops production by better seed production, research & development and by other agriculture development programs. In addition government is also following the three pronged strategy for improving irrigation, water supply and availability which is as under:-

a) To improve storage capacity, work is on going on thirty two projects of dams having allocation of Rs. 22450 million in PSDP 2012-13 and twenty four hydel projects are under

implementation with allocation of Rs. 63982 million.

b) To improve conveyance efficiency major canals have been lined. Likewise major portion of water-courses have been lined/centered and twenty projects are on-going with allocation of Rs. 15007.809 million in PSDP 2012-13.

c) To improve on farm water use high efficiency irrigation system like sprinkler and drip irrigation has been introduced. Similarly, technology of permanent raised bed has been introduced to grow more with less water. Twenty seven projects of irrigation capacity buildings and for flood management structures are under implantation with allocation of Rs. 10234.470 million in PSDP 2012-13 and government is fully committed to complete all these projects on fast track.

d) Grain storages projects have also been undertaken which will help in storing food grains in clean and safe silos for longer period with minimum losses.

The Climate Change Division is also making efforts for sustainable Land Management to combat desertification in Pakistan and implementing six projects which will help in minimizing the adverse impact of abnormal climate patterns.

Moreover, provincial governments; are also under taking number of projects for food and agriculture, water management, soil conservation and infrastructure projects to address the challenges of global food crises.

Conclusion

The Government of Pakistan recognizes the environmental concern and taking necessary measures to combat environmental degradation effectively. This chapter encompasses air and water pollution, solid waste, forest, biodiversity protection issues being faced by these sectors and strategic goal (envisaged in National Sustainable Development Strategy). Significant initiatives have been taken to counter all the complex issues responsible for environmental degradation. It is hoped that these measures will yield desired goals.