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Environment

Pakistan recognizes the importance of environmental concerns as a cross cutting theme in its sustainable development strategy. Hence its protection, renewal and enrichment is recognized as an obligation towards the betterment of its citizens. The environmental concerns of Pakistan are associated primarily with the adverse impact of un-sustainable social and economic development. High population growth rate, lack of public awareness of environmental related education, mismanagement of natural resources, widely unplanned urban and industrial expansions are the core hard issues. These are further compounded with the rapid urbanization. A nation with a population of 177 million with an average population density of 222 persons per sq km, higher than many other developing countries, whose 37 percent people live in urban areas and 63% in rural has a high rate of migration to urban centers which has made the cities dysfunctional, overcrowded and very congested. Rapid urbanization is putting the available insufficient infrastructure under enormous pressure and causing environmental debacles of great magnitude. Serious risks of irreversible damages are present due to air and water pollution, mismanagement of solid waste and destruction of fragile ecosystems.

The Mid-term Development Framework 2005-10 (MTDF 2005-10) has been developed in line with the National Environment Action Plan (NEAP) objectives, and focuses its four core areas: Clean air, Clean water, Solid Waste management, and Eco-system management. NEAP has been prepared keeping in view Pakistan's experience with such initiatives in the last decade.

The government is taking necessary measures and takes benefit of accession to the Kyoto Protocol. Moreover, the country is signatory to numerous

Multilateral Environmental Agreements, such as agenda 21 Rio Principle and Johannesburg Plan of Implementation, Convention on Biological Diversity, Convention on International Trade in Endangered Species of wild flora and fauna, United Nations Convention to Combat Desertification, United Nations framework Convention on Climate Change. Pakistan has also prepared the National Implementational Plan for Persistent Organic Pollutants to ratify the Stockholm Convention and also committed itself to achieving the Millennium Development Goals (MDGs) as adopted by the UN Members States. In all Public Sectors Development Programmes, it is mandatory to highlight the Initial Environment Examination and Environment Impact Assessment by the sponsoring Ministries/Organizations/Departments.

Though the Federal Government initiated a number of policy reforms but now under the 18th Amendment, Ministry of Environment is going to be devolved in June, 2011, and Provinces will have more power in policy development and implementation.

The table 15.1 presents the achievements of the targets.

State of the Environment

a. Air

With an estimated 37 percent of its population living in cities, Pakistan is the most urbanized country in South Asia. Its cities continue to grow, offering employment opportunities, but rapid urbanization has been accompanied by environmental problems such as pollution, waste management, congestion and the destruction of fragile ecosystems. Urban air pollution remains one of the most significant environmental problems, facing the cities. A substantial body of

research demonstrates that high concentrations of suspended particulates adversely affect human

health, prolong a wide range of respiratory diseases and heart ailments.

Table 15.1: The MDG's targets and achievements

Name of Sector/Sub-Sector	Physical Targets of MTFD period			Achievement of Target
	Year 2004-05	2009-10 Targets	MDG Targets 2015	
Forests cover including State and private forests/farmlands (%age of total land area)	4.9%	5.2%	6.0%	5.11%
Area protected for conservation of wildlife (%age of total area)	11.3%	11.6%	12.0%	11.3%
No. of petrol & diesel vehicles using CNG fuel	380,000	800,000	920,000	2,500,000
Access to sanitation (national)%	42	50	90	50
Access to clean water (national)%	65	76	93	65
Number of continuous air pollution monitoring stations.	0	4	--	7
Number of regional offices of Environmental Protection Agencies	0	8	16	6
Functional Environmental Tribunals	2	4	--	4

Source: (Environment Section) Planning & Development Division

The most serious issue of air quality in Pakistan is the presence of excessive suspended particulate matter (SPM) present in the ambient air. The major sources of SPM are vehicles industry, burning of solid waste, brick kilns and natural dust.

The origin of suspended particulates matter (SPM) source may be a natural phenomenon, such as unpaved roads and places uncovered by green grasses or trees. Fine particles size of soil may be raised in the form of dust cloud by driven motor vehicles and by strong wind blow. Other origins may be considered coming from artificial emission of SPM such as emission gasses including the particulate matter from the motor vehicle and industrial activity. Other natural sources of affecting the SPM level are higher, including kind of surface soil, quantity of rainfall, relative moisture content in the atmosphere, and cleaning condition on paved roads and under construction roads.

Several studies of air, water and noise has been carried out by Pakistan Environmental Protection Agency (Pak- EPA). Air Quality data recorded by continuous monitoring station in five capital cities confirmed presence of high concentration of suspended particulate matter. The level of PM (particulate matter size below 2.5 micron), which

is mainly due to combustion source, has reached to an alarming point (2 – 4.7 times higher than the safe limit) “National Environmental Quality Standards (NEQS) for PM 2.5 is 25 microns/m³ annual average”

Table and figure below show annual mean value of PM 2.5 in five capital cities.

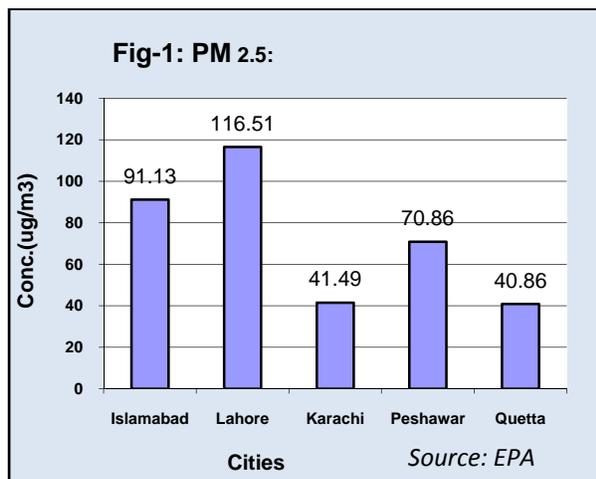
Table No. 15.2 Annual Mean Values of Suspended Particulate Matter (PM 2.5) from June 2010-May 2011

Sr. No.	City	Level (ug/m ³)
1	Islamabad	91.13
2	Lahore	116.51
3	Karachi	41.49
4	Peshawar	70.86
5	Quetta	40.86

Source: Environment Protection Agency (EPA)

The level of other pollutants in the ambient air like Carbon monoxide (CO), Sulphur dioxide (SO₂), Ozone (O₃) and Hydrocarbons (HC) are within safe limit according to National Environmental Quality Standards (NEQS) for ambient air. Sometimes the concentration of above gases goes higher than the safe limit at different places, but this happen for short time and give short time exposure to public. Formation of secondary pollutants like sulphates and

photochemical smog is a very common phenomenon.



The main causes of air pollution also include a

sharp increase in number of vehicles (inefficient and outdated automotives technology, dirty fuels, absence of public transport), and uncontrolled emission of industrial units, burning of garbage and presence of loose dust because of dry climate. Environmental standards are just not enforced in the auto industry.

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 settled in lungs and cause respiratory diseases. The 2-stroke vehicles industry is performing fast in Pakistan and has increased by 142.6 percent in 2010-11 when compared with the year 2000-01. Rickshaws have grown by more than 24 percent while motorcycles and scooters have more than doubled since 2000-01. (See Table 15.3)

Table 15.3: Motor Vehicles on the Road (000 Nos)

Year	Total	Motorcycles/Scooter	Rickshaws
2000-01	2291.3	2218.9	72.4
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	3144.5	3063.0	81.5
2005-06	3868.8	3791.0	77.2
2006-07	4542.8	4463.8	79.0
2007-08	5126.3	5037.0	89.3
2008-09	5444.3	5355.9	88.4
2009-10	5501.2	5412.1	97.3
2010-11 (Jul-Mar)	5558.7	5468.9	89.1
% inc./dec. over 2000-01	142.6	120.4	24.0

E: Estimated

Source: National Transport Research Centre

The use of coal in the power sector has been decreasing. It may be due to the fact that a number of plants have now been converted to natural gas. Likewise, there has been reduction in coal usage for domestic purposes. Bricks kilns are another source of pollution of 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 19.2

percent for bricks kilns in 2009-10 when compared with year 2000-01 (Table 15.4).

CNG is promoted as an alternate motor fuel for Pakistan's market to reduce pressure on petroleum imports and to curb air pollution.

Table 15.4: Consumption of Coal**(000 M/Tons)**

Year	Power	Bricks Kilns	Household
2000-01	205.8	2837.9	1.0
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	3906.2	-
2005-06	149.3	4221.8	-
2006-07	164.4	3277.4	1.0
2007-08	162.2	3760.7	1.0
2008-09	112.5	3274.8	0.8
2009-10	125.1	3382.7	-
2010-11 (July-March)	44.6	3305.5	-

*E : Estimated, - : Not Available**Source: Hydrocarbon Development Institute of Pakistan*

Presently, 3329 CNG stations are operating in the country and 2.50 million vehicles are using CNG as fuel (see Table 15.5). Use of CNG as fuel in transport sector has observed a quantum leap, replacing traditional fuels. After the successful CNG programme for petrol replacement, the government is now looking to replace the more polluting “diesel fuel” in the road transport sector. The government has planned to offer incentives to investors to introduce CNG buses in the major cities of the country.

Table 15.5: Growth in CNG Sector

As on	CNG Stations (No.)	Converted Vehicles (No.)
December, 1999	62	60,000
December, 2000	150	120,000
December, 2001	218	210,000
December, 2002	360	330,000
December, 2003	475	450,000
December, 2004	633	660,000
December, 2005	835	1,050,000
December, 2006	1,190	1,300,000
16 th May, 2007	1,450	1,400,000
February, 2008	2,063	1,700,000
December, 2009	3,051	2,000,000
December, 2010(P)	3,329	2,500,000

P. Provisional

The Motor Vehicle Examiners (MVE) have no facilities to scientifically check fitness or emissions of vehicles. At present, only commercial vehicles are checked by MVE. Even passed vehicle cannot give assurance of compliance of standards. No private vehicle

undergoes any mandatory inspection/emission check.

In consultation with provincial governments, the Ministry of Environment has worked out a model for vehicle examination/emission testing to be established in the country to follow a uniform procedure for motor vehicle inspection for public and private vehicles. The first pilot project in this regard has been approved at a cost of Rs 294 million. It is expected that motor vehicle centers will be established with the help of public private partnerships throughout the country.

Table 15.6: Natural Gas Vehicles (NGV)**Population: Top Ten Countries**

Country	NGV Population	% all NGVs in World
Pakistan	2,500,000	21.6%
Iran	1,954,925	15.4%
Argentina	1,901,116	15.0%
Brazil	1,664,847	13.1%
India	1,080,000	8.5%
Italy	730,000	5.8%
China	450,000	3.6%
Colombia	340,000	2.7%
Thailand	218,459	1.7%
Ukraine	200,000	1.6%

www.iangv.org/tools-resources/statistics.html

Pakistan has become the largest user of Compressed Natural Gas (CNG) in the world, as per the statistics issued by International Association of Natural Gas Vehicles on CNG overtaking Iran, Argentina and Brazil in the

number of vehicles using CNG as fuel replacing more polluting fuels. Due to cost savings, the transport sector has switched from petrol and in some cases from diesel to CNG.

In order to further improve air quality a ban on leaded gasoline was imposed in 2000 and sulphur content in the diesel has been reduced from 1% to 0.6%. Ambient air quality is being monitored continuously through air monitoring stations established in major cities of Pakistan. This monitoring is helpful in assessing the air quality in order to take adequate mitigation measures. More than two million vehicles have been converted for use of CNG as fuel. National Environment Quality Standard (NEQS) for Industrial Gaseous Emission, 2000 are in place to control the industrial pollution. Furthermore, NEQS for ambient air have also been approved by the Council. NEQS for Motor Vehicle Exhaust &

Noise (Amended), 2010 have been approved to control the vehicular emissions. In consultation with Ministry of Petroleum and Natural Resources, Engineering Development Board, Pakistan Automobile Manufactures Associations and other stakeholders, the Ministry of Environment decided that (i) all petrol driven vehicles imported or manufactured locally will comply with Euro-II emission standards with effect from July 2009. Existing models if not complying with Euro-II emission standards will have to switch over to Euro-II models by no later than three years, if not immediately: (ii) all diesel driven vehicles imported or manufactured locally will comply with Euro-II emission standards with effect from July, 2012. The Ministry of Petroleum and Natural Resources will ensure availability of Euro-II complaint diesel (with sulphur contents 0.05 percent) with effect from January, 2012. [Table 15.7]

Table 15.7: Quality of Fuel Oil

	Pakistan	Other Countries of Region
* Gasoline	Unleaded	Unleaded
* Sulphur in Diesel Oil	0.2-0.6%	0.05-0.5%
* Sulphur in Furnace Oil	3%	0.5-1%

Target for Sulphur Content in Diesel Oil: 0.05% by 2012

Realizing the significant impact of poor Ambient Air quality, the Ministry of Environment has developed Pakistan Clean Air Programme (PCAP) to gradually reduce air pollution through various activities. PCAP has been approved by Pakistan Environmental Protection Council on 29th March, 2010. The salient features of the Programme are given below:

- Gradual exclusion of diesel run vehicles from urban centers.
- Establishment of Environmental Squad of Traffic Police in all major cities to control smoke.
- Introduction of low sulphur diesel and furnace oil and promotion of alternate fuels in the country.
- Encourage installation of pollution control devices and other technologies for vehicles and industry.

- Relocation of brick Kilns and adoption of alternate technology for brick manufacturing.
- Establishment of Indoor Air Quality Standards.
- Urban tree plantation, forestation in deserts and sand dune stabilization
- Proper disposal of solid waste.

Under the PCAP, the Pakistan Environmental Protection Agency with grant assistance of the Government of Japan[†] has set up seven

[†] The Bank's support for the NEP is initially focused on providing technical assistance to M/o Environment for the development of **provincial action plans**. The aim is to facilitate a process through which provincial authorities will establish their own priorities within the broad matrix of national environmental goals laid down in the NEP. For implementation of the PCAP, JICA is funding monitoring equipment which

continuous Air Quality Monitoring Stations² and three Mobile Air Quality Monitoring Stations to measure PM10 and PM25 (Particulate Matter less than 10 and 25 microns). Presently these units are being run on trial basis. Data generated so far has shown that PM10 and PM25 in urban centres have reached alarming levels.

Water

Water pollution has been steadily increasing over the years. The sources of this pollution include uncontrolled discharges of municipal as well as industrial waste in water bodies, runoff from agriculture fields where agrochemical usage has been increasing, and other natural as well as anthropogenic activities which take place in the catchment areas.

The existing water resources in the country are under threat due to untreated discharge of municipal and industrial wastes to rivers and other surface water bodies. The majority of the population of Pakistan is exposed to the hazard of unsafe and polluted drinking water. Untreated sewerage, industrial effluents, and agricultural run-off are usually released in streams or drains; ultimately drain the highly polluted water into the rivers and sea. Polluted water poses potential risk to public health. High incidence of water borne diseases can directly be attributed to polluted waters in our lakes. Other impacts of high contamination in the waters include loss of biodiversity and ecosystems, reduction in fish population and damage to soils and crops in the irrigated areas.

Supply of drinking water and provision of sanitation are the most important contributing factors for improving the health of the people in any country. As per World Health Organization (WHO) report 80 percent of the diseases are due

will provide necessary data, there is limited capacity to plan and implement specific interventions. The Bank will initially provide technical assistance, with the possibility of subsequent investment support as plans become more concrete.

² Two continuous Air Quality Monitoring Stations have been installed in Karachi, two in Lahore, and one each Islamabad, Peshawar and Quetta.

to unhygienic conditions and unsafe drinking water. Safe drinking water and proper sanitation are inseparable and critical to health. More than 0.884 billion people lack access to safe water, and 2.5 billion lack access to basic sanitation. The Millennium Development Goals (MDGs) include a target to halve the fraction of the world's population without access to water and sanitation by 2015. The world is roughly on course to reach the target for water supply, but will fall short by half a billion people in sanitation.

In Pakistan, currently over 65% of population is considered to have access to safe drinking water. Inadequate water supply results in high incidence of water related diseases which in turn increase morbidity and mortality rates and pose major threat to the survival and development of children. The National Standards for Drinking Water Quality (NSDWQ) have been approved on 29th March, 2010 in order to improve the water quality and to provide the public with the safe drinking water. Fortunately, the country is on track on access to Improved Water Resources. This achievement owes partly to higher public sector investment in water supply schemes, and self-provision of water from hand and motor pumps in rural areas. Around 95 percent of the urban and 87 percent of the rural population have now access to various areas of improved drinking water supplies with household connection of 48 percent and 19 percent respectively³. Further, less than 1 percent of the population has to travel more than 0.5 km to the source of drinking water⁴ as compared to 2 percent at the start of the decade⁵. However, access to water remains difficult in Southern Khyber Pakhtunkhwa, parts of Baluchistan, Tharparker and Cholistan.

Floods

According to World Bank environmental Damage Need Assessment (DNA) report, Pakistan experienced unprecedented floods from exceptionally heavy monsoon rains during late July and early August, 2010 in the upper

³ Joint Monitoring Programme of WHO and UNICEF. Progress Report - 2008.

⁴ PSLM 2007-08.

⁵ PSLM 2001-02.

catchments area of the Indus river basin⁶. The rains generated flows in the Indus river system surpassing all historical records. In the Khyber-Pakhtunkhwa (KP) province, two tributaries of Indus River, Swat and Kabul experienced record high flows in excess of 400,000 cusecs, surpassing the registered historic 1929's high flow of 250,000 cusecs. Downstream in Punjab, Taunsa Barrage registered a flood peak of 960,000 cusecs⁷, exceeding the historic peak of 788,646 cusecs recorded in 1958. On August 8–9, in the Sindh Province, Guddu Barrage passed a peak flood of 1,149,000 cusecs that corresponds to the maximum discharge estimated in 500 years. The flood caused environmental damages and losses to the population, heightened environmental health risks and affected forests, wetlands and other natural systems.

As evident by the recent floods, the Indus watershed has become highly vulnerable to extreme weather events, which are expected to increase in frequency and intensity as a result of climate change. This is due to the fact that over the course of past decades, most of the watersheds have been degraded and encroached by expanding human settlements and cultivation fields, decreasing water availability, and flood control protection services. The ineffective regulations induced the encroachments into the flood plain and even into the river bed, in the “ketch” area in the form of buildings, houses and growing crops, Acute environmental degradation of watersheds, including accelerated deforestation and drying up of wetlands, aggravated the damages caused by he floods. The DNA report suggests effective short and long term measures to address the entire issue in undertaking series of interventions which also includes restoration of encroached riverine forest land.

⁶ Pakistan's Indus basin system comprises the Indus river itself with several major tributaries on the left bank (Ravi Chenab, Jhelum, Sutlej and Beas) and two major tributaries on the right bank (Kabul & Swat).

⁷ This discharge corresponds to 1 in 500 years return period.

Land

Millions of people are affected by the problems of drought, desertification and land degradation throughout the world. The arid and semi arid regions like Pakistan face even worse situation Large chunks of fertile land change into unproductive barren lands each year. This in turn triggers poverty, unemployment, and food crisis. Land degradation in Pakistan encompasses the vital issues including deforestation and desertification, sodicity and salinity, water logging, soil erosion, negative nutrient balances, and depletion of solid fertility. More than sixty percent of the natural grazing areas in Pakistan have production levels lower than one third of their biological potential.

Water logging in the country has considerably reduced due to prolonged drought conditions and excessive mining of ground water. About 11 million hectares of arable land in Pakistan is affected by water logging while over 3 million hectares are affected by salinity and sodicity. Similarly, the soil of the country is deficient of phosphorous as well as 20-40% deficiency of potassium is prevalent due to extensive use of nitrogenous and phosphate fertilizers only

Sanitation

Pakistan is committed to achieve the MDG target of halving by 2015 the proportion of people without sustainable access to safe and improved sanitation. Strategic direction, capacity development, and monitoring and evaluation, as well as investments are primarily the responsibility of the provincial governments through the provincial line departments.

Forests

Due to arid and semi-arid climate in large parts of the country, Pakistan is placed among the countries with low forest cover. Total area of forest area in the country is 4.21 million hectares. The main causes of low forest cover are arid climate; over-exploitation of forest resources for energy needs, land use change for agriculture and urbanization abstraction and extraction of river waters without caring for the needs of forest ecosystems downstream; competing uses and

inefficient use of wood; and forest fires are the main causes of this situation. Past trends and the current state of forests and forestry indicates that large-scale deforestation and degradation of natural forests have occurred on private and commercial lands in Gilgit- Baltistan and Khyber Pakhtunkhwa.

According to Millennium Development Goals of Forestry Sector, Pakistan is committed to increase forest cover from existing land to 6 percent by the year 2015. This implies bringing an additional 1.051 million hectares land area under forest. However, provincial forest departments, have very limited financial, technical and manpower resources under regular budget to achieve the MDG targets. In order to perform their functions, forest departments implement short to medium

term development projects under provincial and federal PSDP. As a policy, the Government is promoting the concepts of social forestry, integrated participatory watershed management and biodiversity conservation in the shifting paradigm of sustainable forest management.

Measures to Enhance Forest Cover Mass Afforestation and Tree Planting Campaigns

In order to enhance tree cover in the country, tree planting campaigns are held each year. During the tree planting campaigns all the government departments, private organizations, defense organizations and NGOs are involved in planting activities. The achievements during 2001-2010 are as under:

Table No:15.8: Tree Planted (in Million)

S. No.	Year	Spring	Monsoon	Total
1.	2001	83.039	47.111	130.150
2.	2002	67.949	39.705	107.654
3.	2003	55.018	39.000	94.018
4.	2004	63.166	58.000	121.166
5.	2005	65.799	30.654	96.453
6.	2006	57.17	35.340	92.510
7.	2007	61.48	37.32	98.8
8.	2008	73.26	38.123	111.383
9.	2009	55.77	35.96	91.73
10.	2010	57.72	34.54	92.26

Source: Ministry of Environment

Mangroves For the Future (MFF)

Mangroves for the Future (MFF) initiatives focuses on the countries worst affected by the tsunami. However, MFF also include other countries of the region that face similar issues with an overall aim to promote an integrated ocean wide approach to coastal zone management. Pakistan joined MFF as dialogue country in 2008 and prepared National Strategy and Action Plan for the Mangroves for the Future w.e.f. 1-4-2010. Pakistan has become regular member of MFF. As a member Pakistan is entitled to receive reasonable support for institutional strengthening, capacity building and for implementation of small and large projects in coastal areas of Pakistan.

National Tree Planting Day 2010

Prime Minister of Pakistan declared 18th August as National Tree Planting Day (NTPD). Underlying objective of celebration of NTPD is to address deforestation and associated environmental problems being faced by the nation through motivation and involvement of all segments of the society in tree plantation campaign. Large scale tree planting celebrations are held to mark National Tree Plantation Day.

Participation in Reducing Emissions from Deforestation and Forrest Degradation (REDD+)

Under the UN Framework Convention on climate Change, a new mechanism REDD+ has been approved to stop deforestation, forest degradation and to reduce emissions of carbon into

atmosphere. Pakistan has vast potential of controlling deforestation under REDD+ by paying due compensation to forest communities with the international financial assistance. Government of Pakistan, Ministry of Environment has constituted a NSC on REDD+ that will guide and steer REDD+ prospects in Pakistan.

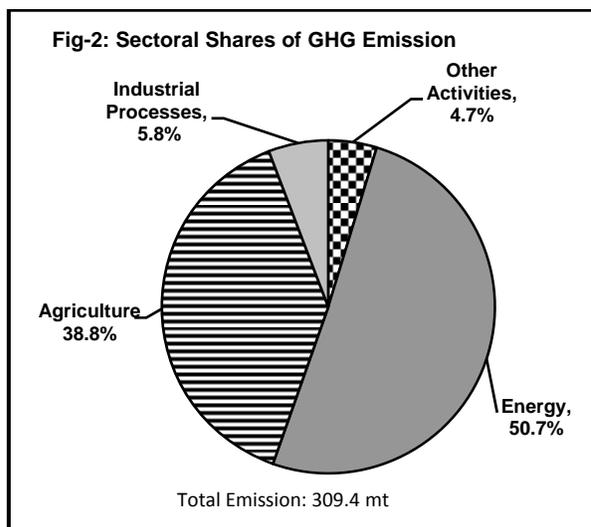
Climate Change

Climate change is one of the most complex challenges of the new century. Pakistan like other developing countries remained extremely vulnerable to the impacts of climate change. The most serious concerns are the threat to water and food security of the country and the vulnerability of its coastal areas. Other climate change related concerns include increased risks and extreme events (floods, droughts and cyclones) and adverse impact of forests, biodiversity human health etc. Poverty reduction and sustainable development remain core priorities of Pakistan and in this context, in October 2008, the Planning Commission established a Task Force on Climate Change and assigned with the responsibility to facilitate the formulation of a Climate Change Policy. The Task Force on Climate Change has submitted the report to Planning Commission, which has given the recommendation to address climate change issues on both the fronts; i.e. Mitigation and Adaptation. Under Mitigation, Energy, Agriculture, Livestock and Forestry sectors have been focused while under Adaptation, Water resources, Storage capacity, Water use efficiency, Glaciers, Capacity building and International and Regional Cooperation has been focused.

Situation Analysis

1. Pakistan's total Green House Gas (GHG) emissions in 2008 amounted to 309 million tonnes (mt) of Carbon dioxide (CO₂) equivalent, comprising about 54% CO₂, 36% Methane, 9% Nitrous Oxide and 1% other gases. The biggest contributor is the energy sector with (50.7% share), followed by the agriculture sector (38.8% share), industrial processes (5.8% share) and other activities (4.7% Share) (Fig-2). Pakistan is a small GHG emitter globally. It contributes only about 0.8% of the total global GHG emissions. On per capita basis, Pakistan with 1.9 tonnes per capita

GHG emissions stands at a level which corresponds to about one-third of the world average, one-fifth of the average for Western Europe and one tenth of the per capita emissions in the U.S., putting it at 135th place in the world ranking of countries on the basis of their per capita GHG emissions. Though Pakistan's per capita energy consumption and CO₂ emissions are low but in CO₂ emissions, per unit of GDP production are relatively high, and the living standards are on a rise. This, coupled with the high rate of growth in population will increase energy demand manifold. To meet this growing energy demand, Pakistan will have to make use of its thermal and coal potentials thereby increasing the GHG emission levels. Hence, it will become essential to adopt more stringent energy conservation and efficiency improvement measures as well as massive afforestation. The carbon sinks are degrading fast as the country has low forest cover with a high rate of deforestation of about 0.2 – 0.4% per annum. Global warming is having a visible impact on the survival, growth rate, and health of forests.



During the last century, average annual temperature over Pakistan increased by 0.6 °C, in agreement with the global trend, with the temperature increase over northern Pakistan being higher than over southern Pakistan (0.8 °C versus 0.5 °C). Precipitation over Pakistan also increased on the average by about 25%. Studies based on the ensemble outputs of several Global Circulation Models (GCMs) project that the

average temperature over Pakistan will increase in the range 1.3–1.5 °C by 2020s, 2.5-2.8 °C by 2050s, and 3.9-4.4 °C by 2080s, corresponding to an increase in average global surface temperature by 2.8-3.4 °C by the turn of the 21st century. Precipitation is projected to increase slightly in summer and decrease in winter with no significant change in annual precipitation. Furthermore, it is projected that climate change will increase the variability of monsoon rains and enhance the frequency and severity of extreme events such as floods and droughts.

Climate change affects almost all the sectors of our society 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 alter bi-physical relationships by changing growing periods of the crops, altering scheduling of cropping seasons, increasing crop stresses (thermal and moisture stresses), changing irrigation water requirements, altering soil characteristics, and increasing the risk of pests and diseases, thus badly affecting the agricultural productivity. Water demands of the country are met by Indus River System that is fed by glaciers Hindukush-Karakoram ranges which are generally believed to be receding under influence of climate change and global warming. The melting of these glaciers due to global warming will result in increased water flows for a few decades (which need to be harnessed through raising more dams in the catchment areas), followed by reduced river flows as the glaciers get depleted (needing again higher reservoir capacity to reduce flow of water into the sea during flood periods).

The adverse impacts of global warming in Pakistan are also showing up in the form of extreme climate events. The country faced severe drought from 1998-2001 and intense floods in years 2003, 2006, and 2010 which had serious consequences for life and property of the people.

It is estimated that greater precipitation and melting of glaciers would increase waters in our rivers by as much as 20 percent initially, suggesting the benefit of increasing capacity for water storage. However, the spatial variation could result in greater risk of drought for areas far from the sea. Climate change will also have an important impact on wildlife and their habitat. Rangelands, forests and their types, and biodiversity will be under even greater threat. This requires major programmes for increasing the forested areas with plantation suited to the looming climate change. It will be essential to build up the capacity for multidisciplinary studies and modeling for reliable climate forecasting and analysis of the corresponding socio-economic impact. This will require sustained regional co-operation as well as monitoring of our entire environment from the North to the South.

Programme/Projects for the Tenth Five Year Plan

Implementation of the climate change programme will be carried out through coordinated efforts of the relevant ministries to secure ample resources and their effective utilization i.e. Economic Affairs Division (EAD), Ministry of Environment and Planning Commission at the federal level. The Ministry of Environment will perform an overarching role of policy formulation, research and development and national/international coordination/facilitation. The Economic Affairs Division will facilitate negotiations with donors, bi/multilateral funding agencies, UN agencies, Banks etc, and the Planning Commission will determine impacts of climate change on the national economy and, accordingly plan and help implement programmes/projects in different sectors, mostly through international support/assistance to mitigate and adapt to these effects/impacts – to minimize economic impact. The active and timely involvement of the private sector must be ensured so that the activities to be undertaken in the implementation phase of the programmes and projects.

The following area will be targeted through mitigation and adaptation measures as well as studies to enhance our understanding for Pakistan specific needs.

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| <ul style="list-style-type: none"> i. Data information on Climatology ii. Reducing climate change induced risks and vulnerabilities from Glacier Lake Outburst Floods (GLOF) in Gilgit Baltistan Area of Pakistan. iii. Enhancement of capacities to harness opportunities under Clean Development Mechanism and Adaptation Fund. | <ul style="list-style-type: none"> affected by water logging, salinity, soil erosion), etc. ix. Clean Development Mechanism. x. Economic Impact Assessment of climate change related vulnerabilities. |
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Studies to enhance our understanding for Pakistan-specific mitigation and adaptation needs and mitigation and adaptation measures would be carried out in the following areas:

- i. Climatology
- ii. Water Resources
- iii. Agriculture and Forestry
- iv. Health impacts
- v. Impacts on Coastal Areas
- vi. Disaster risks resulting from extreme events, in particular floods, droughts, cyclones and Glacier Lake Outburst Floods (GLOF).
- vii. Biodiversity conservation for preserving fragile ecosystems, watersheds and livelihoods.
- viii. Fragile ecosystems: mountainous areas, rangelands, degraded lands (e.g. those

Public Sector Development Programme 2010-11

In the PSDP, allocation for the fiscal year was Rs. 2500 million. There are 40 projects under implementation, which fall in the brown, green and capacity building components/subsectors of environment such as: mass awareness, environmental education and environment protection, preparation of land use plan; forestry; biodiversity; watershed management, environmental monitoring; capacity building of environmental institutions; natural disaster early warning and mitigation; improvement of urban environment; Clean Drinking Water for All etc.

Many projects including forestry, watershed management and biodiversity projects in Tarbela Watersheds are underway to reduce sediment load, create employment opportunities, alleviate poverty, conserve the natural resources and rehabilitate the degraded land resources – through nurseries and plantations, construction of check dams, soil conservation, establishment of community organizations, terracing, etc. Various tree planting projects are under implementation.