NATIONAL CLIMATE CHANGE POLICY

FINAL DRAFT

(Not to be quoted)

GOVERNMENT OF PAKISTAN

Ministry of Environment

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1. Preamble

The National Climate Change Policy provides a framework for addressing the issues that Pakistan faces or will face in future due to the changing climate. The report of the Planning Commission's Task Force on Climate Change, which was chaired by Dr. Ishfaq Ahmad, Advisor S&T has been used as building blocks for preparation of this policy. Furthermore, extensive consultation with provinces, federal institutions and civil society provided valuable inputs to the policy document.

In view of Pakistan's high vulnerability to adverse impacts of climate change, in particular extreme events, adaptation effort is the main focus of this policy document. The vulnerabilities of various sectors to climate change have been highlighted and appropriate adaptation measures spelled out. These cover policy actions addressing sectors such as water resources, agriculture, forestry, coastal areas, biodiversity and various vulnerable ecosystems. Notwithstanding the fact that Pakistan's contribution to the global GHG emissions is very small, its role as a responsible member of the global community in combating climate change has been highlighted by giving due importance to the mitigation effort in sectors such as energy, forestry, agriculture and livestock. Furthermore, appropriate measures addressing issues such as disaster preparedness, capacity building, institutional strengthening, technology transfer and international cooperation have been incorporated as important components of the policy. This policy document holds a living status and shall be reviewed and updated regularly to overarch the emerging concepts and issues of the ever evolving science of climate change.

The policy thus provides a comprehensive framework for the development of Action Plan for national effort on adaptation and mitigation.

2. Goal

To ensure that climate change is mainstreamed in the economically and socially vulnerable sectors of the economy and to steer Pakistan towards climate resilient development.

3. Policy Objectives

The main objectives of Pakistan's climate change policy include:

1. To pursue the sustained economic growth by appropriately addressing the challenges of climate change;
2. To integrate climate change policy with other related national policies;
3. To facilitate and strengthen Pakistan's role as a responsible member of the international community in addressing the climate change challenges;
4. To focus on pro-poor gender sensitive adaptation while also promoting mitigation to the extent possible in a cost effective manner;
5. To ensure Water Security, Food Security and Energy Security of the country in the face of challenges posed by climate change;
6. To minimize the risks arising from expected increase in frequency and intensity of extreme events: floods, droughts, tropical storms etc;
7. To strengthen inter-ministerial and inter-provincial decision making and coordination mechanism on climate change;
8. To facilitate effective use of the opportunities, particularly financial, available both nationally and internationally;
9. To foster the development of appropriate economic incentives to encourage public and private sector investment in both adaptation and mitigation measures;
10. To enhance the awareness, skill and institutional capacity of relevant stakeholders;
11. To promote conservation of natural resources and long term sustainability.

4. Pakistan's Vulnerability to Climate Change Threats

The important climate change threats to Pakistan are:

1. Considerable increase in frequency and intensity of extreme weather events, coupled with erratic monsoon rains causing frequent and intense floods and droughts;
2. Projected recession of Hindu Kush-Karakoram-Himalayan (HKH) glaciers due to global warming and carbon soot deposits from trans-boundary pollution sources, threatening water inflows into Indus River System (IRS);
3. Increased siltation of major dams caused by more frequent and intense floods.

4. Increased temperature resulting in enhanced heat- and water-stressed conditions, particularly in arid and semi-arid regions, leading to reduced agriculture productivity;
5. Further decrease in the already scanty forest cover from too rapid change in climatic conditions to allow natural migration of adversely affected plant species;
6. Increased intrusion of saline water in the Indus delta, adversely affecting coastal agriculture, mangroves and breeding grounds of fish;
7. Threat to coastal areas due to projected sea level rise and increased cyclonic activity due to higher sea surface temperatures;
8. Increased stress between upper riparian and lower riparian regions on sharing the water resources;
9. Increased health risks and climate change induced migration.

The above threats are the cause of major survival concerns for Pakistan, particularly in terms of country's Water Security, Food Security and Energy Security considerations.

5. Climate Change Adaptation

Pakistan's contribution to the total global greenhouse gas emissions is among the lowest but it is among the countries most vulnerable to climate change and has a very low technical and financial capacity to adapt to its adverse impacts. For Pakistan to continue on a development path to achieve its goals envisioned in the Planning Commission's Vision 2030 document, it is imperative to prepare the ground that would enable it to face this new challenge. While Pakistan aims to work on a strategy that seeks to conserve energy, improve energy efficiency and optimize fuel mix for contributing to global efforts on GHG emissions reduction, the more immediate and pressing task before it is to prepare itself for adaptation to Climate Change. Only by devising and implementing appropriate adaptation measures will it be possible to ensure water, food and energy security for the country as well as to minimize the impact of natural disasters on human life, health and property.

5.1. Water Resources

Water resources are inextricably linked with climate; hence, the projected climate change has serious implications for Pakistan's water resources. The

freshwater resources, in Pakistan, are based on snow- and glacier-melt and monsoon rains, both being highly sensitive to climate change. The country specific current information strongly suggests the following future trends in Pakistan: decrease in glacier volume and snow cover leading to alterations in the seasonal flow pattern of IRS; increased annual flows for a few decades followed by decline in flows in subsequent years; increase in the formation and burst of glacial lakes; higher frequency and intensity of extreme climate events coupled with irregular monsoon rains causing frequent floods and droughts; and greater demand of water due to higher evapotranspiration rates at elevated temperatures.

These trends will have large impact on the spatial and temporal distribution of water resources on annual and inter-annual basis in the country. This will further exasperate the already difficult situation of a water stressed-country facing demand increases due to population growth and increasing economic activity. To address the impact of climate change on water resources and to help in enhancing water security, the Government of Pakistan, in collaboration with relevant entities shall take the following measures:

Policy Measures

I Water Storage and Infrastructure

a. Assess and address the needs for additional water storages and distribution infrastructure;
b. Ensure early rehabilitation, remodeling and up gradation of the existing irrigation infrastructure in the country to make it resilient to climate change related extreme events;
c. Identify new potential dam sites to keep the options open to develop new dams, as and when` needed;
d. Develop necessary infrastructure to harness the hill torrents potential;
e. Enforce measures to enhance the life of existing storages.

II Water Conservation Strategies

a. Ensure water conservation, reduction in irrigation system losses and provide incentives for adaptation of more efficient irrigation techniques;
b. Introduce local rain harvesting measures.

III Integrated Water Resource Management

a. Ensure that, while making water allocations (within gross national availability) to various sectors in the medium- to long-term, due consideration is given to changes in sectoral demands caused by climate change;
b. Protect groundwater through management and technical measures like regulatory frameworks, water licensing, slow action dams, artificial recharge especially for threatened aquifers, and adopt integrated water resources management concepts;
c. Ensure rationale ground water exploitation by avoiding excessive pumping;
d. Ensure recycling of wastewater through proper treatment and reuse it in agriculture, artificial wetlands and groundwater recharge etc;
e. Protect and preserve water 'catchment' areas, and reservoirs against degradation, silting and irrigation system contamination;
f. Encourage active participation of farmers in water management along with line departments by accelerating implementation of participatory irrigation management reforms;
g. Ensure water distribution among provinces as far as possible according to crop sowing timings;
h. Address sea water intrusion into Indus Deltaic Region by allocating required water flow downstream Kotri;
i. Take appropriate measures to preserve the ecology of dry river reaches of Eastern Rivers;
j. Develop contingency plans for short term measures to adapt to water shortages that could help to mitigate drought;
k. Explore the possibility of joint watershed management of trans-boundary catchment areas with neighboring countries;
l. Ensure to safe guard Pakistan's rights on trans-boundary water inflows according to international norms and conventions;
m. Explore the possibility of entering into water treaty with Afghanistan;
n. Promote integrated watershed management including ecological conservation practices in uphill watersheds.

IV Legislative Framework

a. Legislate and enforce industrial and domestic waste management practices to protect environment, in particular water resources, from further degradation;
b. Enact and enforce laws and regulations required for efficient water resource management and groundwater regulatory framework;

c. Protect the HKH glaciers, which are considered the world's water tower, by declaring them as 'protected areas' through agreements among countries sharing the Himalayan region.

V Enhancing Capacity

a. Develop and extend technologies and techniques for sea water utilization, water recycling and avoiding wasteful use of domestic and drinking water;
b. Ensure measurement and monitoring of irrigation water delivery at various points of the supply system for effective planning and management;
c. Enhance national capacities in remote sensing and GIS techniques for monitoring temporal changes in glaciers and snow cover;
d. Enhance national capacities for making seasonal hydro-meteorological forecasts, particularly for monsoon rainfall;
e. Prepare a comprehensive inventory of all water resources, including surface and ground water, in order to support an efficient water management system in the country.
f. Strengthen the present hydrological network to monitor river flows and flood warning systems.

VI Awareness Raising

a. Promote public awareness campaigns to underscore the importance of conservation and sustainable use of water resources.

5.2. Agriculture and Livestock

Agriculture is central to human survival and is probably the human enterprise most vulnerable to change in climate. Agriculture sector is the life line and the single largest sector of Pakistan's economy. It contributes 21% to the GDP, employs 45% of the labor force and contributes 70 % of the export earnings. Agriculture in Pakistan is greatly affected by short term climate variability and could be harmed significantly by long-term climate change. As the duration of crop growth cycle is related to temperature, an increase in temperature will speed up crop growth and shorten the duration between sowing and harvesting. This shortening could have an adverse effect on productivity of food and fodder crops. Similarly the hydrological cycle is also likely to be influenced by global warming, necessitating the agriculture and livestock sectors, particularly in rain-fed areas, to adapt to these climatic changes. Since the agriculture sector is

heavily dependent on the water sector, a number of adaptation measures identified in the preceding section are equally applicable to the agriculture sector and will generally not be repeated. To enhance the national food security, the Government of Pakistan, in collaboration with relevant entities, shall take on the following adaptation measures in addition to those covered in Section 5.1:

Policy Measures

I Research

a. Develop appropriate digital simulation models for assessment of climate change impacts on physical, chemical, biological and financial aspects of agricultural production systems in various agro-ecological zones;
b. Develop new varieties of crops which are high yielding, resistant to heat stress, drought tolerant, less vulnerable to heavy spells of rains, and less prone to insects and pests;
c. Develop and introduce better breeds of livestock which have higher productivity of milk and meat and are less prone to heat stress and more drought tolerant;
d. Develop quality datasets on crop-, soil- and climate-related parameters to identify ideal cropping patterns for each region and facilitate research work on climate change impact assessment and productivity projection studies;
e. Enhance the research capacity of relevant organizations to make reliable predictions of climatic parameters and river flows at seasonal, inter-annual and inter-decadal levels, to assess the corresponding likely impacts on various crops and to develop appropriate adaptation measures;
f. Promote targeted research on adoption of sustainable land management practices;
g. Enhance the capacity of the farming community to take advantage of scientific findings of the relevant research organizations.

II Technology

a. Improve the crop productivity per unit of land and per unit of water by increasing the efficiency of various agricultural inputs, in particular irrigation water;
b. Promote energy efficient farm mechanization for increasing yield and labor saving;

c. Improve farm practices by adopting modern techniques such as laser land leveling, crop diversification, proper cropping patterns, optimized planting dates etc;
d. Promote through financial incentives solar water desalination for irrigation and drinking particularly in saline ground water regions;
e. Improve irrigation practices by adopting, wherever feasible, modern techniques such as the use of sprinklers and trickle irrigation;
f. Develop capacity based on Remote Sensing and GIS techniques to assess temporal changes in land cover in different agro-ecological zones;
g. Promote biotechnology in terms of more carbon responsive crops, improved breeds and production of livestock through the use of genetic engineering.

III General Management

a. Establish Climate Change units in agriculture research organizations to devise adaptive strategies for projected impacts of climate change on agriculture;
b. Promote horizontal expansion of cultivated lands through development of wastelands and rainwater harvesting through community based approaches to development;
c. Promote feed conservation techniques and fodder banks in the arable areas;
d. Ensure availability of quality feed and fodder to livestock to supplement their grazing in the rangelands;
e. improve nutritional quality of feed through the use of multi-nutrient blocks (MNB) prepared from urea, molasses, vitamins and minerals;
f. Ensure the enabling financial environment to farmers to invest in and adopt the relevant technologies to overcome the climate related stresses.

IV Risk Management

a. Develop a proper risk management system including crop insurance to safeguard against crop failures due to extreme events (floods, droughts etc.);
b. Improve the extension system and enhance use of media to allow effective and timely communication of climatic predictions and corresponding advice to the farming community;
c. Encourage farmers, particularly in rain-fed areas, to avoid monoculture and, instead, plant a variety of heat and drought resistant low delta crops, to reduce the risk of crop failure;

d. Encourage agriculture drought management practices that recognize drought as part of highly variable climate, rather than treating it as a causal natural disaster;
e. Establish livestock disease monitoring and surveillance system at district levels.

5.3. Human Health

It is now widely recognized that that climate change induced increased frequency and intensity of extreme events such as heat and cold waves, heavy or too little precipitation, strong winds and cyclones do have serious implications for human health. For example, floods and storms not only increase the risk of death and injuries, they also have implications for other health effects such as diarrheal diseases because of insufficient clean drinking water availability, water for personal hygiene or for washing food; they may also cause severe psychological problems among the affected population (e.g. mental health effects such as depression have been observed in the aftermath of the 2010 disastrous floods). Similarly, incidence of many vector borne diseases such as malaria and dengue fever, which are sensitive to temperature and rainfall, may increase with the expected changes in climate. In order to address the impacts of climate change on human health, the Government shall take the following measures:

Policy Measures

a. Access health vulnerabilities of the communities in areas most likely to be affected by adverse impacts of climate change and build their capacities to reduce their health vulnerabilities to climate change;
b. Ensure that appropriate measures to address health related climate change issues are incorporated into national health plans;
c. Inform, sensitize, educate and train health personnel and the public about climate change related health issues;
d. Ensure that preventive measures and resources such as vaccines, quality medications and clean drinking water are available to the general public easily and cost effectively particularly during climate related extreme events;
e. Upgrade and extend disease outbreaks monitoring and forecasting systems to counteract the possible climate change health impacts and prior planning for effective interventions.

5.4. Forestry

The climate change is likely to have multi-facet adverse effects on the ecosystem as a whole, particularly on the already vulnerable forestry sector in Pakistan. Consequently, the most likely impacts of climate change will be decreased productivity, changes in species composition, reduced forest area, unfavorable conditions for biodiversity, higher flood risks and the like, as portrayed in the Planning Commission's Task Force on Climate Change (TFCC) report. Adaptation in forestry sector outlines the need to restore, sustain and enhance Pakistan's forests under sustainable forest management, with particular focus on their relation to climate change. This will not only benefit the state forests but the forest dependent communities and the society as a whole. The scope of this part of policy is to recommend adaptive measures so as to prepare Pakistan's forestry sector to withstand the present and possible future impacts of climate change. To minimize the risks and vulnerability of forests and biological diversity from the impacts of climate change, the Government of Pakistan, in collaboration with relevant entities, shall take the following measures:

Policy Measures

I Awareness Raising

a. Create environmental and forest protection clubs at community level;

II Research

a. Encourage empirical research on forests, biodiversity and forest management systems adapting to climate change;
b. Encourage collaboration with international scientific bodies on forest related adaptation research in Pakistan;
c. Encourage research on forest pathology at provincial levels to curtail insect/ disease damages to the forests.

III Reforms in Governance

a. Resolve the Issues in land tenure system of the forest areas on priority basis, in close consultation with the local communities to streamline the adaptation measures;
b. Facilitate professional leadership for the sake of better management of the forests and forestry;

c. Develop effective mechanism to safeguard interest of vulnerable forest dependent communities;
d. Streamline forest ownership structures into the national and local level policies.

IV Enhancing Adaptive Capacity

a. Ensure inclusion of climate change as a compulsory subject in forest education system;
b. Ensure the availability of sufficient and properly trained forest work force with enhanced capabilities to face the challenges of climate change in the forestry sector;
c. Initiate pilot projects on adaptation efforts in the forestry sector with multilateral assistance.

V Forest Management

a. Aggressively pursue afforestation and reforestation programs with plantation suited to the looming climate change;
b. Restore the degraded mangrove forests in the deltaic region and prevent their further degradation by allowing minimum necessary environmental flows down Kotri;
c. Explore the use of new planning and decision support tools to deal with uncertainty and risk in long-term forest planning;
d. Investigate and discover new forest management and adaptive planning options in line with the scientific research on climate change;
e. Endorse area specific adaptive forest management and conservation practices with greater participation of forest dependent communities;
f. Ensure documentation and utilization of indigenous knowledge while managing various types of forest in the context of changing climate;
g. Ensure managing, protecting and connecting forest fragments to increase resilience and minimize the impacts from external pressures;
h. Promote the sustainable management of forests according to national and international norms;
i. Consider expanding protected areas in the country with respect to ecological parameters including conservation of wildlife and its habitats;
j. Encourage sustainable use of non timber forest produce (NTFP) including wild fauna and birds.

VI Arresting Soil Erosion

a. Ensure management of forest lands in accordance with water and soil management strategies;
b. Afforest barren and degraded lands as well as uphill watershed areas to control sediments and various types of soil erosion;
c. Identify and declare uphill fragile watershed areas as sensitive and bring them under special silvicultural management to check floods and siltation of water reservoirs;
d. Apply various slope stabilization and run-off reduction techniques at exposed sites in mountain forest areas such as vegetation lines, check dams, spurs etc.

VII Reducing Forest Fires, Disease Outbreaks & other Damages

a. Establish forest fire prediction and protection services in the country;
b. Enhance capacity building of forest departments to combat forest fires and involve forest communities in detection and suppression of wildfires;
c. Ensure biological control of forest pests by maintaining viable populations of predatory birds and insects;
d. Encourage *afforestation* of indigenous species and only useful tested exotic species;
e. Increase the species mix to enhance adaptive capacity of the forests as a part of pest and disease management strategy;
f. Promote integrated pest management practices;
g. Fabricate uneven-aged forest belts around forest packs to avoid adverse effects of possible snow and wind storms;
h. Adopt area and species specific adaptive silvicultural practices to reduce environmental damages.

5.5. Biodiversity

Biological diversity is a fundamental building block of the services that ecosystems deliver to human societies. Intrinsically important due to its contribution to the functioning of ecosystems, the biological diversity is difficult to recover or replace once eroded. As mentioned earlier (in Forestry section), the changing effects of climate are likely to have severe consequences on the entire ecological system; the case of biological diversity in Pakistan is no exception to these effects. The climate change is likely to have impact on the *phenology* and species distribution along with community composition and ecosystem dynamics.

A rapid increase of temperature, for instance, may exceed the ability of many species to adapt to these changes. To conserve, restore and protect the biological diversity of Pakistan, the Government shall take the following policy measures:

Policy Measures

a. Encourage empirical research on flora and fauna in the context of their responses to current and historical climatic changes;
b. Set National Biodiversity Indicators and provide the needed financial resources for implementation of the Biodiversity Action Plan (BAP);
c. Establish gene banks, seed banks, zoos and botanical gardens to conserve the biological diversity of valuable species;
d. Integrate conservation and protection of biological diversity into various disciplines such as forestry, marine and pastures etc;
e. Encourage involvement of local communities in conservation and sustainable use of biodiversity;
f. Take necessary measures to establish nature reserves in areas that are rich in biodiversity to preserve their existence;
g. Establish protected areas in all vulnerable ecosystems particularly in coastal and marine areas;
h. Ensure that 'ecosystem based adaptation' is part of an overall climate change adaptation strategy at all scales (national to local);
i. Assist genetically impoverished species or those that have important ecosystem functions by providing natural migration corridors as well as assisted migration.

5.6. Other Vulnerable Eco-Systems

5.6.1. Mountain Areas

The most likely climate change risks to the mountain areas of Pakistan are: Increase in frequency and intensity of precipitation, resulting in more frequent flash floods and landslides; Increase in intensity of wind storms and lightening, resulting in top soil erosion and forest fires; Increase in temperature, resulting in rapid glacier melting and glacial lake outburst floods (GLOFs) and change in cropping patterns. To safeguard against most likely climate change impacts on the mountain areas and to protect their ecosystems and to ensure the livelihood of mountain communities, the Government shall take the following measures:

Policy Measures

a. Carry out detailed studies to identify the most fragile and resilient ecosystem in all ecological zones;
b. Develop program to prevent crop damages due to unexpected weather changes by introducing cold and drought resistant short duration cereal crops suited for high altitudes;
c. Set pilot projects to test warmer areas' high-yielding crop varieties in the mountain areas because the projected global warming may render these varieties suitable for some of the mountain areas;
d. Introduce new feedstock technology for cattle and livestock suited to drier, harsher climates at high altitudes;
e. Prevent accumulation of solid waste, trash and unwanted bio-mass in the mountain areas to avoid clogging of water channels;
f. Ensure that slope stabilization is mandatory part of all road construction projects to minimize landslides;
g. Restrict commercial and development activities detrimental to mountain ecology;
h. Ensure minimal exploitation of declared sensitive watershed areas;
i. Promote growing natural barriers on the shrubby mountain slopes, to protect the agricultural terraces from extreme soil erosion, wind, hailstorm and snowstorm related damage;
j. Promote the use of gravity drip irrigation and hydraulic ram pumps in the mountains areas of Pakistan;
k. Promote and encourage the use of glacier grafting techniques in high altitude areas.
l. Undertake comprehensive study to find and address the impact of "Black Carbon Soot" and "Atmospheric Brown Cloud" on Pakistan's glaciers and their connection to climate change.

5.6.2. Rangelands and Pastures

The National Rangeland Policy provides a detailed sketch for rangelands development in Pakistan. The role of rangelands in environmental conservation is vital and important, their existence and health would remain critical for conserving biodiversity in Pakistan. Degradation of rangelands results in gradual loss of flora and fauna. The climate change impacts that could affect the rangelands and pastures in Pakistan are: reduced precipitation, increased heat, stronger wind, increased soil erosion and abrupt weather changes in mountain

pasture areas. To ensure food security, based on livestock and pasture management, and ecosystem maintenance in the light of impending climate change impacts, the Government of Pakistan shall take the following policy measures:

Policy Measures

a. Ensure building vegetative barriers to safeguard against the erosion of pastures and rangelands' topsoil particularly at higher altitudes;
b. Control and maintain livestock densities for optimal output;
c. Ensure close coordination among forest and livestock departments for efficient management of rangelands and other resources while ensuring the rights of the indigenous people;
d. Ensure maintaining soil and sub-soil moisture and vegetative cover to safeguard range lands from turning into deserts;
e. Improve soil quality by using native and hybrid soil nutrient fixing vegetation;
f. Promote rotational livestock grazing methods in pastures and rangeland, to facilitate regeneration of grasses and other vegetation;
g. Ensure using mixed herd of low maintenance, high production livestock for increased efficiency and low ecosystem impacts;
h. Designate alternative pastures and passages, in case of earlier or later than usual weather change;
i. Improve the quality of rangelands by increasing native rangeland vegetation and planting adapted forest species;
j. Implement appropriate rangeland management systems based on ecological principles;
k. Revive rangelands and create artificial wetlands wherever secondary water resources are available or rain harvesting is possible;
l. Using appropriate varieties of grass, increase grasslands in saline and waterlogged zones to prevent their degradation;
m. Designate appropriate provincial authority to exclusively oversee and manage rangelands.

5.6.3. Arid, Hyper-Arid Areas

The desert dwellings and habitats are highly fragile and are likely to be more vulnerable in wake of climate change. Areas with active desertification and soil degradation, in Pakistan, are facing severe environmental problems. These fragile arid and semi-arid ecosystems are in urgent need of integrated conservation

approaches for adaptation to climate change. Desertification indicators need to be developed to integrate information on socio-economic behaviour and soil degradation to identify climate change impacts and adaption strategies. For ecosystem maintenance and introduction of innovative crops and livestock management in the arid and hyper arid areas in light of impending climate change impacts, the Government of Pakistan shall take the following policy measures:

Policy Measures

a. Find technological breakthrough for irrigation systems, to raise vegetative cover in extremely difficult and harsh areas of arid zone;
b. Ensure building vegetative barriers for safeguarding against sand storms near human habitats;
c. Encourage development of technological innovations for improved water efficiency for crops, including artificial groundwater recharge;
d. Promote "low delta crops" and research on drought and pest resistant crops;
e. Discourage plantation of high water demanding trees except in water logged areas;
f. Undertake development of drought resistant shrubs, fodder crops and grasses for pastures and oasis for livestock;
g. Encourage and promote using local and hybrid livestock species best adapted to arid and desert ecosystems with minimal maintenance;
h. Develop technologically efficient equipments for the rehabilitation of Karez irrigation system including artificial recharge of the groundwater;
i. Promote sand dune stabilization and soil moisture conservation techniques;
j. Ensure sustainable harvesting of indigenous dry land tree species.

5.6.4. Coastal and Marine Ecosystems

Coastal areas in Pakistan are already exposed to a number of natural hazards due to climate change. Tropical cyclones, severe storms, floods, shoreline erosion and other hazards all impact the coastal areas, causing loss of life and damage to property and infrastructure. Further possible impacts of projected sea level rise in Pakistan could be erosion of beaches, flooding and inundation of wetlands and lowlands, salinization of ground and surface waters, and increased intrusion of sea water into the Indus deltaic region (IDR) as well as the increased risk of cyclones originating in the Arabian Sea. Similarly, Pakistan's marine coastal

ecosystems are likely to be severely impacted by climate change: change in sea water temperature and acidification; cyclones; relocation and movement of marine fish and mammals; and heat induced drying of deltaic areas. To safeguard the Coastal areas and Marine ecosystem from the likely climate change impacts, the Government of Pakistan shall take the following measures:

Policy Measures

a. Ensure building natural barriers; plantation and regeneration of mangroves, coastal palm and other trees suitable to the area to control sand and soil erosion and to minimize the disastrous impacts of cyclones and tsunamis;
b. Construct barriers near the low lying coastal human clusters to safeguard against rising sea level and cyclones;
c. Develop salinity tolerant crop cultivars for coastal agriculture;
d. Maintain optimal river water flow for continuation of sediment and nutrient transfer to the marine ecosystem and to reduce intrusion of saline sea water into coastal regions;
e. Reduce and control solid and liquid pollution and waste disposal in the bay areas;
f. Assess potential climate change threats to the fishing sector and develop appropriate adaptation measures including the promotion of aquaculture;
g. Maintain marine ecosystems and fish habitats for healthy fisheries sector.

5.6.5. Wetlands

Pakistan's wetlands play an important role in maintaining and sustaining regional ecological processes that support globally important biodiversity such as bird migration routes and wintering grounds. A significant fraction of Pakistan's wetlands-dependent biodiversity, however, is classified as endemic threatened and vulnerable. There has been a dramatic change in the ecosystem of the wetlands in Pakistan in the last ten years, affecting its ability to function as a habitat for waterfowl, shorebirds, and migratory birds. To protect, sustain and enhance the wetlands in Pakistan, the Government in collaboration with the relevant entities shall take on the following policy measures:

Policy Measures:

a. Ensure conservation and management of high altitude wetlands;
b. Explore possibilities of designing and creating artificial wetlands at appropriate spots of ecological concerns;
c. Promote identification of the risks and impacts of climate change on Pakistan's wetlands;
d. Recognize and enhance of the roles played by wetlands in natural disaster protection and climate change mitigation;
e. Ensure controlling and slowing down of conversion of wetlands and their immediate surroundings for agriculture and grazing purposes;
f. Ensure adequate water supply allowing ecologically necessary water flows to estuaries, peat lands, river, stream and lake marshes, mudflats and inter-tidal areas;
g. Develop adaptation mechanisms for wetlands and communities dependent on wetlands threatened by climate change;
h. Ensure balanced harvesting of wetlands resources and grazing in the areas;
i. Ensure control of siltation of wetlands by reducing deforestation and felling of timber in catchments areas;
j. Ensure setting up of scientific analysis systems to check water quality of the wetlands;
k. Design adequate procedures to control organic and inorganic pollution of wetlands that includes flow of agricultural chemicals and pesticides into the wetlands;
l. Ensure design and implement sustainable, participatory management plans for independent demonstration sites, each chosen to be representative of a broad eco-region in Pakistan.

5.7. Disaster Preparedness

Climate Change is likely to increase climate-related natural disasters with the projected increase in the frequency and intensity of extreme climate events, including floods, droughts, cyclones, landslides triggered by heavy rains and urban flooding due to congestion on storm drainage. Climate change projections are scenario based, hence, contain some degree of uncertainties. But in spite of this there are strong indications that in South Asia, particularly in Pakistan, climate change is intensifying the above mentioned hazards. Pakistan is already experiencing the climate change impacts that are too visible to ignore. Most disasters or hazards that lead to destruction cannot be prevented; their impacts

however, can be minimized by adaptive and preparedness measures. To address the disaster management in a holistic manner in changing climate, the Government of Pakistan, in collaboration with other relevant entities, shall take the following measures:

Policy Measures

a. Allocate adequate financial and other resources to implement "National Disaster Risk Management Framework" formulated by NDMA;
b. Clearly define coordination mechanism outlining the roles and responsibilities of each concerned department during natural disasters;
c. Redesign and upgrade storm drainage capacity of major cities especially Karachi and Lahore keeping in view climate change related likely increase in short duration intense rainfall events;
d. Strengthen early warning systems and develop communities' evacuation plans for vulnerable coastal and other areas against cyclones and sea storms;
e. Construct cyclone shelters in vulnerable coastal areas;
f. Redesign and construct disaster resilience multipurpose school buildings to be used as shelter during natural calamities;
g. Ensure community participation in early warning dissemination and disaster risk reduction activities, particularly in developing evacuation plans;
h. Ensure that old, children, disabled and women get particular focus in evacuation strategies;
i. Set up appropriate mechanisms to monitor the development of glacial lakes and develop evacuation strategies in case of Glacial Lake Outburst Floods (GLOF) for vulnerable areas;
j. Undertake risk mapping for possible avalanches and landslides in vulnerable mountain areas and take precautionary measures accordingly;
k. Undertake GIS mapping of all existing irrigation infrastructure especially flood embankments for efficient monitoring and flood management;
l. Establish local flash flood forecasting & warning system in vulnerable mountainous areas;
m. Strengthen flood forecasting, drought monitoring & early warning system in the country;
n. Enhance the capacities to address the impacts of floods, flash floods, droughts etc. by strengthening relevant agencies;

o. Develop an 'assessment and compensation mechanism' including insurance of losses and damages in the aftermath of disasters and measures for rehabilitation;
p. Develop a mix of strategies for flood management which may include use of dams for managing flood peaks, retarding basins and providing escape channels etc;
q. Undertake formulation and enforcement of "River Flood Plain" regulations and laws;
r. Undertake dam break studies to analyze flood routing etc;
s. Ensure the required strengthening and enhancement of barrages capacity;
t. Undertake hydrological modeling and flood plain mapping/zoning of Indus River system against climate change scenarios to estimate various projected flood levels;
u. Plan, design, construct and strengthen appropriate flood embankments, dykes, protective bunds to protect flood plains in the light of likely flood levels;
v. Ensure that infrastructure, including telecommunication, power, utilities and transport are resilient to the impact of climate change, particularly to the extreme weather events;

5.8. Socio-Economic Measures

5.8.1. Poverty

Climate change is a serious risk to poverty reduction efforts and it threatens to undo decades of development efforts. While climate change is a global phenomenon, its negative impacts are more severely felt by poor people and underdeveloped countries. They are more vulnerable because of their high dependence on natural resources, their limited technical capacity and insufficient financial resources to cope with climatic extremes.

One of the objectives and goal of economic development planning in Pakistan is poverty alleviation. With the onset of climate change the plight of the poor is becoming even more miserable. Therefore, it is imperative to incorporate the possible impacts of climate change on the communities living in the conditions of deprivation and poverty into future developmental plans for Pakistan.

The Millennium Development Goals (MDGs) have specified a way forward by combining efforts towards poverty alleviation along with management of climate change impacts and environmental degradation effects. In Pakistan, with rapidly

increasing population, particularly, below the poverty line, renewed efforts are needed to involve the local communities into population control programs and in managing natural resources as a part of training and education towards economic wellbeing. To address the problems of poor communities living in Pakistan's urban areas and those living in the rural areas practicing agriculture, in the wake of climate change, the Government of Pakistan shall take the following measures:

Policy Measures

a. Integrate poverty-climate change nexus into economic policies and plans;
b. Ensure the implementation and expansion of national population planning strategies and programs, as the population explosion may significantly contribute towards climate change;
c. Enhance general awareness of the problems of unchecked population growth and its demands on natural resources;
d. Strengthen the community level climate change adaptation and mitigation measures to prepare them for enhanced and efficient natural resources management;
e. Improve access of poor communities to appropriate technologies for crop production, integrated pest management and credit facilities for agricultural development;
f. Ensure that development process is sustainable and caters the needs of poor communities.

5.8.2. Gender

Climate change is likely to affect poor and underprivileged regions, communities and people disproportionately as they are more vulnerable and have the least resources to adapt. In Pakistan, women are likely to be strongly affected by climate change as majority of rural women are engaged in agriculture sector which is highly climate sensitive. Climate change is expected to increase the workload of women engaged in agriculture production and other subsistence activities such as collecting fuel wood and water. Further, women are found to be more vulnerable during extreme climate events and disasters.

Pakistan fully recognizes that women are powerful agents of change. It is therefore indispensable to ensure participation of women and female gender experts in all policies, initiatives and decisions relating to climate change. To address the gender aspects of vulnerability from climate change, the Government

of Pakistan, in collaboration with other relevant entities shall take the following policy measures:

Policy Measures

a. Mainstream gender perspective into the climate change efforts at national and regional levels;
b. Ensure to reduce the vulnerability of women to climate change impacts, particularly in relation to their critical roles in rural areas in provisioning of water, food and energy;
c. Recognize women contribution in usage and management of natural resources and other activities impacting climate;
d. Undertake comprehensive study on the gender-differentiated impacts of climate change with particular focus on gender difference in capabilities to cope with climate change adaptation and mitigation strategies in Pakistan;
e. Develop gender-sensitive criteria and indicators related to adaptation and vulnerability as gender differences in this area are most crucial and most visible;
f. Develop and implement climate change vulnerability-reduction measures that focus particularly women's needs;
g. Incorporate women's appropriate role into the decision making process on climate change mitigation and adaptation initiatives;
h. Develop climate change adaptation measures on local and indigenous knowledge particularly held by women.

6. Climate Change Mitigation

Pakistan's Green House Gas (GHG) emissions are low compared to international standards. In 2008 Pakistan's total GHG emissions were 310 million tonnes of CO_2 equivalent. These comprised: CO_2 54%; Methane (CH_4) 36%; Nitrous Oxide (N_2O) 9%; Carbon Monoxide (CO) 0.7%; and Non-Methane Volatile Organic Compounds 0.3%. (Source: Draft National GHG inventory 2008).

Energy sector is the single largest source of GHG emission in Pakistan; it contributes nearly 51% of these emissions and is followed by the Agriculture sector (39%), Industrial processes (6%), Land Use, Land Use Change and Forestry (3%) and wastes (1%) (Source: Draft National GHG inventory 2008). As such, the most important targets for mitigation effort involving reduction of GHG emission

are the Energy and the Agriculture sectors. In the energy sector, integration of climate change and energy policy objectives is particularly important as today's investment will "lock in" the infrastructure, fuel and technologies to be used for decades to come. Similarly, the building and transport infrastructure put in place today should meet the design needs of tomorrow. Therefore, greater attention must be paid to the energy efficiency requirements in building codes and long term transport planning.

6.1. Energy

Pakistan's energy sector has, besides furnace oil, high reliance on natural gas (the fossil fuel with the lowest Carbon intensity), and very low reliance on coal (the fossil fuel with the highest Carbon intensity) in utter contrast to the patterns of primary energy consumption and electricity generation worldwide. It is largely for this reason that the CO_2 emissions per unit of energy consumption in Pakistan are among the lowest in the world.

With this consumption pattern, Pakistan's natural gas reserves have depleted to such an extent that it will be difficult to maintain even the present level of production for long. Similarly the local oil resources are also dismally low. The only sizable fossil fuel resource available in Pakistan is coal with an estimated resource base of 185 billion tonnes. To meet an increasingly large fraction of its future energy needs, Pakistan has no alternative but to seek meeting an increasingly large fraction of its future energy needs through the use of its practically unutilized vast coal resources. As such, clean coal technologies are expected to be part of the energy mix for the medium term future.

To find solutions to the present energy needs and future energy requirements, a creative and sustainable energy policy framework is necessary that may help in reducing the green house gas (GHG) emissions. The change in energy mix, the development of renewable energy resources and the increase of nuclear and hydroelectric share provides an opportunity to reduce carbon emissions in the energy sector in Pakistan. The Government of Pakistan shall take the following policy measures for mitigating its GHG emissions:

Policy Measures

a. Give preferential status to development and promotion of hydropower generation;

b. Ensure that the negative impacts of hydro-power projects on the environment as well as on the local communities are properly assessed and addressed;
c. Promote development of renewable energy resources and technologies such as solar, wind, geothermal and bio-fuel energy;
d. Promote futuristic buildings design with solar panels for energy self sufficiency, especially in public sector buildings;
e. Plan the necessary expansion of nuclear power for Pakistan's energy security while ensuring the highest safety standards;
f. Explore the possibility of obtaining technological know-how and its transfer for installing the clean coal technologies like Pressurized-Fluidized-Bed-Combustion (PFBC), Near-Zero Emission Technology (NZET) for vast coal reserves in south of Pakistan and their inclusion in future pulverized coal Integrated Gasification Combined Cycle (IGCC) systems;
g. Ensure that new coal-fired power stations perform at high-efficiency level and are designed in such a way that they can be easily retro-fitted for Carbon dioxide Capture and Storage (CCS);
h. Install plants to generate power from municipal waste;
i. Consider introducing carbon tax on the use of GHG intensive energy generation from fossil fuels;
j. Promote and provide incentives for activities required for shift in energy-mix and fuel-switching program to low-carbon fossil fuels, and develop indigenous technology for CO_2 Capture and Storage (CCS); Waste Heat Recovery, Co-generation; Coal Bed Methane Capture; and Combined Cycle Power Generation;
k. Give preference to import of natural gas, Liquefied Natural Gas (LNG) and Liquefied Petroleum Gas (LPG) over import of oil and coal except for meeting specific fuel requirements e.g. liquid fuel for transportation, coking coal for steel industry etc.

6.2. Energy Efficiency and Energy Conservation

To ensure ample energy supply to achieve the economic development goal, energy efficiency improvement, energy conservation and demand reduction provides excellent and cost effective ways to reduce carbon emissions and achieve the climate change mitigation goals. The Government of Pakistan shall, therefore, take on the following policy measures:

Policy Measures

a. Strive to conserve energy and improve energy efficiency in all energy using devices and processes;
b. Examine the gradual introduction of "Green Fiscal Reforms" in different sectors of economy, including energy, water, waste/sewage etc. to achieve carbon emission reductions objective;
c. Enact and enforce energy conservation legislation and audit standards;
d. Ensure quality management of energy production and supply, including reduction in transmission and distribution losses;
e. Improve energy efficiency in building by standardizing building and construction codes and legislating/creating incentives for retrofitting, maximum use of natural light, better insulation and use of energy efficient lights, boilers, appliances and ground water pumping units;
f. Promote and gradually make it mandatory to specify the energy efficiency/ fuel consumption rates of energy using equipment and devices of common use.

6.3. Transport

Transport sector has shown the highest emission growth rate of all sectors and accounts for about quarter of carbon dioxide emissions in Pakistan (source: Draft National GHG Inventory, 2008). Thus managing emissions in transport sector is crucial for tackling climate change. What makes the task of reducing emissions in transport too difficult is to tackle the fact that the scope for technical improvement is limited, at least, in the short run and that transport volumes are closely linked to economic growth. Similarly, the emissions from aviation sector are also a matter of concern. In fact emissions of aircraft which are injected directly into upper atmosphere are much more harmful than similar emissions at surface because of their longer residence time in upper troposphere. However, despite difficulties, some policy instruments are available to reduce emissions in road and air transport, therefore, the Government of Pakistan shall take the following policy measures:

Policy Measures

Road Transport

a. Sensitize public to the importance of proper vehicle maintenance for fuel efficiency enhancement and reduction of emissions;
b. Ensure the provision of efficient public transport (Busses) system in the country;
c. Set up and strictly enforce vehicle emission standards;
d. Examine and implement actions required for the use of bio-fuel for local transport;
e. Plan and develop mass transit system in metropolitan cities;
f. Support the private transport sector by providing incentives for reducing emissions and environmental friendly transport services, e.g. electric/ hybrid vehicle for urban use;
g. Promote the development and adoption of environmental-friendly transportation technologies and efficient management technique;
h. Promote greater use of CNG in transportation sector to the extent consistent with the availability of CNG in the market;
i. Secure financing for technology innovations for urban planning and the transportation sector, specifically to address the mitigation issues;
j. Promote the development of new pipelines for efficient transportation of oil in the country.

Aviation

a. Encourage national airline to give due consideration to the fuel efficient new technology aircrafts causing minimum carbon emissions, while planning new fleet;
b. Support International Civil Aviation Organization's (ICAO's) initiatives for carbon emission reduction through improved air traffic management, which include improved weather services and free flight air routes instead of defined routes that hold the potential for reduced flight time and thus fuel consumption;
c. Participate actively in ICAO's activities and initiatives and ensure that new strategies and policies of ICAO may not hurt the economic interests of developing countries' aviation industry.

Railway

a. Ensure the provision of efficient railway system in the country;
b. Upgrade and expand the railway network in the country as the advantages of railway over road travel in terms of carbon emissions are well recognized.

6.4. Town Planning

Climate change presents a range of socio-economic implications for town planning on two counts: First, town planning is a process by which adaptation to climate change impacts is possible in the urban areas. Second, town planning influences the level of emissions produced by human settlements by changing fuel and energy consumption patterns. To adapt to the impacts and to achieve the objectives of climate change mitigation, there is a need to introduce changes to town planning and building systems. The Government of Pakistan, in this regard, shall take the following measures:

Policy Measures

a. Make installations of wastewater treatment plants an integral part of all sewerage schemes;
b. Ensure separate collection, disposal and re-use of recyclable, composite and biodegradable waste preferably at source;
c. Update town planning design principles for lower carbon foot prints;
d. Ensure checking of rural-to-urban migration and develop infrastructure and support facilities in smaller agro-based towns and periphery urban areas;
e. Ensure Proper "Land Use Planning" and encourage vertical instead of horizontal expansion of urban housing projects;
f. Undertake hazard mapping and zoning of areas before construction;
g. Ensure that rural housing particularly the flood damaged reconstruction is climate resilient;
h. Ensure that in large urban areas the industries are located in the designated areas;
i. Make installation of solar water heaters mandatory in commercial and public buildings where water heating is necessary.

6.5. Industries

The major industries in Pakistan include textile, fertilizer, sugar factories, cement, steel and large petro-chemical plants. These industries, among others, contribute about 6% to the total GHG emissions of the country due to the industrial processes in use, in addition to being responsible for more than a quarter of the emissions attributed to the energy sector. The Government of Pakistan, shall take the following measures to play its role in reducing these emissions in the long term:

Policy Measures

a. Incorporate economic incentives to promote emission-reduction by upgrading the industrial processes and technologies;
b. Prepare voluntary "Corporate Social Responsibility"(CSR) guidelines and encourage corporate sector to create CSR-fund to cover carbon emission reductions efforts in industrial sector;
c. Promote the integrated "Cleaner Production" strategy in the Industrial sector by making more efficient use of inputs such as energy, water, raw material etc;
d. Promote the use of energy efficient motors in the industries sector;
e. Encourage the industrial sector to have periodical "Energy Efficiency Audit";
f. Develop capacity to monitor and estimate emissions locally for each industry;
g. Ensure that technology transfer is accelerated for the industries like cement manufacturing to control emissions without hampering the production process.

6.6. Agriculture and Livestock

GHG emissions from agriculture and livestock sectors accounted for about 39% of Pakistan's total GHG emissions in 2008. These emissions are essentially all Methane (CH4) and Nitrous Oxide (N_2O), 79%, and 21% respectively and originated mainly from four sub-sectors: 1) Enteric fermentation in cattle (all in the form of Methane), 2) Rice cultivation, 3) Releases of Nitrous Oxide from agricultural soils/ Nitrous Fertilizer, and 4) Manure management.

During 1994-2008 GHG emissions from agriculture and livestock in Pakistan grew at rate of about 3% per annum (source: Draft National GHG inventory 2008). There is a pressing need to find ways to contain these emissions or at least to slow down their growth rate. These efforts will require technological innovations and financial resources and for that Pakistan would need the support of

International community. To mitigate and minimize the GHG emissions from agriculture and livestock sector the Government of Pakistan shall take the following policy measures:

Policy Measures

a. Promote integration of indigenous knowledge and latest technology with scientific research to spearhead efforts towards an ecologically sustainable green revolution;
b. Promote wide scale adaptation of better management practices for agriculture and livestock with a reduction in the use of chemical fertilizer, water and pesticides;
c. Explore methods for reducing Nitrous oxide releases from agricultural soils, e.g. by changing the mix of chemical fertilizers commonly used;
d. Promote use of green manure, better manure storage and management;
e. Promote development of biogas and manure digester for methane reduction and energy production through CDM support;
f. Develop and adopt new breeds of cattle which are more productive in terms of milk and meat with lower methane production from enteric fermentation;
g. Encourage farmers to use appropriate feed mixes and additives to reduce methane production from enteric fermentation/ digestion in cattles;
h. Manage water in rice paddy to control releases of Methane from agricultural soil and introduce low water delta rice varieties;
h. Promote no till farming for GHG abatement;
i. Promote cultivation of crops used for bio-fuel production to the extent that may not threaten the country's food security;
j. Develop capacity of the relevant institutions to undertake appropriate mitigation actions to reduce GHG emissions from agriculture and livestock sectors.

6.7. Carbon Sequestration and Forestry

Mitigation of climate change is a global responsibility. Agriculture, Forestry and Other Land Uses (AFOLU) provide, in principle, a significant potential for GHG mitigation through CO_2 sequestration. As outlined in the TFCC report, Pakistan's Land Use and Forestry sector contributes only 3% to the total GHG emissions of the country, which is quite low if judged against the emissions from other sectors. Considerable mitigation potential, however, exists in Land Use and

Forestry sector to sequester carbon via afforestation and reforestation measures as well as avoiding deforestation in Pakistan.

The Government of Pakistan, in collaboration with national entities and support from multilateral agencies, shall take on the following measures in forestry sector to sequester the atmospheric carbon, playing its role in mitigating the climate change.

Policy Measures

a. Set and implement annual afforestation and reforestation targets to increase the country's forest cover;
b. Strictly prohibit illegal forest cutting and conversion of forest land to non-forest uses;
c. Use vast mass of cultivable wasteland as carbon sink and to build up soil organic matter;
d. Provide incentives and alternative fuel and livelihood options to the forest dependent communities for avoiding deforestation;
e. Promote farm forestry practices by planting multipurpose fast growing species to meet the needs for timber, fuel wood and fodder for livestock;
f. Encourage and support forestry personnel in carbon forestry project development;
g. Establish linkages with regulated and voluntary carbon markets to promote and encourage forestry mitigation projects in Pakistan;
h. Secure financial assistance from World Bank's Forest Carbon Partnership Facility (FCPF) and UN-REDD program as well as from other international sources to formulate national program for avoiding deforestation and forest restoration;
i. Prepare framework for national REDD strategy on priority basis and ensure its implementation in accordance with the international conventions/ processes;
j. Develop legal and institutional framework for improved forest management, investment and clearly specifying who has the right to REDD+ credits;
k. Ensure to restore and establish the blue carbon sequestration capacity of mangroves, sea-grasses and tidal marshes.

7. Capacity Building & Institutional Strengthening

Expertise to address climate change is meager in the country. Pakistan is hardly prepared to meet the 21st century's biggest challenge of climate change as far as

human resources and institutional capacities are concerned. Insufficient trained human resource is a big constraint, in part, due to brain drain, limited investment in climate change education and lack of demand and opportunity for skilled individuals in Pakistan. The country doesn't have enough climate change scientists, modelers, technologists, and even experts who can handle the international negotiations which are critical for every country. Similarly, there is a lack of credible institutions in Pakistan to deal with comprehensive climate change science, modeling, management, adaptation, mitigation, and policy issues. Since the capacity building and institutional strengthening is the priority area for government, a number of area specific policy measures are mentioned in relevant sections and will generally not be repeated here. However to address the deficiencies in climate change related requirements, human resources and institutions, the Government of Pakistan shall take the following measures:

Policy Measures

Institutional Mechanisms

a. Establish climate change cells in sectoral federal and provincial ministries;
b. Establish the National Climate Change Commission for coordinating all climate change activities at national and international levels;
c. Develop monitoring, reporting and verification (MRV) system for evaluation of emission reduction and change in land use system in order to make full use of UNFCCC REDD+ facility;
d. Improve the inter-ministerial and inter-departmental decision making and co-ordination mechanism on climate change issues both at provincial and federal levels;
e. Strengthen the national institutional framework for undertaking tasks related to the implementation of UNFCCC;
f. Ensure the integration of climate change and overall developmental imperatives, and that climate change and socio economic development are pursued as inseparably twin objectives;
g. Ensure that agriculture, water, forest, energy and DRR related vulnerabilities induced by climate change get duly integrated and addressed in the relevant national policy documents;
h. Take necessary measures to redesign the local administrative structure of Federal and Provincial EPAs to integrate climate change concerns into Environmental Impact Assessments (EIA) processes;

i. Identify the national institutional needs to develop the capacity for carbon trading;
j. Create a National and Provincial Implementing Entities (NIE & PIE) to deal with adaptation and mitigation projects at federal and provincial levels respectively.

Capacity Enhancement

a. Develop climate change professionals by sending young scientists and students to reputable institutions abroad for higher studies;
b. Strengthen national climate change science related institutions, in particular the Global Change Impact Studies Centre (GCISC) and universities, in terms of necessary financial and technical support;
c. Develop climate change curricula with particular emphasis on Disaster Risk Reduction (DRR) and introduce it into formal education system at all levels;
d. Ensure institutional strengthening of the existing Climate Change section, CDM Cell and relevant institutions dealing with REDD+ matters;
e. Develop Knowledge Base Management (KBM) and networking with strategic climate change research establishments to ensure benefits from international scientific advancements;
f. Provide training and support, at national and international levels, to the concerned officials and experts of line ministries and departments to further their knowledge and capacities on climate change issues;
g. Explore and provide training opportunities to enhance capacity for preparing projects and programs in the climate change area;
h. Develop national capacity to gauge the quantum and nature of climate change in Pakistan for reliable climate change vulnerability assessments in various sectors, particularly in water;
i. Enhance the disaster mitigation and preparedness capacities at federal, provincial and district levels;
j. Enhance capacity to undertake comprehensive assessment of economic implications of climate change impacts on various sectors with and without using different adaptation measures;
k. Finalize and adopt the draft national GHG emissions inventory and strengthen institutional capacities to ensure regular updates;

l. Develop an institutionalized system to regularly measure and monitor GHG emissions from various sectors including trans-boundary pollution and maintain a database;
m. Expand and upgrade meteorological services and monitoring stations in various parts of the country, particularly in the northern mountainous areas, glaciated region feeding IRS and along Pakistan's coastline, to the WMO recommended level;
n. Actively participate in new international initiatives to create Global Framework for Climate Services (GFCS);
o. Ensure the capacity development for making reliable projections of climatic changes scenarios, seasonal forecasts and inter-annual forecasts for different parts of Pakistan;
p. Promote the use of GIS/RS based studies to assess and quantify the past temporal trends and monitor the future changes in snow cover, glacial volume, glacial lake formation and burst, deforestation, land degradation (salinity, water logging), soil erosion, inundation of Indus deltaic region and other coastal areas;
q. Undertake scientific studies to preserve glaciers and explore glacier grafting techniques;
r. Strengthen country's tropical cyclone monitoring and prediction system;
s. Establish a national clearing-house for sharing and networking of regularly updated climate change related data;
t. Build domestic response capacity in order to use current and future funds effectively.

8. Awareness Raising

Public education and outreach are vitally important to create broad awareness of climate change issues and its impacts. As such the importance of communicating with the general public and engaging stakeholders in climate change related issues is fully recognized by Pakistan. The Government, both in collaboration with the private sector and independently, is already working actively to raise awareness regarding the issue. The scale of the change required, however, and the vast number of people and interests that must be influenced, call for outreach activities of much greater magnitude. Therefore, the Government of Pakistan in collaboration with the relevant entities shall take the following measures:

Policy Measures

a. Conduct nationwide surveys to gauge the opinions and capabilities of key stakeholders and other potential partners;
b. Develop a national climate change awareness program involving communities, various ministries and departments;
c. Ensure advocacy and mass awareness regarding importance of water and energy conservation impacts of climate change on various sectors including forest ecosystem, biodiversity etc using mass media, public-private partnership, students and community mobilization; and incorporate these issues into formal education systems at all levels;
d. Arrange climate change sensitization workshops for policy makers at national and provincial levels;
e. Create awareness of CDM facility among the relevant stakeholders through training workshops.

9. International & Regional Cooperation

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 the international community to find solutions and help the world toward 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 socio-economic development, hence, it is essential that they work together to face these challenges. South Asia is particularly prone to climate change and related disasters making the need for a regional response to meet the challenge of climate change more urgent and compelling. In order to achieve this international and regional cooperation, the Government of Pakistan shall take the following measures:

Policy Measures

a. Ensure continued attendance at the UNFCCC Conference of Parties and other related meetings;
b. Support exchange of meteorological data including that obtained from high altitude monitoring stations;
c. Facilitate exchange of real time hydrological data in the region for improved flood forecasting and warning services;

d. Work with Nepal, Bhutan and Kyrgyzstan and other mountainous countries to take initiatives on mountain ecosystems, particularly glaciers and their contribution to sustainable development and livelihoods and to show case the region's vulnerability to climate change;
e. Encourage exchange of results from simulation modeling experiments for inter-annual and decadal climatic projections, seasonal forecasts, and predictions of climate extremes in the region;
f. Help establish institutional linkages among national institutions in the South Asian region to facilitate sharing of knowledge, information and capacity building programs in climate change related areas;
g. Support the establishment of SAARC Climate Change Research Centre, preferably in Pakistan in close proximity to the Global Change Impact Study Centre (GCISC);
h. Seek establishment of a regional Inter-governmental Expert Group on Climate Change to develop clear policy direction and guidance for regional cooperation as envisaged in the SAARC Plan of Action on Climate Change;
i. Encourage relevant SAARC centers to undertake studies on the evolving pattern of monsoons to assess vulnerability due to climate change and integrate Climate Change Adaptation (CCA) with Disaster Risk education (DRR);
j. Undertake together with other South Asian countries advocacy and awareness programs on climate change, among others, to promote the use of green technology and best practices for transition to low-carbon sustainable and inclusive development of the region;
k. Promote student exchange programs among SAARC universities particularly in the climate change discipline.

10. Finance

Pakistan is signatory to major environmental conventions and protocols. As signatory to United Nations Framework Convention on Climate Change (UNFCCC) and a member state of World Bank, Pakistan qualifies for financial and technological assistance. In recent UNFCCC Cancun conference the developed countries have committed to create a sizable "Green Climate Fund" with fast start finance. To secure an appropriate share from this initiative, expected to be available in near future, a country needs to create an enabling environment which can facilitate and attract this funding. In order to benefit from future

international financial mechanisms the Government of Pakistan shall take the following measures related to options for a future international financing mechanism:

Policy Measures

a. Continue to assess how best to position the Pakistan vis-a-vis other groups of developing countries in order to secure adaptation funding;
b. Ensure the access and effective use of the opportunities available internationally for adaptation and mitigation efforts e.g. through Global Climate Fund (GCF), Clean Development Mechanism (CDM), Adaptation Fund (AF), Global Environmental Facility (GEF), World Bank's Forest Carbon Partnership Facility (FCPF) etc;
c. Establish a "Pakistan Climate Change Trust Fund" for financing climate change related projects;
d. Continue to push for transparent delivery of new and additional fast start funding by developed countries;
e. Develop Public-Corporate-Civil Society partnership for financing and implementation of climate change adaptation and mitigation projects;
f. Create domestic carbon market opportunities by introducing appropriate investment framework linked with regional banking institutions.

11. Technology Transfer

Climate change being one of the most difficult and complex threat the world faces, needs innovative technological solutions to solve the climate change challenges of both mitigation and adaptation. The recent UNFCCC Cancun conference has agreed to set-up a special "Technology Mechanism" for the development and transfer of new technologies from developed to developing countries. The find solutions to the climate change challenges in Pakistan, the Government shall take the following policy measures:

Policy Measures

a. Ensure that the technology needs to support actions on mitigation and adaptation are nationally determined and are based on national priorities;
b. Promote the development and use of local technologies in combination of innovation and technological advancement in the field of climate change as an effective way to implement the adaptation and mitigation measures;

c. Prepare detailed area analysis for possible wind and solar energy sites in Pakistan, and establish regional partnerships for technology transfer and development;
d. Find technological breakthrough to harness the potential of the geothermal energy in the northern mountain areas of Pakistan;
e. Explore the new technological breakthroughs in the field of bio-fuels;
f. Ensure to obtain and introduce clean coal technologies;
g. Promote technology transfer for designing and manufacturing of emission monitoring equipments for installation near urban and industrial areas in Pakistan.
h. Set a base for technology transfer and absorption at technical institutes, engineering colleges and universities;
i. Facilitate transfer of technology for designing electric/ hybrid vehicles in Pakistan;
j. Develop of new breeds of crops and livestock which are less vulnerable to climate change impacts.

12. Policy Implementation Mechanism

Following approval of the National Climate Change Policy, the Federal Government shall develop an "Action Plan" for its implementation. All relevant ministries, departments and agencies shall also devise plans and programs to implement the policy provisions relating to their respective sectors/ subsectors. Similarly, the provincial governments, AJK, Gilgit Baltistan, Federally Administrated Territories and local governments shall also device their own strategies, plans and programs for implementation of the Policy. To ensure effective Policy and Action Plan implementation and to oversee the progress in this regard, "Climate Change Policy Implementation Committees" shall be established at the federal and provincial levels. One of the tasks of these committees shall be regular monitoring and upgrading of the National Climate Change Policy at an interval of five years. The composition of the committee is as under:

I. National Climate Change Policy Implementation Committee:

1. Minister of Climate Change focal Ministry (Chairperson)

2. Secretaries of Ministries responsible for Climate Change/ Planning and Development / Foreign Affairs/ Industries & Production/Finance/ Water & Power/ Food & Agriculture/ Health/ Defense;
3. Additional Chief Secretaries of Provincial Planning and Development Departments;
4. Chairman NDMA/ Federal Flood Commission;
5. Secretaries of Provincial/ AJK/GB/FATA Environment Departments;
6. Heads of PMD/ GCISC/ Pak EPA/ENERCON
7. Chief Environment, Planning & Development Division;
8. Three representatives from the Corporate Sector/ Chambers of Commerce and Industries;
9. Three eminent experts from the field;
10. Three representatives from Civil Society Organizations;
11. Director General (Climate Change) Member/ Secretary.

II. Provincial Climate Change Policy Implementation Committees:

1. Provincial Minister for Environment (Chairperson)
2. Chairman/Additional Chiefs Secretary Planning and Development Department;
3. Secretaries of Environment/agriculture/Forest/Irrigation/Local Govt/ Public Health Departments;
4. DGs PDMAs
5. Three representatives from Corporate Sector/Chambers of Commerce and Industries;
6. Three representatives from civil society organizations;
7. Three eminent experts from the field;
8. Director General Environmental Protection Agency, Member/Secretary.

The "National and Provincial Climate Change Policy Implementation Committees" shall meet biannually. The Provincial Committees, which will be the key actors in implementation of the proposed climate change agenda, shall report the status of implementation of the Policy to the National Committee. The National Committee shall report to the "Prime Minister's Committee on Climate Change" on regular basis.

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