

CLIMATE CHANGE

The rapidly emerging climatic changes are one of the biggest threats to the sustainability of life on Earth. The phenomenon of global warming is a major cause of environmental degradation. The enhanced discharge of greenhouse gas (GHG) emissions in our outer atmosphere due to fossil fuel combustion leads to a rise in Earth's average temperature besides polluting the air. Climate change affects human life as well as the economy by causing disruption in Earth's climatic processes resultantly leading to floods, famines, droughts and cyclones among other natural disasters. In Pakistan, climatic changes are expected to have wide-ranging impacts, such as: reduced agricultural productivity, increased variability of water availability, increased coastal erosion and sea water incursion, and increased frequency of extreme climatic events.

According to German Watch, Pakistan has been ranked globally in the top ten countries most affected by climate change in the past 20 years owing to its geographical location. According to the Global Climate Risk Index annual report for 2020, Pakistan has lost 0.53 percent per unit GDP, suffered economic losses worth US\$ 3792.52 million and witnessed 152 extreme weather events from 1999 to 2018. Akin to this, ADB analysis shows that the socioeconomic costs of environmental degradation are considerable with climate adaptation needs ranging between \$7 billion and \$14 billion per year.¹ The government being cognizant of the situation is taking measures at policy, management and operational levels to mitigate the adverse effects of climate change in the country.

The Government has launched the Eco-system Restoration Initiative (ESRI) for facilitating the transition towards environmentally resilient Pakistan by mainstreaming adaptation and mitigation through ecologically targeted initiatives. These include afforestation, biodiversity conservation, enhancing policy environment consistent with the objectives of Pakistan's Nationally Determined Contribution (NDC) and attaining Land Degradation Neutrality (LDN). The objective of this initiative is to establish an independent, transparent and comprehensive financial mechanism in Pakistan called "Eco-system Restoration Fund (ESRF)" to finance the projects and programmes. Ministry of Climate Change (MoCC) has taken the following major initiatives:

- The Pakistan delegation at COP-25 secured 06 positions for various committees under the United Nations Framework Convention on Climate Change (UNFCCC) showing trust on Pakistan's commitment to climate negotiations.
- The NDC Partnership is supporting Pakistan in mapping out its climate-resilient

¹ADB. 2017. *Climate Change Profile of Pakistan*. Manila.

development trajectory.

- Ministry of Climate Change is also in the process of revision of NDCs. There is an opportunity to collaborate on Measurement, Reporting and Verification (MRV) and GHG emission inventory strengthening components for the revision of NDCs under the UNFCCC reporting.
- National Committee on Establishment of Carbon Market(NCEC) has been established
- In order to mitigate the carbon emission impacts of vehicles on the environment and its associated costs, the Government of Pakistan has approved its National Electric Vehicle Policy targeting a 30 percent shift to electric by 2030. In addition, the world's first "zero emissions" metro line project has been launched in the city of Karachi.
- A "Clean-Green Cities Index" has been initiated in 20 cities to trigger a shift towards improved waste management and sanitation. Pakistan has also decided to get out of its plastic addiction by banning the single use plastic.
- Pakistan's Second National Communication has been developed and submitted to the United Nations Framework Convention on Climate Change (UNFCCC) Secretariat.
- UNFCCC Secretariat is supporting MoCC in preparing First Biennial Update Report

Water, Sanitation and Hygiene (WASH)

Strategic Unit of the MoCC on Water, Sanitation and Hygiene (WASH)in collaboration with key stakeholders and relevant provincial departments are rolling out the agenda of Sustainable Development Goals (SDGs) related to safe water and sanitation services, Clean Green Pakistan Movement (CGPM) and mobilizing resource for WASH. The Prime Minister of Pakistan with a vision to drive a nationwide movement by the people for the clean and green environment for all citizens of the country has launched the CGPM.

Water Sanitation and Hygiene Budget FY2019 and FY2020

The detail of budgetary allocations and expenditure for WASH in FY2019 is given below in Table 16.1.

Provinces/ Region	Budget FY2019			Expenditures FY2019		
	Current	Development	Total	Current	Development	Total
Balochistan	5,408	8,952	14,360	3,342	6,202	9,544
Sindh	7,871	34,971	42,842	6,592	12,767	19,359
Punjab	13,754	21,700	35,454	7,513	12,810	20,323
Khyber Pakhtunkhwa	5,878	3,873	9,751	4,238	6,577	10,815
Federal	1,260	861	2,121	620	1,166	1,786
Total	34,171	70,357	104,528	22,305	39,522	61,827

Source: Ministry of Climate Change

The per capita WASH allocation in Pakistan during 2018-2019 was Rs 491. This was the highest in Balochistan with Rs 1,167 followed by Sindh Rs 876, Punjab Rs 318, Khyber Pakhtunkhwa Rs 311 and Federal with Rs 244. The per capita WASH expenditure in 2018-2019 in Pakistan was Rs 291. The per capita WASH expenditure in Balochistan is Rs 776 followed by Sindh Rs 396, Khyber Pakhtunkhwa Rs 344, Federal Rs 205 and Punjab with Rs 182.

Table: Budget for WASH FY2020 Rs Million

Region/provinces	Current	Development	Total	Rupees Per Capita
Balochistan	5,970	17,053	23,023	1,872
Sindh	8,849	47,732	56,581	371
Punjab	10,071	31,334	41,405	898
Khyber Pakhtunkhwa	8,287	19,913	28,200	925
Federal	470	7,579	8,049	1,157
Total	33,648	123,611	157,258	739

Source: Ministry of Climate Change

An overview of overall WASH allocations for FY2020 in Pakistan reveals that major allocations have been made in Sindh province (36 percent) followed by Punjab (26 percent), Khyber Pakhtunkhwa (18 percent) and Balochistan (15 percent). A review of the FY2019 budgetary allocations and expenditures revealed that highest level of spending was reported by Khyber Pakhtunkhwa province followed by Federal (84 percent), Balochistan (66 percent), Punjab (57 percent) and Sindh (45 percent) respectively.

Sustainable Development Targets for Pakistan

The perspective and requirements of WASH financial investment have changed with Pakistan's endorsements for indicators of Safely Managed Drinking Water and Sanitation under SDGs. By using the SDG costing tools developed by the World Bank and UNICEF, Pakistan has calculated its annual investment needs for WASH Sector. As per the census of 2017, the population of Pakistan is 207.77 million, which is expected to become 282.81 million by 2030. While using the baseline of figures of 2016 for 2017-2018, Pakistan needs around Rs 449 billion annually.

Table: Annual Financial Needs for Safely Managed Water & Sanitation Services Rs Million

Description	Urban		Rural		Total
	Water	Sanitation	Water	Sanitation	Total
New Services: Basic Access	13,968	12,797	8,595	28,543	63,883
New Services: Safely Managed	62,630	48,904	113,736	123,099	348,369
Sustaining existing services: Basic Access	16,635	11,100	11,110	20,735	59,580
Sustaining existing services: Safely Managed	36,229	11,100	33,461	20,735	101,525
Overall Financing Needs	98,849	60,004	147,197	143,834	449,894

Source: Ministry of Climate Change

Based on the SDG costing tool, it is estimated that Pakistan needs Rs 450 billion annually to meet SDG targets by 2030. Presently, Pakistan is spending Rs 61 billion annually through public sector while the overall layout of the sector is Rs 143 billion.

Forestry

The forest covered area in Pakistan is 4.51 million hectares, constituting 5.01 percent area of the land area. The forestry sector contributes 0.41 percent of the GDP. The government has taken various measures to increase the forest covered area. The major achievements in this regard are highlighted below:

Ten Billion Tree Tsunami Programme (TBTTP): The objective of this programme is to combat the adverse effects of global warming. This is an umbrella project covering all the provinces including AJK and GB with provincial budgetary share. TBTTP also adopts a widespread participatory approach through provincial and federation forestry departments across the country. All segments of society including students, youth and farmers have been actively engaged in the mega afforestation activities. An amount of Rs 7.5 billion was allocated for TBTTP in PSDP 2019-20 out of which Rs 6.0 billion has been released to provinces and territories.

Seasonal Tree Planting Campaigns

In order to improve tree cover in the country, seasonal tree plantation campaigns are held each year. The government departments, private sector organizations, defense organizations and NGOs were involved in planting activities during the year. The status against targets fixed for tree planting are as follows:

(Plants in Millions)			
Season	Target	Achievement	Survival Rate
Monsoon 2019	110.140	93.3	78%
Spring 2020	240.893	--	--
Total	351.033		

Source: Ministry of Climate Change

The other major related activities are given below:

- i) The first phase of the TBTTP is being implemented throughout Pakistan with the support of all provincial governments including AJ&K and Gilgit Baltistan for a period of four years (2019-20 to 2022-23). During this first phase of the programme, a total of 3.29 billion plants will be planted/regenerated. The programme is the replication of the Billion Tree Afforestation Project (BTAP) that was successfully implemented in Khyber Pakhtunkhwa.
- ii) A nationwide "Plant for Pakistan Day" campaign was organized to create awareness and ensure the involvement of the general public in increasing tree cover. Under the campaign, almost 450 events were organized and 1.5 million plants were planted/regenerated and distributed throughout the country.
- iii) MoU was signed between MoCC and Ministry of Water Resources to establish a plantation on Ghazi Barotha Hydropower Spoil Banks.

- iv) MoU was signed between MoCC and Ministry of Communications for the implementation of a project titled "Apni Shahrah" to establish a plantation in the Right of Way of National Highways and Motorways.

Clean Green Pakistan Index

The Prime Minister has launched the Clean Green Pakistan Index (CGPI) for creating a mechanism of strengthening municipal service delivery by local governments for five pillars of Clean Green Pakistan (CGPI). The CGPI is a composite index of five pillars of the Clean Green Pakistan Movement, i.e., water, sanitation, hygiene, solid waste management, and plantation with equal weightage. The overall sum of scores for five pillars will provide the final score of the Clean Green Pakistan Index. CGPI comprises of more than 35 indicators for ranking the cities. Baseline of the CGPI is based on the data received from Municipality of 19 selected cities for the month of December and the data of Multiple Indicator Cluster Survey (MICS) 2018. The weightage of 50 percent has been allocated for the MICS Household data and 50 percent to Municipality data. The initial three months report for January to March is currently under review and submission of the report for April to June is under process. The base year data for 2019 and 2020 will be available in December 2020. The service delivery data is being provided by respective city councils and administration working in each district coordinated by Local Government Departments on a monthly basis. The CGPI has been launched as a pilot in 13 cities of Punjab, which include Multan, Gujranwala, Faisalabad, Lahore, Rawalpindi, Sargodha, Bahawalpur, DG Khan, Sahiwal, Sialkot, Gujrat, Attock, and Murree, and it is piloted in seven cities of Khyber Pakhtunkhwa that includes Bannu, Dera Ismail Khan, Abbottabad, Kohat, Malakand, Mardan, and Peshawar.

Box-1: Green Economic Stimulus Package

Prime Minister has approved the 'Green Stimulus' package as part of the Government's efforts to extend green cover in the country to increase the opportunities of daily wage jobs by almost 100 percent. The Green Stimulus package is launched as a part of the 10 Billion Tree Tsunami project (TBTP), especially in the wake of COVID-19. The project aims to promote plantation, set up nurseries, and promote natural forests with dedicated attention and to create green jobs through greater involvement of communities, especially youth and women. During FY2020, the 10B TTP has generated almost 65,000 jobs, which will be scaled upto 200,000 by December 2020.

Pakistan's "Green Stimulus" has received significant international acclaim and recognition, including the World Economic Forum. In one of the reports compiled by WEF titled COVID-19: Pakistan's 'green stimulus', it has been acknowledged that, 'scheme is a win-win for the environment and for the unemployed.'

Citizen Engagement Programme

The MoCC has also launched a Citizens Engagement Programme titled as 'Clean Green Champions' under the CGPM. People can register themselves as champions and share the voluntary activities under five pillars of Clean Green Pakistan, i.e., Plantation, Safe Water, Safe Sanitation, Hygiene & Liquid Waste Management, and Solid Waste Management. For each pillar of CGPM, the Clean Green Champions will come forward to lead three types of activities. Firstly, extending basic services on a self-help basis like water supply, sanitation, and solid waste collection, etc. Secondly, helping the local governments in providing essential services and handling citizen's complaints. Finally, awareness-raising for inspiring

real change in community behavior towards the environment. Under this programme, so far, 120,000 champions have been registered to contribute towards a clean and healthy Pakistan on a voluntary basis.

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

Reduced Emission from deforestation and Forest Degradation (REDD+) relates to the absorption of atmospheric carbon through forest resources. Due to the accumulation of carbon in standing trees, their financial value increases. Carbon stocked in forests is traded in carbon markets. The REDD+ Readiness Preparation Proposal (R-PP) is being implemented in Pakistan with a grant of \$ 3.8 million since July 2015. Pakistan was also awarded the grant through a competitive process by Forest Carbon Partnership Facility (FCPF) of the World Bank. International and national consultants were hired to prepare documents for the four elements required to complete the REDD+ readiness phase. Meanwhile, in 2018, an additional grant of \$4.01 million has also been awarded by FCPF to further support the preparedness activities in Pakistan until June 2020. The 9th National Steering Committee meeting was held on 6th February, 2020 to further streamline the implementation process. The Forest Reference Emission Level (FREL) of Pakistan has been submitted to the United Nations Framework Convention on Climate Change UNFCCC.

Preparation of Pakistan's National Drought Plan

The "Drought Initiative" is designed to support countries in developing their national action plans in order to enhance the resilience to drought. For this purpose, a national consultant for Pakistan has been selected by the Global Mechanism Team of the United Nations Convention to Combat Desertification (UNCCD) to prepare a comprehensive national action plan.²

National Biodiversity Strategy and Action Plan (NBSAP)

National Biodiversity Strategy and Action Plan (NBSAP) has been approved in November, 2018 and is widely disseminated and is under implementation with the provinces. This plan has been aligned with SDGs (2030).

Declaration of Marine Protected Areas

Astola Island in June, 2017 has been declared as the first marine protected area of Pakistan. The other potential sites like Churna Island and MianiHorr are in process to be declared as Marine Protected Areas.

Measures to Protect Environment.

I. Combating Plastic Pollution to save human beings and marine life in Pakistan

The key problem with plastics is that a major portion of their production comprises disposable packaging items or durable products that are discarded permanently within one year of their manufacturing, such as single-use plastic bags, styrene coffee cups, mineral water or soft drink PET bottles, children toys, toothbrushes, etc. This fast disposal rate and

² The comprehensive National Drought plan is expected to be prepared by September, 2020.

durability is the main reason for plastic pollution, which by one or other means results in landfill and plastics patches in the oceans. Plastic products have hazardous effects on the oceans, wildlife, human life, and overall environment. Accordingly, the Government of Pakistan approved Ban on (Manufacturing, Import, Sale, Purchase, Storage, and Usage) Polythene Bags Regulations.

MoCC has introduced alternate bags made of cotton, jute, and other permissible materials. Ministry also initiated an awareness campaign in coordination with M/o Information & Broadcasting on the hazards of polythene bags, and their alternatives. The provincial governments are being encouraged to follow a similar strategy. In this regard, the Sindh Government has enacted legislation to combat plastic pollutions, and the Government of Punjab is in the process of finalizing its legislation. The remaining provinces/regions, including AJK and GB, are also working on discouraging the use of plastic products.

II. Standard Operating Procedures to streamline transboundary flows of recyclable materials.

Pakistan is a party to Basel Convention on the control of transboundary movements of hazardous wastes and their disposal and MoCC is the National Focal Point and Competent Authority to comply with the obligations under said Convention at a national level. Pakistan is obligated by the provision of the Convention under which import, export, and transit of wastes are required to be controlled. To streamline transboundary flows of recyclable materials, Ministry has developed Standard Operating Procedures (SOPs) for granting permissions to import materials under Basel Convention in 2019. The objective of these SOPs is to ensure Environmentally Sound Management (ESM) and to prevent the import of hazardous wastes and other wastes if it has reason to believe that the wastes in question will not be managed in an environmentally sound manner. Federal and Provincial Environmental Protection Agencies are following these SOPs.

III. Protecting the Ozone Layer.

MoCC is responsible for the implementation of the Montreal Protocol (MP), ensuring the phase-out of Ozone Depleting Substances (ODS). This includes the development of policy guidelines, identification of investment projects, and their monitoring, implementation of regulatory and control measures, data collection, reporting, and carrying out mass awareness activities. The National Ozone Unit (NOU) remained actively involved in a series of activities to raise awareness in targeted stakeholders. The major activities included:

- i. HCFCs import quota issued for the year 2019 was strictly monitored as per the allocated baseline of 248.11 ODP tons for Pakistan.
- ii. Initiated process for engaging academia to undertake research/studies to introduce best practices to phase out ODS from Pakistan. In this context, Memorandum of Understanding between Ministry of Climate Change, National Ozone Unit and National University of Science and Technology (NUST) has been signed.
- iii. Carried out an awareness campaign on protection of ozone layer through newspaper supplements/TV commercial/Radio Spots developed to commemorate International Ozone Day-2019.

- iv. Initiated process of developing legal instruments for regulating management of Ozone Depleting substances in Pakistan.
- v. HCFC import data was collected from FBR on monthly basis to analyze the import figures and consumption of allocated import quota. This helps Pakistan to remain in compliance with regard to import and consumption of different Ozone Depleting Substances.
- vi. HCFC quota for the year 2020 was issued based on the phase-out plan under Montreal protocol, achieving 50 percent reduction targets from baseline of 248.11 ODP tons by 2020.
- vii. The enabling actives for the ratification of Kigali Amendment got initiated

IV. Addressing Persistent Organic Pollutants.

Persistent Organic Pollutants (POPs) are highly toxic chemicals considered as a global threat to human health and the environment. The elimination of POPs pesticide stockpiles became more urgent after 2010 floods that damaged some of the storage sites of hazardous chemicals and pesticides, resulting in a greater risk to human and environmental health. “Comprehensive Reduction and Elimination of Persistent Organic Pollutants in Pakistan” project was started in 2015 with joint implementation of MOCC and UNDP Pakistan. The objective of this programme is to reduce human health and environmental risks by enhancing management capacities and disposal of POPs in Pakistan.

Implementation of Hospital Waste Management Rules(2005)

Pakistan Environmental Protection Agency is responsible for implementing these rules. Hospitals and public health care facilities are supposed to safeguard the health of the community. However, the waste produced by the medical care centers if disposed-off improperly can pose an even greater threat than the original diseases themselves. The best way for safe and cost-effective waste disposal is the segregation of wastes into ‘infectious’ and ‘non-infectious’ wastes. This way, the general waste can be disposed of cost-effectively through normal means and taken to a land fill. The contaminated waste can be handled and treated safely before disposal by either incineration or any other scientific process and ultimately dumping ash of the waste in landfills. Modern practice requires that all waste be covered at the end of the day or sooner to maintain hygiene.

Global Change Impact Studies Centre

The Global Change Impact Studies Centre (GCISC) is a body corporate, governed by an independent Board of Governors with the mandate of conducting research on climate change and its impacts and possible remedies. GCISC was established initially as a development project in 2002 and regularized by the Parliament in 2013 as a national entity under the GCISC Act 2013. The Centre undertakes and commissions scientific investigations on climate change at regional and sub-regional levels. Specific research themes include the climate change profiles of Pakistan, impacts on critical socioeconomic sectors, and identification of appropriate adaptation/mitigation strategies. In addition, it arranges capacity-building opportunities for young scientists in climate-related subjects and engages in outreach and dissemination of research outputs.

The recent analysis performed at GCISC shows that the mean annual temperature has increased over Pakistan in the recent past, with a greater increase in Sindh and Baluchistan. It is observed that the increase in temperature is higher in winter when compared with summer and a maximum increase has been observed in December and February. During the last century, the average temperature over Pakistan has increased by 0.6°C, which is in conformity with the increase of average global temperature. Similarly, mean annual precipitation has also shown an increase over most parts of the country. The increase is higher in summer as compared to winter with September and June showing the greatest increase. ADB projections show that by the end of this century, the average rise in Pakistan's temperature will be between 3°C and 5°C, higher compared to the global average.³ Within the country, northern regions will experience relatively more warming than the south. This increase, particularly in temperature, is associated with a number of adverse impacts, including the increasing frequency of extreme events (floods, droughts, heatwaves, and cyclonic activity), steady regression of most glaciers (except a small minority in the Karakorum Range) that supply the bulk of the country's water supply, and changes in the rainfall patterns.

Box-2: Geomatic Centre for Climate Change and Sustainable Development

Geomatic Centre for Climate Change and Sustainable Development project is one of venture under Ministry of Climate Change, which encourages the application of Satellite Remote Sensing (SRS), Geographical Information System (GIS) and Geographical Positioning System (GPS) technologies in environmental monitoring and decision-making. The objective of this project is to facilitate better environmental planning in the country, particularly for rational and scientific decision-making through assessment of the environmental impact of different human activities, making them compatible with the objectives of sustainable development. The cost of this project is Rs 48.9 million, and the government has allocated Rs 3.2 million during 2019-20.

Impacts of Climate Change on Water Resources

As in many other regions around the world, the incidence of extreme hydrological events is on the rise in Pakistan in many different forms, especially flash flooding in the mountainous streams in the northern part. It has especially been found in water availability analysis of the Kabul River Basin, a snow melt-fed basin, where there is a sharper peak with a clear shift in the annual peak flow by a month. In addition, a more increased frequency of larger magnitude annual maximum flow events has come out as a key finding of this Kabul River Basin study. Another work focused on the Gilgit River Basin, a glacier-fed basin, and it is revealed that faster melting of glaciers under increased temperatures would bring more water flow a month earlier but with a flattened peak.

In the Karakoram region, the especially northeastern part of Northern Pakistan, which contains the major proportion of the Pakistani glaciers, there is evidence that most of the glaciers are either advancing or stable (the famous 'Karakoram Anomaly'). Recently Khurdopin glacier and the Shisper glacier surged down the hill at extremely fast rates, causing a blocked to a flowing stream, thereby forming a temporary lake with an outburst risk. On the other hand, some areas, especially in the Hindukush mountain range (Chitral and western Gilgit) e.g., the Chitaboo Glacier in Chitral has retreated rapidly in recent years due to global warming.

³ADB. 2017. *Climate Change Profile of Pakistan*. Manila.

Climate change analysis indicates that the rate of change of average temperature in the northern part of Pakistan is higher than that for southern Pakistan. A higher rate of increase of temperature in Pakistani mountains is causing the melting of its glaciers at lower altitudes, especially in the Hindukush region (Western parts of Gilgit and Chitral). It is giving rise to the formation of glacial lakes approximately lower parts of glaciers as a direct consequence, and posing Glacial Lake Outburst Floods (GLOFs) threat that is one of the most devastating mountain disasters.

Impact of Climate Change on Agriculture and Food Security

Agriculture is the backbone of the economy, which has also been adversely affected by climate change. Climate change can disrupt food availability, reduce access to food, and affect food quality. Projected increases in temperatures, changes in precipitation patterns, changes in extreme weather events, and reductions in water availability may all result in reduced agricultural productivity. Crop simulation models-based studies depict significant reductions in wheat, rice, and maize yields in the arid, semi-arid and rain fed areas of Pakistan under various Intergovernmental Panel on Climate Change (IPCC) scenarios by the mid and end of the century.

It is expected that there will be an increasing trend in the average maximum temperature for the future projections for both Representative Concentration Pathways (RCPs) with 1-2.0⁰C for RCP 4.5 and 5-6⁰C for RCP 8.5 during Rabi and Kharif season. Temperatures in the South-Eastern part of Pakistan have shown to exceed the thresholds at the times of flowering and ripening, thereby causing wheat yield losses. Due to rise in temperatures an overall increase of 1000 Growing Degree Days (GDDs) between historical and late century extreme scenarios (RCP 8.5) has been observed in case of wheat, implying that South Eastern side of Pakistan is likely to become unsuitable for wheat production due to temperature extremes after mid-century.

Studies were undertaken using the Agricultural Production Systems Simulator (APSIM) model also show that wheat production in the arid areas of Pakistan is likely to suffer to the tune of 17 percent in the 2020s in case of RCP 4.5 whereas 21 percent and 40 percent in case of RCP 8.5 for 2020s and 2080s, respectively. Aqua crop model projects 34 percent and 41 percent decline in Maize yields in case of scenario RCP 8.5 by the end of the century in the Khyber Pakhtunkhwa province. The results suggest that the aggregate impact of climatic parameters, i.e., changes in temperature and rainfall, exerted an overall negative impact on cereal crop yields, given that the management practices and use of technology remain unchanged.

The agriculture sector is the second largest sector contributing to GHG emissions (174 out of 406 Mt CO₂Eq). According to baseline emission (of 2015) projections, agricultural growth is expected to increase up to 271.9 (56 percent) Mt, 314.3(80 percent) Mt and 362.9 (108 percent) Mt of CO₂-equivalent under Business as Usual (BAU), Food Security (FS) and Enhanced Consumption Pattern (ECP) scenarios, respectively.

Modeling of climate change scenarios for Pakistan shows that if agriculture and water management in the Indus River Basin continue in a BAU mode, increasing temperatures and changes in precipitation will pose serious threats to the future livelihoods of farmers and to

the Pakistani agricultural sector. To manage the situation, FAO, under the general oversight of the MoCC, is going to undertake a project on “Transforming the Indus Basin with Climate Resilient Agriculture and Water Management in Pakistan.” The project objective is to transform agriculture in the Basin by increasing resilience among the most vulnerable farmers and strengthening the government’s capacity to support their communities to adapt. The project will be implemented in eight districts of Punjab and Sindh Provinces over a six-year period at a total cost of \$47 million that will be provided by the Green Climate Fund and co-financed by both provincial governments. About 1.3 million rural people will be direct project beneficiaries, including women farmers, as well as professionals involved in project capacity development.

Increased land productivity could help mitigate the impact of climate change on agriculture, with the adaptation of modern and clean technology. In other parts of Asia, Green Revolution policies have helped promote the use of technology to modernize agricultural production and make economies self-sufficient in food.⁴Biennial Update Report (BUR)

BURs are containing updates of national GHG inventories, including a national inventory report and information on mitigation actions. Pakistan has submitted its Second National Communication (SNC) to UNFCCC in August 2019 and now intends to submit its first BUR in 2020/21.

Nationally Determined Contributions (NDC) revision

Pakistan submitted its first NDC in November 2016, which commits to reduce up to 20 percent of its 2030 projected GHG emissions, subject to the availability of international support. Under the Paris Agreement, countries need to revise their NDCs every five years to cut GHG emissions to limit Earth's temperature rise and implement solutions to adapt to the effects of climate change. The updating of NDCs presents countries with significant opportunities to align their climate and development agendas to promote sustainable growth but also presents challenges in reinventing policies and operations and mobilizing enough investment. The MoCC(the National Responsible Government Agency) has just started the work on the revision, and GCISC has been asked to provide technical inputs and liaise with National and Provincial Government Departments and Development partners in this regard.

Zoological Survey of Pakistan (ZSP)

The department is mandated to obtain information on distribution, population dynamics, migratory patterns, status, habit and habitat, and taxonomy of animal life in Pakistan through surveys. The details of achievements are highlighted below:

- During the current financial year, the survey of the Cholistan Game Reserve (District Rahim Yar Khan and Bahawalpur, Punjab)has been carried out with the objective of recording the status of important wildlife species, identification of threats to habitat and preparation of inventories.

⁴ Asian Development Bank. Asia's Journey to Prosperity: Policy, Market, and Technology Over 50 Years, January 2020.

- The objective of the Mid-winter waterfowl census is to study the population dynamics of migratory ducks, Geese, waders, and local water birds and record the population trends of migratory water birds. Wetlands of Punjab and Khyber Pakhtunkhwa were visited for mid-winter waterfowl census, during December and January, in 2019 - 2020.
- During the current financial year, the studies on Houbara bustard and Punjab Urial were carried out separately along with the team of Punjab Wildlife Department to study the distribution and status of the concerned species. The main objective of these studies is to identify the threats to species and its habitat and preparation of conservation strategy for the protection, conservation, and management of the species and its habitat.
- During the FY 2020 the studies of Endangered species, i.e., Great Indian Bustard and Black-Bellied Tern have been conducted with the objective to study the distribution and current population status of concerned species.

Islamabad Wildlife Management Board

The challenges to wildlife protection and preservation of Margalla Hills National Park (MHNP) could be managed through effective implementation of Islamabad Wildlife's initiatives such as:

- Enhanced management of protected areas, i.e., MHNP, by setting goals on international standards.
- The revival of Critically Endangered species and their Habitats.
- Restriction of illegal wildlife trafficking and hunting in ICT.
- Rehabilitation/ Rescue Center for Confiscated Wildlife in Islamabad.
- Zero plastic in hiking trails and other areas of MHNP for “Plastic free National Park”.
- Improvements of Islamabad Wildlife (Protection, Preservation, Conservation and Management) ordinance 1979 Legislation and its implementation.
- Engage different university students to conduct scientific studies in MHNP.
- Awareness and education about the importance of wildlife in MHNP to students and the general public.
- Community participatory approach to develop a liaison among the community to use natural resources in a sustainable way.

Way Forward.

Pakistan has been consistently ranked as one of the most affected countries by climate change. There is a global consensus that climate change is a geographic problem, and reducing the risks caused by climate change is an immense challenge that requires well-planned and coordinated national and global efforts to mitigate its adverse effects on the environment and human life. It is globally acknowledged that the current generation's response to this challenge will be judged by history, for if we fail to meet it—boldly, swiftly, and together—we risk consigning future generations to an irreversible catastrophe. Thus, policymakers, scientists, developers, engineers, and many others around the world are using geographic information system technology to better understand this complex situation and offer tangible solutions in different climate change scenarios. The population is facing

natural hazard challenges like floods, droughts, and cyclones, which have been growing in intensity and frequency with the passage of time. The government is taking different measures to effectively tackle climate change challenges, such as improving technological responses by setting in place early warning systems and information systems to enhance disaster preparedness climate change resilience, and by improving forest management and biodiversity conservation.
