Government of Pakistan

PAKISTAN

UPDATED NATIONALLY DETERMINED CONTRIBUTIONS 2021

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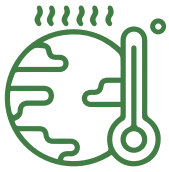

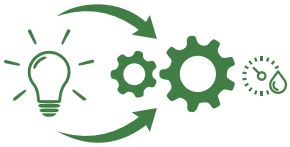

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ADB	Asian Development Bank
AEDB	Alternative and Renewable Energy Development Board
AFOLU	Agriculture, Forestry and Other Land use
ARE 2019	Alternative and Renewable Energy Policy 2019
BAU	Business as usual
BRT	Bus Rapid Transit
BTAP	Billion Trees Afforestation Project
BTR	Biennial Transparency Report
CBDRM	Community Based Disaster Risk Management
CCA	Climate Change Adaptation
CCGAP	Climate Change Gender Action Plan
CDWP	Central Development Working Party Meeting
CGPI – 2019	Clean Green Pakistan Index 2019
CIACA	Collaborative Instruments for Ambitious Climate Action
CID	Climate Impact-Drivers
CIF	Climate Investment Fund
COP	Conference of Parties
CPEC	China - Pakistan Economic Corridor
CPI	Carbon Pricing Instrument
CPPA-G	Central Power Purchasing Agency-Guarantee
CSOs	Civil Society Organizations
DWP	Development Working Party
EIA	Environmental Impact Assessment
EPA	Environmental Protection Agency
ESL	Energy Standards and Labeling
ESRF	Ecosystem Restoration Fund
ESRI	Ecosystem Restoration Initiative
ETF	Enhanced Transparency Framework
EV	Electric Vehicles
FCPF	Forest Carbon Partnership Facility

FFC	Federal Flood Commission
FY	Fiscal Year
GB	Gilgit-Baltistan
GCF	Green Climate Fund
GCISC	Global Change Impact Studies Centre
GDP	Gross Domestic Product
GEF	Global Environment Facility
GFP	Gender Focal Point
GHG	Greenhouse Gases
GHI	Global Horizontal Irradiation / Irradiance
GIS	Geographic Information System
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit (German International Development Agency)
GLOF	Glacial Lake Outburst Floods
GoP	Government of Pakistan
GCMs	General Circulation Models
$GtCO_2e$	Giga Tonnes Carbon dioxide equivalent
HFCs	Hydrofluorocarbons
HiAP	Health in All Policies
IFC	International Finance Corporation
IGCEP 2021-30	Indicative Generation Capacity Expansion Plan 2021-30
IPCC	Inter-governmental Panel on Climate Change
IPP	Independent Power Producer
IPPU	Industrial Processes and Product Use
KP	Khyber Pakhtunkhwa
L&D	Loss and Damage
LDN	Land Degradation Neutrality
LULUCF	Land Use, Land-Use Change and Forestry
MEPS	Minimum Energy Performance Standards
MoCC	Ministry of Climate Change
MoE	Ministry of Energy
MoF	Ministry of Finance
MoI	Ministry of Industries

MoNFSR	Ministry of National Food Security & Research
MoNHSR&C	Ministry of National Health Services, Regulations and Coordination
MOPD&SI	Ministry of Planning, Development & Special Initiatives
MoWR	Ministry of Water Resources
MRV	Monitoring, Reporting and Verification
MT	Million Tonnes
MT CO_2e	Million Tonnes of Carbon dioxide Equivalent
MTOE	Million Tonnes of Oil Equivalent
MW	Mega Watt
NAMAs	Nationally Appropriate Mitigation Actions
NAP	National Adaptation Plan
NAP-SCP	National Action Plan on Sustainable Consumption and Production
NARC	National Agricultural Research Centre
NbS	Nature-based Solutions
NBSAP	National Biodiversity Strategy and Action Plan
NCCP	National Climate Change Policy
NCEC	National Committee on the Establishment of Carbon Markets
NCSW	National Commission on the Status of Women
NDC	Nationally Determined Contribution
NDMA	National Disaster Management Authority
NEECA	National Energy Efficiency and Conservation Authority
NEP 2021	National Electricity Policy 2021
NEPRA	National Electric Power Regulatory Authority
NEVP 2019	National Electric Vehicles Policy 2019
NFPP-IV	National Flood Protection Plan – IV
NIT	National Investment Trust
NIU	NDC Implementation Unit
NMHVRA	National Multi-Hazard Vulnerability and Risk Assessment
NPB	Nature Performance Bonds
NRSP	National Rural Support Programme
NSC	National Steering Committee
NTDC	National Transmission and Dispatch Company
NWP 2018	National Water Policy 2018

P&DDs	Planning & Development Departments
P&M	Policies & Measures
PAEC	Pakistan Atomic Energy Commission
PAI	Protected Areas Initiative
PASS	Poverty Alleviation and Social Safety Net Division
PDMA	Provincial Disaster Management Authority
PMCCC	Prime Minister's Committee on Climate Change
PMD	Pakistan Metrological Department
POPs	Persistent Organic Pollutants
PPIB	Private Power and Infrastructure Board
PPPA	Public Private Partnership Authority
Provincial DoA	Provincial Department of Agriculture
PSDP	Public Sector Development Programme
PSLEP	Pakistan Snow Leopard and Ecosystem Protection Program
RBF	Result-Based Financing
RE	Renewable Energy
REDD+PES	The United Nations Programme on Reducing Emissions from Deforestation and Forest Degradation; Payments for Environmental Services
RLNG	Re-Gasified Liquefied Natural Gas
R-PP	Readiness Preparation Proposal
3Rs	Reduce, reuse, recycle
SBN	Sustainable Banking Network
SBP	State Bank of Pakistan
SDG	Sustainable Development Goal
SECP	Securities and Exchange Commission of Pakistan
SEIAs	Social Environmental Impact Assessments
SFF	Sustainable Finance Framework
SFM	Sustainable Forest Management
SLMP	Sustainable Land Management Project
SMEs	Small and medium-sized enterprises
SOPs	Standard operating procedures
SPO	Second Party Opinion
TBTTP	Ten Billion Tree Tsunami Programme

TNA	Technology Need Assessment
TOE	Tonnes of Oil Equivalent
UNCCD	United Nations Convention to Combat Desertification
UNDP	United Nations Development Programme
UNEP	United Nations Environmental Programme
UNFCCC	United Nations Framework Convention on Climate Change
VNR	Voluntary National Review
VRE	Variable Renewable Energy
WAPDA	Water and Power Development Authority
WASH	Water, Sanitation and Hygiene
WIM	Warsaw International Mechanism

EXECUTIVE SUMMARY

Government of Pakistan (GoP) as a Party to the Paris Agreement of the United Nations Framework Convention on Climate Change (UNFCCC) has performed its role to support the global efforts in combating climate change. GoP takes ownership and pride in submitting an updated Nationally Determined Contributions NDC which is inclusive and represents national consensus to accelerating the transition towards a climate-resilient economy.

The current submission showcases GoP's progress in climate action that ranges from policy and programs on Nature-based Solutions (NbS) to technology-based interventions. Pakistan, recognizing the role of nature in climate adaptation and mitigation, has developed robust natural capital restoration efforts including the Ten Billion Tree Tsunami Programme (TBTTP), Protected Areas Initiative (PAI) etc. These programs have also served as a way to enhance livelihood opportunities for the most vulnerable, including women and youth. In addition, Pakistan has introduced a number of policy actions focused on mitigating greenhouse gas emissions from high emission sectors like energy and industry.

The focus of GoP's climate actions during the decade ahead is decided by the current climate-induced vulnerabilities, aimed at achieving reduced poverty and ensuring a stable economy. The current submission is informed by recent policy development in the country in the NDC sectors, and some ambitious decisions taken by the pro-climate leadership to enhance Pakistan's resilience and decarbonize the economy. In addition—for enhanced contributions—new sectors and new gases have also been added to the updated document. Hence, Pakistan intends to set a cumulative ambitious conditional target of overall 50% reduction of its projected emissions by 2030, with 15% from the country's own resources and 35% subject to provision of international grant finance that would require USD 101 billion just for energy transition.

To reach the target, Pakistan aims to shift to 60% renewable energy, and 30% electric vehicles by 2030 and completely ban imported coal. Moreover, Pakistan seeks to expand NbS by implementation of TBTTP, Recharge Pakistan, and PAI. Pakistan's emissions as per 2018 are 489.87 $MtCO_2e$; Billion Trees Afforestation Project (BTAP) and TBTTP will sequester CO_2 around 500 Mt CO_2e by 2040, if implemented fully. Pakistan requires to strengthen its scientific and technical capacities to reach the set transition targets.

Pakistan's financial needs still remain high, given the country's vulnerability to climate change and capital-intensive transition to decarbonize the economy. The country envisages enhancing the access to international climate finance to deliver the contributions, and also considers employing the instruments on enhanced ambition provided in Article 6 of the Paris Agreement. Pakistan has already identified market and non-market-based approaches to help diversify the funding sources, including Nature Performance Bonds, Green/Blue Bonds, Carbon Pricing Instruments, etc. Pakistan encourages the private sector to play a crucial role in implementing its climate ambition across sectors and the development of NbS that address its mitigation and adaptation potential.

PAKISTAN UPDATED NDCs 2021

Voluntary Contribution of Overall

50%

reduction of Pakistan's Projected emissions by **2030**

15% unconditional

35% conditional

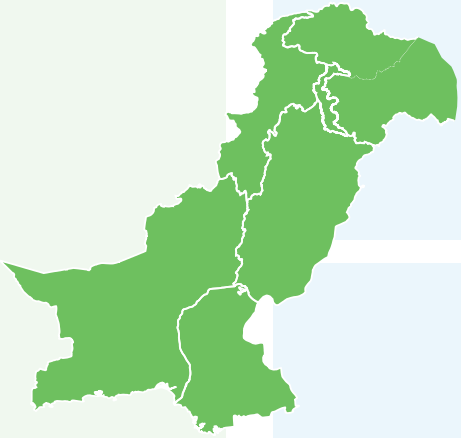
Initiatives take by Government of Pakistan contributed to reduction of

8.7%

emissions between **2016** and **2018**

New sectors:

Blue carbon ecosystems, health, waste, carbon markets and air pollution



Ten Billion Tree Tsunami

TBTTP will sequester **148.76 $MtCO_2e$** emissions over the next 10 years

Inclusive

Youth

Gender

High Priority Actions

Mitigation

Renewable Energy **60%** by 2030

Electric Vehicles **30%** by 2030

Moratorium on new coal power plants
No generation of power through imported coal

Continued investments in NbS

Adaptation

Indus Basin- flood risk mitigation and enhanced water recharge

Enhancing PROTECTED AREAS cover from **12%** to **15%** by 2023

CHAPTER 1

NATIONAL VISION FOR CLIMATE ACTION

Climate change is a threat multiplier, and there is a fundamental inequality in how people are impacted, with the poorest and those less equipped to withstand climate shocks and stresses— essentially those who did the least to cause the crisis— bearing the brunt. Low-income countries suffer more than developed countries where there are insufficient resources to tackle climate change. Pakistan, although only contributing 0.9% to global greenhouse gas (GHG) emissions, is one of the most vulnerable countries to the impacts of climate change. These impacts are primarily in the form of intense flooding, drastic change in rainfall patterns, melting Himalayan glaciers, increasing cases of vector-borne diseases such as dengue, and an overall increase in the frequency and intensity of climate-induced natural disasters. Climate Change imposes numerous challenges, and is becoming an existential threat globally. Pakistan's experience through Nature-based Solutions (NbS) in addressing the global challenges serves as a solution provider. Pakistan has surpassed mitigation contributions, and has taken climate change 'beyond Nationally Determined Contributions (NDCs), and took initiatives which contributed to reduction of 8.7% emissions between 2016-2018.

In view of the above, the central goal of the updated NDCs is to realize the vision of a sustainable, low carbon, and climate-resilient Pakistan. The Government of Pakistan (GoP) aims to work towards the full implementation of NDC contributions considering the current circumstances, and realizing the importance of socio-economic conditions in designing climate action. Pakistan aims to advance the following specific objectives:

1. Improve NDC planning, policy, strategy, and legislation
2. Strengthen an enabling environment for NDC implementation
3. Accelerate the policy coherence and integration to achieve the United Nations' Sustainable Development Goals (SDGs) in the light of its Sustainable Development Report 2020 (SDR2020)

4. Enhance NDC measurement, reporting and verification, and transparency of climate action

GUIDING PRINCIPLES:

1. NbS green livelihood opportunities
2. Improve cross-referencing to climate change in national and provincial policies and action plans on climate adaptation and mitigation
3. Climate-informed preparatory and approval systems dealing with the life-cycle of projects and schemes
4. Foster the development of appropriate economic incentives to encourage public and private sector investment
5. Explore the market and non-market based approaches in diversifying the funding sources for commissioning capital intensive projects
6. Promote opportunities for youth groups to engage in, and benefit from, Pakistan's adaptation and mitigation objectives and targets
7. Gender-sensitive programming

The GoP presents this updated NDC as obligatory under the Paris Agreement to the United Nations Framework Convention on Climate Change (UNFCCC). This Updated NDC represents a consensus of our national aspirations and ambitions, constraints and barriers, as well the multi-sectoral directions of our climate actions, during the decade ahead.

Pakistan's national vision for climate change is aligned with national development plans and sectoral priorities. This updated NDC is anchored on National Climate Change Policy (NCCP), and the Framework for its implementation. This document reflects upon Pakistan's acute vulnerability with a leading role in climate change-related actions and programs in pursuance of the Paris Agreement.

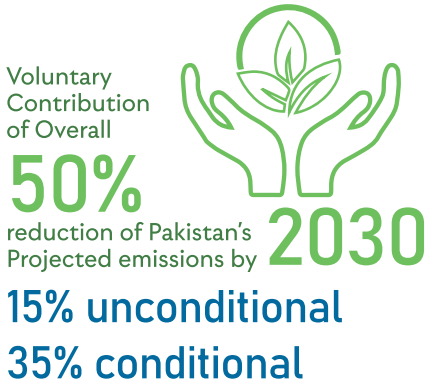
The GoP has undertaken several policy measures since 2016 when the NDC was first submitted. The articulation and progress on ecosystem-based approaches, low carbon development, carbon sequestration, and adoption of renewable energy[1] (RE), have all far exceed the narrative presented in the NDC. To further support ambitions, the GoP has adopted a NbS, approach along with green jobs and other chains of initiatives with its limited national resources.

KEY HIGHLIGHTS OF NDC CONTRIBUTIONS

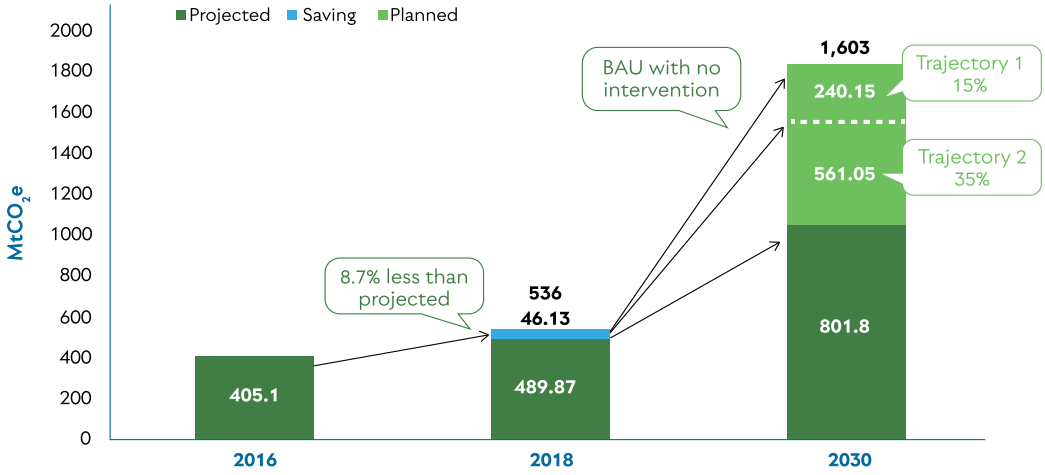
The GoP will follow the GHG emissions trajectory of 1603 million tonnes of carbon dioxide equivalent (Mt CO_2e.) for 2030 as communicated in Pakistan's initial NDC submission in 2016. However, realizing reducing the GHG emissions under the Paris Agreement to limit the temperatures between 1.5 - 2°C, the GoP remains committed to reduce the emissions to the maximum possible extent. The GoP has taken a series of transformative initiatives.

[1] Including hydro

Hence, Pakistan intends to set a cumulative ambitious aim of conditional and voluntary contributions of overall 50% reduction of its projected emissions by 2030, with a 15% drop below business as usual (BAU) from the country's own resources, and an additional 35% drop below BAU subject to international financial support.



Fg.1.1: Voluntary and Conditional Reduction of 50% below its projected BAU emissions by 2030

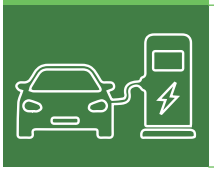


HIGH PRIORITY ACTIONS

The GoP attaches High Priority to reduce future GHG emissions from the following four sectoral initiatives which are conditional to the availability of international financial and technical resources:

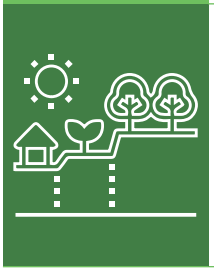
MITIGATION:

1. **RENEWABLE ENERGY:** By 2030, 60 % of all energy produced in the country will be generated from renewable energy resources including hydropower.



2. **TRANSPORTATION:** By 2030, 30 % of all new vehicles sold in Pakistan in various categories will be Electric Vehicles (EVs).

3. **COAL:** From 2020, new coal power plants are subject to a moratorium, and no generation of power through imported coal shall be allowed, shelving plans for two new coal fired power plants in favor of hydro-electric power and focusing on coal gasification and liquefaction for indigenous coal.

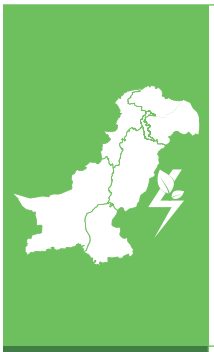


4. **LAND-USE CHANGE & FORESTRY:** 2016 onwards, continued investments in NbS through the largest ever afforestation program in the history of the country—the Ten Billion Tree Tsunami Programme (TBTTP)—will sequester 148.76 $MtCO_2e$ emissions over the next 10 years. The estimated project cost of about US$800 million is being met nationally from indigenous resources as an unconditional contribution.

Tsunami Programme (TBTTP)—will sequester 148.76 $MtCO_2e$ emissions over the next 10 years. The estimated project cost of about $800 million is being met nationally from indigenous resources as an unconditional contribution.

Priority actions will result in an estimated saving of around 1.7 $MtCO_2e$ (emissions from coal power plant are 8.8 $MtCO_2e$) on account of two shelved coal power plants, 24 Mt CO_2e on account of the introduction of EVs, and 22 $MtCO_2e$ on account of stabilizing energy mix 40-60 in favor of renewable energy[2]. Pakistan's emissions as per 2018 are 489.87 $MtCO_2e$, and the Billion Tree Afforestation Program (BTAP) and TBTTP will sequester CO_2 of around 500 Mt CO_2e by 2040, if implemented fully.

ADAPTATION:



5. **RECHARGE PAKISTAN:** By 2030, the project envisages the reduction of flood risk and enhanced water recharge at six sites in the Indus Basin, building resilience of 10 million people, as well as strengthening vulnerable ecosystems. The project is under review by Green Climate Fund (GCF) for funding. In the meantime, Pakistan has allocated PKR 6 billion from national resources to commence the activities in three sites, namely Manchar & Hamal wetland, Taunsa pond area, and Dera Ismail Khan.

6. **PROTECTED AREAS:** By 2023, total protected areas in the country will be enhanced from 12% to 15% that will result in preserving rare fauna / flora, green job opportunities for 5,500 people, and promoting eco-tourism.

[2] Including hydro

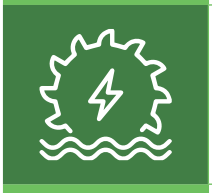
Additionally, other high priority initiatives that will significantly contribute to the country's adaptive capacity include formulation of National Adaptation Plan (NAP), and creation of Green Jobs.

PRIORITY ACTIONS

Reducing energy sector emissions are critical for economic growth and clean air. The costs of achieving some energy sector targets are estimated as follows:

MITIGATION:

I. **ADDITIONAL:** More than 12 GW under construction requiring about $20 billion (PPIB)



II. **HYDROPOWER:** For rapid expansion of RE including hydropower, reaching 60%[3] production by 2030 would require an estimated investment of US$50 Billion by 2030 and $80 Billion by 2040 (IGCEP 2021-30)

III. **TRANSMISSION:** An estimated US$20 billion is required to upgrade the transmission network by 2040.This will escalate in a case with large share of variable power from solar and wind. (JICA study)

IV. **COAL:** Buying out the relatively new coal power projects, including the local Thar coalmines[4], would have an upfront estimated cost of US$18 billion. An additional estimated US$13 billion will be required to replace the production of the coal power plants with solar (World Bank study)

This cost of energy transition alone would require US$101 billion by 2030, and additional US$65 billion by 2040, on account of completing the in-progress RE projects, additional hydropower, transmission, and phasing out of coal and replacing with hydropower. Pakistan will require finance, technology transfer, and capacity building in line with Article 4 of the United Nations Framework Convention on Climate Change (UNFCCC) and Articles 9, 10 and 11 of the Paris

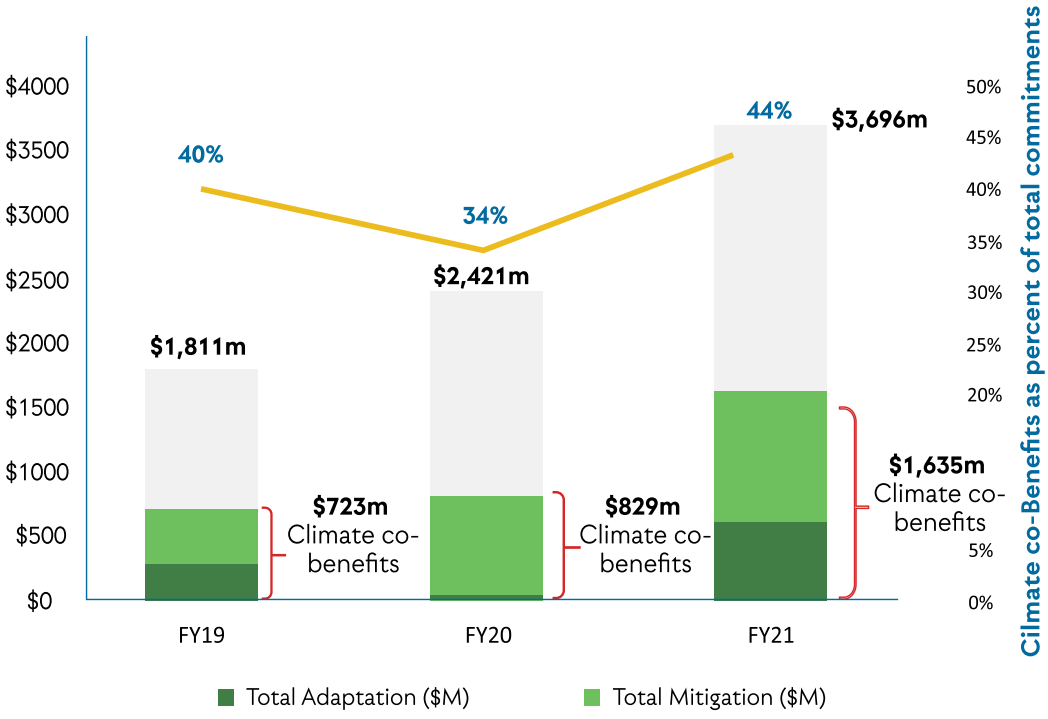
[3] 65% as per revised IGCEP 2021: 1%, 8%, 8% and 46% by bagasse, wind, solar and hydro add up to 63%

[4] VREs, hydro and Thar coal will help in lowering the basket price of the overall system thus providing much needed relief, though in the long run, to the end consumers. Induction of new local coal based committed power plants in Thar, during the next 5 years, share of local coal in the generation mix will enhance to 15% (IGCEP 2021-30)

Agreement to fully implement the climate actions contained in these NDCs. Paragraph 5 of Article 4 of the Paris Agreement specifically committed that "support shall be provided to developing country Parties for the implementation of this Article, in accordance with Articles 9, 10 and 11, recognizing that enhanced support for developing country Parties will allow for higher ambition in their actions".

World Bank endorses Pakistan's climate vision 2021, lending data showing Pakistan is leading the world on Climate Action; a massive 44% of its main stream development funding now climate compatible through on-ground initiatives like the TBTTP, Clean Energy, and Protected Areas Initiative (PAI).

Fg.1.2: Pakistan WB commitments and Climate co-Benefits (millions US$ and percent of total commitments)



CHAPTER 2

THE NATIONAL CLIMATE CHANGE CONTEXT

The Paris Agreement was signed to limit global temperature rise below 2°C and mitigate GHG emissions to the pre-industrial levels. Under the Paris Agreement, each country must determine, plan, and regularly report on the contribution that it undertakes to mitigate global warming, and is required to communicate contributions as NDCs. Pakistan submitted its NDC to UNFCCC in November 2016, in recognition of its responsibility to the comity of nations. Pakistan's first NDC intended to reduce up to 20% of its 2030 projected GHG emissions, subject to the availability of international grants to meet the total abatement cost of about US$40 billion for mitigation and US$7–14 billion for adaptation per annum at current prices.

For the updated NDCs, Pakistan is aiming to highlight the nationally implemented initiatives since 2016, institutional arrangements, and governance approaches that were adopted for enhanced contributions. The revised NDCs follow a whole-of-government approach to revising, reviewing, and reporting on climate action.

HIGHLIGHTS OF PAKISTAN'S NDC CONTRIBUTIONS

2.1 NDC UPDATE PROCESS

This revised NDC is guided by Pakistan's growing climate vulnerability and its active contributions to the Paris Agreement for stabilizing global temperatures at less than 2°C, at 1.5 °C. This NDC revision is guided by three driving principles:

1. **High Ambition:** To undertake initiatives from our limited national resources to support global drive to stabilize global temperatures, while enhancing resilience and adaptation capacity of our people;
2. **Deep Contributions:** To prioritize climate actions in adaptation and mitigation by including additional sectors to the GHG inventory; and

3. **Inclusion:** For institutional arrangements and governance necessary for climate actions by adopting whole-of-government approach.

2.2 INSTITUTIONAL ARRANGEMENT

The revision process blended bottom-up and top-down approaches that ensured active engagement and participation of a wide-range of stakeholders aimed at consensus, based on clarity, transparency and understanding.

A National Steering Committee (NSC) chaired by Special Assistant to the Prime Minister on Climate Change guided the revision process that was spread over almost one year. The technical work was led by two committees - Mitigation Working Group led by Ministry of Energy and chaired by National Energy Efficiency and Conservation Authority (NEECA), and Adaptation Working Group led by Ministry of Water Resources and chaired by Federal Flood Commission, supported by 15 sectoral working groups comprising of federal and provincial level policy-makers, scientists, experts, and other stakeholders. Global Change Impact Studies Center (GCISC) served as the Pak-NDC Secretariat.

This NDC, therefore, reflects a consensus of our national aspirations and ambitions, barriers and constraints, as well the multi-sectoral directions of our climate actions during the decade ahead. The institutional arrangement defined during the revision process would continue, leading up to the review and revision of Pak-NDC and its implementation during the period 2021-2030. This institutional arrangement will also help improve national development planning processes.

2.3 NEW IDENTIFIED AREAS

The updated NDC reflects the GoP's enhanced adaptation and mitigation ambition. If implemented, it will reduce cumulative emissions more than the fully implemented initial NDC submitted in 2016. Pakistan will achieve this by pursuing a three-track implementation strategy:

1. Strengthen existing GHG emission reduction targets or adding new GHG targets;
2. Enhance sectoral non-GHG targets or adding new sectoral non-GHG targets; and
3. Augment existing policies and actions or adding new policies and actions.

Further, this submission has added additional sectors like **gases (HFC - Hydrofluorocarbons and Nitric acid), and short-lived climate pollutants (SLCP)**, not covered in the previous NDC of 2016. The additional sectors include **blue carbon ecosystems**, **health**, **waste**, **Water Sanitation and Hygiene (WASH)**, **air pollution**, **gender** and **youth**. Finally, the revised NDC reflects the GoP's long-term policy of reducing the country's climate vulnerability and accelerating economic growth by following a pro-active renewable energy policy and decarbonization pathways.

2.4 STOCKTAKING OF PAK-NDC 2016

Pakistan developed a NDC roadmap in 2018 with support from diverse stakeholders. The roadmap has a framework identifying and prioritizing needs, highlighting gaps, and proposing a range of mitigation and adaptation options. In 2019, Pakistan consolidated a Partnership Plan in the form of a results-based framework designed to plan, coordinate, monitor, and mobilize support for the implementation of 11 projects in agriculture and water and eight forestry sector projects, prioritized by the GoP.

With GHG emissions of 405 $MtCO_2e$ in 2015, Pakistan only ranked 19th in terms of global emissions due to very low per capita emissions of just 2.4 tCO_2eq. per annum. Its emissions are less than 1% of the world's total. If successful, Pakistan's present per capita carbon consumption will decline, further reducing its share of global emissions from the present levels. The exact future ranking cannot be projected given the changes in carbon emission expected to occur during this period.

Pakistan's NDC in 2016 projected a 300% growth in GHG emissions for the period 2015-2030, based on projected 9% Gross Domestic Product (GDP) growth and increased reliance on fossil fuels. These estimates have now been revised downwards largely due to TBTTP (2016-2021) sequestration of 8.4 $MtCO_2eq$., together with increased contribution to RE and energy efficiency, Covid-19 and economic growth rate, all contributing towards the reduction of 8.7% emissions between 2016 and 2021.

Pakistan set 2015 as the base year for the quantification of emissions in GHG inventory and for the quantification of future emissions for 2030 that will be 1603 $MtCO_2eq$. as outlined in the NDC submitted in 2016. These emissions were calculated based on the GDP growth of over 9%, economic impacts of China Pakistan Economic Corridor (CPEC), and sectoral growth rates. Consideration for economic and industrial parameters, as well as the government's growth targets, social and economic infrastructure and the development goals were considered. Estimated energy demand and meeting the energy needs were given utmost importance. A contribution of reducing 20% of the projected emissions was subject to provision of international financial support of US$40 billion.

The GoP aims to achieve significant economic gains and fiscal sustainability by adopting green pathways for development and scaling up mitigation actions in energy, transportation, land use, land-use change, and forestry sectors (LULUCF). The national and provincial ministries and departments have undertaken many actions and several mitigation and adaptation-related initiatives that go beyond the initial NDC contributions.

In the context of implementing the mitigation targets outlined in the NDC, several barriers will need to be removed. Pakistan has carried a gap analysis by reviewing the implementation of the first NDC submitted in 2016. A sectoral survey was also conducted to evaluate key

elements of success and challenges in respective sectors. Several recurring themes were explicitly expressed including lack of predictable international finance, technology transfer, and capacity building support, in addition to mainstreaming, reforms, and institutional strengthening. Pakistan places emphasis on these factors and they need to be given utmost importance for successful NDC implementation.

CHAPTER 3

CLIMATE VULNERABILITIES, RISKS & COSTS

3.1. CLIMATE VULNERABILITY TRENDS

Pakistan biggest domestic climate change challenge is adaptation as Pakistan has been ranked by Germanwatch as the 8th most affected country in the world over the period 2000–2019. Pakistan's vulnerability to climate change and climate-induced extreme events, and its consistent appearance in the top 10 ranking of Global Climate Risk Index by Germanwatch has placed the country, along with Haiti and the Philippines, in a new category of countries being recurrently affected by catastrophes both in the long-term index as well as in the index for the respective year. ND-Gain Index[5] has placed Pakistan as the 39th most vulnerable country and the 27th least ready' country in the world to address the impacts of climate change. This is borne out of the fact that in Fiscal Year (FY) 2020, 40% of households suffered from moderate to severe food insecurity[6] and therefore cannot absorb further climate shocks to food systems. While the extreme weather events often cause crop failures threatening food security, the increased temperatures, and variations in precipitation and monsoon patterns coupled with increased carbon, are resulting in decreased protein, zinc, iron, and quality of protein in crops. This results in decreased dietary protein causing malnutrition and stunting. The country is increasingly exposed and vulnerable to various natural hazards, particularly floods, tropical cyclones, droughts, landslides, Glacial Lake Outburst Floods (GLOFs) and earthquakes. More than 30 million people have been affected since 2010. The three sectors of the economy that are most at risk include the agriculture-food-water nexus, urban infrastructure, and the financial sector coupled with the government budget. In terms of human costs, the poor are the most vulnerable as they are the most reliant on agriculture, livestock, fisheries, forests and groundwater that is heavily degraded, and are the most directly impacted by natural disasters and slow onset of climate change.

[5] ND-Gain Index Available at: https://gain-new.crc.nd.edu/country/pakistan

[6] World Bank, 2021

CLIMATE CHALLENGE POSES FOLLOWING TWO CONCURRENT CHALLENGES TO PAKISTAN:

3.2. CLIMATIC IMPACT-DRIVERS (CIDS)

Slow-onset of Climate Change in Pakistan is reflected in changing weather patterns, particularly variations in precipitation and temperatures, glacial melt, sea level rise, loss of biodiversity, desertification and droughts. While Pakistan has experienced—on average—a 0.76 ºC rise in temperature, in some regions, the temperature increase has been higher than the national and global averages. The monsoon has begun to touch the upper reaches of the mountain regions including Chitral and Swat that are traditionally not in the monsoon range. Easterly winds from the Arabian Sea visit Balochistan more frequently with torrential rains. The increased temperatures and changes in precipitation have adversely affected the physical environment, weakened the carrying capacity of ecosystems, and increased the exposure to climate-induced disasters in both urban and rural settings. Since most of the poorest people live on marginal lands and in fragile ecosystems, they are often least prepared to manage multi-tiered challenges, or further increase in CIDs, as defined and analyzed in the Inter-governmental Panel on Climate Change (IPCC) 6th Assessment Report.

In upper Indus Basin, the CIDs are manifested in reduced snowfall and snowfall periods and increasing rains and decreasing glaciers, resulting in GLOFs. At the coastal belts of Balochistan and Sindh, the CIDs are observed in increased frequency and severity of tropical storms, coastal rains, and seawater intrusion. In the planes of Punjab and Sindh, CIDs manifest in extended and frequent riverine floods, heatwaves relevant to agriculture and health, coupled with increased aridity in arid and semi-arid regions of Balochistan, Sindh, and parts of Punjab. This is expected to accelerate as the temperatures cross the 1.5°C threshold. The degrading ecosystems have been costly for human health, adversely impacted water-agriculture, and the reduced productivity of ecosystems. These elements are important to understand the country's climate vulnerability and its long-term threats and contextualize adaptation and mitigation needs and measures. Finally, these gradual decadal processes are rapidly settling in, and in effect also cause sudden and abrupt extreme events, incurring immediate as well as long-term Loss and Damage (L&D).

3.3. COMPOUND EXTREME WEATHER EVENTS

The frequency and intensity of floods, heatwaves, landslides, and tropical storms has exposed a very high percentage of Pakistan's population to climate risks and rendered them vulnerable. Given high diversity of ecosystems in the country, compound extreme weather events, or a combination of their drivers and hazards are contributing to societal and environmental risks. Concurrent extreme events at multiple locations have become more frequent including in high latitude mountain areas of Karakoram, Hindukush, and Himalayas mountain ranges, as well as food producing agricultural areas. Communities and local populations have long observed and endured concurrent extreme events at different locations, often well before their validation by the scientists. Most frequent compound extreme events are heatwaves and droughts in parts of Balochistan and Sindh. Summer temperatures in the city of Jacobabad in Pakistan's Sindh

province have been recorded at 52°C . Biologically, humans cannot withstand heat beyond the threshold of 52°C. In fact, the Indus Valley is the number one spot worldwide in the context of climate change[7]. With increasing temperatures and frequent dry spells, compound extreme events are characterized by torrential rains, flash floods and landslides.

While the precipitation has increased at an average rate of 0.08 inches per decade since 1901 worldwide, in Pakistan some dry areas have become drier as they have experienced less than normal precipitation. Further, many extreme temperature conditions are becoming more common since the 1970s: hot summer days and hot summer nights, the latter at an even faster rate than the former, indicating less respite or 'cooling off' at night. Both mean and maximum summer temperatures increased in all parts of the country between 1951 and 2000, while summer temperatures dropped in all parts of the country, receiving monsoon rains in all provinces except in Balochistan. Record-setting daily high temperatures have become more common than record lows. The two decades since 2000 had twice as many record highs as record lows. Generally, a stronger warming trend in the winter is observed as opposed to the summer, with winter growing shorter and summer growing longer. The minimum temperature every summer has been increasing in central regions of Pakistan. The variations in precipitation continue to increase in geographic regions like Sindh, Gilgit Baltistan (GB) among other areas, and have begun to have implications for the future of the country's food security. The temperature increase in a majority of districts results in reduced agricultural productivity. It is expected that both the temperature and precipitation will continue to grow through the 2050s.

In response to the need to build resilience, the GoP has accordingly undertaken and planned several key actions, as recorded below in chapter 4 and 5.

In addition to the factors stated above, there are significant socio-economic dimensions and economic costs of climate change:

3.4. SOCIO-ECONOMIC DIMENSIONS

With the current population estimated to be 220 million, Pakistan is the fifth-most-populous country of the world, growing at a rate of 2.4% per annum. Pakistan emits 2.4 tonnes of CO_2 equivalent per capita, and occupies the 19th position globally, and 3rd regionally in emissions. The population will be 229 million by 2025 and approximately 338 million by 2050, with business as usual (BAU), leaving 2.9 tonnes of CO_2 equivalent per capita emissions by 2025 and 5.4 tonnes of CO_2 equivalent per capita emissions by 2050.

Demographically, Pakistan is a young country, with a projected population of young people reaching 181 million by 2050 with an estimated four million entering the working age every year. This poses significant challenges. Nearly 29.5% of the total population is living below

[7] The first recording was made in July 1987, then in June 2005, followed by a rise in June 2010 and July 2012. The ultra-heat had only persisted for a few hours, with the three-day average temperature under wet bulb measurement for the summer months of 2010 and 2012 at 34 degrees Celsius.

the poverty line, and unemployment is reported to be 4.7%. The situation worsened with the advent of the Covid-19 pandemic. The Ministry of Planning Development & Special Initiatives (MOPD&SI) estimated that 12.3 million (20% of employed labor force) to 18.5 million people (30% of the labor force) was rendered unemployed due to the pandemic.

Pakistan largely remains an agrarian country. According to the Economic Survey of Pakistan year 2020- 2021, agriculture has a 19.2% share in the GDP and accounts for 60% of exports, providing livelihood to about 68% of the country's population living in rural areas, and employing 45% of the national labor force. Adverse impacts of climate change are the major causes of losses in livelihoods, productivity, and human and livestock health. Agriculture sector is highly dependent on water, and climate change is becoming the major cause of water uncertainty that leads to agriculture loss and food insecurity.

At an average economic growth rate of 4.8% from 1952 to 2020, current GDP stands at nearly US$ 284 billion. This classifies Pakistan as a lower middle-income country. The State Bank of Pakistan (SBP) has estimated that the real GDP has contracted by 0.4% in the fiscal year 2019-20, making it the first time since 1951 that the country recorded a negative economic growth. This was mostly due to the coronavirus pandemic and its adverse effects on business activities. The revised Nationally Determined Contribution (NDC) submission has been prepared cognizant of the current socio-economic challenges posed by the Covid-19 pandemic, and highlights the country's contribution for green economic recovery.

3.5. ECONOMIC COSTS

Some preliminary sectoral studies have been carried out regarding direct economic costs of climate change. National Flood Protection Plan IV (NFPP-IV), for example, estimates that the cost of flood disasters has ranged around US$3.32 billion per year, depending on the frequency and intensity of floods. Pakistan is said to be spending 5.8–7.6% of total federal expenditures on climate change, (or about 11% combined on adaptation and mitigation), according to a multi-country study by United Nations Development Programme (UNDP) in 2015. Overall, Pakistan's adaptation needs in 2016 were placed in the range of between US$ 7–14 billion per annum to 2050. This estimated that 70% of this amount was primarily due to infrastructural costs.

Sectoral studies still need to be undertaken to accurately estimate increased costs of development, infrastructure upgradation based on resilience frameworks and building codes, or reduction in crop yields and agricultural productivity. The comprehensive specialized economic analysis of adaptation costs of climate change-induced extreme events based on any projected increase in the frequency of extreme climate events under various temperature increase scenarios and trajectories still need to be undertaken.

CHAPTER 4

MITIGATION: EFFORTS, ACHIEVEMENTS, & NDCs

Pakistan seeks to contributing towards global mitigation efforts without compromising on its growth and development pathways. As highlighted in the Nationally Determined Contribution (NDC) submitted in 2016, Pakistan's top priority remains social development and poverty eradication. We recognize that large-scale investments in high emission sectors can also provide additional opportunities for mitigation potential. However, constraints in technology transfer and climate financing mechanisms have remained barriers.

Pakistan has surpassed mitigation contributions and has taken climate change beyond NDCs, and taken initiatives that have contributed to reduction of 8.7% emissions between 2016-2018.

4.1 POLICY INITIATIVES

i. **Energy Demand and Supply Management:** According to the Pakistan Economic Survey 2019–20, the country is facing demand-supply gap of 3000 Mega Watt (MW) that can best be fulfilled by improving energy-mix. For the demand side management, the Government of Pakistan (GoP) has approved National Electric Vehicles Policy 2020-25 (NEVP 2019) stipulating a target of 30% and 90% share in sale of passenger vehicles and heavy-duty trucks by 2030 and 2040. Also, National Energy Efficiency and Conservation Authority (NEECA) is developing Minimum Energy Performance Standards (MEPS) for electric motors, air conditioners, and LED lights. NEECA's Draft Strategic Plan (2020-2023) will reduce 3 Million Tonnes of Oil Equivalent (MTOE) from the country's primary energy supply contributing to 6.4 $MtCO_2e$ carbon emissions reduction. More importantly, however, the GoP endeavors to meet the demand with the Indicative Generation Capacity Expansion Plan (IGCEP 2021-30), National Electricity Policy (NEP) 2021, and Alternative and Renewable Energy Policy (ARE 2019), included together with hydropower, to prioritize transition to demand side management.

ii. **Engaging Private Sector:** The GoP has engaged the private sector for energy supply. For

example, a Result Based Financing (RBF) pilot project in Sindh and Punjab was initiated in 2019 in order to encourage private sector investment for off-grid solution based on the International Finance Corporation's (IFC) global standard products in off-grid communities. A four-year campaign has been launched to encourage private sector investment towards the lighting needs of consumers in the remote areas, including the addition of 1200 MW of wind.

iii. **Coal Consumption Trends:** In Pakistan, coal consumption has tripled over the last five years to 21.5 million tonnes/year to meet the growing demand from industry, and the start of coal power production from 2018. Whereas, coal import has increased upto five-fold in the last five years, primarily for industrial purposes - around 73%, of which the cement sector constitutes 65% of industrial coal consumption. The relatively high economic growth until 2018 led to increase in cement manufacturing and pushed cement production forecast to grow 10-15% annually over the next decade. This is an additional production of estimated 15-25 Million Tonnes (MT)/year by 2030. The share of power generation from coal was 24% in FY21 and is expected to increase to 31% by FY 25 due to committed plants, but will then decrease to 20.1% by FY30. The estimates are that the increase in coal consumption by power sector will only be 6 MT by 2030. Financially viable coal power exists only from lignite mining in Thar region of Sindh Province.

iv. **Energy Mix Projections:** Pakistan has an estimated hydropower potential of around 60,000 MW, out of which approximately 14% is currently exploited. Pakistan has an average theoretical solar photovoltaic (solar PV) potential of 5.341kWh/m²Global Horizontal Irradiation (GHI) requiring only 0.071% of Pakistan's total land area, mainly in the Balochistan province. If this potential is utilized, all of Pakistan's current energy needs can be met with solar power alone. Pakistan also has a significant untapped potential for wind power generation, mainly in the coastal areas of Sindh and Balochistan. The share of renewables in recent years has increased significantly from 0.25% in 2015 to 5% in 2019[8], and the potential for several-fold growth is tremendous.

There is a strong business case for meeting targets set in the Alternative and Renewable Energy Policy (ARE) 2019 for RE growth. The ARE 2019 mandates 30% solar, bagasse and wind by 2030. Yet, the most recent 'Indicative Generation Capacity Expansion Plan' stipulates that the energy mix should have 65% RE (hydropower, solar, wind and bagasse) by 2030, reversing the large dependence on imported fossil fuel. Given the system constraints, solar and wind will only begin to accelerate after 2030 in Pakistan. The new NEP 2021 includes principles of competitive bidding, environmentally responsible expanded generation through RE and more efficient use of generation.

Against this backdrop, achieving the least cost electricity mix in Pakistan would require an

[8] https://www.s-ge.com/en/article/export-knowhow/20213-c5-pakistan-renewable-energy. According to IGCEP, however, it is 3% in annual power generation. The Regasified liquefied natural gas (RLNG) based plants, though installed and available are envisaged to have a decreasing share in the energy mix from 2021 to 2030 i.e. from 18% to 2% in 2025 and then eventually falling nearly to 0% in 2030. Similar trend is there for imported coal-based plants whose contribution in the overall generation mix falls from 21% in 2021 to only 9% by the year 2030. Moreover, the share of solar and wind in the overall energy mix increases from about 3% in 2021 to 16% in 2030.

ambitious expansion of RE, reaching proposed production levels by 2030 in the base case scenario (4.02% peak demand growth). Hydropower development in Pakistan is critical for the energy transition as it can even out the volatility of high shares of solar and wind. It is estimated that 42% of total installed capacity in 2030 will be hydropower in the base case scenario. Large number of projects are focused on clean hydropower, where more than 12 GW are under construction. In theory, an even higher variable renewable energy share is possible, allowing Pakistan to be close to 100% no-carbon but at a highly unaffordable cost, as transitioning to the proposed energy mix will require investments in the grid, changes to operational procedures, and proper planning of Variable Renewable Energy (VRE) expansion with storage facilities.

4.2 MITIGATION ACTIONS

With respect to the Pak-NDC (2016) mitigation options, the following progress was made during Financial Year 2018-2021:

i. **Policy Environment:** Recognizing that the energy sector plays a critical role in achieving mitigation targets, the policies that guide Pakistan's initiatives include NEP 2021, Energy Efficiency & Conservation Strategic Plan by NEECA, ARE 2019, NEVP 2019, and IGCEP 2021-2030. These policies are coordinated and steered by regulators and specialized agencies including National Electric Power Regulatory Authority (NEPRA), Private Power & Infrastructure Board (PPIB), Alternative Energy Development Board (AEDB), Central Power Purchasing Agency Guarantees (CPPA-G), National Transmission & Dispatch Company (NTDC), Water & Power Development Authority (WAPDA), and Pakistan Atomic Energy Commission (PAEC). There are specialized agencies at the provincial level dealing with hydro and coal generation and transmission issues.

ii. **Wind Power Projects:** About 18 wind power projects of 926.76MW capacity were completed. Twelve wind power projects with a cumulative capacity of 610 MW achieved financial closing in November 2019 .

iii. **Bagasse energy:** Eight bagasse cogeneration projects of 259.1 MW capacity were completed.

iv. **Solar Power Projects:** Five solar projects are operational with installed capacity of 330 MW; four projects by Independent Power Producers (IPPs) with 41.80 MW capacity are expecting financial closure.

v. **Hydropower:** Small hydro are contributing 128 MW, while 877 MW are under implementation and 1500 MW are available for development. Medium to large hydro project of 9,827 MW are installed.

vi. **Net-Metering:** More than 2,300 new licenses were issued by NEPRA during July 2019-March 2020 under its Net Metering Regulations (2015); poised to grow at an accelerated pace, as of March 2020, more than 4,125 solar installations with

cumulative capacity exceeding 75 MW were approved[9].

vii. **International Finance Corporation (IFC) Lighting Pakistan:** A four-year campaign to encourage private sector investment towards the lighting needs of consumers in the remote villages in Pakistan. The program introduced IFC global standard products in off-grid villages.

viii. **Off-Grid Electrification Pilot Project:** The AEDB undertook a RBF pilot project in Sindh and Punjab to encourage private sector investment for off-grid solar solutions in remote villages. The IFC program was completed in 2019 with 7.5 million people served in Sindh, Punjab and GB. The Internationale Zusammenarbeit (German International Development Agency – GIZ) undertook a small-scale RBF project serving limited number of villages in Punjab and Sind. Based on the initial success, Sindh has started a partial RBF program for electrifying 200,000 households. This project is expected to lead to a full-fledged program in 2021. The microgrids are being considered for electrification of remote communities. NEPRA will notify enabling regulations for these.

ix. **Sustainable Energy For All (SEforAll) National Action Plan 2019:** AEDB was mandated to achieve renewable energy targets whereas the energy efficiency targets were mandated to NEECA. This plan targets to – double renewable energy share -and double to energy efficiency rate by 2030. Policy also targets cooking fuel practices in Pakistan with a plan to introduce alternate sources for cooking to a total of 14.03 million households by 2025.

x. **National Electric Vehicles:** Policy for two and three wheelers as well as heavy vehicles will target a 30% shift in sale of EVs by 2030. Pakistan follows the European (Euro) emissions standards, and while the recent switch to Euro 5 still has a limited share of the market, it is expected to have long-term benefits in terms of urban air quality and lowering vehicular emissions from combustion.

xi. **Bus Rapid Transit (BRT):** System has been introduced in five cities—Islamabad, Lahore, Peshawar, and Multan, while a bus rapid transit zero emission metro-line was initiated in 2018 for the city of Karachi. Presently under implementation, the project which will also turn cow-dung to methane as a fuel for the metro-line is under implementation. The 30 km metroline would be the world's first bio-methane hybrid bus fleet where 100% of the fuel demand would be met by biogas. The project will last for an estimated 20 years piloting emission free public transport services. A 40 km Karachi Circular Railway is under development to provide mass transportation while reducing emissions in the city.

[9] Net-metering rules allow DISCOs to balance the units consumed by consumer, from the grid, against the excess unit sold to them. With more than 2,300 new licenses issued during July 2019-March 2020, these installations stand at cumulative installed capacity of 47.6 MW in 2019. This contribution thus far accounts for only 0.12% of total energy mix. As of May 2021, there were 11121 commissioned systems.

In terms of emissions, with 21% increase since 2015, six key sectors and the policy actions taken by Pakistan can be summarized in the following table:

Table: 4.1: Mitigation Policy Action in Six Sectors

GHG Emission	Policy Initiatives	Plans and Targets
Energy		
Biggest source of GHG emissions in Pakistan with 218.9 MT CO_2 eq. in 2018	ARE Policy (2019)	The policy sets the specific target of at least 20% RE generation by 2025 and at least 30% by 2030
	NEECA Draft Strategic Plan (2020-2023)	Sectoral actions account for 6.4 MtCO_2e emissions reduction by 2030
Transportation		
Major energy demand sector contributing to GHG emissions of 51.3 MT CO_2 eq. in 2018	NEVP 2019 for two and three wheelers as well as heavy vehicles	The policy sets the specific target of at least 20% RE generation by 2025 and at least 30% by 2030
	Switch to Euro 5 (in process) Improve Air quality	Goal is to lower vehicular emissions from combustion and improving urban air quality Improve air quality standards as well as monitoring in provincial capital and other major cities
Agriculture		
Second highest emitting sector with 198.59 MT CO_2 eq. in 2018	Punjab Smog Policy (2017)	Complete ban on open burning of rice stubble, solid waste and other hazardous materials Disposal of crop residue in an environmentally friendly manner
	Climate Change Policy Azad Jammu & Kashmir AJ&K (2017)	Climate Change Action Plan (2019–2030)
Industrial Processes		
Third largest emitting sector which releases 25.76 MT CO_2 eq. in 2018	Pakistan's National Action Plan on Sustainable Development Goal-12 (SDG-12) (2017)	Mitigation measures to encourage adoption of clean production technologies, implementation of eco-standard, incentivize carbon trading between industries to limit the production of GHGs Promote bottom up actions by private sector, and develop plans for emissions reductions form major sectors particularly cement and textile

LULUCF		
Fourth GHG emitting sector calculated to be 24.86 MT CO_2 eq. in 2018	National Forest Policy (2018) Land Degradation Neutrality (LDN)	Conserve existing forests, increase tree cover through community participation, and meet international obligations related to forests Identify policy priorities for protecting soil quality for nutrition and micronutrients and piloting approaches on LDN in various ecosystems.
Waste		
Ranked lowest emitting sector in Pakistan that contributes 21.72 MT CO_2 eq. to total GHG emissions in 2018. Methane is the major component with a share of 19.2 MT CO_2 eq.	Clean Green Pakistan Index (CGPI–2019) Banning of single-use plastics	Strengthening municipal service delivery by the local governments. Includes a composite index of five pillars i.e. water, sanitation, hygiene, solid waste management and plantation Encourage turning animal waste (cow-dung) to methane for use as fuel for rural household and urban transportation projects as in Karachi BRT. Promote reuse and source reduction of waste

4.3 CONTRIBUTION TO MITIGATION

While reviewing mitigation options and devising any low-carbon growth strategies, the following overarching sectoral considerations need to be adequately addressed

1. **Energy Demand:** While Pakistan's supply and demand gap has considerably narrowed since 2016, more than 40 million people still remain without access to electricity. Access to energy and generation capacity influences the future investment and licensing of hydropower projects. Off-grid and RE resources have emerged as the least cost preferred option to overcome the energy access challenge.
2. **Carbon Lock-in:** Several coal power plants have become operational since 2016, including the 1,320 MW Sahiwal Coal Power Project. The share of coal power in Pakistan's energy mix is small, and as under-construction hydropower projects become operational this ratio will further improve.
3. **Just Transition:** The introduction of EVs has provided an opportunity to switch fuels for two and three wheelers as well as light commercial transportation in order to ensure continuity of their livelihoods and a just transition for them and their communities. Since the fossil fuel industry is a major employer of local communities[10], any plans for phasing out fossils from the economy require sectoral planning, based on technical studies.

[10] In 2018, the Fuels sector grew by approximately 52,000 jobs, or nearly 5% for a total of 1,122,764 jobs. Oil and natural gas employers added the most new jobs, nearly 51,000, employing 603,000 and 271,000 respectively. Including hydropower

The following table outlines the key sectors along with the overarching objective and supporting actions as contributions towards mitigation.

Table-4.2: Overarching Mitigation Objectives & Supporting Initiatives

Objective	Supporting Actions	Lead Organization	Potential Indicators	Goals
To ensure efficient, affordable and renewable energy supply	Increase in grid efficiency and transmission infrastructure	NTDC	Annual improvement in energy efficiency	Increase energy efficiency with combined sectoral targets to achieve a total of 1.5% annual improvement in energy efficiency
	Mechanisms for grid flexibility and greater integration of VRE	NTDC	Number of RE options explored	At least 20% RE generation[11] by 2025 and at least 60% by 2030
	Improvement in coal efficiency and exploration of green coal technologies	Ministry of Energy (MoE) – Power Division	Number of green coal technologies identified	
	Large scale and distributed grid connected solar, wind and hydroelectricity	AEDB	Ratio of energy mix	

[11] Including hydropower

	Support the deployment of ARE technologies: 1. Promoting innovation and technology transfer to ensure availability of renewable technology at reduced costs (including offshore) 2. Onshore large-scale wind and solar projects	AEDB	Number of low-cost renewable options explored Percentage increase in RE generation	
	Exploration and development of storage technologies to tackle RE intermittency	AEDB	Number of options proposed for RE intermittency	
	Utilizing other alternative energy sources for generating electricity	AEDB	Percentage of electricity generation from alternate sources	Transition from biomass to electricity in 15% of households by 2050
	Research and development programs for carbon capture and sequestration	Ministry of Climate Change (MoCC), GCISC	Number of research reports developed for policy uptake	
Improve mechanisms and procedures to provide for effective conservation and efficient use of energy	Efficient irrigation motors/pumps (electric), fans, boilers/furnaces, stoves, water heaters and LEDs, etc.	NEECA	Annual improvement in energy efficiency	Increase energy efficiency with combined sectoral targets to achieve a total of 1.5% annual improvement in energy efficiency

Green Building codes and certification for new and refurbished buildings, including revolving guarantee mechanism for energy efficient appliances	NEECA	Energy efficient building codes notified Number of buildings certified Revolving guarantee mechanism operationalized	At least 20% RE generation[12] by 2025 and at least 60% by 2030
Mandatory energy audits of large energy consuming industries and companies	NEECA	Number of energy audits conducted	
Explore and adopt cap and trade schemes and carbon levies to manage industrial emission efficiency	MoCC	Reduction in industrial emissions	
Promotion of Energy Standards and Labeling (ESL)	NEECA	Audit reports on enforcement of standards	

[12] Including hydropower

	Tax exemptions for hybrid and EVs	Ministry of Industry (MoI)	Number of vehicles purchased	30% shift to electric passenger vehicles and 50% shift to electric two/three wheelers and buses by 2030 90% shift to electric passenger vehicles and 90% shift to electric two/three wheelers and buses by 2040
	Establishing recharging network for EV adoption	MoI with MoE	Number of charging stations	
	Transition to Euro 5	MoE (Petroleum Division)	Reduction in air pollution	
Promote climate smart inputs and management practices in agriculture and livestock management	Improve irrigation practices and water management	Provincial agriculture department	Reduction in drop per crop	
	Climate resilient agriculture/ agroforestry practices	Ministry of National Health Services, Regulation & Coordination (MoNHSR&C)	Number of farmers trained on farming techniques	
	Introduce climate resilient seed varieties	MoNHSR&C & Provincial Departments of Agriculture (DoAs)	Number of crop varieties developed and piloted	
	Promotion, storage and management of green manure	MoNHSR&C & DoAs	Area of land using green manure	
Promote energy efficient practices in industries	Ensure the provision of gaseous fuels at cheaper rates		Reduction in prices for energy efficient fuels	

	Introduce and practice Polluter Pays Principle (PPP)		Number of industries audited	
	Introduce Refrigeration and Air Conditioning (RAC) standards, and labels	NEECA	Standards and labels notified	
	Switching to zig-zag Brick kiln technology to mitigate SLCP	Provincial departments	Number of units switched approx. 10,000	
	N_2O abatement from nitric acid plants at comparatively low cost that accounted for 5.1% of the total Industrial emissions in 2015	• Nitric and fertilizer productions plants • Provincials EPAs & regulatory agencies, National Fertilizer Corporation, and academic institutes.	Number of plants converted to low emitting technology and selling their credits in the open market	Reduction of 0.9% of the total Industrial emissions for 2030 after the strong growth in this sector
Promote conservation and sustainable management of area under cover	Mass afforestation through the involvement of government agencies, provinces, local governments and non-state actors	MoCC and provincial forest department	Area afforested or number of new plants planted	1 million ha afforested
	Conservation and management of existing forests by controlling deforestation, protecting forest reserves, and controlling other anthropogenic disturbances	Same as above	Increase in forest cover	
	Conservation and restoration of mangroves, peatland ecosystems, and coastal & marine ecosystems to reduce emissions and revive natural carbon sink	Provincial forest department	Increase in restored area as carbon sink	

	Maintaining forest inventories and increasing capacity for monitoring and modeling carbon changes	MoCC, GCISC and provincial forest department	Annual forest inventory reports	
	Encouraging private investments in farm forestry	MoCC and provincial forest department	Number of private investments	
	Develop a comprehensive management system for protected areas including coastal wetlands	MoCC	Number of management plans generated	
	Establishment of a transboundary ecological corridor	MoCC	Number of ecological corridors established	
Promote 3Rs and improve waste management practices	Enacting by-laws on land use (landfills, sewage treatment plants and power plants, waste-to-energy schemes and recycling)	Provincial department	Number of laws enacted	
	Infrastructural development for waste collection, transfer stations and treatment facilities	Same as above	Number of operational waste treatment facilities	
	Promoting a culture of recycling and reuse	Same as above and Environmental Protection Agency (EPA)	Reduction in waste generation	
	Installation of hospital and other on-site waste incineration devices	Provincial department	Number of onsite waste management facilities	
	Material Flow Analysis to generate the evidence on plastic waste management	MoCC	Number of studies conducted	

CHAPTER 5

ADAPTATION: EFFORTS, ACHIEVEMENTS & THE NDC

Adaptation will be a central pillar to manage risks from climate impacts, protect communities, and strengthen the resilience of the economy. National Climate Change Policy (NCCP) has adopted an integrated approach to build resilience in various climate sensitive sectors, and to ensure a comprehensive response at both national and sub-national levels. Pakistan will continue to strive to make considerable progress in various sectors as per the following approach:

5.1 POLICY INITIATIVES

Agriculture is the backbone of Pakistan's economy, providing livelihoods and food security. Unfortunately, this sector is also the most impacted from climate variabilities as seen in the section on Climate Impact Drivers (CIDs) and compound extreme weather events. The crop yields over recent years have adversely been affected by changing climate patterns and associated shocks. The already strained water availability is expected to worsen over the coming decades, with water demand projected to rise significantly with rising population and warmer temperatures. Agriculture sector is also the largest consumer of freshwater, accounting for 95% of total withdrawals. The four major crops that account for 80% of this share include high water consumption and low value crops such as rice and sugarcane. It is estimated that the country loses 4% of its GDP to inefficient water use in agriculture. Hence, to ensure long term water and food security of the country, Pakistan needs to significantly boost water efficiency and agriculture productivity.

The development of a National Adaptation Plan (NAP) has commenced as was envisioned during near-term (2020-2025) targets of Nationally Determined Contribution (NDC) 2016, in order to create a framework for guiding the mainstreaming of medium and long-term climate change concerns into national sectoral policies, strategies and programs for coordinated approach between different tiers of government. The NAP aims to bestow trust in nature's ability to

recoup and regenerate itself by investing in ecosystems as a means of forced adaptation measure. The GCF support through United Nations Environment Programme (UNEP) for the development of NAP will help achieve the objectives through:

i. Strengthening the capacity to coordinate and promote climate change adaptation (CCA) at systemic, institutional and individual levels, and help poor and climate vulnerable communities to adapt to climate change impact;

ii. Integrating CCA into policies, strategies, legislation, regulations, and programs;

iii. Strengthening of a system to generate and share knowledge, experience, and lessons learned at national and sub-national levels to advance CCA; and

iv. Development of a strategy to implement, monitor, and communicate adaptation benefits at different levels, and scale up government efforts in adaptation efforts, and process of regularly updating NAP.

Since almost half of Pakistan's greenhouse gas (GHG) emissions are from agriculture, livestock, and Land Use, Land-Use Change and Forestry (LULUCF), the NAP will also propose strategies, and targets where possible, to reduce emissions from these sources. The medium- to long-term actions (up to 2030) proposed in the NDC 2016, recommended a long list of goals. Many of them were followed in various projects. Additionally, several projects were mobilized in forestry and agriculture-water as well.

LULUCF are responsible for half of Pakistan's GHG emissions in the First National Communication, now combined and bracketed with agriculture in the Second National Communication. The Government of Pakistan (GoP) has, therefore, prioritized three environmental areas for priority actions: Nature-based Solutions (NbS), Land Use Change & Forestry, and Community Infrastructure. These interventions are aligned with NCCP and NDC 2016, and indicate centrality of adaptation and resilience. Accumulatively, these interventions will enhance the adaptive capacity and resilience while giving several socio-economic, health and mitigation co-benefits.

5.2 ADAPTATION ACTIONS

1) Nature-based Solutions

i. **Eco-system Restoration Initiative (2019-2030):** Mainstream adaptation and mitigation through ecologically targeted initiatives for afforestation, biodiversity conservation/ecosystem rehabilitation, and policy development by restoring 30% of degraded forest, 5% of degraded cropland, 6% of degraded grassland (rangeland) and 10% of degraded wetlands by 2030. Further, setting up a transparent Eco-system Restoration Fund (ESRF) to finance the initiatives under the Ecosystem Restoration Initiative (ESRI).

ii. **Protected Areas Initiative (2020-23):** Expanding the coverage of protected areas from 12 to 15% of the total land area by 2023, at an estimated cost of Rs. 3.9

billion, by notifying 15 new national parks covering a land area of over 7,300 square kilometers. The government will implement ecological management plans and governance through community-led conservation funds.

iii. **Reduced Emissions from Deforestation and forest Degradation-Payments for Environmental Services (REDD+PES) (2020-49):** Protecting critical mangrove forests in Sindh and Balochistan, and raising new plantations of mangroves over an area of 16,552 ha for climate mitigation, biodiversity conservation, and strengthening local livelihoods of fisheries and eco-tourism.

iv. **Miyawaki Forests (2019-ongoing):** Small urban forests, as pilot projects, in several cities for mitigating urban heat island effect through native tree species that grow faster, sequester more carbon and are self-sustaining. Presently, 126 urban forest projects using the Miyawaki technique are being implemented across the country, with 51 in Lahore, 50 in Khyber Pakhtunkhwa, 20 in Islamabad and five in Karachi.

v. **Recharge Pakistan (2019-in pipeline):** Building resilience to climate change through Ecosystem-based Adaptation for Integrated Flood Risk Management by identifying flood vulnerable areas where adaptation strategies could be most effective. The project aims to utilize floodwater for restoring wetland ecosystem and recharging its aquifer. The project would possibly impact around 10 million vulnerable people through reduced flood risks, increased water security, improved agricultural productivity and food security, community-based disaster risk management (CBDRM), and climate-resilient livelihood options. The project objectives require an investment of US$150 million (US$50 million requested from Green Climate Fund) in deployment of climate resilient infrastructure.

vi. **Ten Billion Tree Tsunami Programme:** This four-year flagship national program (2019-2023) will increase the existing forest area. During phase one, 3.29 billion plants will be planted and/or regenerated to restore nine different forest categories over an area of 1.2 million hectares by 2023. During phase two, 750 to 850 million plants/ year will continue over the next six years up to 2030. This initiative builds upon the success story of the Billion Trees Afforestation Project (BTAP) that was implemented in the Khyber Pakhtunkhwa (KP) province during 2015-2020, whereby 1.2 billion trees were planted/ regenerated during 2014–2018 period at cost of Rs 14 billion. An investment of approximately US$125 million was directed towards the project from provincial resources. This project increased KP's forest area from 20.3% to 26.6%. It is expected to result in total carbon sequestration of 0.04 $GtCO_2e$. United Nations Framework Convention on Climate Change (UNFCCC), United National Environment Programme (UNEP), UN Convention to Combat Desertification (UNCCD), the Bonn Challenge, and other international organizations such as the World Economic Forum acclaimed the ambitious project. For Pakistan, it has made way for Bonn Challenge II.

vii. **Transforming the Indus Basin with Climate Resilient Agriculture and Water Management (2019-2026):** This US$47.7 million project will disseminate information and utilize state of the art technology to build the country's capacity to adapt to climate challenges in agriculture and water sectors. The project envisages enhancing farmer's resilience to climate through skill and capacity development.

2) Land Use Change and Forestry

i. **Sustainable Land Management Project (SLMP Phase II, 2015-21):** Rehabilitated approximately 10,000 acres of land, 5000 acres of plantations, and 15,000 acres of land receding. For FY 2020-21, 800 acres of plantation, 4500 rangeland rehabilitation, 30 gated structures, and 5000 acres rangeland receding have been planned.

ii. **Sustainable Forest Management (SFM, 2016-21):** Regeneration and management of seven forest landscapes spreading over 145,300 hectares; temperate coniferous forests in Khyber Pakhtunkhwa, dry scrub forests in Punjab, and riverine forests in Punjab and Sindh.

iii. **National Forest Policy (2018):** For strengthening the long-term objectives related to forestry sector, the policy has a three-pronged approach: a) conserve existing forests, b) increase tree cover through community participation, and c) meet international obligations related to forests. By 2030, Pakistan plans to increase forest area from 5.4% to 6.5%.

iv. **REDD+ Readiness Preparation Proposal (R-PP, 2015-2021):** Extended by Forest Carbon Partnership Facility (FCPF) in 2018 to further support the preparedness activities in Pakistan. Forest Reference Emission Level or FREL of Pakistan was submitted to the UNFCCC and the National REDD+ Strategy is presently being finalized.

v. **National Biodiversity Strategy and Action Plan (NBSAP, 2018):** To conserve forest biodiversity and its sustainable use by providing an enabling institutional and policy environment, protection and restoration of forest ecosystem services, increasing indigenous floral diversity; improving knowledge base by adopting scientific research and modern technologies relating to forest biodiversity, and reform the rights and concessions of local people.

vi. **REDD+ Indus delta (2019-2030 Delta Blue Carbon Phase I):** Restoring 350,000 ha in the Districts of Thatta and Sujawal in Sindh province through plantation in 60 years via a multi-phase public private partnership. Phase 1 aims at restoration of 224,997 ha of degraded land through large scale reforestation of which 75,000 ha was restored by 2020 with mangrove plantations.

vii. **Restoring mangrove forests (1990-ongoing):** Under voluntary plantation drives,

Pakistan has annually increased at an annual growth rate of 3.74%, making Pakistan the only country in the region with an expanding mangrove cover. Over four million mangroves were planted under various partnerships, involving public and private sectors as well as Civil Society Organizations (CSOs). Under TBTTP, Sindh province has planned a plantation of 1.5 billion trees, mainly in mangrove areas. Preservation of mangrove forests will be used for carbon capture and to develop resilience against seawater intrusion and tropical storms. In Balochistan, 1,200 ha have been added over the years.

viii. **Sustainable Consumption and Production National Action Plan (SCP-NAP, 2017):** The SCP-NAP aims to accomplish SCP targets pragmatically and systematically as delineated in SDG 12. This NAP document acts as the guiding beacon for promoting the efficient use of resources, minimizing the unsustainable patterns of production, assuring food security and modern infrastructure that resulted in the socio-economic development, better regional connectivity and healthy ecosystem of Pakistan. In continuation of the efforts, a comprehensive strategy is being developed that details the roadmap through identification of relevant indicators to develop a system for monitoring and reporting eventually creating an operational manual for a watch for meeting NAP-SCP related goals.

ix. **Natural Capital Accounts:** Pakistan has signed a letter of support with the UK Statistics Authority to develop guidelines for Natural Capital Accounting system for Pakistan. In addition, Ministry of Climate Change (MoCC) in the recent development in partnership with the World Bank is formulating Natural Capital Account Roadmap that can provide detailed plan for better management of the economy. The outcome will help the government to design the evidence-based national forest policy and plans, improve institutional framework and help design and monitor strategies for implementing Sustainable Development Goals (SDGs).

3) Community Infrastructure

i. **Glacial Lake Outburst Flood II (2017-2022):** Scaled up GLOF I from two districts to 10, and initiated the revision of two policies to include GLOF risk reduction, provide early warning signs to target communities for appropriate actions, scaling up monitoring systems, and deploying 250 small-scale engineering structures to reduce effect of GLOF on local livelihoods. This will help strengthen resilience of communities that are likely to be affected by GLOF.

ii. **Pakistan Snow Leopard and Ecosystem Protection Program (PSLEP, 2018-2023):** At least 1,500,000 hectares of critical snow leopard habitat effectively managed under integrated participatory management landscape approaches, and 4,000 households benefitted from sustainable resource management approaches.

iii. **Clean Green Pakistan Index (2019):** Created a platform for strengthening municipal services, based on a composite index of five pillars—water, sanitation, hygiene, solid waste management, and plantation. Aimed at encouraging local governments and citizens to enhance cleanliness and hygiene in their respective cities and ensuring local representation and participation and knowledge-based practice among communities. Piloted in 12 cities of Punjab and seven cities of KP to compete in strengthening municipal service delivery by the local governments, and upscaled to 93 cities from all provinces in 2020–2021 in order to spark the public's interest in learning about effective waste management, self-hygiene, and the importance of forest cover.

iv. **Piloting the Ban of Single-use Polythene Bags in Islamabad (2019-ongoing):** Engaging and encouraging the residents to use reusable bags achieving source reduction and minimize plastic bag littering in the city by imposing a ban on single-use polythene bags.

v. **Green Stimulus (2020):** Providing short-term relief in the shape of green jobs creation and livelihood under TBTTP post Covid-19 economic downturn by employing 84,609 daily wagers towards achieving a total plantation of 430 million during 2020.

vi. **Pakistan Hydromet & Climate services project (2018-24):** Strengthening Pakistan's public sector delivery of reliable and timely hydro-meteorological and disaster risk management services to enhance community risk to shock.

Finally, ESRF was launched to serve as a financial mechanism for mobilizing resources and to facilitate Government Pakistan's climate compatible development policies. In pursuance of the foregoing, Pakistan will undertake the following policy actions:

Table 5.1: Strengthening Policies, Strategies and Action Plans

Supporting Policy Actions	Lead Agency	Proposed Completion
Cross-Sectoral		
Climate Change Act established: 1. Pakistan Climate Change Council 2. Pakistan Climate Change Authority 3. Pakistan Climate Change Fund PM's Committee on Climate Change was established and met four times to discuss the issues of climate change.	MoCC	2022

National Adaptation Plan is developed, National Climate Change Policy revised, and the Framework for the implementation of NCCP developed after consultation with all relevant national and provincial stakeholders	MoCC, GCISC	2023
National Climate Change Gender Action Plan (ccGAP)	MoCC	2022
Provinces prepare their provincial climate change policies/action plans/strategies	MoCC in collaboration with provinces	2024
Climate proofing risk assessment will be carried out for new public/private sector finance projects	MoCC in collaboration with federal and Provincial Departments	2024
Climate screening appraisal mechanism will be established and implemented for public/private funded projects	MoCC in collaboration with federal and provincial departments	2024
Climate proof development schemes estimated an upward to US$22 per annum, according to estimates by NDC Adaptation Committee to ensure that adaptation consideration is adhered to	MoCC Federal Flood Commission (FFC), and NDMA	2025
Developing a Pakistan Cooling Action Plan (PCAP) which will identify the key cooling needs and prioritize actions for addressing current and future cooling demands with the minimum possible impact on the environment	MoCC in collaboration with NEECA and federal and provincial departments	2026
Disaster Management		
National Multi-Hazard Vulnerability and Risk Assessment (MHVRA) undertaken at district level	NDMA and Provincial Disaster Management Authority (PDMA)s	2025
Social Protection		
Climate change insurance products developed for marginalized communities	MoCC, Poverty Alleviation and Social Safety Net Division (PASS)/EHSAAS	2025
Education		
Climate change is included in the curriculum of all secondary schools and specialized courses will be offered in colleges and universities	MoCC/GCISC and Ministry of Federal Education and Professional Training/ Higher Education Commission	2030

Since the NDC submission in 2016, Pakistan has undertaken several initiatives for strengthening adaptation in various sectors, as provided in the table 5.2.

Table: 5.2: Key Adaptation Sectors & Supporting Actions

Overview	Supporting Actions
The largest employer sector in Pakistan, agriculture, is also highly vulnerable to the climate change. Low growth in the sector coupled with rapid population expansion is contributing to increasing levels of food insecurity	Agriculture: • NWP 2018 recognizes the need of adaptive measures to strengthen the sector's resilience to climate change • Awareness campaigns that utilize media (radio, television etc.) to provide farmers weather updates and advisory services • Adoption of Climate Smart Agricultural practices for the production of a variety of plants • Balanced use of fertilizers, composting and using cropping calendars to perfect the planting times
Water management has emerged as a critical area for Pakistan	Water: • NFPP-IV was approved in 2017 and NWP in 2018. NFPP-IV has targeted to protect 2.47 million hectares area from inundation by flood waters, 779,250 hectares of lands from erosion besides reclamation of 154,180 hectares of eroded land. Under NWP 2018, the construction of two large reservoirs (Diamer Bhasha and Mohmand) was initiated in order to address the agriculture-food-water nexus by increasing the national surface water pool and inter-seasonal water supply • For enhanced urban resilience, urban flooding risks will be reduced by promoting sponge cities, improving urban drainage, undertaking studies to address urban drainage problems in 20 cities of Balochistan, KP, Punjab, and Sindh for enhanced urban resilience, and undertaking non-structural measures, as per NFPP –IV • Pilot realistic water pricing mechanisms, reducing subsidies and water revenue collection systems • For groundwater recharging and water quality improvements, establishing ground water regulatory institutions and mechanisms, modernize irrigation and drainage system, accelerate program for canal and water course lining
The GoP has also planned an Eco-Restoration Initiative that strengthens adaptation through ecologically targeted initiatives. One major objective of this initiative is afforestation	Land: • Achieving Land Degradation Neutrality by 2030 • Restoring 30% of degraded forest, 6% of degraded grassland and 10% of degraded wetlands, 5% of degraded cropland • Establishing an independent, transparent and comprehensive financial mechanism as Eco-System Restoration Fund, to mobilize and facilitate Pakistan's climate compatible development

Health is one of the sectors prioritized by MoCC to be included in climate change adaptation and mitigation agenda. In the last five years, MoCC being the federal agency on issues of climate change and environment has launched multiple initiatives that were designed to reduce burden of diseases	Health Co-benefit: • Reinvestment of revenues in health. Revenues from mitigation actions can be earmarked for specific health related purposes. Revenue can also be implemented to generate funds for specific purposes, such as support COVID-19 recovery • Adopt a Health in All Policies (HiAP) approach to energy policy • Establish mechanisms to facilitate collaboration between health and energy professionals • Continue to obtain reliable data on health co-benefits of climate ambition in Pakistan to inform policies in various sectors Waste and WASH: • Operationalizing Pakistan Wash Strategic Planning & Coordination Cell established at MoCC to fast-track progress towards climate resilient WASH • Strengthening Clean Green Pakistan Index launched in 2019 to focus on improved water, sanitation and hygiene service delivery in targeted urban areas. The Clean Green Pakistan Index (CGPI) to become a key tool for integrating mutual accountability mechanisms focused on five components, namely water, sanitation, hygiene, solid waste and urban plantation Air Pollution: • Revision of Pakistan Clean Air Program to enhance the actions in the light of recent scientific evidence • Switching to zig-zag brick kiln technology: In total 7,896 out of 20,000 traditional brick kilns in Punjab have been converted to the environmentally smart technology to also mitigate SLCP. Learning will be replicated in other provinces • Euro-5 standard fuel in petroleum industry introduced and the aim is to steadily increase is market share • Continuation of Reduction and Elimination of Persistent Organic Pollutants (POP) program, initiated in 2015, will be continued to reduce human health and environmental risks by enhancing management capacities and disposal of POPs • Utilizing the Low Emission Analysis Platform-Integrated Benefit Calculator (LEAP IBC) tool for SLCP to assess the multiple benefits of reducing emissions including climate benefits, and health benefits

5.3 CONTRIBUTIONS TO ADAPTATION

Table 5.3: Supporting Adaptation Actions & Indicators

Objective	Supporting Actions	Lead Organization	Indicators
Agriculture			
Promote climate smart inputs and management practices in agriculture	Development of crop varieties and livestock breeds resistant to heat and water stresses	National Agricultural Research Centre (NARC), DoAs	Number of crop varieties developed, piloted and approved
	Develop sustainable soil fertility improvement practices	DoAs	Area of land with sustainable soil fertility improvement practices
	Adopt mechanical and biological control methods to keep pest populations under control and to protect soil fertility and nutrient value agricultural produce	Ministry of National Food Security & Research (MoNFSR), NDMA, PDMA & DoAs	Area of land with systemic protection from pests
Water Resources			
Improve irrigation and water management	Demand management measures to increase water-use efficiency and productivity	MoWR, Provincial P&DDs, DoIs	Number of demand management measures developed and piloted
	Construction of large and small reservoirs, rain harvesting and storage, groundwater recharge, groundwater management, etc. to improve inter-seasonal water availability	MoWR, Provincial P&DDs, DoIs	Number of small/ large reservoirs constructed or rehabilitated
	Introduction of water conservation technology and techniques in irrigated agriculture	MoWR, DoIs	Number of water conservation technology and techniques piloted

Biodiversity and Other Vulnerable Ecosystems			
To build resilience through nature-based solutions and protection of ecosystems and biodiversity	Wildlife corridors for preservation and protection of wildlife species. Also, Develop community-focused management plans for protected areas	MoCC	Number of wildlife corridors established
	Adoption of good practices of natural grassland management in livestock production	Provincial livestock departments	Area of land protected with sustainable grassland management practices
	Management of notified areas in collaboration with local communities under the Protected Areas Initiative	MoCC	Area of land restores/conserved under Protected Areas Initiative
	Prioritize the consideration of "blue" nature-based solutions (NbS).	MoCC	Number of 'blue' nature-based solutions piloted
	Increase coastal areas under protection, notably through the creation of new marine protected areas and the demarcation of extensive no-take zones	MoCC	Length of coastal areas protected
Disaster Preparedness			
Mitigate impacts of extreme events through preparedness and capacity building.	A hydro-meteorological monitoring system for developing an operational system on water-related DRR products and effective dissemination through online systems	NDMA, FFC, MoWR, GCISC	Hydro-meteorological monitoring system developed
	Establishment of a credible national water, weather, and climate database to tackle natural disasters	NDMA, FFC, GCISC, PMD	Climate database established

	Promote the use of space technologies and digital innovation in DRR, agriculture water management through gender-segregated data and capacity development for national partners	NDMA, FFC, GCISC, PMD	Number of capacity development initiatives undertaken
	Cost-effective innovative disaster risk management solutions to reduce the loss of life, infrastructure, and livelihoods at all scales	PDMAs	Number of cost-effective innovative disaster risk management solutions implemented
	Develop a nationwide scale Multi-Hazard Vulnerability and Risk Assessment (MHVRA) in a Spatio-temporal format including detailed and location-specific assessments to providing comprehensive risk information	NDMA	MHVRA developed
Health			
Incorporate health and environment in climate and disaster risk reduction related policies and vice versa.	Enhance research regarding impacts of climate change on health	Ministry of National Health Services, Regulations and Coordination. (MoNHSR&C)	Number of research studies conducted
	Increase monitoring of climate-sensitive diseases and introduce forecasting systems to increase effective planning prior to pandemic and disease outbreaks	MoNHSR&C	Number of monitoring and forecasting systems developed

	Establish mechanisms to facilitate collaboration between health, nutrition and energy professionals, including dialogue and collaboration between Ministries of Health, Climate and Energy as well as multi-sectoral co-operations	MoCC, GCISC and MoNHSR&C	Number of multi-sectoral collaboration mechanisms operationalized
	Obtain reliable data on health co-benefits of climate ambition in Pakistan to inform policies in various sectors- energy and carbon pricing	MoCC	Number of relevant studies undertaken
	Adoption of One Health mechanism	MoCC	One Health mechanism adopted
	Develop Geographic Information System (GIS) mapping to identify climate change/ health impacts hotspots and implement specified health adaptation prevention and control programs	MoNHSR&C	Number of health adaptation programs implemented with support of GIS tools
	Develop standardize emergency procedures and stockpiling of essential medicines in advance	NDMA& PDMAs	Number of standardized emergency procedures developed
	Ensure and adopt measures to improve child mortality rates and associated women's health issues	MoNHSR&C	Number of measures adopted to improve child mortality rate
	Adopt a Health in All Policies (HiAP) approach to energy policy	MoNHSR&C	HiAP approach to energy policy adopted

WASH			
Improve climate resilience of communities through improved development outcomes in WASH sector	Vulnerability analysis for potential adaptation options targeted and designed for specific needs of communities	MoCC GCISC	Number of relevant vulnerability assessment studies undertaken
	Adopt low cost, climate resilient technology available for infrastructure	MoCC	Number of low-cost climate resilient technologies piloted
	Explore opportunity for metered water supply on cost recovery basis	MoCC	Number of pilots rolled out for metered water supply

CHAPTER 6

CROSS-CUTTERS & CO-BENEFITS

6.1 GENDER EQUALITY

As signatory of the Paris Agreement, Pakistan is committed to gender equality. Several structural constraints, however, continue to hold back women's full participation in mitigation and adaptation realms. Ministry of Climate Change (MoCC), through a Gender Readiness Grant from the Green Climate Fund (GCF), is in the process of developing a Climate Change Gender Action Plan (ccGAP). The exercise, based on United Nations Framework Convention on Climate Change's (UNFCCC) Gender Action Plan, builds upon five pillars: i) capacity-building, knowledge-sharing and communication, ii) gender balance and women's leadership, iii) coherence across UNFCCC and UN, iv) gender-responsive implementation and means of implementation, and v) monitoring and reporting.

Pakistan's ccGAP aims to integrate gender and climate fully in key sectors of the economy, particularly agriculture and food security, water and sanitation, disaster risk management, forests and biodiversity, coastal management, energy and transportation. Various consultations have been held to mobilize wider society for climate action and to ensure that vulnerable segments of the society, particularly the girls and women, are included in the climate policies and strategies as a part of the 'Whole-of-government' approach. For Pakistan, ccGAP is a tool to enhance knowledge and capacities, identify gaps and enabling conditions, and build coordination and actions to strengthen gender-responsive strategies and results to meet the country's climate change objectives.

Pakistan has made efforts towards gender and social inclusion through programs like Ten Billion Tree Tsunami Programme (TBTTP), REDD+ (Reduced Emissions from Deforestation and forest Degradation), GLOF-II (Glacial Lake Outburst Floods), Pakistan Snow Leopard and Ecosystem Protection Program (PSLEP), and Chilgoza Restoration Project. In addition, the Green Stimulus

package has created jobs, including for women, for setting up nurseries, orchards, agricultural forestry, fisheries, horticulture, eco-tourism, wildlife area management and developing small and medium-sized enterprises (SMEs) through forestry operations and protected area management. All these under implementation projects are striving to generate gender data sets, as part of monitoring and evaluation. This large portfolio of projects, however, needs an overall strategy to quantify inputs, outputs and outcomes at project and portfolio levels, an exercise expected to be an integral part of ccGAP to develop an integrated strategy and define sectoral targets for Pakistan.

The National Commission on the Status of Women (NCSW) is a statutory body that was established in 2000 as an outcome of the national and international contributions of the Government of Pakistan (GoP). The Commission serves as the lead agency to mainstream gender. All provinces have also established their provincial commissions. Since the last submission, several provinces have developed their gender policies or action plans. However, climate impacts and women's role in climate mitigation and adaptation in urban and rural contexts still requires further embedding of NCSW's work.

6.1.1 GENDER EQUALITY TARGETS

Since lack of economic empowerment prevents Pakistani women from adapting to the climate change impacts, it is fundamentally important to identify climate risks and specific needs of girls and women to respond to climate change challenges. Some of the proposed actions for gender mainstreaming have been identified as follows:

Table 6.1: Gender Mainstreaming Actions & Potential Targets

Objective	Proposed Actions	Potential Indicators
Agriculture, Forestry and other land-use Change		
Identifying rights-based and gender-responsive measures Ensure that plans, strategies, programs and budgets of government bodies, funding agencies and NGOs promote gender equality and access to resources Assessing the differential impacts of actions in the agriculture sector	Increase women's participation: d. Build capacity of women on drought-resistant crop varieties, contemporary technologies, water-efficient irrigation systems and novel farming practices e. Encourage the investment by women in animal production and bio-product industries to enhance job opportunities and minimize waste f. Ensure women's participation in protected areas management g. Promote non-timber forest production and services for micro-nutrients for the poor and particularly girls who are becoming deficit in vitamin D, A, calcium, and zinc	Trainings and workshops conducted for women farmers Number of women employed/self-employed Number of women engaged in protected area management Non timer products prompted in TBTTP and other forestry initiatives
	Increase poor community especially women's access to agricultural information through radio and mobiles	Number of women accessing information
	Introduce a legal reform that allows female farmers to: a. Buy or sell a land b. Conducive environment for female farmers to sell their goods at farmers markets c. Allows female farmers to access loans and finances d. Ensure that governmental incentives target women farmers also	Number of incentive schemes designed for women

	Increase women's participation in decision-making and implementation a. Raising awareness of whole rural community about importance of women's participation in decision making in natural resources management b. Promote women's participation in decision-making positions at local levels	Number of awareness sessions conducted Number of women present at various forums
	a. Assign a Gender Focal Point (GFP) for the national (inter-ministerial) level committee b. Revisit the national policies and legislation to ensure that gender and climate change are taken into consideration a. Develop guidelines to engender budgets to promote gender-segregated data for inputs, outputs and outcomes	Number of national level forums for better gender integration Number of sectoral policies integrating gender
	Track indicators of women's nutrition by collecting data on women's nutritional status for informing governments about the nature, extent, and consequences of climate change on female malnutrition	Number of indicators for data collection identified
Water Sector		
Promoting the role of women in water resource management	Make local union level women's association to create effort for keeping the water bodies (rivers, canals, lakes and wetlands) usable	Number of union level associations formed
	Capacity development of women to fully engage in water resource management, maintenance of water infrastructure, low water consuming crop technologies, water efficient technologies	Number of capacity building workshops

	Extension services on alternative irrigation technology (e.g. water purification, rain water harvesting, wastewater collection, water conservation)	Number of females targeted extension services launched
	Identification, documentation, and expansion of indigenous water management technology	Number of women-led indigenous technologies identified and promoted
Energy Sector		
Ensure gender integration for efficient energy production, consumption and distribution	Disseminate information on environment-friendly and green technology regarding the positive impact of these technologies on the health of women	Number of information packs disseminated
	Train and create access for women to renewable alternative energy solutions	Number of trainings conducted
	Pilot energy efficient low-cost cooking technology projects	Number of women adopting energy-efficient technologies
	Soft credits/ loans for women to use green technology	Number of women accessing credits/loans
	Provide green jobs in the energy sector for women by designating positions	Number of women employed

Disaster Management		
Introduce social-safety nets with a focus on climate change adaptation for socio-economic development	Schemes developed for cash transfers and social pensions, particularly for the disaster-affected communities	Number of safety net schemes
	Advocacy/awareness at local level, including engaging print and electronic media, community radio for dissemination to improve women, girls and children's security	Number of awareness programs
	Include relevant issues in national curriculum and any other education materials	Education material developed
	Sensitize men and harness them as champions in preventing violence and assaults.	Sensitization sessions conducted
	Provide alternative livelihood opportunities to disaster-affected communities to manage forced migrations	Number of livelihood options designed
	Undertake special programs on income generating activities for women during and after disasters	Number of women earning income
Waste Sector		
Improve waste management and recycling practices	Increase women awareness regarding waste management and recycling through targeted initiatives	Number of awareness sessions
	Encourage women in decision-making positions in municipal waste management	Number of women represented in decision-making forums
	Women's access to credit, finance and services for waste management and recycling entrepreneurship	Number of women accessing credit

	Pilot biogas technology amongst women farmers to deal with agricultural waste	Number of pilots
Health		
Ensure targeted health initiatives regarding women health, hygiene and WASH services	Increase women's awareness regarding health issues and agendas through a One-Health lens	Number of awareness sessions
	Targeted training of women in livestock management and agricultural practices under a OneHealth program	Number of women trained
	Take measures to improve the access of women to medical services in emergencies	Number of actions operationalized
Research, and Knowledge Management		
Institutionalize gender-sensitive benefit-sharing mechanism	Gendered impact of various strategies, plans and projects collected	Gendered MRV mechanism to gather data developed
	Mapping of impacts of climate change and its gender dimension through case-studies	Number of case studies
	Develop different funding scenarios for integration of gender issues in agriculture, forestry, water and waste sector programs	Number of funding proposals submitted
	Strengthen research on the linkages between climate change/gender, disasters and health	Number of research and policy papers
	Introduce Social Environmental Impact Assessments (SEIAs) to collect and present data in a sex-disaggregated manner as a part of Environmental Impact Assessment (EIA) regulations to address gender considerations	SEIA integrated as part of EIA

6.2 YOUTH & VOLUNTEER ENGAGEMENT

Pakistan is a young nation, with 68% of Pakistanis below the age of 30, and 27% aged between 15 and 29. Pakistan's growing young population offers demographic opportunities for climate action. The demographic dividend can best be harvested for climate adaptation and mitigation by investing in an environment that promotes their individual and collective actions. Pakistan has engaged youth groups to a) foster a shared understanding of the challenge, b) creating jobs for youth, c) increasing youth involvement and inclusion, and d) ownership of climate-smart development.

A youth survey by MoCC has mapped the degree of climate awareness and contributions. Several youth and volunteer groups and their organizations were engaged in the Nationally Determined Contribution (NDC) consultative process. The engagement process focused on three core areas: a) review of NDC 2016 through youth's perspective, b) a rapid survey on the relationship between climate change and youth, and c) a mapping of Civil Society Organizations (CSOs) working with youth groups. Gap analysis and proposed recommendations were particularly instructive since youth groups have a particular role in undertaking adaptation and mitigation measures in their communities and neighborhoods.

6.2.1 YOUTH AND VOLUNTEER ENGAGEMENT TARGETS

Moving forward, MoCC will:

1. Promote opportunities for youth groups to engage in and benefit from Pakistan's adaptation and mitigation objectives and targets, particularly through creating jobs for youth, entrepreneurship, macro-enterprises, and start-ups.
2. Work with youth groups to develop National Youth Strategy for Climate Action to strengthen individual and collective actions for adaptation and mitigation.
3. Involve youth in research and innovation for the NDC implementation, and develop an independent report on implementation by youth.
4. Engage with the Ministry of Education, Higher Education Commission, universities, and CSOs to propagate climate education curriculum.

6.3 SUSTAINABLE DEVELOPMENT GOALS

In 2016, coinciding with the submission of NDC, Pakistan also adopted Sustainable Development Goals (SDGs) and set up SDG Support Units at the provincial Planning & Development Departments (P&DDs), coordinated by a secretariat at Pakistan Planning Commission. The units have identified their specific priorities for action and challenges and submitted the first Voluntary National Review (VNR) in 2019.

The provincial SDG units are charged to contribute towards integration of climate change measures into national and provincial policies, strategies and planning. All provincial units have identified data availability as necessary for identification of their SDG priorities. Data availability continues to be a shared challenge for Pakistan NDC and SDG implementation.

National Action Plan on Sustainable Consumption and Production (NAP-SCP, 2017) provides conceptual objectives and frameworks complemented by a set of suggested policy enablers and actions that could translate SCP into projects on the ground. The NAP-SCP is the road map for the country to achieve sustainable socio-economic development by eliminating inefficiencies and over-exploitation of resource base to protect environmental degradation through key sectors including climate change, water, waste, agriculture, forestry, energy, food, transport, industry and education.

SDG 13 acknowledges that the UNFCCC is the main forum for negotiating the global climate response. It, however, does not set specific, measurable targets for mitigation or adaptation, a task that is left to the Paris Agreement and taken up by NDCs. SDGs reflect the centrality of climate change mitigation and adaptation for global sustainable development agenda. SDG 13 cuts across several SDGs and appears in targets under many other goals. SDG 13 reinforces the implementation of all but challenge targets of several SDGs. Pakistan in the year 2020 emerged as one of the countries to achieve SDG-13 Climate Action.

According to SDG report 2020[13], Pakistan's SDG index score improved whereby Pakistan was categorized as one of the countries that had achieved SDG-13.

6.3.1 CONTRIBUTIONS TO SDGS

Table 6.2: SDG Objectives, Actions & Indicators

SDG-13 Targets	Objective	Proposed Actions	Lead Agency	Potential indicators
	Strengthen resilience and adaptive capacity to climate-related disasters	• Improve capacities to mitigate risks and respond to climatic-related disasters • Develop district-level multi-hazard vulnerability assessments	FFC, NDMA, PDMAs	• Number of capacity building initiatives undertaken for improving disaster risk mitigation and response • Number of district level multi-hazard assessments in various provinces

[13] https://s3.amazonaws.com/sustainabledevelopment.report/2020/2020_sustainable_development_report.pdf

	Integrate climate change measures into policies and planning	• Integrate climate consideration in development planning processes	Line Ministries and Provincial Departments, FFC	• Integration of climate considerations in PC-I form
	Build knowledge and capacity to meet climate change	• Undertake studies to assess climate risks and identify sectoral decarbonization pathways	MoCC, Provincial P&DDs, Academia, GCISC	• Number of climate-related studies and risk assessments undertaken
	Implement the UNFCC	• Strengthen the processes around development and implementation of NDCs	MoCC, GCISC	• Development of an action plan for implementation of NDC.
	Promote mechanisms to raise capacity for planning and management	• Promote Integrated Water Resource Management • Undertake human and institutional capacity development on climate change issues	FFC, Ministry of Water Resources (MOWR)	• Number of climate-related capacity development initiatives rolled out

CHAPTER 7

NDC TARGETS & MEANS OF IMPLEMENTATION

Large energy supply and demand gap, high basket price of electricity due to the dependence on imported sources of energy, a sizeable population living below the poverty line, and prevailing water and food insecurity concerns accentuate the need to follow a high economic growth pathway. The Government of Pakistan (GoP) will, therefore, follow the greenhouse gases (GHG) emissions trajectory of 1603 Mt CO_2 Eq. for 2030 as announced in Pakistan's initial Nationally Determined Contribution (NDC) submission in 2016. However, realizing the importance of reducing the GHG emissions under Paris Agreement to limit the temperatures to 1.5/2°C, the GoP aims to reduce the emissions to the maximum possible extent. The GoP has taken a series of major initiatives as outlined in chapters 4 and 5. Hence, Pakistan intends to set a cumulative ambitious conditional target of overall 50% reduction of its projected emissions by 2030, with 15% from the country's own resources and 35% subject to provision of international grant finance that would require USD 101 billion just for energy transition.

7.1 HIGH PRIORITY ACTIONS

Addressing the Global Climate Summit at the United Nations in December 2020, the Prime Minister of Pakistan made an announcement to reduce future GHG emissions on a high priority basis if international financial and technical resources were made available:

MITIGATION:

1. **RENEWABLE ENERGY:** By 2030, 60 % of all energy produced in the country will be generated from renewable energy resources, including hydro.
2. **TRANSPORTATION:** By 2030, 30 % of all new vehicles sold in Pakistan in various categories will be Electric Vehicles (EVs).
3. **COAL:** From 2020 onwards, a moratorium is in place on new imported coal-based power plants and no generation of power through imported coal, plans for two new coal-fired

power plants have been shelved in favor of hydro-electric power, and there is increased focus on coal gasification and liquefaction for indigenous coal.

4. **LAND-USE CHANGE & FORESTRY:** From 2016 onwards, continued investments in Nature-based Solutions (NbS) through the largest ever afforestation programs in the history of the country Ten Billion Tree Tsunami Program (TBTTP) will sequester 148.76 $MtCO_2e$ emissions over the next ten years. The estimated project cost of about US $800 million is being met nationally from indigenous resources, as unconditional contribution.

Pakistan's priority contributions before the UN Summit in December 2020 will result in an estimated saving of around 1.7 Mt CO_2eq[14] on account of the two shelved coal power plants, 24 Mt CO_2e, on account of the introduction of EVs, and 22 Mt CO_2eq on account of stabilizing energy mix 40-60 in favor of renewable energy.

ADAPTATION:

5. **RECHARGE PAKISTAN:** By 2030, the project envisages the reduction of flood risk and enhanced water recharge at six sites in the Indus Basin, building resilience of 10 million people and vulnerable ecosystems. The Project is under review by the Green Climate Fund (GCF) for funding; in the meantime, Pakistan has allocated PKR 6 billion from national resources to commence the activities in three sites, namely Manchar & Hamal wetland, Taunsa pond area, and Dera Ismail Khan.
6. **PROTECTED AREAS:** By 2023, total protected areas in the country will be enhanced from 12% to 15% that will result in preserving rare fauna and flora, green job opportunities for 5,500 people, and promotion of eco-tourism.

Pakistan's high priority contributions reflect deep commitment to the Paris Agreement and an increased ambition-heightened sense of urgency. For even deeper reductions, Pakistan seeks international support to realize this enhanced ambition for her low carbon development or decarbonization pathways. Pakistan's overall mitigation financing gap and an estimated adaptation financing gap are presented below.

7.2 PRIORITY ACTIONS

Financing the mitigation and adaptation gap will be a challenge. Pakistan has a GDP of US$284 billion, but the cost estimates for transition to low carbon and resilient development strategies are substantial, making the role of concessional international climate finance key. The costs of achieving some energy sector targets are estimated as follows, all adding to the cost of Low Emission Development pathways:

1. **IN PROGRESS:** More than 12 GW under construction requiring about $20 billion for Coal and Hydro projects (PPIB).

[14] Emissions from coal power plant are 8.8 $MtCO_2e$

2. **HYDROPOWER:** For rapid expansion of RE including hydropower, reaching 65%[15] production by 2030 would require an estimated investment of US$50 billion by 2030 and $80 billion by 2040.
3. **TRANSMISSION:** An estimated US$20 billion is required to upgrade the transmission network by 2040. This will escalate in a case with large share of variable power from solar and wind.
4. **COAL:** Buying out the relatively new coal power projects, including the local Thar coal mines[16], would upfront an estimated cost of US$18 billion. An additional estimated US$13 billion will be required to replace the production of the coal power plants with solar.

Pakistan considers employing the instruments on enhanced ambition provided in Article 6 of the Paris Agreement. This may include the mitigation mechanism under Article 6.4 Paris as well as bilateral cooperative approaches under Article. 6.2 Paris Agreement. Pakistan may also pilot integrated, holistic and balanced non-market approaches under Article 6.8, as outlined in Chapter 9 below.

Pakistan will require finance, technology transfer, and capacity building in line with Article 4 of the United Nations Framework Convention on Climate Change (UNFCCC) and Articles 9, 10 and 11 of the Paris Agreement to fully implement the climate actions contained in these NDCs. These articles are explicit on supporting developing countries to implement climate change actions and increasing mitigation ambition, considering 'the common but differentiated responsibilities and their specific national priorities'. Paragraph 5 of Article 4 of the Paris Agreement specifically committed that "support shall be provided to developing country Parties for the implementation of this Article, in accordance with Articles 9, 10 and 11, recognizing that enhanced support for developing country Parties will allow for higher ambition in their actions".

7.3 LOSS & DAMAGE

Pakistan urgently requires support for mainstreaming, institutional strengthening and integrated framework for adaptation and mitigation for enhanced social, economic and ecosystem resilience. Pakistan will also need support to bear increasing climate-induced Loss and Damage (L&D), particularly from Glacial Lake Outburst Floods (GLOFs), seawater intrusions, droughts, heatwaves, tropical storms, landslides, and riverine floods. According to the NEEDS study referred to earlier, about 70% of the estimated US$7-14 billion adaptation cost is attributable to the damages to infrastructure. The rapid onset of slow onset is weakening the carrying capacity of our ecosystems and threatening our food, water, and energy security and exposing population to pandemics and vector-borne disease. Our L&D needs go beyond our adaptation requirements in agriculture and food production systems, water variability, human

[15] 65% as per revised IGCEP 2021: 1%, 8%, 8% and 46% by bagasse, wind, solar and hydro add up to 63%

[16] VREs, hydro and Thar coal will help in lowering the basket price of the overall system thus providing much needed relief, though in the long run, to the end consumers. Induction of new local coal based committed power plants in Thar, during the next 5 years, share of local coal in the generation mix will enhance to 15% (IGCEP 2021-30.

settlements and human displacements, biological and genetic diversity, and loss of coastal areas to seawater intrusion. Our need to access climate finance because of L&D is sharp and increasing.

Pakistan's estimates of climate losses have thus far not covered long-term and non-economic losses related to internal migration and displacement, increasing poverty levels and implications for nutrition, stunting, pandemics, gender and other socio-cultural issues. Based on the weather and climate capacity strengthened in recent years, Pakistan will need

1. to undertake gap analysis to assess the current status of L&D and develop a roadmap based on rigorous methodology and costing,
2. to augment and utilize data management systems to record L&D in key sectors of the economy, and
3. to develop institutional mechanisms for L&D as articulated in the Warsaw International Mechanism (WIM) for Loss & Damage for systematic coordination with sectoral ministries, departments and the provinces.

CHAPTER 8

CAPACITY ASSESSMENT & NEEDS

8.1 WHOLE-OF-GOVERNMENT APPROACH

Pakistan's assessment and capability needs are driven by the whole-of-government approach already adopted in its Nature-based Solutions (NbS) approach in initiatives such as Recharge Pakistan, Protective Areas Initiative (PAI), and Ten Billion Tree Tsunami Programme (TBTTP). The need for capacity-building exists at policy, operational, as well as reform levels at national and sub-national tiers alike. In the federation of Pakistan, the provincial governments are responsible for provincial policies, operational plans, and provincial-level governance reforms. There is, therefore, an additional standing need for harmonization and coordination of national and sub-national policies, and for synergizing the national agenda for climate action. The Ministry of Climate Change (MoCC) will work closely with line ministries and provincial Planning & Development Departments (P&DD) to mainstream climate considerations into over-arching development and sectoral planning in a gradual and systematic manner. The wide-ranging mandate of the MoCC requires capacity-development for strong scientific and technical knowledge. MoCC and other ministries and departments will also stand to benefit from institutional and policy reforms, strengthening and capacity-building enactment through upgraded rules, procedures, guidelines, and standard operating procedures (SOPs) for well-coordinated climate actions.

Improved climate forecasting, climate risk communication and early warning and comprehensive risk management framework is especially important for a country facing multiple climate hazards. Embedding climate change requires concurrent actions and investments in several arenas:

1. **POLICIES:** Cross-referencing to climate change in national and provincial sectoral policies and action plans on climate adaptation and mitigation will need improvements. Several policies will need to be refreshed or revised where they exist, or developed where they do

not in order to fully align with Pakistan's climate change needs and contributions. Priority sectors are the ones dealing with mitigation and adaptation, already mentioned in this Nationally Determined Contribution (NDC) submission.

2. **INVESTMENT PROCESSES:** Preparatory and approval systems dealing with the life-cycle of projects and schemes need to be made climate-smart in order to fully embed climate adaptation and mitigation indicators. MoCC will lead the process together with its provincial counterparts, and the Ministry will also provide technical support and backstopping for this purpose.
3. **SCIENTIFIC/TECHNICAL CAPACITIES**: While Pakistan has significantly augmented its climate modelling capacity and has established a robust National greenhouse gas (GHG) Inventory Management System since the NDC in 2016, the capacity need to be also developed for agricultural, health and economic costing purposes at national and provincial levels, as well as at selected universities and at technical research institutions. The areas of capacity and capability development include sub-national level application of General Circulation Models (GCMs); provincial GHG inventory capacities; early warning and forecasting systems for health (pandemics), flooding, weather, as well as attributive extreme events; and, economic and non-economic costing of climate Loss & Damage. Additionally, there is need to augment data collection, usage and reporting systems as well as the decision-support system at the planning and sectoral ministries.

8.2 IMPLEMENTATION MECHANISMS

As focal agency, MoCC leads the processes for preparation, updating, coordination, and implementation of NDCs. Mainstreaming of climate change, however, continues to be a collective challenge. Climate Change has to find place in the country's several policy planning mechanisms and forums as well as in economic decision-making such as Natural Income Accounting, GDP measurement, or annual allocations in the fiscal budgets and engagement. Likewise, it still need to be integrated with apex policy making bodies of the cabinet, as well as ECNEC, and Public Sector Development Programme (PSDP), Central Development Working Party Meeting (CDWP), and Development Working Party (DWP) processes to mainstream climate in sectoral projects and portfolios. The updated NDC has set the direction of travel for whole-of-government in this regard.

The Prime Minister's Committee on Climate Change (PMCCC) will oversee the implementation progress as well as the regional and international partnerships and alliances to ensure that Pakistan continues to be an active member of global community for the implementation of Paris Agreement. Relevant national and provincial policies will be reviewed in order to embed climate change adaptation and mitigation and develop a NDC Coordination and Implementation Plan (NCIP). For institutional reform and augmenting planning processes, MoCC will coordinate for climate proofing of planning processes such as PC-1.

8.3 TECHNOLOGY DEVELOPMENT AND TRANSITION NEEDS

Pakistan needs introduction of new technology and technical cooperation to achieve adaptation and mitigation targets in all sectors. In 2017, Pakistan conducted Technology Need Assessment (TNA) in order to tackle the recurring damage from extreme weather events. A possible outcome of the assessment was to help Pakistan delineate a holistic roadmap for National Climate Change Mitigation Technology Development. The study prioritized several technologies for mitigation and adaptation:

MITIGATION:

1. **ENERGY:** a) Efficiency improvements to boiler and furnace energy, b) Improving energy efficiency in building, and c) Solar energy technology.

2. **AGRICULTURE AND LULUCF:** a) Reforestation and reducing CO_2 emissions from forest degradation, and b) Farm forestry as a carbon sink.

3. **TRANSPORT:** a) Bus rapid transport, and b) Vehicle tuning.

ADAPTATION:

1. **AGRICULTURE:** a) High-efficiency irrigation systems for irrigated and rain-fed areas, b) Drought- tolerant crop varieties, and c) Climate monitoring and forecasting - early warning system.

2. **WATER:** a) Surface rainwater harvesting, b) Groundwater recharge, and c) Urban storm-water management.

Pakistan has tested or piloted several of these recommendations in various regions of the country. Scaling up and scaling out, however, has remained a challenge for reasons of resource limitations or integrated investments that fully integrate and measure climate adaptation and mitigation. However, since no projects were undertaken in some areas between 2014 and 2021, there is a growing urgency to prioritize pilots, mostly missed so far:

Mitigation: Efficiency improvements to boiler and furnace energy (energy), Farm forestry as a carbon sink (Agriculture and land use, land-use change, and forestry sectors), and vehicle tuning in provinces (transportation).

Adaptation: Drought- tolerant crop varieties (agriculture), and Urban storm-water management (water). Collaboration on technology development and deployment for climate action has many co-benefits and it therefore remains an important priority for the Government of Pakistan.

CHAPTER 9

CLIMATE FINANCE & MARKET AND NON-MARKET-BASED APPROACHES

9.1. CLIMATE FINANCE

Pakistan has enjoyed very limited access to international climate finance that includes one project from Adaptation Fund, three from Green Climate Fund (GCF), and completed 15 projects (approved 19) from Global Environment Fund (GEF). Pakistan has thus far not accessed Climate Investment Funds (CIFs), major bilateral climate funds, or facilities—except for one project from Nationally Appropriate Mitigation Actions (NAMAs). As of 2020, the GCF has approved projects worth approximately US$ 7.2 billion and Pakistan has secured about US$ 122 million through intermediary funding (UNDP, ADB, FAO) for three projects. MoCC, however, has supported the accreditation process of two national institutions to improve access to GCF through them for a range of financial instruments, including grants, grant equivalents, long-term concessional loans, equities and guarantees. Additionally, Pakistan's recent and new World Bank commitments had the highest contribution of climate co-benefits CCBs[17] that reached 44% in FY21 (up from 34% in FY20), and is the highest in South Asia's WB portfolio and among the highest in the World.

Pakistan considers employing the instruments on enhanced ambition provided in Article 6 of the Paris Agreement. This may include the mitigation mechanism under Article 6.4 of the Paris Agreement, as well as bilateral cooperative approaches under Article. 6.2. Pakistan may also pilot integrated, holistic and balanced non-market approaches under Article 6.8, as described below.

Market and non-market-based approaches help in diversifying the funding sources for commissioning capital-intensive projects. Some of the initiatives that Pakistan has embarked upon include:

[17] CCBs refer to the share of World Bank's lending commitments that contributes to climate action.

3. **GREEN BONDS:** Water and Power Development Authority (WAPDA) has launched 10-yearGreen Bonds and has raised $500 million for a hydro-energy project. Given the encouraging market response, WAPDA is considering launching additional green bonds. Pakistan may launch additional bonds in other sectors. Securities and Exchange Commission of Pakistan (SECP) has approved national guidelines for green bonds that will encourage innovative financing mechanisms in several sectors for both adaptation and mitigation.
4. **NATURE PERFORMANCE BONDS (NPB):** Building on an earlier experience with the Government of Italy, Pakistan is engaged with several bilateral and other development partners to channel outstanding payments into conservation and climate-related investments via NPB. If successful in implementing the first pilot project, Pakistan will capitalize from country's performance shown in the last few years through various flagship projects.
5. **CARBON PRICING INSTRUMENT:** Under the Collaborative Instruments for Ambitious Climate Action (CIACA) program, Pakistan has received support to establish Carbon Pricing Instrument (CPI). A range of activities have commenced including capacity building on carbon pricing, national consultation on carbon pricing, and scoping of pricing instruments in Pakistani context. The aim is to explore options for the introduction of domestic CPIs to manage the cohort of large-scale emitting installations, representing around 27% of domestic emissions, as well as an opportunity for similar or related economic instruments for the transport sector that. A National Committee on the Establishment of Carbon Markets (NCEC) oversees the development of potential architecture of a carbon market landscape in Pakistan.
6. **BLUE CARBON:** The Nationally Determined Contribution (NDC) in 2016 had not covered mangrove forests, even after Pakistan had increased mangrove coverage from 477 sq. km. in 1990 to approximately 1,464 sq. km. in 2020, with a 3.74% annual rate of change. The existing mangrove forests and tidal marshes potentially store approximately 21.8 million tonnes of organic carbon (or 76.4 million tonnes of CO_2e)[18]. A rapid assessment report[19] has found using the terrestrial forest price of carbon credits of US$ 3 and aspirational blue carbon prices of US$12-15; revenue generated would be US$75 million and US$300-500 million, respectively. Carbon removals would continue beyond 2050 sustaining ongoing revenue. While this preliminary assessment requires further research, a combination of market and non-market-based approaches like Blue bonds can help meet Pakistan mitigation and adaptation objectives in mangrove forests, and also reap co-benefits of livelihood and biodiversity protection.

[18] It was estimated that the gained mangrove areas between 1990 and 2020 accumulated soil carbon at a rate of 2 tonnes CO_2e per hectare per year(approximately 0.54 tonnes of organic carbon per hectare per year)

[19] World Bank. 2021. Pakistan Blue Carbon Rapid Assessment : Policy Recommendations for the Revision of Nationally Determined Contribution. World Bank, Washington, DC.

http://hdl.handle.net/10986/35663

7. **SUSTAINABLE FINANCE FRAMEWORK:** The creation of a Sustainable Finance Framework (SFF) would allow the GoP to issue green, social and sustainability bonds, as well as loans, through the Ministry of Finance (MoF). SFF will provide guidance on identifying eligible expenditures, share best practices on setting up required systems to implement the framework and organize a Second Party Opinion (SPO) on the SFF.

9.2 PUBLIC-PRIVATE PARTNERSHIPS

Pakistan encourages the involvement of the private sector in implementing its climate ambition across sectors and the development of nature-based solutions (NbS) that address Pakistan's mitigation and adaptation potential. Private investors may participate in transactions involving the transfer of mitigation outcomes through the instruments of Article 6 of the Paris Agreement or using voluntary markets where in the recent development, 26 private sector entities have pledged significant emission reduction targets. Pakistan plans to promote bottom-up actions by the private sector, and develop plans for emission reductions form major sectors, particularly cement and textile.

The State Bank of Pakistan (SBP) in 2017 approved green banking guidelines to promote environmental risk management within the commercial banks and encourage climate finance that to reduce vulnerabilities. SBP has also determined to develop a framework for risk management systems. A steering committee comprising of the SBP, International Finance Corporation (IFC), and the Pakistan Banks' Association was constituted to oversee the progress.

A Public Private Partnership Authority (PPPA) was established in 2017 with mandate to facilitate federal implementing agencies in developing, procuring, and implementing infrastructure projects on public-private partnership basis. In several sectors central to Pakistan's mitigation and adaptation needs: (i) Transport and logistics (including roads, bridges, rail, seaports, airports, fishing harbors and cold storages), (ii) Mass Urban Public Transport (including buses, and intra and inter-city rail), and (iii) Municipal Services (including water supply and sanitation; solid waste management; low-cost housing, and health and education facilities). The Authority's environmental safeguard policies cover several aspects of climate induced risks and exposures.

The PPPA can facilitate the flow of financing for implementation of the NDC and adaptation and mitigation priorities from the GCF, as the Minsitry of Climate Change has already pursued direct access modalities for climate finance through accreditation of JS Bank and National Rural Support Programme (NRSP) as the National Implementing Entity.

CHAPTER 10

CLARITY, TRANSPARENCY AND UNDERSTANDING

10.1 GHG INVENTORY 2018

An updated greenhouse gases (GHG) inventory (herein called as 2018) has been prepared by Global Change Impact Studies Centre (GCISC) to gauge the national GHG emissions. This inventory has been prepared based on the latest data sets available, using Inter-governmental Panel on Climate Change (IPCC) 2006 Guidelines. The inventory includes four sectors: i) Energy including Transport, ii) Industrial Processes & Product Use (IPPU), iii) Agriculture, Forestry & other Land Use (AFOLU), and iv) Waste. The estimation under the Inventory shows the total emissions from Pakistan are 489.87 $MtCO_2eq$ for the year 2018, with i) the Energy sector contributing (218.94), ii) Industrial processes (25.76), iii) Agriculture, Forestry and Land Use (223.45) and iv) Waste (21.72) $MtCO_2$ equivalent, respectively. The key GHGs of concern are Carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O).

Table10.1: Summary of GHG Emissions (2017-18)

Sectors	Sub-Sectors	Emissions (Mt CO_2e)	Total Emissions (Mt CO_2e)
Energy	Energy Industries	43.40	218.94
	Manufacturing Industries and Construction	66.20	
	Transport	51.34	
	Others (commercial, residential & agricultural)	44.06	
	Fugitive Fuel emissions	3.94	

Industrial Processes and Product Use (IPPU)	Mineral industry	22.75	25.76
	Chemical Industry	2.71	
	Non-Energy Fuel and Solvent use product	0.10	
	Others (paper & pulp, Food 7 beverages)	0.20	
Agriculture, Forestry and Other Land use (AFOLU)	Livestock	109.12	223.45 (198.59 + 24.86)
	Land	31.52	
	Managed Soils	74.98	
	Rice Cultivation	7.83	
Waste	Solid Waste Disposal	10.23	21.72
	Waste incineration and open burning	0.9	
	Wastewater treatment and discharge	11.90	
Total Emissions			**489.87**

The 2018 inventory is based on revised 2006 IPCC guidelines, in the light of the Katowice Decision. Increasing energy needs and food security concerns have led to increases in the emissions in Energy and Agriculture sector by 19% and 14% respectively as compared to the GHG inventory of 2015.

It has been estimated that Pakistan has achieved a target of 8.7% reduction in GHG emissions in 2018 out of the 20% committed cumulative target of 2030 and this mainly has been attained from climate compatible efforts.

10.2 MONITORING REPORTING & VERIFICATION (MRV)

As a signatory to the Paris Agreement, Pakistan is deeply committed to its implementation. The countries are required, under Enhanced Transparency Framework (ETF), to regularly track the progress on contributions, and particularly to put in place methodological tools necessary to account for GHG emissions, track mitigation, and adaptation Policies & Measures (P&M) as well as support needed and received. Further, under the ETF, Parties are expected to submit their first biennial transparency reports (BTRs) and national inventory reports, if submitted separately, no later than 31 December 2024.

In this context, a broader GHG MRV system has been developed to establish historical baselines, validate data quality, analysis of mitigation policies implementation, and reporting compliance. An overarching objective for mitigation MRV is to ensure that estimates are

consistent and captured within the national inventory, BTR reporting, and feed into the Paris Agreement's global stocktake. Therefore, a broader GHG MRV system, RISQ—a web platform for the compilation of the national MRV system database, has been developed. It will be used by entering into agreements with the key data providing national agencies. Similarly, efforts are underway to develop the national adaptation M&E system by developing a roadmap for its future setup, based on pilot experimentation in the agriculture sector.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