Punjab Climate Change Policy and Action Plan

Environment Protection &
Climate Change Department
Government of the Punjab

2024

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Abbreviations:

ABAD	Agency for Barani Areas Development	P&DB	Planning & Development Board
CDA	Cholistan Development Authority	P&SHC	Primary & Secondary Health Care Department
C&W	Communication and Works Department	PAs	Policy Areas
CBOs	Community-Based Organizations	PCCP	Punjab Climate Change Policy
CH_4	Methane	PCCPIC	Provincial Climate Change Policy Implementation Committee
CO	Carbon Monoxide	PDMA	Provincial Disaster Management Authority
CO_2	Carbon Dioxide	PEECA	Punjab Energy Efficiency & Conservation Agency
CSR	Corporate Social Responsibility	PHA	Parks and Horticulture Authority
DAs	Development Authorities	PHED	Public Health Engineering Department
ECS	Emission Control Systems	PM_{10}	Particulate Matter 10
EPA	Environmental Protection Agency	$PM_{2.5}$	Particulate Matter 2.5
EPCCD	Environment Protection and Climate Change Department	PMD	Pakistan Meteorological Department
ETS	Emission Trading System	PPP	Public-Private Partnership
EV	Electric Vehicle	PRMP	Punjab Resource Management Program
FD	Finance Department	RECP	Resource Efficient and Cleaner Production
FW&FD	Forest, Wildlife & Fisheries Department	SCPNAP	Sustainable Consumption and Production National Action Plan
GCMs	Global Climate Models	SDGs	Sustainable Development Goals
GHG	Greenhouse Gases	SECP	Securities and Exchange Commission of Pakistan
HQs	Headquarters	SMEs	Small and Medium-sized Enterprises
HUD&PHED	Housing and Urban Development and Public Health Engineering Department	SO_2	Sulfur Dioxide
ICI&SDD	Industries, Commerce, Investment & Skills Development Department	SOPs	Standard Operating Procedures
LGCDD	Local Government and Community Development Department	SPA	Small Project Assistance
MEAs	Multilateral Environmental Agreements	SSP	Shared Socio-economic Pathways
MoCC&EC	Ministry of Climate Change and Environmental Coordination	UNFAO	United Nations Food and Agricultural Organization
MPDD	Management and Professional Development Department	VICS	Vehicle Inspection and Certification System
N_2O	Nitrous Oxide	VOC	Volatile Organic Compound
NBS	Nature-based Solutions	WAPDA	Water and Power Development Authority
NCCP	National Climate Change Policy	WASA	Water and Sanitation Agency
NDCs	Nationally Determined Contributions	WASH	Water, Sanitation and Hygiene
NGOs	Non-Governmental Organization	WDD	Women Development Department
NOx	Nitrogen Oxides	WMCs	Water Management Companies

PUNJAB'S CLIMATE OUTLOOK

DEMOGRAPHY

127.7 M

59% Rural

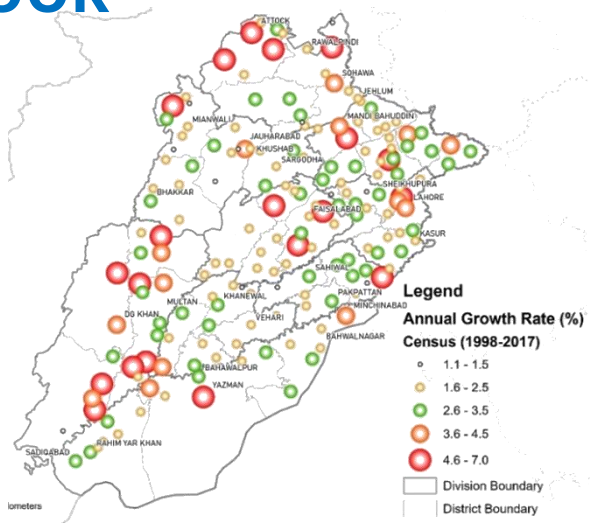
41% Urban

51% | **49%**

6.4
Household Size

2. 53
Avg. Annual Growth Rate 2017-2023

Source: Population Census, 2023



Intercensal Analysis of Punjab 1998 – 2017

Source: (Population Census: 1998 – 2017, prepared by Urban Unit)

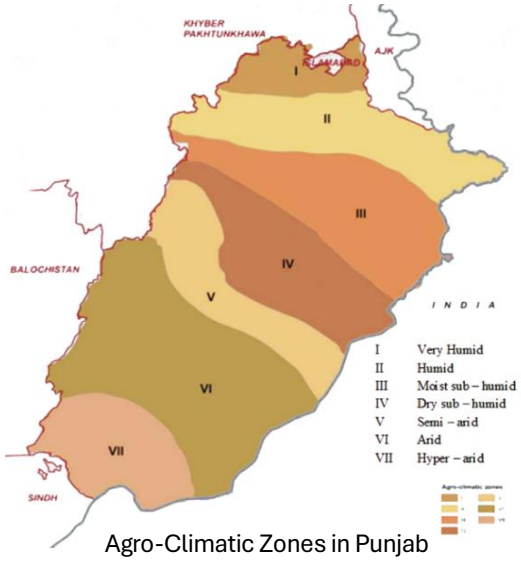
LAND PROFILE

The variety of agroecological zones and the rivers flowing across the province exhibit a unique combination of landform, land cover, soil, and climatic characteristics.

25% of the total area of Pakistan (205,345 sq. km)

58%	29%	8%	5%
Arid Land	Semi-Arid Land	Sub-Humid Land	Other

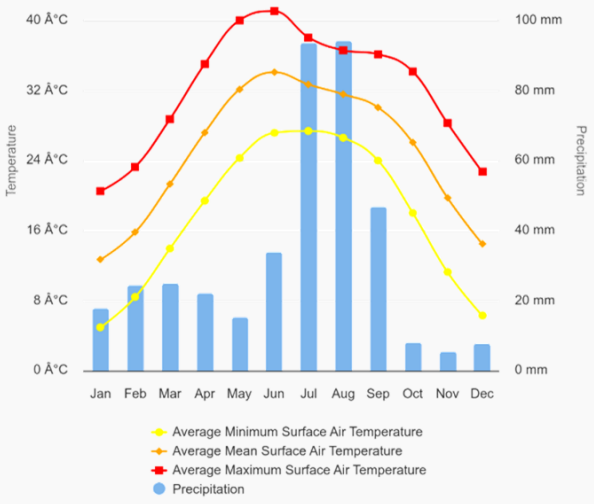
Source: Punjab Forest Policy 2019



Agro-Climatic Zones in Punjab

Source: UNFAO 2019

CLIMATE PARAMETERS



24.8°C
Mean Annual Temperature
(1991-2022)

49.8 mm
Mean Annual Precipitation
(1991-2022)

Source: World Bank Climate Knowledge Portal
Source: Pakistan Meteorological Department (2022)

Extreme Weather Events in Punjab in 2023

January	33 inches	Highest Snowfall in Murree
June 25	70 knots	High Wind Speed in Lahore
June 26	226 mm	Wettest Day in Lahore
July	669 mm	Wettest Month in Lahore
December	Up to 30 days	Overall Punjab

Source: Punjab State of the Environment Report 2023

SECTORAL OVERVIEW

AGRICULTURE

Largest share of the crop production in Pakistan

- 71% Cotton
- 76% Wheat
- 90% Maize

48% Punjab's Labor Force

Source: Agriculture Department

INDUSTRY

48,000 Industrial units (~39,000 cottage industries & SMEs)

68% polluting industries lie within city boundaries

78% Punjab's non-agricultural workforce

Source: Urban Unit

TRANSPORT

21.1 million Vehicles registered (Up till 30 June 2022)

83 % Two-Wheeler Vehicles Share

Source: Punjab Development Statistics, 2023

ENERGY

68% Power Consumption

6-8% per annum Energy Demand

Source: Energy Department PMU

WATER RESOURCES

5 river tributaries

10 inter-river link canals

24 main canal system with several distributaries and minors

30,646 canal miles irrigation system

FOREST

3.1% Forest Area of the total land area

- 41% Scrub Forests
- 27.4% Irrigated Plantations
- 14.4% Rangelands
- 8.6% Riverain Forests
- 8.6% Coniferous Forests

Source: Punjab Forest Policy 2019

BIODIVERSITY & ECOSYSTEMS

3 RAMSAR Sites

- Taunsa Barrage
- Chashma Barrage,
- Uchali Complex

Protected Areas:

- 11 wildlife parks
- 37 wildlife sanctuaries
- 24 game reserves

Key Species:

- 80 Mammals Species
- 670 Birds Species
- Vulnerable Species: Urial
- Endangered species: white-headed duck, Indus Dolphin
- Critically endangered: Great Indian Bustard

Source: RAMSAR Annotated Summary of Pakistan; Punjab Forest, Wildlife & Fisheries Department; IUCN Red List

WASTE AND WASTE WATER

Solid Waste: 115 (DG Khan) **to 5,000 tons/day** (Lahore) Average waste generation in Divisional HQs

434 Wastewater Treatment Plants

56.4% Primary Treatment
43.6% Secondary Treatment
1.8% Tertiary Treatment

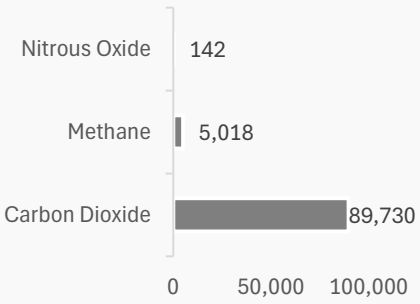
Source: Punjab State of the Environment Report 2023

EMISSION SHARE OF PUNJAB

94,890 Kilotonnes/year (kt/y)

Total GHG Emissions

CO_2, CH_4 and N_2O

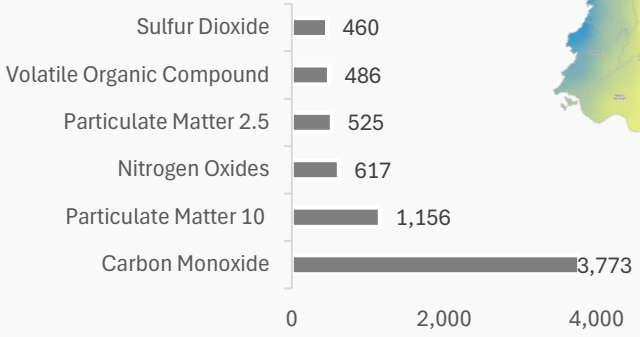


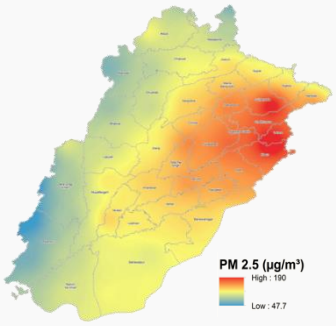
Source: Integrated Assessment of Air Pollution and Climate Change Mitigation in Pakistan 2022 (ccacoalition.org)

7,017 Kilotonnes/year (kt/y)

Total Air Emissions

PM10, PM2.5, SO2, NOx, CO, VOC





Source: Punjab Pollution Inventory, SUPARCO and Urban Unit 2023
https://urbanunit.gov.pk/Download/publications/Files/8/2023/Emission%20Inventory%20of%20Punjab%201990-2020_FD.pdf

KEY CLIMATIC IMPACTS IN PUNJAB

Climate Change is manifesting in the shape of extreme climate events in the Punjab.

Temperature Change and Heat Stress

0.18°C above normal mean change[1]

0.97 °C average rise in 57% of the geographical area of province[2]

20 days added in annual summer of South Punjab[3]

700,000 residents exposed to heatwave in Central & Eastern Punjab[4]

+45% Annual Rain Variation (2022)[5]

0.7 million acres of cropland & orchards damaged (2022)[6]

200,000 Livestock killed (2022)[7]

515 million USD Financial Estimation of Damages in Southern Punjab (2022)[8]

Frequent and Intense Precripitation & Floods

More Drought Years

Metrological Droughts linked with 27% yield variation in province[9]

Largest geographic footprint of drought stress[10]

75% to 90% evaporation loss in Cholistan [11]

89% increase in forest fire events compared to last year [12]

377 in 2024 & 199 in 2023 [13]

Unprecedented spike of forest fires in 2024 impacted northern and eastern Punjab [14]

Destructive Wildfires

(1-3) Punjab's State of Environment Report, 2022; (4) World Bank (2022). Pakistan Country Climate and Development Report; (5) Pakistan Meteorological Department (2022). State of Pakistan Climate in 2022; (6) The Urban Unit. (2022). Flood Damage Assessment; (7) Situation Report No. 12, 2022 (UN-OCHA); (8) Pakistan Floods 2022. Post Disaster Needs Assessment. Ministry of Planning and Special Initiatives, Government of Pakistan; (9) M. Waseem, *et al.* (2022) "Impact of meteorological drought on agriculture production at different scales in Punjab, Pakistan" Journal of Water and Climate Change. 13 (1): 113–124; (10) World Bank (2022). Pakistan Country Climate and Development Report; (11) The Urban Unit. 2022. Drought Management Plan of Cholistan 2022 – 2025; (12-14) Punjab Emergency Services. Punjab faces a spike in forest fires (https://tribune.com.pk/story/2469348/punjab-faces-spike-in-forest-fires)

District-Level Climate Risk Assessment Classification

#	Districts	Floods	Cyclone	Droughts	#	Districts	Floods	Cyclone	Droughts
1.	Rawalpindi	High	Low	Medium	2.	Toba Tek Singh	Medium	Low	High
3.	Sheikhupura	Very High	Low	High	4.	Sialkot	Very High	Low	Very Low
5.	RY Khan	Very High	Low	Very High	6.	Sahiwal	Medium	Low	High
7.	Multan	High	Low	Very High	8.	Narowal	Very High	Low	Very Low
9.	Gujranwala	Very High	Low	Low	10.	Jhang	Very High	Low	Medium
11.	Okara	Medium	Low	High	12.	DG Khan	Very High	Low	Medium
13.	Nankana Sahib	Medium	Low	High	14.	Sargodha	High	Low	Low
15.	Muzaffargarh	Very High	Low	High	16.	Rajan Pur	Very High	Low	Medium
17.	Mianwali	High	Low	Low	18.	Lodhran	Medium	Low	High
19.	Gujrat	Very High	Low	Low	20.	Layyah	Very High	Low	Medium
21.	Faisalabad	Medium	Low	High	22.	Khushab	High	Low	Low
23.	Chiniot	Medium	Low	Medium	24.	Khanewal	Medium	Low	High
25.	Vehari	Medium	Low	Medium	26.	Kasur	Medium	Low	Medium
27.	Pakpattan	Medium	Low	Medium	28.	Jhelum	Medium	Low	Low
29.	M. Bahaudin	Medium	Low	Low	30.	Lahore	Medium	Low	Low
31.	Bahawalnagar	Medium	Low	Medium	32.	Hafizabad	Medium	Low	Low
33.	Bahawalpur	Low	Low	Medium	34.	Attock	Low	Very Low	Very Low
35.	Chakwal	Low	Very Low	Low	36.	Bhakkar	Medium	Very Low	Very Low

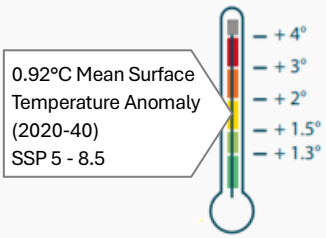
Scoring Key

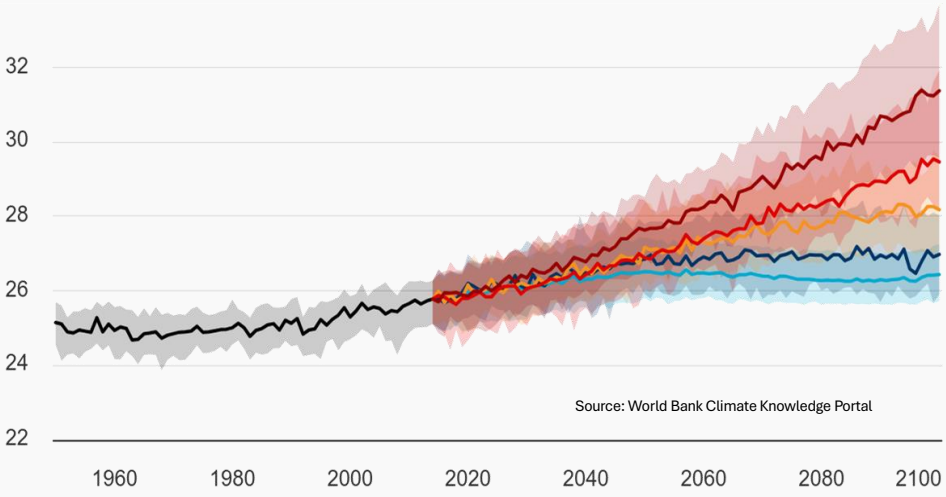
Very High	High	Medium	Low	Very Low

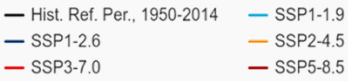
Source: Chaudhry, Q. 2017. Climate Change Profile of Pakistan. Asian Development Bank, Philippines. doi.org/10.22617/TCS178761

CLIMATE CHANGE IMPACTS PROJECTIONS

Historical and projected average annual temperature in Punjab under different scenarios shows a notable increase in temperature.







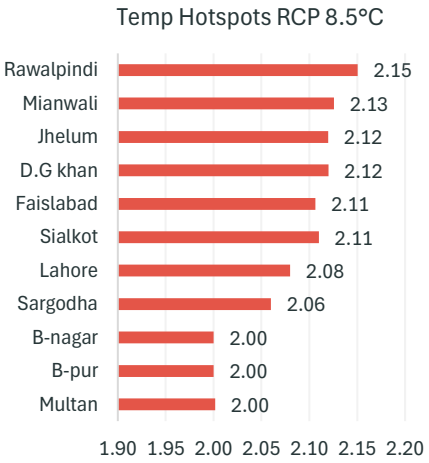
Year	Low Scenario SSP1-2.6	Intermediate SSP2-4.5	High Scenario SSP3-7.0	Very High Scenario SSP5-8.5
2030	26.05	26.15	26.06	26.35
2040	26.48	26.64	26.44	26.78
2050	26.85	27.17	26.88	27.63

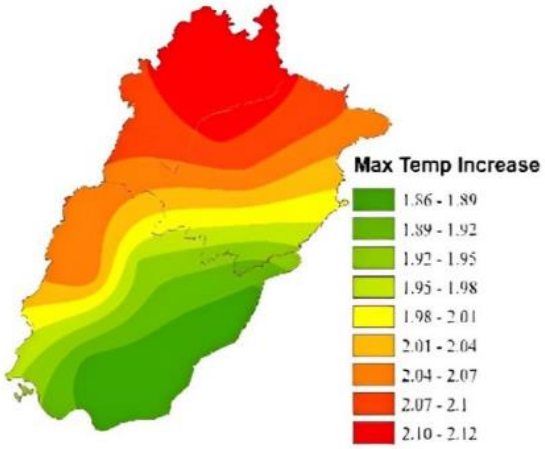
62%

Urban Population (11 cities)

2°c Temperature Change

In worst-case scenario



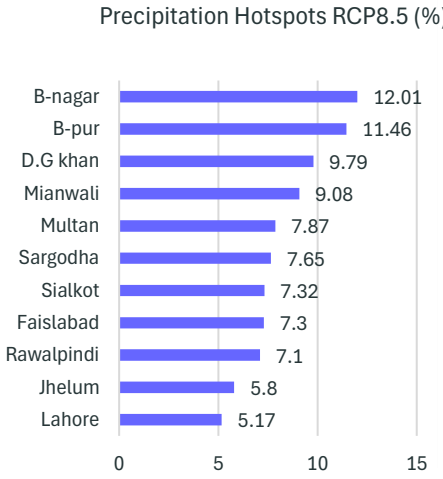


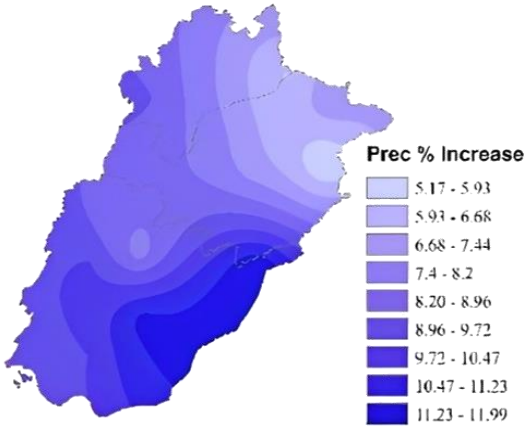
34%

Urban Population (9 cities)

7% precipitation change

In worst-case scenario





Source: Source: Global Climate Models (GCMs) The Urban Unit. 2020. Strategic Environmental Assessment – Punjab Spatial Strategy 2047.

VISION

“A Climate Resilient Punjab”

GOAL

“A sustainably growing Punjab with adequate adaptive capacity to manage and recover from unprecedented climate shocks and promoting low-emission sustainable development.”

OBJECTIVES

The specific objectives of the policy are to:

- Establish evidence and research-based cross-sectoral baseline.
- Ensure climate adaptation and mitigation through embedding into climate action plans and planning and development frameworks.
- Prioritize green investments across vulnerable and affected sectors.
- Achieve low-emission development that yields social, environmental, and economic benefits and mitigate smog by improving the air quality index, making the province greener and more competitive.
- Enhance the resilience of vulnerable sections of the population through district plans encompassing climate justice and gender-responsive approaches for equitable benefits.
- Include youth, women, media, civil society, and vulnerable groups for a call for action.
- Making Punjab a role model in Resilience, Recovery, Rehabilitation, and Reconstruction against climate-induced disasters.
- Integrate climate change education in all curricula (formal, informal, and skill development)

PRINCIPLES

The Policy is guided by the following principles:

Leadership

Integration & Inclusivity

Evidence-based

Climate Justice

Reliance on Nature-based solutions

Abiding by International Commitments

POLICY AREAS

Three Policy Areas (PAs) are defined for strategic planning and goal setting for a Climate Resilient Punjab.

Adaptation		Mitigation		Cross-Cutting	
Action to bear the climate shocks		Actions to reduce the GHG emissions		Adaptation & Mitigation synergies	
Water Resources	Biodiversity & Ecosystems	Energy	Industry	Forestry & Green Spaces	Climate-integrated Planning
Climate-induced Disaster Management	Health & Climate Justice	Transport	Waste	Agriculture & Livestock	Climate Financing

PA 1: Climate Change Adaptation

The adaptation policy area focuses on the sectors that can enhance Punjab's capacities to manage and recover from exacerbating climate shocks by protecting the province's green and blue systems and minimizing the impacts on (vulnerable) populations.

Targets

	5%	Increase in protected areas
	100%	Map high-risk areas and develop land use plans for climate-induced disaster-prone districts
2027	100%	Prepare flood management plans for high-risk areas
	100%	Prepare and implement heatwave and drought management plans for hotspot areas
	100%	Establish baseline and evidence-based research and policy interventions on post-disaster mapping of health impacts.
	100%	Re-assess and remodel the flood-carrying capacity of riverine hydraulic structures including bridges and demarcation floodplain zones
2030	100%	Establish an early warning system in flood-prone areas
	100%	Ensure the provision of shelter places and water filtration plants in heatwave hotspot areas
	100%	Regulate 100% of groundwater
2035	100%	Construct water harvesting structures in all barani areas and flood zones
	15%	Increase in protected areas

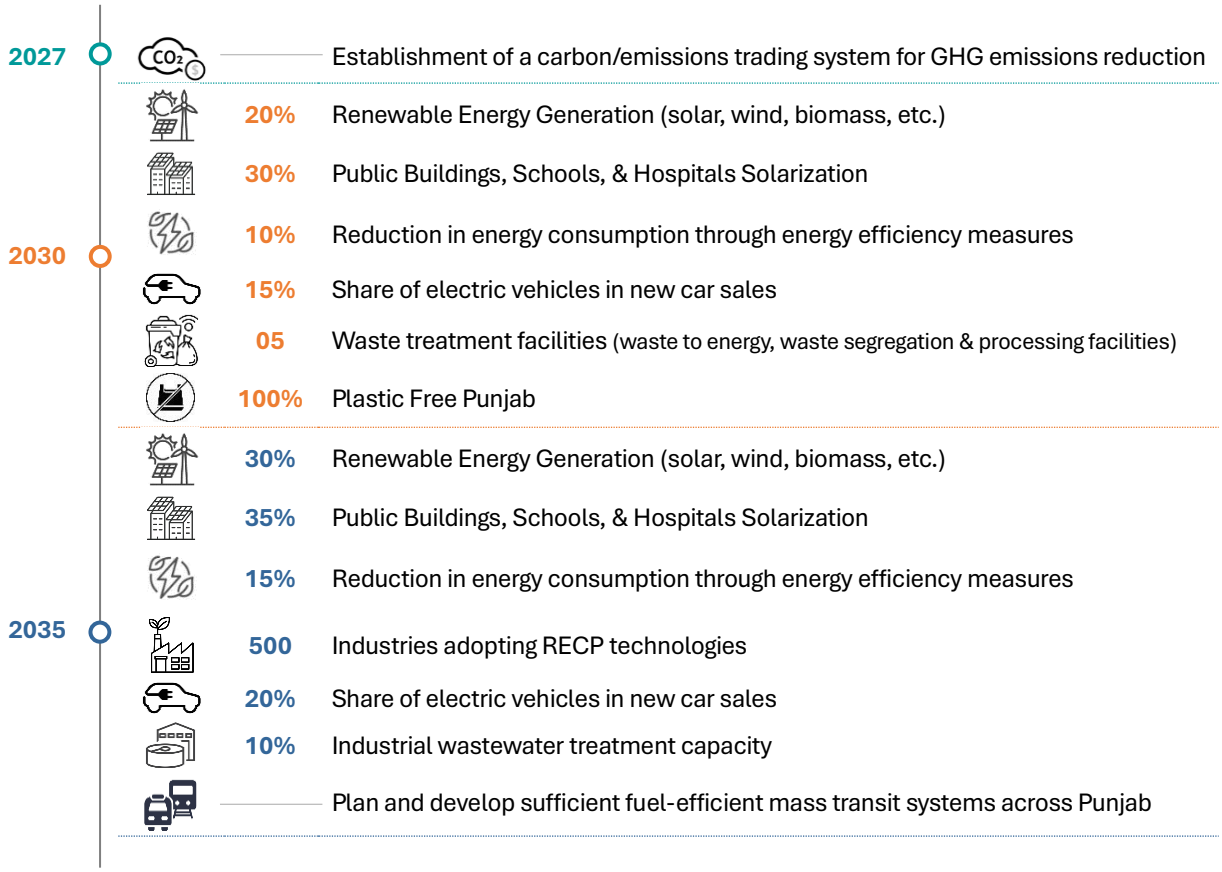
Adaptive Measures to Achieve Policy Targets

1. Water Resources: Enhance water security by conserving and protecting water resources. Improve integrated water resource management and ensure water quality via regulatory and technical measures. Promote climate-resilient water storage and distribution infrastructure such as recharging wells, rainwater harvesting, and community ponds.
2. Biodiversity: Formulate and implement integrated biodiversity conservation programs to conserve and protect high conservation value areas. Rehabilitate degraded habitats through ecosystem-based adaptation, and establish new protected areas to ensure the survival of threatened ecosystems. Improve the health of wetlands (i.e. RAMSAR sites) that act as floodgates, rangelands, pastures, & deserts and conserve aquatic diversity and habitat conditions.
3. Improving Response against Climate-Induced Disasters: Strengthen climate-induced disaster management capacity by prioritizing disaster-resilient infrastructure, effective forecasting, early warning systems and services, zoning, and investing in cost-effective nature-based solutions. Conduct scientific studies and assessments for climate-induced disasters and prepare action plans.
4. Health & Climate Change: Mainstreaming climate adaptation in the healthcare system for effective response to climate-induced disasters and diseases. Focus on mapping post-disaster health impacts and establish a baseline for policy interventions.
5. Climate Justice: Integrate gender-responsive adaptation in sectoral development/investment plans, and uplift the climate-hit population groups through poverty alleviation initiatives by offering social and financial protection schemes.

PA 2: Mitigation and Low Carbon Development

The Mitigation Policy Area focuses on the reduction of GHG emissions and low-carbon development in Punjab to meet national and global commitments.

Targets



Mitigative Measures

1. Energy Generation: Introduce cleaner power generation technologies using alternative fuels and energy resources. Promote off-grid renewable energy in rural and remote areas, expand smart grids, and prioritize the transition of public sector buildings to renewables. Initiatives for home-based solar systems for low-income households are to be provided.
2. Energy Efficiency: Enforce energy efficiency audits, standards, and labeling to enhance energy performance and reduce reliance on fossil fuel consumption.
3. Industry: Establish and implement incentive-based systems to reduce GHGs & air pollutants. Implement Resource Efficiency and Cleaner Production technologies. Make planned investments in installing Combined Effluent Treatment Plants in key polluting industries in the shortest possible period. Ensure that the Emission Control System (ECS) covers the polluting industry through regulations and incentives.
4. Transport: Ensure the provision of a fuel-efficient public transport system (addressing gender-specific travel needs) and encourage non-motorized modes of travel. Enforce vehicle emission standards, and certification, and promote electric vehicle adoption in the public and private sectors. Enhance the capacity and mandate of the Vehicle Inspection and Certification System (VICS) for private vehicles including two/three-wheelers.
5. Waste: Promote an integrated waste management system that includes solid waste and wastewater treatment facilities, waste-to-energy projects, and methane-capturing systems at waste disposal sites. Implement plastic waste management regulations and strategies.

PA 3: Cross-Cutting (Adaptation & Mitigation)

This policy area focuses on the measures that require a combination of adaptation and mitigation strategies in different sectors.

Targets

2027	100%	Develop Cities Climate Action Plans focusing on GHG inventory, pathway projections, risk assessment, and action plans for large cities
	100%	Establish a baseline for agriculture productivity to assess the impacts of climate-smart interventions in the agriculture sector across different crop zones.
2030	100%	Develop climate-resilient master plans for large cities to enhance climate resilience
	10%	Enhance carbon sinks through tree plantation and urban green/forest cover in major cities
	100%	Introduce green building codes and implement them for all new public buildings
	3%	Increase annual growth in agricultural productivity through climate-smart interventions
2035	100%	Develop Cities Climate Action Plans focusing on GHG inventory, pathway projections, risk assessment, and action plans for intermediate cities
	15%	Enhance carbon sinks through tree plantation and urban green/forest cover in major cities
	15%	Introduce green building codes and implement them for all new private buildings
	5%	Increase annual growth in agricultural productivity through climate-smart interventions

Policy Measures:

1. Forestry & Green Spaces: Support the preservation and development of carbon sinks through integrated forest management focusing on afforestation, reforestation, community-based forestation, agroforestry, green spaces, REDD+, corporate forest initiatives, and protecting them from wildfires and deforestation. Effectively implement 'Plant for Pakistan' to counter the climatic impacts through a reforestation drive.
2. Climate-integrated Planning: Develop climate-resilient master plans and action plans that entail climate-informed urban land use planning incorporating green spaces, urban parks, and permeable surfaces as natural buffers for heatwaves, floods, & droughts while ensuring low carbon footprints. Align development planning with Sustainable Development Goals (SDGs), and Multilateral Environmental Agreements (MEAs). Focus on developing resilient infrastructure to withstand climate shocks by maintaining reliable service delivery and adopting net zero/green building codes in cities.
3. Agriculture: Stimulate climate-smart agricultural practices that focus on crop diversification, resilient varieties, and better soil health coupled with progressive and modern irrigation systems that focus on water efficiency & conservation. E-mechanization under the 'Transforming Punjab Agriculture' initiative to improve agricultural productivity, control air pollution & and smog, and promote climate-smart practices.
4. Livestock: Develop climate-resilient livestock breeds to maintain animal health and productivity under changing climate conditions. Reduce livestock-related GHG emissions through effective solutions like manure management, and specialized feed mix. Increase women participation in Agriculture & Livestock.
5. Climate Financing: Institutionalize and leverage green financing, promote green technologies, and climate-sensitive governance in collaboration with national and international organizations, and local communities.

IMPLEMENTATION FRAMEWORK

Time-bound actions

An action plan, delineating time-bound actions with defined roles & responsibilities, and targets.

Institutional and legal pre-requisites for effective implementation:

- Establish Climate Change Cells in key provincial departments to strengthen each department/sector with sound knowledge of policies and actions required by that department. Furthermore, improve and expand our capacities for climate change applied research at the provincial and regional levels in different public sector organizations.
- Revision of rules of business and relevant legislation, where necessary, to mainstream climate change through a legislative process by formulating the Punjab Climate Change Act and making necessary amendments to the Punjab Environmental Protection Act Amended 2017 and Punjab Local Government Act 2022.

Climate Education, Awareness, and Outreach

- Integrate climate change mitigation and adaptation in the education sector at all levels (school curriculums, degree programs, diplomas, awareness, and training).
- Engage the youth in promoting climate awareness and provide leadership and dynamism to climate change programs.
- Launch a well-coordinated and comprehensive awareness program using modern media platforms and engaging with Academia, NGOs, and CBOs, to gather support and validation for climate change policy actions.

Capacity Building and Data Sharing

- Improve technical capacities of government departments in climate-compatible developments, with a special focus on GHG emissions data collection/inventorying, forecasting, and sharing of critical data sets among different levels of the government for effective evidence-based actions.
- Forge strategic partnerships with provincial and national entities dedicated to climate change, pooling human, technological, and financial resources for maximum impact.

Technology transfer

- Indigenize climate-smart technologies for both mitigation and adaptation purposes.
- Develop low-cost sensors for observation of hydro-climatic parameters at a fine resolution to validate the climate projections and build a database for the decision support system.

Research and Development

- Encourage high-level research for inclusive climate resilience focusing on innovation, technology transfer, and data management.
- Foster collaboration with international scientific organizations to enhance research on climate change-related issues and employ gender-sensitive vulnerability assessment tools and methodologies to evaluate the impact of climate change on economically vulnerable sectors in Punjab.
- Downscale the climate projections at the district & city level in collaboration with reputable local and international partners.

Financing

- Create a climate fund to support research in climate-smart technology and solutions, leveraging investments and developing market-based instruments for reducing GHG emissions.
- Implement climate budget tagging in development planning.

Coordination and Monitoring

Provincial Climate Change Policy Implementation Committee (PCCPIC)

The Provincial Climate Change Policy Implementation Committee will oversee the smooth execution of the policy and its action plan. The Environment Protection and Climate Change Department (EPCCD) will be the secretariat of it and will coordinate with national and international organizations. The PCCPIC will meet biannually to review policy implementation and recommend any necessary corrective measures to achieve the policy's objectives and targets.

Senior Minister for P&D, FWF, EP&CCD, and Chief Minister Special Initiatives	Chair
Chief Secretary Punjab	Co-chair
Secretary Environment Protection and Climate Change Department	Member/ Secretary
Secretaries to the Government of the Punjab, Finance Department Planning & Development Board Agriculture Department Forest, Wildlife and Fisheries Department Irrigation Department Local Government and Community Development HUD and PHE Department Energy Department Higher Education Department School Education Department Information and Culture Department Youth Affairs, Sports, Archeology & Tourism Women Development Department Industries, Commerce, and Investment Department	Members
Director General, Provincial Disaster Management Authority, Punjab	Member
Director General, Emergency Services, Punjab	Member
Chief Meteorologist, Pakistan Meteorological Department	Member
Chief Executive Officer, The Urban Unit	Member
Chief/Deputy Chief, SUPARCO	Member

Monitoring and Evaluation

An integrated monitoring portal will be established by EPCDD to collect data on sectoral initiatives, targets, achievements, budget allocations, expenditures, and planned activities related to climate change adaptation and mitigation, as outlined in the policy and action plan. This data will be compiled into the annual State of Climate Change Report, which will be considered by the PCCPIC for strategic and informed decision-making and placed before the Cabinet.

Reporting, Review and Updation

Provincial departments and attached departments relevant to the sectors identified in the policy will regularly report on the progress of policy implementation to the EPCCD. This policy document will remain a 'living' document and undergo review and updating as and when necessary.

PUNJAB CLIMATE CHANGE ACTION PLAN

Policy Area 1: Climate Change Adaptation and Resilience

No.	Actions	Responsible Entity	Short Term (Within 1-2 yrs)	Medium Term (3-5 Years)	Long Term (5-10 years)
	Adaptive Measure (AM.1)				
	Water Resources: Enhance water security by conserving and protecting water resources. Improve integrated water resource management and ensure water quality via regulatory and technical measures. Promote water storage and distribution infrastructure such as recharging wells, rainwater harvesting, and community ponds.				
1.1	Set up rainwater harvesting systems in public buildings in high-potential districts.	HUD&PHED, C&W, DAs, WASAs, LGCDD			
1.2	Install water quality monitoring stations at major surface water bodies	EPCCD/EPA, Irrigation			
1.3	Deploy floating trash barriers to prevent waste and plastics from accumulating in water bodies	WASAs, Irrigation, EPCCD/EPA			
1.4	Conduct feasibility to identify strategic water storage across Punjab such as watershed storage, small dams, dispersion structures with downstream storage, etc.; Identify areas and locations for large-scale groundwater recharging	Irrigation, WAPDA			
1.5	Introduce regulations for controlling groundwater depletion	HUD&PHED, Irrigation, LGCDD			
1.6	Develop and implement a tiered water pricing structure that charges users based on their level of consumption, ensuring that basic needs are met at a lower cost.	HUD&PHED, WASAs, LGCDD			
1.7	Ensure measurement and monitoring of irrigation water delivery through innovative and digital solutions at various points of the supply system for effective planning and management.	Irrigation Department			
1.8	Construct small dams and community ponds, especially in the Pothwar region flood zones and hill torrent areas.	ABAD, Irrigation, C&W, WASAs, LGCDD			

No.	Actions	Responsible Entity	Short Term (Within 1-2 yrs)	Medium Term (3-5 Years)	Long Term (5-10 years)
1.9	Restoration of degraded water storage capacity of reservoirs/ponds/dams	HUD&PHED, WASAs, LGCDD, C&W			
1.10	Enforce water re-use and recycling in water-dependent industries through regulator instruments	EPCCD/EPA, ICI&SDD, WASAs			
1.11	Implement the water accounting system at the canal command scale	Irrigation, EPCCD/EPA			
1.12	Introduce a water quality ranking system for natural water bodies and barrage-barrage channel reach for cleansing of contaminants	Irrigation, EPCCD/EPA			
1.13	Install constructed wetlands to naturally treat agricultural and urban runoff breaching out to natural water bodies	HUD&PHED, WASAs, LGCDD, WASAs			
1.14	Establish aquifer storage and recovery technology in canal command and rain-fed areas	Irrigation, WASAs, Agriculture, EPCCD/EPA, C&W			
1.15	Introduce a water rights trading system to optimize water allocation	Irrigation Department, EPCCD/EPA			
1.16	Allocate water budget for conservation and rehabilitation of threatened wetlands	Irrigation, F W&FD, EPCCD/EPA			

Adaptive Measure (AM.2)

Biodiversity & Vulnerable Ecosystems: Formulate and implement integrated biodiversity conservation programs to conserve and protect high conservation value areas. Rehabilitate degraded habitats through ecosystem-based adaptation, and establish new protected areas to ensure the survival of threatened ecosystems. Improve the health of wetlands (i.e. RAMSAR sites) that act as floodgates , rangelands, pastures, and deserts (arid and hyper arid areas) and conserve aquatic diversity and habitat conditions.

2.1.	Conduct a baseline survey and demark protected areas, and vulnerable & degraded habitats, and develop a dashboard.	FW&FD, EPCCD/EPA			
2.2.	Establish a legal framework at the provincial level to implement the international conventions and commitments for biodiversity.	FW&FD, EPCCD/EPA			
2.3.	Identify and notify new protected areas across the province and prepare their ecosystem management plans. Ensure women's participation in the management of protected areas.	FW&FD, EPCCD/EPA			

No.	Actions	Responsible Entity	Short Term (Within 1-2 yrs)	Medium Term (3-5 Years)	Long Term (5-10 years)
2.4.	Initiate community-led ecosystem rehabilitation programs	FW&FD, EPCCD/EPA			
2.5.	Organize training and manage resources to empower communities to actively participate in biodiversity monitoring, habitat restoration, and sustainable resource management.	FW&FD, EPCCD/EPA			
2.6.	Implement measures to maintain vegetative cover in arid and semi-arid lands to prevent desertification.	Agriculture, FW&FD			
2.7.	Implement measures to prevent topsoil erosion in rangelands and pastures, particularly in the Pothwar region. Encourage and promote rangeland management, reclamation, and restoration practices and advocate for soil conservation practices in rangelands to combat desertification.	Agriculture, FW&FD			
2.8.	Prepare City Biodiversity Index and Action Plans.	FW&FD, EPCCD/EPA			
2.9.	Develop Wetlands and RAMSAR sites conservation and management plan to improve the health of wetlands by conserving aquatic diversity and protecting habitat conditions	FW&FD, EPCCD/EPA			
2.10.	Design and implement ecosystem-based adaptation projects	FW&FD, LG&CDD			
2.11.	Establish gene banks, seed banks, zoos, and botanical gardens to conserve the biological diversity of valuable species				
2.12.	Establish a Center of Excellence on forestry & biodiversity for international-level research and basic-advance level training focusing on climate change.	FW&FD, EPCCD/EPA			
2.13.	Coordinate with the federal government and the international community to get assistance for developing biodiversity projects	FW&FD, EPCCD/EPA			

Adaptive Measure (AM.3)

Climate-Induced Disasters: Strengthen climate-induced disaster management capacity by prioritizing disaster-resilient infrastructure, effective forecasting, early warning systems and services, zoning, and investing in cost-effective nature-based solutions. Conduct scientific studies and assessments for climate-induced disasters and prepare action plans.

3.1.	Develop district-wise hazard maps highlighting areas prone to floods, droughts, heatwaves, and other hazards	PDMA, EPCCD/EPA, DAs, LG&CDD, HUD&PHED			
3.2.	Reassess and remodel the flood-carrying capacity of riverine hydrologic structures including bridges	PDMA, LGCDD			

No.	Actions	Responsible Entity	Short Term (Within 1-2 yrs)	Medium Term (3-5 Years)	Long Term (5-10 years)
3.3.	Carry out a fresh demarcation of high-risk areas, floodplain zones and develop an adaptation district plan and also provide city-wise resilient municipal infrastructure.	PDMA, LGCDD, PHED			
3.4.	Install/strengthen early warning systems in each flood/flash flood zone and develop communities' evacuation plans	PDMA, PMD, C&W, DAs, Irrigation			
3.5.	Adopt a proactive approach toward disaster risk management	PDMA, EPCCD/EPA, DAs, LG&CDD, HUD&PHED			
3.6.	Provide shady/shelter places on heatwave hotspots	LGCDD, PDMA, EPCCD/EPA, DAs,			
3.7.	Launch drought management programs for Southern Punjab	CDA, PDMA, EPCCD/EPA, LG&CDD			
3.8.	Retrofit public buildings and infrastructure to withstand climate-induced disasters	PDMA, EPCCD/EPA, DAs, LG&CDD, HUD&PHED, C&W, Energy			
3.9.	Conduct multi-hazard vulnerability assessments at the district/city level, set actionable targets, and update every 3 years	PDMA			
3.10.	Expedite and expand flood works and hill torrent management projects to enhance flood-resilient infrastructure in flood-prone areas	PDMA, Irrigation			
3.11.	Construct flood-resistant housing in vulnerable areas, incorporating raised foundations and water-resistant materials	PDMA, C&W, DAs			
3.12.	Construct building resilient infrastructure e.g. Redesign and upgrade storm drainage capacity of major cities of Punjab	PDMA, LGCDD, PHED			
3.13.	Develop an institutional setup and regulatory framework for the management of climate-induced migrations	PDMA, EPCCD/EPA, DAs, LG&CDD, IOM			
3.14.	Install soil moisture sensors and drought indices to monitor and forecast drought conditions	PDMA, PMD, C&W, DAs, ICI&SDD, Irrigation, Soil Survey of Punjab			
3.15.	Ensure early rehabilitation, remodeling, and up-gradation of the existing irrigation infrastructure in Punjab	PDMA, Irrigation			
3.16.	Develop projects to tap foreign assistance in strengthening the disaster management regime	PDMA			
3.17.	Enhance livelihood opportunities and entrepreneurship options for local communities to opt for during and post-disaster period	PDMA			
3.18.	Redesign/construct disaster-resilient buildings starting from public hospitals, dispensaries, and schools.	PDMA, LGCDD, PHED, C&W, P&SHC			

No.	Actions	Responsible Entity	Short Term (Within 1-2 yrs)	Medium Term (3-5 Years)	Long Term (5-10 years)
	Adaptive Measure (AM.4)				
	Health: Mainstreaming climate adaptation in the healthcare system for effective response to climate-induced disasters and diseases. Focus on mapping post-disaster health impacts and establish a baseline for policy interventions.				
4.1.	Integrate appropriate measures of climate-related disasters and diseases in the health sector policy and plans.	Health Department			
4.2.	Conduct studies to assess the health vulnerability of communities with respect to climate change and develop management plans to reduce vulnerability.	Health Department			
4.3.	Prepare and implement Climate Sensitive Diseases monitoring and forecasting system	Health Department			
4.4.	Designate special wards and OPDs in each hospital to deal with the patients affected by air-, heat-and water-borne diseases during peak seasons	Health Department and related entities, PDMA			
4.5.	Enhance the fleet of mobile health units to ensure rapid deployment to areas affected by climate disasters, maintaining uninterrupted access to healthcare services for the impacted population	Health Department and related entities, PDMA, Emergency Services			
4.6.	Apply a 'climate lens' approach while framing the WASH sector strategies and plans	Health Department and related entities, LGCDD, PHED			
4.7.	Dedicate a comprehensive segment in future health strategies to the prevention and management of climate-related diseases including post-disaster trauma, anxiety/depression, heatstroke, etc.	Health Department and related entities			
4.8.	Organize training of phase-wise 100,000 healthcare professionals on climate-related health issues.	Health Department and related entities			
	Adaptive Measure (AM.5)				
	Climate Justice: Integrate gender-responsive adaptation in sectoral development/investment plans, and uplift the climate-hit population groups through poverty alleviation initiatives by offering social and financial protection schemes.				
5.1.	Establish microfinance schemes with low or zero-interest loans to support small businesses and entrepreneurship in climate-impacted areas.	PDMA, SPA, P&DB			
5.2.	Engage non-governmental organizations and civil society organizations to initiate schemes to support climate-hit populations at the district level, particularly in south Punjab	PDMA, EPCCD/EPA			

No.	Actions	Responsible Entity	Short Term (Within 1-2 yrs)	Medium Term (3-5 Years)	Long Term (5-10 years)
5.3.	Develop district-level emergency relief action plans and funds with a gender lens to ensure that women and vulnerable groups receive timely and adequate support during climate-induced disasters.	PDMA, EPCCD/EPA, WDD			
5.4.	Develop a comprehensive database of eligible beneficiaries, ensuring data accuracy and inclusiveness.	PDMA, P&DB, SPA, WDD			
5.5.	Use efficient and transparent disbursement mechanisms such as mobile banking, digital wallets, or community banking systems to ensure timely and secure delivery of funds and charity to the target groups.	PDMA, P&DB, FD, Private Sector			
5.6.	Develop and fund programs specifically aimed at improving women's livelihoods in climate-affected areas, such as agriculture training, and access to markets	PDMA, P&DB, WDD			
5.7.	Introduce specialized insurance programs tailored for affected people populations	PDMA, P&DB, SPA, WDD			
5.8.	Launch during and post-disaster social protection schemes for poor population groups.	PDMA, P&DB, SPA, WDD			

Policy Area 2: Mitigation and Low Carbon Development

No.	Actions	Responsible Entity	Short Term (Within 1-2 yrs)	Medium Term (3-5 Years)	Long Term (5-10 years)
	Mitigative Measure (MM. 1)				
	Energy Generation: Introduce cleaner power generation technologies using alternative fuels and energy resources. Promote off-grid renewable energy in rural and remote areas, expand smart grids, and prioritize the transition of public sector buildings to renewables. Initiatives for home-based solar systems for low-income households are to be provided.				
1.1	Formulate a provincial energy policy aligning with the measures outlined in the Alternate & Renewable Energy Policy (ARE 2019), tailored to provincial and local contexts.	Energy Dept, PEECA			
1.2	Support industrial units for phasing out coal and inefficient boilers	Energy Dept, EP&CCD/EPA, ICI&SDD			
1.3	Harness opportunities for renewable and solar energy generation by fostering partnerships with the private sector, and stimulate renewable energy markets through incentivization and supportive frameworks.	Energy Dept, PEECA			

No.	Actions	Responsible Entity	Short Term (Within 1-2 yrs)	Medium Term (3-5 Years)	Long Term (5-10 years)
1.4	Carryout feasibility studies for installation of smart grids in rural centers and decentralized urban centers	Energy Dept, PEECA			
1.5	Improve the energy mix by increasing the share of renewable energy to 20%	Energy Dept, WAPDA			
1.6	Solarize at least 30% of existing public buildings and mandate the solarization of new buildings in the public sector	Energy Dept, PEECA			
1.7	Modernize existing grid infrastructure to support smart grid technologies	Energy Dept, PEECA			
1.8	Improve the energy mix by increasing the share of renewable energy to 30%	Energy Dept, WAPDA			

Mitigative Measure (MM. 2)

Energy Efficiency: Enforce energy efficiency audits, standards, and labeling to enhance energy performance and reduce reliance on fossil fuel consumption.

2.1	Map out the energy-intensive industries and update the database periodically	Energy Dept, EP&CCD/EPA, ICI&SDD			
2.2	Promote efficient energy management systems and interventions to encourage the adoption and development of renewable energy sources.	Energy Dept, PEECA			
2.3	Advocate for the deployment of energy-efficient appliances across households, governmental, and private sectors, as well as irrigation, agricultural zones, and industries.	Energy Dept, PEECA, EP&CCD/EPA			
2.4	Conduct energy audits for energy-intensive industries and commercial buildings and introduce measures to promote sustainable energy consumption and production	Energy Dept, EP&CCD/EPA, ICI&SDD			
2.5	Enforce energy codes and standards for public buildings	Energy Dept, PEECA			
2.6	Phase – out inefficient boilers from industries completely through legislative support; and expand the use of biofuels/biomass in the industrial and power generation sector	Energy Dept, EP&CCD/EPA, ICI&SDD			
2.7	Standardize and ensure the availability of energy-efficient appliances, industrial equipment, agricultural machinery, etc.	Energy Dept, PEECA			
2.8	Design the labeling, testing, and verification protocols to introduce an energy labeling system	Energy Dept, PEECA			

Mitigative Measure (MM. 3)

Industry: Establish and implement incentive-based systems to reduce GHGs & air pollutants. Implement Resource Efficiency and Cleaner Production technologies. Make planned investments in installing Combined Effluent Treatment Plants in key polluting industries in the shortest possible period of time. Ensure that the Emission Control System (ECS) covers the polluting industry through regulations and incentives.

3.1	Develop matrices for assessing carbon footprint to develop the ranking	EP&CCD/EPA			

No.	Actions	Responsible Entity	Short Term (Within 1-2 yrs)	Medium Term (3-5 Years)	Long Term (5-10 years)
	system				
3.2	Develop a result-based framework to support industries for RECP technology adoption	ICI&SDD, EP&CCD/EPA			
3.3	Establish a regulatory framework to implement the concept of a circular economy	EP&CCD/EPA, LGCD, WMCs			
3.4	Assess the feasibility of implementing AI-based emission monitoring system.	EP&CCD/EPA, ICI&SDD			
3.5	Establish and implement an Emission Trading System (ETS) through a regulatory framework	ICI&SDD, Law Dept.			
3.6	Set emission reduction targets and annual caps on emissions	EP&CCD/EPA, ICI&SDD			
3.7	Install continuous emissions monitoring systems in major manufacturing units	EP&CCD/EPA, ICI&SDD			
3.8	Prepare a negative list of carbon-intensive industries	EP&CCD/EPA, ICI&SDD			
3.9	Phase-wise implementation to Install Emission Control Systems (ECS) starting from polluting industries through regulation and incentives.	EP&CCD/EPA, ICI&SDD			
3.10	Support industries to implement RECP technology adoption program	EP&CCD/EPA, ICI&SDD			
3.11	Encourage the corporate sector to create a "Corporate Social Responsibility" (CSR) to create SOPs and funds to cover carbon emission reduction efforts in the industrial sector	ICI&SDD, Private Sector			
3.12	Develop linkages of the domestic ETS with international carbon markets/ETS	EP&CCD/EPA, ICI&SDD			
3.13	Support industries to develop and implement carbon-neutral and net-zero programs	EP&CCD/EPA, ICI&SDD			
3.14	Install combined effluent treatment plants before the disposal point of each industrial estate/cluster/park	ICI&SDD, C&W, WASAs, Irrigation, EPCCD/EPA			

Mitigative Measure (MM. 4)

Transport: Ensure the provision of a fuel-efficient public transport system (addressing gender-specific travel needs) and encourage non-motorized modes of travel. Enforce vehicle emission standards, and certification, and promote electric vehicle adoption in the public and private sectors. Enhance the capacity and mandate of the Vehicle Inspection and Certification System (VICS) for private vehicles including two/three-wheelers.

4.1	Plan and introduce sufficient fuel-efficient mass transit systems in Lahore.	Transport Dept.			
4.2	Append the issuance of fitness certificate with compliance of environmental quality standards for vehicular emissions	Transport, EP&CCD/EPA			

No.	Actions	Responsible Entity	Short Term (Within 1-2 yrs)	Medium Term (3-5 Years)	Long Term (5-10 years)
4.3	Develop dedicated lanes and pathways for bicycles and pedestrians and encourage non-motorized modes of travel	Transport, EP&CCD/EPA, C&W			
4.4	Demark vehicle-free zones (emission-free)	Transport, EP&CCD/EPA, C&W			
4.5	Introduce public bicycle-sharing schemes	Transport, WDD			
4.6	Implement Punjab Electric Vehicle Policy 2020-25	Transport Dept.			
4.7	Plan and introduce sufficient fuel-efficient mass transit systems in all large cities	Transport Dept.			
4.8	Configure state-of-the-art vehicular emission testing setup in existing and prospective VICS Stations	Transport, EP&CCD/EPA			
4.9	Expand the network of EV charging stations across urban and peri-urban areas	Transport Dept.			
4.10	Revise and make the environmental quality standards for vehicular emissions more stringent progressively	EP&CCD/EPA			
4.11	Invest in expanding railway, bus, tram, or metro networks to cover more areas within districts and inter-city connectivity.	Transport Dept., Railway Dept.			
4.12	Initiate manufacturing of EVs at a local level	Transport Dept., ICI&SDD			
4.13	Support the private transport sector by providing incentives for reducing emissions and environmentally friendly transport services;	Transport, EP&CCD/EPA, Private Sector			

Mitigative Measure (MM. 5)

Waste: Promote an integrated waste management system that includes solid waste and wastewater treatment facilities, waste-to-energy projects, and methane-capturing systems at waste disposal sites. Implement plastic waste management regulations and strategies.

5.1	Establish scientific landfills in megacities	LGCDD, WMCs, MCs, EP&CCD/EPA			
5.2	Improve waste collection rate by expanding the collection networks and infrastructure.	LGCDD, WMCs, MCs			
5.3	Prepare a strategy for implementation of 5Rs concept in all sectors, along with quantifiable targets and indicators	LGCDD, WMCs, MCs, EP&CCD/EPA			
5.4	Mainstream Sustainable Consumption and Production National Action Plan (SCPNAP) implementation at the provincial level for achieving sustainable city goals	LGCDD, WMCs, MCs			
5.5	Implement Plastic Management Strategy and Regulations	EP&CCD/EPA			

No.	Actions	Responsible Entity	Short Term (Within 1-2 yrs)	Medium Term (3-5 Years)	Long Term (5-10 years)
5.6	Establish segregation, treatment, and disposal cities in all major cities of Punjab.	LGCDD, WMCs, MCs, Urban Unit			
5.7	Upgrade the landfills with gas collection systems, such as vertical wells or horizontal trenches, to capture methane	LGCDD, WMCs, MCs			
5.8	Pilot the use of methane from landfill sites for electricity generation	LGCDD, WMCs, MCs			
5.9	Launch waste-to-energy projects	LGCDD, WMCs, MCs			
5.10	Enforce the phase-wise installation of wastewater treatment plants	ICI&SDD, WASAs, EPCCD/EPA			

PA 3: Cross-Cutting (Adaptation & Mitigation)

No.	Actions	Responsible Entity	Short Term (Within 1-2 yrs)	Medium Term (3-5 Years)	Long Term (5-10 years)
	Adaptation & Mitigation Measure (AMM. 1)				
	Forestry & Green Spaces: Support the preservation and development of carbon sinks through integrated forest management focusing on afforestation, reforestation, community-based forestation, agroforestry, green spaces, corporate forest initiatives, and protecting natural forests from wildfires and deforestation. Effectively implement 'Plant for Pakistan' to counter the impacts of climate change through a reforestation drive.				
1.1	Map out open areas of designated forest lands and completely restore the affected forests through afforestation and reforestation programs	FW&FD			
1.2	Synchronize the weather forecasting and forest surveillance system, and connect it with the central control room of the disaster management authority to get a real-time monitoring facility to take preventive measures for wildfires	FW&FD, PMD			
1.3	Encourage community-based forestation, farm-forestry through incentives	FW&FD, Agriculture Department			
1.4	Launch a nature conservationist vocational course and engage them in biodiversity conservation	FW&FD, MPDD,			
1.5	Survey and map potential carbon sinks for efficient carbon sequestration	FW&FD, EP&CCD			
1.6	Launch rehabilitation programs for degraded or deforested lands	FW&FD			
1.7	Encourage public-private partnership for corporate forest program	FW&FD, PPP			
1.8	Launch landscaping projects to create new green spaces and enhance biodiversity corridors	FW&FD, PHA, MCs,			

No.	Actions	Responsible Entity	Short Term (Within 1-2 yrs)	Medium Term (3-5 Years)	Long Term (5-10 years)
1.9	Develop synergies and enhance departmental capacities to apply for forestry projects in volunteer carbon markets.	FW&FD, P&DB			
1.10	Create a network of biodiversity parks and natural museums	FW&FD			

Adaptation & Mitigation Measure (AMM. 2)

Climate-integrated Planning: Develop climate-resilient master plans and action plans that entail climate-informed urban land use planning incorporating green spaces, urban parks, and permeable surfaces as natural buffers for heatwaves, floods, & droughts while ensuring low carbon footprints. Align development planning with Sustainable Development Goals (SDGs), and Multilateral Environmental Agreements (MEAs). Focus on developing resilient infrastructure to withstand climate shocks by maintaining reliable service delivery and adopting net zero/green building codes in cities.

2.1	Retrofit existing buildings and infrastructure to improve energy efficiency, reduce air pollution, and greenhouse gas emissions, and enhance resilience to extreme weather.	Energy Department, PEECA, Development Authorities, C&W Department			
2.2	Increase tree cover along main roads, open urban spaces, canals and water bodies, etc. to cool down day temperatures during heatwaves	PHA, Development Authorities			
2.3	Identify open spaces suitable for urban afforestation and maximize the Miyawaki plantation and other techniques of urban ecology in and around urban spaces	PHA, FW&FD			
2.4	Initiate community engagement and awareness campaigns for voluntary plantation on open and free urban spaces to enhance carbon sinks	FW&FD, PHA, EPCCD			
2.5	Expedite the infrastructure upgradation (road rehabilitation, irrigation network upgradation) projects	C&W department, Development Authorities, Irrigation Department			
2.6	Conduct vulnerability assessments of existing infrastructure to prioritize retrofitting and reinforcement	C&W department, Development Authorities, Irrigation Department			
2.7	Integrate the concepts of sponge cities, walkability, densification, etc. in the master plans/action plans.	EP&CCD/EPA and all other sectors			
2.8	Prepare a baseline emission/GHG inventory of Punjab covering all key sectors	EP&CCD/EPA, Urban Unit			
2.9	Conduct Training Needs Assessments and develop and execute technical capacity-building programs for government and non-government actors	EP&CCD/EPA, Urban Unit, PRMP, MPDD			
2.10	Align SDGs with development paradigm	P&DB and all departments			
2.11	Prepare MEA action plan in coordination with MoCC&EC and align with climate financing.	EPCCD, P&D, MoCC			

No.	Actions	Responsible Entity	Short Term (Within 1-2 yrs)	Medium Term (3-5 Years)	Long Term (5-10 years)
2.12	Develop building codes and standards for carbon-neutral buildings	Energy Department, PEECA			
2.13	Update or develop the city's master plans including urban drainage/ urban flooding, drought and heatwave management systems.	LG&CDD, HUD&PHED, Development Authorities			
2.14	Develop City Level Climate Action Plans based on GHG Inventories, Risks & Vulnerability Assessments and Pathway Scenarios	EP&CCD/EPA, Urban Unit			
2.15	Use the potential of the voluntary carbon market for green buildings through zero-emission and sustainable designs.	EPCCD, P&DB, Development Authorities			
2.16	Implement green building code for all new public building	Energy Department, PEECA, EPCCD, LG&CDD, HUD&PHED			
2.17	Plant shady trees near bus stops and provide water coolers and fans in waiting areas/bus-stops/bus-stands operated with solar energy	PHA, Development Authority, MCs,			
2.18	Install screens at prominent public places displaying temperature, air quality index, and weather forecast for public disclosure.	EPCCD, PMD			
2.19	Research and develop new limits of factors of safety/design criteria for infrastructure to adapt the climate change in future developments.	C&W Department, EPCCD, LG&CDD, HUD&PHED			
2.20	Restrict future developments in flood-prone areas or locations susceptible to flood	PDMA, Development Authorities, MCs, LG&CDD, HUD&PHED			
2.21	Protect biological corridors and densely vegetated land while planning for new housing schemes in the outskirts of mega urban centers	FW&FD, EPCCD, Development Authorities			
2.22	Implement codes/ certification systems for green infrastructure such as permeable pavements and green roofs to manage stormwater and reduce urban heat island effects.	Development Authorities, Energy Department, EPCCD			
2.23	Integrate net-zero building requirements into urban planning frameworks	Energy Department, PEECA, LG&CDD, HUD&PHED			

Adaptation & Mitigation Measure (AMM. 3)

Agriculture: Stimulate climate-smart agricultural practices that focus on crop diversification, resilient varieties, and better soil health coupled with progressive and modern irrigation systems that focus on water efficiency and conservation. E-mechanization under the 'Transforming Punjab Agriculture' initiative aims to improve agricultural productivity, control air pollution and smog and promote climate-smart practices. Increase women participation in agriculture (and livestock) ; enhance access to information and encourage jobs in these sectors to foster sustainable livelihoods.

3.1	Prepare and disseminate a catalog of high-yielding, heat-resistant, drought-tolerant and insect/pest-resistant crop breeds suitable for relevant agro-ecological zones through special programs	Agriculture Department, Punjab Seed Corporation			

No.	Actions	Responsible Entity	Short Term (Within 1-2 yrs)	Medium Term (3-5 Years)	Long Term (5-10 years)
3.2	Implement mulching, and manuring practices to improve soil structure and water retention	Agriculture Department			
3.3	Introduce a soil health card system, associate it with subsidies offered to farmers	Agriculture Department, Soil Survey of Pakistan			
3.4	Encourage farmers to use precision agriculture techniques to apply fertilizers more efficiently, reducing over-consumption and minimizing nitrogenous emissions	Agriculture Department			
3.5	Develop local guidelines and standards for sustainable rice cultivation practices	Agriculture Department			
3.6	Train farmers on the principles and benefits of controlled irrigation and alternate wetting and drying practices through extension services, workshops, and demonstration plots	Agriculture Department. Irrigation Department			
3.7	Scale up and commercialize the production of climate-compatible crop varieties	Agriculture Department, Punjab Seed Corporation			
3.8	Introduce e-mechanization in all farmlands to promote climate smart agriculture.	Agriculture Department, EPCCD			
3.9	Introduce a province-wide biochar program for soil health improvement	Agriculture Department, Soil Survey of Pakistan			
3.10	Ensure the use of controlled-release fertilizers that dissolve slowly for GHG emission reduction	Agriculture Department, EPCCD			
3.11	Promote the use of organic fertilizers such as compost, manure, and biochar in combination with synthetic fertilizers	Agriculture Department			
3.12	Upscale alternate wetting and drying and other methane reduction technologies in rice paddies	Agriculture Department			
3.13	Expand the existing (such as precision land leveling) and explore further avenues in precision farming in water-scarce areas	Irrigation, Agriculture, HUD&PHED, WASAs, EPCCD/EPA, C&W, ICI&SDD, LGCDD			
3.14	Expand the soil reclamation program for salt-affected lands	Agriculture Department, Soil Survey of Pakistan			
3.15	Make the water use efficiency at the canal command scale as an indicator of the performance of water management authority	Agriculture Department. Irrigation Department			

No.	Actions	Responsible Entity	Short Term (Within 1-2 yrs)	Medium Term (3-5 Years)	Long Term (5-10 years)
	Adaptation & Mitigation Measure (AMM. 4)				
	Livestock: Develop climate-resilient livestock breeds to maintain animal health and productivity under changing climate conditions. Reduce livestock-related GHG emissions through effective solutions like manure management, and specialized feed mix.				
4.1	Insulate the roofs with heat-resistant materials and improve ventilation of livestock enclosures	LDD			
4.2	Arrange ventilated transport for livestock	LDD			
4.3	Conduct research on climate-resilient livestock breeds	LDD			
4.4	Educate the farmers about and incentivize them to use suitable feed mixes and additives	LDD			
4.5	Establish composting and biogas generation facilities in suitable farmlands	EPCCD, LG&CDD, LDD			
4.6	Make all the public sector and corporate livestock farms climate-proof	LDD, EPCCD			
4.7	Establish breeding programs, genomic tools, and breeding technologies to accelerate the development of resilient breeds	LDD			
4.8	Ensure the supply chain of climate-smart livestock feed in the local market	LDD			
4.9	Encourage the private sector for use of manure and waste on commercial level to promote agricultural enterprises	LDD, Agriculture Department,			
	Adaptation & Mitigation Measure (AMM. 5)				
	Climate Financing: Institutionalize and leverage green financing, promote green technologies, and climate-sensitive governance in collaboration with national and international organizations, and local communities.				
5.1.	Introduce Green Fiscal Reforms in multiple sectors of the economy for carbon emission reductions and develop a Sustainable Finance Framework (SFF).	P&D, EPCCD, FD			
5.2.	Establishment of Climate Financing Unit in Punjab	P&D, EPCCD, FD			
5.3.	Open avenues for green jobs and livelihoods for all through creating equal employment opportunities in multiple sectors, such as, climate smart agriculture, renewable energy, green manufacturing, cleaner technologies, innovation, eco-tourism, etc.	All Sectoral Departments P&D			
5.4.	Initiate Climate Budget Tagging to map the depth of priorities and actions of provincial govt. and to identify the requirements for adaptation and mitigation initiatives/projects/programs.	P&D, EPCCD, FD			

No.	Actions	Responsible Entity	Short Term (Within 1-2 yrs)	Medium Term (3-5 Years)	Long Term (5-10 years)
5.5.	Introduce market-based instruments for emission reduction such as green bonds.	EPCCD (WAPDA, SECP)			
5.6.	Develop a framework to apply economic incentives for emission reduction e.g. in the upgradation of industrial processes and technologies, green energy mix, low-carbon fossil fuels/greener transportation, etc.	EPCCD			
5.7.	Develop a policy/regulatory framework to boost private sector investments for both mitigation and adaptation sectors, and to support small and medium enterprises (SMEs).	EPCCD			

APPENDIX – A

RELEVANCE TO NCCP, SDGs, AND NDCs

PCCP Sectors	NCCP	SDGs	SDG Targets	Pakistan's NDCs
PA 1: Climate Change Adaptation				
Water Resources	4.1		**6.1**-Achieve universal access to drinking water for all **6.3**-Improve water quality & materials having the proportion of untreated water wastewater **6.4**-water use and water scarcity **6.5**-Implement integrated water resources management **6.b-** Support and strengthen the participation of local communities in water and sanitation management **13.1**-Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters	Reduction of flood risk and enhanced water recharge at six sites in the Indus Basin Focus on a) Surface rainwater harvesting, b) Groundwater recharge, and c) Urban storm-water management.
Biodiversity & Ecosystems	4.5, 4.6		**15.1**-Ensure the conservation, restoration **15.4-**ensure the conservation of mountain ecosystems **15.3-**combat desertification, restore degraded land and soil, including land affected by desertification **15.a-**a Mobilize and significantly increase financial resources from all sources to conserve biodiversity and ecosystem **15.8**-Introduce measures to prevent the introduction and significantly reduce the impact of invasive alien species **15.9**-Integrate ecosystem and biodiversity values into national and local planning	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. To build resilience through nature-based solutions and protection of ecosystems and biodiversity
Climate Induced Disasters	4.7		**13.1**-Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters **13.b-** Promote mechanisms for raising capacity for effective climate change-related planning and management **13.2**-Integrate climate change measures into national policies	Development of a Hydrometeorological monitoring system and establishment of Climate database
Human Health	4.3		**2.2**- End all forms of malnutrition **3.3**-End the epidemics **3.7**-Ensure universal access to sexual and reproductive healthcare services **5.6**-Ensure universal access to sexual and reproductive health and reproductive rights **6.1**- Achieve universal access to drinking water for all	Incorporate health and environment in climate and disaster risk reduction related policies and vice versa.

PCCP Sectors	NCCP	SDGs	SDG Targets	Pakistan's NDCs
			6.2-Access to sanitation & hygiene	
Climate Justice			**1.4**-Ensure All have equal rights to economic resources **1.5**- Build the resilience of the poor & reduce vulnerability to climate-related extreme events **5. a**-Undertake reforms to give women equal rights to economic resources, ownership & control over land by national laws **5. c**-Adopt and strengthen sound policies and enforceable legislation for the promotion of gender equality and empowerment **5.5**-Ensure women's full and effective participation and equal opportunities for leadership at all levels **16.7**-Ensure representative decision-making	Gender Mainstreaming actions and potential targets
PA 2: Climate Change Mitigation				
All sectors	-	-	-	Overall, a 50% reduction of its projected emissions by 2030
Energy Generation & Efficiency	5.1, 5.2		**7.2-** Increase substantially the share of renewable energy in the global energy mix **7.a-** Enhance international cooperation to facilitate access to clean energy research and technology & and promote investment in energy infrastructure and clean energy technology	By 2030, 60 % of all energy produced in the country will be generated from renewable energy resources, including hydro. Focus on a) Efficiency improvements to boiler and furnace energy, b) Improving energy efficiency in building, and c) Solar energy technology. 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.
Industry	5.5		**9.4**-Upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies with all countries taking action in accordance with their respective capabilities **12.2-** Achieve the sustainable management and efficient use of natural	No generation of power through imported coal

PCCP Sectors	NCCP	SDGs	SDG Targets	Pakistan's NDCs
			resources	
Transport	5.3		**11.6-**Adverse per capita environmental impact of cities' air quality and municipal and other waste management	By 2030, 30 % of all new vehicles sold in Pakistan in various categories will be Electric Vehicles (EVs). Focus on a) Bus rapid transport, and b) Vehicle tuning.
Waste	5.4		**11.6-**Adverse per capita environmental impact of cities' air quality and municipal and other waste management **12.5**- Substantially reduce waste generation	Banning on single plastic use. Promote reuse and source reduction of waste
PA 3: Cross Cutting (Adaptation & Mitigation)				
Forestry & Green Spaces	4.4, 5.7		**15.2-**Promote the implementation of sustainable management of all types of forests **13.1-** Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters	From 2016 onwards, continued investments in Nature-based Solutions (NBS) through the largest-ever afforestation programs
Climate-integrated Planning	5.4		**11.6**- Adverse per capita environmental impact of cities including air quality and municipal and other waste management **11.3-** Integrated and sustainable human settlement planning and management in all countries **11.b-** Inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters **11.7**- Universal access to safe, inclusive and accessible, green and public spaces **11.2**- Safe, affordable, accessible and sustainable transport systems women, children, persons with disabilities and older persons **13.1**-Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters	Reduction of flood risk and enhanced water recharge at six sites in the Indus Basin in the wake of the project 'Recharge Pakistan'
Agriculture and Livestock	4.2, 5.6		**2.3-** Double the agricultural productivity and incomes of small-scale food producers **2.4**-Ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production that strengthen capacity for adaptation to climate change	Complete ban on open burning of rice stubble, solid waste, and other hazardous materials, Disposal of crop residue in an environmentally friendly manner.

PCCP Sectors	NCCP	SDGs	SDG Targets	Pakistan's NDCs
			13.1-Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters	(Mitigation) Focus on a) Reforestation and reducing CO2 emissions from forest degradation, and b) Farm forestry as a carbon sink. (Adaptation) Focus on 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.