NDC 3.0 Policy Recommendations Sindh

Aligning Sindh's Climate Action with Nationally Determined Contributions

Final Report
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Government of Sindh
Environment Climate Change & Coastal Development Department
Directorate of Climate Change

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Acronyms

DoCC	Directorate of Climate Change
ECC&CDD	Environment Climate Change & Coastal Development Department
FPA	Foreign Project Assistance
GCISC	Global Climate Change Impact Studies Center
GCF	Green Climate Fund
GEF	Global Environmental Facility
GHG	Greenhouse Gases
MoCC & EC	Ministry of Climate Change & Environmental Coordination
MRV	Monitoring Reporting and Verification
NCCP	National Climate Change Policy, 2021
NDCs	Nationally Determined Contributions
PAs	Priority Actions
P&D	Planning & Development
PV	Photovoltaic
SCCP	Sindh Climate Change Policy, 2022
SDG	Sustainable Development Goals
SEPA	Sindh Environmental Protection Agency
UNFCCC	United Nations Framework Convention on Climate Change
WASH	Water Sanitation and Hygiene

Executive Summary

Sindh, Pakistan's second-most populous province, faces severe climate vulnerabilities, including extreme heat, water scarcity, sea-level rise, cyclones, salinity intrusion, and ecosystem degradation. These climatic impacts disproportionately affect children, youth, and marginalized communities, especially in coastal and arid regions.

This document presents a strategic framework to align Sindh's climate actions with Pakistan's upcoming NDC 3.0 with stakeholder consultations, provincial development priorities, and the national climate policy landscape.

Methodology

A participatory, evidence-based process was used to develop these policy recommendations, incorporating:

- Alignment with the Sindh Climate Change Policy (2022), National Climate Change Policy (2021) and previous NDCs
- Sectoral mapping, stakeholder input, and cross-cutting integration of gender, youth, and climate finance
- Emphasis on Monitoring, Reporting, and Verification (MRV) and institutional capacity-building.

Sindh's Climate Vulnerability & Role in NDCs

Sindh is highly exposed to climate impacts and contributes significantly to national emissions. However, it also offers immense potential for climate mitigation and adaptation, including:

- Renewable energy development
- Sustainable agriculture and forestry
- Disaster preparedness and resilient health systems
- Afforestation, mangrove rehabilitation, and blue carbon initiatives

Sindh's strong policy base including Sindh Climate Change Policy 2022, academic partnerships, and budget allocations provide a foundation for robust subnational climate actions.

Cross-cutting themes include gender and young people inclusion, technology transfer, MRV registry, and climate finance mobilization.

Sectoral Contributions

Key sectoral goals of Sindh for NDC alignment include:

- Energy: 25% renewable share by 2030, 200,000 solarized households, phase-out of imported coal, Sindh energy efficiency & conservation program.
- Transport: Karachi BRT expansion, EV charging via renewables, climate resilient infrastructure.
- Agriculture: climate-resilient agriculture, climate-resilient seeds, expansion of agriculture waste recycling, restoration of land through bio-based circular practices.

- Forestry: 60 million trees on 60,000 ha, agro-forestry, youth-led afforestation
- Waste: Circular economy, composting, waste-to-energy
- Water & WASH: Rainwater harvesting, wastewater treatment and reuse, climate-resilient infrastructure
- Urban Resilience: Green infrastructure, flood mitigation, sponge city concepts
- Social Development: Jobs in renewable energy (RE), recycling innovations, climate education, forestation.

Policy Recommendations for NDC 3.0

1. Climate Data & Research: Develop GHG inventories and vulnerability maps
2. Climate Finance: Establish a Climate Finance Unit and access international finance (GCF, IKI)
3. Capacity Building: Train departments on MRV, climate budgeting, and planning
4. Inclusive & Just Transition: Embed gender and young people equity; support fossil-fuel dependent workers
5. Institutional Coordination: Strengthen collaboration across departments and national bodies
6. MRV System: Launch a Climate Reporting Dashboard and pilot GHG tracking in key sectors
7. Cross-Cutting Strategies: Pilot climate-smart cities, nature-based solutions, and child-friendly resilient infrastructure.

Sindh NDC 3.0 Policy Recommendations with Pakistan's NDC 2.0

The Government of Sindh has prepared the NDC 3.0 Policy Recommendations, in alignment with Pakistan's national climate commitments. A comparative analysis with Pakistan's NDC 2.0 reflects alignment in overall targets while underscoring distinct provincial priorities.

Both Sindh and Pakistan have pledged a 50% reduction in greenhouse gas (GHG) emissions by 2030, comprising 15% unconditional and 35% conditional reductions, dependent on international grant-based support.

Sr.#	Description of Components	Sindh NDC 3.0 Policy Recommendation	Pakistan NDC 2.0
1.	**Reduction Commitment Target**	50% Projected Reduction by 2030	50% Projected Reduction by 2030
2.	**Conditional & Unconditional Target**	(15% unconditional & 35% conditional)	(15% unconditional & 35% conditional)
3.	**Conditional Support**	Conditional based on 100% international grant finance.	Conditional is based on international grant finance
4.	**Projected Emissions Target**	2030: 50% (15% unconditional & 35% conditional)	2030: Future Emissions will be 1603 $MtCO_2e$, aiming to lower emissions to 801.8 $MtCO_2e$ (Conditional + Unconditional)
5.	**Conditional Reduction Quantum (GHG)**	No Provincial GHG Survey Conducted. (Request for GHG inventories have been sent to Ministry of Economic Affairs through P&D Sindh).	35% conditional reduction, lowering emissions of 561.05 MtCO2e
6.	**Renewable Energy**	25%	60%

			(including hydropower)
7.	**Transport**	BRT & EV buses phase out of public diesel buses.	30% Electric Vehicles
8.	**Energy Efficiency**	Policies	1.5% annual improvement in energy efficiency
9.	**Protected Area, Conservation and Forestry**	• 100,000 hectares of land conservation under protected area • forest coverage up to 150% from 40,000 hectares to 100,000 hectares • Expansion of agro-forestry ~100,000 hectares • Enhance land protection with sustainable grassland ~ 24,000 hectares.	• Enhancement of 12-15% • 30% restoring degraded land
10.	**Agriculture**	• Scaling up the use of climate-resilient seeds and climate-smart agriculture. • Integration of sustainable crop initiatives. • Scaling up agricultural waste recycling. • Scaling up restoration of degraded land through bio based circular practices • Integration of post disaster loss and damage reduction strategies. • Scaling up the capacity building of farmers on climate resilient agriculture.	• Promote smart climate inputs and management practices in agriculture • High-efficiency irrigation systems for irrigated and rain-fed areas • Drought- tolerant crop varieties, and • Climate monitoring and forecasting - early warning system.
11.	**Water & Waste**	• Enhance a circular economy model to reduce, reuse, and recycle materials through material recovery facilities (MRF) and improved segregation at garbage transfer stations • Promote decentralized composting, especially in peri-urban areas, to manage organic waste sustainably. • Invest in plastic reuse and recovery systems to minimize landfill and marine pollution. • Installation of waste to energy projects. • Promote wastewater treatment and recycling for reuse. • Expansion of rainwater collection systems. • Introduce water efficient technologies and practices. • Expansion of water reservoir to recharge ground water.	• Improve waste management and recycling Practices • Strengthening municipal service delivery by the local governments • Encourage turning animal waste (cow-dung) to methane for use as fuel • Promote 3Rs and improve waste management practices.

		• Improve storm water management with proper drains and retention systems. • Introduce sponge city concepts, where urban landscapes are designed to absorb rainfall and prevent flooding.	

Conclusion & Call to Action

Sindh is uniquely positioned to lead subnational climate action in Pakistan. With high mitigation potential and critical adaptation needs, it can contribute significantly to national and global climate goals. Sindh intends to achieve a cumulative objective of reducing its projected emissions to 50% by 2030. Of this, 15% will be achieved through domestic resources, including 05% from Sindh's carbon market initiatives and remaining from provincially selected programs, and 35% is subject to the provision of **100% international grant finance.** Sindh will proactively target to mobilize finance from both domestic and international sources. Realizing this vision will require:

- Coordinated governance
- Strategic investments in data, people, and finance
- An inclusive and equitable approach to climate resilience.

1.0 Introduction

Sindh, the second-most populous province of Pakistan and a hub of industrial and agricultural activities, is among the most climate-vulnerable regions in South Asia. This document presents targeted policy recommendations to strategies Sindh's alignment with Pakistan's Nationally Determined Contributions (NDCs) under the Paris Agreement. It builds upon past performance (NDC 1 and 2), identifies gaps, and offers a roadmap for enhanced climate mitigation, adaptation, and climate-resilient development planning for the upcoming NDC 3.0 submission.

2.0 Methodology

As a part of Pakistan's commitment to the Paris Agreement, the Ministry of Climate Change & Environmental Coordination (MoCC&EC) is currently engaged in updating the Country's Nationally Determined Contributions (NDC 3.0). The critical update reflects Pakistan's enhanced climate ambitions, integrates new sectoral targets, and outlines a road map for achieving both adaptation and mitigation goal in alignment with article. The Global Climate Impact Studies Center (GCISC) has been nominated as NDC Secretariat by MoCC&EC. The Government of Sindh through Environmental Climate Change & Coastal Development Department (ECC&CDD) has developed the NDC Policy Recommendations. The identification and formulation of NDC Policy Recommendations for Sindh followed a structured, participatory, and evidence-based process to ensure alignment with the Sindh Climate Change Policy (2022), Nationally Determined Contributions (2021), the National Climate Change Policy (2021), and the province's development priorities. The data was collected by sharing templates and conducting consultative meetings with key stakeholders from various government departments. Following are the key considerations and steps to develop the policy recommendations.

As the first step it was ensured that these policy recommendations are well integrated with national policy frameworks, NDC targets, sectorial strategies, and provincial development plans Sindh and Mapping the NDC thematic areas including mitigation, adaptation and socio-economic to provincial sectoral needs and opportunities.

- Organized multi-round consultations including provincial government departments and development partners
- Gathered local knowledge, sector-specific priorities, and implementation challenges
- Incorporated gender-responsive measures, technology transfer, capacity building, and MRV (Monitoring, Reporting, and Verification) mechanism.
- Ensured alignment with SDGs and potential to access international climate finance sources (GCF, GEF, voluntary carbon markets).

3.0 Climate Vulnerability of Sindh

Sindh is increasingly exposed to diverse and intensifying climate-related hazards. These vulnerabilities are exacerbating socio-economic challenges and placing immense stress on natural systems. An overview of key vulnerabilities is provided below: -

3.1 Extreme Heat Events

Sindh experiences some of the highest recorded temperatures in the world, particularly in districts like Jacobabad and Dadu. With temperatures often exceeding 50°C during summer, these heat waves threaten human health, reduce labor productivity, and increase electricity demand due to rising cooling needs. Vulnerable populations, especially children, outdoor workers and older people, are at high risk of heat-related illnesses and mortality.

3.2 Water Stress

The province relies heavily on the Indus River for agriculture, drinking water, and industry. However, water availability is declining due to reduced upstream flows, increased abstraction, and the retreat of Himalayan glaciers. Coupled with inefficient irrigation practices and over-extraction of groundwater, Sindh faces chronic water scarcity, particularly in tail-end regions like Badin and Tharparkar.

3.3 Sea-Level Rise & Coastal Erosion

Rising sea levels in the Arabian Sea are submerging low-lying coastal areas of Thatta, Badin, and parts of Karachi. Coastal erosion is threatening fishing communities, displacing populations, and degrading coastal ecosystems. Saltwater intrusion is also contaminating freshwater aquifers and agricultural lands, undermining food and water security.

3.4 Cyclones and Flooding

The frequency and intensity of tropical cyclones in the Arabian Sea have increased due to ocean warming. Sindh's coastal belt, particularly Karachi and the Indus Delta, is increasingly vulnerable to storm surges, high winds, and intense rainfall. Urban flooding in Karachi has become a recurring hazard due to poor drainage, unplanned development, and blocked waterways, posing serious risks to public safety and infrastructure.

3.5 Salinity Intrusion

Intrusion of seawater into freshwater ecosystems and agricultural lands in southern Sindh is reducing soil fertility and crop yields. This process, accelerated by sea-level rise and low river flows, is leading to the abandonment of farmlands, loss of freshwater fish species, and deterioration of drinking water sources.

3.6 Health Vulnerabilities

Climate-sensitive diseases are on the rise in Sindh. Warmer temperatures, stagnant water from flooding, and poor sanitation are contributing to increased outbreaks of vector-borne diseases such as dengue fever, malaria, and chikungunya. Additionally, heat stress and malnutrition are growing concerns, especially in impoverished rural communities.

3.7 Children and Young People Considerations

Children, adolescents, and young people are among the most vulnerable to climate impacts in Sindh. Extreme heat, flooding, poor air quality, and waterborne diseases disproportionately affect children due to their developing physiology and dependence on caregivers. School closures from climate events disrupt education and psychosocial well-being, while malnutrition risks rise due to food insecurity caused by droughts and salinity intrusion. Climate impacts also exacerbate child labor risks in rural and flood-affected areas.

3.8 Biodiversity and Ecosystem Loss

Sindh's fragile ecosystems, including the Indus Delta mangrove forests, wetlands, and desert landscapes, are being degraded by rising temperatures, changing rainfall patterns, and human encroachment. Mangrove loss reduces natural storm buffers, while desertification in regions like Tharparkar undermines grazing lands, increases sandstorms, and reduces agricultural viability. These factors call for strong provincial engagement in national and global climate commitments.

4.0 Background: NDC Framework in Pakistan

4.1 Pakistan's NDC Overview

Nationally Determined Contributions (NDCs) are commitments made by countries under the Paris Agreement to reduce greenhouse gas (GHG) emissions and adapt to the impacts of climate change. Pakistan, as a signatory, has submitted two NDCs so far:

4.1.1 First NDC (2016)

Pakistan's initial Nationally Determined Contribution (NDC), submitted in 2016, was largely aspirational and qualitative in nature. It acknowledged Pakistan's high vulnerability to climate change and identified several priority sectors for mitigation, including energy, agriculture, forestry, industrial processes, and waste. However, the 2016 NDC did not include any quantified greenhouse gas (GHG) emission reduction targets. Instead, it emphasized the need for substantial international support—in the form of climate finance, technology transfer, and capacity building to enable Pakistan to implement effective climate mitigation and adaptation actions.

4.1.2 Revised NDC (NDC 2 - 2021)

Pakistan submitted an updated and more ambitious NDC in October 2021, providing quantified targets and detailed sectoral pathways. It reflected progress in climate planning and an increased focus on measurable outcomes.

Table 1: Key Elements of Pakistan's Revised NDC (2021)

Key Area	Description
GHG Emission Reduction Target	Pakistan commits to a 50% reduction in projected GHG emissions by 2030 compared to Business-As-Usual (BAU) scenario (1,603 $MtCO_2e$). 15% Unconditional: Via domestic policy reforms, energy efficiency, RE investments, and afforestation. 35% Conditional: Dependent on international finance, technology transfer, and capacity building. Target Emissions with Support: ~800 $MtCO_2e$ by 2030.
Focus Sectors for Mitigation and Adaptation	➢ NDC focuses on major emitting and vulnerable sectors: Energy: Renewable transition (wind, solar, hydro), improved grid efficiency. ➢ Agriculture: Climate-smart practices, efficient irrigation, methane reduction ➢ Forestry & Land Use: Afforestation, Ten Billion Tree Tsunami Program ➢ Waste Management: Composting, recycling, methane recovery. ➢ Water Resources: Flood resilience, governance, water-saving technologies. ➢ Industry: Clean technologies, energy audits, low-carbon practices.
Emphasis on Adaptation and Resilience	➢ Given Pakistan's climate vulnerability, adaptation is prioritized through: Climate-resilient infrastructure ➢ Early warning systems ➢ Nature-based solutions (e.g., mangroves, floodplain restoration) ➢ Food and water security in arid zones
Climate Finance Mobilization	Estimated USD 101 billion is needed for energy transition by 2030. Pakistan seeks support from: ➢ Green Climate Fund (GCF) ➢ Adaptation Fund ➢ Global Environment Facility (GEF) ➢ Bilateral and multilateral donors ➢ Also exploring carbon market mechanisms (voluntary carbon credits, Article 6).

4.2 Sindh's Role in Pakistan's NDCs

Sindh plays a critical dual role in Pakistan's climate landscape: it is both a significant contributor to national greenhouse gas (GHG) emissions and one of the most climate-vulnerable provinces in the country. This makes Sindh a strategically important region for both climate mitigation and adaptation efforts under Pakistan's Nationally Determined Contributions (NDCs).

4.2.1 Mitigation Relevance

- Sindh houses several GHG-intensive sectors, including fossil fuel-based power generation, cement and steel industries, urban transport, and solid waste management systems, especially in Karachi.
- The thermal power plants, large-scale industrial zones, and rapidly growing urban centers all contribute significantly to national GHG emissions.
- However, Sindh also has immense mitigation potential through:
    - Renewable energy development (e.g. the Gharo-Jhampir wind corridor and solar PV projects),
    - Energy efficiency initiatives in buildings and industries,
    - Expansion of mass transit systems (e.g. BRT in Karachi).
    - Expansion of decentralized off-grid renewable energy system
    - Expansion of biomass energy production
    - Improve waste reduction and material recovery.
    - Wastewater treatment and recycling
    - Integration of sustainable crop initiatives
    - Scaling up agricultural waste recycling
    - Expansion of afforestation and agro-forestry
    - Expansion of coverage of protected areas

4.2.2 Adaptation Relevance

- Sindh is on the frontline of climate impacts, facing sea-level rise, cyclones, salinity intrusion, and desertification (Thar), and water scarcity.
- This makes it a priority region for climate adaptation investments, particularly in:
    - Coastal ecosystem restoration (e.g., mangrove plantations),
    - Water-efficient agriculture,
    - Flood risk management,
    - Health and disaster preparedness,
    - Livelihood diversification in vulnerable areas,
    - Increase of private sector participation through policy incentives
    - Expansion of rainwater harvesting system
    - Water efficient technologies in public and private sectors
    - Adoption of drought resistance crops in vulnerable areas
    - Expansion of water reservoir to recharge groundwater
    - Adaptation of green buildings

4.2.3 Challenges in Previous NDC Engagement

Despite its significance, Sindh's role in Pakistan's previous NDC submissions (2016 and 2021) was limited and underrepresented due to several constraints:

- Data Gaps: Lack of subnational GHG inventories and vulnerability assessments restricted evidence-based contributions to the national NDC.
- Institutional Fragmentation: Weak coordination between provincial departments (e.g., energy, environment, planning) and national ministries impeded integrated climate action planning.
- Limited Subnational Planning: Climate change policies and action plans in Sindh were not fully aligned or integrated with national NDC frameworks, reducing the visibility of provincial initiatives.

4.2.4 Emerging Opportunities

- Sindh has shown increasing commitment to climate action in recent years:
    - The Sindh Climate Change Policy (2022) provides a framework for provincial adaptation and mitigation strategies.
    - ECC&CDD is declared as Designated Department for Carbon Market by Government of Sindh.
    - Directorate of Carbon Market is being established under ECC&CDD by Government of Sindh.
    - The Sindh Solar Energy Program and interest in electric mobility are notable steps forward.
    - Efforts to restore mangroves in the Indus Delta have gained international recognition.
- Sindh province is the home to active academic institutions and think tanks (e.g., NED, KU, IoBM, SZABIST, MUET and many others) that can support research, innovation, and monitoring under NDC implementation.
- There is growing potential to mobilize climate finance for Sindh-specific projects through mechanisms such as the Green Climate Fund (GCF), the Adaptation Fund, and voluntary carbon markets.
- Decentralization and provincial autonomy under Pakistan's climate governance architecture now offer Sindh the opportunity to shape its own contributions in alignment with national targets.

To strengthen Sindh's engagement in future Nationally Determined Contributions (NDCs), a structured and proactive approach to climate planning is imperative. This strategic framework is comprised of four key components:

1. **Establishment of a Provincial Coordination Mechanism**: A dedicated provincial climate coordination body will be established to ensure direct alignment with the national NDC implementation process. This mechanism will facilitate streamlined, interdepartmental collaboration to achieve climate objectives.

2. **Development of a Subnational GHG Inventory and MRV mechanism for NDC and carbon market projects of Sindh**: The Government of Sindh plans to develop its own

Greenhouse Gas (GHG) inventory and a comprehensive Monitoring, Reporting, and Verification (MRV) mechanism. This is crucial for accurately tracking emissions and climate mitigation actions at the subnational level.

3. **Integration of Climate Goals into Sectoral Plans**: It is essential to align development plans in key sectors—specifically energy, agriculture, transport, industries, and waste management—with provincial and national climate goals. This integration will promote policy coherence and maximize the co-benefits of both mitigation and adaptation efforts.

4. **Proactive Participation in National Consultations**: The province will participate actively in national consultations regarding NDC revisions. This engagement will ensure that Sindh's unique climate vulnerabilities, strategic priorities, and ongoing initiatives are adequately represented and integrated into Pakistan's overarching climate change strategy.

4.3 Stock takes from NDC 2: Sindh's Position

4.3.1 Mitigation

Sindh province is the home to several major sources of greenhouse gas (GHG) emissions that significantly contribute to Pakistan's overall carbon footprint. The province hosts large thermal power plants which are among the primary emitters due to their reliance on fossil fuels for electricity generation. Additionally, Sindh has a high concentration of energy-intensive industries, including steel, cement, and textile manufacturing, all of which are substantial contributors to industrial emissions. Furthermore, the rapid urbanization of Karachi, the country's largest metropolitan city, has led to increasing emissions from the transport sector, construction activities, and lack in infrastructure of solid waste management systems and wastewater treatment and recycling systems. These combined factors position Sindh as a critical province for implementing targeted mitigation strategies within Pakistan's climate framework.

Sindh has made commendable progress in promoting renewable energy and low-carbon initiatives in recent years. A significant focus has been placed on harnessing the province's renewable energy potential, particularly through the development of wind energy in the Jhampir-Gharo corridor, which is recognized as one of the most promising wind zones in South Asia. In addition to wind power, there has been considerable expansion in solar photovoltaic (PV) installations, both at the utility and distributed scales. The implementation of the Sindh Solar Energy Program has further accelerated solar deployment, especially in public buildings and off-grid areas. Moreover, the province has also net-metering policies to encourage rooftop solar installations by households and businesses. Complementing these efforts, Sindh is also exploring innovative waste-to-energy solutions, with several pilot projects currently under development aimed at converting municipal solid waste into usable energy, thereby reducing both landfill burden and GHG emissions.

4.3.2 Adaptation

Several key initiatives have been undertaken in Sindh to enhance climate adaptation and disaster risk management. One of the flagship efforts is the Sindh Resilience Program, supported by the World Bank, which aims to strengthen flood protection infrastructure and improve disaster risk management systems in vulnerable districts. In the coastal areas, the Sindh Forest Department has led successful mangrove restoration programs in the Indus Delta, enhancing coastal ecosystem resilience and providing natural buffers against sea-level rise and storm surges. To address the growing threat of extreme heat events, particularly in urban areas, Heat Action Plans have been introduced in Karachi, focusing on early warning systems, public awareness, and improved health response. Additionally, climate-smart agriculture pilots have been launched in both coastal and arid zones, promoting water-efficient practices and drought-resistant crops to improve food security under changing climatic conditions.

Despite these positive steps, several challenges continue to hinder the effectiveness and scalability of adaptation actions in Sindh. One major issue is fragmented adaptation financing, with limited access to sustained, long-term climate finance streams from both national and international sources. Furthermore, there is weak Monitoring, Reporting, and Verification (MRV) mechanism at the provincial and local levels, making it difficult to track progress, evaluate impacts, and integrate lessons learned into future programming. Lastly, climate risk is still not fully mainstreamed into development planning, resulting in missed opportunities for building resilience into infrastructure, urban planning, and sectoral strategies across the province. Addressing these gaps will be crucial for enhancing Sindh's adaptive capacity in the face of escalating climate threats.

4.4 Carbon Market Potential in Sindh

Carbon markets are identified as a source of climate finance and Sindh Province has unique progress in the country to successfully leverage carbon markets and attain market transactions, attracting global engagement. The Government of Sindh has successfully secured authorization by the Government of Pakistan, ensuring integrity and transparency for the internationally traded carbon credits.1 Implemented by the Government of Sindh through Sindh Forest & Wildlife Department in two phases, DBC-1 and DBC-2 projects, represent the world's largest blue carbon initiatives under the voluntary carbon market.

Sindh province offers significant conditional opportunities for carbon market engagement across agriculture, industry, waste, energy, transport, and forestry/land-use sectors. The sectors present significant potential to generate critical carbon credit through public and private development, including diversification of carbon assets through other types of credits, including plastic credits. These conditional opportunities can also serve as an avenue for mobilizing international finance resources. The potential conditional carbon market projects include but are not limited to the following:

Sectors	Project types
Waste management	• Plastic waste recycling with verified plastic credits. • Construction & demolition waste recycling for low-carbon building material projects. • E-waste recycling projects (electronics → material recovery with carbon avoidance claims). • Waste-to-Energy through improved waste management and emission mitigation.
Industrial decarbonization	**Manufacturing** • Energy efficiency upgrades in cement, textiles, steel, sugar, and fertilizer. • Fuel switch projects: replacing coal/furnace oil with biomass, RDF, or renewable energy. • Waste heat recovery (WHR) in cement and steel. • Carbon capture, utilization, and storage (CCUS). • Textile circularity.
Transport decarbonization	• EV transition projects: buses, rickshaws, fleets. • Modal shift projects: freight from trucks to rail. • Logistics efficiency: fleet management, fuel-saving telematics. • Biofuels adoption. • Bio-gas buses powered by agricultural and municipal waste • Electric two/three-wheelers for urban and peri-urban Sindh.
Energy Efficiency	**Construction** • Energy-efficient buildings (EE retrofits, passive design, green cooling). • Low-carbon building materials: fly ash bricks, green cement. **Community** • Clean cooking / improved cookstoves (ICS distribution projects). • Efficient lighting programs (LEDs, solar lamps). • Public institution EE: schools, hospitals powered by renewables. • Green schools' initiatives: energy-efficient retrofits, rainwater harvesting, tree planting. • Green urbanization in cities through afforestation and conservation.
Traditional and emerging renewable energy technologies	**Electricity, Gas & Water** • Renewable energy projects: solar PV, wind farms (Jhimpir–Gharo corridor). • Distributed renewables: solar mini-grids, agricultural solar pumping. • Biogas-to-electricity from municipal waste or livestock farms. • Efficient water pumping & desalination powered by solar/wind. • Methane captures from wastewater treatment plants. **Emerging** • Green hydrogen pilots in industrial clusters

	• Battery storage projects linked with wind-solar hybrids and others.
Agriculture, Forestry, and Other Land Use (AFOLU)	• Biowaste projects: turning agri-residues (wheat straw, sugarcane trash, rice husk) into bio-products for sequestration. • Livestock methane reduction: improved feed, enteric fermentation inhibitors, manure management (anaerobic digesters, biogas). • Rice cultivation methane reduction: alternate wetting & drying. • Blue carbon projects: mangrove afforestation/restoration. • Mangrove–aquaculture silvo fisheries: integrated shrimp/fish farming with mangroves. • Sustainable aquaculture: low-impact fish farming, mangrove–aquaculture integrated systems. • Watershed management in irrigation zones. **Forestry and other land use:** • Dryland afforestation: Drought-resistant native species • Agroforestry: Integrated tree-crop systems, windbreaks, and shelterbelts. • Improved Forest Management (IFM) through Community-managed woodlots: Reducing illegal harvesting, switching to ICS/biogas to lower pressure and Forest protection & avoided deforestation in riverine forests along Indus. • Wetland restoration → blue carbon + biodiversity credits. • Rangeland carbon projects: Rotational grazing, reseeding degraded pastures in Thar and Kohistan. • Community forestry: agroforestry, woodlot development.

5.0 Strategic Planning for NDC 3.0

To prepare for NDC 3.0, Sindh is considering the following steps and initiatives: -

5.1 Establish Climate Governance Mechanisms

To effectively contribute to Pakistan's Nationally Determined Contributions (NDCs), NDC Mitigation and Adaptation Implementation Committees are planned to be established to build a robust climate governance framework for Province. This involves creating formal structures, enhancing policy coherence, and strengthening data systems:

5.2 Sindh NDC Working Group

NDC working group would be a multi-sectoral platform bringing together representatives from key sectors such as energy, agriculture, transport, environment and development partners to coordinate climate action. This group will ensure sectoral alignment, monitor progress, and provide input for national submissions to the UNFCCC.

5.3 Align Sindh Climate Change Policy with NDC Goals

The provincial climate policy is to be updated (if needed) to reflect Pakistan's revised NDC targets. This includes integrating mitigation targets, adaptation priorities, and climate financing strategies into Sindh's development plans, laws, and regulations.

5.4 Provincial MRV, GHG Inventory, and Data Monitoring Capacities

Sindh plans to establish its own Monitoring, Reporting, and Verification (MRV) mechanism to track emissions and adaptation outcomes. Developing a GHG emissions inventory and strengthening data collection from departments and local governments is essential to report transparently and access climate finance.

5.5 Institutionalize Young People Participation

In all climate policy discussions and NDC monitoring activities, representation of young people, including those from rural, coastal, and flood-affected communities will be ensured.

5.6 Sectoral Contributions

Sindh's emissions and vulnerabilities vary across sectors. Identifying clear contributions from each sector is essential to designing a provincial climate action plan aligned with NDC 3.0. The Environment Climate Change and Coastal Development Department through its Directorate of Climate Change, has conducted consultative meetings with key government stakeholders of the province and collected data on mitigation and adaptation priorities and plans for on-going and proposed plans. The brief recommendations for each sector are provided below, and the respective

departments' information on NDC 3.0 regarding sectoral priorities and plans are attached as Annexures 1 to 9.

5.6.1 Energy

- Increase renewable energy (RE) share from 6.8 % (currently 2250 MW) upto 25% by 2030 by scaling up solar and wind energy and other potential sources.
- Transition out of imported coal and reduce reliance on fossil fuels.
- Implement energy efficiency retrofits in public buildings and industries to reduce consumption and emissions.
- Scaling up in decentralized / off-grid renewable energy systems.
- Scaling up waste to energy projects.
- Scaling up energy efficiency program
- Expansion of 200,000 households with off-grid solar energy supply.
- Increase in private sector participation through policy incentives.

5.6.2 Transport

- Expand mass transit systems like the Karachi BRT and Yellow Line to reduce emissions.
- Phase out old public diesel vehicles.
- Scaling up EV charging supply through sustainable sources (i.e., solar, bioenergy, etc.).
- Expand climate resilient transport infrastructure
- Reduction of 2.6 MT GHG emissions through BRT Redline Karachi Project.

5.6.3 Agriculture

- Scaling up the use of climate-resilient seeds and climate-smart agriculture.
- Integration of sustainable crop initiatives.
- Scaling up agricultural waste recycling.
- Scaling up restoration of degraded land through bio based circular practices
- Integration of post disaster loss and damage reduction strategies.
- Scaling up the capacity building of farmers on climate resilient agriculture.

5.6.4 Forestry

- Expand mangrove reforestation in the Indus Delta for carbon sequestration and coastal protection.
- Expansion of afforestation in new areas of 60,000 hectares for ~ 60 million plantations.
- Increase in forest coverage up to 150% from 40,000 hectares to 100,000 hectares.
- Promote private investment for forestation.
- Expansion of agro-forestry ~100,000 hectares.
- Carbon sequestration through agro-forestry 0.2 to 0.3 million tons annually with about 1.0 to 1.5 million tons during 05-year period
- Enhance land protection with sustainable grassland ~ 24,000 hectares
- Enhance young people's involvement in environmental conservation and forestation 50,000 - 100,000.
- Expansion of 100,000 hectares land conservation under protected area initiatives.

5.6.5 Waste

- Enhance a circular economy model to reduce, reuse, and recycle materials through material recovery facilities (MRF) and improved segregation at garbage transfer stations (GTS). (01 MRF & 04 GTS)
- Promote decentralized composting, especially in peri-urban areas, to manage organic waste sustainably.
- Invest in plastic reuse and recovery systems to minimize landfill and marine pollution.
- Installation of waste to energy projects.

5.6.6 WASH & Water

- Promote wastewater treatment and recycling for reuse.
- Expansion of rainwater collection systems.
- Introduce water efficient technologies and practices.
- Expansion of water reservoir to recharge ground water.
- Expansion of climate resilient and renewable energy powered infrastructure (i.e., schools, hospitals, water filtration plants, water pumping stations, etc.).

5.6.7 Climate Resilience

- Promote green infrastructure (such as low carbon brick, urban forests, parks, and energy efficient equipment).
- Improve storm water management with proper drains and retention systems.
- Introduce sponge city concepts, where urban landscapes are designed to absorb rainfall and prevent flooding.
- Promote low carbon brick under Sindh People's Housing for Flood Affectees (SPHF) Project of 2.1 million flood affected houses.

5.6.8 Sectoral Contributions of Young People

- **Energy-**As appropriate, support vocational training programs for young people in renewable energy installation, maintenance, and energy auditing.
- **Forestry-**The school- and community-based afforestation programs will ensure the engaged students and local young people groups will engage them with REDD+ and carbon credit projects.
- **Waste-**Promote youth-led recycling enterprises and innovation challenges to reduce plastic pollution.
- **WASH & Water-**Involve school children and youth clubs in awareness campaigns on water conservation and hygiene.

5.7 Sindh NDC 3.0 Policy Recommendations with Pakistan's NDC 2.0

The Government of Sindh has developed the NDC 3.0 Policy Recommendations. A comparative analysis between Sindh's NDC 3.0 Policy Recommendations and Pakistan's NDC 2.0 is presented below.

Both Sindh and Pakistan have pledged a 50% reduction in greenhouse gas (GHG) emissions by 2030, comprising 15% unconditional and 35% conditional reductions, dependent on international grant-based support.

Sr.#	Description of Components	Sindh NDC 3.0 Policy Recommendation	Pakistan NDC 2.0
12.	**Reduction Commitment Target**	50% Projected Reduction by 2030	50% Projected Reduction by 2030
13.	**Conditional & Unconditional Target**	(15% unconditional & 35% conditional)	(15% unconditional & 35% conditional)
14.	**Conditional Support**	Conditional based on 100% international grant finance.	Conditional is based on international grant finance
15.	**Projected Emissions Target**	2030: 50% (15% unconditional & 35% conditional)	2030: Future Emissions will be 1603 $MtCO_2e$, aiming to lower emissions to 801.8 $MtCO_2e$ (Conditional + Unconditional)
16.	**Conditional Reduction Quantum (GHG)**	No Provincial GHG Survey Conducted. (Request for GHG inventories have been sent to Ministry of Economic Affairs through P&D Sindh).	35% conditional reduction, lowering emissions of 561.05 MtCO2e
17.	**Renewable Energy**	25%	60% (including hydropower)
18.	**Transport**	BRT & EV buses phase out of public diesel buses.	30% Electric Vehicles
19.	**Energy Efficiency**	Policies	1.5% annual improvement in energy efficiency
20.	**Protected Area, Conservation and Forestry**	• 100,000 hectares of land conservation under protected area • forest coverage up to 150% from 40,000 hectares to 100,000 hectares • Expansion of agro-forestry ~100,000 hectares • Enhance land protection with sustainable grassland ~ 24,000 hectares.	• Enhancement of 12-15% • 30% restoring degraded land
21.	**Agriculture**	• Scaling up the use of climate-resilient seeds and climate-smart agriculture. • Integration of sustainable crop initiatives. • Scaling up agricultural waste recycling. • Scaling up restoration of degraded land through bio based circular practices • Integration of post disaster loss and damage reduction strategies. • Scaling up the capacity building of farmers on climate resilient agriculture.	• Promote smart climate inputs and management practices in agriculture • High-efficiency irrigation systems for irrigated and rain-fed areas • Drought- tolerant crop varieties, and • Climate monitoring and forecasting - early warning system.

22.	**Water & Waste**	• Enhance a circular economy model to reduce, reuse, and recycle materials through material recovery facilities (MRF) and improved segregation at garbage transfer stations • Promote decentralized composting, especially in peri-urban areas, to manage organic waste sustainably. • Invest in plastic reuse and recovery systems to minimize landfill and marine pollution. • Installation of waste to energy projects. • Promote wastewater treatment and recycling for reuse. • Expansion of rainwater collection systems. • Introduce water efficient technologies and practices. • Expansion of water reservoir to recharge ground water. • Improve storm water management with proper drains and retention systems. • Introduce sponge city concepts, where urban landscapes are designed to absorb rainfall and prevent flooding.	• Improve waste management and recycling Practices • Strengthening municipal service delivery by the local governments • Encourage turning animal waste (cow-dung) to methane for use as fuel • Promote 3Rs and improve waste management practices.

Sindh advocates for an expanded circular economy approach, decentralized composting, waste-to-energy projects, plastic recovery, wastewater reuse, and sponge city models for urban resilience. Pakistan's measures are focusing on municipal service delivery, waste-to-fuel conversion, and the 3Rs (reduce, reuse, recycle). It is assessed that over all share of waste (dry and wet) is not more than 5% (as mentioned in NDC 2.0). This requires huge investment and provides a good platform of public private partnership to earn carbon credits. The Government of Sindh will ensure full support for enabling environment for these initiatives. In summary, Sindh's NDC 3.0 policy recommendations complement Pakistan's NDC 2.0 by advancing localized, sector-specific measures in forestry, agriculture, and water management, while remaining consistent with the national emission reduction targets.

6.0 Policy Recommendations

6.1 Climate Data, Research & Evidence

Robust climate action requires a foundation of accurate data and evidence. Sindh plans to prioritize the development of provincial greenhouse gas (GHG) inventories and climate vulnerability maps to better understand local emission sources and climate risks. These tools will guide targeted interventions and investment. Furthermore, institutions to be supported through funding to conduct adaptation cost-benefit analyses, enabling evidence-based decision-making. Partnerships with development partners, universities and policy think tanks can also support long-term climate research, innovation, and knowledge-sharing.

6.2 Climate Finance Mobilization

To meet its climate goals, Sindh will proactively target to mobilize finance from both domestic and international sources. Sindh intends to achieve a cumulative objective of reducing its projected emissions to 50% by 2030. Of this, 15% will be achieved through domestic resources, including 05% from Sindh's carbon market initiatives and remaining from provincially selected programs, and 35% is subject to the provision of 100% international grant finance**.** Establishing a dedicated Directorate of Carbon Market under the Environment Climate Change & Coastal Development Department would streamline access to funds and support project development. Capacity-building programs to be introduced to train officials in preparing competitive proposals for Green Climate Fund (GCF), International Climate Initiative (IKI), and other global funds. Additionally, Sindh will enhance participation in voluntary carbon markets, building readiness for carbon crediting mechanisms that can unlock new revenue streams for mitigation and adaptation.

6.3 Capacity Building

Effective climate action depends on the capacities of institutions and human resources. Sindh will implement comprehensive training programs for line departments on climate budgeting, monitoring, and reporting (MRV). Establishing a Provincial Climate Cadre or designating climate focal points for effective tracking of for climate targets progress in all key departments can ensure accountability and sustained coordination. Moreover, workshops at the local government level are essential to promote climate-smart planning in cities and districts that are most vulnerable to climate impacts.

6.4 Inclusive and Just Transition

As Sindh shifts toward a low-carbon, climate-resilient economy, it will ensure the process is socially inclusive and equitable. Climate programs will actively incorporate gender considerations, particularly in agriculture and informal employment sectors where women are most affected. There is also a need to create livelihood transition plans for workers displaced from high-emission sectors such as coal and fossil fuels. Climate finance mechanisms will be leveraged to support pro-poor adaptation, local resilience-building and equitable economic development.

Climate action will explicitly include children and young in planning, implementation, and monitoring, ensuring that interventions are aligned with the UN Convention on the Rights of the Children and Young people. This includes:

- Protecting children from climate-related health risks through heat action plans that cover schools, playgrounds, and childcare facilities.
- Embedding climate change and sustainability education in school curricula, combined with extracurricular climate clubs and leadership programs.

Ensuring that skills development programs target green jobs for young people, particularly those transitioning from climate-vulnerable livelihoods.

6.5 Institutional Coordination

Inter-agency coordination is critical for effective climate governance. Sindh will promote collaboration between the ECC&CDD, Planning & Development Department, and national institutions such as the MoCC & EC, GCISC, , NEPRA, and AEDB. An inter-agency platform can facilitate the identification, appraisal, and financing of climate projects. Existing institutional setups like the Sindh SDG Support Unit can be used to integrate climate targets into mainstream development planning, ensuring policy coherence and improved implementation.

6.6 Monitoring, Reporting & Verification (MRV)

Developing a strong MRV mechanism will enable Sindh to track its climate actions and align with national and international reporting requirements. A Provincial Climate Reporting Dashboard linked with Pakistan's national MRV framework to be developed for transparent monitoring. Sindh plans to pilot GHG tracking in 2–3 priority sectors—such as energy, transport, and waste—to build institutional experience. At the same time, local governments must be trained and equipped to report on climate project performance and results.

6.7 Cross-Cutting Areas

The climate strategy of Sindh province will include cross-cutting themes that connect mitigation, adaptation, and sustainable development. Selected urban centers like Karachi, Hyderabad, and Sukkur can serve as pilots for climate-smart cities, adopting low carbon targets and green infrastructure. Investment in climate-resilient infrastructure, including flood-resilient roads, schools, and health facilities, is critical to protecting public assets. Sindh also plans to scale up nature-based solutions, including mangrove rehabilitation, riverine forestation, and flood buffer zones, which offer cost-effective and ecosystem-based resilience.

All climate-resilient infrastructure including schools, health facilities, and public spaces would be considered child- and youth-friendly, incorporating safe drinking water, shaded areas, flood-resilient construction, and accessible evacuation routes. Climate early warning systems will also

include child-centered communication tools (visual alerts, school drills) to ensure rapid response and safety.

7.0 Conclusion

The province of Sindh stands at a pivotal moment in its climate journey. As both an emitter and a highly climate-vulnerable province, Sindh has a unique opportunity and responsibility to play a transformative role in achieving Pakistan's Nationally Determined Contributions (NDCs) under the Paris Agreement. While past NDCs have underrepresented the province's efforts and challenges, the upcoming NDC cycle presents a critical window to embed Sindh's climate actions into national and international frameworks more effectively.

This document has outlined the strategic considerations across governance, finance, capacity, and data systems to align Sindh's development with a low-carbon, climate-resilient future. With its vast renewable energy potential, dynamic urban centers, vulnerable coastal ecosystems, and capable academic and policy institutions, Sindh is well-positioned to become a national leader in subnational climate action.

Realizing this vision will require bold political will, sustained institutional coordination, and targeted investments from domestic and international in both mitigation and adaptation. Most importantly, it calls for a just and inclusive approach that safeguards vulnerable communities and builds resilience from the ground up. Sindh aims to meet its climate goals and further also unlock new pathways for sustainable economic growth, improved public health, ecosystem protection, and social equity. If adequate support is provided, Sindh aims to achieve a cumulative objective of reducing its projected emissions to 50% by 2030. Of this, 15% will be achieved through domestic resources, including 05% from Sindh's carbon market initiatives and remaining from provincially selected programs, and 35% is subject to the provision of **100% international grant finance.**

Sindh may lead with ambition, innovation, and integrity, making climate action central to its development agenda and setting an example for other provinces to follow.

Annexures

Annexure-1: Sindh Energy Department

Annexure-2: Transport and Mass Transit Department

Annexure-3: Agriculture, Supply & Prices Department

Annexure-4: Forest and Wildlife Department

Annexure-5: Sindh Solid Waste Management Board

Annexure-6: Sindh Irrigation Department

Annexure-7: Public Health Engineering & Rural Development

Annexure-8: Karachi Water & Sewerage Corporation

Annexure-9: Sindh People's Housing for Flood Affectees