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# Report of Policy Lab on Bridging Gaps in Climate Change Mitigation Policies and their Implementation in Pakistan

پاکستان میں موسمیاتی تبدیلی سے نمٹنے کی پالیسیوں کے اطلاق میں حائل رکاوٹوں کا خاتمہ

## Policy Analysis & Recommendations- Part-7 of 11

## Capacity Building, Climate Education, and Mass Awareness Emphasized the Need for Public Engagement, Education, and Institutional Capacity Development

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بِسْمِ اللَّهِ الرَّحْمَـٰنِ الرَّحِيمِ

# إِنَّ اللَّهَ لَا يُغَيِّرُ مَا بِقَوْمٍ حَتَّىٰ يُغَيِّرُوا مَا بِأَنفُسِهِمْ

(سورة الرعد 13:11)

ترجمہ (اردو):

بے شک، اللہ کسی قوم کی حالت نہیں بدلتا جب تک وہ خود اپنی حالت کو نہ بدلے۔

Translation (English):

Indeed, Allah does not change the condition of a people until they change what is in themselves.

(Surah Ar-Ra'd 13:11

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# ظَهَرَ الْفَسَادُ فِي الْبَرِّ وَالْبَحْرِ بِمَا كَسَبَتْ أَيْدِي النَّاسِ لِيُذِيقَهُمْ بَعْضَ الَّذِي عَمِلُوا لَعَلَّهُمْ يَرْجِعُونَ

(سورة الروم 30:41)

ترجمہ (اردو):

خشکی اور تری میں فساد ظاہر ہو گیا ہے، لوگوں کے اپنے ہاتھوں کے کیے ہوئے اعمال کی وجہ سے، تاکہ اللہ انہیں ان کے کچھ اعمال کا مزہ چکھائے، شاید کہ وہ باز آ جائیں۔

Translation (English):

Corruption has appeared on land and sea because of what the hands of people have earned, so that He may let them taste part of what they have done, that perhaps they will return (to righteousness).

(Surah Ar-Rum 30:41)

# Climate-Adaptive Infrastructure and Environmentally Sustainable Urban Growth addressed sustainable urbanization and resilient infrastructure development

Research Group

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# PREFACE

Climate change presents an existential challenge to Pakistan, demanding urgent, well-coordinated, and evidence-based policy responses. Recognizing the gravity of the issue, the Policy Lab on Climate Change Mitigation in Pakistan was conceived, designed, and led under the visionary guidance of Dr. Muqeem ul Islam, Chief Instructor, National Institute of Public Administration (NIPA), Peshawar, during the 41st Mid-Career Management Course. This initiative aimed to foster a dynamic and policy-oriented dialogue through a Public Policy Simulation Exercise, conducted from September 24th to 29th, 2024, followed by research presentations and seminars on September 30th and October 1st, 2024.

The Policy Lab brought together policymakers, researchers, and practitioners to develop actionable strategies for climate change mitigation, with a particular focus on Pakistan's national and regional policy frameworks. Structured into eleven dedicated research groups, the Policy Lab comprehensively addressed various dimensions of climate governance, adaptation, and mitigation. Each research group (RG) was tasked with developing strategic policy recommendations aligned with national priorities and international commitments.

RG-1: Task Force on National Climate Policy Framework and International Obligations focused on aligning Pakistan's policies with global frameworks like the Paris Agreement and the Sustainable Development Goals.

RG-2: Task Force on Climate Policy Framework of Khyber Pakhtunkhwa ensured regional priorities were harmonized with national and international commitments.

RG-3: Committee on Biodiversity, Ecosystem Restoration, and Reforestation worked to protect biodiversity, enhance reforestation, and promote ecosystem restoration.

RG-4: Committee on Climate-Smart Agriculture, Food Security, and Sustainable Land & Water Management explored innovative solutions for sustainable agriculture and resource management.

RG-5: Committee on Energy Conservation, Renewable Resources, and Electric Vehicle Adoption developed policies for energy efficiency and transition to renewable energy.

RG-6: Committee on Carbon Financing, Carbon Credits, and Global Climate Resilience Investments proposed financial mechanisms to support climate action and resilience building.

RG-7: Committee on Capacity Building, Climate Education, and Mass Awareness emphasized the need for public engagement, education, and institutional capacity development.

RG-8: Committee on Climate-Adaptive Infrastructure and Environmentally Sustainable Urban Growth addressed sustainable urbanization and resilient infrastructure development.

RG-9: Committee on Circular Economy and Sustainable Waste Management advanced the adoption of circular economy principles and efficient waste management systems.

RG-10: Committee on Climate Risk Reduction, Disaster Preparedness, and Flood Resilience developed strategies for disaster risk reduction and flood resilience.

RG-11: Committee on Gender Inclusion and Cultural Engagement for Climate Mitigation ensured inclusivity in climate policies, with a focus on empowering women and recognizing cultural dimensions.

The research outcomes of the Policy Lab present a roadmap for Pakistan's climate resilience, rooted in policy innovation, multi-stakeholder engagement, and actionable frameworks. This report serves as a valuable resource for decision-makers, practitioners, and researchers committed to mitigating climate change impacts in Pakistan. It is hoped that the insights and recommendations put forth in this document will inform future policies and drive Pakistan towards a sustainable and climate-resilient future.

It is hoped that this document will serve as a significant milestone in the design, implementation, and facilitation of policies, paving the way for broader economic and industrial transformation in Pakistan, انشاءالله .

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*September 23, 2024*

# Executive Summary

The rapid urbanization of cities and the increasing impacts of climate change pose significant challenges to sustainable urban development. In regions like Khyber Pakhtunkhwa, particularly in cities such as Peshawar, these challenges are compounded by a lack of comprehensive urban planning, insufficient climate-adaptive infrastructure, and the vulnerability to natural hazards. This executive summary provides an overview of the current situation, government responses, and the need for effective climate-adaptive measures for resilient urban growth.

**Climate Challenges and Urban Growth in Khyber Pakhtunkhwa**

- **Rapid Urbanization:** The population growth in cities like Peshawar has led to unplanned urban expansion, often at the expense of essential infrastructure and green spaces.
- **Climate Vulnerabilities:** Khyber Pakhtunkhwa is highly susceptible to climate-related hazards, including flooding, extreme heat, and droughts, exacerbated by inadequate urban planning and limited resources.
- **Environmental Strain:** Cities are experiencing heightened risks of urban flooding, rising energy demands, and poor air quality, further stressing an already overwhelmed infrastructure.

**Government Efforts and Legislative Frameworks**

- **National Climate Policy and Legislation:** Pakistan has passed the Pakistan Climate Change Act (2017) and updated the National Climate Change Policy in 2021, focusing on adaptation and mitigation measures to address climate challenges.
- **Initiatives for Urban Resilience:** Key initiatives such as the Ten Billion Tree Tsunami Project and the Prime Minister's Urban Forest Project reflect the government’s commitment to increasing urban green spaces and combating environmental degradation.
- **Khyber Pakhtunkhwa Climate Policy:** The provincial government has aligned its climate policies with federal initiatives, emphasizing urban forestry, carbon sequestration, and waste management as part of broader climate adaptation goals.

**Challenges in Implementing Climate-Resilient Infrastructure**

- **Policy Gaps and Implementation Shortfalls:** While policies have been created, the actual implementation of climate-adaptive infrastructure in Khyber Pakhtunkhwa remains slow, hindered by weak institutional capacity, inadequate funding, and lack of coordination across agencies.
- **Infrastructure Deficiencies:** Urban areas like Peshawar are struggling with poorly designed drainage systems, traffic congestion, and urban flooding, which exacerbate the effects of climate change.

- **Limited Green Spaces:** Despite the government's push for urban greening, green spaces in major cities remain limited, impacting environmental quality and resilience.

**Ongoing Projects and Progress**

- **World Bank-Funded Initiatives:** Key projects like the Community Infrastructure Program (CIP II) and the Rural Investment and Institutional Support Project are addressing environmental concerns at the community level, focusing on sustainable infrastructure and local resilience.
- **Urban Planning and Green Infrastructure:** Khyber Pakhtunkhwa's efforts in promoting vertical buildings and sustainable urban development practices show promise but require more robust integration of climate adaptation strategies.

**Recommendations for Improved Climate-Resilient Urban Growth**

1. **Strengthen Governance and Coordination:** Enhance the capacity of local agencies and improve collaboration between federal, provincial, and municipal levels to ensure the effective implementation of climate-adaptive infrastructure projects.
2. **Invest in Green Infrastructure:** Increase investment in urban green spaces, green roofs, and nature-based solutions that reduce the urban heat island effect and improve air quality.
3. **Promote Climate-Resilient Building Practices:** Encourage the development of energy-efficient and zero-emission buildings through stricter regulations and incentives for private sector involvement.
4. **Integrate Climate Change into Urban Planning:** Ensure that climate adaptation and resilience are central to all urban planning decisions, focusing on sustainable transportation, waste management, and water conservation systems.
5. **Community Engagement and Awareness:** Increase public participation in climate adaptation planning through awareness campaigns and local initiatives that empower communities to take action on climate resilience.

Despite considerable efforts towards climate change action in Khyber Pakhtunkhwa (KP), significant gaps persist that hinder the province from fully addressing climate challenges. While the region has made notable strides in climate policy, such as adopting the Provincial Climate Change Policy (2022), the translation of these policies into actionable outcomes remains slow. A critical review of the provincial development programs, such as the ADP 2024-25, reveals the need for further refinement in integrating climate change considerations into long-term planning.

This summary outlines key insights derived from the analysis, highlighting the primary challenges, funding opportunities, and necessary policy actions to achieve climate-adaptive urban growth in KP.

**Key Findings**

- **Climate Change Challenges in KP**: Despite strong commitment to climate change action, KP remains one of the most hazard-prone provinces, with frequent floods and heatwaves exacerbating vulnerabilities.
- **Policy Gaps and Implementation**: While the provincial development plan allocates a significant portion of resources to climate action, donor agencies and experts observe that these resources are not being fully leveraged or directed toward practical implementation.
- **Financial Support and Opportunities**: The recent US$ 12 billion funding package, driven by bilateral and multilateral donors, offers an important opportunity to accelerate climate action, provided it is effectively utilized in line with international best practices.
- **Land Use and Urban Planning**: The current land use zoning and urban planning efforts must be updated to align with emerging climate challenges. The remaining districts (29 in total) need immediate attention to integrate climate adaptation measures in urban planning.

**Recommendations for Action**

1. **Develop Context-Specific Strategies**
    - **Comprehensive Provincial Strategy**: Establish a more robust national and provincial strategy that incorporates climate adaptation plans tailored to the unique challenges of different urban regions.
    - **City-Level Planning**: Ensure that the Urban Policy Unit's zoning exercises align with emerging climate risks, emphasizing practical implementation at the city level.
2. **Prioritize Green Building Codes**
    - **Region-Specific Codes**: The adoption and enforcement of region-specific green building codes must be prioritized to ensure climate-conscious development across urban and peri-urban areas.
3. **Embed Climate-PIMA and the 5Es Framework**
    - **Public Investment Portfolio**: The environmental components of the 5Es Framework (Efficiency, Equity, Economy, Environment, and Engagement) and Climate-PIMA (Climate-Proof Infrastructure and Mitigation Actions) should be fully integrated into the Provincial Annual Development Plan (ADP) to drive climate resilience.
    - **Clear Monitoring**: Resources allocated for climate change actions should be tracked with clear indicators to measure progress.
4. **Enhance Coordination and Capacity Building**
    - **Stakeholder Coordination**: Strengthen coordination between federal, provincial, and local agencies to ensure consistent implementation of climate change strategies.
    - **Capacity Building**: Build the capacity of key stakeholders, including urban planners and local authorities, to effectively execute climate-adaptive projects.
5. **Align Urban Planning Guidelines**

- **Update Existing By-Laws**: All urban planning guidelines and building codes must be revised to reflect climate adaptation measures. This will ensure a comprehensive approach toward sustainable urban growth in KP.

## Conclusion

While Khyber Pakhtunkhwa has made significant progress in addressing climate change, there are still critical gaps in policy implementation, institutional capacity, and the integration of climate change considerations into urban planning. By leveraging the US$ 12 billion funding package and focusing on key areas such as green building codes, the 5Es framework, and targeted city-level strategies, KP can achieve its goal of becoming a resilient, climate-adaptive province. Immediate actions, including improved coordination, capacity building, and the alignment of urban policies with climate goals, will be essential for the province to meet the challenges posed by climate change effectively.

## *Introduction*

The daunting challenge of unprecedented urban growth, in view of climate change issues, changing patterns of land use, urban flooding, urban heat, carbon emissions, and rising energy demands, is increasingly dominating the policy agenda worldwide (Desa, 2014; Desa, 2019; cited in Rayan et al., 2021). While the developed world is considering multiple theoretical frameworks and instrumental approaches, such as Urban Green Infrastructure modeling as a resilience tool (Davies et al., 2005), urban landscape and greening policies (Naeem et al., 2018), and enhancing the health of urban ecosystems (Weber and Allen, 2010) to mitigate their rapidly transforming urban outlook—moving beyond the concept of achieving urban sustainability—Pakistan is still struggling with floods, droughts, uncontrolled migration, and a major shift from agricultural land to poorly planned urban housing schemes to meet the demands of migrants (Tzoulas et al., 2007). Pakistan is among the top ten countries in the world (ranked eighth) considered most vulnerable to natural hazards, according to the long-term climate risk index (CRI) of German Watch (Eckstein et al., 2020), due to limited resources and poor planning (Ahsan, 2018). This leaves, among other regions of the country, the north-western region (Khyber Pakhtunkhwa) at relatively higher risk due to its natural geophysical position and the absence of strategic land use planning processes, urban green infrastructures, and climate change strategies to mitigate these multiple hazards (Khayyam and Noreen, 2020). Building resilient and climate-adaptive infrastructures, and planning green spaces to address climate variation through integrated planning instruments, can harness the potential for the protection, restoration, and advancement of ecological and economic benefits for the people (Gill et al., 2007; Rayan, Gruehn & Khayyam, 2021).

The shift towards Climate-Adaptive Infrastructure as a remedy is being advocated in literary sources as well as national, sub-national, and global forums, as a strategic intervention to mitigate the various hazards of climate change. Adaptation is the planned, responsive process of a nation's adjustments in their ecological, economic, and social systems to mitigate both existing and predicted climate change stimuli and their adverse impacts, reducing vulnerabilities and increasing resilience through active and knowledge-based stakeholder engagement to protect livelihoods and ecosystems. This can involve building flood protection measures, early warning systems, drought-resistant cropping practices, redesigning systems, and efficiently enforcing governmental policies (UNFCCC, 2024; GCA, 2024). Climate-adaptive infrastructure, while addressing public needs amidst growing population and urbanization, simultaneously addresses the risks and opportunities of the "accelerating climate crisis." Similarly, climate-resilient infrastructure is "planned, designed, built, and operated" to comply with and respond to climate impacts, with the ability to withstand climate impacts and recover early and easily in case of disruption (CAI, 2024; Cho, 2024). Adaptation refers to the process and ability of adjusting to actual and expected climate change effects, whereas resilience refers to the capacity to bounce back from the hazards of climate change and withstand such challenges (DLA, 2023).

On a further and ideal note, a climate-adaptive city reflects effective resource management, a low-carbon economy, adaptability, resilience, future-oriented planning, innovation, sustainability, and the capacity of stakeholders to cope with the impacts and negative consequences of climate change (Yari et al., 2024). Environmentally sustainable urban growth involves housing, transportation, energy, water, waste, food, and health standards, while also addressing heritage preservation, disaster planning, and urban-rural linkages in a holistic manner to support growing urban populations, ensuring sustainable livelihoods, improved quality of life, and minimizing the

environmental impact of such growth. However, it is equally important to note that population diversity and city size—for instance, cities like Manila and Beijing, with populations almost ten times larger than individual countries like Slovenia and Lesotho—cannot be considered for similar climate change solutions. Likewise, the geographic location of coastal cities compared to cities with water scarcity issues, given their context-specific characteristics, cannot be addressed equally for climate change mitigation (Yari et al., 2024).

The growth of urban centers and cities involves land use intensity, density, and transportation, with a trend toward minimizing the human footprint. As a result, the application of efficient green technologies is necessary to pave the way for sustainable urban growth, with the ideal goal of a development process that has the potential to LAST (Life Cycle, Aesthetics, Scale, Technologies) across an indefinite period (Calendar, 2012).

## *Pakistan's Response*

As a responsible state, Pakistan has ratified all the global conventions on climate change and, as an appreciable step, has passed the Pakistan Climate Change Act, 2017, as a commitment "to meet Pakistan's obligations under international conventions relating to climate change and to provide for the adoption of comprehensive adaptation and mitigation policies, plans, programmes, projects, and other measures required to address the effects of climate change." The Act further calls for the establishment of the Pakistan Climate Change Council under the Prime Minister, with Provincial Chief Ministers as members (Section 3 of the Act), and an Authority (Section 5 of the Act Ibid.). Pakistan has explicitly ratified the following conventions in their entirety as overarching guiding sources of action against climate change: United Nations Framework Convention on Climate Change (UNFCCC), Rio De Janeiro, 1992; Kyoto Protocol to the UNFCCC, 1997; and the Paris Agreement, 2015. The Act was preceded by the National Climate Change Policy 2012 (updated in 2021), the National Sustainable Development Strategy 2012, the Pakistan Environmental Protection Act 1997, the Pakistan Climate Change Action Plan 2021-25, and the Framework for Implementation of Climate Change Policy 2014-30, along with a multitude of cross-cutting climate change legislative actions in other sectors like irrigation, agriculture, energy and power, disaster risk management, etc., in addition to assigning climate change responsibilities to the Federal Ministry of Climate Change.

The Federal Government updated the National Climate Change Policy in 2021, which includes initiatives like the Ten Billion Tree Tsunami Project and the Prime Minister's Urban Forest Project (inspired by the Japanese Miyawaki technique, which enables trees to grow 10 times faster and 30 times denser; 21 sites in Islamabad and 51 in Lahore were selected), Clean Green Pakistan, and Protected Areas and National Park Initiatives, with a vision to increase the forest area by at least 15%. The updated policy emphasizes the Eco-System Restoration Initiative (ESRI) as a key initiative for an environmentally resilient Pakistan (NCCP 2021).

Priorities in urban planning include a focus on technological innovation in urban planning and transport, changing energy consumption and building construction patterns, integrated and biodegradable waste management systems, wastewater treatment plants, promoting private sector involvement in designing zero-emission buildings through renewable energy, land use planning and zoning, and the development and adoption of a Green Building Code (NCCP, 2021). A Climate-Resilient Urban Human Settlements Unit has been established in the Ministry of Climate Change, which is currently working on the Climate Change Resilient Urban Human Settlement Strategy.

## *Statement of the Problem*

Unprecedented rapid urbanization, mainly due to population explosion in recent decades, has gradually evolved into a multidisciplinary climate challenge across the country, especially in major metropolitan cities, including Khyber Pakhtunkhwa, with Peshawar as the province's major metropolitan city, along with the volatile northern region. Adherence to the principle of climate-adaptive infrastructure and environmentally sustainable urban growth lies at the core of all local, national, and global public policy debates and strategies as the first step in the right time and direction. The public perception of the ground situation is a mix of both improvement, in terms of vertical buildings, shopping malls, and public transport with reduced carbon emissions, and worsening, in terms of repeated urban floods, emissions, traffic chaos, poorly planned drainage and sewerage systems, and increasing heatwaves. This paper will undertake a detailed review of the actions and strategies of the government and concerned agencies, with the aim of identifying the Khyber Pakhtunkhwa government's alignment with climate change goals, as well as gaps in the process. It will assess whether efforts to mitigate climate change challenges—especially in pursuing climate-adaptive infrastructure and environmentally sustainable urban growth—are on the right track, in order to facilitate the development of workable recommendations for policy action by the government.

## *Scope and Significance of the Study*

The issue of climate change, being global in nature, has primarily been viewed from a national perspective owing to Pakistan’s ratification of global charters. However, the explicit focus of this study is on the case of Khyber Pakhtunkhwa, a prime province prone to climate change issues and inherently vulnerable to natural climate variability hazards, including floods, major river outflows, and a limited revenue and resource base to tackle such complex issues. The case of Peshawar, as the major provincial metropolis, has been examined in further detail to gather evidence of actions taken and to identify gaps in achieving the goals of climate-adaptive infrastructure and environmentally sustainable urban growth. The study is limited to urban growth and development, with a focus on the Urban Policy Unit of the Planning and Development Department and the Peshawar Development Authority, both of which are central to the area under analysis, while also taking input from other relevant agencies. The study will revolve around the existing pace of progress in the urban sector in the direction of climate mitigation, viewed through the lenses of adaptation and resilience, to highlight environmentally sustainable urban growth, the progress achieved, and the gaps that remain.

## *Methodology*

Reliance has been placed on deductive analysis of the available literature and the information retrieved from the concerned government agencies involved in urban planning and development. A major emphasis has been placed on deductive analysis through a mix of qualitative and quantitative methods to support the objectives of this paper. Further reliance is placed on discourse analysis and a literature review of the most relevant papers accessed on the subject. Simultaneous government and international agencies’ reports, legislative documents, parliamentary acts, etc., have also been reviewed through a deep analytical lens. Ethical considerations are prioritized. Time limitations are a key point in undertaking the research, as this is a multifaceted issue requiring in-depth analysis. The key area of analysis also includes consultation with relevant government agencies through direct interviews and critical

discussions.

## *Analysis*

### *The Khyber Pakhtunkhwa Picture*

The Khyber Pakhtunkhwa Environmental Protection Act 2014, Khyber Pakhtunkhwa Climate Change Policy 2022, and Khyber Pakhtunkhwa Climate Change Action Plan 2022 are in line with the recommendations and policy direction of the Federal Climate Change Policy 2021, aiming to reduce the vulnerabilities of natural and human systems and decrease emissions through technology-based solutions.

The constituents of the policy include the primary idea of promoting urban and peri-urban forestry through plantation drives on highways and near high-rise buildings, solid waste management, carbon sequestration, energy efficiency and conservation, low-emission transport sector development, relocation of hazardous industries, strengthening the urban policy structure—including city development agencies, land use zoning, promotion of vertical buildings in urban areas, and spatial planning for urban development—for a target of 22 metropolitan regions in the province. According to the most recent dialogues with the IMF, it was acknowledged that the land and building acts of Khyber Pakhtunkhwa (up to 2021) have been addressing several key factors related to natural hazards, the availability of green spaces, and the types and structures of buildings, which is a positive sign.

Key projects funded by the World Bank include the Community Infrastructure Program (CIP II), with an Environmental Management Plan as one of its key objectives at the district, tehsil, and community levels. Additionally, the Khyber Pakhtunkhwa Rural Investment and Institutional Support Project and the Rural Water Supply and Sanitation Project are addressing various environmental concerns from different angles at the tertiary levels of the province. The progress in action by the province can be assessed through the following table from the donors' reports:

**Provinces Climate-focused Action and Investment Plans**

| Province | Climate Focused Action Plan |
|---|---|
| **Baluchistan** | Baluchistan has not yet formulated a climate plan that links with the NCCP. |
| **Khyber Pakhtunkhwa** | The Khyber Pakhtunkhwa Climate Change Policy 2022 aims to reduce the vulnerability of natural and human systems as well as lessen greenhouse gas emissions through technological or nature-based solutions. The policy is aligned with the NCCP. The policy also has an action plan and investment plan that outlines specific measures and activities for achieving its objectives in relevant sectors. The action plan identifies potential sources of financing and implementation mechanisms for each sector. |
| **Punjab** | The Punjab Provincial Climate Change Action Plan contains planned actions and projects to improve climate change resilience and achieve mitigation targets, but these are not costed. |
| **Sindh** | Sindh developed a Provincial Climate Change Policy in 2022 and a Provincial Climate Change Action Plan with the support of UNDP. |

*Ministry of Planning, Development and Special Initiatives, Government of Pakistan* 4o mini

In the following sections, major actors and their roles in the climate change front have been elaborated in order of actions and priorities:

***The Actors***

A-1 Planning & Development Department: responsible for overall planning management and coordination of all policies and procedures concerning development, including the preparation and approval of the provincial development programme.

A-2 Urban Policy Unit: established under the Planning & Development Department as a focused body to tackle the urban policies of the province.

B-1 Local Government, Elections and Rural Development Department: being the custodian of the entire local government system in the province, it has further been mandated with the regulation of climate change rules and regulations through the local governments at the district and tehsil levels in line with the Khyber Pakhtunkhwa Local Government Act 2013.

B-2 Peshawar Development Authority: the main administrative body under the LG&RD Department, overseeing major urban areas of the provincial metropolis, including Hayatabad, Regi Model Town, and limited surrounding areas, including building control, rules, regulations, and by-laws.

C-1 Climate Change, Forestry, Environment & Wildlife Department: the main climate response department of the province, responsible for environment, forestry, wildlife, and biodiversity, and in charge of formulating, implementing, and coordinating climate change policies with the federal ministry of climate change.

C-2 Environmental Protection Agency: the main regulatory body for the formulation, execution, and enforcement of environmental protection policies in the province, working under the Climate Change, Forestry, Environment, and Wildlife Department.

D-1 Transport Department: responsible for the preparation and implementation of transport policies in the province.

D-2 Provincial Urban Mobility Authority: a recently established authority mandated to formulate urban mobility policies and mechanisms in line with the emerging demands of the province, especially rapid urbanization.

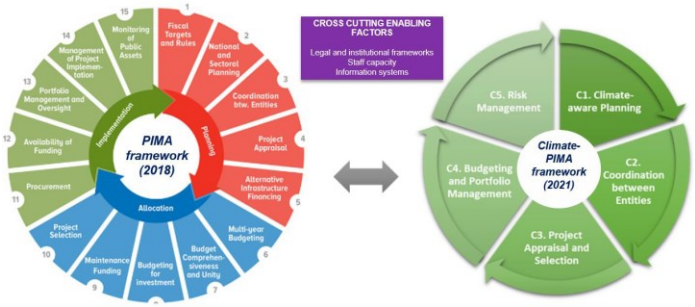
E-1 Private Sector, Civil Society, and Community.

### *The Factors*

**A-1** Planning, Coordination, Monitoring, and Evaluation: including Public Investment Management Assessment (PIMA) and the recently approved Climate-PIMA and 5Es Framework at the heart of all climate change policies, under the guiding principles of the Federal Ministry of Planning, Development, and Special Initiatives.

### *Climate-PIMA:*

On the recommendations of the multilateral partners, the Government of Pakistan pledged to initiate a comprehensive Public Investment Management Assessment (PIMA) to translate the public investment objectives into reality from all dimensions. Recently, after approval by the Federal Cabinet, the National Economic Council (NEC) also approved the Climate-PIMA to make it an integral part of the entire public sector development programme. Preceding the most recent bailout and structural adjustment package from the International Monetary Fund (IMF), a detailed technical assistance study was carried out by the IMF in August 2023, approved in November 2023, and finalized in June 2024. All provinces, including Khyber Pakhtunkhwa, have been directed to integrate the Climate-PIMA into the entire planning process to ensure climate-aware planning from project inception, appraisal, selection, to approval and execution, while also ensuring the best value for public investments and effective climate risk management.




*Source: Ministry of PD&SI, GOP

### *5Es Framework*

Recently approved by the Federal Government and disseminated to all provinces for strict adherence, the 5Es Framework serves as a short- to medium-term strategy for achieving Vision 2025, encompassing five major areas: Exports, E-Pakistan, Environment and Climate Change, Energy and Infrastructure, and Equity and Empowerment. The Government of Pakistan has committed to planning Climate-Smart Municipal Services for mitigation and adaptation targets, Nature-Based Solutions (NbS), Green Infrastructure for flood control and groundwater recharge, Green Building Codes for the public sector, the National Flood Protection Plan for urban flooding, and land use planning and community engagement to raise awareness. The idea of Green Infrastructure for Resilient Cities is also at the forefront of the 5Es Framework. Additionally, a comprehensive National Climate Finance Framework is being envisioned.

***5Es Framework***


Source: Ministry of PD&SI, GOP

***Climate Markers***

The following tables reflect the overall picture of the Provincial Annual Development Programme 2023-24 of Khyber Pakhtunkhwa, showcasing various sectors addressing the climate change issue from specific angles as a first step in planning for climate action. There is, however, a need to strengthen the existing capacities of the provincial departments as well as the districts to maintain harmony in this regard. To this effect, a climate-specific digitalization initiative is being planned in the Ministry of Climate Change as the central secretariat. The tables highlight the ability and extent of various sectors, based on data from individual projects, to accommodate and plan climate-specific interventions, including adaptation, mitigation, and further cross-cutting interventions and rehabilitation initiatives for prior climate hazards. A further exercise has been undertaken to bifurcate the partial or complete/full climate compliance of these projects on a sector basis (Table-1). Similarly, the data has been quantified.

**Table-1: Khyber Pakhtunkhwa ADP 2023-24 showing Climate Response**

| Sector | Adaptation | Cross-Cutting | Mitigation | Post Disaster Rehab. | Total | Partially Compliant | Fully Compliant | Total |
|---|---|---|---|---|---|---|---|---|
| Agriculture | **15** | **1** | **4** | | **20** | **14** | **6** | **20** |
| Elementary & Secondary Education | **72** | | **9** | | **81** | **69** | **12** | **81** |
| Energy & Power | | **23** | **23** | **1** | **47** | **28** | **19** | **47** |
| Environment | | | **4** | | **4** | | **4** | **4** |
| Forestry | **12** | | **17** | | **29** | **7** | **22** | **29** |
| Industries | **1** | **3** | **10** | | **14** | **13** | **1** | **14** |
| Livestock & Dairy Development | **6** | | **3** | | **9** | **6** | **3** | **9** |
| Roads | **277** | **19** | **3** | **6** | **305** | **287** | **18** | **305** |
| Tourism | **14** | **4** | **17** | **1** | **36** | **26** | **10** | **36** |
| Transport | | | **2** | | **2** | **2** | | **2** |

| Sector | Adaptation | Cross-Cutting | Mitigation | Post Disaster Rehab. | Total | Partially Compliant | Fully Compliant | Total |
|---|---|---|---|---|---|---|---|---|
| Water | **50** | **50** | **50** | **50** | **200** | **87** | **113** | **200** |
| **Total:** | **447** | **100** | **142** | **58** | **747** | **539** | **208** | **747** |

Source: Planning and Development Department, Khyber Pakhtunkhwa, Annual Development Programme 2023-24

**Table: ADP 2024-25 Showing Financial Contribution to Climate Change Initiatives**

| Sector Name | Allocation | Climate Schemes Allocation | % share in Climate |
|---|---|---|---|
| **Agriculture** | 4629.84 | 1714.971 | 37% |
| **Auqaf, Hajj, Religious & Minority Affairs** | 1164.68 | | |
| **Board of Revenue** | 1486.57 | | |
| **Drinking Water & Sanitation** | 6676.50 | | |
| **Elementary & Secondary Education** | 10583.67 | 9761.905 | 92% |
| **Energy & Power** | 4107.18 | 3849.678 | 94% |
| **Environment** | 67.17 | 67.173 | 100% |
| **Establishment & Administration** | 756.79 | | |
| **Excise, Taxation & Narcotics Control** | 177.60 | | |
| **Finance** | 20.00 | | |
| **Food** | 309.00 | | |
| **Forestry** | 3124.68 | 1823.246 | 58% |
| **Health** | 19786.41 | | |
| **Higher Education** | 4674.89 | | |
| **Home** | 6544.99 | | |
| **Housing** | 302.01 | | |
| **Industries** | 2224.16 | 944.214 | 42% |
| **Information** | 71.50 | | |
| **Labour** | 152.94 | | |
| **Law & Justice** | 2146.90 | | |
| **Livestock & Dairy Development** | 2718.72 | 885.772 | 33% |
| **Local Government** | 3387.99 | | |
| **Mines & Minerals** | 217.66 | | |
| **Multi Sectoral Development** | 51310.14 | | |
| **Population Welfare** | 499.00 | | |
| **Public Private Partnership** | 224.00 | | |
| **Relief & Rehabilitation** | 1640.69 | | |
| **Roads** | 27715.67 | 20751.877 | 75% |
| **Science Technology & Information Technology** | 1167.96 | | |
| **Social Welfare** | 1338.92 | | |

| Sector Name | Allocation | Climate Schemes Allocation | % share in Climate |
|---|---|---|---|
| **Sports** | 6630.57 | | |
| **Tourism** | 3282.87 | 2933.721 | 89% |
| **Transport** | 104.19 | 68.682 | 66% |
| **Urban Development** | 7560.06 | | |
| **Water** | 13194.06 | 12804.842 | 97% |
| **Grand Total:** | **190,000.00** | **55606.081** | **29%** |

Source: Planning and Development Department, Khyber Pakhtunkhwa, Annual Development Programme 2023-24

**A-2** Land use planning, zoning, and city master plans serve as technical support to the execution department, i.e., the Local Government and Rural Development Department.

**B-1** Implementation and enforcement occur primarily through the local government system (not yet in place) and the devolved Tehsil-level municipal administration. The LG Act 2013 is in place; however, the Provincial Land Use and Building Control Act 2021 has also been enacted.

**B-2** The Rapid Bus Transit (BRT) system has achieved international gold standard awards, significantly minimizing carbon emissions.

**C-1** The Provincial Climate Change Policy 2022 and Climate Change Action Plan 2022 have been prepared to complement the Federal Climate Change Policy through the Environmental Protection Agency. The province pioneered the flagship Billion Trees Tsunami Project successfully and is further executing federal programs such as the Ten Billion Trees Tsunami and Green Pakistan initiatives.

**C-2** Overall enforcement of IEE/EIA is especially important in the planning, appraisal, and approval process of developmental projects.

**D-1** The Transport Department is developing new policies and projects, including traffic management plans, particularly in urban areas.

**D-2** The KP Urban Mobility Authority is in place but has yet to fully address the rising demands and challenges of rapid urbanization. It has been established to construct, develop, operate, and maintain the mass transit system and supporting systems. The operation of the major mass transit system, Peshawar BRT, has also been assigned to the authority.

**E-1** Engagement with the private sector, civil society, and the community has so far remained limited to a few forestry initiatives, particularly in the mass plantation drives of the flagship projects.

### *Comparative Analysis with International Best Practices*

A unique example of an environmentally sustainable urban growth model is Masdar City in Abu Dhabi, designed as a zero-carbon, zero-waste city powered by wind and solar energy. It produces no greenhouse emissions, incorporates water recycling and composting, and promotes green transportation, mostly electric, along with energy-efficient buildings, minimizing its ecological footprint. The city has planned innovative technologies, including a Smart Grid system, a 10MW solar farm, advanced battery systems, sustainable construction materials, and atmospheric water harvesting facilities, with the potential for job creation, research and development, and an institute of science and technology. In 2015, it was declared by Forbes as the greenest city in the world.

Prominent examples of climate-adaptive infrastructures in the West include seawalls and coastal protection, flood-resilient design, green infrastructure, climate-resilient water management, heat island mitigation, climate-resilient transportation, smart grids, and energy efficiency. Similarly, initiatives addressing environmentally sustainable urban growth include the use of renewable energy, the establishment of green spaces, a shift to green transportation, innovation in waste management, construction of energy-efficient buildings, water conservation, innovative urban planning, and green architecture. A detailed

outline of the aforementioned initiatives has been provided in Table "X" appended to this paper for reference.

## *Application of Analytical Models*

### *PESTLE Analysis*

| | |
|---|---|
| **Political** | The call and need for Climate-Adaptive infrastructure due to the frequency of natural and climate hazards especially floods both in the northern hilly areas and the urban areas, has attained political significance in the recent decades. |
| **Economic** | Demand for addressing climate change issues through resilience, mitigation and adaptation warrants to be placed as an economic priority in all governmental planning and policy formulation due to involvement of the factor of security of life and properties of humans. Proper resourcing needs to be aligned with all policies and planning across sectors. |
| **Social** | Healthy, safe and secure human life being the priority of state agencies require major consideration in all climate change policies. The need for climate-adaptive infrastructure for instance securing the people from the hazards of repeated floods in swat and Kabul rivers warrants prioritization through mitigating policies under the flood protection measures, rapid response and early warning systems, disaster risk reduction and management, rivers embankments, enforcement of anti-river encroachment drives and above all building construction protocols for maximizing public safety and benefits on the one hand and reducing burden of rehabilitation portfolios on the public exchequer on the other hand. |
| **Technological** | The need for new technological additions to the existing policies of introducing innovative climate-adaptive infrastructure is gaining momentum. The current shift towards solarization in view of the ever-increasing energy shortfall is one example besides the growing trend of using hybrid and electric vehicles. On a similar note, new climate-aware technologies are needed in introducing environmentally safe, cost-effective and energy friendly construction patterns in urban areas. |
| **Environmental** | Flagship projects are in place in the province which needs to be made sustainable and replicated across the province in context-specific scenarios. For example, the Miyawaki model of Japanese plantation as being considered by the Federal Government in Islamabad and Lahore can also be studied for implementation. |
| **Legal** | Legal frameworks are although in place both at national and provincial levels in line with global commitments, however, these frameworks, policies and legislation still need translation into reality through aggressive implementation plan with an action plan including financing arrangements. |

### *GAP Analysis*

| Area | Present situation | Desired State | GAPs and Actions Required |
|---|---|---|---|
| **Climate-Adaptive Infrastructure** | Frequent flooding | Resilient state of rivers | Well-planned river embankments and plantation |
| | Increasing energy demands | Renewable energy sources | Incentivizing private sector for innovative solutions in green energy investments |
| | Fossil fuels use for energy projects | Maximizing renewable energy production | Investments and incentivization in solar solutions |
| | High emission transportation | Green and climate resilient transport systems | Enforcement and regulation; hybrid and electric vehicles import and manufacturing policies (high costs may be relooked) |

| Area | Present situation | Desired State | GAPs and Actions Required |
|---|---|---|---|
| | | | Practice of Cycling lanes in urban roads planning |
| | Conventional buildings prone to emissions, internal and external | Energy efficient buildings, insulation and heat reduction, energy saving, green roofing, green architecture on international lines | Technology transfer<br><br>Climate friendly, cost-effective building materials be encouraged.<br><br>R&D and Industrial-academia linkages be ensured |
| | Depleting ground water resources | Water conservation and Aquafer recharge systems | Implementation, regulation and enforcement with public awareness. Rainwater harvesting and aquafer recharge systems be promoted. |
| **Environmentally Sustainable Urban Growth** | Rapid and unplanned urbanization | Land use planning and zoning | |
| | Water logging, salinity. Discharge of non-treated wastewater into river system | Wastewater treatment plants | Investment in sewerage treatment and wastewater treatment plants |
| | Ill-managed waste disposal | Recycling plants and regulated waste management | Investment and awareness emphasized |
| | Deforestation | Biodiversity and eco-system | Community awareness, regulation, |

***SWOT Analysis***

| STRENGTHS | WEAKNESSES |
|---|---|
| 1- Legal Framework and Policies in place<br>2- Commitment in line with global ratified conventions<br>3- Coordination with Federal Government<br>4- PIMA and Climate-PIMA<br>5- Centrality of Environment in the 5Es Framework<br>6- KP Government's progress already lauded by multilateral aid agencies and bilateral donors<br>7- Commitment to involve private sector, civil society and community | 1- Institutional Capacity especially at the districts level<br>2- Implementation frameworks and timelines yet to be established<br>3- Financial resourcing<br>4- Conflicting roles of developers and regulators e.g., PDA, TMAs<br>5- Digitalization yet to take place |

| OPPORTUNITIES | THREATS |
|---|---|
| 1- Learning opportunities from international best practices<br>2- Donors' commitment to the extent of US$ 12 billion can be directed towards climate-change (ref: IMF's bail out package of US$ 7 billion)<br>3- Carbon market and carbon financing<br>4- Private sector engagement in innovative climate solutions | 1- Rising energy demands versus fossil fuels e.g., IPP issue<br>2- Rapid urbanization<br>3- Climate impacts<br>4- Frequency of floods<br>5- Existing focus on prior rehabilitation works |

### *Issues and Challenges*

**Climate-Adaptive Infrastructure:**

1. Continuous flood risks in the northern regions of the province as well as in settled districts along the banks of the Kabul and Swat rivers.
2. Landslides and soil erosion due to forest cutting or flood damage, especially during cloudbursts and flash rains.
3. Ill-managed, ill-planned, and uncontrolled construction practices.
4. Energy shortages hindering economic activity.
5. Heatwaves and rising temperatures correlated with building structures and energy demands.

**Environmentally Sustainable Urban Growth:**

1. Rapid urbanization, growth strains, and increasing loads on energy supply, services, and road infrastructure.
2. Air and water pollution and loss of biodiversity.
3. Inadequate waste management, wastewater disposal, drainage, and sewerage systems, resulting in a major shortfall of sewage treatment plants.
4. Inadequate public transportation, contributing to increased emissions.
5. Neglected private sector involvement to help reduce the financial burden on the public sector.

## *Conclusion*

Recollecting from the analysis of the paper, especially the role of the actors and their contributing factors, as well as the analysis part, it is evident that despite a serious level of commitment to climate change action, there are still visible gaps that need to be addressed. Khyber Pakhtunkhwa, while at the forefront of progressing on the climate change agenda on several accounts, is also the most hazard-hit province. It needs to translate the already framed policies into actions. Limitations in institutional capacities and frameworks, as well as the need for updating existing policies and action plans into reality, are key challenges, along with the financial factor.

Although prima facie, the provincial ADP 2024-25 shows 29% of resources across various sectors flowing towards climate change actions as partial or full compliance—appearing to be a commendable approach—a review from a critical perspective, as observed by donor agencies, indicates that explicit actions are still needed to reap the benefits of such a strategy. The most recent IMF conditionality is thus directed and aimed in the right direction to lay more emphasis on the adoption of both the 5Es Framework and Climate-PIMA in the entire planning process.

It is of pivotal importance that bilateral and multilateral donors, upon the recommendation of the IMF, are also considering a funding package estimated at US$ 12 billion, wherein climate change is a priority area. This funding can be envisioned as a major source of contribution to the government's plans and strategies, alongside learning from international best practices. In a similar vein, the land use zoning and planning exercise for all the remaining districts (29 pending so far) by the Urban Policy Unit also needs to be first aligned with the emerging climate challenges. Furthermore, through the application of green building codes, it should be integrated for strict adherence to climate-adaptive infrastructure and environmentally sustainable urban growth. The penultimate goal of making Khyber Pakhtunkhwa a Green Province will thus be achieved accordingly.

## *Recommendations*

1. There is a need for a comprehensive national and provincial strategy incorporating adaptation plans at the city levels (context-specific while taking cognizance of the Urban Policy Unit's prior land use zoning; 6 districts completed and 29 in the pipeline; and master plans as and when finalized) to facilitate the Provincial Climate Change Policy 2022 and Action Plan Target of 22 Metropolitan Regions in a realistic manner.
2. Region-specific Green Building Codes should be accorded top priority to ensure climate-aware planning.
3. The environmental component of the 5Es Framework and the Climate-PIMA needs to be explicitly embedded within the public investment portfolio, i.e., the Provincial ADP, especially in the environmental cross-cutting sectors. Limited resources should be prioritized and directed in this direction with clear indicators for periodic monitoring.
4. There should be an emphasis on planning coordination, monitoring, and capacity building of the stakeholders to achieve the desired output in line with the Provincial and Federal policies concerning climate change.
5. All existing urban planning guidelines and building by-laws must be aligned with the above-mentioned recommendations.

### *Operational Plan (Logical Framework Analysis)*

| # | Action | Responsibility | Resourcing | Timeline | KPI |
|---|---|---|---|---|---|
| **1** | Integration of 5Es Framework into the entire planning process | P&D Department | P&D Department | 1 to 2 Years | Climate-Aware Planning |
| **2** | Application of Climate-PIMA into the ADP process and projects | P&D Departments and Line Departments | Collective under supervision of Climate Cell of P&D Department. Donor funding options open. MOCC can be consulted soon. | 1 to 2 years | Climate Change Compliance of public investments |
| **3** | Institutional Capacity Building of all stakeholders | Collective responsibility under supervision of P&D Department | Donor funding options through MOCC | 1 to 3 years | Coping ability |
| **4** | Green Building Code | C&W, Finance, EPA, UPU, LG&RD | P&D and Finance Departments | 1 to 2 years | Climate resilient infrastructure |
| **5** | Climate-adaptive infrastructure | Collective | Diverting resources and shifting | 1 to 2 years and continued onwards | Multiple indicators |

| | | | | | |
|---|---|---|---|---|---|
| | | | priorities for funding from available sources till exploration of donor assistance | | |
| **6** | Environmentally sustainable urban growth | Collective | Reordering investment priorities | As above | Climate response |
| **7** | Adopt the slogan of KP Climate Governance | P&D Department with stakeholders | Monitoring progress on 5Es and C-PIMA | 1-5 years medium 5-10 years long term Intervention | Green KP |

***Table-"X"***

***A Quick Look at Some Global Examples***

| Climate-Adaptive Infrastructure | Environmentally Sustainable Urban Growth |
|---|---|
| 1. Sea walls and coastal protection<br>2. Flood-resilient design<br>3. Green infrastructure<br>4. Climate-resilient water management<br>5. Heat island mitigation<br>6. Climate-resilient transportation<br>7. Smart grids and energy efficiency | 1. Renewable energy<br>2. Green spaces<br>3. Green transportation<br>4. Waste management<br>5. Energy-efficient buildings<br>6. Water conservation<br>7. Innovative urban planning<br>8. Green architecture |
| **Sea Walls and Coastal Protection:**<br>1. Rotterdam, Netherlands: Maasvlakte 2 sea wall.<br>2. New York City, USA: Staten Island seawall.<br>3. Miami, USA: Sea wall and beach nourishment.<br>4. Singapore: Coastal protection measures.<br>5. Copenhagen, Denmark: Coastal protection and flood gates.<br><br>**Flood-Resilient Design:**<br>1. Amsterdam, Netherlands: Floating homes and flood-resistant buildings.<br>2. Venice, Italy: MOSE floodgate project.<br>3. Hamburg, Germany: Flood-resilient urban design.<br>4. Bangkok, Thailand: Flood protection walls and canals.<br>5. Jakarta, Indonesia: Giant Sea wall and flood control project.<br><br>**Green Infrastructure:**<br>1. Chicago, USA: Green roofs and urban forestry.<br>2. Tokyo, Japan: Green spaces and urban parks.<br>3. Copenhagen, Denmark: Green roofs and green spaces.<br>4. Vancouver, Canada: Greenest City Action Plan.<br>5. Singapore: Gardens by the Bay and green infrastructure.<br><br>**Climate-Resilient Water Management:**<br>1. Copenhagen, Denmark: Rainwater harvesting and green roofs. | **Europe:**<br>1. Copenhagen, Denmark: Carbon-neutral city by 2025.<br>2. Stockholm, Sweden: Green spaces, public transport, waste-to-energy.<br>3. Barcelona, Spain: Superblock program, pedestrian-friendly streets.<br>4. Amsterdam, Netherlands: Canal-based transportation, green roofs.<br>5. Freiburg, Germany: Solar-powered city, green architecture.<br><br>**North America:**<br>1. Vancouver, Canada: Greenest City Action Plan, renewable energy.<br>2. San Francisco, USA: Zero-waste policy, green buildings.<br>3. New York City, USA: Green infrastructure, sustainable transportation.<br>4. Portland, USA: Walkable neighborhoods, green spaces.<br>5. Toronto, Canada: Green roof bylaw, public transportation.<br><br>**Asia:**<br>1. Singapore: Urban planning, green infrastructure, water management.<br>2. Tokyo, Japan: Energy-efficient buildings, public transportation.<br>3. Seoul, South Korea: Green spaces, bike-sharing, renewable energy.<br>4. Hong Kong: Public transportation, green architecture.<br>5. Curitiba, Brazil: Innovative urban planning, green spaces.<br><br>**South America:**<br>1. Curitiba, Brazil: Green spaces, public transportation.<br>2. Medellín, Colombia: Urban renewal, green infrastructure. |

| | |
|---|---|
| 2. Rotterdam, Netherlands: Water-sensitive urban design.<br>3. Singapore: Water management system and rainwater harvesting.<br>4. Melbourne, Australia: Water-sensitive urban design.<br>5. New York City, USA: Green infrastructure for stormwater management.<br><br>**Heat Island Mitigation:**<br>1. Phoenix, USA: Urban forestry and cool pavement.<br>2. Los Angeles, USA: Cool pavement and urban forestry.<br>3. Tokyo, Japan: Green spaces and heat island mitigation.<br>4. Paris, France: Urban forestry and cool roofs.<br>5. Melbourne, Australia: Urban forestry and green spaces.<br><br>**Climate-Resilient Transportation:**<br>1. Copenhagen, Denmark: Bike-friendly infrastructure and electric buses.<br>2. Amsterdam, Netherlands: Electric vehicles and bike-sharing.<br>3. San Francisco, USA: Electric buses and green transportation.<br>4. Vancouver, Canada: Green transportation and bike-friendly infrastructure.<br>5. Singapore: Electric vehicles and autonomous transportation.<br><br>**Smart Grids and Energy Efficiency:**<br>1. Barcelona, Spain: Smart grid and energy efficiency.<br>2. Copenhagen, Denmark: District heating and smart grid.<br>3. Singapore: Smart grid and energy efficiency.<br>4. Tokyo, Japan: Smart grid and energy efficiency.<br>5. New York City, USA: Smart grid and energy efficiency. | 3. Buenos Aires, Argentina: Bike-sharing, green spaces.<br><br>**Africa:**<br>1. Cape Town, South Africa: Renewable energy, water conservation.<br>2. Nairobi, Kenya: Green spaces, public transportation.<br><br>**Middle East:**<br>Dubai, UAE: Sustainable transportation, green buildings.<br><br>**Oceania:**<br>1. Sydney, Australia: Green spaces, public transportation.<br>2. Melbourne, Australia: Sustainable transportation, green architecture. |
| **Climate-adaptive infrastructure in India** | **Environmentally Sustainable Urban Growth in India** |
| Flood-Resilient Cities:<br>Flood protection walls, tidal gates, and stormwater drainage system in Mumbai, Chennai, Tamil Nadu, | Green Cities:<br>Green spaces, lakes, parks and gardens in major cities of Pune, Bengaluru. |

| | |
|---|---|
| Kolkata, West Bengal, Ahmedabad and Surat in Gujarat.<br><br>Green Infrastructure:<br>Green spaces, urban forestry, lakes restoration, watershed management, stormwater harvesting in Bengaluru, Karnataka, Hyderabad, Telangana, Pune, Chandigarh, Delhi (urban forestry and waste-to-energy plants.<br><br>Climate-Resilient Water Management:<br>Rainwater harvesting, graywater reuse in Chennai, Tamil Nadu, Bengaluru, Karnataka, Hyderabad, Telangana, Ahmedabad, Gujarat Indore, Madhya Pradesh.<br><br>Heat Island Mitigation:<br>Cool pavement, urban forestry, and green spaces, cool roofs in Ahmedabad, Gujarat, Pune, Maharashtra, Bengaluru, Karnataka, Hyderabad, Telangana, Delhi.<br><br>Climate-Resilient Transportation and Smart Grids and Energy Efficiency Initiatives:<br>Electric buses, metro expansion, non-motorized transport infrastructure in Delhi, Mumbai, Maharashtra, Bengaluru, Karnataka, Hyderabad, Telangana and Pune, Maharashtra. | Chandigarh: Designed by Le Corbusier, it's a planned city with ample green spaces.<br>Mysuru, Karnataka: Has a strong focus on sanitation, waste management, and green initiatives.<br>Thiruvananthapuram, Kerala: Known for its greenery, clean beaches, and eco-tourism.<br><br>Smart Cities:<br>1. Bhubaneswar, Odisha: Selected as one of the first Smart Cities in India.<br>2. Ahmedabad, Gujarat: Has implemented various smart city initiatives.<br>3. Surat, Gujarat: Known for its IT infrastructure, smart traffic management.<br>4. Indore, Madhya Pradesh: Implemented smart city initiatives, including waste management.<br>5. Jaipur, Rajasthan: Has implemented smart city initiatives, including public transportation.<br><br>Sustainable Transportation:<br>1. Delhi: Has expanded its metro network, promoting public transportation.<br>2. Mumbai, Maharashtra: Has implemented bus rapid transit (BRT) systems.<br>3. Bengaluru, Karnataka: Has introduced electric buses and bike-sharing.<br>4. Pune, Maharashtra: Has implemented bike-sharing and public bicycle systems.<br>5. Chandigarh: Has introduced electric buses and non-motorized transport infrastructure.<br><br>Waste Management:<br>1. Mysuru, Karnataka: Known for its efficient waste management system.<br>2. Pune, Maharashtra: Has implemented waste-to-energy plants.<br>3. Bengaluru, Karnataka: Has implemented waste segregation and composting.<br>4. Thiruvananthapuram, Kerala: Has implemented waste management initiatives.<br>5. Indore, Madhya Pradesh: Has implemented waste-to-energy plants.<br><br>Energy Efficiency:<br>1. Hyderabad, Telangana: Has implemented energy-efficient street lighting.<br>2. Bengaluru, Karnataka: Has implemented energy-efficient buildings.<br>3. Pune, Maharashtra: Has implemented solar-powered streetlights.<br>4. Ahmedabad, Gujarat: Has implemented energy-efficient initiatives. |

| | |
|---|---|
| | 5. Chandigarh: Has implemented energy-efficient buildings.<br><br>Innovative Urban Planning:<br>1. Lavasa, Maharashtra: A planned city with sustainable design principles.<br>2. Navi Mumbai, Maharashtra: A planned city with green spaces and efficient transportation.<br>3. Gurugram, Haryana: Has implemented innovative urban design principles.<br>4. Kochi, Kerala: Has implemented innovative urban planning initiatives.<br>5. Visakhapatnam, Andhra Pradesh: Has implemented smart city initiatives. |

Collected from various online sources, International Council for Local Environmental Initiatives (ICLEI), Ministry of Urban Development, Government of India, Indian Institute of Technology (IIT), & National Institute of Urban Affairs (NIUA).

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