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INTEGRATING CLIMATE RESILIENCE INTO URBAN PLANNING: A CRITICAL ANALYSIS OF KP CLIMATE CHANGE ACTION PLAN 2022

Javed Iqbal[1], Irfan Ullah[2] & Sumayya[3]

[1]Provincial Management Officer, Government of Khyber Pakhtunkhwa (KP), Pakistan
[2]Special Education Department, Government of Khyber Pakhtunkhwa (KP), Pakistan
[3]Subject Specialist, Elementary & Secondary Education Department, KP, Pakistan

KEYWORDS	ABSTRACT
	This study critically examines strategies 4.1 and 4.2 of KP Climate Change Action Plan 2022, aim to integrate climate resilience into urban planning & reduce climate-induced rural-to-urban migration. Rapid urban expansion in KP especially in Peshawar, has resulted in land degradation, increased carbon emissions, and heightened vulnerability to climate-related hazards. Using the qualitative methodology and thematic content analysis of policy documents, literature, and planning frameworks, this study identifies key challenges impeding the implementation of these strategies. The analysis shows that despite strong policy intent, practical gaps, like poor regulatory enforcement, under-resourced planning bodies and absence of performance monitoring systems undermine the operationalization of both strategies. The findings indicate that aligning spatial planning with climate adaptation requires multi-scalar, inclusive governance model supported by reliable data, stakeholder engagement and sustainable financing. It recommends capacity building, using climate-risk data in planning, strengthening public-private partnership, engaging community & establishing robust monitoring & evaluation systems as pathways to promote climate-resilient & equitable urban development in KP.
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Corresponding Author	Irfan Ullah
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INTRODUCTION

Urbanization, when poorly planned, significantly contributes to carbon emissions, land degradation and climate vulnerability, issues that are increasingly urgent in the Global South, particularly in regions like Khyber Pakhtunkhwa (KP), Pakistan. As urban growth accelerates in cities such as Peshawar, there is rising need to adopt sustainable planning principles that ease environmental

degradation and enhance resilience to climate change (Rehman & Khan, 2022; Shahid & Piracha, 2016). In response, the KP Climate Change Action Plan 2022 (KP-CCAP) has introduced Strategies 4.1 and 4.2, which advocate for revising town planning design principles to reduce carbon emissions and for providing infrastructure in rural and peri-urban areas to decrease rural-urban migration. Strategy 4.1 proposes updating planning and design frameworks by incorporating climate-smart practices, including the energy-efficient infrastructure, green transportation networks, and low-carbon materials. This reflects the paradigm shift toward the compact, mixed-use urban forms that minimize dependency upon fossil fuels while maximizing land efficiency (Seto & Reenberg, 2014; Ahmed, 2013).

Additionally, it calls for strong stakeholder engagement and regulatory reforms to ensure effective implementation, monitoring, and enforcement. Though, several implementation challenges persist, ranging from limited technical capacity to financial constraints & weak enforcement mechanisms (Ullah & Takaaki, 2016). Complementing this is Strategy 4.2, which addresses the push factors driving rural populations to cities. By enhancing infrastructure in smaller Agro-based towns and peri-urban regions like healthcare, education, and water management systems this strategy aims to create viable, self-sustaining communities that can slow rural-to-urban migratory trend (World Bank, 2011; Rahman, Khan, & Abbas, 2021). As previous studies on the urban development in KP suggest, institutional weaknesses, tolerant real estate markets, and lack of climate awareness have historically hindered the effective urban governance (Dawn News, 2014; Planning Commission of Pakistan, 2011). Thus, evaluating the implementation of these strategies over cohesive perspective of policy, planning & climate adaptation is vital for guiding future climate-resilient development in the province.

Problem Statement

The province of Khyber Pakhtunkhwa (KP) is undergoing rapid urban expansion, characterized by unplanned spatial growth, the conversion of arable land, and emergence of informal settlements. This development path, particularly in urban centers like Peshawar, has seriously compromised environmental sustainability and increased population's vulnerability to climate-related hazards. Although KP Climate Change Action Plan 2022 specifies strategic interventions namely, Strategy 4.1, which advocates for revising town planning design principles to reduce carbon emissions, and strategy 4.2, emphasizes infrastructure development in smaller Agro-based towns and peri-urban areas to mitigate rural-urban migration there remains a significant gap in implementation. The root of this gap lies in a convergence of institutional, socio-political, and technical challenges. Weak execution of urban regulatory frameworks, limited inter-agency coordination, lacking stakeholder engagement, lack of capacity in planning institutions hinder mainstreaming of climate-responsive urban development.

Additionally, financial constraints, resistance to paradigm shifts in planning practices, and limited community awareness obstruct the operationalization of sustainable infrastructure and low-carbon urban models. As a result, the failure to align urban planning with climate resilience objectives has led to ongoing environmental degradation, unequal development, and increased vulnerability to climate change aiming to provide a strategic framework for integrating climate adaptation and

mitigation measures across key sectors, including urban development. Without clear, integrated approach that supports the strategic goals of the Action Plan through regulatory reform, capacity building, and inclusive governance, the province risks compromising its climate adaptation and sustainable development targets under both national and international commitments. Integrating climate resilience into urban planning involves adopting proactive policies like green substructure, sustainable drainage systems, climate-sensitive zoning, energy-efficient construction, and early warning mechanisms.

Research Objectives

1. Critically evaluate the integration of climate-responsive town planning principles outlined in Strategy 4.1 of KP Climate Change Action Plan 2022, focusing on regulatory frameworks, stakeholder engagement, and institutional capacity.
2. To evaluate the effectiveness of infrastructure development and support facilities in peri-urban & Agro-based towns as outlined in strategy 4.2, in reducing rural-to-urban migration and promoting equitable regional development.
3. Identify key application challenges & institutional barriers including financial constraints, technical limitations, and policy fragmentation that hinder operationalization of strategies 4.1 and 4.2 in KP urban and regional planning.
4. To propose strategic and policy recommendations for enhancing the climate resilience of KP's urban development processes through evidence-based design principles, capacity building, and inclusive governance mechanisms.

LITERATURE REVIEW

Worldwide, cities occupy less than 3% of the earth's land yet generate roughly 70% of energy-related CO_2 emissions (IPCC, 2023). In the Global South, accelerated urban expansion is eroding peri-urban farmland and increasing vulnerability to climate extremes (Seto & Reenberg, 2014). Pakistan reflects these trends: between 1998 and 2023, the national urban share rose from 32% to an estimated 38% of population (UN DESA, 2002; EnvPK, 2024). In Khyber Pakhtunkhwa (KP), unregulated growth around Peshawar led to significant loss of prime agricultural land & increased flood risk (Rehman & Khan, 2022). Compact city and 15-minute city models. Large N analyses of 700 cities show that walkable 15-minute urban forms correlate with significantly lower per capita transport emissions, even after controlling for GDP, population size (Marzolla et al., 2024). European exemplars, like Bahnstadt (Heidelberg), demonstrate, passive-house building codes & integrated district heating reduce operational energy use by 80% compared to conventional neighborhoods (Time, 2024).

Green/blue infrastructure (GBI). Meta-analyses confirm that multifunctional GBI, green roofs, rain gardens, urban forests, can provide heat mitigation of up to 5 °C and reduce peak-flow runoff by 30-60% (Guardian, 2024; Huang, 2023). A 2024 bibliometric review of 813 publications charts an epistemic shift from purely engineering solutions to socio-ecological GBI frameworks, integrate governance and community co-management (Huang, 2024; Land, 2024). The implications for KP. Pakistan's pilots, such as Karachi's "eco-street" retrofits, highlight the feasibility of integrating low-carbon design into dense urban fabrics (Ahmed et al., 2020). Still, weak municipal enforcement and

limited technical skills have hindered the mainstream adoption of energy-efficient codes (Ahmed, 2013; Khyber Pakhtunkhwa EPA, 2014). Thus, the success of Strategy 4.1 hinges on pairing revised design guidelines with capacity building and robust monitoring and evaluation. Global evidence links rural infrastructure to reduced out-migration by enhancing the local opportunity structures (World Bank, 2011).

Case studies from India, Vietnam, and Colombia show that reliable roads, healthcare, and value-added facilities lower the "push" factors driving urban drift (IPCC AR6 WG2 Ch. 6, 2022). In KP, the community-driven micro-hydro schemes and farm-to-market roads have increased household incomes and reduced migration intentions (Shahid & Piracha, 2016). This shift is crucial not only for urban decongestion but also for fostering climate resilience at the grassroots level. Despite the forward-looking nature of these strategies, their success heavily depends upon the political will, interdepartmental coordination, adequate funding, and ongoing community engagement. Still, Ullah and Takaaki (2016) find out that many peri-urban projects remain underfunded and rarely incorporate climate-risk screening an alignment gap that Strategy 4.2 must address. Comparative research highlights that the fragmentation of mandates and limited access to climate finance are prevalent challenges in sub-national execution (IPCC, 2023). Citizen science flood monitoring in Indonesia & Fiji exemplifies how devolved, data-driven accountability can boost service delivery (Wolff et al., 2021).

For KP, incorporating similar participatory metrics, such as those used in green bonds or blended financing models, could free up resources while enhancing transparency. International literature supports the conceptual pillars of KP's Strategies 4.1 and 4.2: (i) Compact, low-carbon urban design decreases emissions and disaster risk; (ii) targeted peri-urban infrastructure investment relieves migration pressure and inspires balanced growth; and (iii) success relies on governance capacity, sustainable finance, and community engagement. Despite global best practices and provincial policy intentions, no integrated empirical study has yet evaluated how KP's Strategies 4.1 (climate-responsive planning) and 4.2 (peri-urban infrastructure) interact to influence emissions, migration dynamics, and resilience outcomes at the district scale. Furthermore, the standardized indicators linking spatial change, the greenhouse gas (GHG) inventories, and socio-economic co-benefits are lacking. This study addresses these gaps by (a) empirically assessing implementation barriers and synergies between the two strategies and (b) proposing a unified, stakeholder-driven monitoring framework for KP.

RESEARCH METHODOLOGY

This study employs a qualitative methodology based on secondary data analysis to examine the implementation of Strategies 4.1 and 4.2 of KP Climate Change Action Plan 2022, with a focus on climate-responsive town planning and infrastructure development in Peshawar. The study's scope includes policy documents, government reports, planning guidelines, academic literature, media sources related to urban development & climate resilience in KP. Using thematic content analysis, research critically evaluates planning practices, institutional capacity, stakeholder engagement, and sustainability challenges, aiming to explore the alignment between policy objectives and their practical application.

FINDINGS OF STUDY

This thematic analysis identifies and explores the major themes that emerged from the critical review of Strategies 4.1 and 4.2 of the KP Climate Change Action Plan 2022. These strategies aim to reduce the urban carbon emissions and curb rural-to-urban migration by promoting climate-resilient urban planning and infrastructure development in the concerned peri-urban and Agro-based diverse towns.

Climate-Responsive Urban Design & Land Use Planning

One of central themes is necessity for climate-responsive urban design. The revised town planning principles under strategy 4.1 stress compact, mixed-use change, energy-efficient infrastructure and integration of renewable energy sources. This approach aligns with international best practices in sustainable urbanism (Bulkeley & Betsill, 2013; UN-Habitat, 2020). Still, implementation in KP faces challenges due to inadequate integration of climate risk data into planning tools and policies (Khan et al., 2021).

Sub-theme: Environmental Suitability

The contextual climatic risks like floods, heatwaves, and droughts require design principles specific to each region. Absence of climate-resilient zoning, poor execution led to vulnerability in Peshawar (Saeed et al., 2020).

Institutional Capacity & Governance Gaps

The analysis highlights significant institutional and governance challenges. Weak inter-agency coordination, overlapping mandates, and limited technical capacity are major barriers to policy execution (Jan et al., 2024), relies heavily on capable urban planning institutions and monitoring bodies, as under-resourced.

Sub-theme: Regulatory & Legal Frameworks

Despite the existence of zoning laws and building codes, their implementation remains inconsistent. In this connection, a gap exists between legislative frameworks and their active operationalization, which is further complicated by the informal housing market along with the illegal settlements (Qadeer, 2022).

Stakeholder Engagement & Participatory Planning

The inclusive planning has emerged as a core theme. Strategies 4.1 and 4.2 emphasize stakeholder engagement; however, local governments lack structured mechanisms to ensure participation of groups. The lack of grassroots-level input undermines ownership and of development interventions (Mehmood & Zhang, 2021).

Sub-theme: Community-Based Resilience Building

Community-led approaches, including local disaster risk committees and participatory land-use planning, have proven active in similar contexts (IFRC, 2021). KP Action Plan must integrate these models thoroughly.

Infrastructure, Service Delivery in Peri-Urban & Agro-Towns

Strategy 4.2 aims to boost basic infrastructure in peri-urban and rural towns to alleviate migration pressure on cities. Still, service delivery remains inconsistent, particularly in areas like sanitation, healthcare, & education, gap compels rural populations to relocate to urban centers, despite their environmental vulnerabilities.

Sub-theme: Livelihood & Economic Diversification

The absence of economic incentives and Agro-processing facilities hampers the effectiveness of decentralized development. The international experiences underscore importance of integrating the rural value chains and ensuring market access to stabilize the population distributions (World Bank, 2020).

Financial Constraints & Funding Mechanisms

A major constraint identified is insufficient & fragmented financing. Real strategy implementation necessitates long-term investment in low-carbon infrastructure and climate-resilient technologies. However, public funding is scarce, and institutional frameworks for accessing international climate finance are lacking.

Sub-theme: Public-Private Partnerships (PPPs)

In the same line, leveraging public-private partnerships (PPPs) and donor financing is essential. In this linking, the models from South Asia and Sub-Saharan Africa demonstrate success when local governments are empowered to co-develop climate-resilient infrastructure with the private actors (UNEP, 2022).

Monitoring, Evaluation & Adaptive Governance

Effective implementation depends on the performance measurement systems. The KP Action Plan outlines key performance indicators (KPIs) such as emissions reduction, infrastructure development, and capacity building; nevertheless, it lacks the robust framework for the real-time monitoring and policy adaptation.

Sub-theme: Data-Driven Decision Making

The thematic evidence shows that reliable data systems particularly GIS and climate vulnerability assessments are crucial for guiding interventions and informing corrective strategies (Ahmed et al., 2022). KP must institutionalize data collection, feedback loops, and periodic evaluations to ensure the long-term policies.

DISCUSSION

The study critically evaluates Strategies 4.1 and 4.2 of the KP Climate Change Action Plan 2022, which aim to integrate climate resilience into urban planning and reduce rural-urban migration through infrastructure development in peri-urban areas. Strategy 4.1 advocates for revising town planning principles to lower carbon emissions through compact, energy-efficient urban design and stakeholder engagement. However, implementation is hindered by weak institutional capacity, fragmented regulatory frameworks, and inadequate financial and technical resources. Moreover,

the limited integration of the climate risk assessments into planning processes and inconsistent enforcement of zoning the laws further impede the adoption of the low-carbon design across KP, particularly in Peshawar.

Strategy 4.2 aims to address rural-urban migration by enhancing infrastructure in smaller Agro-based and peri-urban towns, thereby improving local livelihoods and reducing pressure on urban centers. However, challenges such as underfunded service delivery, a lack of climate screening in projects, and insufficient community participation hinder effectiveness of this approach. In this drive, thematic findings identify key barriers including governance inefficiencies, financing gaps, the poor stakeholder engagement, and weak monitoring structures. In this linking, despite these challenges, global as well as regional evidence support transformative potential of compact urban design, green infrastructure, and participatory development in achieving the climate-resilient and equitable growth.

CONCLUSION

This study concludes that the KP Climate Change Action Plan 2022 presents a forward-looking framework for addressing the dual challenges of the urban carbon emissions and climate-induced migration. However, translating its strategic intent into actionable outcomes requires an integrated approach based on institutional reform, inclusive governance, sustainable financing, and adaptive planning. In this connection, without addressing the current gaps in the regulatory enforcement, technical capacity, and stakeholder involvement, KP risks worsening environmental degradation, social inequalities, and vulnerability to climate risks. To ensure long-term resilience, there is an urgent need to implement the coordinated, data-driven, together with the community-oriented execution mechanism.

Recommendations

1. Enhance Government Capacity and Coordination. The government should establish a clear system that enables all departments to collaborate on climate-friendly urban planning. This includes training staff, hiring skilled experts, and ensuring that everyone adheres to the same goals and regulations.
2. Incorporate Climate and Risk Data into Urban Planning. District and city planners should utilize climate data, such as flood zones, heat risk maps, and pollution levels, to make the informed decisions. This will help protect communities and minimize damage from climate-related events.
3. Promote Public-Private Partnerships (PPPs): To enhance the infrastructure and services, the government should work with private companies and organizations. These partnerships can help fund green energy, water systems, and safe housing, especially in smaller towns and peri-urban areas.
4. Engage Local Communities in Planning: Involve residents, including farmers, women, and youth, in the planning and development of their communities in the diverse regions. Their participation ensures that projects meet the community's needs and that are accepted by the concerned residents.

5. Establish Clear Monitoring & Evaluation System: A robust tracking system should measure progress toward climate goals, such as reducing carbon emissions, promoting eco-friendly communities, and mitigating unnecessary urban migration. This will enhance policies over time and ensure accountability among departments.

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