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EXECUTIVE SUMMARY

# Sustainable Urban Resilience in Pakistan:

## Community-Based Natural Solutions for Environmental Transformation

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# Sustainable Urban Resilience in Pakistan: Community-Based Natural Solutions for Environmental Transformations

## Executive Summary

The project addresses the critical ecological and social challenges that Pakistan's largest urban centers face as they expand rapidly under climate stress. Cities like Karachi and Lahore are struggling with air pollution, rising temperatures, biodiversity loss, and recurrent floods, conditions that undermine health, safety, and livability. Conventional infrastructural-based interventions have often been costly, fragmented and socially marginalizing, providing a short-term reduction. In that regard, the given research shows that community-based nature-based solutions (NBS) offer cost-efficient, sustainable, and socially inclusive options that can help to reduce environmental risks and increase the resilience of communities simultaneously.

The urban policy in Pakistan has long been based on the idea of focusing on economic and infrastructural growth at the cost of environmental balance, which led to serious environmental consequences. The study argues that community-based actions, including micro-forests, rooftop gardens, wetlands and biodiversity corridors, could transform the urban landscape of Pakistan by instilling resilience via ecological recovery, and active citizen engagement. The research objectives guided the analysis in four directions: assessing how NBS mitigate pressing urban challenges; examining how they foster social cohesion, resource sharing, and self-sufficiency; exploring their adaptability across varied urban contexts; and proposing a framework to embed them in city planning. This approach links theory and practice, providing both scholarly contribution and policy relevance.

The theoretical foundation draws on Social-Ecological Systems theory and Urban Resilience theory, both of which stress that human and ecological systems form interdependent networks. Resilience is understood not as return to pre-crisis conditions but as the capacity to adapt and evolve. From this perspective, NBS are not only environmental interventions but also social infrastructures that enable cooperation, participation, and shared stewardship. While global literature shows that NBS can enhance biodiversity, regulate microclimates, and manage water systems, the Pakistani context has been dominated by top-down, expensive projects, leaving little space for localized and affordable solutions. The study therefore addresses this gap by focusing on community-driven initiatives that fit dense, resource-constrained urban environments. Methodologically, the research employed a mixed-methods design to combine quantitative measurement with qualitative insight. Structured surveys with 300 participants in Karachi and Lahore provided data for structural equation modeling, testing the hypothesized relationships between NBS, environmental improvements, and urban resilience. Thirty in-depth interviews with community members, local leaders, and policymakers enriched the analysis by revealing perceptions, experiences, and governance barriers. Site observations documented the condition of green interventions in practice, while secondary environmental data added empirical depth. This design ensured that the research captured both measurable outcomes and lived realities.

The findings of study showed the effectiveness of nature-based solutions (NBS) to air pollution, flooding, and heat stress. Respondents highlighted neighborhoods with rooftop gardens with lower temperatures, micro-

forests that provided endurance to biodiversity, and wetlands that offered lasting solutions to flood control. The projects were also seen to have fostered significant social catalysis, inspiring collaboration, trust, and collective action. Respondents emphasized that the custodianship of green spaces as a community-maintained bonds and reinforced networks that were critical in crises such as flooding or heatwaves. However, governance gaps, lack of funding, and institutional irregularities were also often mentioned as barriers that limited scalability and sustainability. The multi- group comparison analyses showed differences in context in which the resilience outcomes of Lahore were more heavily attributed to environmental shifts because of improved governance and institutional capacity while Karachi fell short due to infrastructural stress and fragmented management. The research also acknowledged the importance of social processes such as cohesion, self-sufficiency, and resource sharing. These findings position NBS as social and ecological infrastructures, and as such, foundations of community resilience and restoration.

The research extends these findings by suggesting a strategic framework for integrating nature-based solutions into urban planning. The strategic framework has three pillars: ecological interventions such as rooftops gardens, wetlands, and micro-forests; social mechanisms that create trust, cooperation, and ownership; and institutional mechanisms that enable policy integration, financing, and multi-sector collaboration. It advocates for participatory governance that goes beyond the SDGs and the Paris Agreement, involving communities from the start to raise funds and support it.

The research indicates that contrary to the expensive and unsustainable option of inward development, community- based NBS is cost-effective, flexible and socially inclusive resilience options. It makes people more resilient to shocks and by reducing the exposure of the community to the climate stress. This research suggests that with adequate government and community support, ecological methods of urban intervention can be applied in other urban areas. Broadly speaking, this research has proven that resilience to sustainable Pakistani cities is achievable through planning with nature at the core of the urban planning. NBS in communities go beyond the environmental risk to social risk by repairing social fabrics and establishing frameworks of inclusive governance. The evidence, framework and recommendations from the research can serve the purposes of informing policymakers, practitioners and communities in the pursuit of inclusive, livable, resilient and equitable cities.

