

Chapter 6

Blue–Green Infrastructure for Climate Resilience: Aiding Urban Development

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ABSTRACT

This study aims to explore the effectiveness of climate resilience measures in mitigating climate-related adversities, with a particular focus on the role of blue-green infrastructure. It investigates how blue-green infrastructure contributes to climate resilience and assesses its success in urban development both in India and globally. The study also examines the challenges and opportunities associated with implementing blue-green infrastructure in the Indian context, identifying key barriers and enablers for its adoption. The study highlights the alignment of blue-green infrastructure with Sustainable Development Goals, particularly those related to climate action and sustainable urbanization, offering insights into how such infrastructure can support broader sustainability objectives. Through these analyses, the research provides a comprehensive understanding of the potential of blue-green infrastructure as a climate-resilient solution for urban development.

INTRODUCTION

Climate change is the long-term variations in global or regional climate patterns, primarily due to human activities, including the burning of fossil fuels which release greenhouse gases such as carbon dioxide into the atmosphere. It has become a global issue affecting the health, food, water and social progress globally (Liu & Masago, 2023). These gases trap heat from the sun, leading to a rise in global temperatures,

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commonly known as global warming. This warming affects weather patterns, causing more frequent and severe events like heatwaves, storms, and droughts, melting ice caps and glaciers, and rising sea levels. These events have a threaten on ecosystems, biodiversity, and human societies by disrupting agriculture, increasing the risk of natural disasters, and impacting water and food security. Another major concern is the prolonged droughts having severe impacts on agriculture, water supply, and food security, leading to economic strain and, in some cases, forced migration. India has experienced record-high temperatures and prolonged dry spells (Panda et al., 2017) and is now ranked on the UN's Global Drought Vulnerability Index, with repeated drought episodes in major rice-producing states like Uttar Pradesh, Jharkhand, West Bengal and Bihar (Amrit et al., 2021). Rising temperatures and changing precipitation patterns affect water availability and energy demand, leading to increased operational costs for businesses, reduced economic output and impact the agriculture yield badly. Studies have confirmed that the climate change will lessen the agricultural output from 4.5 percent to nine percentage through 2020 to 2039 (Kamadi et al., 2023). The global warming results in loss of more than thirty million full-time jobs in the farming and construction sectors (Rao et al., 2016), reduction in the output of several crops by three to seven percentage (Dhanya & Ramachandran, 2016) and variations in the rainfall in the summer and winter monsoon in northwestern parts of India (Subash et al., 2023). The heatwaves impact the health resulting in reduced workforce productivity and increase in healthcare costs. The climate change can threaten the crucial economic activities like tourism and fisheries, increase insurance costs, and lead to capital flight or reduced investment due to perceived risks. Converting these challenges into financial terms explains the reduction in GDP to around one percent (Singh, 2022).

These climate adversities are happening primarily due to human activities that have significantly altered the Earth's climate system. The burning of fossil fuels for energy, transportation, and industrial processes releases large amounts of greenhouse gases, such as carbon dioxide and methane, into the atmosphere, trapping heat and causing global warming. The farm machines used by farmers are steered by fossil fuels causing the emission of greenhouse gases effecting climate change (Chel & Kaushik, 2011). India's emissions were estimated at 2.144 tons per capita of GHG emissions, 69.4 kg per capita of CO emissions, 20.36 kg per capita of NO₂ emissions, and 9.51 kg per capita of SO₂ emissions (OECD, 2023) and 47,000 million metric tons of CO₂, 570 million metric tons of CCl₄, and 9 million metric tons of N₂O (Basha and Reddy, 2022). From 2003 to 2017, a total of 520,861 forest fires were detected across India's varied forest landscapes (Sannigrahi et al., 2020), Uttarakhand Forest fire led to a 52% rise in CO, a 52% increase in NO_x, and an 11% increase in O₃ (Hussain et al., 2023). Deforestation and urban development further worsen this by reducing the number of trees that can absorb carbon di-oxide.

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