

Urban Heat Island Effect in Indian Cities

Anna Kowalczyk*

Department of Urban and Environmental Studies, Jagiellonian University, Poland,

*Corresponding author: Anna Kowalczyk. Department of Urban and Environmental Studies, Jagiellonian University, Poland,

Email: anna.kowalczyk.env@urbanclimate.pl

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Abstract

Rapid urbanization has significantly altered land surface characteristics in Indian cities, leading to the emergence of the urban heat island (UHI) effect. The replacement of natural vegetation with concrete, asphalt, and buildings increases heat absorption and reduces cooling through evapotranspiration. As a result, urban areas experience higher temperatures than surrounding rural regions. This article examines the causes, impacts, and implications of the urban heat island effect in Indian cities and highlights mitigation strategies to reduce urban heat stress and enhance urban sustainability.

Keywords: Urban heat island, urbanization, land surface temperature, climate change, Indian cities

Introduction

Urbanization has transformed landscapes across India, replacing natural land cover with impervious surfaces such as roads, buildings, and pavements. These changes significantly alter the surface energy balance, leading to higher heat absorption and retention in urban areas compared to surrounding rural regions [1]. The release of pollutants such as sulfur dioxide, nitrogen oxides, particulate matter, and carbon dioxide has raised serious concerns regarding environmental sustainability and public health. Air pollution from thermal power plants significantly degrades ambient air quality and contributes to respiratory and cardiovascular diseases [2]. Unsustainable use of natural resources, pollution, and habitat destruction have intensified environmental pressures worldwide. These challenges disproportionately affect vulnerable populations, highlighting the importance of

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environmental sustainability for social equity and human well-being. Climate change is a cross-cutting issue that affects progress across multiple SDGs [3]. Rising temperatures, extreme weather events, and sea-level rise threaten livelihoods, infrastructure, and ecosystems. Addressing climate change through mitigation and adaptation strategies is essential for achieving sustainable development and reducing long-term environmental risks. The interconnected nature of the SDGs underscores the need for integrated approaches that recognize the links between environmental, social, and economic objectives [4]. Strengthening environmental governance, promoting sustainable consumption and production, and enhancing international cooperation are critical for advancing environmental goals. Monitoring and evaluation frameworks play an important role in tracking progress and identifying gaps [5]. Ensuring environmental sustainability within the SDG framework requires coordinated efforts among governments, private sectors, and civil society. Mainstreaming environmental protection into development strategies is essential for achieving the SDGs and securing a sustainable future.

Conclusion

The urban heat island effect poses a growing challenge for Indian cities, affecting public health, energy use, and overall urban livability. Rapid urban expansion without adequate environmental planning has intensified heat stress in urban areas. Implementing mitigation measures such as urban greening, cool roofs, and sustainable land-use planning can significantly reduce urban temperatures. Addressing the urban heat island effect is essential for enhancing climate resilience and ensuring sustainable urban development.

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