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**Research Topic:** Integrating Urban Heat Island Mitigation Strategies for Community Sustainability in Dhaka.

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## **Research Question**

1. How do combined urban heat island mitigation strategies, specifically green infrastructure and cool pavements, impact temperature reduction and environmental sustainability in Dhaka?
2. What are the differential effects of green infrastructure and cool pavements across diverse urban zones in Dhaka, considering variables such as land use and neighborhood characteristics?
3. How do UHI mitigation strategies influence social factors, including quality of life, public health, and the resilience of vulnerable communities in Dhaka?

## **Introduction**

Urban Heat Islands (UHI) are a serious environmental problem, causing higher temperatures in cities compared to rural areas. This rise increases health risks, energy use, and challenges urban sustainability by raising the demand for cooling [1]. Studies highlight UHI solutions like green roofs and parks that cool cities and improve livability [2]. Han et al. suggest that combining multiple strategies is essential for sustainable urban growth [4].

However, research gaps remain in understanding how these strategies work together across different urban areas. Most studies look at strategies separately, missing how they might enhance each other's benefits. Social impacts, particularly on vulnerable groups, are also often overlooked, limiting fair UHI solutions [3], [5].

This study will explore the combined impact of green infrastructure and cool pavements on reducing temperatures and boosting resilience in Dhaka. Using a mixed methods approach with temperature data and interviews, this research aims to close these gaps and develop inclusive, locally tailored UHI strategies.

## **Literature Review**

Urban Heat Islands (UHI) require both mitigation (emission reduction) and adaptation (green spaces), yet balancing these strategies is key for urban management [1].

Green infrastructure, like green roofs and parks, helps reduce urban heat but varies in effectiveness due to differing landscapes and climates [2].

While cool pavements and green roofs lower temperatures, data on their combined effects is limited, highlighting a need for research on strategy integration [3].

A review of 400 studies points to the importance of high-resolution data and long-term monitoring for better UHI management across cities [4].

Much UHI research lacks real-world testing and overlooks vulnerable communities, underscoring the need for inclusive, effective solutions [5].

This research will address gaps by testing combined UHI strategies, like green spaces and cool pavement, across various urban settings. It will also assess their impacts on diverse communities to create adaptable, inclusive solutions.

## **Research Methodology**

This study will use a mixed-methods approach to explore combined UHI strategies and fill research gaps.

### **Quantitative Phase**

A sample of 300 urban areas will be chosen to include different climates and socio-economic levels. Data on UHI methods (like green roofs, cool pavements) will be collected from temperature records, satellite images, and planning documents. Climate databases (e.g., NOAA, ESA) will provide the data to compare how well these combined strategies work across cities.

### **Qualitative Phase**

Semi-structured interviews will be conducted with 50 urban planners and community leaders to understand the effectiveness, challenges, and social impact of UHI strategies on communities. This will offer insights on inclusivity and adaptability, often missed in UHI studies.

### **Data Analysis**

Quantitative data will be analyzed with descriptive statistics and correlation analysis to see how strategy combinations impact cooling and satisfaction. The qualitative data will undergo thematic analysis to find key themes on community impacts. This will help identify gaps and improve UHI strategies for various cities.

### **Roadblocks & Limitations**

Potential delays in accessing reliable data and securing participant availability may affect the study's timeline. Additionally, the accuracy of climate data may vary across sources, and findings could be limited by region-specific factors that may not fully apply to diverse urban settings.

### **Post-Program Plan**

The post-program plan includes offering resources for stakeholders to implement UHI strategies, establishing a monitoring framework, and sharing findings through reports, publications, and presentations to ensure broader adoption.

## References

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## Timeline

