
AMRUT Funded Centres of Urban Planning for Capacity Building – SPAV

Targeted Urban Research Project:

Canopy Layer UHI mitigation strategies for hotspots of Hyderabad using Local Climate Zones (LCZs) approach

Project Summary

Global warming is a critical challenge for humanity in the coming decades, while rapid urbanization exacerbates Urban Heat Islands (UHI). Rising temperatures and the UHI effect led to increased extreme weather events such as heatwaves, especially in core cities. In this context, climate-responsive urban planning and design strategies have gained traction globally. The need for developing Canopy Layer UHI mitigation strategies in Hyderabad also arises from the city's rapid urbanization, which has led to significant temperature increases in specific areas, intensifying the effect. This phenomenon impacts public health, increases energy consumption, and challenges urban sustainability. By using the Local Climate Zones (LCZs) approach and mapping indices such as NDVI, NDWI, NDBI, and LST, the research identifies hotspots and assesses the impact of urban development on temperature variations. Tools like ENVI-met and Urban Weather Generator (UWG), Climaudio will be used to process the data obtained through field measurements and modified weather files of the identified hotspots. Analyzing these relationships facilitates the creation of targeted zoning regulations and the developing of practical solutions for mitigating heat effects, thereby enhancing climate resilience and improving living conditions in Hyderabad.

Methodology

The research project aims to develop evidence-based implementable Canopy Layer UHI mitigation strategies for hotspots of Hyderabad using the LCZs approach. The following methodology shall be adopted in the study.

1. Mapping of NDVI, NDWI, NDBI, and LST Maps of Hyderabad for 2004 and 2024 for identification of hotspots in the city using the GIS, using Landsat 8 open-source data.
2. Identify and classify LCZs for the identified hotspots through site surveying using WUDAPT.
3. Modelling and Simulation of identified hotspots using ENVI-met and ClimateStudio.
4. Statistical analysis of the relationship between LCZs and hotspots.
5. Generating feasible UHI mitigation for identified hotspots using ENVI-met / Rhino / Climate Studio / Urban Weather Generator.

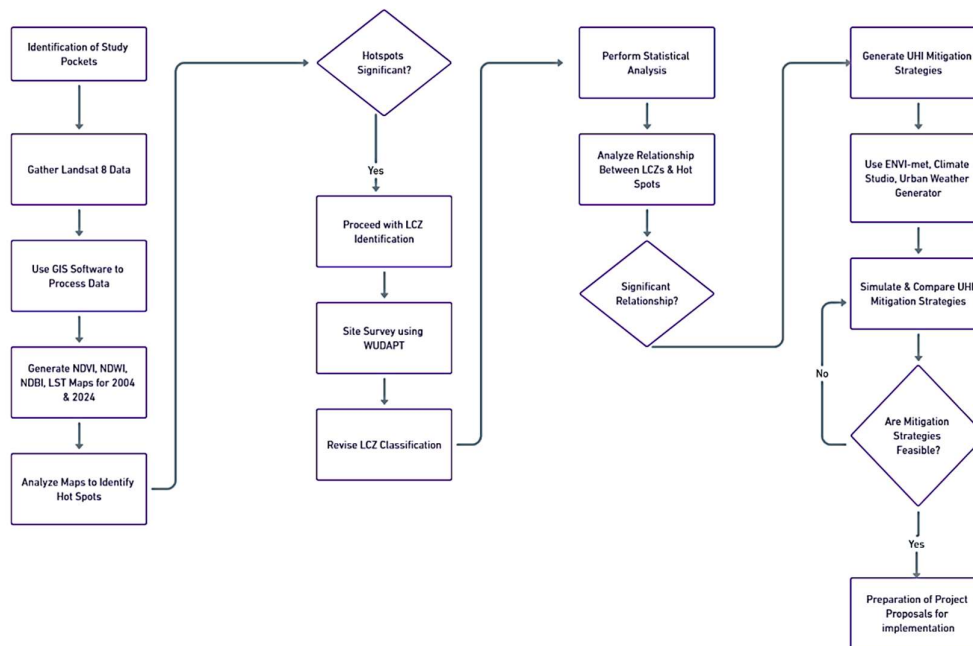


Figure 1 Methodology Flow Chart (Source: Authors)

Relevance to any Urban Local Body

- Strategic Urban Planning: Optimizing land use and infrastructure development.
- Mitigating Urban Heat Islands: Implementing targeted interventions for thermal comfort and energy efficiency.
- Improving Environmental Quality: Enhancing green spaces and reducing pollution.
- Policy Development: Formulating zoning regulations for sustainable urban growth.
- Climate Resilience: Strengthening infrastructure against climate impacts.

- This initiative ensures sustainable development and enhances urban livability aligning with city corporations' goals for effective governance and community well-being.

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Deliverables and Outcomes

1. Maps of NDVI, NDWI, NDBI, and LST of Hyderabad for 2004 and 2024
2. Map of LCZs for identified hot spots
3. Report on mitigation strategies for the identified hot spots for implementation
4. Formulation of UHI Mitigation projects at Urban Block/Neighbourhood Level.

Study Location - Hyderabad

- Location: Hyderabad, IND
- Longitude: 78.47
- Latitude: 17.45
- Elevation above sea level: 545.0 m
- Köppen-Geiger climate zone: Aw. Tropical wet and dry or savanna.
- NBC climate classification: Composite Climate
- Average yearly temperature: 26.7 °C
- Hottest yearly temperature (99%): 39.2 °C
- Coldest yearly temperature (1%): 15.4 °C
- Annual cumulative horizontal solar radiation: 2043.47 kWh/m²
- Percentage of diffuse horizontal solar radiation: 38.5 %

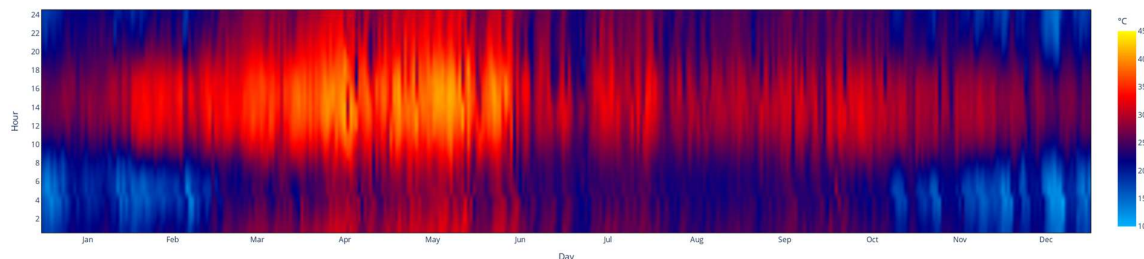


Figure 2 Daily DBT heatmap (Source: CBE Clima Tool)

Project Team:

Dr. Faiz Ahmed Chundeli (PI)
Ar. Vijesh Kumar (Co-PI)
Ar. Kapil Natawadkar (Member)
Ar. Jyoti Kushwaha (Student Member)