Briefing

URBAN HEAT ISLAND AND HEAT IMPACT IN KHULNA CITY AND SATKHIRA MUNCIPALITY

Heat Adaptation Measures

Keywords: Urban Heat Island (UHI), Heat impact, Heat adaptation plan, Bangladesh, Heat stress, Heat vulnerability

Urban Planning & Infrastructure

Khulna and Satkhira need climate-smart urban design to tackle rising heat. Expanding green infrastructure trees, parks, rooftop gardens can reduce UHI effects. Heat-resilient building codes with insulation, ventilation, and reflective materials should guide both housing and urban master plans.

Public Health & Awareness

Heat stress threatens vulnerable groups, especially infants, elderly, and outdoor workers. Establish and introduce cooling centers, shaded rest spots, and water stations are vital steps. Awareness campaigns and social protection schemes can reduce income loss and strengthen community resilience.

Policy & Governance

The absence of Heat Action Plans (HAPs) is a major gap. Developing city-specific HAPs and early warning systems should be prioritized. Policies must mainstream heat adaptation policy into national climate, disaster, and urban frameworks with clear financing.

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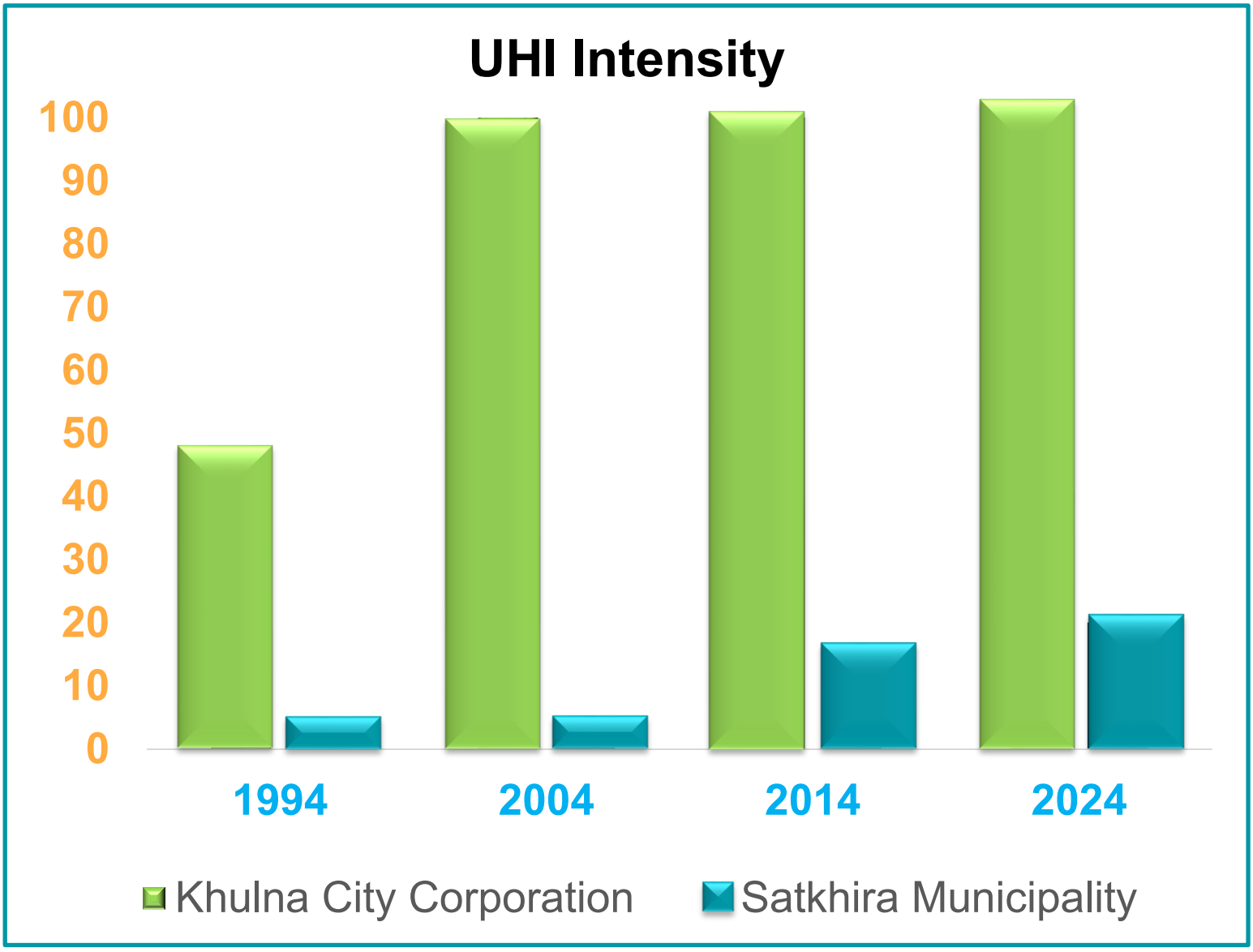
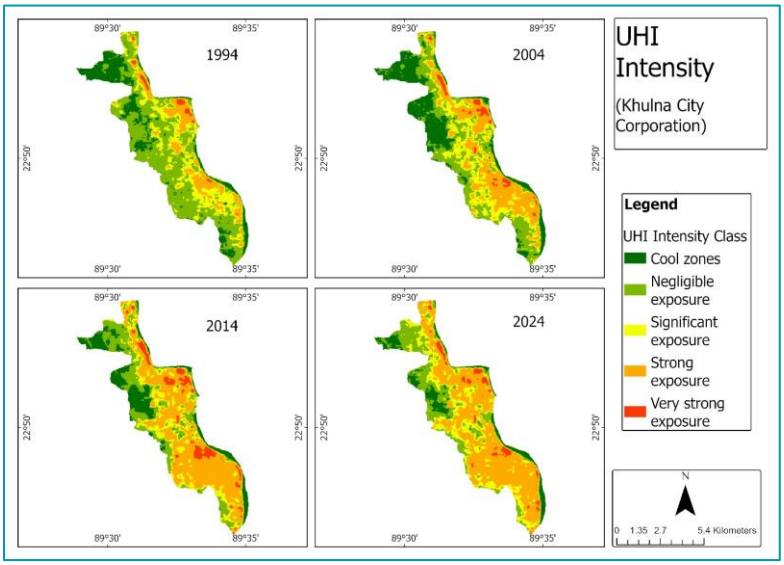
The Khulna City Corporation and Satkhira Municipality are diverse urban and semi-urban landscapes of the country. The area of Khulna city is 45.65 sq. km. (Rahman & Kabir, 2019; Jodder et al., 2022), and the Satkhira Municipality covers an area of 27.84 sq. km. (Islam, 1991; Hasan et al., 2022).

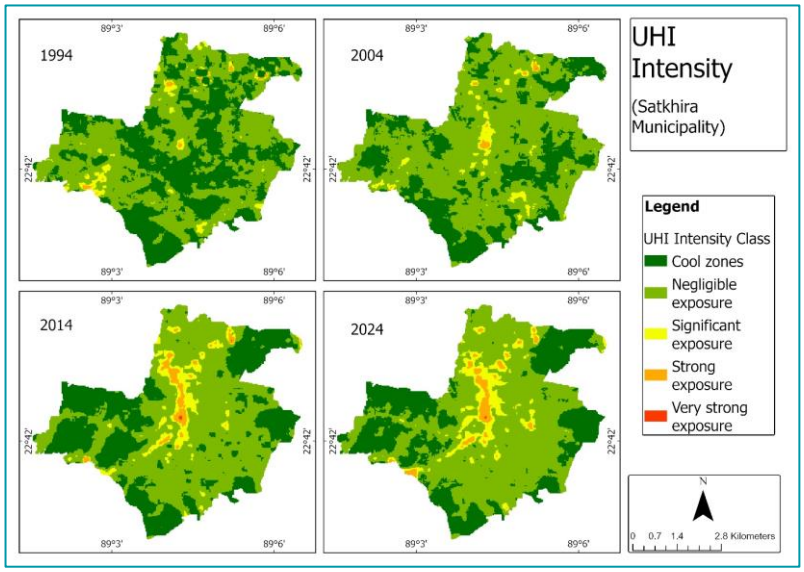
Khulna City has a consistently warm climate with an average annual temperature of 32°C, making the period from December to February the most favorable for living, while the rainy season spans from May to September. Due to rapid urbanization, Khulna City faces significant Urban Heat Island (UHI) effects and increased Land Surface Temperature (LST) (Suborna et al., 2025). The city regularly experiences heatwaves, defined as three or more consecutive days over 36°C (Rashid et al., 2024; Suborna et al., 2025), a risk compounded by dense infrastructure, insufficient cooling systems, and limited green spaces (Nissan et al., 2017; Dewan et al., 2021; Suborna et al., 2025). Various meteorological factors, including monsoon dynamics, local topography, and global climate phenomena such as El Niño and La Niña, significantly influence the temporal variation of rainfall. Khulna and Satkhira consistently demonstrate higher annual total rainfall (1992 to 2022).

Both Khulna and Satkhira receive high annual rainfall due to their proximity to the Bay of Bengal and strong monsoonal influences. However, Khulna and Satkhira are classified as highly vulnerable to the combined effects of climate factors such as temperature, rainfall, and wind speed, whereas Khulna exhibits a moderate vulnerability.

Urban Heat Island (UHI) intensity in Khulna City Corporation and Satkhira Municipality has gradually risen from 1994 to 2024. In 1994, there were 47 locations in the Khulna City Corporation area and 4 locations in the Satkhira Municipality area that formed UHI, which increased to 152 locations in Khulna City Corporation and 20 locations in Satkhira Municipality during 2024.







In both municipalities, heat stress is a common phenomenon. Due to the formation of heat islands and the increasing trend of land surface temperature, the residents are experiencing heat-related health problems. All age groups are vulnerable to heat-related health problems; however, the elderly and infants are more vulnerable than other age groups. Dehydration, abdominal discomfort, heat stroke, asthma, and vomiting are found to be increased with heat. Also, heat-related illnesses such as dysentery, diarrhea, and dengue fever have become more prevalent in both urban areas during heatwaves.

Heat stress contributes to an increase in hypertension among the citizens, particularly affecting newborns and the elderly. Informal wage earners such as construction laborers, day laborers, and rickshaw pullers lost their working days and suffer from food insecurity during the heatwaves.

There is no heat adaptation plan for either urban areas or Bangladesh. To reduce the heat impact in urban areas of Bangladesh, there needs to be integration of multisectoral Heat adaptation strategies in Bangladesh's urban areas, which involve Heat Adaptive Urban Planning & Infrastructure, Public Health & Awareness, Policy & Governance, and Community & Sectoral Collaboration

Urban Planning & Infrastructure

- **Green Infrastructure and NbS:** Green spaces, urban vegetation, and green roofs.
- **Building Design:** Building design with insulation to reduce indoor temperatures and enhance ventilation. Application of NbS in the design of low-income housing.
- **Climate-Smart Planning:** Heat-adaptive measures in urban planning.

Public Health & Awareness

- **Cooling Facilities:** Establishment of cooling centers, heat shelters, accessible drinking water sources, and application of NbS for drinking water in public areas.
- **Social protection Scheme:** Supplementary social protection scheme as an anticipatory action during heat waves for low-income people.
- **Healthcare Response:** Strengthening the health sector to manage heat-related illnesses through training and improved access to healthcare for vulnerable populations.

Policy & Governance

- **Heat Action Plans (HAPs):** Developing location-specific Heat Adaptation Plans (HAPs) and implementing HAPs.
- **Early Warning and Climate Advisory Systems:** Establish data-driven and community-based heat early warning and climate advisory systems to provide timely information and enable preemptive action.

Acknowledgement

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