



Urban Heat Island Effect

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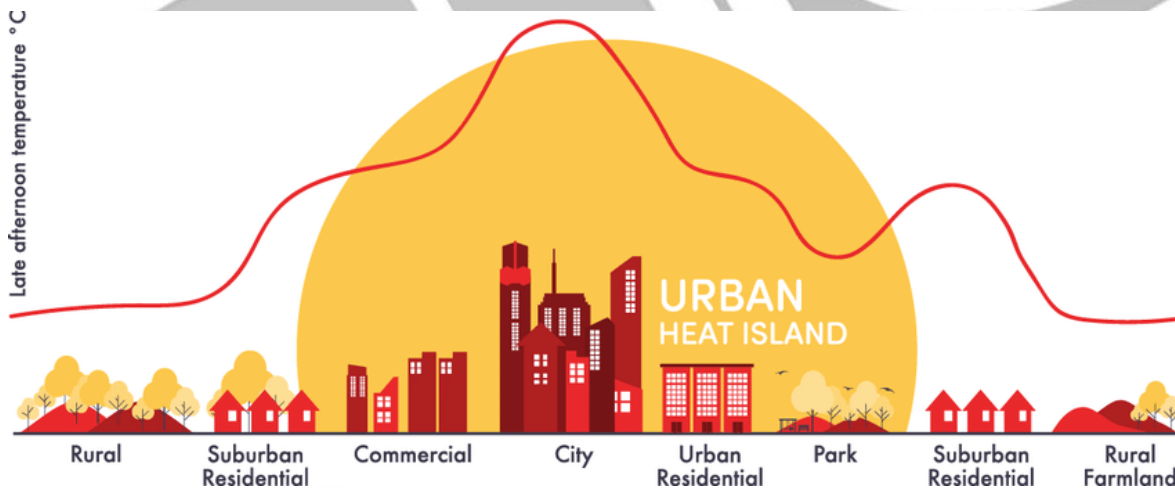
Why in News?

A recent study highlights the dual impact of the [Urban Heat Island \(UHI\) effect](#)—while it elevates heat-related mortality, it substantially reduces cold-related deaths.

- In 2018, the global decline in cold-related fatalities was 4.4 times greater than the rise in heat-related deaths, with cities like Moscow witnessing even larger differentials.

What is Urban Heat Island?

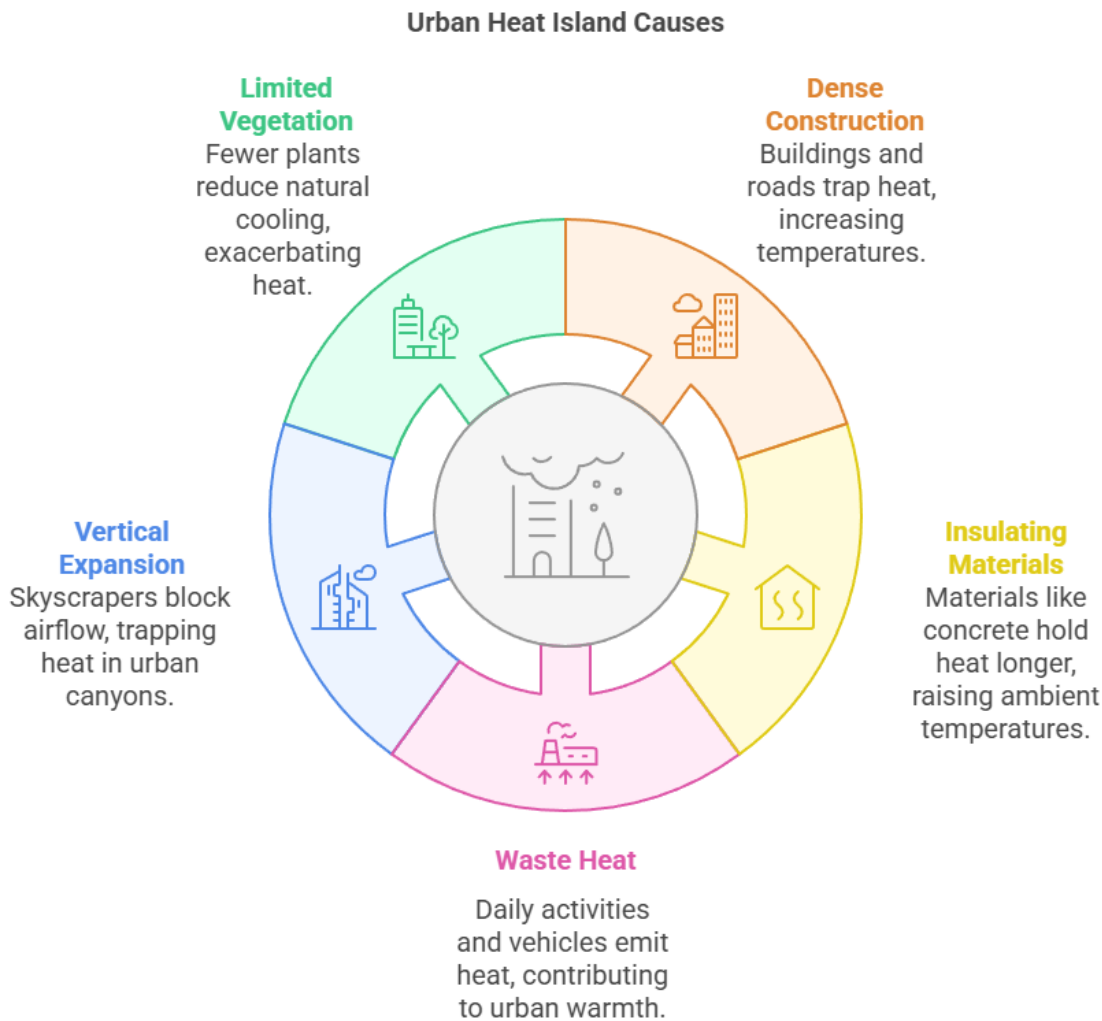
- **About:** An **Urban Heat Island (UHI)** is a **metropolitan area significantly warmer** than nearby rural surroundings.
 - Urban areas **heat up more than natural landscapes** because materials like **concrete and asphalt** absorb and **retain heat** more effectively.
 - The effect is most noticeable in **large, densely populated cities** like **New Delhi, New York, Paris, and London**.



- **Causes:**
 - **Impervious Surfaces:** Materials like **asphalt, concrete, and steel** absorb daytime heat and release it slowly at night due to **low albedo**, trapping more heat.
 - **Lack of Vegetation:** Limited **green cover and tree canopy** reduce **evapotranspiration**, cutting off natural cooling and increasing urban heat buildup.
 - **Anthropogenic Heat:** **Vehicular emissions, industrial processes, and air conditioning** release excess heat, significantly raising urban temperatures.
 - **Air Pollution and Soot:** **Black carbon** and other **particulate matter** absorb solar

radiation, raising **ambient temperatures** and worsening the **UHI effect**.

- **Urban Morphology: Dense buildings, narrow streets**, and poor **airflow** create an **urban canyon effect**, trapping heat within confined spaces.
 - Skyscrapers and high-rises restrict air flow and trap heat.



▪ **Consequences:**

- **Increased Energy Demand:** UHI raises cooling energy use, straining grids and increasing carbon emissions.
 - By elevating **local temperatures**, urban areas **drive up energy consumption for cooling** and positioning urban heat islands as **localized accelerators** of climate change.
- **Deterioration of Air Quality:** Higher temperatures boost **ground level ozone formation**, worsening smog and respiratory issues.
- **Heat-Related Health Risks:** UHI increases **heat strokes, dehydration, and cardiovascular stress**, especially in vulnerable groups.
- **Strain on Water Resources:** UHI accelerates **evaporation**, reducing water availability and increasing cooling water demand.
- **Biodiversity Loss:** UHI harms **native vegetation, disrupts ecosystems, and threatens urban wildlife** due to excessive heat and reduced green spaces

▪ **UHI Mitigation Strategies:**

UHI Mitigation

Green Solutions

Utilizing trees, parks, and green roofs to reduce temperatures and improve insulation.



Blue Solutions

Implementing water features and permeable surfaces for temperature reduction and water infiltration.



Grey Solutions

Employing reflective materials and urban redesign to minimize heat absorption and improve airflow.



Behavioral & Policy Measures

Encouraging soft mobility, energy efficiency, and public awareness for heat adaptation.



UHI Mitigation Case Studies:

- **Los Angeles Cool Roof Initiative:** It requires the use of **reflective roofing materials** in all new buildings and major renovations to ensure roofs effectively **reflect sunlight and release absorbed heat** through high solar reflectance and thermal emittance.
- **Dubai's Smart Cooling Systems:** It involves generation of **chilled water** at a central facility and **distributing it via underground pipes** to multiple buildings leading to **30-50% more energy-efficient** than individual AC units.
- **Paris' Cool Streets Initiative:** It is a comprehensive **urban transformation program** aimed at combating urban heat by:
 - Converting streets into **pedestrian-only zones**.
 - Replacing asphalt with plants and trees, thereby **increasing green space** in urban areas etc.

Click Here to Read More: [Heat Waves](#)

UPSC Civil Services Examination, Previous Year Question (PYQ)

Q. What are the possible limitations of India in mitigating global warming at present and in the immediate future? (2010)

1. Appropriate alternate technologies are not sufficiently available.
2. India cannot invest huge funds in research and development.
3. Many developed countries have already set up their polluting industries in India.

Which of the statements given above is/are correct?

(a) 1 and 2 only

(b) 2 only

(c) 1 and 3 only

(d) 1, 2 and 3

Ans: (a)

PDF Refernece URL: <https://www.drishtias.com/printpdf/urban-heat-island-effect>

