



Urban Heat Islands

For Prelims: Urban Heat Island, Green House Gasses and Green house effects, Climate Change and its impact, NASA's Ecosystem Spaceborne Thermal Radiometer Experiment (Ecostress)

For Mains: Causes and Impact of Urban Heat island, Inter relation of the climate change, heat wave and urban heat island

Why in News?

Recently, several parts of India are experiencing severe heat waves. Urban areas and cities are the places which have higher temperatures than rural places. This phenomenon is referred to as "[Urban Heat Island](#)".

- According to experts, these temperature discrepancies are caused by variations in heating over highly urbanized and semi-urbanized areas, as well as the relative availability of open and green spaces in the surrounding areas.

What is an Urban Heat Island?

- Urban heat island may be defined as the local and temporary phenomenon in which certain pockets within a city are experiencing higher heat load than its surrounding area.
- This rise of heat basically happens due to buildings and houses of cities made up of concrete where the heat is trapped and not able to dissipate easily.
 - Urban heat island is basically induced due to trapped heat between establishments made up of concrete.
 - The temperature variation can range between 3 to 5 degrees Celsius.

Why are Cities Hotter than Rural Areas?

- It has been observed that greener localities experienced lower temperatures than non-green localities.
- Green vegetation like plants, trees and forests are prominent factors to regulate the incidences of the urban heat islands.
- Rural areas are blessed with more green cover in the form of plantations, farmlands, forests, and trees than urban areas.
- Transpiration is the phenomena which the plants carry to regulate the temperature.
- In urban areas is the basic cause of Urban Heat Island in urban areas.
 - Frequent construction of Highrise structures, roads, parking spaces, pavements, and public transportation transit lines have accelerated the incidences of urban heat islands.
- It occurs by black or any dark colored material.
 - Buildings in cities are often made of glass, bricks, cement, and concrete. All of them are dark-colored materials, which attract and absorb more heat

What are the Causes of Urban Heat Island?

- **Manifold increase in construction activities:** For building simple urban dwellings to complex infrastructures, carbon absorbing material like asphalt and concrete is needed for the expansion of cities. They trap huge amounts of heat which increases the mean surface temperatures of urban areas.
- **Dark surfaces:** Many buildings found in urban areas have dark surfaces, thereby decreasing albedo and increased absorption of heat.
- **Air conditioning:** Buildings with dark surfaces heat up more rapidly and require more cooling from air conditioning, which requires more energy from power plants, which causes more pollution. Also, air conditioners exchange heat with atmospheric air, causing further local heating. Thus, there is a cascade effect that contributes to the expansion of urban heat islands.
- **Urban Architecture:** Tall buildings, and often accompanying narrow streets, hinder the circulation of air, reduce the wind speed, and thus reduce any natural cooling effects. This is called the Urban Canyon Effect.
- **Need for mass transportation system:** Transportation systems and the unimpeded use of fossil fuels also add warmth to urban areas.
- **Lack of Trees and green areas:** which impedes evapotranspiration, shade and removal of carbon dioxide, all the processes that help to cool the surrounding air.

How can Urban Heat Islands be Reduced?

- **Increase Area Under Green Cover:** Plantation and effort to increase the area under green cover are the primary requirement to cut heat load within urban areas.
- **Passive Cooling to Reduce Urban Heat Islands:** Passive cooling technology, a widely-used strategy to create naturally ventilated buildings, can be a vital alternative to address the urban heat island for residential and commercial buildings.
 - **The IPCC report** cites ancient Indian building designs that have used this technology, which could be adapted to modern facilities in the context of global warming.
- **Other methods** of heat mitigation include using appropriate construction materials.
 - Roof and terraces should be painted in white or light colors to reflect heat and reduce the absorption.
 - Terrace plantation and kitchen gardening should be promoted.

What has NASA said about India's Urban Heat Islands?

- **NASA** has observed that higher incidences of heat islands in urban parts of Delhi is occurring.
 - Temperatures were significantly higher in the urban part of Delhi than in surrounding farm areas.
- The image was acquired by **NASA's Ecosystem Spaceborne Thermal Radiometer Experiment (Ecostress)**, which revealed a massive red spot over Delhi and smaller red patches around neighboring cities Sonapat, Panipat, Jind, and Bhiwani.
 - Ecostress is a radiometer-equipped device that was sent to the [International Space Station](#) in 2018 by NASA.
 - Ecostress is primarily responsible for assessing the temperature of plants, as well as knowing their water requirements and the influence of the climate on them.
- These red patches in the data of Ecostress indicated greater temperatures i.e, incidents of urban heat islands, whereas the rural areas surrounding cities had lower temperatures.

Source: IE