Mains Practice Question

Q. What is urban heat island effect and what are its causes and consequences? Suggest some measures to mitigate the urban heat island effect in Indian cities. (150 words)

05 Jun, 2023 GS Paper 1 Geography

Approach:

- **Introduction:** Briefly define Urban Heat Island and make a figure on it to make your introduction more elaborative.
- **Body:** Mention causes and consequences of Urban Heat Islands and discuss mitigation measures supported by some data or report.
- **Conclusion:** Summarize the key points and emphasize the importance of adopting measures to mitigate the urban heat island effect for sustainable urban development.

Introduction:

- Urban heat island effect is a phenomenon where cities have higher air temperatures than the surrounding countryside. This effect can be noticeable, especially at night. This is due to a number of factors, including the use of dark, heat-absorbing materials in construction, the lack of vegetation, and the heat generated by human activity.

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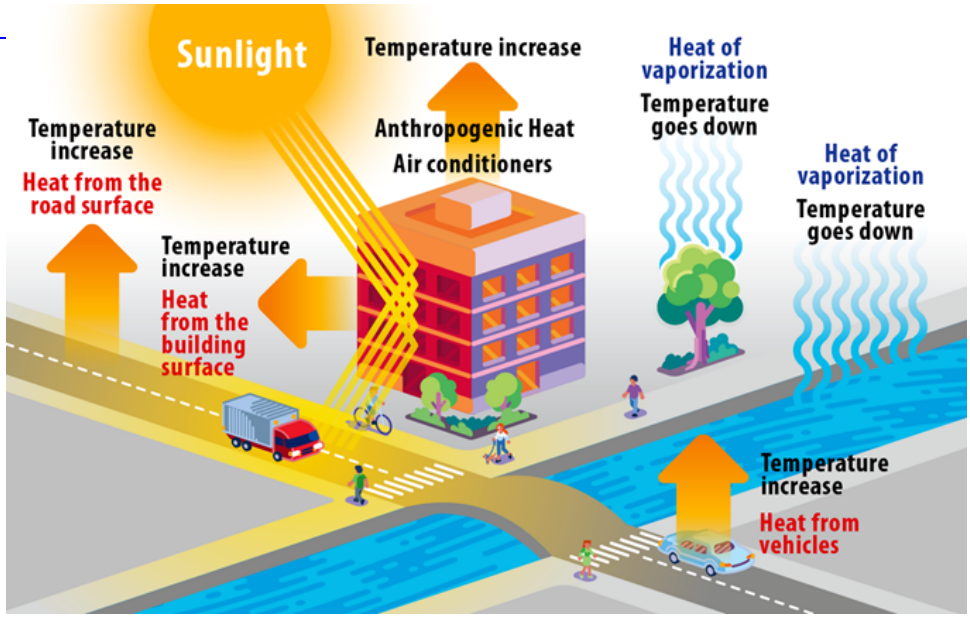

Body:

Causes:

- **Low albedo materials:** Albedo is the ratio of the reflected solar energy to the incident solar

energy. Low albedo materials absorb more solar energy and store more heat, which increases the urban temperature.
- **Paved and impermeable surfaces:** Paved surfaces, such as roads and parking lots, can also absorb solar radiation as heat, and they are typically impermeable. They don't allow water to be absorbed by plants or water bodies, which can help cool the area.
- **Lack of vegetation:** Vegetation helps to cool the air by absorbing carbon dioxide and releasing oxygen. Areas typically having less vegetation are more vulnerable to the heat island effect.
- **Human activities:** Human activities, such as power generation, transportation, industry, and air conditioning, can also generate heat and greenhouse gas emissions that contribute to the urban heat island effect.

Consequences: The urban heat island effect can have several negative consequences, including:

- Increased energy consumption and costs for cooling buildings and vehicles.
- Increased air pollution and greenhouse gas emissions from fossil fuel combustion.
- Increased health risks such as heat stroke, heat exhaustion, and cardiovascular diseases.
- Reduced water quality due to increased runoff and evaporation.
- Reduced biodiversity and ecosystem services due to habitat loss and fragmentation.

Mitigation Measures:

- **Improving urban design and planning:** Urban design and planning can also help reduce the urban heat island effect by enhancing natural ventilation, reducing surface area exposed to sunlight, increasing albedo, and incorporating water features. For example, using porous materials for pavements, creating open spaces and corridors for air circulation, orienting buildings to maximize shade and breeze, and creating artificial lakes or ponds.
- **Increasing vegetation:** Vegetation can lower air temperatures by providing shade and cooling through evapotranspiration. Cities can expand parkland, plant street trees, and install green roofs and walls that harbour plant life. One study found that the presence of vegetation can lower nearby air temperatures by as much as around 4°F.
- **Using cool roofs and pavements:** Cool roofs and pavements feature bright coatings or materials that reflect more sunlight and absorb less heat. They can reduce the surface temperature of roofs and pavements by up to 50°F and lower the ambient air temperature by several degrees.
- **Reducing Greenhouse gas emissions:** Promote sustainable transportation and improve energy efficiency in homes and businesses to reduce greenhouse gas emissions.

Conclusion:

- The urban heat island effect is a serious problem that can have a number of negative consequences. However, there are a number of measures that can be taken to mitigate the urban heat island effect. By taking these measures, we can help to make our cities more livable and sustainable.

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