Urban Heat Island is a concept where the urban area experiences warmer conditions than its surrounding regions. This is noticeable during the summer and winters.

What is the Urban Heat Island Effect?

An Urban Heat Island (UHI) is that part of an urban or a metropolitan area that is marked by remarkably high temperature as compared to its rural counterpart due to excessive human activity. The difference in temperature is noticed usually during the night and when winds are weak. The UHI is noticed when both the summer and winter seasons are at their peak. The term heat island is also used. Generally such terms are used to denote any area that has high temperatures compared to the surrounding area, but it usually refers to those areas which have a high-level of human activity.

What are the causes of the Urban Heat Island Effect?

There are many factors that are the cause of a UHI effect. For example, dark surfaces absorb far more solar heat and radiation, which is why roads, pavements and roofs of buildings in urban areas witness a spike in high temperatures as compared to their counterparts in suburban and rural areas. The reason being that the materials commonly used in urban areas for pavement and roofs, such as concrete and asphalt, have significantly different thermal bulk properties such as, heat capacity and thermal conductivity, than the surrounding rural areas. This often leads to urban areas experiencing higher temperatures than surrounding rural areas.

Geometric effects are also a cause for UHI. The tall buildings within many urban areas provide multiple surfaces for the reflection and absorption of sunlight, increasing the efficiency with which urban areas are heated. This is called the "urban canyon effect". Another effect of buildings is the blocking of wind, which also inhibits cooling by convection and prevents pollutants from dissipating. Waste heat from automobiles, air conditioning, industry, and other sources also contributes to the UHI.

Other factors include reduction in vegetation, water bodies and crop fields as a result of unplanned expansion and urbanization. The changing land pattern has resulted in high-rise concrete and also asphalts across the urban areas. These structures are opaque to the incoming radiations as they have low albedo. The automobiles, industries and air conditioners play a major role in the increasing heat in the urban areas. Nevertheless, aerosols add up to it.

Most of the cities across the world experience these following consequences including our National Capital region

What is the impact of the Urban Heat Island effect?

The UHI has the following impact on a variety of forces and factors at play:

Impact on animals:

In regions with temperate climates, urban heat islands will be prolonging the growing season, thus throwing the breeding strategies of the inhabiting species in disarray. This can be seen the best in the effects that urban heat islands have on water temperature. With the temperature of the nearby buildings sometimes reaching over 50 degrees and above precipitation will warm rapidly, causing runoff into nearby streams, lakes and rivers (or other bodies of water) to provide excessive thermal pollution. The increase in thermal pollution has the ability to increase water temperature by 20 to 30 degrees. This increase will cause the fish species inhabiting the body of water to undergo thermal stress and shock due to the rapid change in temperature to their climate.

Urban heat islands caused by cities have altered the natural selection process. Selective pressures like temporal variation in food and water are relaxed causing a new set of selective forces to roll out.

Impact on weather and climate:

Aside from the effect on temperature, UHIs can produce secondary effects on local meteorology, including the altering of local wind patterns, the development of clouds and fog, the humidity, and the rates of precipitation. The extra heat provided by the UHI leads to greater upward motion, which can induce additional shower and thunderstorm activity. In addition, the UHI creates during the day a local low pressure area where relatively moist air from its rural surroundings converges, possibly leading to more favorable conditions for cloud formation. Rainfall rates downwind of cities have increased between 48% and 116%. Partly as a result of this warming, monthly rainfall is about 28% greater between 20 miles (32 km) to 40 miles (64 km) downwind of cities, compared with upwind. Some cities show a total precipitation increase of 51%.

Conclusion:

Therefore, considering the above-mentioned impact, it turns to be the need of the hour to counter them with apt strategies. Policy makers should focus on reducing the unplanned expansion by taking steps to increase the opportunities in rural areas and plan up the further expansion. Further planning should include passive cooling measures and also proper ventilation set up. To conclude, on a brief note, the increasing global warming needs anthropogenic intervention to make the earth habitable but these interventions should be foolproof.

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