Abstract

An Urban Heat Island (UHI) is a metropolitan area with higher air and surface temperatures than surrounding areas. The UHIE is a relative measure of the heat in an urban area compared to surrounding areas. A Nature Communications article defined UHIE to be the trend that “built environments are commonly hotter than their neighboring rural counterparts.” The United States Environmental Protection Agency (EPA) estimates that “the percentage of urban dwellers worldwide is expected to reach 70%, so the problem of urban heat islands will continue to grow.” For this reason, in the scope of this research project, it is important to grasp a basic understanding of the trend as a whole and explain the scientific reasoning behind why the trend is continuing to occur and how it will increase with the growth of Urban Sprawl.

Surface heat islands occur when vegetation is replaced by materials such as asphalt and concrete, which absorb and emit heat more than natural surfaces do, causing surface temperatures to increase. Deforestation to urbanize also takes away vegetation’s natural cooling effects through shade and evapotranspiration. There is a direct correlation between land use-land cover and surface and air temperatures (Connors et al, 2013), evidenced by past research. Further investigation into the specific “effects of the spatial patterns”(2013) of land covers is necessary. Atmospheric heat islands are characterized by higher air temperature and more air pollution in urban areas.

The UHIE is caused by: the size and shape of cities, urban materials, urban haze, and anthropogenic heat. It has major negative implications in three areas: human health, energy consumption, and water quality. Higher temperatures and higher air-pollution levels lead to heat related deaths and illnesses, respiratory difficulties, heat exhaustion, and strokes. Urban areas also require more electricity, often supplied by fossil fuel, which, when burned, releases air pollutants and greenhouse gasses. Hot pavements and rooftop surfaces heat up stormwater runoff, which drains into streams and other water bodies. This harms native species that are used to living in cool aquatic environments, and contaminates freshwater.

Scientists measure and analyze the UHIE by studying its causes and effects. Data is obtained through in situ collection, satellite observation, aircraft-borne instruments, and ground-based thermal sensing. A popular remedial effort is to plant vegetation. Many organizations in large cities such as New York and Phoenix are forming to turn unused real estate plots with scrap yards as community gardens and places where trees are able to grow.