URBAN HEAT ISLAND ANALYSIS

TACOMA, WASHINGTON | 2020

EARTH ECONOMICS

THE DANGER OF EXTREME HEAT

Extreme heat – exacerbated by the "urban heat island" effect and climate change is the deadliest climate related disaster in the US. Urban heat islands occur in areas with a high percentage of impervious surface area and little green space where temperatures can significantly exceed the regional average. These heat islands are found in dense urban areas with a limited greenspace and large amounts of asphalt, concrete, and other impervious surfaces.

Global temperatures have risen approximately 1°C over the past century.

Urban areas have risen an additional 1-3°C due to the urban heat island effect.

WITH A NATURE-BASED SOLUTION

Urban heat islands are a critical public health issue – with a nature based solution. Urban trees and greenspace can effectively mitigate urban heat islands, while providing numerous benefits such as air quality improvement and stormwater capture.[3]

Urban vegetation offers shade and evapotranspiration, which can lower peak summer temperatures 2-9°F.[3,4]

Urban trees provide heat reduction, which supports public health by reducing heat stress and contributes to reduced household energy costs.

ANALYSIS FOR TACOMA, WASHINGTON

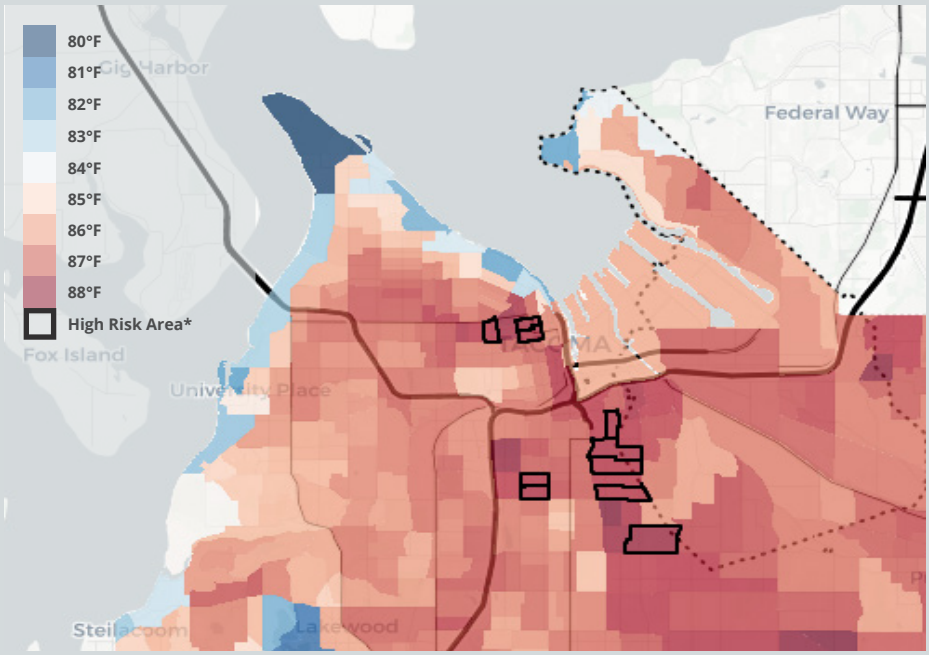
In Tacoma, our analysis found that urban heat islands increase maximum temperatures by as much as 6.2 degrees F above the local baseline. Combined with regional climatic effects, neighborhoods in Central and South Tacoma may be as much as 14 degrees F hotter than neighborhoods in North Tacoma. 11,980 people live in neighborhoods where maximum temperature exceed the 90th percentile and where average per capita incomes are less than 200% the federal poverty level (outlined in black in map). Every additional degree carry significant public health costs.

In the Tacoma's most severe urban heat islands, all-cause mortality rates are estimated to increase by as much as 8.4% when regional temperatures exceed 82 degrees F. Tacoma experiences about 30 days above 82 degrees per year, on average. Our model estimates that 3– 15 lives are lost in the city each year due to extreme heat exacerbated by urban heat islands.

The public health burden of urban heat islands is disproportionately levied on the lowest income households. In Tacoma there is a strong correlation between household income and urban heat islands.

Without intervention, Tacoma's heat island impacts will grow significantly in a changing climate. Number of days above the 82 degree F threshold has increased by more than 50% since 1980. On the current trajectory the Seattle-Tacoma area will experience 42 days above the temperature threshold by 2050, and 59 days above the threshold by 2100.

Tacoma Temperatures



THERE IS A STRONG CORRELATION BETWEEN SUMMER HEAT AND NEGATIVE HEALTH OUTCOMES.

TEMPERATURES ABOVE 82°F SIGNIFICANTLY INCREASE THE RISK OF CARDIOVASCULAR DISEASES, RESPIRATORY ILLNESSES, AND HEAT STROKE.[1]

WHAT ARE **URBAN HEAT ISLANDS?**

Dense urban areas absorb and trap heat due to impervious surfaces — like pavement and rooftops — that absorb solar radiation, buildings that block wind flow, pollution and smog that trap solar radiation, and low levels of vegetation and tree cover that restrict evapotransporation — which functions as natural air conditioning.

Urban heat islands have significant impacts on human health and will have an even greater impact over the next century as the climate warms and populations urbanize.

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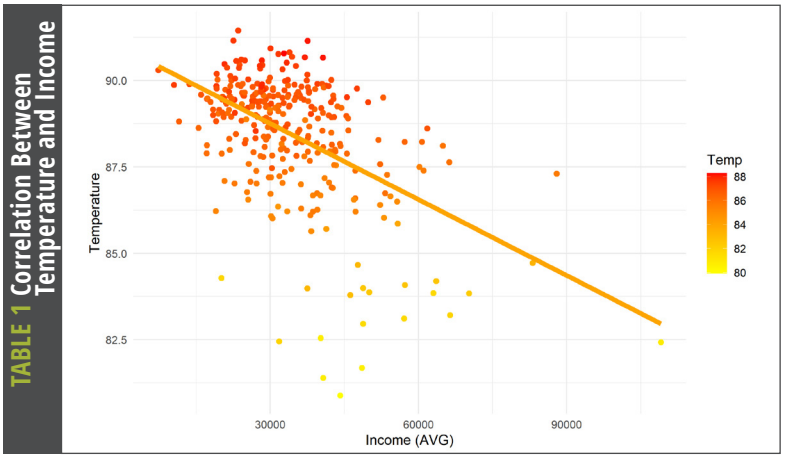
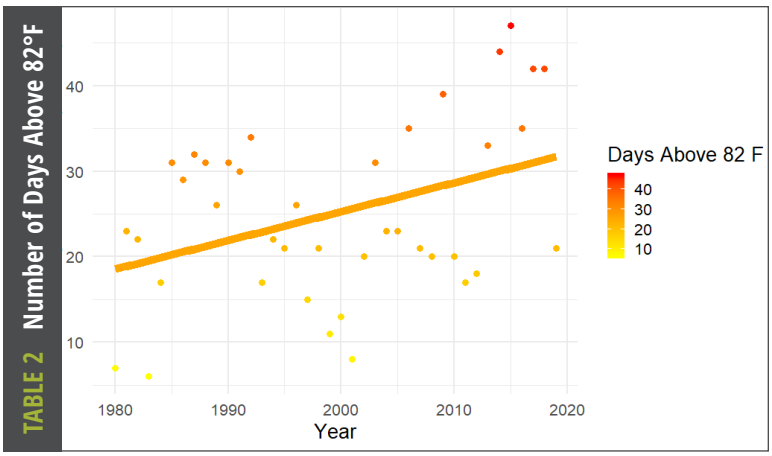
THE COST OF PUBLIC HEALTH

CAUSES THE GREATEST ECONOMIC BURDEN ON LOW-INCOME COMMUNITIES.



TEMPERATURES IN THE SEATTLE/TACOMA AREA

HAVE INCREASED BY MORE THAN 50% IN THE LAST 20 YEARS.



REFERENCES

[1] Anderson, B. G., & Bell, M. L. (2009). Weather-related mortality: how heat, cold, and heat waves affect mortality in the United States. Epidemiology (Cambridge, Mass.), 20(2), 205.

[2] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5071163/

[3] https://trid.trb.org/view/1488373