

## **Methodology**

### **Estimating urban heat island (UHI) index at the census tract level**

1. Identify 50 largest cities in the U.S., by population.
  - Eight large cities—Long Beach (CA), Oakland (CA), Arlington (TX), Columbus (OH), El Paso (TX), Ft. Worth (TX), Mesa (AZ), and Virginia Beach (VA)—were not included in this analysis. These eight cities are either not in Climate Central’s standard list of media markets, included as part of another market, or not in the city shapefile.
2. Overlay the city boundaries on the census tract map and “crop” to include the tracts in a city. The boundaries of the city shapefiles extend beyond the official boundaries of the city.
3. Overlay each census tract boundary over the Land Cover Zone (LCZ) map and “crop” to identify the LCZ types in a tract.
  - The LCZ map was created by [Demuzere et al. \(2020\)](#). The map is a “100 m-resolution global map of local climate zones (LCZs)...composed of [10 built and 7 natural land cover types](#).”
  - Count the number of each LCZ in each tract and calculate the percentage of each LCZ in each tract.
4. Based on the parameters established by Demuzere et al. (2020), apply the percentage of impervious cover, permeable surfaces, height of buildings, albedo, and population density to each census tract based on the LCZs.
5. Based on research by [Sangiorgio et al. \(2020\)](#), apply the temperature parameters that are associated with each land cover parameter (impervious cover, permeable surfaces, height of buildings, albedo, and population density). The land cover type that is defined as open water was excluded from the analysis. Although there are some individuals that have homes on the water, this analysis centers on areas of population.
6. Sum all temperature parameters in each tract to determine the estimated Urban Heat Island (UHI) Index in each census tract.

### **Calculating city-wide values**

The total population at each UHII threshold temperature (e.g. 7°F, 8°F, etc) was based on the sum of the total population in each census tract that exceeded a designated UHII threshold.

Source files

- LCZ file (<https://www.nature.com/articles/s41597-020-00605-z>)
- Census tract population data (2020 redistricting data) and shapefiles defining the boundaries of the census tracts (<https://www.census.gov/programs-surveys/decennial-census/about/rdo/summary-files.html>)
- City boundaries shapefiles (<https://catalog.data.gov/dataset/500-cities-city-boundaries>)