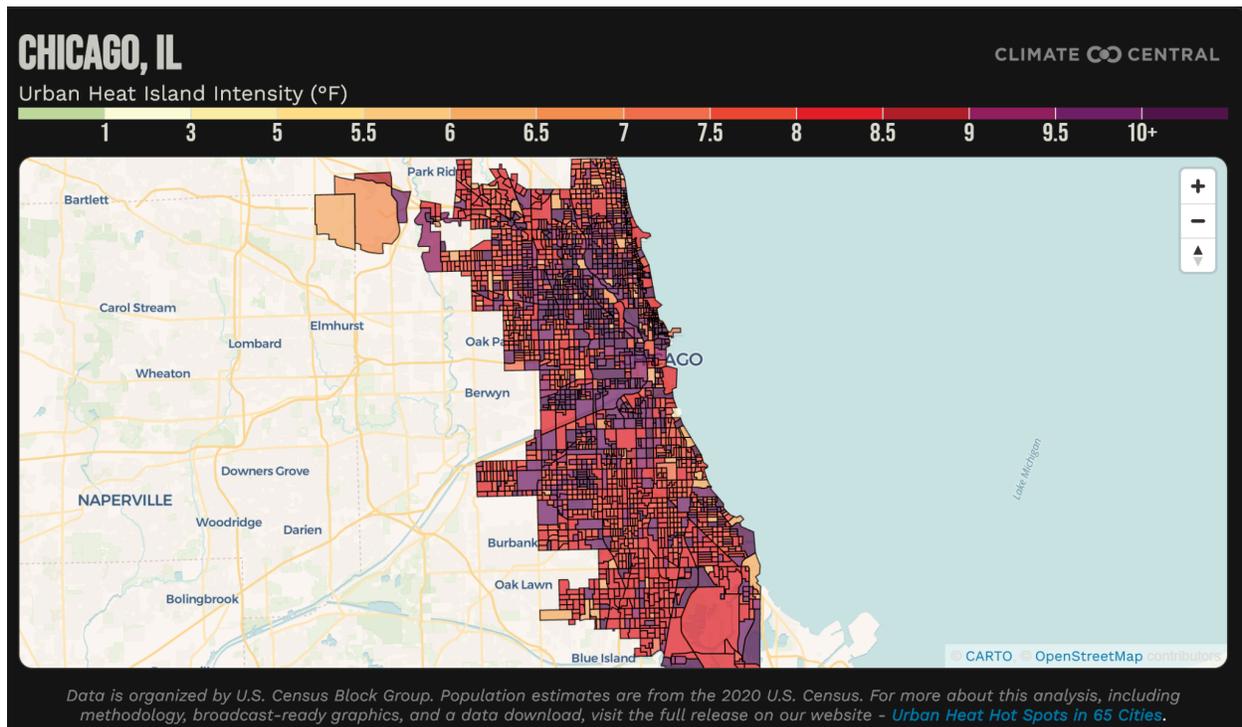


Methodology for Climate Central’s Urban Heat Island Analysis

Estimating urban heat island (UHI) index at the census block group level

1. Using the Nielsen list of largest designated TV market areas we selected the top 65 markets and used the primary city in each market.
 - Because of issues with the data files Hartford, CT, Greenville, NC and Lexington, KY were dropped from the analysis and replaced with cities further down the list. There is no TV market in NJ, so Newark was added to include the densely populated urban state.
2. Overlay the city boundaries on the census block group map and “crop” to include the block groups in a city. Census Place maps were used to represent the official boundaries of the city only, not including the adjacent metro-area.
3. Overlay each census block group boundary over the Land Cover Zone (LCZ) map and “crop” to identify the LCZ types in a block group.
 - 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](#).” The Climate Central analysis excluded 1 natural land cover type, open water.
 - Count the number of each LCZ in each block group and calculate the percentage of each LCZ in each block group.
4. Using the pre-determined LCZ characteristics (Demuzere et al. (2020)), estimate the percentage of impervious cover, permeable surfaces, height of buildings, albedo, and population density in each census block group based on component LCZs in that block. Population density was calculated using block group level population and area from Census. 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.
5. Using the previously determined LCZ characteristics, apply the temperature parameters associated with each characteristic ([Sangiorgio et al. \(2020\)](#)). For example, if the block group has an average building height between 5 - 10 m, 0.38 degrees is added to the UHI.
6. Sum all temperature parameters in each block group to determine the estimated Urban Heat Island (UHI) Index for that area.

Sample City



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 block group that exceeded a designated UHII threshold.

Source files

- LCZ file (<https://www.nature.com/articles/s41597-020-00605-z>)
- Census block group population data (2020 redistricting data) and shapefiles defining the boundaries of the census block groups (<https://www.census.gov/programs-surveys/decennial-census/about/rdo/summary-files.html>)
- Census Places shapefiles (<https://www.census.gov/cgi-bin/geo/shapefiles/index.php>)

For more information on Climate Central Reports:

<https://www.climatecentral.org/climate-matters/urban-heat-islands-2024>

<https://app.climatecentral.org/dataviz/urban-heat-hot-spots>