End-of-century Manhattan climate index to resemble Oklahoma City today

August 4 2015

The downtown Dallas, Texas (USA) skyline from a levee along the Trinity River. Facing southeast. Credit: drumguy8800/Wikipedia

Climate change caused by greenhouse gas emissions will alter the way that Americans heat and cool their homes. By the end of this century, the number of days each year that heating and air conditioning are used will decrease in the Northern states, as winters get warmer, and increase in Southern states, as summers get hotter, according to a new study from a high school student, Yana Petri, working with Carnegie's Ken Caldeira. It is published by *Scientific Reports*.

"Changes in outdoor temperatures have a substantial impact on energy

use inside," Caldeira explained. "So as the climate changes due to greenhouse gases in the atmosphere, the amount of energy we use to keep our homes comfortable will also change."

Using results from established climate models, Petri, under Caldeira's supervision, calculated the changes in the number of days over the last 30 years when U.S. temperatures were low enough to require heating or high enough to require air conditioning in order to achieve a comfort level of 65 degrees Fahrenheit. She also calculated projections for future days when heating or air conditioning would be required to maintain the same comfort level if current trends in greenhouse gas emissions continue unchecked.

Looking forward toward the end of this century, her calculations found that Washington state will have the smallest increase in air conditioning-required days and southern Texas will have the largest increase. Likewise, upper North Dakota, Minnesota, and Maine would have the largest decrease in heating-required days and southern Florida would have the smallest decrease.

Petri then took this inquiry one step further and looked at a sum of heating-required days and cooling-required days in different regions both in the past and in future projection, to get a sense of changes in the overall thermal comfort of different areas.

"No previous study has looked at climate model projections and tried to develop an index of overall thermal comfort, which is quite an achievement," Caldeira said.

Today, the city with the minimum combined number of heating- and cooling-required days, in other words the place with the most-optimal outdoor comfort level, is San Diego. But the model projected that in the same future time frame, 2080-2099, the climate would shift so that San

Francisco would take its place as the city with the most-comfortable temperatures.

Other changes predicted by the model are that the amount of heating and cooling required in New York City in the future will be similar to that used in Oklahoma City today. By this same measure, Seattle is projected to resemble present day San Jose, and Denver to become more like Raleigh, NC, is today.

Provided by Carnegie Institution for Science

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