SHIFTING CITIES: 1,001 BLISTERING FUTURE CITIES

SUMMARY

If it feels hot to you now in the dog days of this summer, imagine a time when summertime Boston starts feeling like Miami and even Montana sizzles. Thanks to climate change, that day is coming by the end of the century, making it harder to avoid simmering temperatures.

Summers in most of the U.S. are already warmer than they were in the 1970s. And climate models tell us that summers are going to keep getting hotter as greenhouse gas emissions continue. What will this warming feel like? Our new analysis of future summers illustrates just how dramatic warming is going to be by the end of this century if current emissions trends continue unabated.

For our Blistering Future Summers interactive we have projected summer high temperatures for the end of this century for 1,001 cities, and then showed which city in the U.S. – or elsewhere in the world, if we couldn't find one here – is experiencing those temperatures today. We've highlighted several striking examples on the interactive, but make sure to explore and find how much hotter summers will likely be in your city.

By the end of the century, assuming the current emissions trends, Boston's average summer high temperatures will be more than 10°F hotter than they are now, making it feel as balmy as North Miami Beach, Fla., is today. Summers in Helena, Mont., will warm by nearly 12°F, making it feel like Riverside, Calif.

In fact, by the end of this century, summers in most of the 1,001 cities we analyzed will feel like summers now in Texas and Florida (in temperatures only, not humidity). And in Texas, most cities are going to feel like the hottest cities now in the Lone Star State, or will feel more like Phoenix and Gilbert in Arizona, among the hottest summer cities in the U.S. today.

In some cases, summers will warm so dramatically that their best comparison is to cities in the Middle East. Take Las Vegas, for example. Summer highs there are projected to average a scorching 111°F, which is what summer temperatures are like today in Riyadh, Saudi Arabia. And at 114°F°, living in Phoenix will feel like summering in sweltering Kuwait City.

On average, summer heat is projected to warm 7-10°F, though some cities will have summers 12°F warmer than they are now. As you explore the interactive, you'll find that for cities in the Northwest, the Great Plains, the Midwest, and the Northeast, warming is best illustrated by a southward shift. In some cases, however, the shift is slightly northward and inland – for example, warming in coastal San Diego makes it feel like Lexington, Ky., – and represents more than a 6°F temperature increase.

This analysis only accounts for daytime summer heat – the hottest temperatures of the day, on average between June-August – and doesn't incorporate humidity or dewpoint, both of which contribute to how uncomfortable summer heat can feel. This projected warming also assumes greenhouse gas emissions keep increasing through 2080, just as they have been for the past several decades.

LOCKED IN TO SUMMER WARMING

We also analyzed how much summer warming U.S. cities will experience if greenhouse gas emissions rates slow compared to current trends. Drawing on the emissions scenarios used by the Intergovernmental Panel on Climate Change (IPCC) in their Fifth Assessment Report (which model different future emissions trajectories)[1], we projected average summer high temperatures at the end of this century for three additional emissions scenarios to the one illustrated in the interactive.

While RCP8.5 (used in the primary analysis above) assumes that greenhouse gas emissions continue, largely unabated, through the end of the century, the other scenarios are based on some amount of emissions reductions. RCP6 sees emissions continue to grow, until about 2060, after which time they decrease and then stabilize (though overall greenhouse gas concentrations in the atmosphere will continue to grow under this scenario). RCP4.5 sees emissions stabilize over the next twenty years, and then decrease. RCP2.6 assumes drastic climate policy intervention that leads to rapidly decreasing emissions beginning in 2020.

Even with these moderate-to-dramatic emissions cuts characteristic of RCP2.6, RCP4.5, and RCP6, U.S. cities are already locked into some amount of summer warming through the end of the century. Table 1 (next page) shows warming for several cities, in terms of which cities will they feel like by the end of this century.

METHODOLOGY

Summer high temperatures (average of daily maximum temperatures for June, July, and August) were calculated for 1,001 U.S. cities with 1986-2005 data from PRISM Climate Group, Oregon State University, http://prism.oregonstate.edu, accessed 1 July 2014. The projected summer high temperatures were calculated for these cities for the period 2081-2099, based on the RCP8.5 emissions scenario (and the other scenarios in a subsequent analysis), which is the high emissions scenario used in the IPCC's 5th Assessment Report. This is essentially a continuation of our current emissions trends through the end of the century. The temperature change was calculated through that period using a downscaled multi-model ensemble approach (Downscaled CMIP5 Climate Projections archive at http://gdo-dcp.ucllnl.org/downscaled_cmip_projections/) and that number was added to the current temperature (from PRISM) to get the future temperature.

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(1) Scenario Process for AR5, Intergovernmental Panel on Climate Change: http://sedac.ipcc-data.org/ddc/ar5_scenario_process/RCPs.html

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Table 1. Projected average summer high warming under four emissions scenarios

	RCP2.6		RCP4.5		RCP6		RCP8.5	
City (Current Temp (°F))	**(°F)**	**Feels Like**	**(°F)**	**Feels Like**	**(°F)**	**Feels Like**	**(°F)**	**Feels Like**
Atlanta, GA (87.6)	(90.2)	Hileah, FL	(92.2)	The Woodlands, TX	(93.8)	Cedar Park, TX	(97.2)	Pharr, TX
Austin, TX (94.3)	(96.8)	Pharr, TX	(98.6)	Mission, TX	(99.8)	Laredo, TX	(102.8)	Gilbert, AZ
Boston, MA (79.0)	(81.5)	Blacksburg, VA	(83.5)	Bayonne, NJ	(84.7)	Chantilly, VA	(88.4)	North Miami Beach, FL
Denver, CO (85.5)	(88.1)	Coral Gables, FL	(90.9)	New Orleans, LA	(92.4)	Missouri City, TX	(96.3)	Pharr, TX
Harrisburg, PA (83.3)	(86.3)	Newport News, VA	(88.7)	Delray Beach, FL	(90.4	Sunrise, FL	(94.2)	San Antonio, TX
Saint Paul, MN (81.1)	(84.4)	Harrisonburg, VA	(87.0)	Fayetteville, AR	(88.7)	North Miami, FL	(93.0)	Mesquite, TX