https://www.nytimes.com/interactive/2022/12/13/climate/climate-footprint-map-neighborhood.html

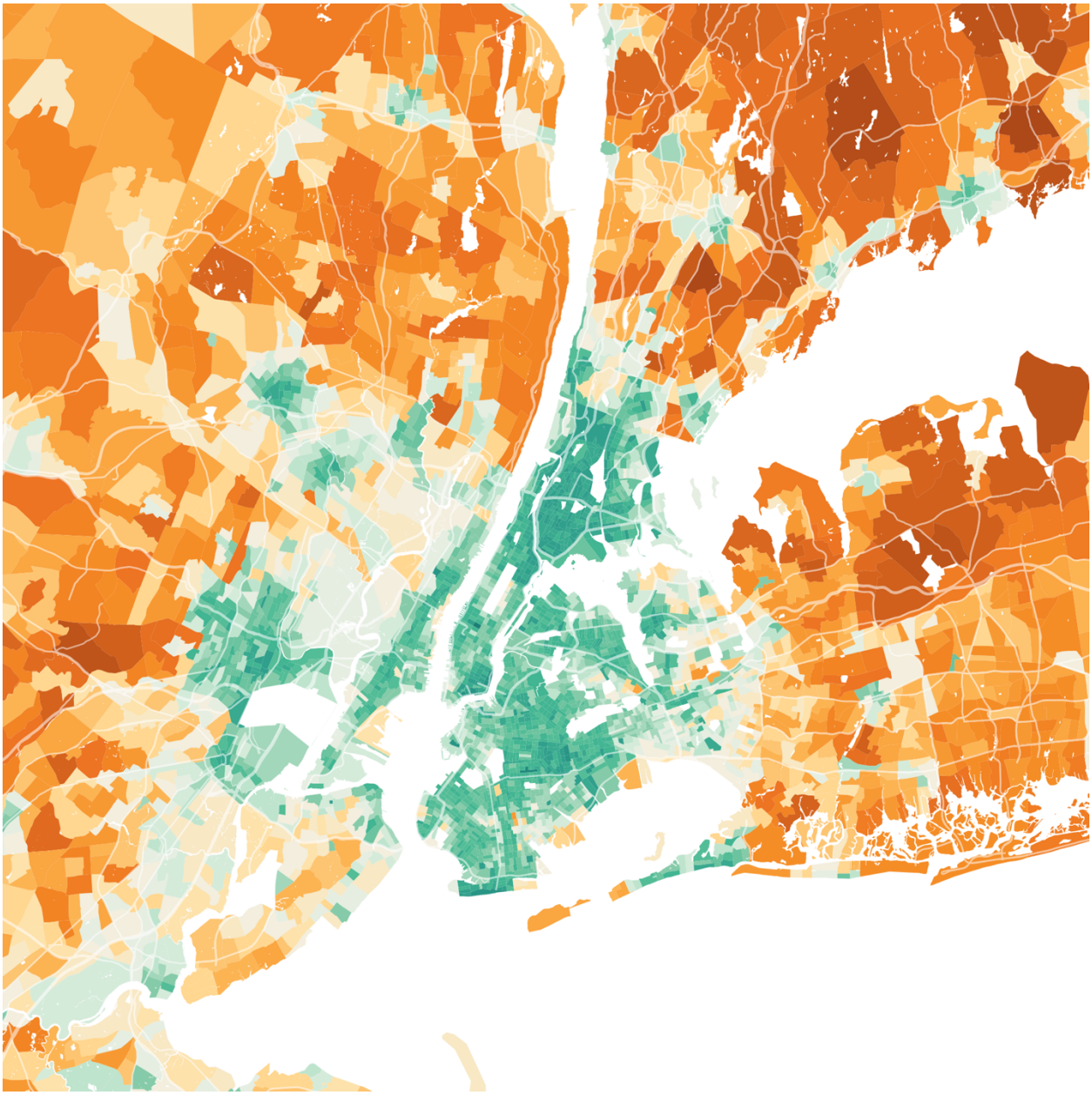
The New York Times

December 13, 2022

The Climate Impact of Your Neighborhood, Mapped

By Nadja Popovich, Mira Rojanasakul and Brad Plumer

New data shared with The New York Times reveals stark disparities in how different U.S. households contribute to climate change. Looking at America's cities, a pattern emerges.



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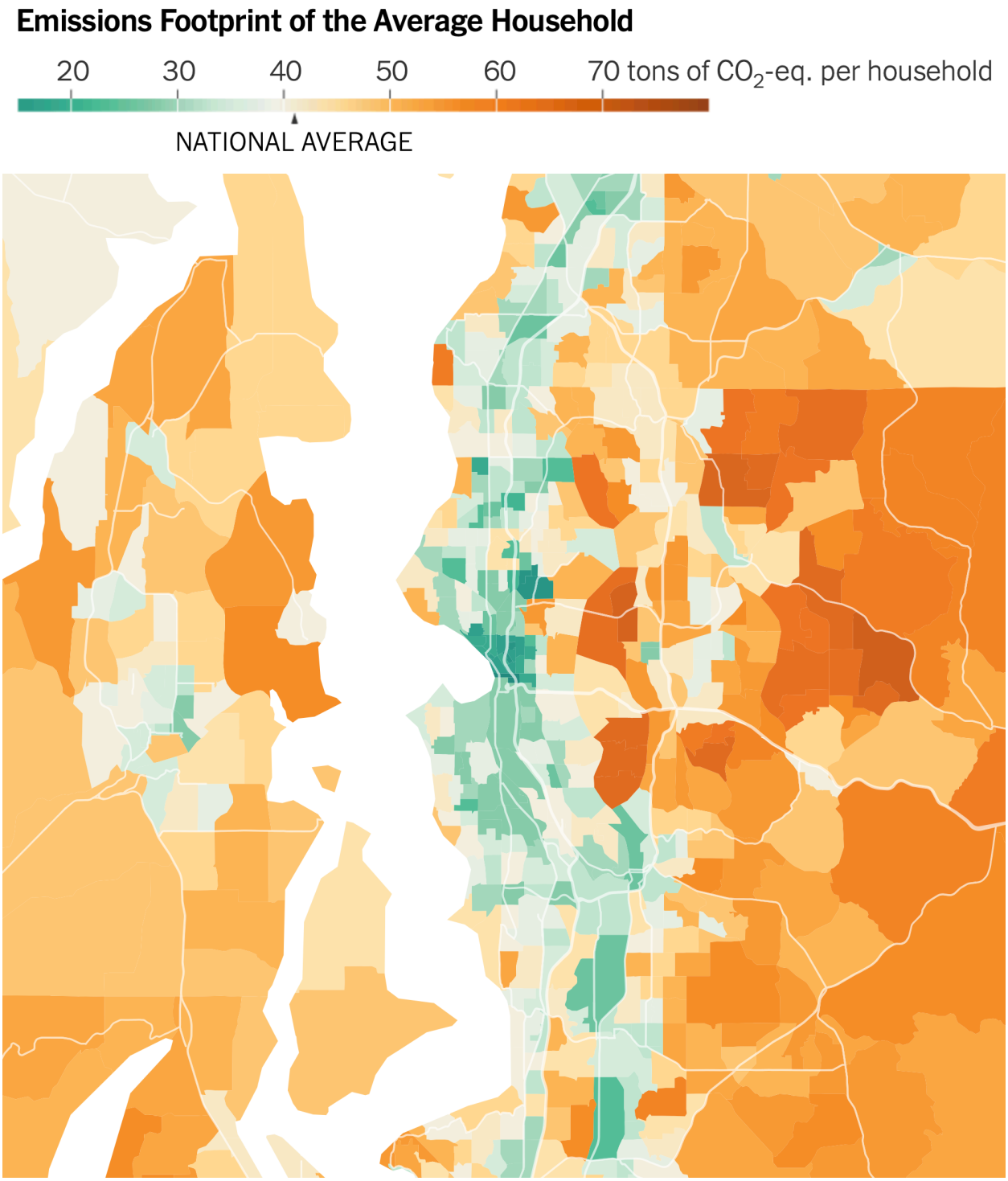
Emissions Footprint of the Average Household
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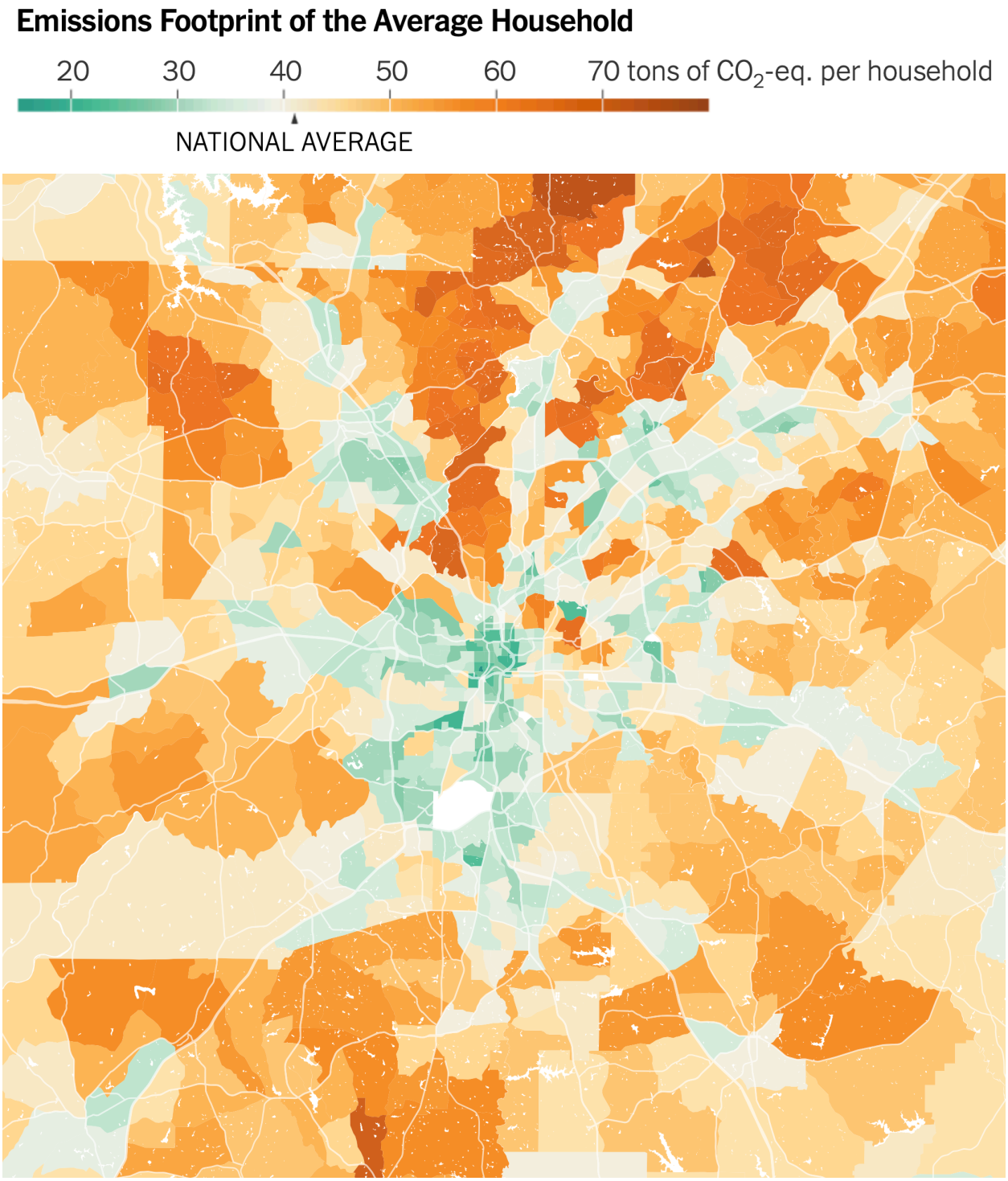
70 tons of CO_2-eq. per household
NATIONAL AVERAGE

Seattle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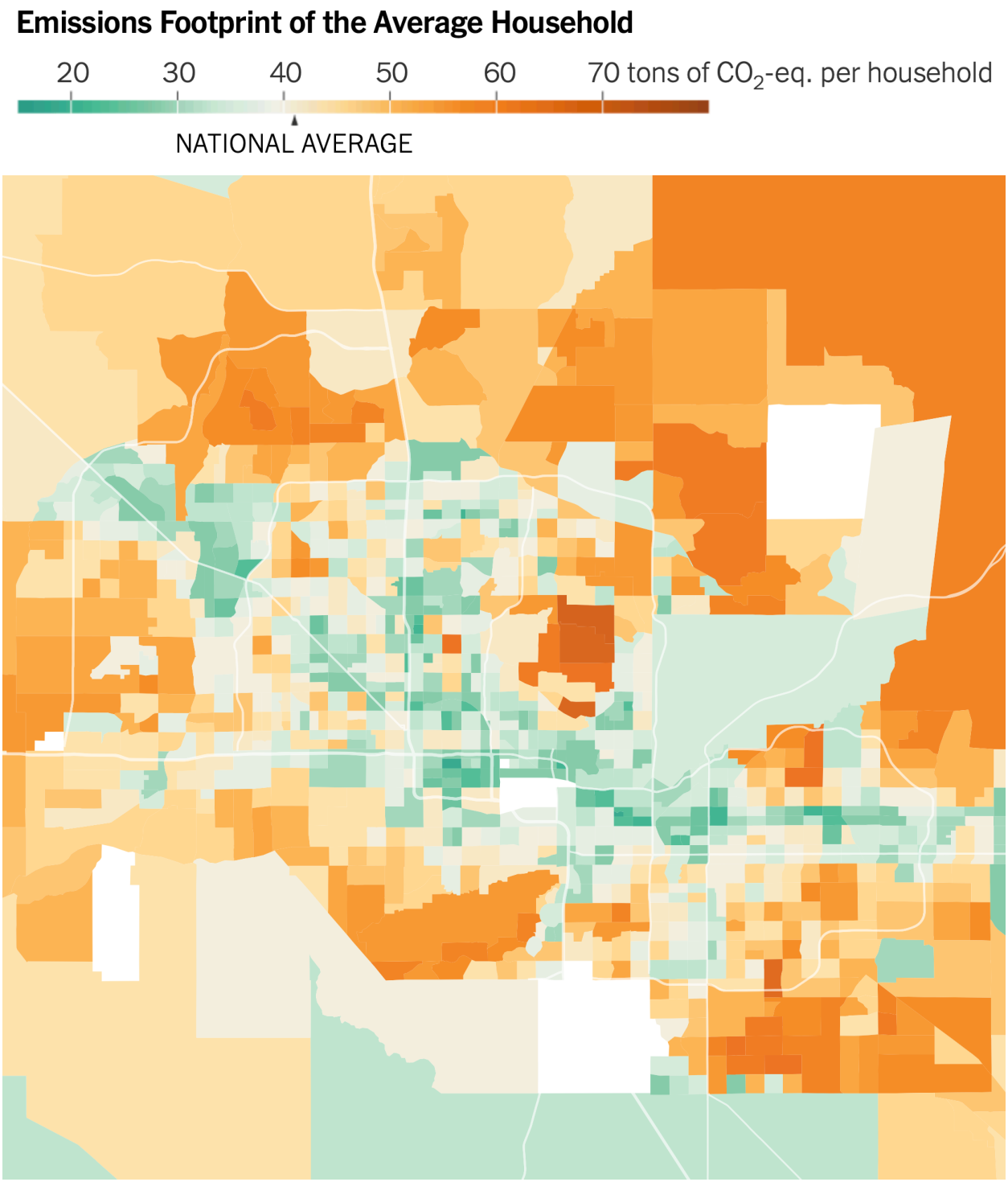
Atlanta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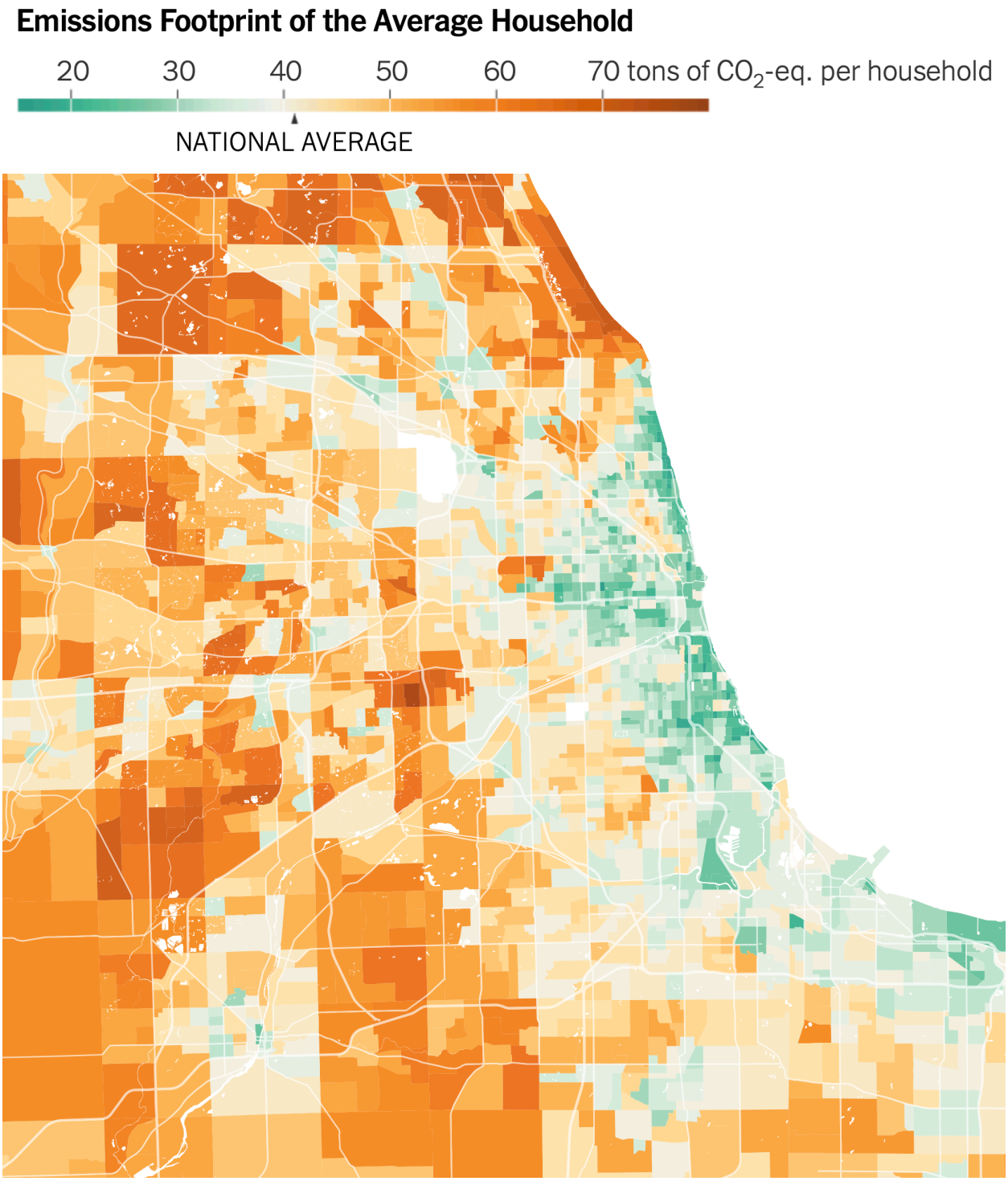
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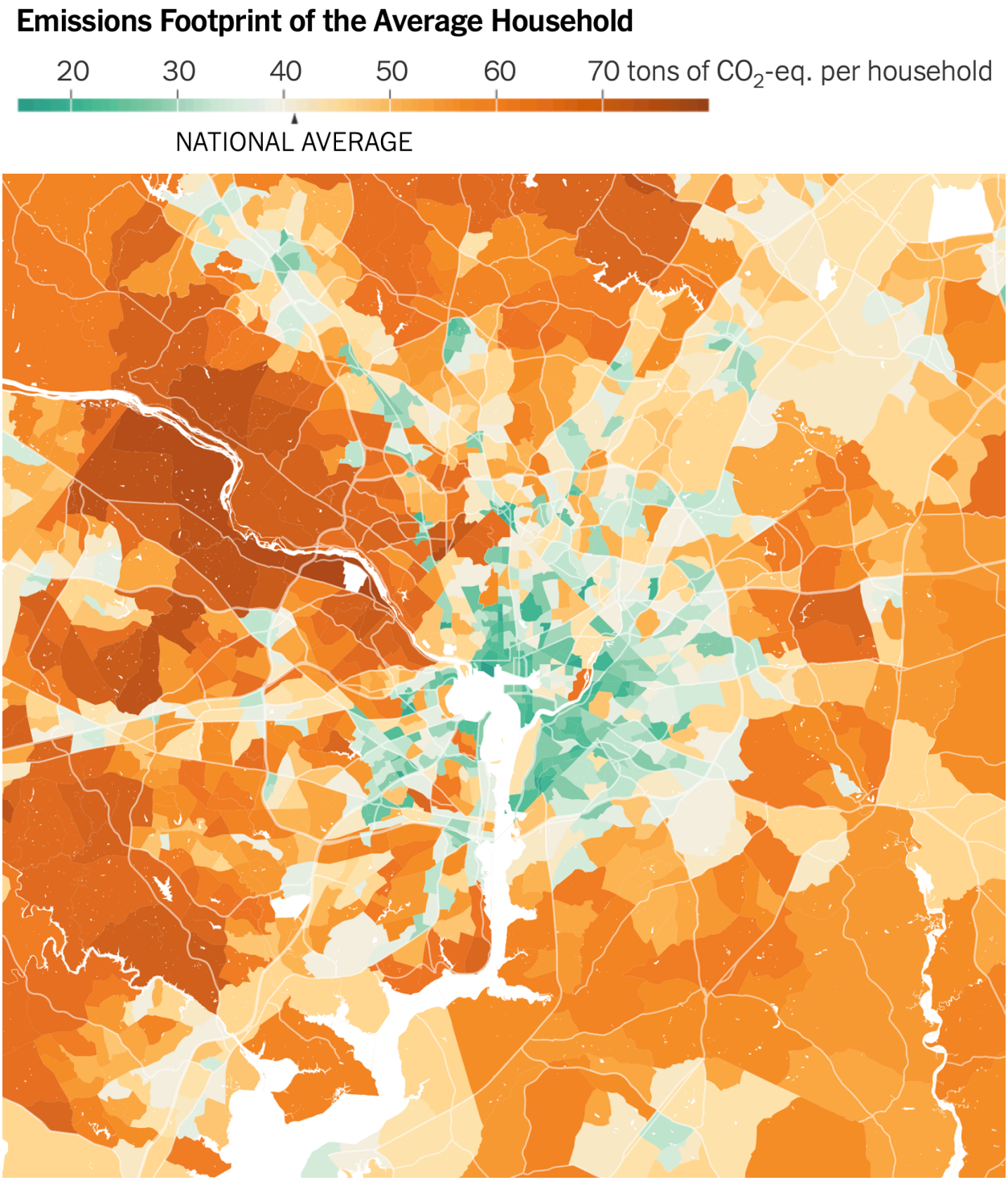
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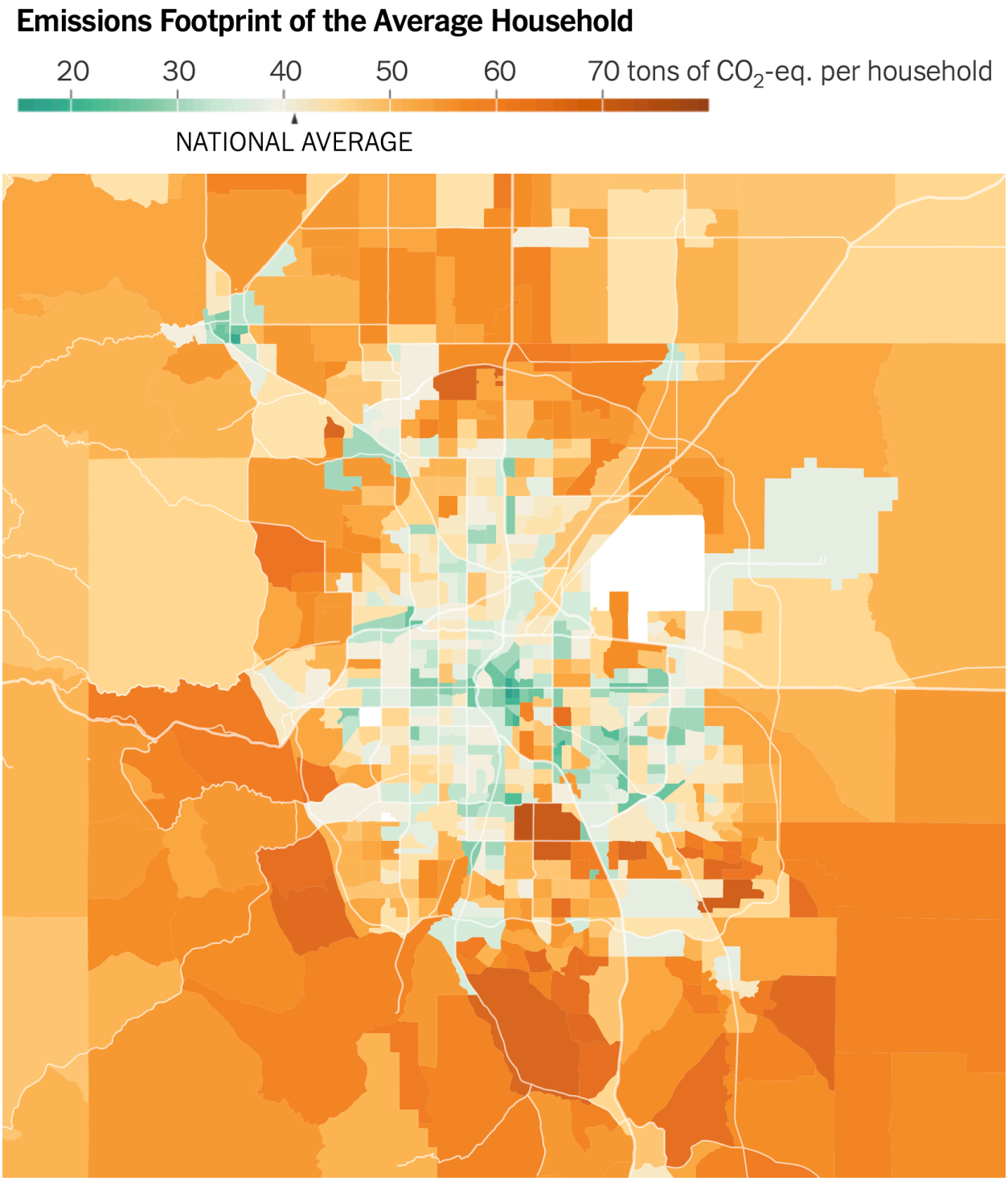
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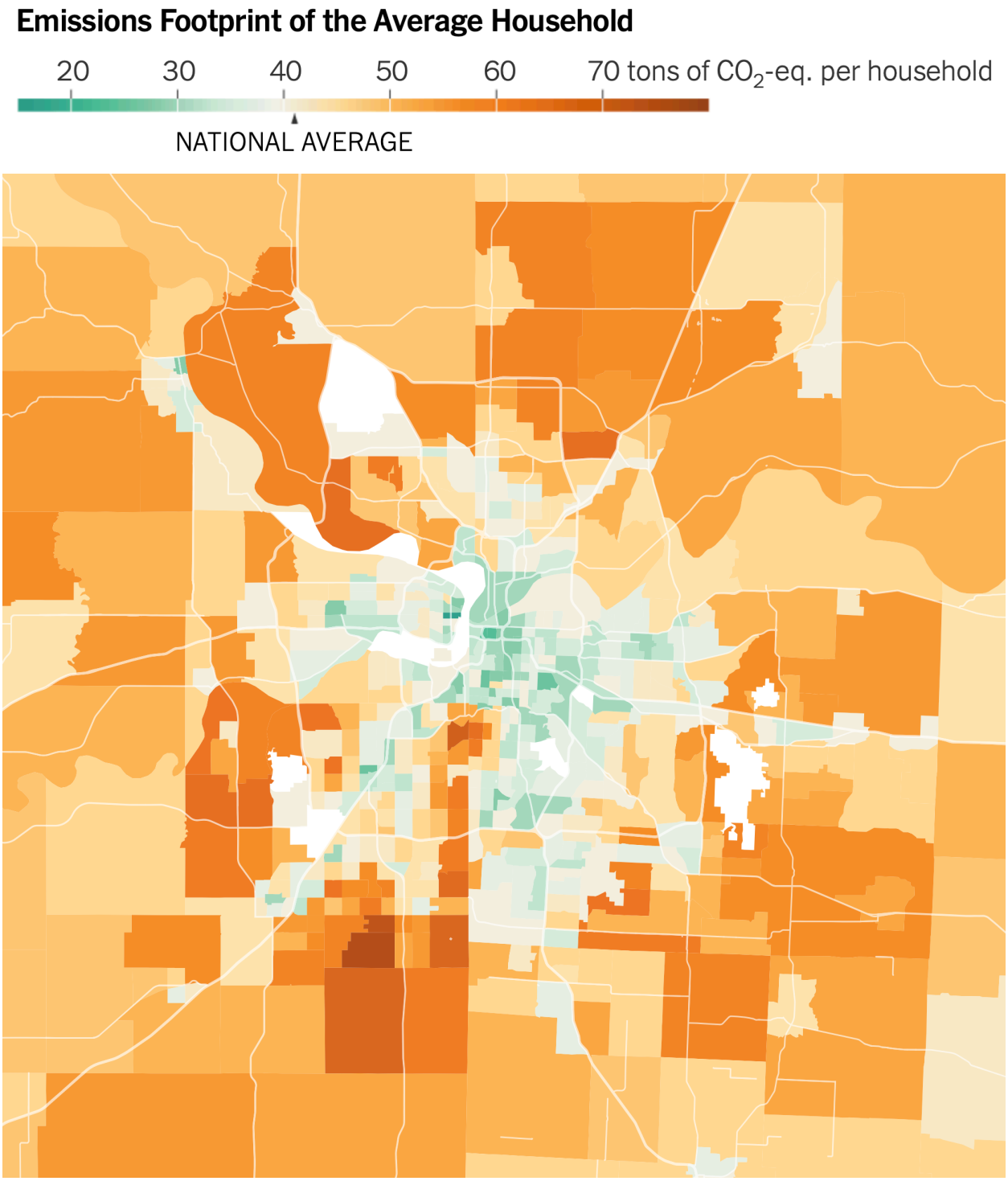
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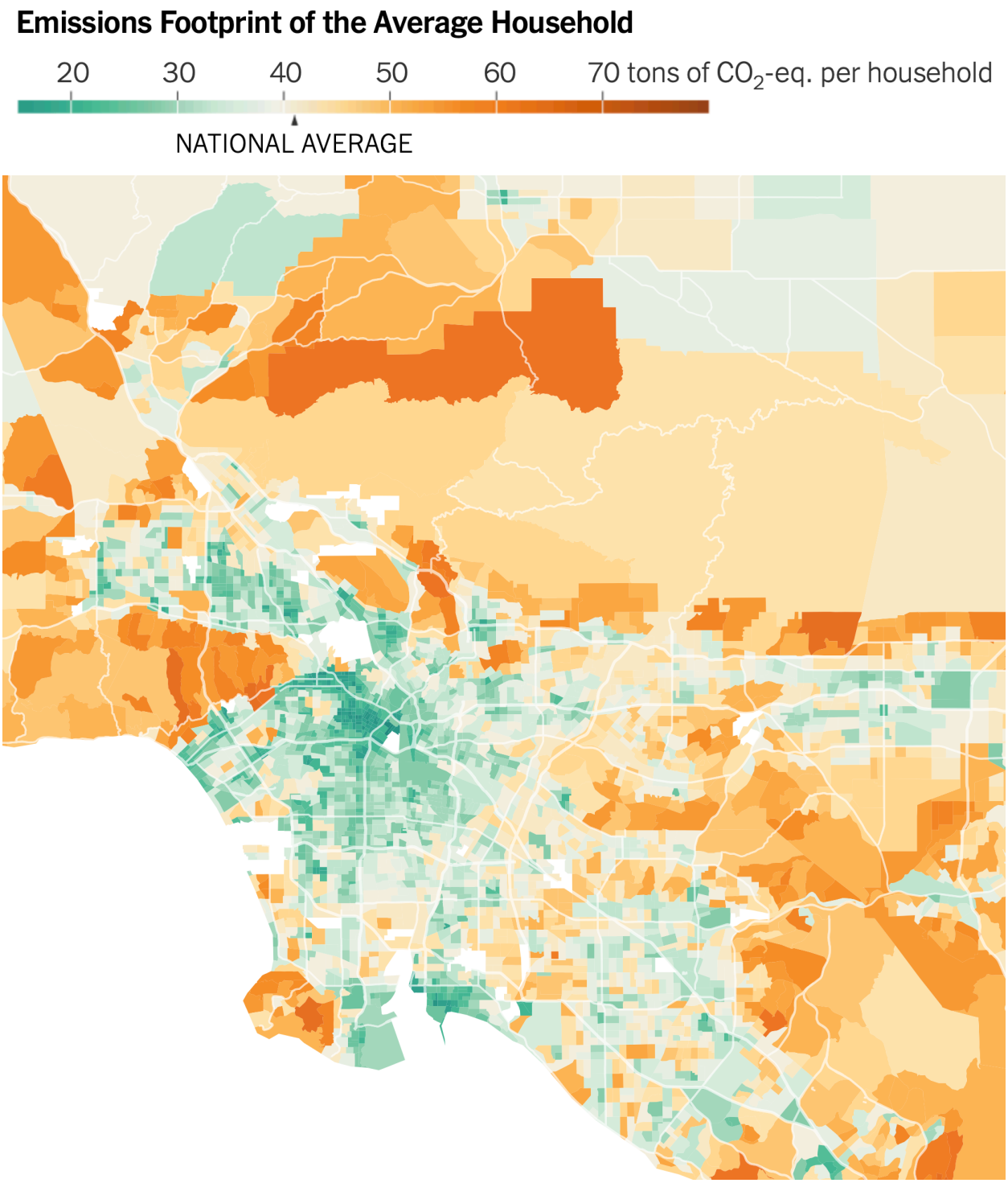
Kansas City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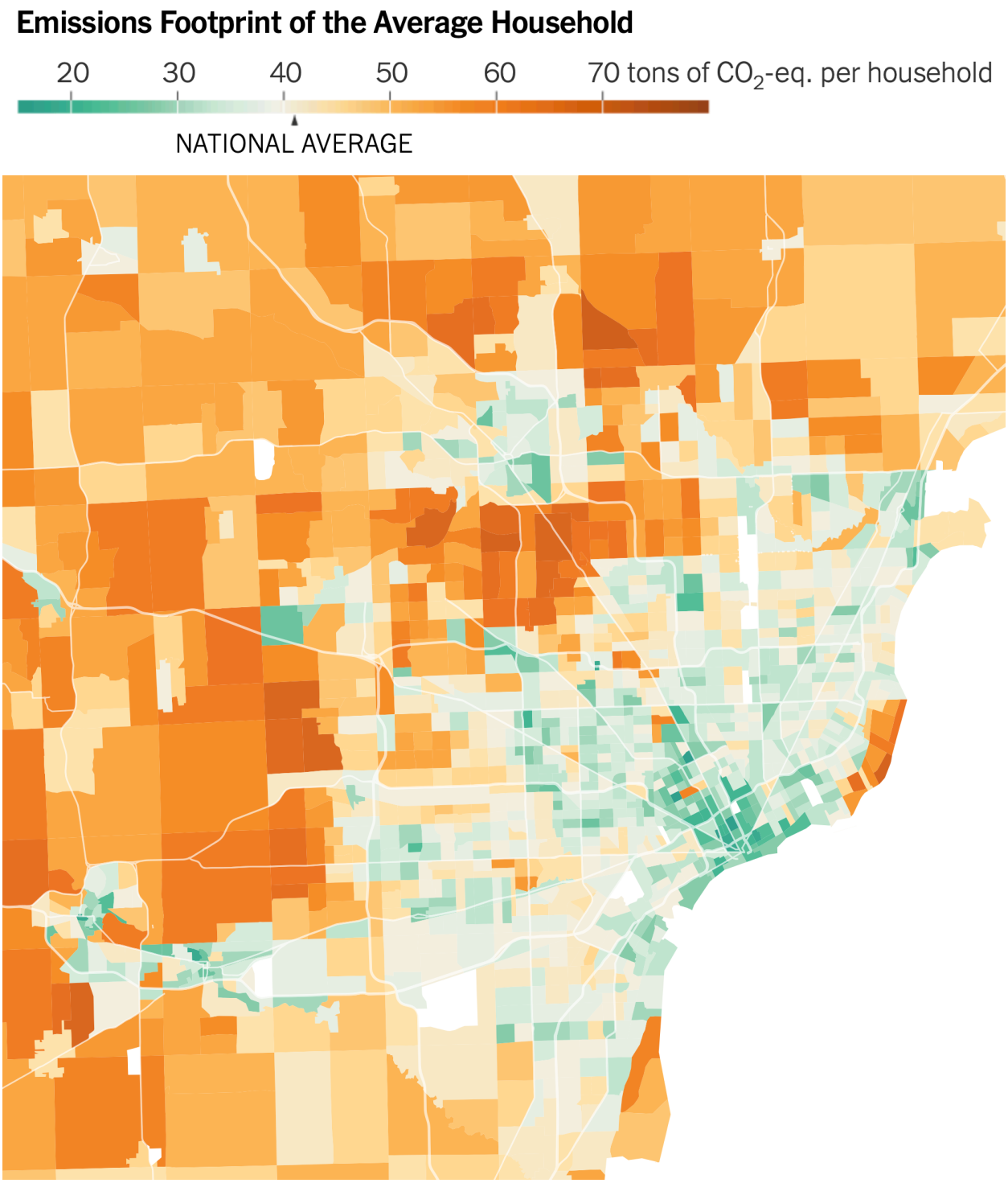
Los Angeles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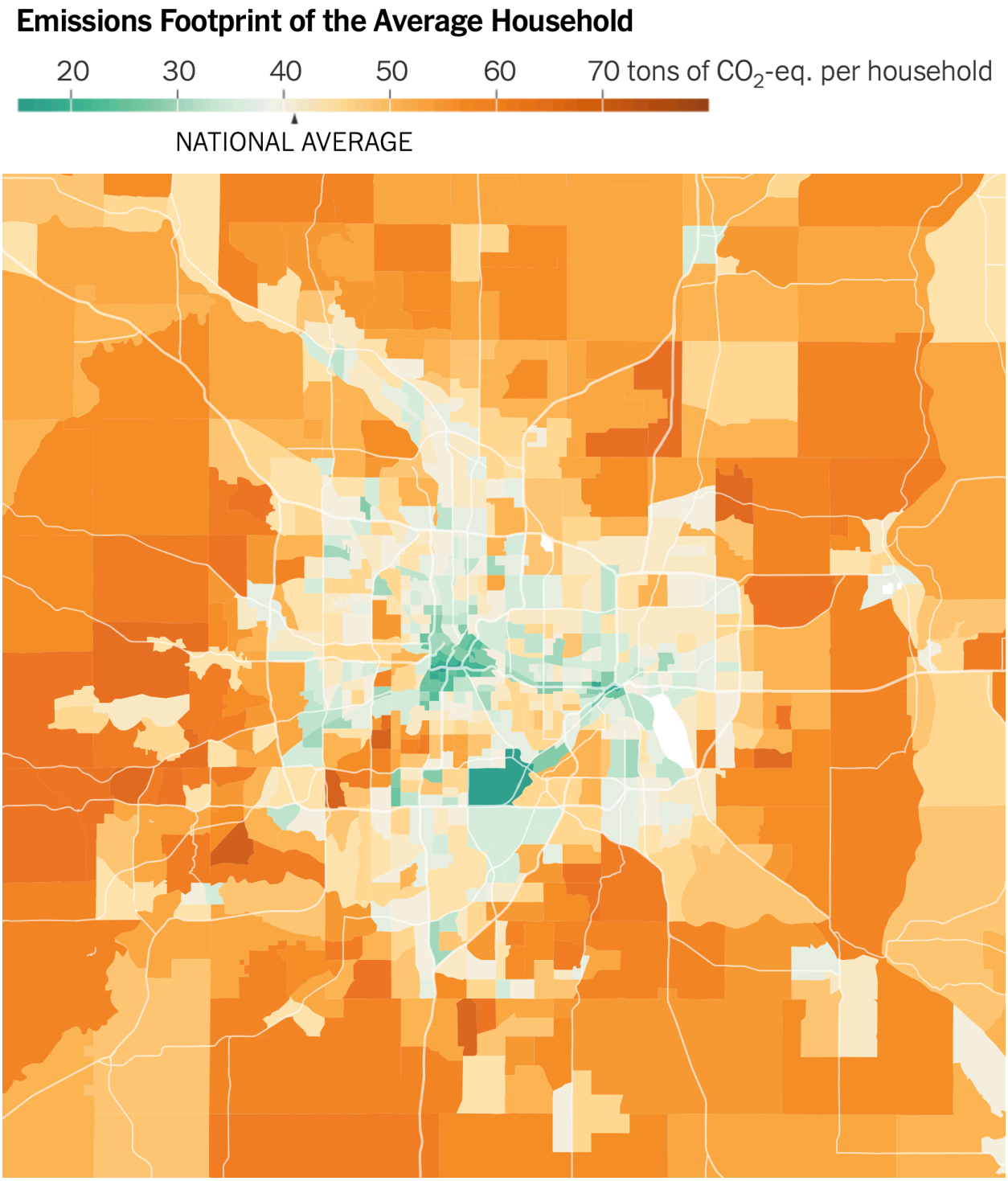
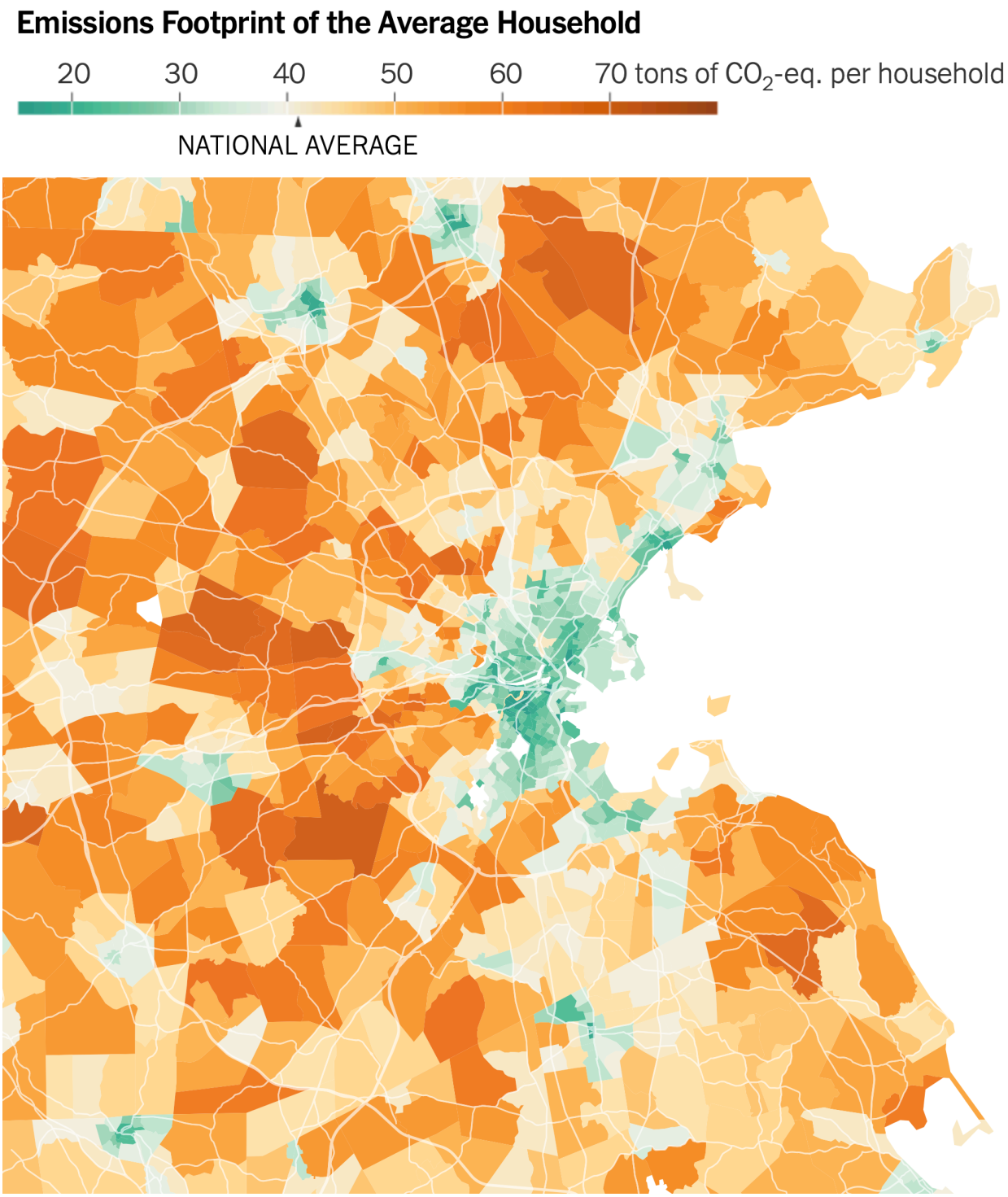


Minneapolis



Boston

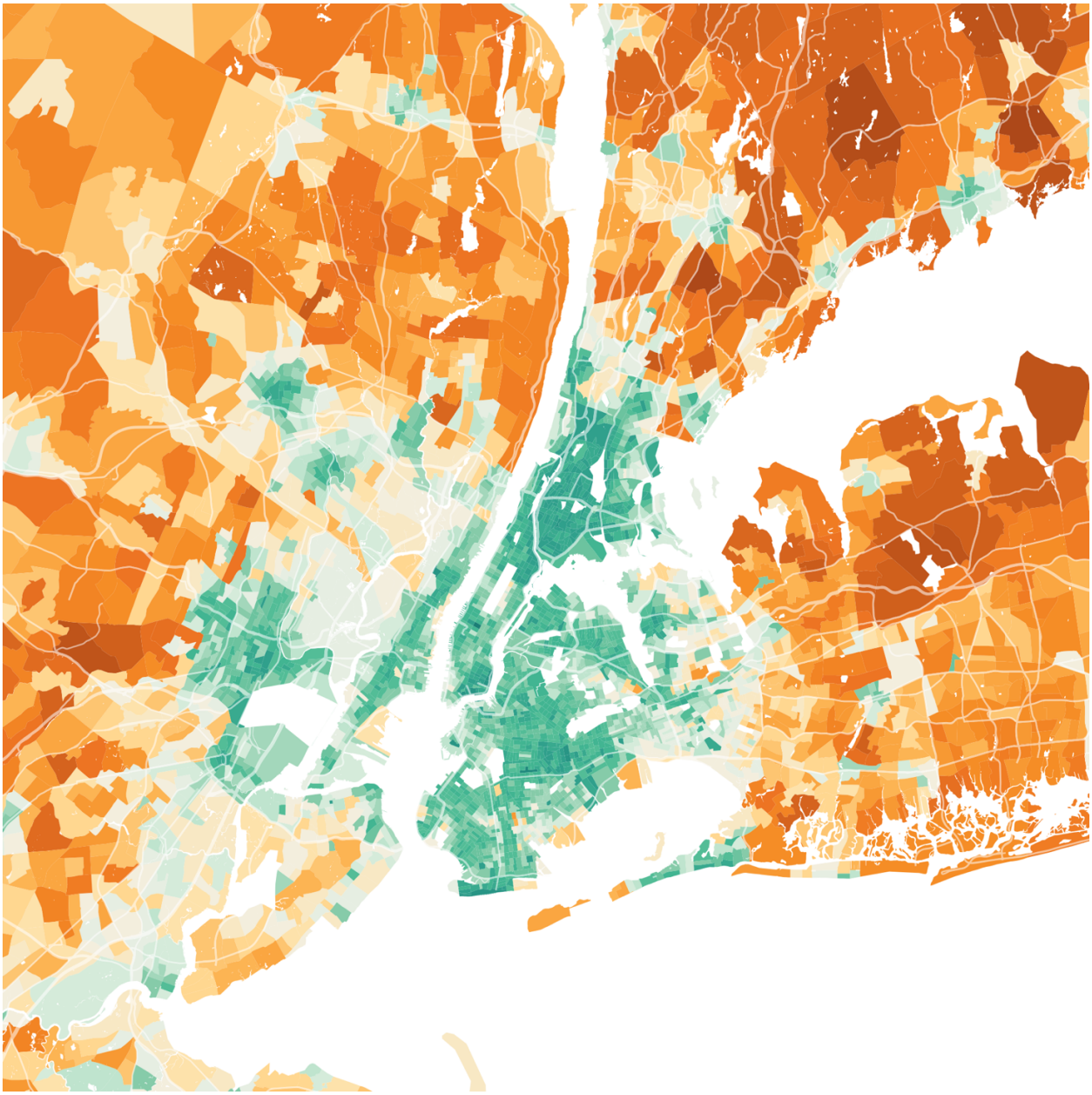
Households in denser neighborhoods close to city centers tend to be responsible for fewer planet-warming greenhouse gases, on average, than households in the rest of the country. Residents in these areas typically drive less because jobs and stores are nearby and they can more easily walk, bike or take public transit. And they're more likely to live in smaller homes or apartments that require less energy to heat and cool.

Moving further from city centers, average emissions per household typically increase as homes get bigger and residents tend to drive longer distances.

But density isn't the only thing that matters. Wealth does, too.

Higher-income households generate more greenhouse gases, on average, because wealthy Americans tend to buy more stuff — appliances, cars, furnishings, electronic gadgets — and travel more by car and plane, all of which come with related emissions.

Take New York. America's largest city provides the clearest example of these patterns:



The densest and most transit-friendly neighborhoods near the city center run deep green, with some of the lowest emissions per household nationwide.

But in more distant suburbs and exurbs, average emissions per household can be two to three times as high, with some of the largest climate footprints in the nation.

Even in hyper-dense Manhattan, rich households on the Upper East Side have a bigger climate impact than their neighbors just a few blocks away because they fly more, have bigger apartments and buy more stuff.

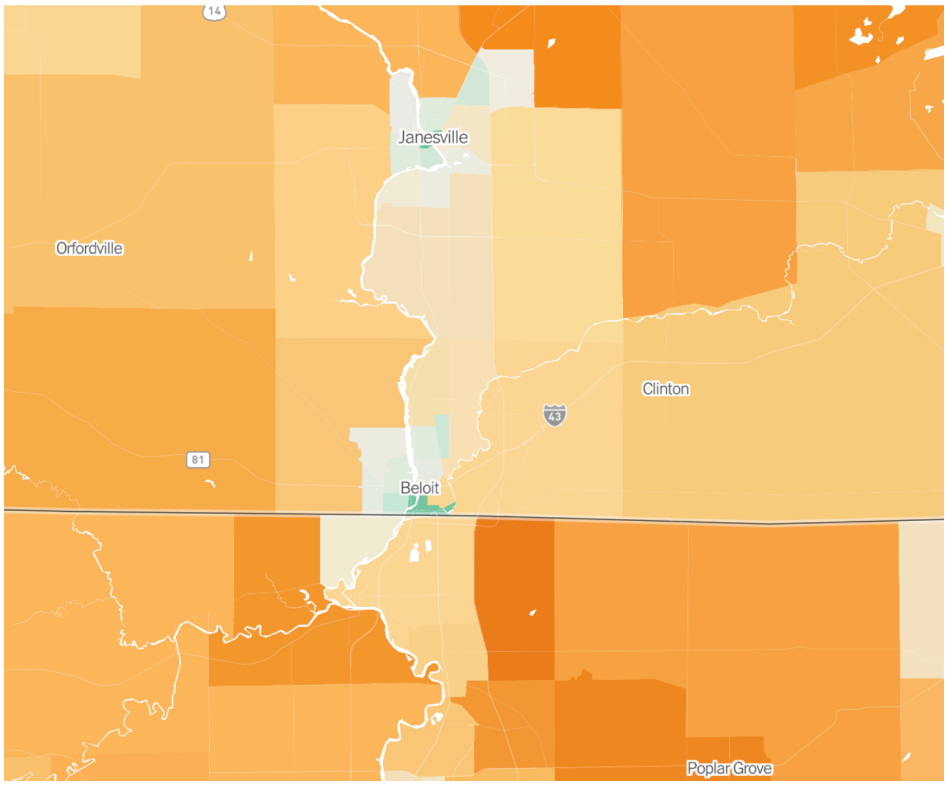
The maps above are based on research from the University of California, Berkeley that estimates what are known as consumption-based emissions. The data was produced by EcoDataLab, a consulting firm partnered with the university.

A map of emissions linked to the way people consume goods and services offers a different way to view what's driving global warming. Usually, greenhouse gases are measured at the source: power plants burning natural gas or coal, cows belching methane or cars and trucks burning gasoline. But a consumption-based analysis assigns those emissions to the households that are ultimately responsible for them: the people who use electricity, drive cars, eat food and buy goods.

"When individuals or households want to know what influence they have over emissions, a consumption-based carbon footprint is the most relevant indicator," said Chris Jones, director of the CoolClimate Network at the University of California, Berkeley, which developed the methodology behind the data set. "And it can help us see what sorts of larger systemic changes are necessary" to help cities reduce those emissions, he said.

The original idea behind the research, which began more than a decade ago, was to connect climate change with daily life, to help people understand how their choices contribute to a global problem, Dr. Jones said. That could inspire individuals to take steps to reduce their climate impacts, such as by composting food scraps instead of tossing them in the trash.

But Dr. Jones said he quickly realized the research could be even more powerful in the hands of policymakers. Cities and local governments could use the data to identify the most effective ways to fight climate change — by, for example, encouraging developers to build more housing in neighborhoods where people don't need cars to get around or helping households in suburbs more quickly adopt cleaner electric vehicles.



Explore the Map for Yourself

The researchers used a model, a simplified mathematical representation of the real world, to estimate the average household's emissions in each neighborhood based on electricity use, car ownership, income levels, consumption patterns and more. Driving and housing are frequently the largest contributors to a household's carbon footprint, although what people eat, what they buy and how often they fly are also important factors.

The results are averages across each census tract: If you take more flights, drive more miles or buy more goods than your neighbors, you may have a higher emissions footprint than your area's average. Conversely, if you put solar panels on your roof or drive an electric car, that can lower your emissions.

What Goes Into a Household's Emissions Footprint?

TRANSPORTATION

Gasoline, motor oil, air travel, vehicle manufacturing, other transportation

HOUSING

Home electricity, natural gas, fuel oil, housing construction and maintenance, other

SERVICES

Healthcare, education, other services (emissions from electricity, other sources)

FOOD

Meat, dairy, cereals, fruits, vegetables, other food, dining out (production, other sources)

GOODS

Apparel, furniture, appliances, other goods (manufacturing, maintenance, other sources)

Yet household emissions often depend on factors that individuals have limited control over, such as whether public transportation is available in their neighborhoods or whether electricity in their area comes from a highly polluting coal-burning plant or emissions-free solar, wind or nuclear plants.

"Consumption is not the individual act we all think it is," said Siobhan Foley, head of sustainable consumption at C40, a network of the world's biggest cities committed to addressing climate change. "We treat it like a personal choice, but it's shaped by all these other factors."

Consider housing. For decades in the United States, the majority of new homes have been built in the suburbs and, increasingly, exurbs, where climate footprints are larger. As a result, for many people today, it is often easier and cheaper to find a home in a high-emissions community than a lower-emissions one.

Those high-emissions communities are in part the result of government investment in roads and highways in the postwar era. Add to that white flight from cities, as well as the simple fact that many Americans increasingly wanted, and could afford, the quintessential single-family home with a yard and a driveway in the suburbs. While the pace of suburban sprawl slowed in the early 2010s as interest in city living rebounded, it has more recently picked up again in the wake of the pandemic as remote work allows people to live farther from job centers.

Many New York City neighborhoods have lower than average household emissions footprints, in part because of the city's extensive public transit system. Karsten Moran for The New York Times

Just as importantly, many cities and local governments often artificially limit the amount of denser or transit-friendly housing available, particularly in wealthier neighborhoods, through zoning that favors single-family homes or requirements around minimum lot sizes and parking spaces. But if people get pushed out of, say, Brooklyn or San Francisco and into the exurbs because of a shortage of housing, their household emissions are likely to soar. (In some cities like Portland, Ore., lower-income families that rely on transit the most have been disproportionately pushed out to more car-dependent neighborhoods.)

For both climate change and affordability reasons, "we need to be building smaller homes in denser places, closer together and closer to jobs, to public transportation," said Jenny Schuetz, a housing researcher at the Brookings Institution. "But the locations where we should be adding a ton more housing have made it really hard to build."

As an example, Dr. Schuetz said, "Manhattan and Inner Brooklyn should have probably doubled their housing stock in the last 20 years. They didn't. And so a lot of houses got built out in Long Island, in the Hudson Valley, out in New Jersey instead."

The new data does point to some ways that local governments can reduce emissions, such as sourcing more electricity from renewable sources or retrofitting existing homes to be more energy efficient. But in earlier research, Dr. Jones has shown that for many cities, such as Berkeley, Calif., the single most effective climate strategy local leaders can pursue is to add what's known as infill housing, apartments or townhouses built in underutilized parts of cities to reduce car dependence and improve energy efficiency.

Larger homes use more energy to heat and cool, and they're often found in more car-dependent communities, increasing households' emissions footprints. Tannen Maury/EPA, via Shutterstock

The United States is already suffering from a housing shortage: By some estimates, the nation will need to add as many as 20 million new homes in the next decade. Using Dr. Jones's research, the think tank RMI estimated that if those homes were built in more climate-friendly neighborhoods rather than at the outer fringes of cities, the nation could lower its carbon dioxide emissions by 200 million tons per year by 2030. That's roughly the equivalent of taking 43 million cars off the road.

"Anyone who cares about climate policy really needs to pay a lot more attention to housing," said Zack Subin, a senior associate at RMI's urban transformation program.

Still, while some states like California and Oregon have lately taken steps to enable more housing in transit-friendly neighborhoods, such moves can face pushback from residents who don't want to see new apartments go up on their blocks.

Reducing the climate impact of cities doesn't mean filling every city and town with huge skyscrapers, experts said. Locating stores, restaurants and community centers within a short distance from suburban homes can reduce automobile travel. Those hubs can also support better access to transit or commuter rail. In the Chicago metropolitan area, for instance, some suburban communities like Aurora and Joliet have lower average transportation emissions per household near their town centers than areas that are farther out. While the towns are still car oriented, their layouts enable shorter trips.

“It’s not about moving everyone to New York City,” Dr. Jones said.

Some suburban town centers have lower average household emissions than surrounding areas because they are connected to commuter rail and have more compact layouts. Charles Rex Arbogast/Associated Press

Not all neighborhoods can be redesigned to be less car dependent, however, and those are places that would see the biggest emissions cuts if motorists switched to cleaner electric cars. Yet one striking finding in Dr. Jones’s research is that electric vehicle sales are mostly booming in neighborhoods where transportation emissions are already lower than average, such as parts of the Bay Area, suggesting that the places where electric cars would have the largest climate benefit aren’t yet adopting them.

Some local governments are now using the new research to identify overlooked strategies to tackle climate change. For instance, in King County, Wash., an area of 2.2 million people that encompasses Seattle, local officials are exploring programs to reduce food waste and increase recycling in order to reduce the region’s consumption-based footprint.

“Usually, communities focus on things like transportation and buildings, because those are the biggest sources of emissions,” said Matt Kuharic, the King County climate change program coordinator. “But if you look at consumption-based emissions you see that other sources can have a big footprint, like food. Having that data makes it easier to justify tackling that as part of our climate strategy.”

METHODOLOGY & NOTES

Household emissions maps

Data reflects average household emissions footprints in 2017.

The maps are based on a data analysis by the EcoDataLab, in collaboration with the University of California, Berkeley.

They reflect a consumption-based emissions accounting. This method assigns responsibility for greenhouse gas emissions to consumers (in this case, households) rather than producers. The data is not a direct measurement of a household's consumption or behavior. Instead, EcoDataLab uses a model (a simplified, mathematical representation of the real world) to estimate consumption and emissions at the household level, depending on real-world data where available, as well as estimates based on demographic, regional and national averages. The data reflects average household emissions footprints in 2017, prior to the coronavirus pandemic.

The analysis is based on a methodology developed by Chris Jones and collaborators at Berkeley, and published in multiple scientific journals. More detail on the latest modeling methodology can be found here.

This data set reflects best-in-class estimates of carbon footprints at the household level nationwide, but it includes caveats:

- The data reflects household averages for each census tract, but there can be wide variation in households' emissions footprints within each location.

- The national-level analysis relies on some inputs that are less local than others, and therefore provides a generalized view of differences in household emissions at the census-tract level. The analysis includes available local data on factors like energy consumption. But for other inputs, such as the fuel efficiency of vehicles in a neighborhood, the analysis relies on regional and national averages. The Berkeley and EcoDataLab team is currently working with select county, city and municipality officials to refine the data further with more localized data inputs to its models. In places where more detailed analyses have been completed, the emissions patterns do not significantly differ from those in the national model.

Additional analysis

On the explorable map, The New York Times did additional analysis to define local household emissions in relation to the national average in each category and for total emissions.

- About average: Census tracts where households' average emissions are within one standard deviation of the national mean.

- Higher or lower than average: Where emissions are beyond one standard deviation from the mean, but lower than two standard deviations.

- Much higher or much lower than average: Where emissions are more than two standard deviations from the mean.