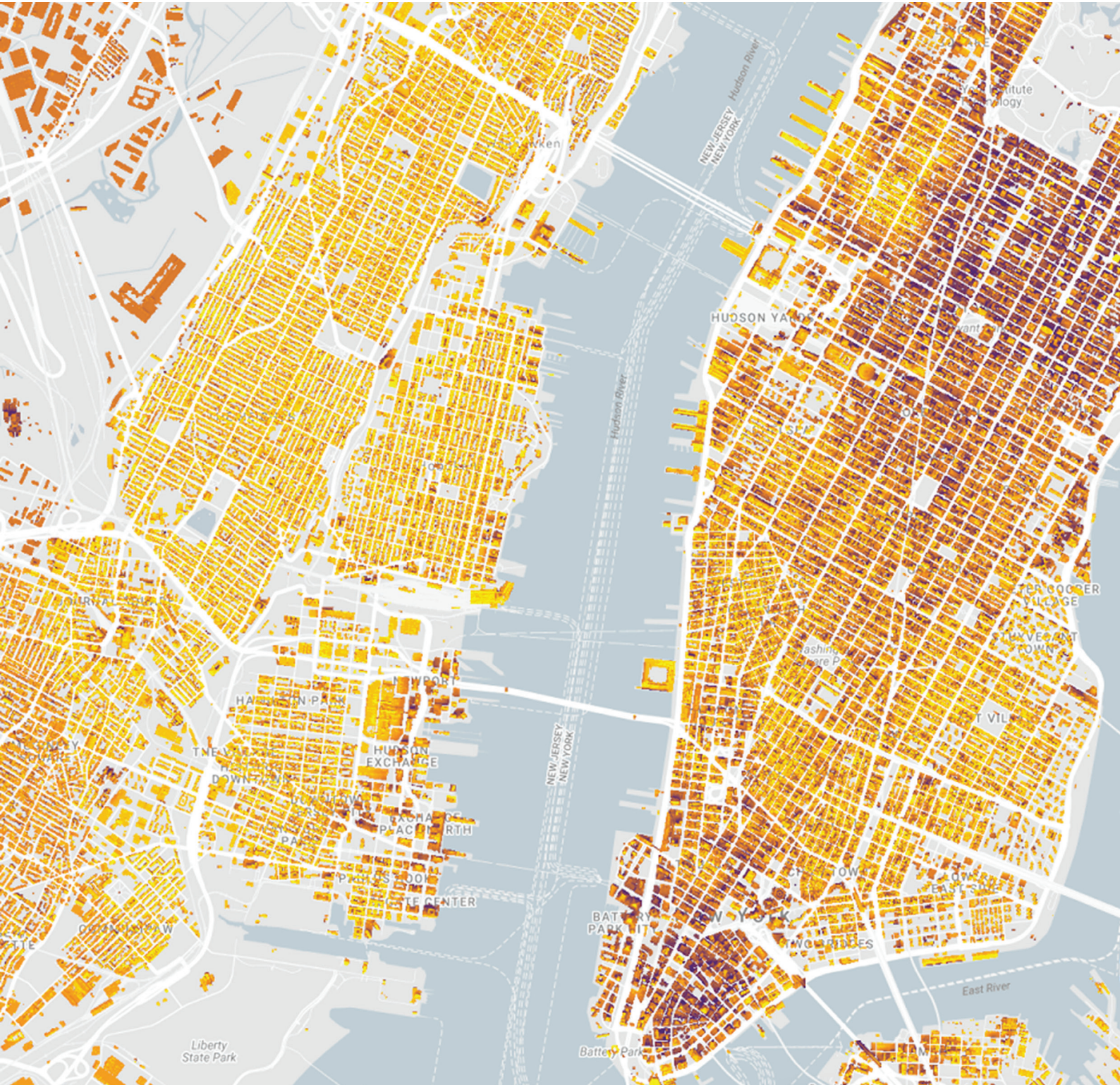


ENERGY

# Installing inequality: the racial disparities in solar deployment

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The possibility of installing solar photovoltaics (PV) distributed on rooftops has allowed communities to actively participate in molding the future of sustainable cities.

Solar PV owners also experience significant economic benefits in the form of tax credits, rebates, and lower net electricity consumption from utilities, leading to lower electricity bills. It comes at no surprise that the rooftop PV has surpassed 300 GW of installed capacity worldwide, with trends on the rise.

In the United States, more than a million rooftops already have solar PV systems on them, with the numbers continuously expanding, contributing to the achievement of bold initiatives to fully decarbonised states' power sectors, such as those in California, Hawaii and New York.

### An unequal access to clean energy

Unfortunately, this growth has not benefited everyone equally. We recently published a study in *Nature Sustainability* with a worrying trend: there are racial disparities found in rooftop solar PV deployment in the United States.

Environmental and energy injustices have long been identified as a hurdle in dealing with climate change. In the words of Mary Robinson, former United Nations Secretary-General's Special Envoy on Climate

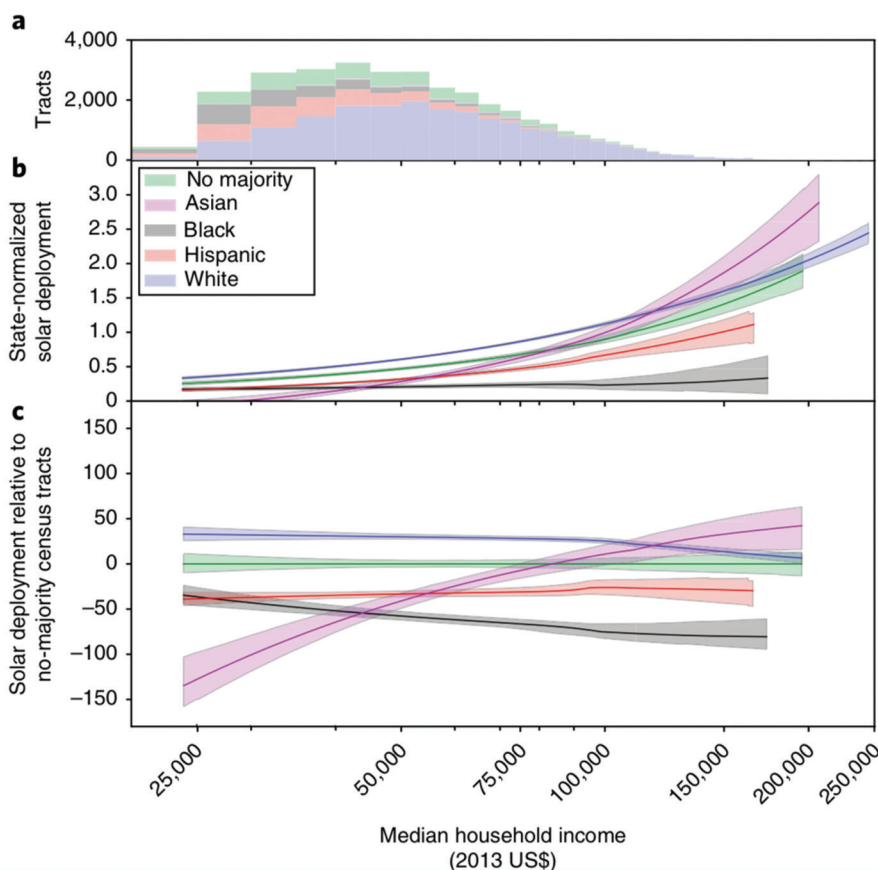
Change, "we must simultaneously address the underlying injustice in our world and work to eradicate poverty, exclusion and inequality."

### What the data says

We leveraged a collaborative effort with Google's Project Sunroof team, who map rooftop solar PV potential across 60 million rooftops in the United States. Combining Google's Project Sunroof's location of existing rooftop solar installations across the U.S. with demographic data such as household income, home ownership, and ethnicity and race, from the U.S. Census Bureau's American Community Survey, we were able to explore trends across census tracts with and without solar rooftop PV installed while controlling for median household income.

We present here the three most revealing elements of our findings.

1. For the same household income, black-majority census tracts – or neighborhoods – have installed up to 69% less rooftop PV than no-majority census tracts (neighbourhoods where no single race or ethnicity makes up the majority). Hispanic-majority census tracts have installed up to 30% less rooftop PV than no-majority census tracts. Meanwhile, white-majority census tracts have installed 21% more rooftop PV than no-majority census tracts.

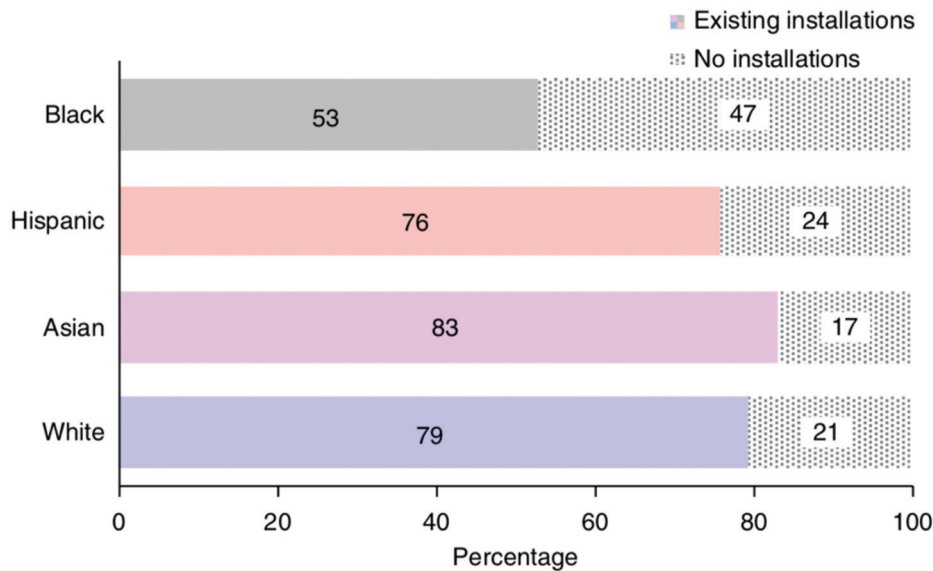


In this graph, we see the relationship between household income and rooftop PV installation by race and ethnicity.

(a) Histogram of the distribution of census tracts analysed at intervals of US\$5,000.

(b,c) Rooftop PV installations relative to the available rooftop PV potential and normalised by state as a function of the median household income for majority census tracts in absolute values (b), and normalised relative to the rooftop PV adoption of no majority census tracts (c).

Each colour represents a race or ethnicity that holds majority in a set of census tracts. Dark continuous curves represent our results after being fitted through a weighting algorithm. Lighter shading represents the 90% confidence interval range where the installation parameters fall after 1,000 sampling iterations for each predominant race or ethnicity in that census tract.



Percentages of each census tract with and without existing rooftop photovoltaic installations. In the census tracts listed, at least 50% of the population self-identified as a single race or ethnicity.

**Graphic Source:**  
 Sunter, Deborah, Castellanos, Sergio, and Kammen, Daniel (2019) "Disparities in rooftop photovoltaics deployment in the United States by race and ethnicity", *Nature Sustainability*, 2, 71 – 76

2. When correcting for home ownership, black- and Hispanic-majority census tracts have installed less rooftop PV compared to no-majority tracts by 61% and 45%, respectively, while white-majority census tracts installed 37% more.

3. Nearly half of all black-majority census tracts had no existing rooftop solar systems. This is nearly twice that of any other racial or ethnic group in the study.

Put in other words, if you were to drive through a neighbourhood (at any income level), chances are the installed PV you would see on a given rooftop, would most likely be on a white-rented or white-owned household.

### The need for more inclusive energy infrastructure policy

Plenty of questions still remain open, for example, how has a systematic disparity developed? Have approaches from NGOs focused on certain demographics been successful in recent years? Our project identifies this inequality and does so in a given point in time. We recognise the urgency to conduct more research to help determine the root causes of the differences and track the evolution of policy interventions over time. However, already these findings can be useful in developing better and more inclusive energy infrastructure policy and outcomes, including as part of the evolving 'Green New Deal', and programs at the state and federal level.

It is exciting that advances in remote sensing and in 'big data' science is enabling researchers across the world to increase the resolution and level of sophistication in diagnostic studies that can allow stakeholders to think more deeply about the effectiveness and inclusiveness of current policies and approaches to accelerating solar PV deployment and fighting climate change. ■

**For the same household income, black neighborhoods have installed up to 69% less rooftop PV than neighbourhoods where no single race or ethnicity makes up the majority.**

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