

# What is driving reductions in residential greenhouse gas emissions in the US?

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In 2005, greenhouse gas (GHG) emissions from residential energy use hit an all-time high in the United States. Each year since, emissions have dropped at an average annual rate of 2 percent.

In a study published in *Environmental Research Letters*, "Drivers of change in US residential [energy consumption](#) and [greenhouse gas](#)

emissions, 1990-2015," a team of researchers from the Yale School of the Environment (YSE) outlined several factors that have contributed to this decrease, highlighting efficiencies in new home construction, [energy consumption](#) and [household appliances](#), as well as less emissions in electric generation.

"Without the reductions in GHG intensity of electricity, residential GHG emissions would have been higher," growing by 30 percent from 1990 to 2015 rather than the current 6 percent, says YSE Ph.D. student Peter Berrill from the Center for Industrial Ecology, who co-authored the paper with Ken Gillingham, associate professor of economics at YSE, and former YSE faculty member Edgar Hertwich.

Using detailed data gathered from multiple U.S. [housing](#) surveys and energy reviews, Berrill found positives in less GHG-intensive electricity, but added that it's "too risky" to rely on only electricity to decarbonize the residential sector in the coming decades. This, he says, is due to other troubling trends: [population growth](#); reduction of household size, including more senior citizens living on their own; substantial increases in floor area per house in recent decades; and increased access to residential cooling.

To stem the tide against those trends, Berrill sees a need for societal change.

"Without it, we're not going to see meaningful change," he says. More attention needs to be paid, says Berrill, to building smaller homes, including more multi-family housing, and retrofitting existing homes to be more efficient. He also suggested regional approaches—for example, population growth is slower in the Northeast and Midwest, and more attention needs to be paid to renovating and retrofitting older homes in areas with slowly growing housing stock.

Berrill, Gillingham and Hertwich also authored a related paper recently published in *Environmental Science Technology*, focused on how housing policy and types of housing are linked to residential energy demand. The researchers analyzed federal policy changes in the 1970s and 1980s that increased single-family housing construction considerably—an estimated 14 million new homes by 2015, leading to a greater need for heating and cooling, water and electricity.

The researchers estimate that a shift from single-family housing to multi-family housing could reduce energy demand by as much as 47 percent per household and more than 8 percent across the entire U.S. housing stock.

"Removing policy barriers and disincentives to multifamily housing can unlock a large potential for reducing residential energy demand and GHG emissions in the coming decades," the researchers say.

**More information:** Peter Berrill et al, Drivers of change in US residential energy consumption and greenhouse gas emissions, 1990–2015, *Environmental Research Letters* (2021). [DOI: 10.1088/1748-9326/abe325](https://doi.org/10.1088/1748-9326/abe325)

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