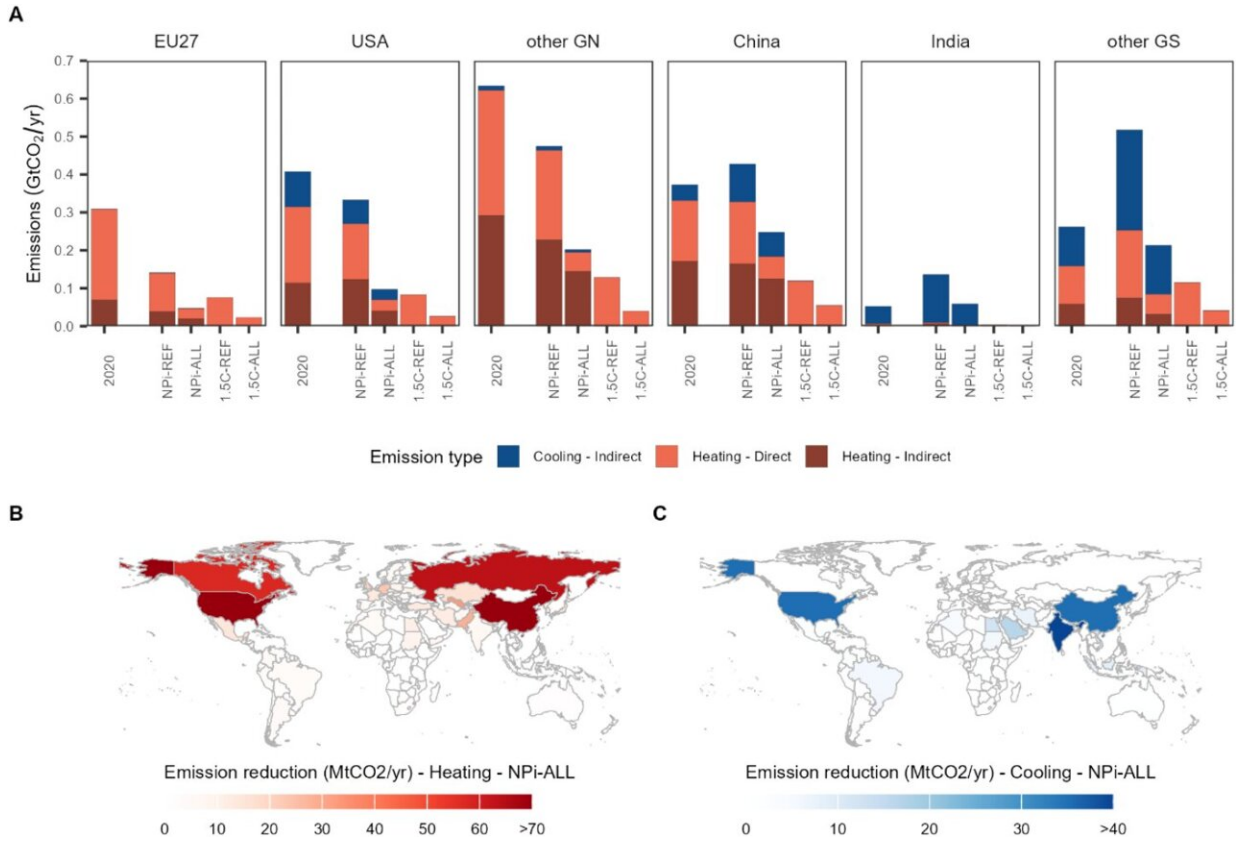
Demand-side policies crucial for net-zero heating, say researchers

June 4 2025



A CO_2 emissions for space heating and cooling in different world regions in 2020 (base year) and in 2050 for different combinations of demand-side (REF and ALL) and climate policy (NPi and 1.5°C) scenarios. Credit: *Climatic Change* (2025). DOI: 10.1007/s10584-025-03923-6

A new study by IIASA researchers shows that a more rigorous and widespread application of already tested demand-side policies could get us halfway toward achieving net-zero emissions in residential heating and cooling.

The study, published in *Climatic Change*, finds that changes in behavior, shifts to cleaner fuels, and improved technologies could reduce global CO_2 emissions from residential heating and cooling by 57% by 2050 compared to a business-as-usual scenario.

When combined with strong climate policies, total emissions reductions could reach as high as 91%. However, to fully eliminate remaining emissions, additional measures will be needed, for example, to phase out fossil fuel-based heating systems still in use by mid-century.

"We don't need to reinvent the wheel—we just need to use the tools we already have more rigorously and broadly. Policy implementation is key," says lead author Alessio Mastrucci, an IIASA senior researcher jointly associated with the Sustainable Service Systems and Transformative Institutional and Social Solutions research groups of the IIASA Energy, Climate, and Environment Program.

Despite 107 countries having adopted net-zero legislation or binding commitments as of 2024, the study finds that action still lags behind. It emphasizes the importance of coupling decarbonization efforts with behavioral and structural changes in how buildings use energy.

The study authors call for an integrated policy approach that combines demand reduction, energy efficiency, fuel switching, and technological upgrades; however, an effective policy combination will be very different in rapidly urbanizing regions of the Global South and the renovation-focused Global North. Technology adoption must go hand-in-hand with institutional change and public engagement to maximize

impact.

"Buildings account for 21% of global greenhouse gas emissions," said co-author Benigna Boza-Kiss, a IIASA researcher in the IIASA Energy, Climate, and Environment Program. "To get to net-zero, we must rethink not only how we heat and cool our homes, but how we design, build, and use them."

The study provides a set of strategies that have already proven successful in certain countries and that should be considered by policymakers in other countries seeking to meet mid-century climate targets by focusing on demand-side action in the residential sector.

The study authors are all part of the EDITS project, short for "Energy Demand changes Induced by Technological and Social innovations"—a global network of experts and researchers focused on improving how demand-side solutions for climate mitigation and human well-being are modeled, analyzed, and communicated. The initiative aims to identify key gaps and untapped potential in understanding and advancing low-energy demand transformations.

More information: Alessio Mastrucci et al, Towards net-zero emissions in global residential heating and cooling: a global scenario analysis, *Climatic Change* (2025). DOI: 10.1007/s10584-025-03923-6

Provided by IIASA