

# Slowing climate change is possible—here's how nations could make it happen

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A new report breaks down how nations could come together to slow temperature increases. Credit: Graphic by Melanie Robinson-Hess | Pacific Northwest National Laboratory

January 2024 marked the first year during which the globe's surface temperatures rose 1.5°C above average. Although it's unknown whether this trend will continue, it does mean that temperatures are nearing the limit agreed upon in 2015's Paris Agreement at the United Nations Climate Change Conference.

With news like that, it's easy to feel like it's too late, that there's nothing we can do to curb [greenhouse gas emissions](#) enough to make a difference. But a [report](#) from the Joint Global Change Research Institute (JGCRI), a partnership between Pacific Northwest National Laboratory (PNNL) and the University of Maryland, shows that the world's goal to stay below a 1.5°C temperature rise is still within reach. The study was led out of the Center for Global Sustainability in the University of Maryland.

The report lays out a scenario in which major societal players come together to reduce greenhouse gas emissions, increase electrification, and protect forests. The report specifically calls out six areas of society—power, transportation, buildings, industry, [land use](#), and non-CO<sub>2</sub> greenhouse gases such as methane—in which they recommend various policies that could make a difference in cutting greenhouse gas emissions globally.

"These recommendations represent the biggest emissions reductions potential in the global economy," said Michael Westphal, now Head of Science for the Intergovernmental Panel on Climate Change. He was a research scientist at JGCRI when the report published. "Together, these recommendations make up the All-of-Society Climate Change Pathway."

The team used the Global Change Analysis Model (GCAM) to determine how policies in these six sectors could help achieve the global temperature goal.

"GCAM is a powerful tool that brings together representations of the world's energy, agriculture and land use, water, and climate systems along with interactions across them to examine how policies in these areas might reduce emissions in the future," said Gokul Iyer, a co-author on the report and senior Earth scientist at JGCRI. GCAM is developed and maintained in JGCRI.

If the policies outlined below were enacted today, greenhouse gas emissions would fall 32% by 2030. Here's how the big sectors of society would change under the All-of-Society 1.5°C Climate Pathway.

## **Power**

Electricity runs the world—our homes, businesses, devices, and even some of our vehicles. To produce much of that electricity, we burn fossil fuels like coal and natural gas. Although renewable energy such as solar and [wind power](#) is increasing, research shows that deployment of renewable energy must increase faster to reach our temperature goals. In 2023, 60% of the [total energy generated in the United States](#) was from fossil fuels, 18% was from nuclear energy, and 21% was from renewable sources such as wind turbines and [solar panels](#).

To increase the amount of [renewable energy](#) powering society, the researchers recommend that countries invest in power grid updates, set ambitious clean energy goals to encourage innovation, or set retirement dates for coal plants. With those actions, wind and solar—plus other renewable sources—would make up 62% of electricity generation globally by 2030.

## **Transportation**

Transportation contributes to greenhouse gas emissions with its

combustion-fueled cars, trucks, and buses. In 2021, transportation contributed 28% of [greenhouse gas emissions in the United States](#) and 14% globally.

The researchers suggest that nations could invest more in public transportation infrastructure and more efficient city planning to increase access to buses and trains. Meanwhile, offering incentives for consumers to adopt electric vehicles could boost sales to 51% globally.

## **Buildings**

Buildings make up about [30% of greenhouse gas](#) emissions in the United States from direct emissions like burning gas for heating and cooking and indirect emissions from power plants burning coal and gas to provide electricity. Globally, buildings contribute about [26% of greenhouse gas emissions](#).

Increasing the electrification in buildings—with technology such as heat pumps rather than gas-powered heating—can help decrease those emissions.

Around the world, local and regional jurisdictions could encourage people to adopt more energy-efficient technologies and provide subsidies for homeowners to make upgrades. These same jurisdictions could also tighten energy efficiency codes, requiring buildings to be more energy efficient.

## **Industry**

Activities like iron, steel, and cement production, as well as materials, plastics, and chemical manufacturing, make up a diverse energy sector. Much of the greenhouse gas emissions from industry come from burning

[fossil fuels](#) in transportation as well as the manufacturing processes.

If national governments invested in alternative fuels made from agricultural or municipal waste or set aggressive electrification and efficiency standards, emissions from iron and steel would drop by 50%, while aluminum emissions would drop 36% by 2030.

### **Non-CO<sub>2</sub> greenhouse gases**

After CO<sub>2</sub>, methane is the most abundant greenhouse gas emitted by society. In 2021, methane accounted for [12% of all United States greenhouse gas emissions](#). That number might seem low, but methane is much more efficient at trapping heat in the atmosphere and its impact is [28 times greater than CO<sub>2</sub>](#) over a 100-year timeframe.

Across the globe, human activities drive more than half of [methane emissions](#). Sources include agriculture and livestock, coal mining, landfills, and leaking methane from natural gas systems. To reduce these emissions, the report authors recommend better regulations for fossil fuel extraction infrastructure, which can leak a lot of methane if not properly maintained. Governments both national and regional could also provide incentives like tax credits to encourage companies to reduce their methane emissions or develop technology such as methane capture.

With these actions, methane emissions would drop by 30% in 2030 compared to 2020's levels, which equates to 120 megatons.

### **Land use**

Forests around the globe soak up billions of tons of carbon dioxide every year, acting as one of Earth's largest carbon sinks. In 2021 at COP26, 145 countries agreed to halt or reverse deforestation by 2030. According to the All-of-Society Climate Pathway, reductions in land use change



emissions contribute to 6% of the total reductions by 2030, highlighting the importance of the land sector to keeping warming to 1.5°C.

At the national scale, the authors recommend that governments enact ambitious benchmarks for reducing deforestation and provide subsidies to farmers and landowners who practice climate-friendly land management. Local and national governments could also invest in wildfire mitigation strategies to protect forests and surrounding communities from wildfire damage.

**More information:** Report: [cgs.umd.edu/research-impact/pu... 5degc-aligned-action](https://cgs.umd.edu/research-impact/publications/5degc-aligned-action)

Provided by Pacific Northwest National Laboratory

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