



(2024/05/13)

What is the carbon footprint of a house in Japan?

Researchers identify the emission hotspots in the supply chain when building a house in Japan

Fukuoka, Japan—Researchers at Kyushu University have published a comprehensive analysis on the carbon footprint of constructing a wooden house in Japan. The study covered the total amount of emissions produced, taking into consideration the entire supply chain including the processing and transport of the raw materials that go into building a house.

The team hopes that by identifying emission hot spots in the supply chain that go into building a house, policy makers can implement strategies to reduce its climate impact. Their analysis was published in the [*Journal of Environmental Management*](#).

As humanity maneuvers itself through the climate crisis, researchers and industry professionals alike have been working to identify sectors with high CO₂ emissions so they can implement policies that potentially reduce greenhouse gas production. But in today's highly interconnected economy, figuring out a sector or object's greenhouse gas output is astoundingly complex.

"For example, it's easy to calculate how much CO₂ a single automobile will potentially produce. It's another thing entirely to try and find the totality of emissions a car produces from assembly line to scrap yard. You need to consider the emission that come from the supply chain and manufacturing the raw materials," explains Professor Shigemi Kagawa from Kyushu University's Faculty of Economics, whose team has been studying supply chain emissions.

To this end, Kagawa and his team began looking into the combined carbon emissions that come from building a standard wooden house in Japan—which account for approximately 90% of the country's total housing stock—and which industrial sectors contribute to it the most.

"If you combine the emissions generated by construction activity and the supply chain manufacturing of its essential products it can account for approximately 23% of all global emissions," explains doctoral candidate Seiya Imada and first author of the study. "94% of that comes from the supply chain alone. Therefore, emission reduction efforts targeting the supply chain is the best way to mitigate any emissions from the construction sector."

According to the team's findings, the estimated carbon footprint of building a single wooden house in Japan is 38 tons of CO₂. Making up the largest share of that—accounting for 32% of total emissions—was the electric power sector. Other sectors included pig iron production at 12%, with cement, road freight transport, and private power generation each covering 7% of total emissions.

"We also looked into some of the hotspots in the supply chain network. Our analysis found that the steel manufacturing process accounted for the largest share of the carbon footprint, at approximately 15% of total emissions," continues Imada. "The second highest contributing group was the division involved in material transport and the building materials for a house's

exterior, like bricks. That group accounted for approximately 7.4% of the total carbon footprint.”

The team hopes these new findings can help both industry groups and consumers re-evaluate the carbon footprint of this sector of the construction industry. Some countries have begun to emphasize the importance of constructing ‘low-carbon’ buildings. And while Japan does encourage methods to reduce a home’s total energy use, it still does not have a policy that specifically targets the reduction of CO₂ during its building phase.

“Policy makers should promote efforts of renovating and remodeling already existing houses. There should also be a focus on reusing the foundation, which are made with materials from high emission sectors,” Concludes Imada. “The supply chain is very complicated, but if we want to avoid the worst results of the climate crisis, we must be able to understand it and implement policies that reduce emissions effectively.”

###

For more information about this research, see "CO₂ emission hotspots analysis on supply chains for wooden houses in Japan," Seiya Imada, Keitaro Maeno, Shigemi Kagawa, *Journal of Environmental Management*, <https://doi.org/10.1016/j.jenvman.2024.120151>

About Kyushu University

Founded in 1911, [Kyushu University](#) is one of Japan's leading research-oriented institutes of higher education, consistently ranking as one of the top ten Japanese universities in the Times Higher Education World University Rankings and the QS World Rankings. The university is one of the seven national universities in Japan, located in Fukuoka, on the island of Kyushu—the most southwestern of Japan’s four main islands with a population and land size slightly larger than Belgium. Kyushu U’s multiple campuses—home to around 19,000 students and 8000 faculty and staff—are located around Fukuoka City, a coastal metropolis that is frequently ranked among the world's most livable cities and historically known as Japan's gateway to Asia. Through its [VISION 2030](#), Kyushu U will “drive social change with integrative knowledge.” By fusing the spectrum of knowledge, from the humanities and arts to engineering and medical sciences, Kyushu U will strengthen its research in the key areas of decarbonization, medicine and health, and environment and food, to tackle society’s most pressing issues.



Fig. 1. Tatekawa in Honjō (Honjō Tatekawa), from the series Thirty-six Views of Mount Fuji, woodblock print by Katsushika Hokusai. A

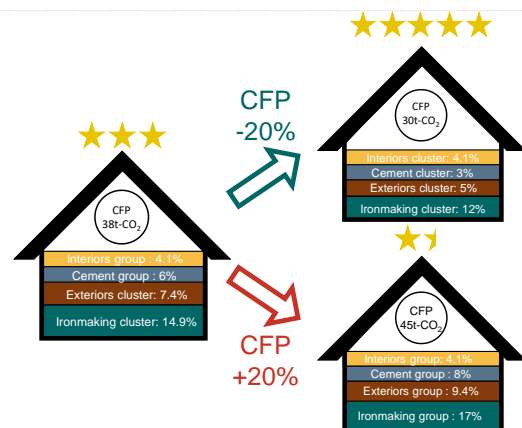


Fig. 2. A Proposed Carbon Footprint Labeling for New Homes. The carbon footprint of one new wooden house and the

depiction of timberyards during the Edo period (1603-1867), with Mt. Fuji viewable at a distance.

percentage each material group contributes to that footprint. Material groups are labeled to show its contribution to the carbon footprint. Labels such as these can help consumers and construction companies visualize the carbon footprint of building a new house and evaluate their climate impact.

[Contact]

Shigemi Kagawa, Professor
Department of International Economy and Business
Faculty of Economics
Tel: +81-92-802-5513
E-mail: kagawa@econ.kyushu-u.ac.jp