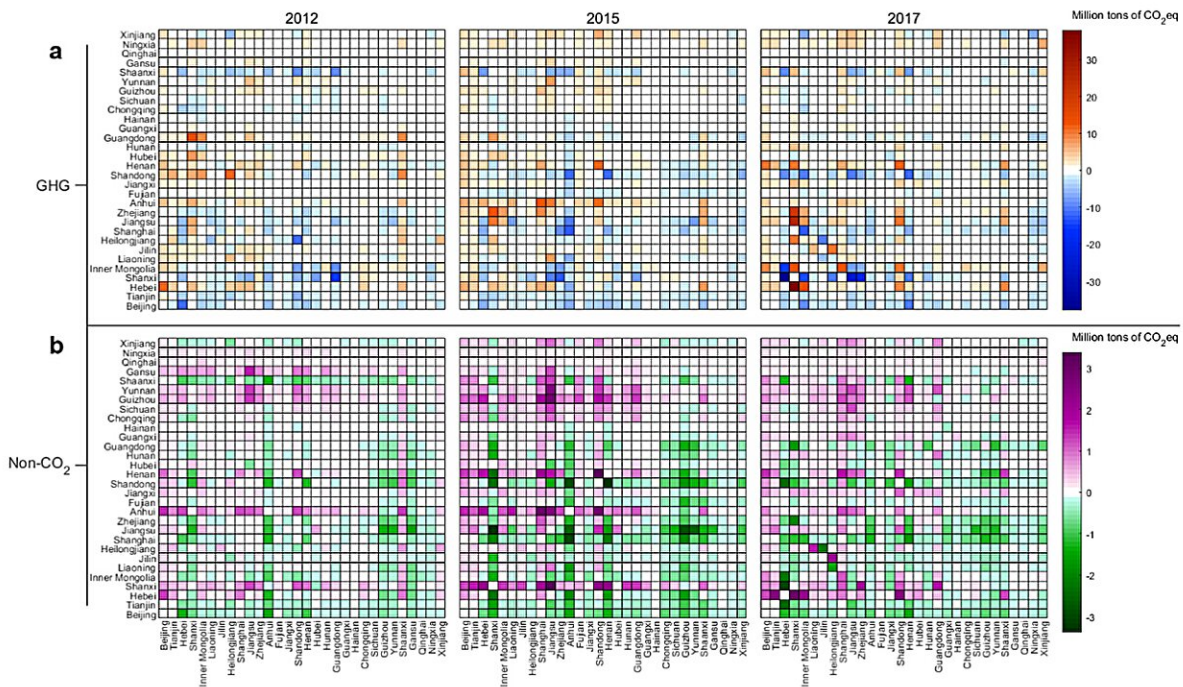


# Researchers track greenhouse gas emissions in Chinese value chains with an interprovincial input–output model

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Net value-added emission transfer (in Mt CO<sub>2</sub>-eq) in the interprovincial value chains between the 30 selected provinces in 2012 (left), 2015 (center), and 2017 (right). Credit: Energy and Climate Management, Tsinghua University Press

China's economy has shifted from a stage of high growth to a stage of high-quality development, and the establishment of a dual-carbon target

requires profound changes in the industrial structure and energy systems, as well as finding the right direction and pathway for industrial adjustment. While the potential for technological emission reduction continues to be released, the main factor affecting China's carbon emissions is the speed and intensity of economic transformation and industrial restructuring.

A research team of Dr. Gu Alun from Tsinghua University in Beijing, China, recently analyzed the correlations between [greenhouse gas emissions](#) due to differences in industrial divisions between provinces at the time and regional scales, which helped to better understand and analyze the patterns and relationships between provincial value chains and the formation of industrial chains. In addition to CO<sub>2</sub> emissions from fossil-fuel combustion, they also considered the distribution of non-CO<sub>2</sub> emissions.

The team [published](#) their research results in *Energy and Climate Management* on April 18, 2024.

"In the context of the economic transformation and development strategy, the economic development and interaction between regions and provinces will also carry an increasing flow of GHG emissions, and some provinces may transfer the production of energy-intensive products to other provinces through product flows with other provinces to achieve their carbon emission reduction targets, which poses a challenge to the realization of China's overall dual-carbon targets.

"Therefore, it is necessary to pay attention to the GHG emissions of each province in China and analyze the degree of correlation of economic development between provinces and the relationship of emissions in the inter-provincial value chain in conjunction with the national value chain, so as to better understand the patterns and relationships of GHG emissions implied in the formation of inter-provincial value chains and

industrial chains," said Gu, senior author of the paper, associate researcher in the Energy, Environment and Economy Institute at Tsinghua University.

China's domestic value chains have been gradually strengthened in recent years, and the resilience of the domestic economy has been further improved. The inter-provincial value chain has a relatively low degree of correlation, and each province still relies heavily on its own province for the inputs and distribution and use of intermediate products.

The national average inter-provincial correlation of intermediates in 2017 was 25.34%, while the national average correlation of intermediates coming from its own province was 69.16%, much higher than the inter-provincial correlation of intermediates. The main value added gains of each province still come mainly from the formation of national value chains, and the domestic economy is more resilient.

From 2012 to 2017, the phenomenon of inter-provincial value chain emissions transfers became increasingly evident. Value chains in Beijing, Tianjin, Shanghai and Guangdong Province caused relatively high local emissions in other provinces, in contrast to the provinces of Henan, Jiangsu, Zhejiang and Hebei, where the net transfer of value chain emissions was larger in the North China region. From 2012 to 2017, the trend of inter-provincial value chain emissions transfer has been deepening, and is more pronounced in provinces such as Shanxi and Hebei.

There is less inter-provincial movement of non-CO<sub>2</sub> emissions, but there are still signs of a growing shift in movement and a more decentralized shift, with mainly the western region providing more non-CO<sub>2</sub> value-added emissions to the south-eastern coastal provinces

Some industries with high value chain emissions have [production](#)

[processes](#) that pull emissions not only from other industries in the province, but also from local emissions in other provinces; some industries with high emissions from production in the province also raise their local emissions as a result of increased value added in other provinces and industries.

The research team expects to guide Beijing, Tianjin and developed coastal regions to make full use of the resources of both the international and domestic markets and, while participating in the global value chain, to continuously enhance their participation in the construction of domestic inter-provincial value chains, in particular to strengthen the participation of the tertiary industry, which is less carbon-intensive but has greater demand from the national economy, in the national value chain.

In central and western provinces, industries and value chains can be developed according to different resource endowment advantages, high energy-consuming and low-yield production capacity can be phased out, and advanced technology and experience can be introduced to continuously strengthen and enhance local core competitiveness.

**More information:** Alun Gu et al, Tracking greenhouse gas emissions in Chinese value chains with an interprovincial input–output model, *Energy and Climate Management* (2024). [DOI: 10.26599/ECM.2024.9400001](#)

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