



## OPEN ACCESS

## EDITED AND REVIEWED BY

Mobeen Ur Rehman,  
Shaheed Zulfiqar Ali Bhutto Institute of  
Science and Technology (SZABIST),  
United Arab Emirates

## \*CORRESPONDENCE

Huaping Sun,  
✉ shp797@163.com

†These authors have contributed equally  
to this work

## SPECIALTY SECTION

This article was submitted to  
Environmental Economics and  
Management,  
a section of the journal  
Frontiers in Environmental Science

RECEIVED 31 October 2022

ACCEPTED 08 December 2022

PUBLISHED 04 January 2023

## CITATION

Sun H, Fang K and Shi Y (2023), Editorial:  
Green innovation and industrial  
ecosystem reconstruction in achieving  
environmental sustainability.  
*Front. Environ. Sci.* 10:1085266.  
doi: 10.3389/fenvs.2022.1085266

## COPYRIGHT

© 2023 Sun, Fang and Shi. This is an  
open-access article distributed under  
the terms of the [Creative Commons  
Attribution License \(CC BY\)](https://creativecommons.org/licenses/by/4.0/). The use,  
distribution or reproduction in other  
forums is permitted, provided the  
original author(s) and the copyright  
owner(s) are credited and that the  
original publication in this journal is  
cited, in accordance with accepted  
academic practice. No use, distribution  
or reproduction is permitted which does  
not comply with these terms.

# Editorial: Green innovation and industrial ecosystem reconstruction in achieving environmental sustainability

Huaping Sun<sup>1,2,3\*†</sup>, Kai Fang<sup>4†</sup> and Yongjiang Shi<sup>5†</sup>

<sup>1</sup>School of Economics and Management, China University of Geosciences, Wuhan, China, <sup>2</sup>School of Finance and Economics, Institute of Industrial Economics, Jiangsu University, Zhenjiang, China, <sup>3</sup>School of Economics and Management, Xinjiang University, Urumqi, China, <sup>4</sup>School of Public Affairs, Zhejiang University, Hangzhou, China, <sup>5</sup>Department of Engineering, University of Cambridge, Cambridge, United Kingdom

## KEYWORDS

green innovation, industrial ecosystem reconstruction, low-carbon system, environmental sustainability, carbon neutrality

## Editorial on the Research Topic

[Green innovation and industrial ecosystem reconstruction in achieving environmental sustainability](#)

After the Paris Agreement, all countries are actively promoting green development and low-carbon transformation. The industrial development is now facing profound adjustment and ecosystem reconstruction. In this context, green innovation plays an increasingly important role in industrial low-carbon transformation, ecosystem reconstruction and environmental sustainable development. China is moving towards ecological civilization, as different countries have experienced similar experiences before. For example, developed countries such as the United States, Europe and Japan, as manufacturing powers or regions, have achieved or are achieving carbon peak and are on the way to carbon neutrality. At present, more than 140 countries or regions around the world have committed to achieving the goal of carbon neutrality. In view of the realization mechanism, path and impact of carbon neutrality, many scholars have made in-depth exploration from a series of perspectives such as technological emission reduction and policy promotion. Here, we launched a virtual Research Topic (VSI) to address key issues under the theme of green innovation and industrial ecosystem reconstruction, with 33 of research articles selected, covering industrial carbon emissions, green finance, and effect of industrial spatial co-agglomeration on green economic efficiency, and environmental policies for green innovation in China and the entire world.

The transition to a low-carbon system is imminent under the constraints of carbon-neutral targets. Carbon emissions are the primary concern in achieving environmental sustainability and carbon neutrality. Zhang X. et al. provided a two-stage method for forecasting China's annual carbon emissions. Another two research articles highlight the

reduction of energy industrial pollutants and carbon emissions. One research focuses on the potential for coal-related carbon emissions reduction over the past decades. The paper explored the conflict formation mechanism among coal enterprises, downstream coal-fired power plants, and government in the process of strategic energy decarbonization transformation from the perspective of industrial chain (Fang and Xu). The other one find China's electricity consumption efficiency has improved significantly since the 12th Five-Year Plan, supported by different robustness tests. The mechanism analysis finds that green technology innovation positively affects energy efficiency but is not the best option for cities with many listed companies. Cities with many listed companies can achieve energy savings by adjusting their industrial structure (Pu et al.).

As other sources of anthropogenic CO<sub>2</sub> emissions, low-carbon tourism reflects the degree of environmental concern in the tourism industry and is also the foundation of green, sustainable, and ecological tourism. The transformation of the tourism industry, known as the sunrise industry, to a low-carbon pattern contributes to the sustainable development of tourism cities (Mao et al.). Another study examines the effect of green human resource management (GHRM) on the environmental performance of hotels industry. It also investigates the crucial role of pro-environmental psychological capital, psychological green climate, and pro-environmental behaviors to enhance the environmental performance (Nisar et al.). It is found that for resource-based cities, the economic growth mainly relies on the development of the secondary industry, which is primarily dependent on local natural resources. The empirical results show that the regional industrial structure has a significant negative impact on the cities' ecological resilience, and the regional industrial structure has a significant positive effect on their environmental pressure (Chen and Wang). The high-tech industry plays a crucial role in reducing carbon emission and achieving green economic development. One research uses Meta-Frontier data envelopment analysis to measure the innovation efficiency level of the high-tech industry, compares the difference in this industry's innovation efficiency under the regional Frontier and common Frontier, and inspects the convergence condition of its innovation efficiency in the three major areas of eastern, central, and western China (Zou et al.).

With rapid urbanization and rising living standards, the household sector has become the second largest contributor to urban carbon emissions and important pathway to achieve China's carbon reduction targets. One paper explores the emission reduction paths of urban households. It is found that rich households tend to increase their use of clean energy (Li et al.). With the development of the economy and society, environmental pollution and resource waste problems are emerging, especially in agricultural production, and the adoption of ecological agricultural technologies is a prerequisite to alleviate ecological pressure (Dong et al.). Improving resource use efficiency is an effective way to

accelerate the realization of carbon emission peak and carbon neutrality, one study adopted the entropy weight TOPSIS method and performed a thorough analysis of the temporal and spatial Research Topic in Zhejiang's agricultural sustainable development (Fu et al.). Facing increasingly serious resource and environmental constraints, the adoption of green technology has become the key to driving the green production transformation of farmers under the constraints of environmental regulation (Lu et al.). Improving farmers' green production behavior can guarantee food safety at the source. One study aimed to find targeted policy recommendations according to different spatial aggregations of non-green production behavior (Yu et al.). The highly intensive use of pesticide is a big threat to environmental sustainability in China. Another study explains the increase of rice pesticide use in China's rapid urbanization process from the perspective of changes in the delay of pest control (Fang et al.).

Economic Development Zones have been proven to be an economic success and have been pursued by many governments around the world over the past several decades. One paper exploits the relationship between the foundation of EDZs and firms' pollution emissions with a multi-period differences-in-differences model. They find that the establishment of EDZs can improve firm environmental performance by improving energy efficiency, optimizing the business environment, and upgrading technology (Wei et al.). The development of the regional economy is of major concern against the backdrop of the "new normal." As a problem that has persisted in China for decades, zombie firms have a negative impact on regional and industrial sustainable development. Despite the low level of zombification of industrial enterprises in the Yangtze River Delta Urban Agglomeration, the results of the study indicate that it has a considerable negative influence on enterprise investment. The carbon intensity effect and the competitive weakening effect are also examined as two impact mechanisms (Wang H. et al.). Another paper proposes a dynamic industrial transfer index to characterize the spatial matchability of factor mobility and industrial transfer, and then explores the correlation between factor mobility, industrial transfer and industrial carbon emission intensity (Zheng et al.). The spatial relationship between high-tech industrial agglomeration and urban ecological efficiency has been a widespread concern. One study empirically analyzed the bidirectional influence relationship between high-tech industrial agglomeration and urban ecological efficiency and its spatial spillover effect by constructing a spatial simultaneous equation model, and based on the classification of urban resource endowment (Wang M. et al.). Another 2 studies analyzed the spatiotemporal differences and spatial effect of green economic efficiency in China's regional economies (Jiang et al., Wang K.-L. et al.).

In the context of international path to industrialization advancement, environmental problems are becoming

increasingly serious. Therefore, the cultivation of green technology innovation has become an urgent task during the current industrialization development (Chen et al.). To alleviate climate change and environmental issues, China has implemented many environmental regulation policies. Government policy is an effective strategy to encourage green innovation, but the effect of industrial policy on enterprise green innovation remains under-explored, and also little is known about how environmental policies affect enterprise energy utilization efficiency and green innovation. One paper takes the SO<sub>2</sub> and carbon emission trading pilots (SETP, CETP) in China as the quasi-experiment and studies whether the market-based environmental regulation (MER) policy promotes green technology innovation (Qu et al.). Using China's listed manufacturing enterprises data from 2010 to 2020, another study employs Made in China 2025 as a quasi-natural experiment as well as the DID method to explore the effect and mechanism of industrial policies on green innovation (Xu). Based on Porter's effectuation and deterrence theory, environmental regulation is an important driving force for green technology innovation. Another paper finds that an incentive environmental protection policy and punitive environmental protection policy have different impact mechanisms on enterprise green innovation and energy utilization efficiency (Wang Y. et al.). Another article investigates how talent policies affect corporate green technological innovation based on signaling theory and principal-agent theory (Zhang Y.-B. et al.).

Historically, most carbon emissions come from developed countries, but the developing countries and emerging countries are affected. At present, developed countries lack a unified and coordinated willingness to act and efforts, because their efforts alone can neither save the earth nor save the disaster caused by global warming. As developed countries have emitted carbon in the past, but now the carbon emissions have exceeded the critical value, developing countries are faced with the pressure to reduce carbon emissions, and these problems need the coordination of countries. Therefore, these developed countries should recognize and deal with this urgent problem. In recent years, global green development has entered a new stage with profound changes in development conditions. Progress in development has put forward higher requirements for the safe and stable operation of the financial and economic environment. One research article used data from 1980 to 2019 to examine the relationship between financial annexation, financial development, green innovation, and CO<sub>2</sub> emissions in China (Sun et al.). One paper predicts the default probability of the scale of green bond debt that should be repaid by municipal governments in Shandong Province (Wang C. et al.). By optimizing enterprises' capital structure, the deleveraging policy has a close relationship with green innovation. Utilizing the panel data of listed manufacturing enterprises

in China from 2010 to 2019, one paper confirms that the deleveraging policy can play a positive role in improving enterprise green innovation (Shen and He).

Achieving high-quality economic development is a crucial feature of world new development stage. As an environmental regulation tool by implementing a differentiated credit policy, green credit is an inevitable choice to achieve high-quality economic development (Zhang R. et al.). By extracting the financial information of environmental protection investment from the social responsibility reports of listed companies and analyzing the current status of target investment in the automobile manufacturing industry, another research shows that the current environmental protection investment in the automobile manufacturing industry is not strong and the government needs to increase supervision (Liang and Yao). In the carbon neutrality strategy, facilitating the green innovation of enterprises and promoting industrial upgradation have become a key issue. One research explores the relationship between the financial ecological environment, financing constraints, and green innovation of manufacturing enterprises based on endogenous growth and stakeholder theories (Zhao and Wang).

Green innovation has become a critical measure to address the sustainable development challenges of manufacturing industries, and research has largely neglected the important role of managers as decision-makers within firms. Using a sample of China's listed manufacturing firms from 2009 to 2019, one study explores the impact of market competition and financialization on corporate green innovation and examines the moderating effect of market competition (Guo et al.). Using the representative samples of several futures contracts covering different listing periods, another paper conclude a significant and gradual change of the relations between the Shanghai crude oil futures market and international benchmarks, from unidirectional Granger causality to bidirectional Granger causality (Wang H. et al.). To develop green finance and ensure the goal of carbon peaking and carbon neutrality, China set up the pilot zones for green finance reform and innovation in 2017. One paper empirically tested the policy effect of the pilot zones with data from 2010 to 2019 for prefecture-level cities in China. The study shows that the pilot zones have induced an effect on regional green technology innovation, reflected in the application and acquisition of both green invention patents and green utility patents, and the promotion effect is better for green utility patents than green invention patents, which is supported by the robustness test using PSM-DID (Muganyi et al., 2021; Zhang C. et al.).

Carbon emissions and environmental pollution are a global problem, which cannot be solved by the efforts of any alone. Countries need to consult together to promote green innovation, and then work together to solve this problem, so as to achieve sustainable development. It is imperative to strengthen the construction of the global green innovation platform, especially

to improve the level of global low-carbon governance and cooperation. We hope these articles may contribute to developing new roadmaps and strategies for green innovation and providing valuable references in the industrial ecosystem reconstruction and policy optimization in China and worldwide. Taking the present VSI as a starting point, we look forward to more publications on exciting breakthroughs and practical experiences of green innovation and industrial ecosystem reconstruction in achieving environmental sustainability.

## Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

## Reference

Muganyi, T., Linnan, Y., and Sun, H. P. (2021). Green finance, fintech and environmental protection: Evidence from

## Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

## Publisher's note

All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers. Any product that may be evaluated in this article, or claim that may be made by its manufacturer, is not guaranteed or endorsed by the publisher.

China. *Environ. Sci. Ecotechnology* 7, 100107. doi:10.1016/j.ese.2021.100107