

# Development of Renewable Energy Businesses within China's Green Industry Framework

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## Abstract

The main goal of the research is to develop a set of guidelines for the development of business within the framework of the green industry, in compliance with all current environmental regulations, as applied to the realities of the current economic situation in China. The methodology basis is a combination of system analysis of the key principles of business development within the framework of environmental strategy in China with a comprehensive analysis of green industry concept as a factor limiting the activities of enterprises to avoid environmental pollution. The results obtained in the research indicate the presence of significant results in the interaction of government and business in the framework of mutually beneficial collaboration for the growth of the green industry. Chinese business structures invest in the development of "green" industrial and manufacturing technologies while ensuring the necessary level of environmental protection.

## Keywords

Environmental management, Economic development strategy, Environmental policy, Green technology, Clean production.

## Introduction

The research issue is determined by the need to develop clear strategies for business development within the established principles of environmental management, in compliance with the principles of environmental protection, and ensuring the effectiveness of the implementation of measures for the development of environmental initiatives. Currently, the issue in question is not studied enough, due to the absence of sufficient scientific publications on complex research of the basic methods of development of business within the requirements of the developed ecological strategy and with the application of modern green technologies. China was used as the research's base, because the country has made significant progress in the implementation of environmental innovation into its economy. Many enterprises in the country have already implemented in their activities developments in

the field of environmental management, and it has brought tangible results. All this has become possible largely due to the implementation of state support programs for the concept of the green industry in the country, which is demonstrated by large investments in this field. The experience of China is of significant interest to other countries, faced with the problem of the need to transfer the activities of several enterprises under the standards of the concept of the green industry.

China's green industry has attracted a lot of attention as the nation attempts to lead the world in sustainable development while confronting serious environmental challenges. Millions of people have been lifted out of poverty by the country's rapid industrial growth, which began in the late 1970s, and has resulted in serious air and water pollution. Air pollution is still a major concern; PM2.5 concentrations in many Chinese cities are several times higher than WHO recommendations, which is thought to be the cause of 1.2 million premature deaths per year. Despite these challenges, China has made substantial strides in enhancing its environmental policies. Progressively, China's air quality has been improving gradually, with major cities observing a 21% reduction in annual PM2.5 concentrations since 2018. The government has also

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committed to a long-term strategy focusing on reducing carbon emission intensity through the use of non-fossil fuel energy (Babak et al., 2016). The latest Five-Year Plan emphasizes investment in clean energy technologies, signaling a firm move towards wind, solar, and nuclear power, especially with investments in onshore technologies and offshore wind in coastal regions. These initiatives reflect China's commitment to moving towards a greener economy, despite the ongoing reliance on coal, which powers a significant portion of its energy needs. The country's experience is increasingly relevant globally as nations grapple with balancing economic growth and environmental sustainability (Kapron, 2023).

C. Machado and J.P. Davim (2022) conducted a joint study on the basic principles of environmental safety measures in the construction of modern production processes. The researchers came to the conclusion that the demands of each enterprise's environmental strategy are not always fully satisfied by the state of scientific research currently being conducted in the area of environmentally friendly production process management. Meanwhile, M.A. Parvez Mahmud et al. (2022) conducted joint research on the theory, practice, and methodology of life cycle assessment of power plants operating on renewable energy sources. According to the authors, a facility's ability to sustain itself over the course of its life depends primarily on how well its environmental strategy is implemented, how well all of its essential components interact with one another, and how well its energy source consumption is recorded. The issue of tracking the consumption of renewable energy sources is also raised in other related sources (Dastbaz et al., 2015; Syrmanova et al., 2020). At the same time, the issue of product development within the concept of green industry is raised in the work of V.K. Singh et al. (2022), aimed at studying the principles of building green energy systems. According to the authors, there is still much to be discovered about the energy potential of renewable energy sources. This presents a huge opportunity for research and development of industrial production facilities that run on energy from renewable sources like solar and wind.

D. Bochtis et al. (2020) in a joint scientific study aimed at studying the key aspects of bioeconomics in agricultural production, noted that green technology is of key importance in agricultural activities, acting as a major factor in ensuring reliable environmental protection in the development of agricultural enterprises. The scientists came to the conclusion that a single agricultural enterprise functioning under the umbrella of the "green industry" can be reliably guaranteed to be adhering to effective environmental poli-

cies if it uses environmentally friendly materials in its operations. C.-C. Lee and J. Hussain (2022) in joint research considered several problematic aspects of building carbon-neutral sustainability and "green" development in energy consumption. The scientists concluded that in the current manufacturing sector, carbon emissions are a major threat. The problem is considerably lessened when green technologies are implemented into the operations of agricultural businesses, which makes it necessary to look into ways to boost investment in the agricultural sector in order to maintain high-quality green innovation implementation (Trusova et al., 2021; Shahini et al., 2023).

The goal of the article is to investigate the prospects and strategies for advancing business practices within the framework of the green industry concept, aligning them with established environmental policies and management standards, particularly in the context of the People's Republic of China. This includes examining the efficacy of environmental initiatives, the application of modern green technologies, and the role of state support programs in fostering environmental innovation within Chinese enterprises. The research seeks to fill the gap in the scientific literature concerning the complex analysis of methods for developing business operations that adhere to an ecological strategy and utilize green technologies, drawing on China's experience with implementing environmental management developments and its implications for green industry standards globally.

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## Materials and methods

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The methodological basis in this research foundation combines the key principles of business development in the framework of environmental strategy in China analysis with a comprehensive study of the green industry concept as a factor limiting the activities of enterprises to prevent environmental pollution. The statistical information that was used in this research is based on several Chinese works (Zheng et al., 2018; Chen et al., 2017), and other (Smagulova et al., 2015; Khajuria et al., 2022) authors considered various aspects of green innovation policy implementation in the economy of the People's Republic of China in their research.

The practical application of the system analysis method of the basic principles of building a business, within a given environmental strategy allowed the determination of the main directions of business development within the concept of the green industry in China today. At the same time, the funda-

mental elements of the business-government agency interaction within the concept of the green industry, necessary to ensure the effective development of the economy and growth of the gross domestic product (GDP), with a sufficient level of environmental protection were identified. A comprehensive study of the principles of building a green industry as a factor that can ensure the preservation of the environment and limit the activities of production enterprises has allowed the identification of the main trends in the construction of environmental policy in China. At the same time, the principles of the development of green investment policy in the country were considered, as well as statistical data on investment in the development of the economy and industry within the framework of state environmental protection policy.

The selected combination of research methods pre-defined its main stages. In the first stage of the research, the role of the green industry in the economy of China was considered, as well as the main directions of business development in the country, within the framework of the specified ecological concept. At the same time, the essential elements of business process regulation by the state were determined, and the results achieved in this direction were assessed. The role of the state in the issues of providing measures to protect the environment from damaging emissions of industrial enterprises, expressed in the termination of the most polluting from an environmental point of view of industrial production is noted. Statistical data showing the level of damage to the environment from the activities of environmentally unsafe industrial enterprises are presented.

At the next stage of the research, the influence of the “green” investments policy on the development of business in the country was considered, and particular statistical information showing the volume of investment in the economy, aimed at the development of environmentally friendly technologies were presented. It also assesses the level of renewable energy sources usage to meet the demands of running industrial enterprises and presents specific statistical indicators showing the actual volume of their use in the total volume of energy consumption in the industry.

At the final stage of the research, an analytical comparison of its results with the results and conclusions of other studies on several related topics was conducted. This allowed the clarification of the results obtained and to form on their basis the conclusions, acting as their logical reflection and summarizing the entire complex of scientific research carried out within the framework of the stated topic.

## Results

The green industry has a prominent place in China’s economy as the country has officially announced its ambitious climate change plans. They are referring to achieving a carbon peak (total emission of CO<sub>2</sub> reaches a historical peak in a certain period and then gradually decrease) by 2030 and carbon neutrality (the total emission of CO<sub>2</sub> is offset by planting trees, energy-saving, etc.) by 2060. Such claims highlight the need to develop and implement a set of measures to reduce greenhouse gas emissions as soon as possible, as well as to improve the efficiency of natural resources at all stages of the production cycle of industrial enterprises in the country (Zhao et al., 2022). Business development within the concept of the green industry in China is conducted within the framework of the Agenda adopted by the United Nations on September 25, 2015, which outlines the main trajectories of social and economic development of the country in the long-term time horizon. The official title of the Agenda is “Transforming Our World: The 2030 Agenda for Sustainable Development Goals”. The Sustainable Development Goals (SDGs) are a universal call to action, comprising 17 interlinked global goals designed to be a “blueprint to achieve a better and more sustainable future for all” by 2030. Established by the United Nations in 2015, these goals recognize that ending poverty and other deprivations must go hand-in-hand with strategies that improve health and education, reduce inequality, and spur economic growth – all while tackling climate change and working to preserve oceans and forests. SDGs include 17 goals of sustainable development, which are divided into 169 supporting tasks structured around 3 pillars: economic, social and environmental. These targets are designed to be clear and measurable, which allows countries to track progress and ensures accountability (Khajuria et al., 2022).

China’s green investment policy dates to the 9th Five-Year Plan (1996-2001) when the principles of environmental protection for industry, sustainable economic development, the green economy, and land conservation were officially proclaimed. The 11th Five-Year Plan (2006-2010) is the world’s first-ever “green economy and industry development plan” based on the concept of “environmentally based innovative development of a modern communist society. In 2001 “green” investment was 186 billion yuan – 1.7% of China’s GDP, and by 2010 had increased 8.5 times to 1.6 trillion yuan – 4% of GDP (Chen et al., 2017). The experience of the People’s Republic of China is a clear demonstration of the consolidation of market

and government structures in the development of a “green” economy (Zheng et al., 2018).

In 2017, China created the largest carbon market in the world. Following that, every business entity was offered a choice: either invest in the advancement of “green” industrial and production technologies and receive substantial state benefits, or stick to the use of earlier technological solutions and pay back all costs to society associated with the release of harmful emissions into the environment. In particular, the use of alternative energy sources in the Chinese industry generates 23.7% of total electricity consumption, and the share of renewable energy in new power generation capacity reached 65.5% in 2017 (Tao, 2018). The number of private companies producing electricity from alternative sources has increased significantly at the same time, which has been made possible by the state’s provision of the required support. In particular, the National Renewable Energy Center of China buys large amounts of electricity from private wind and solar power plants at specially defined tariffs, the profitability of which is ensured by their relatively high cost compared to the standard (Levanchuk, 2016). Currently, business development within the concept of the green industry in China prioritizes the following key areas:

- Organization of productions with a maximum reduction in the volume of emissions of harmful substances into the environment.
- Increasing the volume of investment in the development of environmentally friendly industrial technologies.
- Close cooperation between business structures and the state in the implementation of joint production development programs within the concept of the green industry.

The state’s industrial policy and the mechanism for allocating investment funds at the state level are the primary factors influencing the present business development trends within the framework of the green industry in China. The economic efficiency and competitiveness of the country’s business structures are since the Chinese government fully supports vital industrial sectors and actively participates in the formation of public and private corporations, whose activities contribute to national development and improvement (Chen et al., 2017).

Under the classification of the Organization for Economic Cooperation and Development (OECD), “green” technologies include the following areas: general environmental management (waste management, minimization of harmful emissions into the environment, regeneration of affected land); obtaining energy in the necessary volumes from alternative sources, re-

ducing the adverse effects of climate events, reducing atmospheric pollution. At the beginning of 2020, the Chinese government planned to increase the amount of energy produced from renewable sources to 15% and reduce the carbon intensity of the economy to 45%. From 2011 to 2022, China officially closed more than 2000 environmentally dirty enterprises (state and private). State spending on renewable energy production and the green industry has multiplied during this time, outpacing comparable measures in the United States and European Union member states. A significant area of “green” technology development that has seen significant advancements thanks to widespread encouragement is nanotechnology. Today, the government of the People’s Republic of China has set an ambitious goal – to capture global leadership in expanding the range of practical applications of green technologies. In 2022, China’s green investment significantly increased, reaching approximately 2.6 trillion yuan, marking a 20% increase from the previous year. This surge in green investment demonstrates China’s commitment to prioritizing growth in sectors that are more sustainable than traditional industries like real estate and infrastructure (China’s green. . . , 2023).

Moving into 2023, green development and decarbonization continued to be routine topics in China’s policy discussions. But there appears to have been a slight shift in emphasis toward encouraging economic stability, attaining modest growth, improving self-sufficiency, and finding work. The Chinese government set a GDP growth target of 5%, reflecting a more conservative growth approach (Ziying, 2023). Despite a more moderate overall economic growth target, China’s issuance of green bonds remains robust. The country is expected to issue between 90 billion dollars and 100 billion dollars of green bonds in 2023. This forecast highlights China’s continued efforts to maintain its leadership in green finance and to bring its practices into line with international norms (Wu & Ahmad, 2023). In 2022, China led the global market in green bond issuance, reaching 76.25 billion dollars and solidifying its position as a significant player in green finance (Kapron, 2023). These figures and policy directions indicate that China is maintaining a strong trajectory toward enhancing its green investments and finance, with an eye on leading global efforts in this field while balancing its broader economic objectives.

The development of business within the concept of the “green” industry in China is inseparable from the peculiarities of the strategy of ecological development of the state economy. The country’s economy is currently experiencing a period of rapid expansion, and one of the most important concerns in this regard is the ongoing pollution and environmental degradation

problem. The country's environmental policy provides for state regulation of business processes in the following aspects:

- Control of hazardous substance emissions from production facilities.
- Equipping state and private production enterprises with technological equipment that reduces environmental damage.
- Gradual transition to meeting the energy needs of operating businesses to renewable sources.
- Gradual replacement of technological processes in enterprises with more environmentally advanced ones.
- Increasing the overall level of environmental literacy of the personnel of production enterprises.

Certain results have already been achieved in this area. As early as 2012, the State Environmental Protection Administration of the People's Republic of China publicly listed 11 private industrial companies that were causing significant damage to the environment by emitting metal aerosols, sulfur and nitrogen oxides, carbon monoxide, soot, and carbon dioxide. Almost all of these companies operate in the metallurgical industry. Every year, the State Environmental Protection Administration prepares a periodic report on environmental protection in cities with manufacturing. At the beginning of 2013, China released the results of a long-running statistical study of the consequences of damage to the national economy from environmental pollution. The presented statistical information shows that the damage for 2010-2012 exceeded 3% of the country's GDP, with an amount of 7% of the gross domestic product needed to cover the losses from the damage (Zhen, 2014).

The challenge of putting environmental protection laws into practice in the face of fast economic development has contributed significantly to the growth of the green industry concept in China. Intensive economic growth is accompanied by increased pressure on limited natural resources, which is a determining factor in the historical development of society. China's environmental policy has been shaped by the implementation of economic reforms, with economic growth occurring during an increase in economic tensions in the country (Mozias, 2016). As a result, even though business development in the nation has generally been going well, there are still some challenges because of the integration of multiple Chinese companies into the green industry. In the middle of 2021, there was a sharp decline in the shares of several companies in the country, and the negative dynamics were the most intense for the period since 2008 (Wan et al., 2023).

Notwithstanding the challenges at hand, business development in China within the framework of green

policy holds great promise. This has to do with the government policy that places a strong emphasis on developing the domestic market over the next five years. This involves a significant expansion of the volume of domestic demand for manufactured products, as well as the implementation of structural state reforms regarding the regulation of the supply of manufactured products. At the same time, the country is actively developing digital platforms: B2B – business to business, B2C – business to consumer, G2G – government to government, C2C – consumer to consumer, G2C – government to consumer, and G2B – government to business, with a focus on both domestic and foreign market segments. The platform economy of the People's Republic of China, which optimally fits into the concept of the green industry, will receive motivation for development, in the context of trends toward the improvement of artificial intelligence (AI) systems and their use in various business areas (Stepanova, 2021).

Rapid and intricate changes have occurred in the economic landscape in recent years, primarily as a result of the COVID-19 pandemic and the supply chain disruptions that followed in China. In 2020, China's economy experienced a severe contraction accompanied by strict lockdown measures, with growth falling by at least 6%. Since supply chain volatility is now acknowledged as a major business threat, the pandemic has highlighted the vital role that supply chains play and elevated chief supply chain officers to important strategists in organizations. The impact of public health measures has been profoundly demonstrated by the marked shift in consumer behavior in China, as evidenced by a 32% decline in offline spending during the 12 weeks following the outbreak. These disruptions have resulted in global shortages of in-demand goods, underscoring the incapacity of current supply chains to promptly respond to such abrupt surges in demand. The susceptibility of major urban centers is highlighted by the economic turmoil caused by Shanghai's lockdowns, demonstrating the ongoing testing of supply chains' resilience. In addition to creating difficulties for international trade in the form of labor shortages, logistics issues, and semiconductor scarcity, these disruptions have also increased inflation and slowed economic growth, particularly in industries like the automobile sector. The Global Supply Chain Index has risen to unprecedented heights as a result of the pandemic's widespread effects, surpassing even the levels caused by catastrophic events like the 2011 tsunami in Japan. This indicates the pandemic's profound and extensive influence on global supply chains (How the pandemic... , 2023; The global... , 2023).

Thus, the development of business within the concept of the green industry in China has significant prospects, which are supported by the existence of government programs to finance the “green economy. The rapid advancement of artificial intelligence technologies has also made it easier, as it permits the steady application of cutting-edge information technologies to ensure efficient management of production and technological processes at the country’s businesses, all while preventing or minimizing environmental harm.

## Discussion

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[9] Y. Hao et al. (2022) in research on the impact of industrial agglomerations on air pollution note that modern industrial agglomerations not only bring economic development but also have an extremely negative impact on the environment. According to the scientists, the creation of a model for determining the environmental air pollution scale from industrial enterprises will enable industry development to be regulated within the parameters of the ecological strategy that has been adopted, addressing the potential for lowering the amount of hazardous emissions into the environment. The scientists’ conclusions coincide in principle with the results of this research, mainly in the context of assessing the practical effectiveness of developing a model to determine the dependence of the scale of ambient air pollution during the operation of industrial enterprises on the volume of their production activities. Environmental pollution has serious negative effects on China’s economy and public health. Pollution has led to increased respiratory and cardiovascular diseases and premature deaths, straining the healthcare system and reducing productivity. The depletion of natural resources, such as coal, and the resulting environmental degradation hinder economic growth and reduce potential for future economic growth (Sabyrhanova & Bajzhanova, 2011). The social costs are substantial, with increased healthcare expenses, reduced labor productivity, and negative impacts on tourism and trade.

L. Xu (2022) studies how China has implemented specific policies and initiatives to encourage the adoption of green technologies, including nanotechnology, in its industrial sector. One such policy is “Made in China 2025,” which aims to improve the green innovation of manufacturing enterprises. Through a variety of strategies, including corporate social responsibility programs, tax breaks, and environmental subsidies, it encourages green innovation. The policy’s

effects are, however, dependent on enterprise governance and regional factors, indicating a nuanced approach is needed for different areas and companies. In order to promote green innovation, the Chinese government also uses financial instruments such as green bonds and loans as well as market policy tools like carbon emission trading schemes. Additionally, non-market measures are used, such as improving the renewable energy standard system and constructing a legal framework to support green and low-carbon development. By boosting sustainability, cutting waste and emissions, and improving efficiency, these technologies and regulations support the expansion of the green industry. The shift towards a green economy is also helping China to address its environmental challenges and meet its commitments to international climate goals.

The connection between green economy performance and government spending is addressed in a joint study by H. Feng et al. (2022). In the study, the authors concluded that today the most promising countries in terms of the development of a green economy and the prospects of building business within the concept of green industry are Saudi Arabia, Japan, and China. Independent economic tests show a favourable impact of green innovation on regional economic development, indicating good prospects for a sound environmental strategy in business, according to scientists. The conclusions of researchers coincide with the results of this scientific work in the context of the impact of environmental innovation on the development of certain business areas.

The issue is considered by F. Kusumo et al. (2022) in a joint scientific study of closed-loop assessment systems in biological systems. Researchers note that the economics of the closed loop has recently gained considerable popularity in global and regional contexts, in terms of the principles of environmental justice. The researchers concluded that the economy of the closed cycle is an alternative to the traditional type of economy, and all its indicators have their characteristics reflecting the actual level of implementation of the principles of environmental strategy in the activities of enterprises and the effectiveness of their implementation of the concept of the green industry in the long-term time perspective. The conclusions of this scientific research require testing in the practical plane and therefore seem to be controversial.

Moreover, L. Saha et al. (2021) in research on the degree of impact on humans and the environment of electronic waste, as one of the by-products of doing business by several modern enterprises, note that this kind of waste contains a large number of hazardous components, which have an extremely nega-

tive impact on the biosphere in the location of enterprises, which such waste is emitted. In accordance with the scientists, carrying out operations in accordance with the environmental management principles requires the prompt implementation of a set of measures to monitor the volume of emissions of harmful substances into the environment during the operation of enterprises producing electronic waste (Zhumadilova et al., 2023). The conclusions of the researchers clearly illustrate the need to implement the principles of environmental management in the sphere of activity of contemporary businesses, thus complementing the results of this scientific work.

A similar issue is considered in the study by M.A. Al-Ghouti et al. (2021), on advances in sustainable management and conservation of natural and energy resources. Following the authors, the destruction of modern industrial waste by incineration has become widespread throughout the world. At the same time, it is concluded that the transformation of industrial waste into energy has significant consequences for the environment, so the activities of any modern enterprise should include a set of measures to minimize the damage to the outside space, caused by the incineration of waste from the operation of the enterprise (Sargsyan et al., 2023). The findings of this study completely align with the researchers' conclusions.

In turn, Y. Huang et al. (2022) conducted research on the trends in the reduction of carbon emissions in the export trade of the manufacturing industry. Following the authors, the impact of increasing material costs on the elimination of harmful carbon emissions of enterprises in the sphere of industrial production is insufficiently studied. Researchers conclude that the servitization of industrial enterprise production processes has an extremely negative impact on the export performance of manufacturing industrial products. Furthermore, the negative influence of resource servitization is much higher at export operations with the products of the manufacturing industry, at the enterprises of which intensive environmental pollution occurs, than at export of the products of the manufacturing industry, where such pollution does not occur (Sarybaeva et al., 2015). The researchers' conclusions are debatable because they ignore the particulars of the operations of particular industrial enterprises.

Meanwhile, A. Sudharshan Reddy and A.T. Nair (2022) considered the available technology principles of microplastic structural rehabilitation in modern hydraulic treatment plants in joint research. The scientists came to the conclusion that a variety of environmentally friendly water treatment techniques have been incorporated into today's wastewater treatment plant systems. Particulate matter extracted

from wastewater can be carbonized to produce a substance that can then be used to decompose other pollutants, which is an effective example of a successful environmental management strategy for managing the removal of pollutants (Zhumadilova and Zhigitova, 2023). The conclusions of the researchers do not contain fundamental contradictions with the results of this research.

Research by A. Shamzzuzoha et al. (2022) investigated the key principles of creating a professional education center for green innovation. It was concluded, that for the introduction of "green" innovations in the activity of modern industrial enterprises, it is necessary to understand the nature of skills gaps of these enterprises in the field of conducting the ecological policy. Scholars observe that prompt detection and closure of these kinds of gaps enables businesses to continue implementing their daily operations in an environmentally responsible manner. The conclusions of the researchers need practical testing in specific areas of industrial enterprises, as the specifics of these areas have a direct impact on the effectiveness of the implementation of certain innovative solutions at the enterprises.

The problems of environmental assessment of industrial waste management located in rural areas are considered in joint research by P. Morias Lima et al. (2021). The authors note that the problem of solid waste management in industrial enterprises affects all cultural groups and regions and in the near future is practically insoluble. Today, the development of the industrial enterprise, belonging to any sphere of business, is inextricably linked to the need for effective disposal of solid waste of its industrial life activity without causing damage to the environment (Bayzhanova et al., 2013). The researchers' conclusions, which primarily expand on the findings in the context of evaluating the significance of waste disposal issues for the industrial enterprise in its operations, do not, in general, conflict with the findings of this study.

The reviewed studies collectively highlight the significant environmental impacts of industrial activity and the importance of implementing green policies and innovations to mitigate harmful effects. Y. Hao et al. (2022), M.A. Al-Ghouti et al. (2021), and P. Morias Lima et al. (2021) demonstrate how industrial pollution and waste management practices can degrade air, land, and water quality, with severe consequences for public health. L. Xu (2022), H. Feng et al. (2022), and A. Shamzzuzoha et al. (2022) examine policy tools, like carbon trading schemes and investments in green technology, that Chinese authorities have employed to encourage greener industry practices. F. Kusumo et al. (2022) and A. Sud-

harshan Reddy and A.T. Nair (2022) analyse alternative closed-loop and waste-to-energy systems that can improve resource efficiency and reduce environmental footprints. However, Y. Huang et al. (2022) sound a note of caution that green interventions do not always translate into reduced emissions, indicating a nuanced approach is required. All things considered, the research highlights the necessity of implementing a variety of strategies, from enterprise innovations to government regulations, in order to shift towards more sustainable industrial models that lessen the harm that current practices cause to the environment. While the studies assess different contexts and solutions, they converge on the urgency of addressing the ecological impacts of industry through comprehensive and context-specific interventions.

## Conclusions

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Business development within the concept of the green industry requires considering several factors that determine the efficiency of enterprises or a particular industry in terms of minimizing the harm caused to the environment by the activities of these enterprises or industries. Such factors should include environmental management of enterprise activities (control of harmful emissions and waste, prevention of excessive water and air pollution); gradual transition to renewable energy sources as the main means of solving the issues of energy supply of the enterprise, the maximum elimination of the effects of climate change, minimizing the volume of harmful emissions into the atmosphere. Simultaneously, state support for business development within the green industry concept is a necessary component. This support kind is expressed in the allocation of investment funds for the development of green technologies and stimulating the transition of enterprises to the use of alternative energy sources in their activities.

The high rate of economic development in China necessitates the search and implementation of effective mechanisms for implementing environmental policy at the state level, which is expressed, first of all, in the regulation of production enterprises in various sectors of business. The results of the government's environmental policy are the termination of several enterprises that have caused significant harm to the environment by harmful emissions into the atmosphere, as well as a consistent transition to the use of alternative energy sources to meet the needs of operating industries. Thus far, China's state policy regarding environmental management has proven to be entirely

justified. This is evidenced by the rapid growth of the country's gross domestic product over the past decade as industrial production increases and pollution levels decline. Prospects for further research in the framework of the declared topics are conditioned by the possibility of the practical application of China's experience in the development of business within the concept of the green industry in other countries, to obtain similar results.

In conclusion, this research highlights the importance and complexity of integrating ecological safety within business development and industrial production, with a focus on minimizing environmental damage. The research underscores China's significant strides in advancing the green industry concept through substantial state investments and the implementation of green technologies within its business structures. The study's findings show that businesses and the government can work together effectively to promote a sustainable economy, and there is hope that China's green industry will continue to expand. The practical implications suggest that the research outcomes can guide the structuring of business processes in enterprises that are aligned with green industry concepts and existing environmental policies. The findings contribute to a growing body of knowledge advocating for a harmonious balance between industrial growth and environmental stewardship, not only within China but also as a model for global best practices in sustainable development.

The research's overall conclusions provide insightful information to a worldwide audience and support the widespread use of green technologies and regulations to reduce industrial pollution. While China provides a unique context, the principles of green industry, environmental management, and sustainable resource use are globally relevant. Countries at different stages of development can learn from China's approach to environmental policy-making, the integration of green technologies, and the challenges encountered. Such knowledge exchange can stimulate innovation, inform policy adjustments, and foster international collaboration towards a global green transition, underscoring the shared responsibility to protect the environment while pursuing economic development.

## References

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- Al Al-Ghouti, M.A., Khan, M., Nasser, M.S., Al-Saad, K., & Heng, O.E. (2021). Recent advances and applications of municipal solid wastes bottom and fly ashes: Insights into sustainable management and conservation of resources. *Environmental Technology & Innovation*, 21, article number: 101267.



- Babak, V., Mokiychuk, V., Zaporozhets, A., & Redko, O. (2016). Improving the efficiency of fuel combustion with regard to the uncertainty of measuring oxygen concentration. *Eastern-European Journal of Enterprise Technologies*, 6(8–84), 54–59.
- Bayzhanova, S.B., Kudabaeva, A.K., & Dzhanahmetov, O.K. (2013). On the question of ecological safety of leather production. *Izvestiya Vysshikh Uchebnykh Zavedenii, Seriya Tekhnologiya Tekstil'noi Promyshlennosti*, (6), 154–157.
- Bochtis, D., Achillas, C., Baniyas, G., & Lampridi, M. (2020). *Bio-economy and Agri-production*. Academic Press, London.
- Chen, D., Li, O., & Xin, F. (2017). Five-year plans, China finance and their consequences. *China Journal of Accounting Research*, 10(3), 189–230.
- China's green finance development in the fast lane. (2023). [http://www.china.org.cn/business/2023-06/23/content\\_88936624.htm#:~:text=According%20to%20the%20latest%20estimate,as%20real%20estate%20and%20infrastructure](http://www.china.org.cn/business/2023-06/23/content_88936624.htm#:~:text=According%20to%20the%20latest%20estimate,as%20real%20estate%20and%20infrastructure) [07.09.2023].
- Dastbaz, M., Pattinson, C., & Akhgar, B. (2015). *Green Information Technology*. Morgan Kaufmann, Burlington.
- Feng, H., Liu, Z., Wu, J., Iqbal, W., Ahmad, W., & Marie, M. (2022). Nexus between Government spending's and Green Economic performance: Role of green finance and structure effect. *Environmental Technology & Innovation*, 27, article number: 102461.
- Hao, Y., Guo, Y, Li, S., Luo, S., Jiang, K., Shen, Z., & Wu, X. (2022). Towards achieving the sustainable development goal of industry: How does industrial agglomeration affect air pollution? *Innovation and Green Development*, 4, article number: 100003.
- How the pandemic has changed China's economy – Perhaps for good. (2023). <https://theconversation.com/how-the-pandemic-has-changed-chinas-economy-perhaps-for-good-167597#:~:text=Greg%20Baker%20FAFP,But%20in%202021%2C%20the> [07.09.2023]
- Huang, Y., Zhang, Y., Xiang, Y., & Dong, X. (2022). Has servitization reduced the embodied carbon emissions of manufacturing export trade? Evidence from 38 countries worldwide. *Environmental Technology & Innovation*, 1, article number: 102950.
- Kapron, Z. (2023). China aims to become a leader in green finance. <https://www.forbes.com/sites/zennonkapron/2023/04/19/china-aims-to-become-a-leader-in-green-finance/?sh=1fb2ece27d49> [07.09.2023]
- Khajuria, A., Atienza, V.A., Chavanich, S., Henning, W., Islam, I., Kral, U., Liu, M., Liu, X., Murthy, I.K., Oyedotun, T.D.T., Verma, P., Xu, G., Zeng, X., & Li, J. (2022). Accelerating circular economy solutions to achieve the 2030 agenda for sustainable development goals. *Circular Economy*, 1(1), article number: 10000.
- Kusumo, F., Mahlia, T.M.I., Pradhan, S., Ong, H.C., Silitonga, A.S., Rizwanul Fattah, I.M., Nghiem, L.D., & Mofijur, M. (2022). A framework to assess indicators of the circular economy in biological systems. *Environmental Technology & Innovation*, 28, article number: 102945.
- Lee, C.-C., & Hussain, J. (2022). Carbon neutral sustainability and green development during energy consumption. *Innovation and Green Development*, 8, article number: 100002.
- Levanchuk, V.A. (2016). China Development Bank and sustainable development. *Bulletin of International Organizations: Education, Science, New Economy*, 3, 153–168.
- Machado, C., & Davim, J.P. (2022). *Green Production Engineering and Management*. Woodhead Publishing, Soston.
- Morias Lima, P., de Morais, M.F., Constantino, M.A., Paulo, P.L., & Magralhaes Filho, F.J.C. (2021). Environmental assessment of waste handling in rural Brazil: Improvements towards circular economy. *Cleaner Environmental Systems*, 2, article number: 100013.
- Mozias, P.M. (2016). Environmental Policy in China: Up the Downward Ladder? *Society and State in China*, 7, 274–314.
- Parvez Mahmud, M.A., Farjana, S.H., Lang, C., & Huda, N. (2022). *Green Energy*. Academic Press, London.
- Sabyrhanova, S.S., & Bajzhanova, S.B. (2011). Reduction of materials consumptions of a knitted fabric. *Izvestiya Vysshikh Uchebnykh Zavedenii, Seriya Tekhnologiya Tekstil'noi Promyshlennosti*, (2), 64–67.
- Saha, L., Kumar, V., Tiwari, J., Rawat, S., Singh, J., & Baudhdh, K. (2021). Electronic waste and their leachates impact on human health and environment: Global ecological threat and management. *Environmental Technology & Innovation*, 24, article number: 102049.
- Sargsyan, G., Gukasyan, P., Sargsyan, H., & Poveda, R. (2023). Diffusion flames and a semi-empirical method for estimating the distribution of hydrogen molecules in propane flames. *Scientific Herald of Uzhhorod University. Series "Physics"*, (53), 42–52.
- Sarybaeva, E.E., Bayzhanova, S.B., Bashkova, G.V., Sarybaeva, K.E., & Shardarbek, M.Sh. (2015). Use the multifunction entanglement as way of the reduction specific consumption of materials double knitted fabric. *Izvestiya Vysshikh Uchebnykh Zavedenii*,

- Seriya Teknologiya Tekstil'noi Promyshlennosti*, 359 2015-January(5), 123–127.
- Shahini, E., Misiuk, M., Zakhodym, M., Borkovska, V., & Koval, N. (2023). Analysis of the economic efficiency of growing pigs for meat and its improvement. *Scientific Horizons*, 26(6), 110–120.
- Shamzzuzoha, A., Chavira, P.C., Kekale, T., Kuusniemi, K., & Jovanovski, B. (2022). Identified necessary skills to establish a center of excellence in vocational education for green innovation. *Cleaner Environmental Systems*, 7, article number: 100100.
- Singh, V.K., Bangari, N., Tiwari, R., Dubey, V., Bhoi, A., & Babu, T. (2022). *Green Energy Systems*. Academic Press, London.
- Smagulova, Zh.B., Mukhanova, A.E., & Musaeva, G.I. (2015). Analysis of the world experience of transition to a green economy: background and directions. *International Journal of Applied and Basic Research*, 1, 92–96.
- Stepanova, S.T. (2021). *Chinese economic policy at the present stage*. <https://ru.valdaiclub.com/a/highlights/kitayskaya-ekonomicheskaya-politika/> [07.09.2023]
- Sudharshan Reddy, A., & Nair, A.T. (2022). The fate of microplastics in wastewater treatment plants: An overview of source and remediation technologies. *Environmental Technology & Innovation*, 28, article number: 102815.
- Syrmanova, K., Agabekova, A., Sakibayeva, S., Kovaleva, A., Botashev, Y., Kaldybekova, Z., & Bayzhanova, S. (2020). Physical-mechanical properties research of paint materials on the basis of petroleum bitumen. *Egyptian Journal of Chemistry*, 63, 609–616.
- Tao, Y. (2018). Development of alternative energy. *China*, 10, 28–29.
- The global supply chain is still facing pandemic pressures. (2023). <https://usafacts.org/articles/the-global-supply-chain-is-still-facing-pandemic-pressures/#:~:text=Even%20natural%20disasters%20like%20the,lockdown%20measures%20in%20early%202020> [07.09.2023]
- Trusova, N., Demchenko, I., Kotvytska, N., Hevchuk, A., Yeremenko, D., & Prus, Y. (2021). Foreign-Economic Priorities of the Development of Investment Infrastructure of Agri-Food Production Entities. *Scientific Horizons*, 24(5), 92–107.
- Wan, S., Lee, Y.H., & Sarma, V.J. (2023). Is Fintech good for green finance? Empirical evidence from listed banks in China. *Economic Analysis and Policy*, 80, 1273–1291.
- Wu, J., & Ahmad, R. (2023). *China to keep lead in green bond market amid alignment with global standards*. <https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/china-to-keep-lead-in-green-bond-market-amid-alignment-with-global-standards-74039783> [07.09.2023]
- Xu, L. (2022). Towards green innovation by China's industrial policy: Evidence from Mage in China 2025. *Frontiers in Environmental Science*, 10, 924250.
- Zhao, G., Geng, Y., Tang, C., Hao, H., Bleischwitz, R., & Tian, X. (2022). Improving aluminium resource efficiency in China: Based upon material flow analysis and entropy analysis. *Circular Economy*, 1(1), article number: 100005.
- Zhen, L. (2014). The state of the natural environment and ecological policy of China. *Humanities, Socio-Economic and Social Sciences*, 5, 1–6.
- Zheng, P., Zhu, J., & Wang, H. (2018). The Performance Evaluation of Chinese Commercial Banks under the “Equator Principle”. In: *Proceedings of the 2018 4th International Conference on Social Science and Higher Education* (pp. 841–844). Atlantiss Press, Dordrecht.
- Zhumadilova, A., & Zhigitova, S. (2023). Features of Modern Areas of Solid Waste Disposal. *Evergreen*, 10(2), 640–648.
- Zhumadilova, A., Zhigitova, S., & Turalina, M. (2023). The impact of greenhouse gases on climate change. *Scientific Horizons*, 26(6), 97–109.
- Ziying, S. (2023). *China's two sessions of 2023: Trend for green development, green finance, and Belt and Road Initiative (BRI)*. <https://greenfdc.org/chinas-two-sessions-of-2023-trend-for-green-development-green-finance-and-belt-and-road-initiative-bri/#:~:text=Overall%2C%20green%20development%20and%20decarbonization,the%20lowest%20in%20a> [07.09.2023]