



Study on the development path of low-carbon economy under the guidance of Marx's ecological thought: A case study of China

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ABSTRACT

This paper probes into the guiding effect of Marx's ecological thought on the development of China's low-carbon economy. This paper summarizes Marx's ecological thought and the core idea of low carbon economy, and points out the close relationship between Marx's ecological thought and low carbon economy in starting point, theoretical guidance and practical approach. This paper analyzes the development status and existing problems of China's low-carbon economy, such as lack of green and low-carbon consciousness, slow transformation of economic development mode, lagging carbon reduction technology and imperfect system. Under the guidance of Marx's ecological thought, the paper puts forward specific paths to promote the development of China's low-carbon economy, including liberating ideas to correctly grasp the relationship between man and nature, transforming development modes to promote the synchronous coordination of ecology and economy, strengthening scientific and technological empowerment to promote the synergistic effect of pollution reduction and carbon reduction, and building a community of life between man and nature in accordance with the laws of nature. And improving the institutional guarantee to eliminate the antagonism of the relationship between man and nature. These paths aim to achieve sustainable development of low-carbon economy and provide strong support for ecological environmental protection and climate change response in China and the world at large. Through this study, it not only helps to deepen the understanding and application of Marx's ecological thought, but also provides theoretical support and practical guidance for the development of China's low-carbon economy.

Keywords: Marx; Ecological thought; Low-carbon economy; Development path; Research

1. INTRODUCTION

(1) Background: The Industrial Revolution brought a huge leap in productivity, but it also led to increasingly severe environmental problems. As machines replaced human and animal power, human society moved towards an unprecedented level of industrialization. ¹However, during this process, the sharp increase in the concentration of carbon dioxide in the atmosphere has created a vicious circle for the global climate, with meteorological disasters such as hurricanes, floods and droughts becoming more frequent and natural ecosystems facing the threat of imbalance. In this context, Marx's ecological thought appears to be particularly important. They pointed out the close relationship between man and nature, and warned of the ruthless revenge that conquest of nature can bring. ²³China, the world's largest carbon emitter, has recognised the urgency of tackling climate change and has put forward ambitious two-carbon targets.

To achieve this goal, it is necessary to abandon the traditional path of industrial development with high energy consumption, high emissions and high output, and comprehensively promote the green transformation of its economy and society. (Lou Xin et al., 2016) Learning from and applying Marx's ecological thought, in-depth analysis of the concept, content, characteristics and significance of "low-carbon economy" is of important guiding significance for China to promote the dual-carbon strategy and develop low-carbon economy. At the same time, in view of the problems existing in the process of promotion, it is necessary to actively explore and promote the new path of low-carbon economy development, in order to contribute^[1] to the realization of high-quality economic and social development in the 14th Five-Year Plan period.

¹ Selected Works of Marx and Engels Vol. 1 [M]. Beijing: People's Publishing House, 1995:277.

² The Complete Works of Marx and Engels, Vol. 42 [M]. Beijing: People's Publishing House, 1979:95.

³ Selected Works of Marx and Engels Vol. 4 [M]. Beijing: People's Publishing House, 1995:383.

(2) Significance of the topic: With the deepening of cultural and economic globalization, ecological crisis has evolved from a local problem in the past to a global challenge. In the face of increasingly severe climate warming and environmental damage, it is urgent for all countries in the world to change the traditional economic development model and unswervingly follow the path of low-carbon. In this process of transformation, Marx's ecological thought provides valuable theoretical guidance. The core of the thought lies in the correct handling of the relationship between man and nature, the pursuit of sustainable use of nature, aimed at meeting the needs of the present generation, while not harming the interests of future generations. In a theoretical sense, Marx's ecological thought not only provides a new theoretical framework for observing and transforming the world, but also injects new vitality and ideas into the construction of socialist ecological civilization with Chinese characteristics. In addition, an in-depth study of this thought will help promote the innovation and development of Marxist theory in China. From a practical point of view, the environmental damage caused by economic globalization has had a serious impact on human survival and development. China's past extensive growth model can no longer meet the requirements of the new era, and it must transition to a green and low-carbon development model. Marx's ecological thought has pointed out the direction for solving the current ecological crisis. The study and practice of the low-carbon economic development path under its guidance will help build an ecological civilization system with Chinese characteristics, effectively solve the resource and environmental problems, accelerate the green and low-carbon transformation, and thus realize the grand goal of carbon peak and carbon neutrality.

(3) Research status at home and abroad: In recent years, the research heat of Marx's ecological thought has increased significantly in China, although it started late (Feng Shuhui et al., 2015), scholars have explored this field in depth from different angles and formed many theoretical achievements. In the past, the relevant research mainly focused on politics, economy and culture, while the discussion on ecological thought was relatively rare. However, as China faces increasingly severe ecological and environmental problems after reform and opening up, more and more scholars have begun to pay attention to Marx's ecological thought^[2-6]. Especially since the 18th National Congress of the Communist Party of China, the construction of ecological civilization has been elevated to a national strategic height, further promoting the upsurge of research in this field. Domestic scholars are keen to sort out the connotation and development vein of Marx's ecological thought and reveal its value in The Times, in order to provide theoretical support for solving contemporary ecological and environmental problems.

In contrast, there are many viewpoints on Marx's ecological thought abroad, including negation, defense and improvement. Some, such as William Leyes^[7] and Ager, have denied Marx's ecological ideas, while scholars such as the Frankfurt School and John Bellamy Foster have defended them. At the same time, James O^[8] Connor and other scholars tried to improve Marx's ecological thought, and put forward the double crisis theory. In the aspect of low-carbon economy, scholars at home and abroad have conducted extensive research, but there are still few in-depth discussions based on Marx's ecological thought. The contributions of domestic and foreign scholars such as Feng Shuhui, Wang Yanyan, William Le^[9]yes, Agger, John Bellamy Foster^[10] and others in their respective fields have undoubtedly provided valuable theoretical resources and practical guidance.

(4) Research ideas and content framework: The topic of this paper is closely related to the goal of "double carbon" put forward by China. Through the review of Marx's ecological thought and low-carbon economy research at home and abroad, the background and significance of the topic are clarified. The paper adopts scientific research methods, excavates the innovative points of the paper, deeply discusses Marx's ecological thought, and makes a comprehensive analysis of the concept, connotation, main characteristics and practical significance of low-carbon economy. Further, the paper analyzes the close relationship between Marx's ecological thought and low-carbon economy, as well as the specific guidelines of this thought for China's low-carbon economy. At the same time, the paper also examines the development status of China's low-carbon economy, in-depth analysis of the existing problems and their causes. Finally, from the Angle of Marx's ecological thought, it puts forward the feasible path for China to realize the goal of "double carbon" and promote the development of low-carbon economy in the new era. Through this series of comprehensive research and analysis, the paper draws a comprehensive and in-depth conclusion, which provides important theoretical and practical guidance for the sustainable development of China's low-carbon economy.

(5) Research methods: This study adopts a variety of research methods to deeply explore the internal relationship between Marx's ecological thought and low-carbon economy. First of all, using the literature research method, taking "Marx's ecological thought" and "low-carbon economy" as the core, extensively collecting and reading a large number of materials and literature in relevant databases. By systematically sorting out and analyzing these materials, we successfully sorted out the theoretical framework of Marx's ecological thought, and then provided a solid theoretical support for exploring a new path of China's low-carbon economic development. Secondly, it uses the method of analysis and induction to dig deeply into the ecological thoughts scattered in the works of Marx and Engels in various periods. Although they did not systematically elaborate ecological thoughts, through careful study and comparison, they not only further clarified their ideological context, but also summarized the important views on man and nature, ecological crisis, science and technology drive, and reconciliation between man and nature. In addition, the interdisciplinary research method also plays an important role in this study. Since Marx's ecological thought involves many disciplines such as political economy, philosophy and sociology, and low-carbon economy is also a complex system involving multiple levels of economy, politics, culture and society, the knowledge and methods of these disciplines are comprehensively used to deeply analyze practical problems from multiple perspectives and reveal the important guiding role of ecological thought in the development of low-carbon economy. Finally, adhering to the principle of the unification of theory and practice, it not only deeply studies the ecological discourse in the classic works of Marx and Engels, but also closely combines the actual situation of China's low-carbon development. In this way, we strive to explore a more sustainable, inclusive and resilient economic growth mode, in order to provide strong support for promoting high-quality economic and social development, and realize the organic unity of academic research and practical operation.

(6) Research innovation: The innovative entry point of this paper is reflected in the combination of Marx's ecological thought with the research on the problems and countermeasures of China's low-carbon economy. Previous studies often focus on Marx's ecological thought or low carbon economy respectively, and rarely combine the two. However, this paper breaks this

convention, takes Marx's ecological thought as the theoretical foundation, deeply explores its connotation and key points, and uses it as the logical starting point throughout the whole paper. Through this new perspective, the paper deeply discusses the problems existing in China's low-carbon economy, and puts forward feasible countermeasures and suggestions. In addition, the paper is based on a new research background, that is, carbon peaking and carbon neutrality, which is a hot topic in today's economic society. The paper clearly points out that a low-carbon economy is the only way to achieve the goal of "double carbon", and closely combines the latest data and development results of the industry sector, and is committed to exploring a low-carbon economic transformation road that conforms to Chinese characteristics. At the same time, the paper is also very targeted, it in-depth analysis of the ecological thoughts in Marx's classic works, and closely linked to the reality, for China's low-carbon economic development in the specific problems faced by a detailed analysis. On this basis, the paper puts forward a series of practical and operational path suggestions from the aspects of correctly understanding the relationship between man and nature, changing the mode of development, adhering to the drive of scientific and technological innovation and improving the system.

2.THE MAIN RESEARCH CONTENT

(1) Overview of relevant theories

1) Overview of Marx's ecological thought

When discussing Marx's ecological thought, we must first understand its historical background. With the rise of the Industrial Revolution, the contradiction between man and nature became increasingly acute, which provided the soil for Marx to form his unique ecological thought. As a double-edged sword, science and technology not only greatly promoted the development of productive forces, but also led to the emergence of ecological crisis to a certain extent. The unrestrained exploitation and waste of natural resources under the capitalist system further aggravate the antagonism between man and nature. The formation of Marx's ecological thought is not isolated, but based on deep theoretical sources. They absorbed the essence of European philosophy, especially inspired by Darwin's biological evolution theory, and recognized the intrinsic connection between nature and the development of human society.⁴At the same time, Liebig's agricultural chemistry theory also provided powerful theoretical support for their criticism of the capitalist agricultural production mode. On the basis of criticizing Hegel's idealist view of nature and Feuerbach's humanistic view of nature, Marx and Engels built up their unique ecological thought system. The core contents of Marx's ecological thought covered the relationship between man and nature, the ecological crisis caused by the capitalist mode of production, the potential of science and technology to improve the ecological environment, and the way to realize the reconciliation of contradictions between man and nature. They believed that nature existed before human beings and provided the material conditions for human survival and development. However, while making use of and transforming nature in practical activities, human beings are also restricted by nature.⁵The profit-maximizing nature of the capitalist mode of production leads to the over-exploitation and waste of natural resources, which in turn causes serious environmental damage. In order to realize the reconciliation between man and nature, Marx put forward the key ways such as following the laws of nature, appropriately controlling the material transformation between man and nature and reforming the capitalist system. They stressed that the development of science and technology can provide strong support for improving the efficiency of resource utilization and promoting the recycling and reuse of waste, thus helping to improve the ecological environment. As a German philosopher and economist, Marx's ecological thoughts have exerted a profound influence in modern times, providing valuable ideological resources for understanding and dealing with the relationship between man and nature.

2) Overview of low carbon economy

Under the background of the increasingly severe global climate change, the concept and core content of low-carbon economy, as a new economic form, have attracted more and more attention. Low-carbon economy aims to promote economic development in the direction of low energy consumption, low emission and low pollution by reducing greenhouse gas emissions, especially carbon dioxide emissions, combined with technological innovation and institutional innovation. Its main contents cover low-carbon energy, low-carbon technology, low-carbon industry and low-carbon life and other aspects, through structural transformation, to achieve a win-win situation of economic development and environmental protection. The characteristics of low-carbon economy are advanced, ecological, economic and phased. It not only emphasizes reducing carbon emissions and improving energy efficiency, but also strives to promote the protection and improvement of the ecological environment. Developing a low-carbon economy is of great significance for slowing down climate warming, promoting healthy and sustainable economic development, coordinating the energy mix and improving environmental quality. In terms of low-carbon energy, it mainly refers to the energy of low energy consumption, low pollution and low emission, such as solar energy, wind energy and other clean energy, the development and utilization of these energy will help to change the traditional energy consumption structure and reduce the dependence on fossil energy. Low-carbon technology is the key to achieve low-carbon goals, involving the renewal of production tools, energy conservation and efficiency and waste gas purification treatment and other fields. The development of low-carbon industry requires changing the mode of economic development and guiding the industry to transform and upgrade in a more environmentally friendly and efficient direction. In addition, the concept of low-carbon life encourages everyone to start from daily life, save energy and reduce emissions, and jointly promote the low-carbon development of the whole society. The proposal and development of low-carbon economy has received the attention and support of many scholars and experts. Rubinstead, a British environmental expert, put forward the widely recognized concept of low-carbon economy, and emphasized the promotion of low-carbon technology progress^[1] through market and government means. At the same time, the data provided by the National Bureau of Statistics reflect the relationship between China's economic development and energy

⁴ Selected Works of Marx and Engels (Volume 3)[M]. Beijing: People's Publishing House,1972.

⁵ Wang Jianhui. Research on Marxist Ecological Thought [M]. Hubei: People's Publishing House,2007:43.

consumption, providing an important reference for the development of low-carbon economy. The Greenhouse Gas Bulletin released by the World Meteorological Organization provides data on global carbon dioxide concentration and temperature changes, further highlighting the importance of developing a low-carbon economy. ⁶Jiang Fei, a reporter from the Economic Observer, and Dai Houliang, an expert on the energy industry, also discussed the relationship between low-carbon development and economic growth from different perspectives, stressing the importance of green and low-carbon development and energy security.

(2) Marx's ecological thought is an important guiding ideology for China's development of low-carbon economy

1) The relationship between Marx's ecological thought and low-carbon economy

As a famous German philosopher and economist, Marx provided a valuable theoretical perspective when discussing the harmonious coexistence between human beings and nature. They deeply analyzed the relationship between man and nature, and stressed the importance of eliminating alienation and private ownership and realizing communist society. This thought not only provided a new dimension for understanding the relationship between man and nature, but also provided a solid theoretical foundation for the development of low-carbon economy. (Chang Nana et al.,2021) As an emerging economic model, low-carbon economy is precisely based on the common starting point of harmonious coexistence between man and nature, and is committed to reducing resource consumption and environmental pollution through technological innovation and green energy utilization, so as to achieve the dual goals^[12] of economic growth and environmental protection. This practical approach is not only a positive response to Marx's ecological thought, but also a profound reflection on the problem of ecological destruction under the capitalist development model. Therefore, (Zhai Meicheng et al., 2020) In the process of promoting the development of low-carbon economy, Marx's ecological thought provides important theoretical guidance and inspiration, prompting more attention to the harmonious relationship between man and nature and realizing the goal^[13] of sustainable development.

2) Marx's ecological thought provides guidelines for China's low-carbon economic development

At present, the world is facing the increasingly serious climate change and environmental problems, it is particularly important to explore the guiding role of Marx's ecological thought on China's low-carbon economic development. Marx emphasized the harmonious symbiosis between man and nature, and took the primacy, objectivity and restraint of nature on man and society into consideration of social and economic development. (Ran Jiangjing et al., 2019) This is highly consistent with the current concept of developing a low-carbon economy in China, especially in the aspects^[14] of emphasizing reconciliation between man and nature, scientific and technological progress and appropriate institutional arrangements. In the research, the works of Marx are quoted as the theoretical basis, while the in-depth study of China's development reflects the concern and thinking of China's economy and development path. ⁷This discussion not only provides important ideological support for the development of low-carbon economy, but also provides valuable theoretical guidance for China's future sustainable development.

(3) The basic situation of China's low-carbon economic development

1) Development Status

In recent years, the Chinese government has attached great importance to green and low-carbon development and vigorously advocated and promoted it at the national policy level. This strategic orientation has yielded remarkable results. According to the research data of the Global Carbon Project, the growth rate of China's carbon emissions has slowed down significantly, and the situation of rapid growth of carbon emissions has been basically reversed^[15]. This change not only reflects the Chinese government's firm determination to protect the environment, but also shows that China has initially taken on the basic characteristics of decoupling carbon emissions from economic development, marking that the low-carbon economy has entered a new stage of development. At the same time, (Liu Tiansen et al.,2020) China has also made important progress in the construction of a carbon trading market. It has established and steadily promoted a carbon emission trading market to promote carbon emission reduction through market mechanisms. In addition, in the fields of low-carbon economy such as wind power, photovoltaic power generation and new energy vehicles, China has also achieved remarkable results, demonstrating strong technological strength and market potential. It is worth mentioning that (Wang Wenbing et al., 2020) China has also made a positive contribution to carbon emission reduction by afforestation, and the forest area in southwest and northeast China has continued to increase, becoming an important source of new green area in the world. These measures have not only improved the quality of China's ecological environment, but also made China an important participant and contributor in the global response to climate change. Scholars generally agree that these positive changes have laid a solid foundation for sustainable development in China and around the world, and are expected to have a more far-reaching impact in the future.

2) Existing problems

In the current process of low-carbon economic development, China still faces many challenges. First of all, (Zhang Yuwen et al., 2022) the popularization of green and low-carbon awareness is still insufficient, which is reflected in the lack of awareness of the urgency of green transformation by some local governments and enterprises, and some places even only use^[16] green and low-carbon as a propaganda slogan without really implementing it. At the same time, the pace of transformation of economic development mode is slow, mainly because China's energy structure is difficult to change fundamentally in the short term, and fossil energy is still the main source of carbon dioxide emissions. In particular, the coal-based energy consumption structure,

⁶ Data Source: Greenhouse Gas Bulletin 2021 [EB/OL].[2022-09-30].Chrome-extension://
ibllepbhcoppkjllbabhnigcbffpi/https://www.cma.gov.cn/zfxgk/gknr/qxbg/202301/P0202301203085206841
70.pdf.

⁷ Ma Jiantang. Grasp the new development stage completely, accurately and comprehensively, Implement the new development concept, Build the new development pattern, Development Research [R],2021-06-28.

coupled with the difficulty of promoting clean energy, has further exacerbated the difficulty of transition. In addition, the adjustment of industrial structure is also under great pressure, the proportion of secondary industry remains high, and the capacity of high-energy-consuming industries continues to grow, which constitutes an obstacle to the green transformation of the industrial system. From a technical point of view, (Zhuang Guiyang et al., 2014) the lag of carbon reduction and reduction technologies is also a problem that cannot be ignored. Despite the huge scale of the low-carbon technology industry, the self-sufficiency rate of key technologies is low, and many key technologies for carbon control and emission reduction have not been mastered by China. In particular, the import dependence and high cost development and utilization of photovoltaic and other materials, as well as the lack of systematic and orderly research on low-carbon technologies, have restricted the progress^[17] of low-carbon technologies. Finally, at the institutional level, China still lacks specific carbon emission reduction legislation, and existing laws and regulations lack effective regulatory support for carbon emissions. At the same time, the phenomenon of "double-headed regulation", the lack of policy coordination, the imperfect carbon tax policy system, and the imperfect market-based carbon reduction mechanism all show that the institutional system still needs to be further improved^[18]. In order to solve these problems, it is necessary to deepen the power reform and improve the clean energy market mechanism, so as to promote the comprehensive development of low-carbon economy.

(4) The path to promote the development of China's low-carbon economy under the guidance of Marx's ecological thought

1) Emancipate our minds and concepts, and correctly grasp the relationship between man and nature

When we deeply understand the rich connotation of harmonious coexistence between man and nature, we realize that man and nature are a life community, and nature's primacy and objectivity make it the source of human life. Human beings must rely on nature, conform to nature, and form a symbiotic relationship with nature. To protect nature is equivalent to protecting human beings themselves, which requires respect for the objective laws of nature. ⁸Marx's ecological thought provides profound guidance on this point, emphasizing the principles to be followed when dealing with the relationship between man and nature. Further, it is necessary to correctly understand the scientific value of harmonious coexistence between man and nature. ⁹Adhering to this kind of harmonious symbiosis not only helps to view the relationship between man and nature in an equal and reciprocal way, but also promotes the development of social productive forces and creates rich social, cultural and economic values. More importantly, this kind of harmonious symbiosis is conducive to the sustainable development of mankind, contains huge economic value, and is the key to promoting the healthy and sustainable development of society. In order to achieve this goal, (Yin Jingjing et al., 2021) it is necessary to accurately grasp the basic requirements for harmonious symbiosis between man and nature. First of all, it is necessary to find a balance between protection and development, which requires the use of systematic thinking to deal with multiple relations such as pollution control and emission reduction, overall and local. At the same time, we must adhere to green, low-carbon, circular and sustainable ways of production and life, and strive to turn ecological advantages into development advantages so as to achieve harmony between man and nature and promote common prosperity^[19]. In this process, Marx's ecological thought has provided valuable theoretical guidance, which will help us to be more firm and clear on the road of promoting the development of low-carbon economy.

2) Transform the mode of development and promote the synchronization and coordination of ecology and economy

To cope with global climate change, China is actively promoting strategies to reduce pollution and carbon. Optimizing and adjusting the energy structure is an important part of this process. Since 80% of greenhouse gases come from energy activities, it is particularly important to build a modern energy system that is multi-energy complementary, safe and efficient, green and low-carbon. The key to this system is to promote the reduction of fossil energy and high-quality development, strictly control the growth of coal consumption, and step up the elimination of backward production capacity. At the same time, it is also necessary to vigorously develop low-carbon energy and storage systems, such as light, water and wind energy, and strive to expand the use of non-fossil energy. In addition, accelerating industrial transformation and upgrading is also an important means to achieve carbon reduction targets. Industrial restructuring has contributed more than 50% to China's overall carbon reduction. This includes promoting the decarbonization of traditional industries, introducing internationally advanced low-carbon technologies to enhance the capacity of industrial carbon reduction and decarbonization, and greening key areas, such as the promotion of new energy vehicles in the transportation sector and the development of ultra-low energy buildings in the construction sector. Through these measures, low carbon, green and sustainable socio-economic development is expected to be achieved.

3) We will strengthen scientific and technological empowerment and promote synergies between pollution reduction and carbon reduction

Science and technology play a vital role in promoting the development of low-carbon economy and ecological and environmental protection. ¹⁰In order to reduce carbon dioxide emissions, it is necessary to make use of scientific and technological innovation, especially to increase investment in technological research and development in the field of green and low-carbon, and integrate scientific research resources for long-term follow-up and focus on key problems. The research and development of key technologies, such as carbon dioxide synthesis chemicals and new power systems, will help to achieve the reduction of carbon emissions. At the same time, promoting the pilot application of cutting-edge technologies such as direct light storage, renewable energy and the integration of buildings is also an important way to reduce carbon emissions. In addition, through the progress of science and technology, (Liu Yi et al., 2022) believes that the recycling of waste can be promoted more

⁸ Selected Readings of Xijunping's Works (Volume 1)[M]. Beijing: People's Publishing House,2023:604.

⁹ Ren Ping. Marx in Contemporary Pursuit [M]. Nanjing: Jiangsu People's Publishing House,2003.

¹⁰ Liu Qingyun. On the century-old Pursuit of Social construction led by the Communist Party of China [J]. Journal of Wuhan University of Technology (Social Science Edition),2021,34(02):8-14.

effectively, the problem of large amounts of waste generation can be solved, and the harm of traditional treatment methods to the environment can be reduced. Recycling of waste, such as the recycling of glass, can not only reduce environmental pollution, but also achieve a win-win^[20] situation of economic and ecological benefits. In order to realize the substitution of green energy, it is necessary to promote the research and development of core technologies, especially the research and development and application of low-carbon clean energy. Through the joint action of government, school and enterprise, the research and development of solar energy and wind energy should be intensified, and the key technology chain of new energy should be broken through. At the same time, the research and development of core technologies such as smart grid and distributed energy, as well as the research and development and application of safe and reliable energy storage technologies, will promote the integrated development of energy and new technologies and provide strong support for the construction of a low-carbon economy.

4) Follow the laws of nature and build a community of life between man and nature

In the relationship between man and nature, we must deeply recognize the primacy of nature and the conditions it provides for life. As a part of nature, human beings not only depend on nature, but also regulate and dominate nature through practical activities. However, this regulation and domination must be carried out within the limits allowed by the laws of nature, otherwise it will inevitably come back to roost. Marx elaborated on this point in depth in his *Collected Works of Marx* (Volume 7), where they emphasized the close connection between man and nature and the necessary conditions for the transformation of matter. With the development of modern society, materialism has become increasingly prevalent, which has led to human beings being increasingly controlled by material things and desires. Lu Shuyuan deeply analyzed the negative influence of materialism on human spiritual life in *Ecological Literature and Art*. In order to resist this tendency, it is necessary to control one's material pursuit reasonably and realize the balanced development of material and spiritual pursuit, so as to promote the low-carbon sustainable development. At the same time, the synergistic effect of environmental protection and governance is crucial. We must adhere to the combination of protection and governance, strive to achieve "low-carbon" the whole process, and strictly draw red lines for ecological protection. In addition, comprehensive protection and restoration of mountains, rivers, forests, fields, lakes, grass and sand, consolidation of the achievements of returning farmland to forests, and scientific afforestation activities are all important measures to maintain ecological balance. In particular, it is an important task at present to promote coordinated management of ecosystems in key regions and take the path of ecological priority and green development. In the context of globalization, resource and environmental issues and ecological crises have become increasingly international. Therefore, it is all the more important to strengthen international cooperation. We need to jointly address resource and environmental issues and ecological crises, actively participate in global climate and environmental governance, and promote exchanges and cooperation in low-carbon technologies. 11Mo Fangchun mentioned in "Foreign Scholars' Research on the Ecological Thought of Capital" how to control the relationship between man and nature, which provides valuable ideas. Through international cooperation, we can jointly build a community of human and nature life and contribute to the sustainable development of the earth.

5) Improve institutional guarantees to eliminate the antagonism in the relationship between man and nature

Marx once pointed out profoundly that the capitalist mode of production is the fundamental cause of the destruction of the natural environment and ecological alienation, while the socialist system provides the fundamental institutional guarantee for avoiding such ecological alienation. Under the current severe challenge of global climate change, it is particularly important to promote the sustainable development of green and low-carbon economy. In order to achieve this goal, it is necessary to construct and improve the system from the three levels of laws and policies, institutional mechanisms and cultural environment. First of all, in terms of laws and policies, we can learn from the legal systems of advanced countries, formulate basic laws for low-carbon economic development in line with national conditions, and implement various provisions by enhancing the practicability and operability of laws and regulations. At the same time, we should increase financial support for green environmental protection and new energy projects, and further improve the price mechanism for the development of renewable energy and the green electricity price policy, so as to form a fiscal and tax policy system conducive to the development of low-carbon economy. Secondly, in terms of institutional mechanisms, it is necessary to improve the support system for green and low-carbon economy, such as strengthening the coordinated control of pollutants by improving the emission standard system, and gradually promoting the transition from dual control of energy consumption to dual control of total carbon emission and intensity. 12In addition, improving the ecological protection compensation system is also the key, which will help build the value realization mechanism of ecological products, and then promote the continuous improvement of ecological environment quality in the region. In order to ensure the effective implementation of these systems and policies, the management system should also be rationalized, and it is suggested that the national energy conservation department should coordinate the supervision function of carbon emissions, and formulate a clear list of carbon emission supervision responsibilities. Finally, in terms of culture and environment, the concept of low-carbon development needs to be integrated into the national education system, and the public's awareness of environmental protection needs to be enhanced through extensive publicity and education and special training on ecological civilization. At the same time, it is also necessary to explore and improve the incentive mechanism of green consumption, advocate green and low-carbon production and life mode, so that the knowledge of ecological environmental protection will be deeply rooted in the hearts of the people, so as to form a good atmosphere for the whole society to participate in the development of green and low-carbon economy.

¹¹ Xijiping. Questions and Answers on Learning Socialism with Chinese Characteristics for a New Era [M]. Beijing: Study Press, People's Publishing House, 202:361.

¹² Notice on the issuance of the Implementation Plan for Synergistic Efficiency of Pollution Reduction and Carbon Reduction [EB/OL].[2022-06-13]. https://www.mee.gov.cn/xxgk/xxgk03/202206/t20220617_985879.html.

3. CONCLUSIONS AND PROSPECTS

(1) Research conclusions

Developing a low-carbon economy is a reflection of the idea of deepening the harmonious development of man and nature, an urgent need to solve China's resource bottleneck and ecological problems, and achieve sustainable economic and social development. It is also an inevitable choice to demonstrate the responsibility of a major country and promote the building of a community with a shared future for mankind. To develop a high-quality low-carbon economy and promote global climate governance is bound to be a broad and profound systemic transformation. It is an arduous task and requires persistent efforts. So how to develop low-carbon economy and what theory should be adhered to as guidance, we need to seek guidance and inspiration from Marx's ecological thought. Marx's ecological thought, from the perspective of practice, conducted an all-round exploration and research on the relationship between man and nature, analyzed and explained the ecological crisis problem, pointed out that communist society is an ideal society of ecological harmony, and stressed that we should follow the objective laws of nature, correctly handle the relationship between man and nature, make better use of nature and transform nature. So that nature can meet the needs of contemporary people for survival and development, while not harming the interests of future generations. Marx's ecological thought not only provides strong guidance for resolving the current contradiction between the environment and economic and social development from the standpoint, viewpoint and method, but also provides cultural consciousness and theoretical confidence for persisting in the road of socialist ecological civilization with Chinese characteristics. This paper analyzes the relationship between Marx's ecological thought and low-carbon economy by studying and sorting out the main content of Marx's ecological thought, tries to find the value inspiration and theoretical compliance for China's low-carbon economic development from the perspective of the connotation of ecological thought, and combines the current reality of China's low-carbon economic development. It aims to explore the high-quality development path of China's low-carbon economy from the unique perspective of the connotation of Marx's ecological thoughts. Of course, there is no doubt that the contradiction between man and nature has a long history, and green and low-carbon development is a long and arduous task, which requires the joint efforts of all parties. Although the author has read many classic works related to Marx's ecological thought, patiently and carefully sorted out hundreds of literature materials, and made great efforts to write this paper, due to the incomplete collection of materials and limited personal research skills, there are inevitably some biases and omissions in the article, which require further study and research. Dual carbon transition, time tight task heavy difficulty. As a major responsible socialist country, we should never forget to take Marx's ecological thought as the theoretical guideline and action guide for China's economic development, take ecological and environmental protection as the highest standard for measuring all practical activities, promote the sound development of low-carbon economy in China, and lay a solid foundation for realizing the modernization of harmonious coexistence between man and nature.

(2) Research Outlook

In the context of global climate change and continuous environmental deterioration, the development of low-carbon economy has attracted wide attention and formed a consensus in the international community. The theoretical basis of this consensus is derived from Marx's ecological thought, which provides important guidance for the development of China's low-carbon economy. Although the development of China's low-carbon economy has achieved some results, it still faces many problems and challenges, especially in institutional innovation, technological innovation and public awareness of environmental protection. However, the future development opportunities are also obvious. The progress and innovation of science and technology provide the possibility for the utilization and technical support of clean energy, and the enhancement of global environmental protection awareness also makes international cooperation in the field of low-carbon economy closer. However, we should not ignore the challenges ahead, such as further innovation and improvement at the institutional level, increased investment in technological innovation, and increased public awareness and participation in environmental protection. In order to meet these challenges and seize the opportunities, it is necessary to deepen the understanding and application of Marx's ecological thought, at the same time to strengthen international cooperation and exchanges, and actively learn from the successful experience of other countries. To sum up, although China's low-carbon economy has broad prospects for development, the task remains arduous. Joint efforts from various aspects are needed to promote the sustainable development of a low-carbon economy through institutional innovation, technological innovation and public participation, so as to make positive contributions to the global response to climate change.

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