

The Exploration of Green Shipping Concepts and Ideological Education in the Context of Ecological Civilization Construction in the Maritime Economic Geography Course

Xinyi Ma, Yongqing Ji*, Junhong Yuan, Yuetong Zhao

Key Laboratory of Philosophy and Social Science in Hainan Province of Hainan Free Trade Port International Shipping Development and Property Digitization, Hainan Vocational University of Science and Technology, Haikou, 571126, China

*Corresponding author: Yongqing6688@126.com

Abstract: With the advancement of global ecological civilization construction, green shipping, as an important part of the transformation of the maritime industry, has attracted increasing attention. This paper explores the basic concepts, technological evolution, and application of green shipping in teaching from the perspective of maritime economic geography courses. First, it analyzes the core concepts of green shipping and the global development background, discussing the strategies and technological advancements driving green shipping. Secondly, combining the framework of maritime economic geography courses, it studies the transformation of the maritime industry and the green development path in ecological civilization construction, with a focus on analyzing the relationship between green development models and ecological protection. Finally, it emphasizes the necessity of integrating ideological and political education into maritime economic geography courses, exploring innovative teaching methods and practices that combine green shipping concepts and ecological civilization construction. This study aims to provide theoretical support for the development of ideological education in maritime economic geography courses and promote the dissemination and implementation of green shipping and ecological civilization concepts.

Keywords: Green shipping; Maritime economic geography; Ecological civilization construction; Ideological education; Green development

Introduction

As global climate change and environmental issues become increasingly severe, green shipping has gradually become a research hotspot in the international shipping sector as a key approach for the shipping industry to respond to environmental challenges and promote sustainable development. Maritime economic geography, as an interdisciplinary subject that involves shipping activities and geographical space, resource distribution, and more, has inherent interdisciplinary advantages, helping to analyze the interaction between the shipping industry and the ecological environment from a macro perspective. This paper, through a deep understanding of the concept of green shipping, explores how to effectively integrate ideological education into maritime economic geography courses to cultivate students' ecological civilization awareness and social responsibility. With the accelerating global transition of the shipping industry toward green practices, the education sector urgently needs to explore new teaching models that organically combine the core concepts of green shipping and ecological civilization construction to enhance students' overall quality and promote the green development of the shipping industry. Therefore, this study is of significant theoretical importance and practical necessity for promoting the teaching reform of maritime economic geography courses.

1. The Connotation and Development Trends of Green Shipping

1.1 Basic Concepts and Principles of Green Shipping

Green shipping refers to the use of advanced technologies, optimization of shipping operations, and management in maritime activities to minimize negative environmental impacts while improving

energy efficiency and promoting the sustainable use of resources. The core goal is to achieve the green transformation of the shipping industry, promoting a win-win situation for ecological protection and economic benefits. Green shipping focuses not only on controlling ship emissions but also on ship design, port facilities, and route planning, ensuring the sustainability of the entire shipping system.

The basic principles of green shipping can be summarized as follows: First, reducing carbon emissions and environmental pollution, particularly reducing the emissions of carbon dioxide, nitrogen oxides, sulfur oxides, and particulate matter, to prevent pollution of the marine ecosystem. Second, promoting the efficient use of energy and the application of clean energy, especially in the transformation of ship propulsion systems, by encouraging research and application of fuel alternatives and electric drive technologies. Third, adopting environmentally friendly shipping management methods, such as optimizing route design and intelligent shipping scheduling, to improve overall transportation efficiency and reduce energy consumption and emissions.

Additionally, the implementation of green shipping also includes the optimization of ship design and hull technologies. By introducing innovative hull designs such as air lubrication and coating technologies, it is possible to reduce water resistance and energy consumption, while enhancing the stability and efficiency of ship navigation. Green shipping is not only about environmental protection but also about the rational use of resources. By improving the overall environmental protection level of the maritime industry, it promotes the global green transformation of shipping. ^[1]

1.2 Technological Evolution and Future Development of Green Shipping

The technological evolution of green shipping has undergone continuous upgrades and innovations, from traditional coal-powered systems to modern eco-friendly propulsion systems. Early green shipping efforts primarily focused on improving fuel usage, such as using low-sulfur fuels and liquefied natural gas (LNG) to reduce harmful emissions during combustion. However, as environmental requirements have become stricter, the technological advancements in green shipping have entered a stage of parallel development across multiple fields, covering ship design, energy conversion and management, and shipping operations.

In the evolution of ship propulsion systems, the research and application of alternative fuels have been particularly important. In addition to LNG, green alternative fuels such as hydrogen and ammonia have gradually become research hotspots. These fuels have lower carbon emissions and can effectively slow the accumulation of greenhouse gases. Furthermore, the development of electric and hybrid-powered vessels has made significant progress, utilizing renewable energy sources such as wind and solar power to supplement propulsion and further reduce the carbon footprint of ships.

The intelligence and digitalization of ships are also key developments in green shipping technology. Through intelligent navigation systems, route optimization algorithms, and ship energy efficiency management systems, shipping companies can monitor and adjust the ship's sailing status in real-time, thus reducing unnecessary energy consumption. The application of intelligent systems makes ship operations more efficient and energy use more precise, further advancing the green transformation of the shipping industry. ^[2]

In the future, the technological development of green shipping will focus on multidimensional energy innovation and integrated management. From ship propulsion to operations, from fuel selection to hull material optimization, green shipping will continue to rely on technological innovation to drive sustainable industry development. Moreover, the digitalization and intelligentization of shipping will further promote green collaboration within the industry, reducing environmental impacts while enhancing the overall competitiveness of the sector.

1.3 Global Promotion Background and Strategy of Green Shipping

The global promotion of green shipping originates from the key position of the shipping industry in the global economy and its increasingly prominent environmental impacts. As the primary mode of global freight transport, shipping plays a crucial role in facilitating global trade but also faces significant environmental challenges. Marine pollution, greenhouse gas emissions, and other issues have drawn increasing attention from the international community. Therefore, promoting the transformation to green shipping is not only a requirement for the industry's own development but also part of the global sustainable development strategy.

From an international perspective, the promotion of green shipping is primarily driven by emission

reduction targets under the United Nations Framework Convention on Climate Change and relevant regulations proposed by the International Maritime Organization (IMO) to reduce carbon emissions in the shipping industry. The IMO has proposed action plans for reducing greenhouse gas emissions from shipping in multiple stages, especially in its "2050 Vision," which clearly states that by 2050, shipping industry emissions should be reduced by more than 50%. This goal requires global shipping companies to accelerate the green transformation, improve the environmental performance of shipping technologies, and promote the application and popularization of alternative energy sources.

On a strategic level, the promotion of green shipping depends not only on the acceleration of technological innovation but also on cooperation and coordination within the global shipping system. Shipping companies from various countries strengthen cooperation in technology research and development and resource utilization, promoting the formulation of common standards, and using multinational cooperation to facilitate the popularization of green shipping technologies. The establishment of international green shipping alliances aims to promote the innovation and application of green shipping technologies through technology sharing, financial support, and joint research, forming a new global green shipping ecosystem.^[3]

Moreover, the promotion strategy of green shipping also includes strengthening policy support for the green transformation of the shipping industry. Through incentive mechanisms, financing support, and other measures, it encourages shipowners and shipping companies to invest in green technologies and low-carbon shipping projects. In terms of the unification and implementation of green shipping standards, the international shipping industry should further strengthen the enforcement of green standards to ensure the consistency and coordination of global shipping in its green transformation.

2. Ecological Civilization Construction from the Perspective of Maritime Economic Geography

2.1 Basic Framework of Maritime Economic Geography and Its Connection to Ecological Civilization

Maritime economic geography, as an interdisciplinary field, combines the basic principles of geography and maritime economics. It aims to study the spatial distribution of global and regional maritime activities, resource allocation, industrial structure, and their interrelationships. Within the framework of maritime economic geography, the main research objects include maritime transportation networks, port facilities, shipping routes, and their impact on economic and social development. By analyzing shipping flows, logistics systems, resource distribution, and demand, maritime economic geography reveals the interactive relationship between the maritime industry and the global trade system.

The concept of ecological civilization emphasizes the harmonious coexistence between humans and nature, efficient resource utilization, and environmental protection. The connection between maritime economic geography and ecological civilization lies in the impact of maritime activities on the ecological environment and their sustainability in resource utilization. The shipping industry is one of the largest sources of carbon emissions globally, yet it also serves as a key hub connecting the global flow of resources and energy. Therefore, maritime economic geography not only focuses on the spatial distribution and development trends of the shipping industry but also explores how to achieve low-carbon, environmentally friendly, and sustainable shipping modes within the global maritime network. Ecological civilization construction requires maritime economic geography to integrate factors such as environmental protection, green shipping, and energy transition, promoting a balance between economic development and ecological protection within the maritime industry.^[4]

2.2 Transformation of the Maritime Industry and Green Development Paths in Ecological Civilization Construction

Under the framework of ecological civilization construction, the transformation of the maritime industry is not only necessary for the development of the shipping industry itself but also a crucial step in addressing climate change and achieving sustainable development. With the rising global environmental standards and adjustments in the energy structure, green shipping has become one of the core objectives of the maritime industry transformation. The transformation path of the maritime industry includes technological innovation, changes in management models, and adjustments in industrial structure.

First, technological innovation is a key driving force for the green transformation of the maritime industry. Innovations in ship propulsion systems, such as the application of low-carbon fuels and clean energy, can significantly reduce emissions during ship operations and alleviate environmental burdens. For example, the development of green alternative fuels such as hydrogen, ammonia, and biofuels provides new power options for the shipping industry. Additionally, the application of renewable energy such as wind and solar power is gradually gaining popularity in the shipping industry, becoming a new way to achieve low-carbon development in shipping.

Second, the management model of the maritime industry needs to evolve toward greater intelligence and efficiency. The application of digital technologies, such as shipping management systems, the Internet of Things (IoT), and big data analysis, allows shipping companies to monitor energy efficiency in real-time during operations and optimize aspects like routing, scheduling, and loading, maximizing energy utilization efficiency. The introduction of intelligent shipping management systems not only improves operational efficiency but also reduces carbon emissions during shipping.

Adjusting the industrial structure is also a critical element of the green transformation of the maritime industry. With the rise of green shipping, traditional shipping models are gradually evolving toward low-carbon and environmentally friendly approaches. The construction of green ports, green ships, and green shipping service systems is transforming the previous industry development model, which was primarily focused on transport volume, and is promoting the diversification of the green shipping industry.

2.3 Green Development Models of Maritime Economic Geography and Ecological Environmental Protection

The green development model of maritime economic geography focuses on optimizing the spatial layout of shipping activities and coordinating them with resource and environmental considerations. In traditional maritime economic geography, shipping activities often emphasize transport efficiency and logistics costs, while the green development model incorporates environmental protection and sustainable development into the analysis. In this model, the selection of ports and shipping lanes, ship design and layout, and route planning must fully consider their impact on the ecological environment, aiming to optimize both ecological and economic benefits.

Green ports are an essential component of the green development model in maritime economic geography. Green ports focus not only on the green construction of port facilities but also on energy efficiency and resource recycling in port operations. The energy supply in ports is gradually transitioning to clean energy, and environmental protection technologies for equipment and facilities have been widely applied, promoting the development of ports in a low-carbon and green direction. Additionally, green ports emphasize environmental monitoring and management to minimize the negative impact of shipping activities on the surrounding ecological environment.^[5]

At the ship level, the green development model requires that ships' design and construction meet environmental protection standards, reduce carbon emissions, and optimize energy use. For example, the use of efficient fuel technologies, green coating technologies, and air lubrication systems can enhance ship energy efficiency and navigational stability. Moreover, optimizing ship management systems also helps reduce energy waste and environmental pollution.

The planning of shipping lanes and routes is also a crucial aspect of the green development model. Proper route design not only improves shipping efficiency but also avoids excessive disruption to the marine ecological environment. The layout of green shipping routes follows the principles of shortest and most efficient paths, reducing fuel consumption and carbon dioxide emissions through intelligent scheduling systems and navigational strategies, thereby achieving a more environmentally friendly maritime transportation mode.

3. Innovative Exploration of Ideological Education in Maritime Economic Geography Courses

3.1 Positioning and Role of Ideological Education in Maritime Economic Geography Courses

In the maritime economic geography course, the core positioning of ideological education is to combine scientific knowledge with humanistic care, helping students establish correct values and a sense of social responsibility. As an interdisciplinary course, maritime economic geography covers the spatial distribution of maritime activities, resource allocation, and their impact on the global economy,

providing multidimensional entry points for ideological education. Through the guidance of ideological education, students can not only understand the economic logic of the shipping industry but also realize the importance of environmental protection and sustainable development, cultivating a deep awareness of ecological civilization construction.

The role of ideological education in the course is not only the transmission of theoretical knowledge but also the cultivation of social responsibility and a global perspective. While the shipping industry promotes global trade, it also comes with significant resource consumption and environmental pressure. By integrating ideological elements into the curriculum, students can recognize the profound impact of shipping on the ecological environment, especially the necessity of the green shipping transition. By guiding students to focus on topics like green technology and low-carbon shipping, it stimulates their thinking on how to balance economic development with environmental protection in real-world applications, achieving sustainable development goals.

Moreover, ideological education can enhance students' sense of responsibility and practical abilities, encouraging them to think comprehensively about issues such as resource usage, environmental protection, and social impact within maritime economics. Through the combination of theoretical teaching and practical activities, students can not only acquire professional knowledge in maritime economic geography but also develop the ability to conduct comprehensive analyses from social and ecological perspectives when facing complex global economic and environmental challenges. This interdisciplinary ideological education model lays a solid foundation for students' future career development, fostering them to become shipping professionals with social responsibility and innovative spirit.^[6]

3.2 Ideological Teaching Methods and Models Integrating Green Shipping Concepts

Integrating green shipping concepts into ideological education is an important means to improve the effectiveness of maritime economic geography courses. By guiding students to think about the relationship between the shipping industry and the environment, teaching methods can take forms such as case studies, interactive discussions, and project design, to enhance students' understanding and recognition of green shipping. First, in the course content arrangement, the teaching can include explanations of green shipping technologies, policies, and global shipping development trends, allowing students to recognize the role and significance of the shipping industry in the global ecological system.

In terms of teaching methods, simulation and role-playing are effective approaches. By designing simulated shipping management scenarios, students can consider the practical application of green shipping concepts in decision-making processes. This not only improves the practical relevance of their theoretical knowledge but also helps students apply these concepts in real-world situations. Additionally, interdisciplinary project design is an innovative teaching model. By organizing students to participate in cross-disciplinary green shipping program design and evaluation, they gain a deeper understanding of the significance of green shipping and its far-reaching impacts on society, the economy, and the environment through practical experience.

These diverse teaching methods not only enable students to master professional knowledge in maritime economic geography but also stimulate their focus on environmental protection and sustainable development, ultimately cultivating shipping professionals with a strong sense of social responsibility.^[7]

3.3 Ideological Practice for Cultivating Awareness of Green Shipping and Ecological Civilization Construction

In ideological practice, cultivating students' awareness of green shipping and ecological civilization construction requires a combination of various forms of teaching activities and social practice. First, the course can organize students to participate in research activities related to green shipping, allowing them to gain an in-depth understanding of the environmental challenges faced by the global shipping industry. Through on-site visits to green ports, low-carbon ships, and other green shipping facilities, students can better understand the practical needs and implementation paths of green shipping.

Additionally, ideological practice can include organizing lectures, academic seminars, and other activities related to green shipping. Inviting industry experts, environmental organizations, shipping companies, and other relevant professionals to interact with students, sharing the latest technological

developments and practical applications in green shipping. Through these exchanges, students can deepen their understanding of ecological civilization construction and further clarify the important role of the shipping industry in global sustainable development.^[8]

At the end of the course, social responsibility reports or environmental action plans can be designed, encouraging students to consciously incorporate green shipping concepts into their future careers. Through these ideological practice activities, students not only deepen their understanding of green shipping but also develop the awareness of practicing ecological civilization construction in their work, becoming active contributors to the sustainable development of the industry.

Conclusion

In the future, the integration of green shipping concepts and ideological education for ecological civilization construction in maritime economic geography courses will not only promote technological advancements and industry transformation in green shipping but also cultivate more shipping professionals with a global perspective and a sense of social responsibility. Through the innovation of teaching models and the deepening of ideological practice, students' recognition of green shipping can be effectively enhanced, helping them understand the crucial role of maritime activities in environmental protection. Looking ahead, with further technological development and the gradual unification of global green shipping standards, green shipping will become the driving force of the maritime industry. To better advance this process, maritime economic geography courses need to continue optimizing teaching content and methods, incorporating the latest green shipping research results, and cultivating more high-quality shipping professionals who are adaptable to the green economy era, thus contributing to global sustainable development.

Fund Projects

Demonstration Project of ideological and Political Education in Curriculum of Hainan Vocational University of Science and Technology (HKSZ2024-03)

References

- [1] Liu Guancheng, Zhao Ti. *Analysis of Green Shipping Legal Policies and Recommendations* [J]. *Navigation*, 2024, (06): 4-7.
- [2] Feng Hongxin. *Low-carbon Transformation and Green Shipping Development: Challenges and Opportunities* [J]. *China Waterway Transport*, 2024, (11): 59-61.
- [3] Deng Chanjuan. *Exploration of Ecological Civilization Education Path for College Students under the "Curriculum Ideology and Politics" Perspective* [J]. *Journal of Jiamusi Vocational College*, 2024, 40(10): 181-183.
- [4] Wei Wubin, Li Tingliang. *Exploration of Pathways for Deep Integration of Ecological Civilization Education into College Students' Ideological and Political Education* [J]. *Times Report*, 2024, (10): 100-102.
- [5] Zhang Ziyi. *Research on China's Green Shipping Logistics Law and Policy* [J]. *Logistics Technology*, 2023, 46(20): 32-34.
- [6] Deng Yusong, Yang Gairen, Liao Dalan, et al. *Exploration and Reflection on the Ideological and Political Teaching Model of "Ecological Environmental Science" Courses in Universities* [J]. *Education and Teaching Forum*, 2021, (27): 141-144.
- [7] Westman L, Huang P. *Ecological Civilisation: A Historical Perspective on Environmental Policy Narratives in China*[J]. *International Quarterly for Asian Studies*, 2022, 53(2): 181-206.
- [8] McCook L J, Lian J, Lei X, et al. *Marine protected areas in southern China: Upgrading conservation effectiveness in the 'eco-civilization' era*[J]. *Aquatic Conservation*, 2019, 29-38.