

Summary of Research Status of Low Carbon Ports at Home and Abroad

Jing Chen^{1,2}, Chunyan Dong^{1,3}

¹Nanjing Vocational Institute of Transport Technology, Nanjing 211188, China

²Nanjing University, Nanjing 210023, China

³HOHAI University, Nanjing 210098, China

Email: 120360952@qq.com

Abstract. Ports are an important force for the development of regional economy. However, the development of ports has caused increasingly serious damage to the environment. A large number of carbon dioxide emissions in port areas have aggravated the greenhouse effect. Therefore, the construction of low-carbon ports is a necessary measure to reduce air pollution. Through combing the domestic and foreign literature, the article explains the definition of low-carbon ports and discusses the development mechanism and countermeasures of low-carbon ports.

1. Introduction

Global warming has brought tremendous challenges to the survival of mankind, and it has also attracted the attention of all countries in the world. How to reduce the "greenhouse effect" is a common problem faced by all countries in the world. The global people have also reached consensus on the development of a low-carbon economy. China, as the largest water transport country in the world, has a throughput that is far ahead in the world. However, in recent years, in order to pursue economic benefits, the increase of ports and the expansion of the production scale in the port area, a large amount of energy consumption has led to carbon dioxide in the air, etc. Emissions of greenhouse gases are also increasing. It is only sensible for the port to follow the road of "low carbonization", which is in line with the requirements of society and the interests of the people, and at the same time, the port can achieve sustainable development, the only road to development. While continuously improving the service function of the port area, China's ports are also accelerating the pace of the construction of "low-carbon ports" and have achieved certain results, especially the promotion and application of new technologies such as "oil to electricity", which has greatly reduced the number of ships. The cost of Hong Kong has reduced energy consumption, reduced the emission of carbon dioxide in the air, and effectively alleviated the air pollution ^[1]. Since the concept of low-carbon ports was put forward, the exploration and research on low-carbon ports at home and abroad have been gradually deepened and the research results obtained have been numerous. After reading the literature on the status quo of low-carbon ports research at home and abroad, the research of domestic and foreign scholars is mainly Around the following two aspects: First, the definition of low-carbon ports; Second, the mechanism and countermeasures for the development of low-carbon ports.



2. The concept of low carbon port

There is no controversy among scholars at home and abroad about the concept of low-carbon ports. The ideas to be conveyed are basically the same. The definition of low-carbon ports is centered on saving resources and the low carbonization of ports is achieved through energy conservation and emission reduction. Compared with domestic scholars, foreign scholars have not discussed too much about the concept of low-carbon ports. They have studied more about the implementation mechanism and countermeasures of low-carbon ports.

Sheng Xu and Yanmin Ma (2013) believe that low-carbon ports are derived from a low-carbon economy and are also necessary for the development of a low-carbon economy. Low-carbon ports must establish a low-carbon concept, while low-carbon ports must reduce energy consumption and carbon dioxide emissions in ports, construction of a healthy environment, good air quality ports ^[2]. The main characteristics of low-carbon ports can be summarized by "three lows and three highs." "Three highs" means high efficiency, high benefits, and high efficiency. "Three lows" refers to low pollution, low consumption, and low emissions. As a new mode of port development, low-carbon ports can be realized by increasing the utilization rate of energy, increasing the use of clean energy and the use of carbon elimination technologies. Yuma Tian, Qinying Zhang, Gengyong Cao, and Shouyue Wei (2013) considered that the concept of low carbon ports can be inferred from the concept of low-carbon transportation because the port is a part of transportation. Low-carbon transportation is based on the current active response to climate change in countries around the world. A brand-new concept refers to the realization of "low-carbon" modes of transportation in the transportation process through advanced technological means and reasonable system management. After summarizing the concept of low-carbon transportation, the concept of low-carbon ports was introduced. Low-carbon ports can be defined as: port development methods that improve energy resource utilization and reduce environmental pollution through technological innovation and policy implementation ^[3]. Bin Ouyang, Lin Wang, Jingdong Huang, Aiyang Gao (2015) and others believe that low-carbon ports are to be achieved through green construction, low-carbon operations, and intelligent management. And they described the concept of low-carbon ports in three aspects: subject, object, and process. From the analysis of the main body, the government, enterprises, and society are the main bodies for the development of low-carbon ports. From the object level, they have reduced port resources and energy. Waste and reduction of emissions of polluting gases in the air are fundamental to the development of low-carbon ports. From the process analysis, the low-carbon concept should be embodied in the entire life cycle of port development, including the construction, operation, production, and management of the port ^[4].

3. The implementation mechanism and countermeasures of low-carbon ports

How to achieve low carbon in the development process of the port, for this reason, scholars at home and abroad have been actively exploring and researching. Since the construction of foreign low-carbon ports started earlier, there are already relatively mature theoretical foundations and development models. The Chinese government mainly realizes the low carbonization of ports through energy conservation and emission reduction. Since the 13th Five-Year Plan, although the low-carbon construction of our ports has achieved certain results, the development of ports has been left over for decades and cannot be resolved within a short period of time. Therefore, China is currently building low-carbon ports. There are still some obstacles, and many problems remain unresolved. Some scholars at home and abroad have summarized these issues and proposed relevant countermeasures.

Andrew (2006) focuses on the combination of theory and practice, and puts forward that the most important thing in building a low-carbon port is to establish a sound environmental protection law and relevant laws and regulations ^[5]. Goulielmos. AM (2000), after conducting a further study of European port environmental protection policies, he considered that protecting the port environment was not only related to transport but also related to the marine environment. In addition, he briefly analyzed the port environmental issues and Finding out the reasons and proposing corresponding suggestions in a targeted manner, we believe that in order to better promote the construction of low-carbon ports,

environmental costs should also be included in port costs ^[6]. PaiPai E. (1999) not only analyzed the factors influencing the development of port operations, but also analyzed the environmental impact factors related to the operation and development of ports, studied the environmental management system of British ports, and understood the status of environmental protection in British ports. Corresponding suggestions were made for the construction of low-carbon ports ^[7]. Emanuel (2007) believes that in some ports, the natural geographical advantages can be used to supply power to the port through wind power generation ^[8]. Cuilian Liu and Hao Wang (2017) pointed out five major factors that have constrained the development of China's low-carbon ports and put forward corresponding suggestions. First, although at present both the port companies themselves and the government, compared with the initial period of port construction, environmental awareness and The concept of low-carbon has been strengthened, but the measures taken for energy-saving and emission-reduction are not considered comprehensively. It only starts from a certain link in production and transportation operations or an operation department, ignoring the improvement of efficiency and the simplification of procedures. It is believed that the port companies should continuously consider the aspects of the port's geographical environment, the construction period of the port, and the length of the operation period in view of its own characteristics, constantly sum up experience, actively explore and study, and formulate a low-carbon port development plan suitable for its own development. Reduce waste of resources. Second, although the state has issued relevant laws and regulations to support the low-carbon construction of ports, it lacks local laws and regulations on low-carbon construction of ports, and the establishment of local laws and regulations can effectively promote the low-carbon development of ports. Supervision. Third, due to the lack of cooperation between port companies and the society, the society's understanding of low-carbon ports is not deep enough to effectively support the construction of low-carbon ports. Therefore, port companies must not only communicate and cooperate with the government, but also need strengthen cooperation with the society ^[9]. Sheng Xu (2013) proposed that China's ports are excessively dependent on petroleum, coal and other resources. The high carbonization of the port energy structure is one of the biggest challenges for China's construction of low-carbon ports, and pointed out that the construction of low-carbon ports can be promoted from four aspects. It is necessary to use scientific and reasonable standards as a guide to formulate relevant low-carbon assessment criteria in light of the actual conditions of the port. Second, China's ports should adjust and improve energy consumption structure, make full use of new clean energy, and reduce the impact on coal, oil and gas. The over-reliance of energy-intensive air pollution has led to the development of an energy utilization system that focuses on the utilization of coal energy, the utilization of electric energy, and the use of other energy sources to improve the utilization of energy. The third is to integrate the port resources, and develop the port green logistics actively, reduce unnecessary energy losses, improve resource utilization, save costs, achieve low-carbon purposes, and fourthly, develop new clean energy and introduce new lows actively. Carbon technology, increase the use of new clean energy. Hongjun Hu (2012) analyzed several challenges facing China's current construction of low-carbon ports and proposed five suggestions in a study on China's port development based on a low-carbon economy perspective. First, it is necessary to improve the supervision and management system of low-carbon ports and formulate corresponding laws and regulations restrict the discharge of CO₂ in ports, and second, use advanced information technology and design levels to rationally plan and plan ports, and use equipment as much as possible to produce high-efficiency and low-pollution equipment. Third, port enterprises should strengthen the use of clean and renewable energy such as solar energy. Fourth, China's ports should accelerate the research and development of low-carbon technologies, provide good technical support for the construction of low-carbon ports, and fifth, for high-end service industries, the port We must pay sufficient attention to the economic growth of the port by continuously improving the level of finance, insurance, and financing of the port ^[10]. Shuai Liu and Qunxuan Qi (2013) analyzed domestic and foreign scholars' low-carbon port index system, and conducted a lot of research on the design ideas of the port evaluation index system. Finally, the social system impact, environmental impact, ecological impact, economic benefits, and The five-tiered comprehensive evaluation index system for low-carbon

ports, including resource utilization and conservation, provides good practical guidance for the development of low-carbon ports in the port, and provides a scientific management basis for the port management department, and also provides low-carbon assessments for other ports in the future. The establishment of the index system provides a reference ^[11].

4. Conclusion

The construction of low-carbon ports is an inevitable trend for the development of ports around the world. Ports should grasp the opportunities for building low-carbon ports. At the same time, building low-carbon ports is also a challenge. As countries around the world pay more attention to the climate change situation, the theory and practice of low-carbon ports construction at home and abroad are also increasing. Their experience in building low-carbon ports is worth learning and exploring. As for the study of low-carbon ports, scholars at home and abroad generally believe that the construction of low-carbon ports is an inevitable choice for the port to achieve long-term development, reduce air pollution, reduce resource waste, and reduce costs. It is of great significance to increase economic efficiency and promote the long-term and stable development of the port. However, looking at the status quo and research results of low-carbon ports at home and abroad, there are still some problems. Most scholars study the commonality of low-carbon ports, rarely combining the characteristics of the port itself, and then conduct targeted research. The construction of low-carbon ports cannot be completed overnight. It is a long-term process and requires the efforts of the government, enterprises, and port workers. In macro terms, the government should improve the relevant policies and laws and regulations on energy-saving and emission reduction of ports and strengthen the supervision of enterprises. on the micro level, for the enterprises themselves, they should also intensify their efforts to innovate and seek ways actively to achieve low carbonization throughout the entire life cycle of the port, so as to enable the port to achieve leapfrog development^[12].

References

- [1] Lü Chuanbin. Global Greenport: The era of low-carbon shipping Towards a green economy *J. Disaster Prevention Expo*, 2015(02):57-61.
- [2] Xu Sheng, Ma Yanmin. Research on the Construction Standards and Development Countermeasures of Low-carbon Ports *J. China Port*, 2013(06): 6-8.
- [3] Tian Yuma, Zhang Qinying, Cao Gengyong, Wei Shouyue. Research on the Status Quo and Development Countermeasures of Low Carbon Port Construction in Zhejiang Province.*J. Chinese Market*, 2013(38):120-121.
- [4] OuYang Bin, Wang Lin, Huang Jingdong, Gao Aiying. Research and application of evaluation index system for green low-carbon ports.*J. Water Sports Engineering*, 2015(04):73-80.
- [5] Timothy Andrew Stojanovic, Hugh D. Ormerod smith, and Christopher F. Wooldridge. The impact of Habitats Directive on European port operations and management. *Geo Journal*, 2006, (65): 165-176.
- [6] Goulielmos AM. European policy on port environmental management plan for and harbor projects.*J. Global Nest: the Int. J.*, 2000, 2(2): 189-197.
- [7] Paipai E.Guidelines for port environmental management[M].HR wallingford,1999.
- [8] Melachrinoudis E. Orimonde. Is this the next generation low carbon project.*J. Dual Power Project*, 2007, 15(9):49-51.
- [9] Liu Cuilian, Wang Miao. Existing problems and countermeasures in China's port green and low carbon development *J. Water Transportation Management*, 2017, 39(03):21-24.
- [10] Hu Hongjun. Research on the development of China's ports based on the perspective of low-carbon economy *J. China Water Transport (the second half of the month)*, 2012, 12(12):26-27.
- [11] Yan Qun, Liu Shuai. Evaluation of green low-carbon ports. Research *J. Industrial Technology & Economy*, 2013, 43(12):57-63.
- [12] Yu Desong, Zhang Hua, Yu Shixiong, Cao Fu. The construction and development of China's

green ports *J. China's water transport (the second half)*, 2014, 14 (02): 55-56.