

## *Original Paper*

# Research on the Realistic Challenges and Implementation Paths of New Quality Productivity Driving High-Quality Development of the Ocean

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### ***Abstract***

*To build a maritime power, pursue the sea and pursue the dream of Dark Blue, it is necessary to accelerate the construction of new marine productivity, which is an important strategic starting point to promote high-quality development and realize Chinese path to modernization. The marine new quality productivity is the internal requirement for promoting the sustainable development of the ocean, and is also the strategic choice to achieve Chinese path to modernization. This paper analyzes the realistic dilemma of the current high-quality development of the ocean, and proposes the realization path of the new quality productivity to promote the high-quality development of the ocean, in order to speed up the pace of building a maritime power.*

### ***Keywords***

*new quality productivity, High quality development of the ocean*

## **1. The Value Implication of New Quality Productivity in Promoting High-Quality Development of the Ocean**

Firstly, the "new" in marine new quality productive forces embodies the organic unity of technological breakthroughs, new factor compositions, and industrial upgrades. Its new technologies emphasize revolutionary breakthroughs with scientific and technological innovation at the core, surpassing traditional technological innovation and focusing on the effective translation of science and technology

into productive forces. The emergence of new quality productive forces not only enriches the types of means of labor and objects of labor in the marine field but also vigorously promotes the transformation of production methods and innovation in material productive forces. New business forms focus on upgrading traditional marine industries through technology and the industrialization of technology, transforming towards more forward-looking, pioneering, digital, and green industries, thereby achieving industrial transformation on a broader scale and with greater intensity.

As a core element of the marine economy, new quality productive forces in the ocean play a pivotal role in promoting the ecological stability of coastal regions and are key to advancing the strategy of building a strong maritime nation. While implementing the concept that new quality productive forces are green productive forces and promoting the intensive development of the marine economy, it is necessary to fully integrate new quality productive forces with marine industries, enhance their scientific and technological innovation capability in the marine field, and leverage technological innovation as the core engine for the high-quality development of the marine economy (Xie & Li, 2024).

### *1.1 Marine New Quality Productive Forces are an Intrinsic Requirement for Promoting Sustainable Ocean Development*

Driven by technological innovation, marine new quality productive forces provide new means for marine resource development, marine ecological environment protection, and marine equipment manufacturing. They reshape the marine industrial system, spawn new business forms, and offer new solutions to long-standing problems constraining marine development. They are of great significance for advancing the modernization of ocean governance and building a maritime community with a shared future. Marine new quality productive forces can promote the formation of a new pattern of high-quality synergistic development between marine endeavors and industries. Their characteristics determine that they are both an effective means to solve marine problems and the most dynamic innovative force within marine industries.

Building a strong maritime nation, as an important part of fully constructing a modern socialist country, not only highlights the critical role of the ocean in national development but also reflects China's firm determination to deepen the understanding of marine resource value, strengthen marine ecological environment protection, and accelerate the integration of marine science and technology with the economy. The construction of a maritime community with a shared future also requires current attention. Building this community reflects China's responsibility in deeply participating in global ocean governance and demonstrates the global consensus on promoting the harmonious coexistence of humanity and the ocean. The proposal of the concept of a maritime community with a shared future represents the culmination of an ocean view across three dimensions: "subject-space-time," corresponding respectively to the marine life community, the marine world community, and the marine development community, emphasizing the overall interconnectedness and synergistic construction of the global marine ecosystem, equality, mutual benefit, cooperation, and win-win outcomes among over

150 maritime countries (regions), and the sustainable development and shared well-being of the world's marine economy.

With the continuous development of China's maritime endeavors, the marine economy holds an important strategic position in high-quality development, and the ocean's status as a strategic area for high-quality development is increasingly prominent. The marine economy plays an irreplaceable role in becoming a new growth point for the national economy, expanding domestic demand, breaking resource bottlenecks, and accelerating the transformation of old and new growth drivers. The strategic position of the marine economy in high-quality development is reflected not only in its abundant marine resource endowment, continuous innovation-driven effects, significant open demonstration effects, important regional coordination significance, and core security functions but, more importantly, in how the ocean-oriented economy carries the expansion of economic activity space from land to sea, promotes dual domestic and international circulation markets from sea back to land, and realizes the high-quality economic development mode and grand strategic pattern of land-sea economic integration. Building a strong maritime nation is also an inevitable mission for the great rejuvenation of the Chinese nation. It must be viewed from the overall perspective of the cause of socialism with Chinese characteristics, coordinating both domestic and international situations and coordinating land and sea development. From multiple perspectives, building a strong maritime nation has significant and far-reaching impacts on promoting national high-quality development, safeguarding national sovereignty and security, promoting ecological civilization construction, and participating in global governance. It not only helps promote the sustained and healthy development of the domestic economy, enhance China's comprehensive strength and international influence in the maritime field, but also favors achieving a win-win situation for economic development and environmental protection. It helps actively participate in the reform and construction of the global governance system, creating more favorable internal and external conditions for the great rejuvenation of the Chinese nation.

By reducing the cost of marine resource development, it promotes sustainable ocean development. Ocean development is characterized by high difficulty, high technology, and high risk. Developing marine new quality productive forces, based on technological innovation, marine resource development, and R&D of high-end marine equipment, combined with the realization of marine resource value, enables rapid iteration and cost reduction, thereby lowering the cost of marine resource development. It gathers resources through innovation, accelerating the construction of a maritime community with a shared future. Currently, as a new extension of the concept of a human community with a shared future in the maritime field, the concept of a maritime community with a shared future has become a consensus among nations worldwide. Accelerating the development of marine new quality productive forces and creating global platforms for innovation cooperation can provide lower-cost, higher-performance solutions for ocean governance, build a mutually beneficial path for marine development, and contribute Chinese wisdom to promoting a new global maritime landscape.

### *1.2 Marine New Quality Productive Forces are a Strategic Choice for Realizing Chinese Modernization*

The ocean is a strategic area for high-quality development. To build a strong maritime nation, harness the ocean's potential, and pursue the dream of the deep blue, it is necessary to accelerate the development of new quality productive forces in the ocean, which is a crucial strategic lever for promoting high-quality development and realizing Chinese modernization<sup>[2]</sup>. In recent years, driven by the accelerated iteration of digital technologies and the upgrading of national strategic measures, digitalization has become a key means to promote industrial upgrading and enhance industrial competitiveness. Marine new quality productive forces focus on marine informatization, digitalization, and greening as the main lines, integrate scientific and technological innovation resources, and introduce new technologies, business forms, models, and drivers<sup>[3]</sup>, optimizing the combination of factors such as data, resources, capital, and labor in the marine field, to promote the deep transformation and upgrading of marine industries and build a modern marine industrial system—an advanced form of productive forces.

The Chinese path to modernization must promote comprehensive material abundance and all-round human development, insisting on safeguarding and improving people's livelihoods in the course of development, encouraging joint efforts to create a better life, and continuously realizing the people's aspirations for a better life. Building a maritime power entails diverse connotations and outcomes, but it cannot deviate from the fundamental requirement of being people-centered. Meeting the multi-level and diversified needs of the public regarding the ocean serves as a crucial criterion for assessing the progress of maritime power construction. Targeted measures must be taken to address the pressing "pain points" and "shortcomings" in the marine sector as perceived by the public, effectively ensuring national security in energy, food, water resources, and other areas, safeguarding the public's rights to enjoy pristine seas and clean beaches, guaranteeing a stable supply of high-quality seafood, and striving to meet the people's growing demand for a better life while continuously enhancing their sense of achievement in the development of a maritime power. The Chinese path to modernization is one of harmonious coexistence between humanity and nature. Respecting, adapting to, and protecting nature are intrinsic requirements for building a modern socialist country in all respects. A healthy ocean is the fundamental requirement for constructing a maritime power, and balancing the relationship between humanity and nature as well as development and conservation must be treated as a major principle in advancing work. Further improving the marine resource development and conservation system while maintaining ecological security boundaries will comprehensively enhance marine resource utilization efficiency, protect marine biodiversity, and achieve "development through conservation and conservation through development," safeguarding our vast and beautiful blue homeland. "Building a maritime power requires vigorously developing marine high-tech." Advanced marine technology is a hallmark of a maritime power, yet compared to developed maritime nations, China's marine technological innovation capabilities remain insufficient, with few original and high-value-added

innovations, and notable "bottlenecks" in core and key common technologies. Leveraging the advantages of the new national innovation system, we must uphold the strategic goal of achieving high-level self-reliance and self-improvement in marine technology, optimize the national marine scientific research framework, and comprehensively shape new advantages for future marine development. Accurately grasping the trends in marine technology, we must focus on breakthroughs in deep-sea, green, and safe marine high-tech fields. The Chinese path to modernization is one of peaceful development. As an emerging maritime power, China is increasingly becoming a central theme in the world stage, with its development offering more opportunities and injecting strong momentum into the region and the world. While integrating domestic marine conservation and utilization efforts with the fulfillment of international treaties and obligations to demonstrate the responsibility of a major country, we must also actively share China's wisdom and achievements in marine governance with the international community, continuously expanding the "maritime circle of friends," and deeply participating in global marine governance to safeguard national maritime interests.

The ocean is a strategic area for high-quality development. The innovation in means of labor brought by marine new quality productive forces will promote digitalization, refinement, and greening as new trends in the future development of marine industries, drive significant improvements in the efficiency of marine resource development and utilization, and substantial growth in output value. Promoting the development of the marine economy holds profound significance and practical value for China's high-quality economic development and the realization of Chinese modernization.

## **2. The Practical Challenges of New Productive Forces in Promoting High-Quality Marine Development**

### *2.1 Key Marine Core Technologies Urgently Need Breakthroughs*

In recent years, China has achieved significant breakthroughs by vigorously advancing marine science and technology innovation, establishing a relatively comprehensive marine science and technology innovation management system. However, compared to developed countries in marine science and technology, China's innovation mechanisms remain imperfect, with outdated scientific management, severe underinvestment in R&D, and weak innovation capabilities. The overall development level lags behind, lacking core competitiveness, particularly in areas such as marine remote sensing, marine navigation and positioning, direct seawater utilization, and marine energy utilization technologies. These gaps make it difficult to provide strong technological support for the rapid growth of China's marine economy.

Currently, there are still deficiencies in China's core technologies in the marine field. In the realm of high-end shipbuilding and offshore equipment manufacturing, these enterprises need to further enhance their independent research and production capabilities for core technologies and key components when assembling equipment. Additionally, the mechanism for cooperation between industry, academia, and research needs to be improved. Taking Shandong Province, which has strong marine economic strength,

as an example, basic research results account for about four-fifths of the province's scientific and technological achievements, while the remaining one-fifth are applied research results. The matching degree between scientific research achievements and market demand still needs to be improved, and there is an urgent need to establish an integrated mechanism for cooperation between enterprise needs and university research and development. Thirdly, the research level in basic fields related to the development of the marine economy needs to be further improved. For example, China still has a certain gap compared to international advanced research levels in the fields of marine biotechnology and pharmaceuticals, which restricts the development of the marine pharmaceutical and biological products industry (Zhao, 2022).

### *2.2 The Structure and Layout of the Marine Economic Industry Are Unreasonable*

In the face of increasingly fierce competition for maritime rights and interests, the CPC Central Committee and the State Council have set the strategic goal of developing the marine economy and building a strong maritime nation. However, in reality, China's marine economy faces severe imbalances, with multiple contradictions such as the overall development of the marine economy and the lack of clear maritime strategic priorities, the continuous deepening of marine economic development and the relative lag of marine management systems and mechanisms, the over exploitation of offshore resources and the relative lag of deep-sea resource development, the overall lagging development and excessive local development, and the relatively weak development of high-level marine resources and core technology research and development capabilities, which restrict the macro guidance role of the marine economic strategy. The scientific, guiding, and operable nature of the overall planning and development strategy for the marine economy urgently needs to be strengthened.

The irrational industrial structure and layout present a significant challenge to the current development of the marine economy. For a long time, China's marine resource development has been extensive, with low intensive utilization, leading to an uneven development of the marine economy. Some regions and sectors have experienced excessive development intensity, while others have been relatively underdeveloped. This unbalanced development not only affects the overall efficiency of the marine economy but also limits its sustainable development capacity. The layout of marine industries tends to be similar, and the development and utilization efficiency of advantageous resources such as coastlines and ports is low. For instance, in some marine industry clusters, especially near the coastlines of major cities, various industries competitively and extensively seize and use coastlines, resulting in a lack of coordination between production, living, and ecological spaces. This has led to prominent contradictions between ports and cities, a lack of waterfront spaces, damage to ecological spaces, and a series of other issues (Liu, 2024). Furthermore, issues such as overlapping functional zones in oil and gas resource extraction areas with existing marine functional zoning, and the intertwining of oil and gas development with marine ecological red lines, increase the potential risks of marine ecological and environmental protection.

### *2.3 There Are Loopholes in Marine Economic Management*

The overall level of marine economic management in China has shown a continuous upward trend, but there are still some challenges and room for improvement. Firstly, there is a lack of inspection norms and standards. For example, the inspection standards for marine ranching platforms have not kept pace, resulting in some platforms being unable to undergo inspection, which has affected the development of the marine ranching industry. Secondly, the talent structure is unreasonable. Taking Shandong as an example, although the province has strong marine science and technology capabilities, the talent structure is unreasonable, with a shortage of high-end engineering and technical talents. Although the Shandong Peninsula Blue Economic Zone has abundant marine science and technology capabilities, there is a lack of practical and skilled talents, which has affected the innovation and development of the marine industry. The relationship between the central and local governments has not been straightened out yet. The establishment of marine management institutions is inconsistent, and comprehensive regulations are lagging behind, which has affected the coordination and management of the marine economy.

Currently, China's marine economic management system primarily features a combination of comprehensive management and segmented management, characterized by "vertical and horizontal" divisions (Xing, Liu, Liu et al., 2012). Marine industry management is the responsibility of various national departments, adopting a hierarchical management system; marine comprehensive management, on the other hand, is led by the State Oceanic Administration, which is responsible for organizing and coordinating various marine management tasks (Hu & Li, 2014). However, a unified and coordinated mechanism and institution for marine administrative management and maritime law enforcement management have not yet been established, leading to difficulties in coordinating contradictions and conflicts among departments during marine development, and responsibilities are not fully implemented.

## **3. The Realization Path of Promoting High-quality Development of the Ocean with New Productive Forces**

### *3.1 Strengthen Scientific and Technological Innovation and Technological Application to Enhance the Level of Marine Productivity*

With the rapid development of the global economy and the increasing demand for marine resources, enhancing marine productivity has become a common concern for all countries. In this process, scientific and technological innovation and application play a crucial role. Strengthening scientific and technological innovation and application, and improving the level of marine productivity, are key ways to enhance marine governance capabilities.

Strengthening scientific and technological innovation is the foundation for enhancing the level of marine productivity. Technological innovation can promote the optimization and upgrading of the marine industrial structure and improve the efficiency of marine resource development and utilization.

By developing innovations in fields such as deep-sea exploration technology and marine biotechnology, marine mineral resources can be more effectively exploited, and marine energy production can be increased. Through research and development of new marine materials and seawater desalination technologies, the cost of marine development can be reduced and resource utilization can be improved. Technological innovation can also drive advancements in marine environmental protection technology, reduce marine pollution, and safeguard the health of marine ecosystems<sup>[8]</sup>.

Strengthening technological application is the guarantee for enhancing the level of marine productivity. Technological application can transform the achievements of scientific and technological innovation into actual productivity, thereby promoting the development of the marine industry. By promoting advanced marine aquaculture technology, marine fisheries management technology, etc., the output and quality of the marine aquaculture and fisheries industries can be improved. By applying marine engineering, marine architecture, and other technologies, more efficient marine infrastructure can be constructed, enhancing the development level of marine transportation, tourism, and other industries. Technological application can also promote the integrated development of the marine industry with other industries, expanding the development space of the marine industry.

Promote the deep integration of the marine economy into major national regional strategies, and establish a number of high-quality marine economic development demonstration zones, specialized marine industry clusters, and modern marine cities. Enhance the level of autonomy in marine equipment manufacturing, promote the large-scale development of seawater desalination and comprehensive utilization, facilitate the diversified development and application of marine clean energy, and accelerate the industrialization process of marine drugs and biological products. Promote the green and low-carbon transformation of traditional marine industries, develop deep-water offshore aquaculture and sustainable deep-sea fisheries, store and utilize marine oil and gas safely, and promote the green, intelligent, and safe upgrading and transformation of ports. Accelerate the development of modern marine service industries, enhance the professionalization level of modern maritime and commercial service industries, promote the quality upgrading of marine culture and tourism, and support the integrated development of the digital economy in the marine field. Optimize the use of financial instruments to support the green and low-carbon development of the marine economy. Strengthen national scientific and technological capabilities in the marine field, enhance the layout of national laboratories, State Key Laboratories, etc., and build a national deep-sea gene bank, a national deep-sea specimen museum, and a national deep-sea big data center, promoting the construction and efficient operation of a national comprehensive marine test site. Increase the input of elements for basic and frontier research, and promote original breakthroughs in directions such as marine dynamic processes, land-sea interactions, and changes in marine ecosystems. Support the research and development of core equipment for deep-sea scientific exploration, oil and gas mineral resource exploration, and biological gene resource exploration and development. Continue to implement the "chip" project for marine forecasting. Improve the effectiveness of the transfer and transformation of



marine scientific and technological achievements, and create a number of leading enterprises with strong innovation capabilities and "specialized, refined, unique, and innovative" small and medium-sized enterprises.

Strengthening scientific and technological innovation and technology application, and enhancing the level of marine productivity, are key ways to improve ocean governance capabilities. Governments of all countries should fully recognize this and take effective measures to promote the development of marine scientific and technological innovation and technology application, contributing to the achievement of sustainable marine economic development and global ocean governance.

### *3.2 Promote Industrial Upgrading and Transformation, and Enhance Marine Economic Strength*

With the continuous deepening of global economic integration, the marine economy has become an important pillar of economic development for various countries. In recent years, with the rapid development of marine technology, China has made remarkable achievements in deep-sea exploration, development, and utilization. Advanced deep-sea drilling platforms, intelligent marine monitoring systems, and independently developed deep-diving equipment have become important "weapons" leading the development of the blue economy. These deep-sea technologies not only facilitate the upgrading and transformation of traditional marine industries but also promote the rapid rise of emerging marine industries. As a new engine of future economic growth, the blue economy carries enormous development potential. By continuously strengthening the innovation and nomy. These deep-sea "weapons" not application of deep-sea technology, we will further expand the space for the development and utilization of marine resources, providing strong impetus for the sustainable development of the global ecoonly endow China's marine economic development with new momentum but also paint a grand prospect for realizing the blueprint of the great rejuvenation of the Chinese nation. As the largest developing country in the world, the development of the marine economy is of great significance for enhancing the country's comprehensive strength. In order to achieve sustainable development of the marine economy, it is necessary to promote industrial upgrading and transformation, and enhance the strength of the marine economy.

We should increase support for emerging marine industries, which serve as a new driving force for marine economic development, encompassing marine biotechnology, marine new energy, marine new materials, and marine high-end equipment manufacturing, among others <sup>[9]</sup>. The government should formulate corresponding policies and measures to encourage enterprises to increase R&D investment, guide capital towards emerging marine industries, and cultivate a number of internationally competitive clusters of emerging marine industries.

In the process of cultivating new productive forces in the marine field, we must break through the bottlenecks and bottlenecks that hinder the development of new productive forces, allowing various advanced production factors to flow towards the development of new productive forces. We should coordinate the present and the future, focusing on the current bottlenecks and difficulties that restrict the high-quality development of industries and making precise efforts, while also aiming at frontier

fields and forward-looking technologies to develop new business forms, new technologies, and new products. We should leverage the market advantages of enterprise demand traction, R&D funding investment, organized R&D management, and technology achievement transformation and incubation, gather to build interdisciplinary and cross-field joint research institutes and R&D centers, utilize digital technology to promote interdisciplinary and cross-field team collaboration, carry out organized R&D, jointly tackle key core technologies, accelerate the formation of a "entrepreneurial innovation" model that is product-oriented and enterprise-centered, break through the innovation chain, integrate the industrial chain, and collaborate in talent cultivation during joint problem-solving. Focusing on the development trends of emerging marine industries, we should continuously improve the efficiency of the transformation of scientific and technological achievements in the marine field of universities, strengthen the integration of scientific research and industrial needs, promote the tackling and industrialization of key core technologies, address the pain points of the industrial chain, leverage the advantages of innovative resources, accelerate the transformation of scientific and technological achievements, break through the bottlenecks of the innovation chain, embed innovation into all aspects and processes of industrial development, and transform scientific research achievements into actual productive forces.

We must strengthen the national strategic scientific and technological force, optimize the allocation of innovation resources, refine the positioning and layout of national scientific research institutions, high-level research universities, and leading technology enterprises, enhance basic research in the marine field, advance key and core technology research, and achieve high-level scientific and technological self-reliance and self-improvement. We should strengthen the construction of major marine science and technology innovation platforms, support the development of basic, original, and forward-looking marine science and technology innovation research and development, continuously emerge the latest achievements in the marine science and technology field, and provide a strong driving force for the development of new productive forces. We should act as a "incubator" for three-dimensional linkage in the marine field, an "accelerator" for the transformation of achievements, and a "promoter" for the integration of the two chains, promoting the high-end, intelligent, and green development of marine-related industries. We should vigorously promote the continuous iteration and upgrading of industries such as marine engineering equipment, marine energy and minerals, marine electronic information, and marine biomedicine, cultivate a number of specialized marine industrial clusters, and continuously expand the basic foundation of the marine economy.

In today's increasingly fierce global technological competition, scientific research and technological breakthroughs have become the key to enhancing a country's core competitiveness. Especially in the marine field, the improvement of independent innovation capability determines whether China can occupy a favorable position in future international competition. We must continue to invest in scientific research and technological breakthroughs to achieve multiple major breakthroughs in marine energy development, marine biotechnology, and marine equipment manufacturing. The generation of scientific

research achievements can not only promote the transformation and upgrading of the marine industry but also inject new vitality into the construction of a maritime power. In the future, by strengthening scientific research and technological breakthroughs, cultivating more advanced marine industries, and continuing to consolidate China's leading position in the global marine economic landscape, we will provide solid scientific and technological support for achieving high-quality economic development.

### *3.3 Strengthen Policy Guidance and Institutional Construction, and Optimize the Marine Governance Environment*

To improve the legal and regulatory system, formulating and refining relevant marine laws and regulations is the foundation for ensuring marine governance capabilities. The government should strengthen the research and formulation of marine laws, and promptly revise and improve existing laws and regulations to meet the needs of marine governance. It is also necessary to strengthen the promotion and popularization of marine laws and regulations, and enhance the public's legal awareness and concept of the rule of law.

To establish a sound management mechanism, the government should set up a specialized agency responsible for ocean governance, clarify the responsibilities and tasks of each department, and form a joint force to promote ocean governance work. A scientific assessment and evaluation system should also be established to conduct regular assessments and supervision of ocean governance work, ensuring the effective implementation of various measures. It is necessary to strengthen international cooperation and exchanges. Marine issues on a global scale are becoming increasingly prominent, requiring joint responses from all countries. The government should actively participate in international ocean affairs and strengthen cooperation and exchanges with other countries and regions. By conducting joint research, co-construction, and sharing, the capacity for ocean governance can be continuously improved.

We should strengthen the support for scientific and technological innovation, which is one of the important means to enhance ocean governance capabilities. The government should increase investment in marine science and technology research and development, encourage enterprises and scientific research institutions to carry out innovative research, and promote the application and promotion of technological achievements in the field of ocean governance. Remote sensing technology can be utilized to monitor changes in the marine ecological environment and develop new types of marine clean energy.

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