The Legal Dilemma and Countermeasures in the Transfer of Marine Technology in China

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Abstract: The transfer of marine technologies plays a vital role in advancing China's marine economy, enhancing scientific research capabilities, and protecting the environment. This process is crucial for balancing international interests and fostering global cooperation. However, China faces legal challenges in marine technology transfer, including intellectual property rights issues, institutional frameworks, transfer models, and the willingness of developed countries to fulfill their commitments. This paper provides an in-depth analysis of these challenges and proposes strategies through institutional reforms and enhanced international collaboration, offering valuable insights for advancing China's marine technology transfer and contributing to global marine governance.

***Keywords*:** marine technology transfer, legal dilemma, intellectual property, international cooperation, governance system

1. Introduction

Marine technology transfer represents not merely the cross-border flow of technological know-how, but also a pivotal arena for international interest distribution and institutional competition. Against the backdrop of booming global marine economies, marine technologies are playing an increasingly vital role in resource development, environmental protection, scientific innovation, and related fields. China's active participation in international marine technology transfer has not only secured essential technical support for its maritime development but also significantly advanced global cooperation in these domains. However, constrained by complex international interest dynamics and systemic disparities, China faces multiple legal challenges during this process. These obstacles not only hinder the efficiency of technology transfer but also undermine its influence in global marine governance. Therefore, resolving these challenges holds critical significance for building China into a maritime power.

2. Legal Dilemma In Marine Technology Transfer In China

2.1 Legal obstacles at the level of intellectual property rights

Intellectual property monopoly in technology introduction

China faces significant technological gaps with developed maritime nations in emerging fields such as deep-sea exploration and marine renewable energy development, encountering intellectual property "barrier effects" during technology acquisition. Technology-owning countries leverage core IP monopolies to impose stringent transfer conditions through patent portfolios and technical secrecy protections. For instance, foreign companies demand exorbitant licensing fees from Chinese firms for deep-sea oil and gas extraction equipment technology transfers, restricting secondary development and application scope while increasing acquisition costs and stifling domestic innovation. Over 60% of China's marine engineering equipment sector relies on foreign core patents, with annual intellectual property licensing fees accounting for over 35% of total technology acquisition expenditures[1].

There are also disputes over the definition of rights in technical outputs. China holds technological advantages in marine biopharmaceuticals and seawater desalination, yet disputes often arise during technology transfer due to unclear rights ownership and usage scope. A research institution transferred marine bioactive substance extraction technology to Southeast Asian countries, but failed to specify the transferee's right to sublicense. This oversight led to unauthorized use by a third-party company, triggering infringement lawsuits. Such disputes highlight the dilemma between short-term gains and long-term development: overly restrictive rights hinder technology dissemination, while excessive leniency weakens domestic R&D motivation[1].

2.2 Institutional defects of relevant institutions and mechanisms

2.2.1 The lack of operational rules for international governing bodies

The BBNJ Agreement (Biodiversity in Beyond-National-territorial-Sea Areas) under the United Nations Convention

on the Law of the Sea established institutions for marine technology transfer, such as the Committee on Capacity Building and Technology Transfer (CBTT), but did not specify their organizational structure or operational mechanisms. While CBTT members 'selection procedures, technical needs assessment criteria, and transfer process oversight protocols are outlined as guiding principles, China's participation in technological cooperation lacks clear regulatory frameworks[2]. Notably, China missed opportunities for deep-sea mining technology collaboration due to its inability to formally submit technical proposals to CBTT through official channels[3].

2.2.2 Inefficient mechanisms for information exchange and financial support

While the BBNJ Agreement establishes a technical information exchange mechanism, China's research institutions struggle to access real-time updates on technology transfers due to the absence of a unified information sharing platform. Research indicates that less than 30% of Chinese marine research institutions are aware of international technology transfer projects, with most relying on unofficial channels that result in delayed and inaccurate information[4]. Fragmented funding mechanisms further complicate matters, as international organizations often attach political strings to technology transfer grants, coupled with lengthy approval processes. In 2023, China's application for marine pollution monitoring technology transfer was ultimately shelved due to delays in funding approvals[5].

2.3 Problems existing in the technology transfer model

2.3.1 Short-termization leads to technological dependence

Historically, China's marine technology transfer programs predominantly adopted short-term assistance models. A notable example was the fishery resource exploration technology transfer to an African nation, which only provided equipment and basic operational training without establishing a long-term maintenance system. This resulted in the equipment becoming idle after 18 months due to inadequate repair capabilities. The "heavy delivery, light capability" approach trapped recipient countries in a "import-lose-try again" cycle, significantly diminishing the global influence of China's technological exports[6].

2.3.2 Ignoring the actual needs of recipient countries

Some technology transfer programs are disconnected from recipient countries' actual conditions. When China transferred wave energy generation technology to an island nation without considering the complex marine meteorological conditions, the equipment malfunction rate reached 40%, leading to contractual disputes. Technology transfers should align with practical needs; otherwise, they waste resources and undermine the foundation of international cooperation trust [6].

2.4 The lack of willingness of developed countries to fulfill their obligations

2.4.1 Technology barriers and patent portfolio strategy

Leading nations in marine technology establish patent portfolios to build technological barriers. In the marine environmental monitoring sector, a U.S. company has formed a "patent pool" with over 200 related patents. Chinese enterprises face licensing fees accounting for 55% of their total costs when adopting these technologies[7]. This strategy stifles technological progress in developing countries through intellectual property monopolies, violating the BBNJ Agreement's principle of "promoting equitable access to technology."

2.4.2 The avoidance of mandatory clauses

Article 24 of the BBNJ Agreement imposes a "compulsory obligation" on developed countries to transfer marine technologies to developing nations. However, technology powerhouses evade this responsibility by conflating "technical assistance" with "commercial transfers." The EU packages deep-sea drilling technology as "voluntary technical exchange," refusing to provide non-commercial transfers as required by the agreement. China's technology imports face restrictions due to stringent commercial contract clauses[8].

3. Strategies For China To Deal With The Legal Dilemma Of Marine Technology Transfer

3.1 Improve the system of intellectual property protection and utilization

3.1.1 Establish an intellectual property risk prevention and control system

In the technology introduction phase, establish a patent early warning mechanism and conduct comprehensive analysis of core technology patent portfolios. For deep-sea robotics technology, commission professional institutions to assess patent infringement risks to avoid falling into "patent traps". Utilize antitrust legal measures to curb intellectual property abuse, referencing the EU Antitrust Guidelines to review the reasonableness of excessive patent licensing fees imposed by foreign enterprises.

3.1.2 Build a balance mechanism of rights for technology output

China has formulated the "Marine Technology Export Management Measures" to clarify standards for defining rights in technology transfer. For strategic technological fields such as marine biopharmaceuticals, a "patent licensing + technology equity participation" model is adopted to protect R&D stakeholders' interests, while promoting technology dissemination through equity binding mechanisms. A Technology Export Dispute Mediation Center has been established, and the Marine Technology Arbitration Committee jointly founded with ASEAN countries in 2024 has successfully resolved three fisheries technology transfer disputes[1].

3.2 Promoting the improvement of rules in international governance mechanisms

3.2.1 Participate in the formulation of operational rules for international institutions

Leveraging the implementation opportunities of the BBNJ Agreement, China collaborated with developing countries to establish operational rules for the Committee on Deep-sea Technology (CBTT). The "regional representation system" was proposed to ensure equitable representation across regions within the committee. A standardized technical needs declaration process was established, prioritizing China's deep-sea ecological restoration technologies in the list[2]. In 2023, China-led efforts to develop the "Assessment Framework for Marine Technology Needs of Developing Countries" were incorporated into CBTT discussions.

3.2.2 Build an efficient information and capital mechanism

In collaboration with BRICS countries, China has established the "Marine Technology Transfer Information Sharing Platform" to integrate global technology supply and demand data. During its six-month trial operation, the platform launched 23 technical cooperation projects, including the China-Brazil deep-sea exploration technology collaboration[4]. Regarding funding, efforts were made to establish the "South-South Cooperation Marine Technology Fund", with an initial investment of 1 billion yuan (RMB). By streamlining approval procedures, the fund has supported 5 seawater desalination technology introduction projects in developing countries by 2024[5].

3.3 Innovative cooperation models for technology transfer

3.3.1 Implement the "capacity building" type transfer model

The technical export and long-term capacity-building program involved transferring aquaculture technologies to Latin American countries. This initiative included establishing regional technical training centers that trained over 200 local technicians, implementing a five-year equipment maintenance cooperation mechanism, and boosting the technology survival rate to 85%. This model not only strengthened recipient countries 'technological autonomy but also amplified China's global technological influence.

3.3.2 Implement localized adaptation programs

A national assessment system for technology transfer was established, and research on the Marine environment, industrial base and legal system of the recipient country was conducted before the launch of the project. The typhoon early warning technology was transferred to Bangladesh, and the monitoring equipment was modified according to the geographical characteristics of the dense river network in Bangladesh, which increased the accuracy of early warning by 40%[6].

3.4 Strengthening international cooperation and supervision over the implementation of the Convention

3.4.1 We will build a multilateral consultation mechanism for sharing benefits

China has established a "technology complementarity cooperation" mechanism with developed maritime nations, exchanging its deep-sea mining environmental protection technologies for Norway's deep-sea drilling equipment expertise, thereby leveraging complementary strengths to reduce collaboration barriers[7]. The country is also promoting the establishment of a "technology transfer revenue reinvestment" system, requiring technology recipients to allocate portion of application benefits into joint R&D efforts, creating a virtuous cycle of "transfer → application → re-innovation".

3.4.2 Establish an international alliance for performance monitoring

In collaboration with developing countries, the "BBNJ Agreement Implementation Monitoring Working Group" was established to track and evaluate developed nations' compliance with technology transfer obligations. In 2024, the group released the "Marine Technology Transfer Compliance Report", which revealed that the United States had achieved only a 38% compliance rate in transferring marine renewable energy technologies, prompting international pressure on the U.S. [8].

4. Conclusions

The legal challenges China faces in marine technology transfer reflect the restructuring of interests and institutional competition during the transition period of global ocean governance. To resolve these issues, efforts must be made from multiple dimensions including intellectual property protection, international rule-making, and innovative cooperation models: improving institutional frameworks to balance technological protection and dissemination, participating in rule-making to enhance international discourse power, and innovating models to achieve win-win cooperation. This will help China break through technical bottlenecks, boost its maritime competitiveness, contribute Chinese wisdom to building a fair and reasonable global marine governance order, and promote the common development of humanity's oceanic endeavors.

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