

Cooperation on Capacity-Building and the Transfer of Marine Technology: An Interpretation of Article 41 under the BBNJ Agreement

Ziyi Chen, Qi Lyu*

School of Law, Central China Normal University, Wuhan, 430079, China

*Corresponding Author

ABSTRACT

Cooperation mechanism on capacity-building and the transfer of marine technology (CBTMT) under the BBNJ Agreement, is pivotal for enabling inclusive, equitable, and effective cooperation and participation in the activities undertaken, thereby assisting Parties-in particular developing State Parties-in implementing the Agreement. Article 41 established cooperation norms on CBTMT through three pillars: mandatory cooperation obligations, cross-sector partnerships, and differentiated cooperation process. These provisions aim to safeguard developing countries' interests while advancing the global governance framework for the sustainable use and conservation of marine biodiversity. However, compromises during the negotiations of the BBNJ Agreement introduce challenges in implementation, primarily due to the reluctance of developed countries and other stakeholders to engage fully into cooperative efforts, coupled with the power inequality among the Parties. This paper proposes a legal analysis framework to address these challenges and enhancing the efficacy of CBTMT cooperation under the BBNJ Agreement.

KEYWORDS

BBNJ Agreement; Capacity-Building; Transfer of Marine Technology; Ocean Governance.

1. INTRODUCTION

In recent years, the advancements in global ocean governance have heightened international focus on the conservation and sustainable use of marine biodiversity. The formal adoption of *the Agreement on the Conservation and Sustainable Use of Marine Biodiversity beyond National Jurisdiction under the United Nations Convention on the Law of the Sea* (BBNJ Agreement) in 2023 marks a milestone. The aim of the BBNJ Agreement is to protect marine ecosystems and biodiversity through international cooperation, and by providing innovative mechanisms and sound legal frameworks. The BBNJ Agreement addresses four main issues: marine genetic resources and benefit sharing (MGRs), environmental impact assessments (EIAs), area-based management tools, including marine protected areas (ABMTs), and capacity-building and transfer of marine technology (CBTMT), among which the CBTMT serves as the cornerstone for effective implementation of the provisions under other three issues. Although there are some extensive studies on capacity-building and the transfer of technology, [1-3] specific study on cooperative mechanism for CBTMT remains limited. This paper focuses on the normative framework of CBTMT cooperation under the BBNJ Agreement, and is structured as follows: the first part explains the concept of the core terms in relation to CBTMT, and discusses the necessity of CBTMT cooperation; the second part gives a theoretical analysis to the Article 41 under the BBNJ Agreement; the last part discusses the implementation challenges. This paper aims to provide actionable insights for policymakers to identify the challenges of CBTMT cooperation, in

which way to enhance the international cooperation in this field and to improve the future implementation of the BBNJ Agreement.

2. RATIONALE FOR COOPERATION ON CBTMT

2.1. Conceptual Scope of CBTMT

CBTMT refers to “capacity-building” and “transfer of marine technology”. The collective use of these two terms is first introduced by the BBNJ Agreement, but the terms themselves are not innovations. A mandate for “capacity-building” and “transfer of technology” already exists in UNCLOS and other international agreements. In general sense, capacity-building and the transfer of technology have been recognized by the international community as the essential approaches to achieve sustainable development goals. Requirements for capacity-building and the transfer of technology are written in numerous outcome documents and action plans adopted at major international conferences on sustainable development. The concept of capacity-building was rising as an essential element of people-centered development in the 1990s.^[4] Definitions of capacity-building are sometimes vague and inconsistent, according to the context the term is used. But there seems to be a consensus that capacity-building suggests a demand-driven approach for sustainable social and economic development, basing on the recognition of indigenous capacities and institutions. The term of technology transfer emerged with the call for the establishment of a new International Economic Order. The definition of technology transfer is also complex and often-contested. The Special Report on Technology Transfer made by the Intergovernmental Panel on Climate Change describes the transfer of technology, in the context of climate change, as “...the broad set of processes that cover the flows of knowledge, experience, and equipment for mitigating and adapting to climate change among different stakeholders. These include governments, international organizations, private sector entities, financial institutions, NGOs and research and/or education institutions. It comprises the process of learning to understand, utilize, and replicate the technology, including the capacity to choose it, adapt it to local conditions, and integrate it with indigenous technologies.” Adopting this broad definition, the connotation of technology transfer and capacity-building is overlapping to some extent. The transfer of technology usually encompasses both hard technologies (e.g., physical infrastructure and equipment) and soft technologies (e.g., knowledge, expertise, and institutional frameworks). The transfer of soft technologies often includes both bidirectional and multidirectional flows, while in the field of biodiversity the transfer of technology is typically characterized by a unidirectional and linear pattern, with technology flowing from biodiversity-rich countries to those with relatively limited biodiversity-related technological capacity.^[5]

In the field of international law of the sea, capacity-building and the transfer of technology is a centerpiece of the new ocean order set by UNCLOS, as a resolution to the comprehensive and multidisciplinary approach firmly rooted in principles of sustainable development. The transfer of technology is stressed in Part XI (the Area), Part XII (Protection and Preservation of the Marine Environment), Part XIII (Marine Scientific Research), and Part XIV (Development and Transfer of Marine Technology) of UNCLOS. UNCLOS does not define the transfer of technology, but according to the basic objectives and the measures achieving these objectives provided in general provisions of Part XIV, transfer of marine technology under the convention indicates both technical assistance and commercial transaction. In practice, the scope of technology transfer is largely determined by the nature of the technology transferred and the mode of transfer. With respect to capacity-building, although not expressly mentioned under UNCLOS, it remains a central issue in the implementation of the convention. Requirements on capacity-building can be interpreted from provisions in relation with developments. As was pointed out by the co-chairpersons of the consultative process at the third meeting, “[a]lthough UNCLOS does not use the phrase ‘capacity-building’, it contains over 25 references to the need to help developing States and take their concerns into account.” *The Global Ocean Science Report 2020* considers capacity development as a fundamental tenet of IOC-UNESCO

and of the Ocean Decade, stating that capacity development is a process by which individuals and organizations obtain, strengthen and maintain the capabilities to set and achieve their own development objectives over time.^[6] In a word, UNCLOS established a comprehensive legal framework for ocean-related activities with a latent and inexorable link to capacity-building through the transfer of technology, scientific and technical assistance, knowledge sharing, and cooperation and collaboration.

The BBNJ Agreement fills the lacuna of UNCLOS by including CBTMT as one of the four elements of the agreement. The BBNJ Agreement stresses that one of the objectives of CBTMT is to “develop the marine scientific and technological capacity, including with respect to research, of Parties, in particular developing States Parties, with regard to the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction, including through access to marine technology by, and the transfer of marine technology to, developing states Parties”. However, neither “capacity-building” nor “transfer of marine technology” is explicitly defined in the “Use of Terms” clause in Article 1 of the BBNJ Agreement. Therefore, it is necessary to examine the relevant provisions in Part V (Capacity-building and the transfer of marine technology) of the BBNJ Agreement in order to delineate the meanings of capacity-building and the transfer of marine technology under the agreement. The operational nature of capacity-building suggests that it does not require a rigid definition, it refers to a broad range of activities aimed at enhancing the marine scientific and technical capabilities of Contracting Parties for the conservation and sustainable use of marine biodiversity in ABNJ. Article 44 which outlines the types of CBTMT can be used to define the scope of capacity-building, according to which capacity-building efforts encompass three types of activities empowering State Parties to achieve self-defined development goals: (i) human resource development, referring to supports for the development or strengthening of human resource capacities; (ii) institutional strengthening, referring to supports for the development and strengthening of institutional capacity and national regulatory frameworks or mechanisms; (iii) infrastructural development, referring to supports for the development and strengthening of relevant infrastructure and technological tools. The transfer of technology under the BBNJ Agreement is limited to marine-related technologies. Unlike the unidirectional flow in traditional biodiversity agreements (e.g., the CBD), the BBNJ framework emphasizes equitable, needs-driven transfers, prioritizing developing states’ priorities. Article 1(10) of the BBNJ Agreement provides an enumerative list outlining seven primary categories of marine technology: (i) information and data on marine sciences and related operations and services; (ii) manuals, guidelines, criteria, standards and reference materials; (iii) sampling and methodology equipment; (iv) observation facilities and equipment for in situ and laboratory observations, analysis, and experimentation; (v) computer and computer software, including models and modelling techniques; (vi) related biotechnology; and (vii) expertise, knowledge, skills, technical, scientific and legal know-how and analytical methods related to the conservation and sustainable use of marine biodiversity. A capacity-building and transfer of marine technology committee is to be established under the BBNJ Agreement, one of its mandates is to provide recommendations on the indicative and non-exhaustive list of types of capacity-building and of transfer of marine technology, in order to reflect technological progress and innovation and to respond and adapt to the evolving needs of States, subregions and regions.

2.2. The Interrelationship between Capacity-Building and the Transfer of Marine Technology

The BBNJ Agreement is the first international instrument to explicitly integrate the terms of capacity-building and the transfer of technology within its text. Few existing international instruments directly address both “capacity-building” and “transfer of technology” in their substantive provisions. For instance, Part XIV of UNCLOS which is titled as “development and transfer of marine technology”, omits explicit references to capacity-building. Similarly, Article 18 of the CBD uses the expression of “technical and scientific cooperation”, and the Conference of the Parties adopted a decision on

“Capacity-building and development, and technical and scientific cooperation” at its fifteenth meeting, emphasizing the importance of bridging the capacity gaps of developing country Parties in fulfilling their obligations under the CBD and its framework agreements through capacity-building and technical cooperation. Although the latent and inexorable link between capacity-building and the transfer of technology is widely recognized, the BBNJ Agreement specifies upfront the establishment of a body or process for implementation by underlying such link. The BBNJ Agreement explicitly underscores in its preamble that “support for developing country Parties through capacity-building, as well as the development and transfer of marine technology, is a fundamental element for achieving the objectives of conservation and sustainable use of marine biodiversity in ABNJ”. The BBNJ Agreement also set out specific provisions in Part V titled “Capacity-building and the transfer of marine technology”.

The interplay between capacity-building and the transfer of technology can be observed from two sides: capacity-building is necessary to ensure that the transfer of technology brings lasting benefits, and the transfer of marine technology is a key component of capacity-building. On the one hand, capacity-building defines the modalities for the transfer of marine technology. In general, the transfer of technology occurs primarily through technology trade, regulated by the international intellectual property rights treaty system and trade-related agreements under the World Trade Organization (WTO). This system typically prioritizes economic benefits through free market competition, with a strong commercial emphasis. However, the BBNJ Agreement emphasizes the principle of equity in the transfer of technology, significantly reducing the commercial focus. The BBNJ Agreement requires the transfer of technology to facilitate capacity-building in developing State Parties, particularly least-developed countries, landlocked developing countries, geographically disadvantaged countries, small island developing states, coastal African countries, archipelagic countries, and middle-income developing countries. In accordance with the target for capacity-building, the transfer of technology under the BBNJ Agreement, unlike in the general practice, should also be country-driven rather than market-driven. On the other hand, as one of the modalities for capacity-building, the transfer of marine technology plays a substantial role in supporting developing countries to build their own capacity. Capacity-building can be implemented through different modalities as mentioned previously. However, due to the complexity condition of marine biodiversity and the challenges of accessing the deep-sea environments, technology is the key element for developing countries to implement the BBNJ Agreement and to achieve its objectives. Therefore, capacity-building must be closely integrated with the transfer of technology to promote the conservation and sustainable use of marine biodiversity in ABNJ.

The integration of capacity-building and the transfer of marine technology constitutes the institutional foundation of the BBNJ Agreement. It is only through capacity development that developing countries will be able to realize their rights and fulfill their obligations under the Agreement, ultimately ensuring that all State Parties can contribute to, and benefit from, the conservation and sustainable use of ABNJ biodiversity.^[7] Thus, an effective implementation of CBTMT will facilitate the achievement of the objectives relating to the other three key components of the BBNJ Agreement.

2.3. The Necessity of Cooperation on CBTMT

The BBNJ Agreement emphasizes the importance of cooperation both in the general provisions of Part I and in the specific provisions of Part V, stating that Parties shall promote international cooperation in marine scientific research and in the development and transfer of marine technology consistent with UNCLOS in support of the objectives of the BBNJ Agreement.

The marine and coastal ecosystems are inherently interconnected, while divisions between areas within and beyond national jurisdictions are artificial constructs. Biological, physical, and chemical processes in different regions interact dynamically, creating a complex web of interdependencies. Due to the “chain effect” of marine ecological processes, the conservation and sustainable use of

marine biodiversity necessitate unprecedented levels of global cooperation, which, in turn requires substantial capacity and technical support from all States. Furthermore, biodiversity challenges in ABNJ often exceed the capabilities of individual States, making transnational cooperation essential to achieving meaningful outcomes. Consequently, cooperation on CBTMT is vital to collectively enhance the ability of States to manage and protect marine ecosystems.

Cooperation on CBTMT serves as the institutional foundation for the full and effective implementation of the BBNJ Agreement. Marine biodiversity is characterized by its cross-cutting nature across both spatial and temporal dimensions, making it one of the most complex scientific fields of recent decades. From the outset of the Preparatory Committee meeting of the BBNJ Agreement, Limited Developed Countries (LDCs) highlighted that they were facing great challenges on the implementation and capacity across all areas of the package deal. Landlocked Developing Countries (LLDCs) also emphasized their limited participation in ocean-related matters, underscoring the need for the BBNJ Agreement to safeguard their rights. Currently, in the area of marine genetic resources and digital sequence information, only a handful of developed countries possess the large research vessels necessary for expeditions in ABNJ, and opportunities to commercialize scientific discoveries are nearly exclusively controlled by public and private laboratories in developed nations. ^[6] The same predicament is presented with respect to MPAs, where only a handful countries have the capacity to establish and effectively manage MPAs. ^[8] Therefore, advancing the full and effective implementation of the BBNJ Agreement necessitates addressing capacity gaps in marine knowledge, technology, policy, and law at the individual, institutional, and international levels. Cooperation on CBTMT is indispensable for bridging these gaps and ensuring equitable participation of all Parties.

Cooperation on the CBTMT can also enhance synergies with existing frameworks for global ocean governance. The current frameworks for global ocean governance are fragmented, with limited cross-sectoral coordination and integration.^[9] The established international frameworks for ocean governance are primarily dominated by various global and regional institutions, which struggle to respond effectively to the dual pressures of expanding human activities and drastically changing climate factors. Against this backdrop, the BBNJ Agreement serves as an important complement to the existing international frameworks for ocean governance. The BBNJ Agreement envisions multi-tiered approaches for CBTMT cooperation, extending beyond traditional international collaboration to include global, regional, sub-regional, and sectoral bodies. The provisions under the BBNJ Agreement ensure that its interpretation and application are without prejudice to relevant legal instruments, frameworks, and global, regional, subregional, and sectoral bodies (IFBs). Simultaneously, the State Parties are encouraged, where appropriate, to advance the objectives of the BBNJ Agreement in decision-making within IFBs. The principle of “without prejudice” enables the BBNJ Agreement to build upon existing IFBs for ocean governance, ensuring adaptability to emerging challenges driven by scientific and technological advancements. Additionally, the BBNJ Agreement can foster synergies with governance mechanisms for marine areas under national jurisdiction. By acknowledging the interconnected nature of oceans and seas, this approach prevents isolated conservation efforts by States, thereby making the implementation of CBTMT more cost-effective and efficient.

3. REGULATORY FRAMEWORK FOR COOPERATION ON CBTMT UNDER THE BBNJ AGREEMENT

All countries can benefit from the ecological, economic, scientific, and cultural services provided by marine biodiversity. However, multifaceted and inclusive cooperation is needed to achieve equal access to marine technology, along with shared governance and the sustainable use of ocean resources. No single country or international organization can independently fulfill the dual responsibilities of utilizing and conserving marine biodiversity. The key mechanism for facilitating and implementing CBTMT under the BBNJ Agreement lies in robust international cooperation. Therefore, a

comprehensive understanding of the necessity and characteristics of cooperation norms for CBTMT is essential for anticipating how this mechanism will be implemented in the future practice. Article 41 of the BBNJ Agreement specifically delineates the framework for CBTMT cooperation. It draws on relevant provisions from several international instruments, including UNCLOS, the Paris Agreement, the Nagoya Protocol, the Minamata Convention on Mercury, among others. These provisions establish a regulatory framework for cooperation among parties by addressing the duty to cooperate, the subjects of cooperation, and the cooperation process.

3.1. Mandatory Obligations for Cooperation

The first paragraph of Article 41 provides Parties shall cooperate, directly or through relevant legal instruments and frameworks and relevant global, regional, subregional and sectoral bodies, to assist Parties, in particular developing States Parties, in achieving the objectives of this Agreement through capacity-building and the development and transfer of marine science and marine technology. The use of the term “shall” indicates that cooperation is, to some extent, a mandatory obligation.

During the negotiation process of the BBNJ Agreement, the nature of the duty to cooperate was highly contested, with four primary viewpoints emerging. Some countries, mainly developed countries, advocated for an exclusively voluntary transfer of technology, while some developing countries especially least developed countries supported a strictly mandatory transfer. Some countries proposed a hybrid model allowing for both voluntary and mandatory transfers. Also there are some countries rejected the dichotomy altogether, arguing that the transfer of technology should not be framed solely as voluntary or mandatory obligation. Throughout the Preparatory Committee phase, the European Union, Japan, and Russia emphasized the voluntary transfer of technology, with the United States proposing its inclusion on mutually agreed terms—a stance supported by Japan, Australia, and Canada but opposed by developing countries such as the African Group and Cuba. Nepal, representing the interests of LDCs, called for special and mandatory provisions on CBTMT. The specificity of cooperation in this area, distinct from general cooperation obligations, was seen as crucial for developing countries to effectively implement the Agreement. During the third intergovernmental negotiations, Russia reiterated its opposition to legally binding cooperation obligations. However, by the fourth round of negotiations, several developed and developing countries supported a model incorporating both mandatory and voluntary elements, aligning with the principle of common but differentiated responsibilities. Some negotiators cautioned against a rigid voluntary-mandatory divide, noting that such a framework could complicate discussions on intellectual property rights. Instead, alternative wording was proposed to balance legal certainty with practical feasibility. Eventually, in the fifth intergovernmental negotiations, consensus was reached on the phrase “shall cooperate,” which was adopted in the final text. Beyond Article 41, Article 42 further reinforces this commitment, stating that “Parties, within their capabilities, shall ensure capacity-building for developing States Parties and shall cooperate to achieve the transfer of marine technology” This wording reflects a compromise that accommodates diverse perspectives while integrating proposals from developing countries.

The debate over voluntary versus mandatory obligation on transfer of technology predates the BBNJ Agreement and can be traced back to UNCLOS. Article 144 of UNCLOS mandates cooperation between the Authority and States Parties to facilitate technology and knowledge transfer related to activities in the Area. Article 5 of Annex III originally imposed a mandatory obligation on seabed development contractors, requiring them to share technology with the Enterprise. However, the subsequent 1994 Agreement on the Implementation of Part XI of UNCLOS shifted towards market-based acquisition or joint venture arrangements, effectively eliminating mandatory transfers. As a result, over the past 40 years, the transfer of marine technology has remained one of the most significant implementation gaps under UNCLOS. The BBNJ Agreement seeks to address these past historical shortcomings by establishing a more balanced and enforceable cooperation framework.

3.2. Cross-sector Partnership in Cooperation

The second paragraph of Article 41 stipulates that the Parties shall cooperate at all levels and in all forms, including through partnerships with and involving all relevant stakeholders, such as, where appropriate, the private sector, civil society, and Indigenous Peoples and local communities as holders of traditional knowledge, as well as through strengthening cooperation and coordination between relevant legal instruments and frameworks and relevant global, regional, subregional and sectoral bodies. By incorporating a broad range of stakeholders, the implementation of the BBNJ Agreement is expected to be more representative, integrating diverse knowledge systems and perspectives.

The cooperation framework for CBTMT under the BBNJ Agreement is State-driven, while the challenges of technology transfer cannot be fully addressed through States' consents alone. Notably, the private sector is listed in the first place as the "relevant stakeholder" in this provision, reflecting its dominant role in holding patents for cutting-edge marine technologies-many of which are concentrated in developed countries. Given its fundamentally profit-oriented nature, the private sector has historically shown limited willingness to engage in technology transfer efforts on fair or concessional terms, often favoring competitive rather than cooperative approaches. This reluctance poses significant challenges for developing countries seeking access to advanced marine technology to build their capacities. The tension rising from private-sector involvement was evident during BBNJ negotiations. At the third intergovernmental meeting, the Group of 77 and China proposed incorporating various forms of cooperation, including partnerships with stakeholders such as industry and the private sector. However, developed countries such as Japan, South Korea, and Canada opposed this reference, advocating for its removal. Ultimately, a compromise was reached, allowing for the inclusion of the private sector in the cooperation framework, but linking its role to specific modalities of marine technology transfer. The final text stipulates that such transfers should be conducted on equitable and most advantageous terms, including on concessional and preferential terms, and on mutually agreed terms and conditions.

In addition to private-sector engagement, Article 41(2) also recognizes indigenous peoples and local communities (IPLCs) as holders of traditional knowledge. This designation is similar to that found in Article 22 of the Nagoya Protocol. During negotiations, how to define the right-holders of traditional knowledge was under debate. Some countries proposed that only IPLCs can be recognized as the right-holders, while others considers that States and other entities could also be included. The BBNJ Agreement ultimately adopted the point of view that IPLCs are the only right-holders of traditional knowledge. Due to their close interaction with marine ecosystems, IPLCs possess valuable knowledge of marine biodiversity, which can complement scientific research, promote sustainable resource use, and prevent redundancy in biodiversity exploration efforts. However, unlike the private sector, which benefits from robust national and international intellectual property protections, IPLCs have historically faced exploitation in research collaborations. Issues such as parachute research and marine biopiracy have frequently marginalized local communities, with external researchers failing to engage meaningfully with them or secure their interests.^[10] By emphasizing the participation of IPLCs as right-holders of traditional knowledge, the BBNJ Agreement seeks to move beyond the dominance of western scientific paradigms, fostering a more inclusive and equitable framework for capacity development and ocean governance.

3.3. Differentiated Cooperative Processes

The final paragraph of Article 41 mandates that Parties, in implementing this Part, shall fully recognize the special needs of developing country Parties. This provision not only acknowledges the importance of addressing the specific challenges faced by developing countries, but also explicitly categorizes State Parties into different groups, including least developed countries, geographically disadvantaged states, and middle-income developing countries. This distinction reflects a nuanced

approach giving considerations to development disparities and aligns with the principle of common but differentiated responsibilities.

From the early stages of the negotiations, there was broad consensus that the framework for CBTMT should accommodate the needs of developing countries. However, developed countries were generally reluctant to grant special preferences to developing states. For instance, the United States advocated for the removal of middle-income countries from the text and sought a clearer definition of what constitutes special needs. Meanwhile, the European Union went further by proposing to delete explicit references to developing countries altogether, arguing that CBTMT should address the needs and priorities of all countries rather than focusing solely on developing states. ^[11] Despite these opposing positions, the final text of the BBNJ Agreement retained a specific reference to developing countries, especially those with special needs, ensuring that their interests were fully considered. As a compromise to accommodate concerns from developed countries, the BBNJ Agreement does not impose burdensome reporting obligations on CBTMT providers, thus striking a balance between accountability and flexibility in implementation.

4. CHALLENGES TO COOPERATION ON CBTMT UNDER THE BBNJ AGREEMENT

Overall, the cooperation norms under the BBNJ Agreement are primarily designed to safeguard the interests of developing countries. However, after two decades of negotiations, the final text reflects a carefully compromise that balances divergent priorities without imposing substantial constraints on developed countries. In one regard, the ambiguous language and soft regulations of the BBNJ Agreement may provide developed countries and other stakeholders with grounds to resist cooperation in practice. For instance, discretionary clauses such as “where appropriate” in Article 41(2) allow Parties significant leeway in determining their level of engagement. In another regard, even when cooperation is initiated, the capacity gaps among participants may lead to imbalanced decision-making power, thereby undermining the fairness of cooperation. These challenges pose significant obstacles to the effective implementation of CBTMT cooperation norms under the BBNJ Agreement.

4.1. Limited Willingness of Cooperation

The sufficient involvement of CBTMT providers is a key element that influences the effectiveness of CBTMT cooperation norms. And the engagement of the relevant countries and other stakeholders is driven by both internal and external incentives. Exploration in ABNJ often relies on cutting-edge technologies which are mainly controlled by private entities in developed countries. Usually, the private sector lacks intrinsic motivation to cooperate with developing countries to transfer marine technology, especially cutting-edge technologies protected by intellectual property. The BBNJ Agreement attempts to provide external incentives to foster cooperation on CBTMT by two mechanisms. First is non-monetary benefit-sharing mechanism. CBTMT is an integral part of the benefit-sharing framework for marine genetic resources. Benefit-sharing requirements obliged the State Parties to transfer technologies listed as non-monetary benefits. Second is mandatory obligation on CBTMT cooperation established by Article 41, which has original value as a mechanism for promoting the conservation and sustainable use of marine biodiversity. However, the BBNJ Agreement does not provide a robust implementation framework, so these obligations may not be fully complied with according to interpretation by different stakeholders.

Under the benefit-sharing mechanism, cooperation is a mandated obligation. However, State Parties may decide how to fulfill such obligation, and the baseline is the overarching principle of benefit-sharing. Consequently, the willingness of developed State Parties to engage in cooperation is unlikely to exceed the minimum requirements established by benefit-sharing mechanism. The legal nature of

marine genetic resources in the ABNJ has been mired in controversy throughout the negotiations of the BBNJ Agreement. The final text of the BBNJ Agreement incorporates both the principle of the common heritage of humankind and the principle of the freedom of the high seas under its General Principles clause. It seems to strike a balance between the two principles, but remains considerable ambiguity for implementation. Furthermore, the BBNJ Agreement stipulates that Parties shall be guided by the principle of the common heritage of humankind as set forth in UNCLOS, in which way limits the application of this principle. Under UNCLOS, the common heritage principle applies solely to the international seabed area and does not extend to the high seas, which narrows its scope of application covered by the BBNJ Agreement. Within the international seabed area, the principle of the common heritage of humankind applies only to solid, liquid, or gaseous mineral resources, explicitly excluding living resources. And it is specified in UNCLOS that the legal status of the overlying waters remains unaffected by provisions governing the seabed area. So, the legal framework governing marine biodiversity in ABNJ does not perfectly match the conservation objectives under the BBNJ Agreement. As a result, the extent to which the principle of the common heritage of humankind could apply largely depends on the interpretations by the Parties. Even the BBNJ Agreement also incorporates the principle of equity and the fair and equitable sharing of benefits as general principles and approaches, State Parties can nevertheless interpret these principles in a way that serves their own interests.

The normative framework for CBTMT cooperation allows for broad participation, but the use of discretionary language such as “as appropriate” in Article 41(2) indicates its soft law character. It is a recommendatory provision, affording Parties discretion in determining their level of engagement. Moreover, even where State Parties bear mandatory obligations, private sector retains the discretion to decide whether to participate in cooperation efforts. Their reluctance to engage in the transfer of technology could thus pose implementation challenges to the CBTMT corporation. International treaties generally cannot impose direct obligations on private sector. The private sector-particularly multinational corporations from developed countries-holds significant technological expertise and plays a crucial role in the transfer of technology. However, private sector usually seeks to maximize corporate interests, rather than adherence to commitments made by the government under international agreements. Meanwhile, private property is under robust protection in most developed countries, so governments usually have no authority to intervene in technology transfer conducted by private sectors. At international level, the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPs) also safeguard intellectual property rights in cross-border technology transactions. Therefore, in the absence of strong regulatory mandates, capacity-building efforts may be perceived as merely moral obligations or social responsibility of technical corporations. The extent to which private entities would be willing to relinquish the protective framework provided by intellectual property rights in order to facilitate the transfer of marine technology remains uncertain under the BBNJ Agreement. In practice, capacity-building and technical assistance programmes are predominantly confined to areas within national jurisdiction. For instance, a study of 157 capacity-building projects led by Japan revealed that most initiatives were concentrated in coastal areas or exclusive economic zones, with rare CBTMT programs directly targeting ABNJ. [12]

4.2. Power Inequality in the Cooperation

The BBNJ Agreement reaffirms the importance of contributing to the realization of a just and equitable international economic order. Nevertheless, the BBNJ Agreement cannot reverse the structural inequity between developed countries and developing countries. Such inequality also persists in CBTMT cooperation, between suppliers (predominantly developed countries) and recipients (primarily developing countries), stemming from the inherent capacity gaps and the disparities that emerge during the cooperation process.

Compared to marine areas within national jurisdiction, the exploitation of biodiversity in ABNJ remains in its early stage. Exploration of deep-sea environments, such as hydrothermal vents and

mesopelagic coral reefs, for biodiversity study and utilization is highly dependent on advanced technologies. Moreover, the commercialization of marine genetic resources requires substantial investment in time and financial resources. For instance, developing new drugs based on marine genetic resources can take 10 to 15 years to reach the market, requiring an average investment of \$2.8 billion.^[13] Such high costs incentivize technologically and financially capable countries to collaborate with peers of similar capacity, prioritizing mutual benefits through shared research and development resources. Even when developed countries engage in CBTMT cooperation with developing countries, their superior technical expertise such as fieldwork experience and deep-sea research often leads to dominance position. This imbalance makes it difficult for developing countries, especially researchers in the Global South, to effectively contribute to negotiations on research methodologies that align with their interests.^[14]

Motivations for participating in CBTMT cooperation varies among Parties, with an unequal distribution of decision-making power and influence. This imbalance can result in prioritizing the interests of the most powerful Parties at the expense of the weaker ones. A wide range of stakeholders are involved in CBTMT cooperation, including governments, intergovernmental organizations, NGOs, the private sector, academia, philanthropic organizations, and indigenous peoples and local communities. Each group of stakeholders pursues distinct objectives, and has its own priorities—whether for scientific research, marine conservation, equitable access to marine resources, preservation of cultural values, or the advancement of marine technology. For example, in *the Blue Whale of Sri Lanka* project, local marine biologists have noted that research conducted by external researchers from developed countries is often driven by the assumptions, motivations, and needs of their home countries, with little regard for the perspectives of local researchers.^[15] Such dynamics exacerbate power imbalances, sidelining local expertise and knowledge systems.

To sum up, while the CBTMT norms aim to promote capacity-building in developing countries, the recipient Parties—often the weaker participants—typically have limited influence over the project direction. The results are that the projects are largely driven by the stronger Parties, relegating the recipient Parties to a passive role. The dominance of Western scientific frameworks further marginalizes alternative epistemologies and local knowledge systems. Consequently, existing power disparities may not only persist but widen, undermining the development of national capacities in the weaker Parties.

5. CONCLUSION

The cooperation norms enshrined in Article 41 of the BBNJ Agreement constitute the cornerstone of Part V of the BBNJ Agreement, providing a practical foundation for achieving its overarching objectives. These norms emphasize the imperative for enhanced cooperation among Parties and stakeholders. Despite the obligations on cooperation is clearly provided in Article 41 under the BBNJ Agreement, challenges persist in practice. Firstly, the lack of motivation of developed countries, particularly the private sector, to engage in collaborative efforts constrains the scope and depth of the transfer of technology, largely due to the conflicts with commercial interests. Secondly, asymmetrical power dynamics between technology suppliers (predominantly developed states) and recipients (primarily developing states) result in inadequate representation of the latter's needs and priorities in capacity-building initiatives. Addressing these challenges is pivotal to ensuring the effective implementation of the CBTMT provisions under the BBNJ Agreement once it enters into force. Although this paper refrains from proposing specific solutions, it establishes a conceptual framework for analyzing the systemic barriers to CBTMT cooperation. This analysis not only offers insights for the future implementation of the BBNJ Agreement, but also may contribute to broader discourse on equitable international marine governance. Furthermore, its findings hold substantial reference for policymakers and scholars seeking to refine global ocean governance mechanisms.

REFERENCES

- [1] Harden-Davies H, Snelgrove P. Science Collaboration for Capacity Building: Advancing Technology Transfer Through a Treaty for Biodiversity Beyond National Jurisdiction. *Frontiers in Marine Science*, 2020, 7: 14.
- [2] Harden-Davies H, Amon D J, Vierros M, et al. Capacity development in the Ocean Decade and beyond: Key questions about meanings, motivations, pathways, and measurements. *Earth System Governance*, 2022, 12: 7.
- [3] Harden-Davies H, Lopes V F, Coelho L F, et al. First to finish, what comes next? Putting Capacity Building and the Transfer of Marine Technology under the BBNJ Agreement into practice. *npj Ocean Sustainability*, 2024, 3(1): 3.
- [4] Eade D. Capacity-building: An Approach to People-centered development. Oxfam (UK and Ireland), 1997: 2-3.
- [5] Böhm M, Collen B. Toward equality of biodiversity knowledge through technology transfer. *Conservation Biology*, 2015, 29(5): 1290-1302.
- [6] United Nations Educational, Scientific and Cultural Organization. Global Ocean Science Report 2020: Charting Capacity for Ocean Sustainability, United Nations, 2021.
- [7] Santos B S, Devereaux S G, Gjerde K, et al. The diverse benefits of biodiversity conservation in global ocean areas beyond national jurisdiction. *Frontiers in Marine Science*, 2022, 9: 7.
- [8] WANG Y. On dilemmas and solutions for the issues of high seas marine protected areas during the BBNJ negotiation. *Applied Ecology and Environmental Research*, 2019, 17(4): 8615-8629.
- [9] Wright G, Rochette J, Gjerde K, et al. The long and winding road: negotiating a treaty for the conservation and sustainable use of marine biodiversity in areas beyond national jurisdiction. *The Institute for Sustainable Development and International Relations*, 2018(Studies No 08/18): 82.
- [10] Gewin V. Pack up the parachute: why global north–south collaborations need to change. *Nature*, 2023, 619(7971): 885-887.
- [11] Summary of the Third Session of the Intergovernmental Conference (IGC) on the Conservation and Sustainable Use of Marine Biodiversity of Areas Beyond National Jurisdiction: 19-30 August 2019. *IISD Earth Negotiations Bulletin*, 2019, 25(218): 24.
- [12] Fujii I, Maekawa M, Shimizu N, et al. Implications of existing capacity building efforts for the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction: A case study of Japan. *Marine Policy*, 2022, 138: 7.
- [13] United Nations Office of Legal Affairs. Chapter 23: Developments in the exploration for and use of marine genetic resources in The Second World Ocean Assessment: Volume II, 2021: 363-376.
- [14] Sink K, McQuaid K, Atkinson L, et al. Challenges and Solutions to develop capacity for Deep-sea Research and Management in South Africa. 2021[2024-11-09]. <https://oneoceanhub.org/wp-content/uploads/2022/03/Challenges-and-Solutions-to-develop-capacity-for-deep-sea-research-and-management-in-south-africa.pdf>.
- [15] de Vos A. The Problem of Colonial Science: Conservation Projects in the Developing World Should Invest in Local Scientific Talent and Infrastructure. 2020[2024-11-09]. <https://www.scientificamerican.com/article/the-problem-of-colonial-science/>.