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Preserving Community Interests in Ocean Governance towards Sustainability

Edited by
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Preface to "Preserving Community Interests in Ocean Governance towards Sustainability"

It is increasingly clear that the protection of the marine environment and the sustainable development of marine resources have been the most important components in global ocean governance and closely related to the vital interests of the whole international community. Although there are international normative documents and arrangements concerning ocean governance such as the United Nations Convention on the Law of the Sea (UNCLOS), the Rio Declaration, and the United Nations Sustainable Development Goals, the traditional mare liberum doctrine still remains firm in the promotion of national interests as individual states continue to grab marine space and resources in an unsustainable manner without seriously considering the collective interests of the international community, as well as the interests of future generations. Such national selfishness has caused severe environmental risks and disasters in the ocean, particularly the maritime area beyond national jurisdiction, including the high seas, Antarctica, and the international seabed (the area), commonly known as "global commons", but are of vital interest to the present generation as well as future generations. Thus, the rationale for preserving the community interests in ocean governance towards sustainability has become increasingly urgent.

This Special Issue is designed to focus on the community interests in ocean governance towards sustainability, and how to preserve these interests through the effective implementation of the international law of the sea and of the SDGs. The scope of the Special Issue will have several edge-cutting coverages: first, it will examine relevant legal issues concerning ocean governance in the context of SDGs for long-lasting benefits of the international community; second, it will identify new legal obligations to safeguard navigation and maritime security by considering the marine environment; third, it will evaluate effective legal frameworks for the sustainable use of marine resources (living and non-living); and fourth, it will discuss the regulations for marine scientific research and new developments of marine technologies for marine environmental protection. The purpose of this Special Issue is to highlight the concept of community interests in sustainable ocean governance, which will be fully reflected in a series of anticipated papers.

References to community interests appear from time to time in scholarly writings in the field of international relations and international law. The concept of community interests refers to interests protected by international law binding either all, or a group of, states and go beyond the delimitation of sovereign sphere of influence. There is existing literature, including books and journal articles, that considers the various manifestations of what has been described as "community interests" in many areas regulated by international law, including natural resources, global markets, human rights and use of force, and observes how law has evolved from a legal system based on more or less specific consent and aimed at promoting particular interests of states, to one that is more generally oriented towards collectively protecting common interests and values. However, the topic is never thoroughly researched and there is a huge gap in the existing literature, particularly in the context of ocean governance and sustainability. This Special Issue attempts to fill this gap, so as to attract more studies on this important topic in academia.

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Article

Climate Change and Fisheries Regulation: What We Should Consider for the Future?

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Abstract: Climate change and its effect on marine environment, especially ocean warming, acidification and sea level rise, impacts fisheries in different ways. However, fisheries and climate change are regulated by different international management mechanisms, which makes the current fisheries management system face challenges. Realizing this, the present paper is designed to consider whether international law should be introduced to apply better management of fisheries so as to cope with the issues arising from climate change. In addition, the paper highlights the importance of incorporating relevant principles into future fisheries regulations by examining an existing bilateral fishery agreements.

Keywords: climate change; fishery management; legal principles; LOSC; precautionary approach; sustainable development; ecosystem

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1. Introduction

It is acknowledged that the precise and localized impacts of climate change on fisheries are still poorly understood [1]. This is because "the inherent unpredictability of climate change and the links that entwine fishery and aquaculture livelihoods with other livelihood strategies and economic sectors make unravelling the exact mechanisms of climate impacts hugely complex" [2]. This view is agreed to by the Stern Review on the Economics of Climate Change, in its statement that "for fisheries, information on the likely impacts of climate change is very limited" [3]. The ocean has absorbed 93% of the extra heat arising from the enhanced greenhouse effect (1971–2010), with most of the warming (64%) occurring in the upper (0 to 700 m) ocean [4]. To reverse that heating, the warmer upper layers of the ocean have to mix with the colder, deeper layers, which can take as much as 1000 years [4]. Temperature plays an essential role in the biology and ecology of marine organisms, the speed of isotherm migration ultimately determines the speed at which populations must move, adapt or acclimate to changed sea temperatures [4]. Shifts in stock distribution due to climate change have the potential of creating local extinction of economically important stocks while enhancing fisheries in areas where they were not present before [5]. For example, since 2010, the distribution proportion of Pacific halibut has increased from 9% to 11% in Canadian waters, and from 7.5% to 13% in Alaskan waters [5].

Oceans also absorb approximately 30% of emitted anthropogenic CO_2, causing ocean acidification [6]. Rising water temperatures and ocean acidification damage coral reefs by enhancing reef dissolution and bio-erosion, affecting coral species distribution, and leading to community changes. Coral reefs are further exposed to other increased impacts, such as enhanced storm intensity, turbidity and increased runoff from the land [6]. Relatively small increases in sea temperature (as little as 1 °C to 2 °C) can cause mass coral bleaching and mortality across hundreds of square kilometers of coral reef [4]. When this occurs on a global scale, it is referred to as a "mass bleaching event." In 1998 a mass bleaching event killed almost 16% of the world's reef-building corals [7]. Loss of coral reef habitats leads to a reduction in reef fisheries production, which negatively impacts communities and countries highly dependent on coral reef ecosystems for their food, income and livelihoods. The economic costs due to the ocean acidification-driven reduction in the fisheries production

of coral reef habitats are estimated to be between $5.4 to $8.4 billion annually under a high emission scenario [8]. What is worse is that ocean acidification can slow the rebuilding of coral reefs and weaken their structures.

The links between fisheries and their ecosystems are deeper and more significant than those that exist in mainstream agriculture [9]. The productivity of a fishery is tied to the health and functioning of the ecosystems on which it depends for food, habitat and even seed dispersal [10]. Estuaries, mangroves, coral reefs and seagrass beds are particularly significant in the provision of ecosystem services, especially as nurseries for young fish, and are also amongst the most sensitive and highly exposed to the negative impacts of coastal development, pollution, sedimentation, destructive fishing practices, and climate change [7]. Because fish tend to live near their tolerance limits of a range of factors, increased temperature and acidity, lower dissolved oxygen, and changes to salinity can have deleterious effects [11].

Sea level rise will likely damage or destroy many coastal ecosystems such as mangroves, seagrasses, and coral reefs, which are essential to maintaining wild fish stocks [12]. The threats to coastal habitats and fisheries from sea-level rise are exacerbated by increases in coastal extreme events, such as tropical cyclone winds and rainfall [12]. Changes in surface temperature could alter local ecosystems and affect the abundance and species composition of fish stocks [2].

Climate change in particular would affect fisheries and the fishery industry in East Asia. As we know, 85% of fishers and fish farmers worldwide live in Asia, with the greatest numbers being in China (9.6 million fishers and 5.0 million fish farmers) [13]. China is the largest producer of fish, accounting for 35 percent of global fish production in 2018 [14]. Thus, any adverse impact of climate change on fisheries will inevitably affect the livelihoods of fishers and fishing communities, particularly in Asia.

It is evident that climate change has impact on fishery, the present paper is designed to consider whether international law, particularly international legal principles, should be introduced to apply better management to fisheries so as to cope with the issues arising from climate change.

2. Applicability of Legal Principles

As for the legal governance of climate change and fisheries, there are two different but associated legal frameworks in international law. The former is regulated by the United Nations Framework Convention on Climate Change (UNFCCC) while the latter is regulated by the United Nations Convention on the Law of the Sea (LOSC). Though governed by two different legal regimes, the two sets of laws have some legal principles in common. It is acknowledged that although there are no specific references to climate change in most of the Law of the Sea instruments, there are rules relevant to climate change both under the LOSC and under customary law in this field [15,16]. In most recent marine pollution instruments, specific references to climate change remain relatively rare [15]. One example which incorporates climate change is the 2008 Protocol on Integrated Coastal Zone Management in the Mediterranean Sea. It makes express reference to the UNFCCC and to climate change in preambular paragraphs, and in Article 5 (e) it identifies the obligation of States parties to "prevent and/or reduce the effects in particular of climate change," as one of the objectives of integrated coastal management [15]. However, there is no such express mention in fisheries agreements, whether global, regional, or bilateral. Yet the following legal principles should be applicable to both climate change and fishery management.

2.1. Precautionary Approach/Principle

This principle/approach requires states to take precautionary measures even if there is no conclusive scientific proof of potential damage to a particular natural environment, climate, or fishery. The precautionary approach was first incorporated into the international fisheries law as the 1995 Straddling Fish Stocks Agreement provides that "States shall apply the precautionary approach widely to conservation, management and exploitation of

straddling fish stocks and highly migratory fish stocks in order to protect the living marine resources and preserve the marine environment." In order to implement this approach, states shall, e.g., improve decision-making for fishery resource conservation, obtain and share the best scientific information; take into account, inter alia, uncertainties relating to the size and productivity of the stocks, reference points, and stock condition; and develop data collection and research programs to assess the impact of fishing on non-targets [17].

The Seabed Chamber of the International Tribunal for the Law of the Sea (ITLOS), in its 2011 Advisory Opinion on the Responsibilities and Obligations of States, confirmed that the precautionary approach is "an integral part of due diligence obligation of sponsoring States, which is applicable even outside the scope of the [Nodules and Sulphides] Regulations" [18]. This statement from an international judicial agency has no doubt strengthened the applicability of the precautionary approach not only to deep seabed activities, but also to other ocean uses, including fisheries.

In state practice, the North Pacific Fishery Management Council (NPFMC) has closed sections of the ocean to fishing because of the scientific uncertainty of data due to climate change, and the Arctic Management Area is closed to commercial fishing until such time in the future that sufficient information is available with which to initiate a planning process for commercial fishery development [19].

This principle/approach is also applicable to climate change when there is a reasonable, foreseeable threat of serious or irreversible damage, including serious or irreversible damage to states vulnerable to the impacts of climate change [15]. According to the UNFCCC, "The Parties should take precautionary measures to anticipate, prevent or minimize the causes of climate change and mitigate its adverse effects. Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing such measures, taking into account that policies and measures to deal with climate change should be cost-effective so as to ensure global benefits at the lowest possible cost. To achieve this, such policies and measures should take into account different socio-economic contexts, be comprehensive, cover all relevant sources, sinks and reservoirs of greenhouse gases and adaptation, and comprise all economic sectors. Efforts to address climate change may be carried out cooperatively by interested Parties" [20]. It is obvious that the precautionary approach applies to both climate change and fisheries so that there is no difficulty in incorporating it in a legal document for fishery management in coping with climate change.

2.2. Principle of Sustainable Development

Sustainable development means development as meets the needs of the present without compromising the ability of future generations to meet their own needs [21]. The concept has been widely accepted by the entire world community, and has gradually been reflected in national and international laws and policies, such as the 1992 Rio Declaration [22], Agenda 21 [23], and the Johannesburg Declaration [24]. One of the major purposes of the concept of sustainable development is to coordinate the relationship between resource uses and environmental protection, such that are not contradictory, nor in conflict, but can interplay mutually. Environmental protection is necessary to achieve the goal of resource uses which are sustainable, and economic benefits deriving from resources can provide the conditions in which environmental protection can best be achieved.

In international jurisprudence, the International Court of Justice has recognized the importance of sustainable development. It has developed legal doctrines concerning sustainable development particularly in two particular cases. In the case concerning the Gabčíkovo–Nagymaros Project (Hungary/Slovakia) (1993–1997), the Court held that "in the field of environmental protection, vigilance and prevention are required on account of the often irreversible character of damage to the environment and of the limitations inherent in the very mechanism of reparation of this type of damage. Throughout the ages, mankind has, for economic and other reasons, constantly interfered with nature. This need

to reconcile economic development with protection of the environment is aptly expressed in the concept of sustainable development" [25].

In the case concerning Pulp Mills on the River Uruguay (Argentina vs. Uruguay) (2006–2010), the Court considered that "the attainment of optimum and rational utilization requires a balance between the Parties' rights and needs to use the river for economic and commercial activities on the one hand, and the obligation to protect it from any damage to the environment that may be caused by such activities, on the other" [26]. That balance is exactly a reflection of sustainable development. In the discussion on Article 27 of the Statute of the River Uruguay of 1975, the Court held that "Article 27 embodies this interconnectedness between equitable and reasonable utilization of a shared resource and the balance between economic development and environmental protection that is the essence of sustainable development" [26].

In a word, sustainability has penetrated into our daily life. Sustainable development is an indispensable requirement for ocean governance, including fishery management. In the context of the ever-deteriorating conditions of the environment we rely upon, global warming, and climate change, this application is even more important.

The climate system is a common natural resource for the benefit of present and future generations, and sustainable development requires states to balance economic and social development with the protection of the climate system, and supports the realization of the right of all human beings to an adequate living standard and equitable distribution of the benefits thereof [15]. The UNFCCC sets forth its objective as "to achieve, in accordance with the relevant provisions of the Convention, stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner" [20]. In order to fulfil this objective, the Convention obliges states to "promote sustainable management, and promote and cooperate in the conservation and enhancement, as appropriate, of sinks and reservoirs including biomass, forests and oceans as well as other terrestrial, coastal and marine ecosystems" [20]. Likewise, the UN Convention on Biological Diversity, which is more relevant to fishery management, is also designed to protect the environment and promote sustainability, with the objective being to conserve biological diversity and use its components sustainably [27].

2.3. Ecosystem Approach

As we know, the Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR) endorsed the ecosystem approach to the management of the entire Southern Ocean. This approach is in contrast to other conventions on fisheries such as the IWC, Northwest Atlantic Fisheries Organization (NAFO), or International Commission for South East Atlantic Fisheries (ICSEAF), where the aim of the convention is a sustainable yield of the target species and the welfare of the industry dependent upon it [28,29]. CCAMLR is based upon the conviction and understanding that the waters surrounding the Antarctic continent form a distinct marine region. Thus, there was recognition from the outset that the requirements of ecosystem management would require coverage of an area larger than that of the Antarctic Treaty. As early as 1977, the ATCPs agreed that the agreement should apply not only to the area of the Antarctic Treaty, but also should "extend north of 60° South Latitude where that is necessary for the effective conservation of species of the Antarctic ecosystem" [30]. The application of the Convention extends up to the Antarctic convergence, or polar front, which is a complex transition zone lying between 45° and 60° south latitude, within which colder Antarctic waters sink beneath the warmer, sub-Antarctic waters to the north.

According to Article II of CCAMLR, the ecosystem approach contains three basic elements or conservation principles: the first, maximum net recruitment, requires harvesting and associated activities to prevent a decrease in the size of any harvested population to

levels below those which ensure the population's stable recruitment; the second, maintenance of ecological relationships, requires harvesting and associated activities to prevent changes or minimize the risk of changes in the marine ecosystem; and the third requires parties to the Convention to maintain the ecological relationships that exist between harvested, dependent, and related populations of Antarctic marine living resources, and to restore depleted populations to levels which ensure the greatest net annual increment. This provision provides authorization for designating selected protected areas of the sea where harvest would be prohibited unless it would restore the ecosystem to such a structure and function as it was before harvesting occurred. The establishment of such areas in the Southern Ocean would provide a hedge against uncertainty and the risk of inadvertent exploitation in harvesting elsewhere [30].

The ecosystem standard provided in CCAMLR was viewed as an important innovation in international arrangements for marine living resource management [31]. It is designed to protect the marine ecosystem as a whole, while conserving living species. However, due to the absence of an effective enforcement mechanism and comprehensive scientific data about the whole marine ecosystem, there are many difficulties in its implementation [32]. Secondly, the term "rational use" in the conservation principle of CCAMLR is yet to be unambiguously defined, i.e., how and to what extent the use is rational. Furthermore, since the entry into force of CCAMLR, the ecosystem standard has not been effectively enforced, with particular conservation measures coming into being so late that some species and areas have been over-exploited already [33]. In this context, for the purpose of the effective implementation of the ecosystem standard of CCAMLR, it is necessary to make it clear in furtherance of the concept of sustainable development to apply the precautionary principle: the catch of the species of which mankind has collected sufficient scientific data is permissible, but fishing must be sustainable and subject to the total allowed catch which must ensure the greatest net recruitment of the taken species. As for species for which there is lack of sufficient scientific data, the catch should be strictly controlled or forbidden while awaiting further scientific justification. In short, fishing activities shall be prohibited unless they are conducted in full compliance with the ecosystem standard.

The ecosystem principle/approach is generally incorporated into the international fisheries laws, but there is still room to discuss whether it is applicable to climate change. However, it has correctly pointed out that "efforts to develop an ecosystem based approach without taking into account climate change would lead to unfortunate results" [34]. On the other hand, "climate change is a key driver for developing an ecosystem based fishery management as it exerts a pervasive influence over the whole fished system" [34].

2.4. Principle of Common but Differentiated Responsibilities

Article 4 of the UNFCCC specifies the treaty obligations for developed and developing countries in accordance with the principle of common but differentiated responsibilities. There is general agreement that the protection of the climate system is a common responsibility of all parties to the UNFCCC, and this common responsibility could be said to flow from the common concern occasioned by climate change and its adverse effects [15]. The common responsibility of all parties is to cooperate in developing the climate change regime, and to work to achieve the objective of the Convention by taking steps to protect the climate system for present and future generations [20].

As for the differentiated responsibilities, there is consensus that many, albeit not all, of the responsibilities of states under the climate change regime are subject to differentiation [20]. This differentiation is reflected in the distinctions between Annex I, non-Annex I, states with economies in transition, and least-developed states that are drawn in UNFCCC Article 4, as well as distinctions between Annex I and non-Annex countries in the Berlin Mandate and the Kyoto protocol, and between developed and developing countries in the Bali Action Plan [20].

Large developing countries such as China and India frequently used this principle for any climate change negotiation. For example, China presented its working paper

on addressing aviation emissions based on the principle "common but differentiated responsibilities"' to the International Civil Aviation Organization (ICAO) in September 2007 [35] and, jointly with India, the application of the principle "common but differentiated responsibilities" to the reduction of greenhouse gas emissions from international shipping to the International Maritime Organization (IMO) in August 2008 [36]. It is opined that a treaty with limited differential treatment in favor of developing countries and considerable flexibility for all would be held up as the gold standard for the negotiation of the 2015 climate agreement [37]. According to the Paris Agreement adopted in December 2015, its implementation should reflect equity and the principle of common but differentiated responsibilities and respective capabilities in light of different national circumstances [38].

While the principle of common but differentiated responsibilities constitutes a pivotal norm in the overall legal framework for climate change, it may not directly apply to fisheries management. Though financial assistance and/or technology transfer is sometimes reflected in fishery agreements, there is no express mention of the differentiation between developing and developed countries in fisheries agreements. It would be interesting to see whether it would be applicable to fishery management in future.

Besides the above legal principles, other principles used for climate change can be used for fisheries management, such as best management practices and ecosystem-based management. The general principle of cooperation applies to both sectors. To examine the applicability of these principles in the context of climate change, a case study is observed in the following section.

3. Existing Fisheries Agreements

The case study is focused on the fishery agreement between China and Japan, a bilateral agreement in international law. As we know, both China and Japan border the East China Sea, where fishermen from both countries have operated since ancient times. Before the establishment of official diplomatic ties between the two countries, non-governmental fishery agreements were signed in 1955, 1963, and 1965.

Following the establishment of diplomatic ties, the two countries started their consultations on a governmental fishery agreement. The fishery agreement between the Government of the People's Republic of China and the Government of Japan was finally signed on 15 August 1975, and came into force on 23 December 1975 [39]. The 1975 Agreement was revised twice, in 1978 and in 1985 [19]. Although the 1975 agreement introduced more rigid protective measures than the non-governmental agreements, it was largely the same as the non-governmental ones.

The entry into force of the LOSC in 1994 ushered in a new era of fishery relations between China and Japan. Both countries established their EEZs based on the relevant provisions of the LOSC, as well as on their respective domestic legislations. Since the broadest width of the East China Sea is less than 400 nm, the whole sea area became EEZs that were shared by China, Japan and Korea. The fishery relationship between the two sides inevitably needed a new adjustment. After several rounds of negotiation, the two sides finally reached agreement in September 1997 regarding fishery management in the East China Sea [40]. The new agreement came into force on 1 June 2000.

The agreement contains some significant provisions in response to the changed situation. (a) the agreement contains as one of its purposes the establishment of a new fishery order in accordance with the LOSC, conserving and utilizing rationally marine living resources of common concern, and maintaining the normal operation order at sea. Both sides agreed to cooperate to conduct scientific research in fishery and to conserve marine living resources [39]. Each should adopt necessary measures to ensure compliance by their nationals and fishing boats with the provisions of the fishery agreement and the conservation measures and other conditions provided for in the relevant laws and regulations of the other party when they are engaged in fishery activities in the other's EEZ, and should inform each other of such conservation measures and other conditions provided for in its relevant laws and regulations [39]. (b) providing reciprocal fishing rights: the agreement

applies to the EEZs of both countries. However, this does not include all the EEZs, as the agreement excludes the EEZ area south of 27 °N, and west of 125°30′ E in the East China Sea, where Taiwan and the disputed Diaoyu/Senkaku Islands are located. Within the EEZ, China and Japan give each other's nationals and fishing boats the right to fish in each other's EEZs, pursuant to the principle of reciprocity, the fishery agreement and their relevant domestic laws and regulations. The competent authorities of each party issue fishing permits to nationals and fishing boats of the other party, and may levy appropriate fees on the issuance of such permits. (c) Establishing the provisional measures zone (PMZ). For the conservation and quantity of fishery resources in the PMZ, both sides should adopt, based on decisions made by the Sino-Japanese Fishery Joint Committee, appropriate management measures in order to protect marine living resources from the harm of being overexploited. Each party should take administrative and other necessary measures for its nationals and fishing boats fishing in the PMZ, and should not impose administrative and other measures on nationals and fishing boats of the other party in this water area. The establishment of a common fishery zone is a typical form of fishery cooperation for shared waters between any two countries. Though there are many examples in the world, what is new is that the PMZ was the first such zone between China and Japan. It indicates that the fishery cooperation between these two countries had entered into a new era. (d) In order to implement the fishery agreement as well as to coordinate respective fishery management procedures, both sides decided to establish the Joint Fishery Committee which consists of four members, two of whom are appointed by each party. The decision-making mechanism is based on the unanimous consent of the committee members [39].

From the above, we can see that the latest fishery agreement between China and Japan is a positive response to the LOSC without considering any factor of climate change, and although some conservation measures provided for in the agreement are indirectly related to the climate change regime/law. A similar legal phenomenon also exists in domestic legislation in fisheries management. For example, the 1976 Magnuson–Stevens Fishery Conservation and Management Act (MSA) was amended in 1996 and 2006 with an increased conservation focus that strengthened the role that science should play in decision-making, but "no explicit mention of climate change or particular level of scientific certainty is required by the legislation" [19].

The Arctic experienced major melts in 2007 and 2012, and has seen a general trend of decline in ice thickness and extent. In 2017, Arctic ice hit a record winter low for the third year in a row. Ice-free waters, combined with the general warming trend, have brought new species to Arctic waters, e. g. the snow crab moving into Svalbard's waters [8]. The increased presence and availability of commercial species may encourage a new competitive race to fish in Arctic waters. Acknowledging the Arctic ocean systems have been changed "due to climate change and other phenomena, and that the effects of these changes are not well understood" [41], five bordering countries (Canada, Denmark [Greenland], Norway, the Russia Federation, and the United States of America) and other possible fishing countries (China, Iceland, Japan, the Republic of Korea, and the European Union) concluded the Agreement to Prevent Unregulated High Seas Fisheries in the Central Arctic Ocean, agreeing to a fishing ban for the next 16 years to give scientists time to understand the region's marine ecology and the potential impacts of climate change before fishing becomes widespread [13]. The climate change factors have been considered in the Agreement to Prevent Unregulated High Seas Fisheries in the Central Arctic Ocean maybe a positive start, but there is no specific provision directly related to climate change in this agreement.

Therefore, it is worth examining some of the latest fishery agreements to see whether the climate factor has been considered. In addition to bilateral fisheries agreements, climate change could be a necessary element in the future making of fisheries law at international, regional (North Pacific), bilateral, or even domestic levels. Towards that direction, future fishery agreements should not only apply the legal principles mentioned above, but also introduce more specific measures in response to climate change, such as reduction of

emissions from fishing vessels; improvement of fuel efficiency; and reduction of yields and increase of yield variability.

4. Regional and National Efforts for Climate Resilience in Fisheries

Regional Fisheries Management Organizations (RFMOs) are international organizations that serve as fora for the establishment, implementation, and enforcement of legally binding management and conservation measures for fishing. Many RFMOs are established under international conventions and have the authority to adopt legally binding provisions with regard to the conservation and management of fish stocks. Recognizing climate change and its impacts on the environment and fishery resources, several RFMOs and many states take efforts for climate resilience in fisheries.

Environmental changes driven by climate change are further compounded by local habitat changes in salmon freshwater ecosystems. The Big Bar landslide on the Fraser river is particularly concerning, as it has blocked upstream access to critical sockeye, chinook, and coho spawning areas since 2019, and the changing ocean conditions may be further influenced by increases in salmon numbers rearing in the North Pacific [42]. The Working Group on Salmon Marking (WGSM) of the North Pacific Anadromous Fish Commission (NPAFC) developed a high-seas otolith mark recovery database that would complement the existing mark release database and provide researchers with data that could be used to assess returns across each species range, validate genetic stock identifications, establish migration patterns, infer impacts of climate change and carrying capacity, and make inferences about inter- and intra-species population dynamics [42]. Meanwhile, the member states also take action to deal with climate change in their fishery management. For example, the Korean 2020 research plan involves investigations of mortality and climate change effects on salmon to reveal the mechanisms of mass mortality of chum salmon during their early life in rivers and coastal areas in conjunction with return rate fluctuations [42]. Russia plans to conduct surveys in the northwestern Pacific Ocean, Okhotsk, and Bering Seas, and the information from surveys will be used to improve the understanding of how climate change will affect Pacific salmon production and ecosystems of the far eastern seas and adjacent Pacific waters [42].

States in the Asia-Pacific Fishery Commission (APFIC) region have made wide-ranging efforts with respect to climate change adaptation and mitigation, include climate-smart fisheries for sustainable food security, climate resistant fisheries products, climate-smart management practices. For example, Bangladesh has climate change-resilient fisheries in its development plan. Several countries, including Cambodia, Malaysia, Nepal, and the Philippines, are working to establish community-targeted early-warning and notification systems regarding climate changes [43].

It is also to note that cooperation among states is important to deal with the impact of climate change on fisheries, such as sharing data and information. In this regard, the South East Atlantic Fisheries Organization (SEAFO) has taken steps to enter into co-operation agreements with other RFMOs, such as CCAMLR, on collecting data and information that could be used to study the impact of climate change on the marine ecosystems [44].

5. Remaining Issues

Due to the complexity of international governance for fishery management and climate change, there are considerable pending issues to be sorted out. First is the impact of carbon storage on fisheries and how we should regulate it. Certain climate mitigation and adaptation measures may have significant impacts on the marine environment. For instance, carbon capture and storage (CCS), touted as a mitigation technology that could lead to deep emission reductions, could also if the technology is mishandled and/or mismanaged lead to significant leakage of stored CO_2 occurs to the ocean [15]. Climate geo-engineering is a problem of a similar nature.

The Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter adopted in 1996 created, in a 2007 amendment, a new category

in the Annex 1 list of wastes and other matter that may be considered for dumping, thereby allowing for the storage of CO_2 in sub-seabed geological formations [15]. The parties to the 1996 Protocol adopted a "Risk Assessment and Management Framework for CO_2 Sequestration in Sub-Seabed Geological Structures (CS-SSGS)" as well as "specific guidelines for assessment of carbon dioxide streams for disposal into sub-seabed geological formations." The 1992 Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR) adopted a similar amendment to allow carbon storage in geological formations under the seabed, complemented by guidelines adopted by the OSPAR Commission [15]. It remains unknown whether these regulations are adequate, particularly in the context of the conservation of marine biological resources including fisheries, and whether the lawmakers considered the impact of such activities on fisheries.

Second, but not last, is the linkage of livelihood of the coastal communities and fisheries management in the context of climate change. It is advocated to increase the use of marine protected areas as a climate change adaptation strategy in threatened marine ecosystems [45]. This is no doubt a positive call, but such more establishments may affect fishing communities and their livelihoods. The case registered with the Permanent Court of Arbitration concerning the Matter of the Chagos Marine Protected Area between Mauritius and the United Kingdom (2010–2015) is illustrative. In the case, Mauritius challenges the United Kingdom's establishment of a Marine Protected Area (MPA) around the Chagos archipelago, which extends to a distance of 200 nautical miles from the baselines of this archipelago and covers an area of more than half a million square kilometers [46]. One of the legal challenges from Mauritius is that "the MPA is fundamentally incompatible with the rights and obligations provided for by the Convention, including the fishing rights of Mauritius in regard to the Chagos Archipelago and its surrounding waters" [46]. The above dispute shows that it is necessary to consider the needs and interests of local fishing communities while any environmental protection measure is put in place.

6. Conclusions

The International Bar Association, in 2014, released a detailed report on the role of international law in addressing climate change and advocates the concept of climate justice [47]. Climate justice implies the recognition that climate change is a matter of human rights and development, and also that the victims of global warming are not responsible for it [48]. Climate justice also means sharing responsibility [48]. As Mary Robinson states, "the only solution to climate change are fair solutions that protect human rights and uphold the rule of law" [48]. In terms of fishery management and the fishery legal regime, it is certainly the time for policy/law makers to accommodate the climate change considerations into the process of fishery policies and fishery laws, whether international, regional, or domestic. This paper has argued that, first, some fundamental principles of international law should be applicable to future fisheries regulation, no matter whether it is multilateral, regional, bilateral, or national; and second, that climate change factors should be seriously considered in the concluding of future fishery agreements. With this in mind, human mankind may realize climate justice for present and future generations.

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Global Fisheries Management and Community Interest

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Abstract: The conservation of fishery resources is a common interest of the international community. In the 1990s, the global fisheries management system was formed based on the 1982 United Nations Convention on the Law of the Sea (LOSC). In order to achieve sustainable fisheries management, the international community also adopted a series of legally binding and non-binding policy instruments for the implementation of the global fisheries regime. The regional institutional framework was strengthened and expanded to offer broad coverage worldwide. Based on the analysis of the global fisheries management system, the article concludes that the current legal and policy instruments collectively provide a comprehensive framework for global fisheries management, but there still exist limits in addressing the challenges of fishery resources today. More effective implementation of the current legal system through better cooperation among States, as well as efficient coordination within and between national, regional and global institutions, is required.

Keywords: fishery resources; community interest; sustainable development; international cooperation

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1. Introduction

For centuries, the international legal order had been developed with a relatively stable set of rules, mainly ensuring the respect of state sovereignty, but in the past few decades, there has been a shift in the focus of certain social relations between States [1] (p. 268). This has led to changes in international law, which has a number of new concepts to indicate the common interest in upholding human values or protecting common goods. For example, the Convention on Biological Diversity (CBD) affirms that "the conservation of biological diversity is a common concern of humankind" [2] (para. 3 of Preamble); the United Nations Framework Convention on Climate Change (UNFCCC) acknowledges that "the change in the Earth's climate and its adverse effects are a common concern of humankind" [3] (para. 1 of Preamble); the WTO law protects the community interest of promoting an essentially rule-based and fair world market, and the law of state responsibility reacts to serious breaches of common interests in human rights and humanitarian assistance.

The term "community interest" is not particularly clear and the great variation in its meaning, across regimes and even within each of them, can affect their identification in international law [4] (p. 38). However, there are two basic dimensions. Firstly, community interests are "common". These interests always correspond to the category of "public good" as defined in economics and are characterized by the fact of being "non-excludable". Any attack on the public good will necessarily affect the enjoyment of its benefits by all members of the community [4] (p. 39). The commonality of these common interests usually translates into the collective identity of their holders and/or bearers—that is, a "community", and, when the latter is universal, the "international community" [4] (p. 39). With the second dimension, the "community interest" leads to the consequence that all members of the international community as a whole have an interest in the protection of the common interests [5] (p. 332). The need to safeguard community interests triggered the generation of the concept of sustainability, which has been a feature in international legal relations for a long time [6].

Fishery resources are of great importance for food security and nutrition, economic growth through fish production and trade, as well as poverty alleviation and the creation of employment opportunities in the international community. According to a report published by the Food and Agriculture Organization (FAO), fish accounted for approximately 17% of animal protein consumed by the global population and provided approximately 3.3 billion people with almost 20% of their average per capita intake of animal protein in 2017 [7] (p. 67). In 2016, approximately 39 million people were engaged in the primary sector of capture fisheries [7] (p. 7). In the past, there were grounds for believing that fishery resources were limitless and could be exploited without loss to anyone else. However, biological, environmental, anthropological and many other factors have caused the situation to change. For example, overfishing and illegal, unreported and unregulated fishing (IUU fishing) are the main human factors and the adverse impact of climate change is difficult to underestimate.

In order to achieve the sustainability of fishery resources, it is important to pursue proper conservation policies towards the prevention of the exhaustion of these resources. The international response to the growing depletion of the world's fish stocks and the degradation of their habitats has been through the elaboration and adoption of three types of instruments. First, global fisheries treaties were adopted to address the conservation and management of fish stocks. Second, international voluntary instruments were adopted to promote a framework of principles and standards for responsible fisheries. Third, the regional institutional framework for the management of fishery resources was strengthened and expanded in coverage.

2. Main Threats to Global Fisheries

IUU fishing [8] as well as the environmental impact of climate change and marine pollution are major challenges to the sustainable development of fishery resources today. According to the annual report of the FAO, global capture fisheries production was 96.4 million tons in 2018, and fisheries in the ocean provided 87.5% of the global total [7] (p. 6).

Overfishing and destructive fishing practices are recognized as the main threat to marine biodiversity in the areas within and beyond national jurisdiction (ABNJ) [9]. The adverse effects of fishing activities on the marine ecosystem mainly come from the overutilization of marine biological resources. When the degree of utilization of a certain biological population exceeds its maximum sustainable yield, it will cause the decline or even exhaustion of the targeted stocks and bycatch species, especially some species that are more susceptible to fisheries, such as marine mammals, sharks, turtles and seabirds, etc. [10] (p. 66). Overfishing not only has negative ecological consequences, but also reduces fish production in the long term, which subsequently has negative social and economic consequences. The world's marine fisheries had 34.2% of stocks classified as overfished in 2017 [7] (p. 54). It is estimated that rebuilding overfished stocks could increase fishery production by 16.5 million tons, which would certainly increase the contribution of marine fisheries to the food security and wellbeing of coastal communities [11] (p. 174).

The international community also recognizes IUU fishing as a major threat to the sustainability of fishery resources, to the livelihoods of the people that depend on them and to food security and marine ecosystems [8] (para. 1). It is well known that IUU fishing has escalated in the past 20 years, and it is found in all types and dimensions of fisheries, representing 20% of total catches per year, and undermines national and regional efforts to manage fisheries sustainably [12] (p. 12). Addressing IUU fishing and its impacts continues to be an essential part of fisheries governance. This issue is especially critical in developing countries, which lack the capacity and resources for effective monitoring, control and surveillance [13] (p. 82). Strong political will and concerted action by flag States, port States, coastal States and market States are required [13] (p. 82).

The ocean has absorbed 93% of the extra heat arising from the enhanced greenhouse effect [14] (p. 1). Given the essential role that the temperature plays in the biology and ecol-

ogy of marine organisms, the speed of isotherm migration ultimately determines the speed at which populations must move, adapt or acclimate to changed sea temperatures [15] (p. 1667). Shifts in the distribution and abundance of large pelagic fish stocks will have the potential to create "winners" and "losers" among island States as catches of the transboundary fish stocks change among and within their exclusive economic zones (EEZs) [15] (p. 1702). For example, there has been an increase in fish stocks of warmer-water species near the Taiwan Strait, which were historically distributed throughout the South China Sea, partly as a result of warming conditions [15] (p. 1686). This is very likely to continue, although some fish stocks will eventually decline [15] (p. 1660). The ocean has also absorbed approximately 30% of atmospheric CO_2 from human activities, which results in decreased ocean pH and carbonated ion concentrations and increased bicarbonate ion concentrations—that is, ocean acidification [15] (p. 1673). These two changes may exacerbate the existing overfishing and IUU fishing indirectly and challenge the sustainability of capture fisheries and aquaculture development.

The threats to fishery resources represent a potentially irreversible threat to human communities and thus require the widest possible cooperation by all States and their participation in an effective and appropriate response. To avert some of the worst impacts of fishery degradation and to realize sustainable development, the international community has taken actions, i.e., cooperation through global or regional agreements, as well as resolutions and declarations, on sustainable fisheries and marine ecological environment protection.

3. Protection of Community Interests in the Global Fisheries Management System

3.1. Basic Legal Framework of Fisheries Management: The 1982 LOSC

The LOSC provides a general legal framework for all kinds of activities in the seas and oceans. The preamble of the LOSC explicitly recognizes its aim of promoting the conservation of marine living resources, including fishery resources [16] (para. 4 of Preamble), and it established a basic framework for international cooperation in this field. There are two approaches applied for the conservation of the fishery resources in the LOSC, namely the zonal management approach and the species-specific approach.

3.1.1. Zonal Management Approach

Based on the LOSC, the ocean is divided into different zones within national jurisdiction, e.g., internal waters, territorial seas, exclusive economic zones and continental shelves, and areas beyond national jurisdiction, such as high seas. The LOSC governs human activities in the ocean according to the legal category of marine spaces, which is referred to as the "zonal management approach" [17] (p. 295). Under this approach, different rules apply to the conservation of marine living resources according to different jurisdictional zones.

In the areas within national jurisdiction, marine living resources are the important food supplies and mainstay of economy for coastal States. The coastal States not only enjoy the rights of exploring and exploiting the marine living resources, but also shoulder the responsibility of conserving and managing these resources [16] (Art. 61). It is estimated that approximately 90% of all commercially exploitable fish stocks are caught within 200 miles of the coast [18] (p. 162). For the conservation of living resources, the coastal States are required to ensure, through proper conservation and management measures, that the maintenance of living resources in the EEZ is not endangered by over-exploitation [16] (Art. 61). According to the LOSC, a coastal State shall determine the allowable catch of the living resources in its EEZ [16] (Art. 61) and determine its capacity to harvest the living resources of the EEZ; where the coastal State does not have the capacity to harvest the entire allowable catch, it shall, through agreements or other arrangements, give other States access to the surplus of the allowable catch [16] (Art. 62). The second obligation, i.e., optimum utilization, reflects the 1970s' concern of distant water fishing States that coastal States would drastically limit utilization of the fishery resources newly enclosed

in their fisheries zones [19] (p. 6). Therefore, these States argued that it was necessary to establish an international obligation for the coastal States to ensure their utilization. Consequently, the coastal States are required to determine their capacity to harvest the living resources of the EEZ. However, the mechanism on the basis of the allowable catch presents considerable difficulties. For example, reliable scientific data are a prerequisite for allowable catch determination, while the data collection and analysis are complicated and costly; sometimes, it is difficult for developing countries to fulfill this obligation properly [18] (p. 283).

While the high seas are open to all States, every State enjoys the freedom of fishing [16] (Art. 87). At the same time, every State needs to adopt with respect to its national measures as well as cooperate with other States for the conservation of the living resources on the high seas [16] (Arts. 117, 118). Fishing on the high seas, to some degree, should rather be regarded as a privilege predicated on adherence to certain rules, not an absolute freedom [20] (p. 231). Increasing restrictions for the freedom of fishing on the high seas is a tendency, particularly in the LOSC, the United Nations Agreement for the Implementation of the Provisions of the 1982 LOSC relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (Fish Stocks Agreement) and regional fisheries management agreements.

The conservation of fishery resources involves both national interests and international community interests at the same time [5] (p. 364). Cooperation among States is one of the essential elements in the legal regime of high seas fisheries under the LOSC, and Article 117 requires "all States" to take, or to cooperate with other States in taking, such measures for their respective nationals as may be necessary for the conservation of the living resources of the high seas. Article 118 imposes upon States to cooperate with each other in the "conservation and management" of living resources in the areas of the high seas, and further requires States to cooperate as appropriate to establish sub-regional or regional fisheries organizations to this end.

3.1.2. Species-Specific Approach

The LOSC also adopts the species-specific approach to the conservation of marine living resources, under which conservation measures are to be determined according to specific categories of marine species such as shared fish stocks, straddling fish stocks, highly migratory species, marine mammals, anadromous stocks, catadromous species and sedentary species [16] (Arts. 63–68, 120). In order to implement the LOSC provisions, the Fish Stocks Agreement was adopted to provide a framework for cooperation in the conservation and management of straddling and highly migratory species [21]. The objective of the Fish Stocks Agreement is to ensure the long-term conservation and sustainable use of straddling fish stocks and highly migratory fish stocks through effective implementation of the relevant provisions of the LOSC [22] (Art. 2). This objective is achieved through the incorporation of a number of key State obligations, such as assessment of the impacts of fishing, other human activities and environmental factors on target stocks and ecologically related species or dependent or associated stocks; implementation and enforcement of conservation and management measures through effective monitoring, control and surveillance; and application of the ecosystem approach and precautionary approach [22].

The Fish Stocks Agreement reinforced States to cooperate with other States directly or through appropriate regional fisheries management organizations (RFMOs) or arrangements for the conservation and management of straddling fish stocks and highly migratory fish stocks, including cooperation for the establishment of new RFMOs where none exist in a particular region or sub-region [22] (Art. 8). States having a real interest in the fisheries concerned are encouraged by the Fish Stocks Agreement to become members of such RFMOs. It also provides that only States that are members of an RFMO, or those that agree to apply the conservation and management measures established by such an organization or arrangement, shall have access to the fishery resources to which the measures apply [22] (Art. 8).

In general, the LOSC provides a basis for fisheries cooperation and legal certainty. As the most comprehensive codification of the international law of the sea so far, the LOSC has become the foundation of the international governance system for the conservation of fishery resources, with the strong support of the United Nations system.

3.2. FAO's Efforts in the Global Fisheries Management

As the primary management agency for marine fisheries, the FAO attaches great importance to the construction of sustainable fisheries. It has formulated and issued many fishery regulations, such as the Code of Conduct for Responsible Fisheries, Agreement on Port State Measures to Prevent, Deter and Eliminate IUU Fishing (PSMA) and a series of International Plan of Action (IPOAs) with regard to fishing issues, e.g., the International Plan of Action for the Management of Fishing Capacity and the International Plan of Action to Prevent, Deter and Eliminate IUU Fishing (IPOA-IUU). These instruments have played a key role in the conservation of marine fishery resources.

3.2.1. Code of Conduct for Responsible Fisheries (FAO Code)

In March 1991, the FAO Committee on Fisheries called for the development of new concepts for responsible, sustained fisheries. The FAO Code was drafted, negotiated and adopted by FAO member States to serve this purpose. It served as the basis for the development of the ecosystem approach to fisheries. This approach provides a framework for considering not only the ecological but also the social and economic aspects of sustainability and the governance context in which the fisheries sector operates [7] (p. 142). According to the data from the questionnaire on the implementation of the FAO Code sent every two years to all FAO member States, the percentage of States adopting an ecosystem approach to fisheries or a similar approach increased from 69% in 2011 to 79% in 2015 [13] (p. 82). However, the level of adoption varies among regions (see Figure 1).

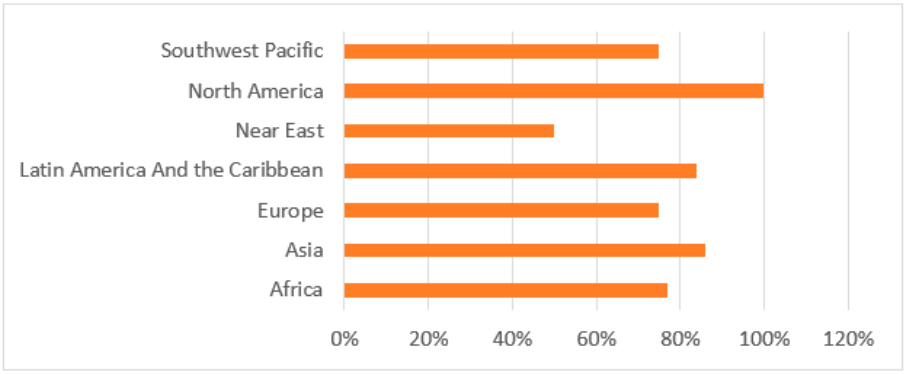

Figure 1. Percentage of States adopting ecosystem approach to fisheries/similar ecosystem approaches at the regional level. Source: FAO questionnaire on the implementation of the Code of Conduct for Responsible Fisheries, 2015 data.

A key problem of the FAO Code is its non-binding nature, which impedes its effectiveness due to the lack of legal force. However, it was incorporated into several important legally binding agreements, such as the FAO Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas (FAO Compliance Agreement) [23] (Art. 1.1). Recognizing the vulnerability inherent in such a management scheme, the FAO Compliance Agreement demands that party States "cooperate in a manner consistent with this Agreement and with international law" to prevent non-party States from undermining the FAO Compliance Agreement [24] (Art. 8).

3.2.2. IPOA-IUU

The IPOA-IUU was adopted by consensus at the 24th Session of the FAO Committee on Fisheries on 2 March 2001, and it was the first global instrument to introduce the

expression of IUU fishing [8] (para. 3). Like the FAO Code, the IPOA-IUU is also a non-binding instrument. It was conceived as a comprehensive toolbox, which is a full range of tools that are available for use in a number of different situations to combat IUU fishing [25]. The commitments that FAO members have made under the IPOA-IUU, e.g., to enact national legislation to address all aspects of IUU fishing; to implement flag States' responsibility [26]; to implement monitoring, control and surveillance (MCS) measures; cooperative investigation of IUU fishing, expertise and technology exchange; harmonization of national measures and co-operation of MCS efforts; and to develop National Plans of Action (NPOAs) as soon as possible but no later than three years after the approval of the IPOA-IUU to achieve the objectives of the IPOA-IUU to full effect [24] (p. 14).

While the "hold all" terms of IUU fishing are stipulated in the IPOA-IUU, the range of measures available to non-flag States has been controversial [25]. In addition, there are ambiguities in the scope of unregulated fishing against which States can take action, such that certain unregulated fishing is not considered to be in violation of applicable international law and does not require the application of the measures envisaged under the IPOA-IUU [8] (para. 3.4). Faced with ambiguities in the scope of unregulated fishing, States other than the flag State might hesitate in taking necessary measures allowed under the IPOA-IUU.

3.2.3. PSMA

A major achievement in the global effort to combat IUU fishing, the binding FAO Agreement on PSMA, entered into force on 5 June 2016. The agreement provides an opportunity for States to collaborate and exchange information on fishing vessels and their activities, which can also be done through and with RFMOs. It creates a network that supports port States in combating IUU fishing, flag States in the control of their vessels, coastal States in protecting their fishery resources and market States in ensuring that products derived from IUU fishing do not enter their markets [27].

The PSMA sets conditions for the entry and use of ports by foreign fishing vessels [27]. It defines minimum international standards to be applied by port States in reviewing information prior to the vessels' entry into port; conducting inspections in their designated ports; taking measures against vessels found to have engaged in IUU fishing; and exchanging information with concerned States and international entities [27]. Inspection and compliance records of fishing vessels compiled through the information exchange mechanism under the PSMA could serve as a reliable resource for inclusion in national risk assessments and could help States to take appropriate action in cases of non-compliance with national, regional or international laws and regulations, including the prohibition or freezing of subsidies by the flag States concerned [13] (p. 98).

The global implementation of the PSMA would effectively establish "compliance checkpoints" at ports around the world for a large number of fishing vessels, especially those that operate in waters outside the jurisdiction of the flag State and seek entry into ports of other States. It is remarkable that the recognition of the requirements of developing States (developing States constitute the majority of parties and the majority of coastal States globally) is crucial, and parties of the PSMA emphasized the development of a framework to support developing States in their implementation of the agreement. A dedicated working group is tasked with addressing the requirements of developing States' parties, including the administration of required funding to support capacity development efforts [28].

After the PSMA entered into force, some notable achievements have already been made. At the national level, a number of States made efforts, such as updating relevant legislation and increasing port inspection capacity, to implement the PSMA. At the regional level, the number of RFMOs that have adopted conservation and management measures regarding IUU fishing, and more specifically regarding port State measures, has continued to increase. Achievements in combating IUU are expected to grow with the increased

uptake and implementation of the PSMA and as the global commitment to combat IUU fishing continues to build.

3.3. New Developments of Regional Institutional Approach for Fisheries Management on the High Seas

RFMOs are international organizations that serve as fora for the establishment, implementation and enforcement of legally binding management and conservation measures for fishing. RFMOs are currently the only legally mandated fisheries management bodies on the high seas, and States' commercial fishing fleets must abide by RFMOs' regulations in order to fish in these areas [29]. Many RFMOs are established under international conventions and have the authority to adopt legally binding provisions with regard to the conservation and management of fish stocks, and almost all of the high seas on Earth are now covered by at least one RFMO (see Appendix A) [30] (p. 1036).

The functions of RFMOs include the collection, analysis and dissemination of fisheries information, statistics and data; the establishment, implementation and regulation of conservation and management measures to ensure the long-term sustainability of fish stocks; the adoption of decision-making procedures; the establishment of monitoring, control, surveillance and enforcement measures and the adoption and establishment of participatory rights, etc. [22] (Art. 10). Like any international organizations, RFMOs' success in managing and conserving the resources under their jurisdiction depends on the political will of their member States [31] (p. 17).

The LOSC does not provide any information as to the role and mandate of RFMOs, while the Fish Stocks Agreement empowers RFMOs by giving them the mandate to fully conserve and manage highly migratory and straddling fish stocks under their area of competence and by imposing more stringent obligations on States. Under the Fish Stocks Agreement, only member States of these RFMOs are entitled to access the fishery resources under the organization's management [22] (Arts. 8, 17), but non-parties to the Fish Stocks Agreement have access to them under the freedom of fishing that is applicable on the high seas as they cannot be bound by a treaty to which they have not agreed to be bound. RFMOs have attempted to control activities by non-party vessels by giving incentives for cooperation, such as drawing the attention of non-parties to the activities of their vessels in the regulatory area of RFMOs [22] (Art. 17).

Current progress at the regional level has shown that in order to realize the conservation and sustainable use of biodiversity on the high seas, regional cross-institutional cooperation through coordinated efforts is necessary. The need for States and institutional cooperation both at the international and regional levels has been further highlighted in the UNGA Resolutions on Oceans and the Law of the Sea and in the Ad Hoc Open-Ended Informal Working Group to Study Issues Relating to the Conservation and Sustainable Use of Marine Biological Diversity Beyond Areas of National Jurisdiction (BBNJ Working Group) reports [32]. In this respect, cooperation and coordination between RFMOs and regional seas organizations in regional ocean governance is a new trend. The Collective Arrangement between the Protection of the Marine Environment in the North-East Atlantic (OSPAR) Commission and the North-East Atlantic Fisheries (NEAFC) Commission is a good example of such inter-institutional collaboration. The contracting parties adopted a stepped approach, starting with opening dialogues and mutual exchanges to learn about each other's mandates and activities through the cooperation ladder (Figure 2) [33].

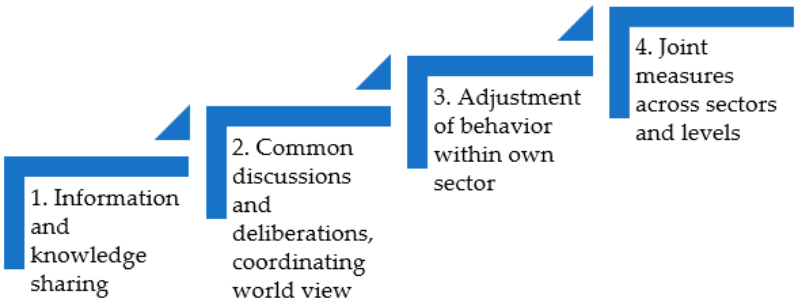

Figure 2. The cooperation ladder of OSPAR Commission and NEAFC Commission. Source: UNEP. Realizing Integrated Regional Oceans Governance—Summary of Case Studies on Regional Cross-Sectoral Institutional Cooperation and Policy Coherence. Regional Seas Reports and Studies No. 199.

As mentioned above, the need for cooperation between RFMOs and organizations that deal with the management of human activities in other sectors rises rapidly. Global guidance is available to ensure that area-based management tools, including the marine protected areas (MPAs), is integrated within broader fisheries management frameworks and follows good practices with regard to participatory approaches [13] (p. 80).

MPAs are vital to the sustainable development of oceans. They safeguard vulnerable species and ecosystems, conserve biodiversity and avert potential conflicts among users by delineating specific allowed activities [34]. A number of international policy instruments have recently been established in support of MPAs. For example, Aichi Target 11 [35] and Sustainable Development Goals (SDG) Target 14.5 [36], in particular, aimed for the designation of 10% of coastal and marine waters as protected areas by 2020. According to the 2020 SDG Report, over 17% (or 24 million square kilometers) of waters within national jurisdiction were covered by protected areas by the end of 2019 [37] (p. 60). The global mean percentage of each marine key biodiversity area covered by protected areas increased from 30.5% in 2000 to 46.0% in 2019, but the majority of these sites still have incomplete or no MPA coverage [38].

The protection and conservation measures taken in MPAs include prohibition of, or restrictions on, navigation, dumping, fishing activities, seabed exploration, land-based pollution and access for tourism. In so-called "no take" zones, all forms of exploitation are prohibited. For example, in the South Orkney Islands Southern Shelf MPA, all types of fishing activities shall be prohibited within the defined area, with the exception of scientific fishing research activities agreed by the Commission for monitoring or other purposes on advice from the Scientific Committee [39] (Art. 2). The benefits of setting "no take" zones include maintenance of or an increase in fisheries productivity, maintenance of biodiversity and stock structure and protection of habitats [40] (p. 52). However, it is important to recognize that while MPAs have positive effects on biodiversity inside "no-take" zones, efforts to secure the sustainability of fishery resources must build on a wider range of natural resource management interventions. Implemented in isolation, MPAs can result in the shifting of fishing pressure to areas that lack such management measures, or may have significant impacts on the livelihoods and food security of fisheries dependent communities [13] (p. 102). To avoid the negative consequences, MPAs should be combined with other management measures that control fishing effort outside the protected areas. Hence, MPAs must be an integral part of overall fisheries management plans and should not be viewed as a stand-alone fisheries management tool, unless they are the only viable option, such as in situations where the capacity to implement other forms of management is lacking [40] (p. 150).

4. Achievements of Global Fisheries Management System

Whereas the human causes for the threats to global fisheries vary, to a large extent, from the fundamental characteristics of fish, they are a common property and renewable natural resource that is incapable of being spatially confined [41] (p. 457). Today, however,

it is widely acknowledged that fishery resources are finite and a common interest for human beings. How to realize the sustainable development of fishery resources becomes an important issue of international concern.

In addition to providing comprehensive multilateral rules to regulate the use of the seas, one of the most fundamental contributions of the LOSC has been acting as a new international law of global fisheries management [19] (p. 4). The fundamental redistribution of fishery resources between States has been laid down in the LOSC: the establishment of EEZ, which has ended the freedom of fishing within 200 nm along the coast with the richest fishery resources, is a typical example [42] (p. 41). Part V of the LOSC sets out the EEZ concept, under which the coastal States have "sovereign rights for the purpose of exploring and exploiting, conserving and managing the natural resources, whether living or non-living", as well as "the jurisdiction of protection and preservation of the marine environment" [16] (Art. 56). The EEZ has been described as an inheritance by the coastal States from the rest of the world: "Under the new regime of the seas, the world community has willed to the coastal States the bulk of living resources in waters off their shores." [43] (p. 1358). This is because the EEZ essentially brings under national jurisdiction large tracts of ocean space that previously belonged to the regime of the high seas. For this reason, the LOSC regulates that the coastal States not only enjoy the sovereign rights over the natural resources in EEZ, but fulfill two important obligations, namely conservation and optimum utilization [16] (Arts. 61, 62).

The traditional legal framework for fisheries management was based on the principle of free access to the living resources. The doctrine associated with this approach was the freedom of the high seas, which was the single operating principle under general international law for a long time [19] (p. 4). However, in the 1958 Geneva Conventions, freedom of high seas fishing is restrained by the requirement of due regard, the duty of cooperation and the duty of conservation [44]. By following the Geneva Conventions, the LOSC sets out more restrictions on high seas fishing, which altered the situation of utilization aspect dominated the concept of conservation. Furthermore, according to the traditional international law theory, a treaty is only legally binding on its contracting parties, but fisheries management rules have broken this limit. For example, the Fish Stocks Agreement does not only restrict the behavior of the contracting parties, but is also applicable to non-party States. Article 17 (1) provides:

> "A State which is not a member of a sub-regional or regional fisheries management organization ... ... and which does not otherwise agree to apply the conservation and management measures established by such organization or arrangement, is not discharged from the obligation to cooperate, in accordance with the Convention and this Agreement, in the conservation and management of the relevant straddling fish stocks and highly migratory fish stocks."

Moreover, the non-member State shall not authorize vessels flying its flag to engage in fishing operations for the straddling fish stocks or highly migratory fish stocks that are subject to the conservation and management measures established by such organization or arrangement [22] (Art. 17). In other words, the era of freedom of fishing on the high seas is ended, which makes fishing on the high seas completely under the joint management of the international community [45] (p. 276).

Based on the LOSC, other international instruments set out more specific rules especially for cooperation between States on high seas fishing: the IPOA-IUU covers flag, port, coastal and market State responsibilities, and envisages broad participation and coordination among States, as well as representatives from industry, fishing communities and NGOs, and the use of a comprehensive and integrated approach, so as to address all impacts of IUU fishing [25]; the Code of Conduct provides principles and standards applicable to the conservation, management and development of all aspects of fisheries, i.e., the capture, processing and trade of fishery products, fishing operations, aquaculture, fisheries research and the integration of fisheries into coastal area management [23] (Art.

1.3). The international voluntary fisheries instruments have played a role supplementary to the LOSC, providing guidelines for the sustainable utilization of fishery resources.

Apart from fishery management measures on combating IUU fishing taken by the FAO and RFMOs, other instruments and international organizations of conserving marine living resources also assist in ensuring the sustainability of fishery resources and they include the IUCN, UNEP, the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and the Convention on the Conservation of Migratory Species of Wild Animals (CMS) and the Ramsar Convention (wetlands). These international institutions have a strategic interest in both conservation and sustainable use, and have been increasingly working with the FAO to strengthen actions on addressing biodiversity considerations in fisheries, and to some extent, to give due recognition to fisheries' interests (and sustainable use) across their institutions [46] (p. 215).

In addition to the legal system of fisheries management, the formation of the intergovernmental mechanism for the management can be seen as another achievement. As the nature of global commons, the management of fishery resources requires cooperation between appropriate international and regional institutions to ensure multi-sectoral and integrated management [47] (p. 278). At the international level, the United Nations has convened several conferences on the subject of fisheries, and the FAO also included fisheries issues in the Agriculture (Fisheries) Ministerial Conference. Meanwhile, the RFMOs have been established globally, which represents the regional-level institutional model. As highlighted by Oude Elferink, much progress in the governance of high seas activities could be made at the sectoral and regional levels, incorporating both voluntary and binding approaches [48] (p. 254). Global ocean governance has gradually formed two paths in the process of practice, namely regionalism and globalism. They are both competing with each other and gradually integrating and complementing each other [49] (p. 6). On the one hand, the regional approach itself is inspired and promoted by the LOSC and other global ocean governance norms, rules and systems, and at the same time, it is an integral part of the international ocean governance framework to deal with issues such as marine environmental protection and fishery resources conservation; on the other hand, regional practices have formed a regional governance framework according to their own characteristics [49]. The regional approach has also been shown to engender a better legal commitment and policy convergence on behalf of States in the region, to be more cost-effective and more efficient in dealing with large-scale changes [50] (pp. 71, 79). However, it should be noted that the regional approach faces the interference of the competing influences of major powers and is more vulnerable to disputes or differences in interest claims among States within the region [49].

5. Limits of the Global Fisheries Management System

The fisheries management system has made positive contributions to the promotion of the sustainable development of fisheries. However, there still exist several essential limitations, which caused the trend of declining fishery resources.

The first essential limitation is in regard to the gaps between the management approaches and the characteristics of the marine ecosystem. The zonal management approach established by the LOSC is on the basis of distance from the coast, but ignores the fact that the ocean space and the natural resources within it are closely interrelated and need to be considered as a whole [20] (p. 223). The spatial scope of "man-made jurisdictional zones" does not always correspond to "ecologically defined space", which comprises the area where marine ecosystems extend [51] (p. 20). Moreover, the divergence between the law and nature raises considerable difficulty with regard to the conservation of straddling and highly migratory fish species. Due to their nature, these species do not respect manmade maritime boundaries. Hence, a clear-cut distinction between marine spaces under the coastal State's jurisdiction and marine spaces beyond such a jurisdiction is not always suitable for the conservation of these species [52] (p. 131).

The LOSC imposed sovereign control over large sea areas that had traditionally been part of the international commons. In doing so, the LOSC attempted to balance the interests of the fishing States, derived from the freedom of high seas, with the interests of the world community in conserving and sustainably exploiting fisheries [53] (p. 226). However, the LOSC did not solve the problem of how to manage and conserve fish stocks that straddle a State's EEZ and either a neighbor State's EEZ or the high seas, nor disputed EEZs. This triggered an issue that the coastal State attached importance to the utilization of fishery resources rather than conservation, and the conservation measures of the coastal State are essentially characterized by its own economic and social interests in the EEZ [5] (p. 367).

Although the species-specific approach adopted by the LOSC and the Fish Stocks Agreement has played a supplementary function, it seems that the situation was not improved very much as the relevant provisions are too general to apply, which represents the second limitation of the fisheries management system [17] (p. 296). For example, according to the LOSC, States shoulder the obligation to cooperate on the conservation of fishery resources on the high seas, but the relevant provisions leave some ambiguities with regard to the content of the duty of cooperation [54] (p. 57). These provisions do not provide specific guidance describing how cooperation should be performed, nor do they explicitly state how to judge whether or not such obligation of cooperation was breached [55] (p. 26). In practice, cooperation may take various forms and need not necessarily to be pursued in a single form at any given time. The International Court of Justice (ICJ) in the Fisheries Jurisdiction cases required some forms of cooperation, such as a joint examination of conservation measures and entering into negotiations in giving effect to the duty of due regard [56] (pp. 31, 32, 201). Nevertheless, the obligations of contributing and exchanging available scientific information, fishing effort statistics and other data relevant to the conservation of fish stocks are treated as the most basic content. For example, parties to the PSMA have recognized the importance of swift and efficient information exchange; they have shared relevant information of foreign vessels seeking entry into, and using, their designated ports almost in real time to allow swift detection of IUU fishing. In order to operate effectively, the parties tasked the FAO with developing a global information exchange system (GIES) to facilitate the sharing of information relevant to the PSMA, and established an informal working group to provide guidance on the elaboration of the system [57]. The FAO has developed pilot PSMA applications for States to upload their designated ports and national contact points. As of February 2020, 49 States had uploaded their national contact points, and 39 States had uploaded information on their designated ports [7] (p. 110).

The third limitation relates to the issues of binding force and the implementation of relevant international instruments. The voluntary instruments adopted by the FAO, such as the FAO Code and the IPOAs, do make great efforts in the global fisheries management, but their non-binding nature does significantly impede their effectiveness due to the lack of legal force. Thus far, efforts to achieve a fine balance between encouraging widespread international participation and the effective implementation of the guidelines and measures outlined in these voluntary instruments have largely failed [19] (p. 17). As mentioned above, the FAO Code has been incorporated into the FAO Compliance Agreement with mixed results. This approach might be an example to solve the problem of the vulnerability inherent in such voluntary instruments, and strike a traditional balance between *mare liberum* and environmental stewardship [53] (p. 235).

6. Conclusions

The conservation and management of fishery resources is an indispensable component of the protection of community interests in international law, as well as involving the interests of the survival and development of human beings, which is not only for the present but also for future generations. The legal framework governing the conservation of fishery resources in the LOSC relies essentially on the zonal management approach and the species-specific approach, though these two approaches comprise limitations. For

filling the regulatory gaps, the international community has endeavored to negotiate more specific fishery agreements and non-binding policy instruments, as well as to apply management tools, i.e., MPAs, which jointly compose the governance regime for the sustainable development of fisheries. At present, it can no longer deny that the survival of mankind as a whole should be closely aligned with the protection of community interests, and the existing management system makes great efforts to achieve it. One of the outstanding achievements is that the era of freedom of fishing on the high seas is ended, which makes fishing on the high seas completely under the management of the international community.

The international community endeavored to build a governance regime for the global commons on the paradigm of consensus. However, this assumes that all players are negotiating in good faith towards a common goal, rather than protecting their short-term national interests. "Free-riders" outside the system or progress-blocking within the system will be inconsistent with the fundamental duty to cooperate, and make the governance regime less effective. The traditional fisheries management system is State-centered. No matter the General Assembly' resolutions or the rules adopted by FAO, or the directives of RFMOs, are based on the State's sovereignty commitments. However, it proves that it is not effectively working. The quest for effective mechanisms for the global fisheries management will continue to be an important topic in international law. In order to protect the community interest of human beings, a multi-governing model is needed, i.e., the participation of stakeholders, such as the government organizations, NGOs, companies and individuals, in addition to nation States.

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Appendix A

Table A1. Regional fishery bodies fact sheet.

	Name	Area of Competence	Species and Stocks Coverage
Continents	Central Asian and Caucasus Regional Fisheries and Aquaculture Commission (CACF)	The inland waters and areas within the territorial boundaries of the States of Central Asia	All living aquatic resources
	Lake Chad Basin Commission (CBLT)	Inland waters of Lake Chad Waters and Lake Chad Basin	The waters and transboundary water resources
	Committee for Inland Fisheries and Aquaculture of Africa (CIFAA)	Inland waters of member countries	All species
	Commission for Small-Scale and Artisanal Fisheries and Aquaculture of Latin America and the Caribbean (COPPESAALC)	Marine coastal and inland waters of member countries	All species
	Commission is European Inland Fisheries and Aquaculture Advisory Commission (EIFAAC)	Inland waters of member countries	All species
	Lake Tanganyika Authority (LTA)	The Lake Tanganyika Basin	Littoral and pelagic species of the Lake Tanganyika
	Lake Victoria Fisheries Organization (LVFO)	Lake Victoria	All aquatic species
	Mekong River Commission (MRC)	The Mekong River Basin	All living resources
	The Aquaculture Network for the Americas (RAA)	The inland territories and national waters of member states	All commercially farmed aquatic species
Global and trans-ocean	Agreement on the Conservation of Albatrosses and Petrels (ACAP)	All the areas of land or water that any albatross or petrel inhabits, stays in temporarily, crosses or over-flies at any time on its normal migration routes	22 species of albatross and 8 species of petrels
	Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR)	Southern Ocean	All marine living resources, except for the management or harvesting of whales and seals
	Commission for the Conservation of Southern Bluefin Tuna (CCSBT)	Atlantic Ocean, Pacific Ocean and Indian Ocean	Southern bluefin tuna
	International Whaling Commission (IWC)	Global	Whales
	Central America Fisheries and Aquaculture Organization (OSPESCA)	National waters, inland waters and EEZs of its member States	Marine capture, inland capture and aquaculture fish stocks of member States

Table A1. *Cont.*

	Name	Area of Competence	Species and Stocks Coverage
Pacific Ocean	Asia-Pacific Fishery Commission (APFIC)	Asia-Pacific area, including the Bay of Bengal	Marine, fresh and brackish water species, including coastal and high seas stocks
	Convention on the Conservation and Management of Pollock Resources in the Central Bering Sea (CCBSP)	High seas of the Bering Sea	Alaska pollock
	Pacific Islands Forum Fisheries Agency (FFA)	High seas, National waters	Tuna and tuna-like species
	Inter-American Tropical Tuna Commission (IATTC)	Eastern Pacific Ocean	Tuna and tuna-like species and other species of fish taken by vessels fishing for tunas and tuna-like species
	International Pacific Halibut Commission (IPHC)	High seas, National waters	Pacific halibut
	North Pacific Anadromous Fish Commission (NPAFC)	High seas of North Pacific Ocean and its adjacent seas	Chum salmon, Coho salmon, pink salmon, sockeye salmon, Chinook salmon, cherry salmon, steelhead trout
	North Pacific Fisheries Commission (NPFC)	High seas area of the North Pacific Ocean	Fish, mollusks, crustaceans and other marine species caught by fishing vessels within the Convention Area
	North Pacific Marine Science Organization (PICES)	The temperate and sub-Arctic region of the North Pacific Ocean and its adjacent seas	All living resources
	Pacific Salmon Commission (PSC)	Transboundary rivers and salmon-spawning rivers belonging to one party, where the salmon are subject to capture by the other party	All Pacific salmon stocks
	Southeast Asian Fisheries Development Center (SEAFDEC)	SEAFDEC does not have a defined geographical area of competence	All fishery resources
	Secretariat of the Pacific Community (SPC)	All the Pacific Island countries and territories which, together with France, USA, New Zealand and Australia, comprise the member States	All fishery resources
	South Pacific Regional Fisheries Management organization (SPRFMO)	High seas of the Pacific Ocean	All species except highly migratory species, sedentary species which are subject to national jurisdiction, anadromous and catadromous species, marine mammals/reptiles and sea birds
	Network of Aquaculture Centers in Asia-Pacific (NACA)	The inland territories of member states	All commercially farmed aquatic species
	Western and Central Pacific Fish Stocks Commission (WCPFC)	Western Central Pacific Ocean	Highly migratory fish stocks
Mediterranean and Black Sea	General Fisheries Commission for the Mediterranean (GFCM)	Mediterranean Sea and the Black Sea	All living marine resources

Table A1. *Cont.*

	Name	Area of Competence	Species and Stocks Coverage
Indian Ocean	Bay of Bengal Programme Inter-Governmental Organization (BOBP-IGO)	EEZ of the member States and contiguous areas beyond national jurisdiction	All marine fish stocks
	Indian Ocean Tuna Commission (IOTC)	Indian Ocean and adjacent seas north of the Antarctic Convergence	Tuna and tuna-like species
	Regional Commission for Fisheries (RECOFI)	National waters in the region	All living marine resources
	Southern Indian Ocean Fisheries Agreement (SIOFA)	High seas in the region	Resources of fish, molluscs, crustaceans and other sedentary species, excluding: (i) sedentary species subject to the coastal States; (ii) highly migratory species
	Southwest Indian Ocean Fisheries Commission (SWIOFC)	Indian Ocean	All living marine resources
Atlantic Ocean	Fishery Committee for the Eastern Central Atlantic (CECAF)	Atlantic Ocean	All living marine resources
	Ministerial Conference on Fisheries Cooperation among African States Bordering the Atlantic (COMHAFAT)	EEZ of the member States	All marine living resources
	Regional Fisheries Commission for the Gulf of Guinea (COREP)	National waters, inland waters of member States	All marine living resources
	Caribbean Regional Fisheries Mechanism (CRFM)	National waters, inland waters of member States	All fisheries resources
	Joint Technical Commission of the Maritime Front (CTMFM)	EEZ of the member States	The main fishery resources are white mouth croaker, argentine hake and stripped weakfish
	Fisheries Committee for the West Central Gulf of Guinea (FCWC)	National waters of member States	All fisheries resources
	International Commission for the Conservation of Atlantic Tuna (ICCAT)	Atlantic Ocean including the adjacent seas	Tuna, tuna-like species and pelagic sharks
	Joint Norwegian–Russian Fisheries Commission (JointFish)	Barents Sea and Norwegian Sea	Cod, capelin, Greenland halibut, king crab
	Northwest Atlantic Fisheries Organization (NAFO)	North-West Atlantic Ocean	All marine fisheries resources, except salmon, tunas, marlins, whales and sedentary species
	North Atlantic Marine Mammal Commission (NAMMCO)	The North Atlantic Ocean	All species of cetaceans and pinnipeds
	North Atlantic Salmon Conservation Organization (NASCO)	Atlantic Ocean north of 36° N, throughout the species' migratory range	Atlantic salmon
	North-East Atlantic Fisheries Commission (NEAFC)	Those parts of the Atlantic and Arctic Oceans and their dependent seas which lie north of 36° north latitude and between 42° west longitude and 51° east longitude (with excluding)	All resources of fish, molluscs, crustaceans and including sedentary species, excluding other international agreements, highly migratory species and anadromous stocks
	South-East Atlantic Fisheries Organization (SEAFO)	South East Atlantic Ocean	Resources of fish, molluscs, crustaceans and other sedentary species, excluding: (i) sedentary species subject to the coastal States; (ii) highly migratory species
	Sub-Regional Fisheries Commission (SRFC)	National waters of member States	All fisheries resources
	Western Central Atlantic Fishery Commission (WECAFC)	Western Central Atlantic	All living marine resources

Source: FAO Fisheries Division, available at http://www.fao.org/fishery/rfb/search/en.

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May China Fish in the Arctic Ocean?

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Abstract: In addition to the traditional so-called Arctic states, non-Artic states and some other international organisations are now showing a growing interest in this area. China, for example, has achieved some progress, since becoming an Arctic Council permanent observer, through participation in resource development in the region and strengthening its bilateral relations with the Arctic states. The present study examines China's Arctic policy and its implications for the governance of the Arctic Ocean. It also provides an insight into the existing relevant international legal instruments and examines China's interest in the participation, governance, and resource protection activities in the Arctic Ocean region, to successfully implement Chinese Arctic policy. To this end, the study examines the connection between the "white paper" and "China's Arctic Policy", in the context of executing the "Belt and Road Initiative", in particular the "Arctic Silk Road". The study concludes that China intends to perform a dynamic role in governing the Arctic Ocean, as a less challenging but cooperative partner in this region.

Keywords: China's white paper for Arctic policy; fisheries resources; Arctic Ocean; Chinese legal rights

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1. Introduction

Over the past 15 years, the ice of the Central Arctic Ocean (CAO) has been increasingly melting and thus, offering new opportunities for international navigation [1]. For example, in the summer of 2012, around 40% of the CAO was covered with ice and thus appeared as unexplored open water on maps [2]. In recent times, new ocean access can be observed for the first time in many years of known history. In addition, as global warming increases, the probability of an ice-free Arctic Ocean increases in the coming years [3].

It is a fact that the fish stock of the Arctic is moving towards the sub-Arctic waters [4], with the summer retreat of the sea ice and the warming of the oceanic waters [5]. This combination of species in open waters and fishery stocks moving north increases the prospect of fishing in the Arctic, although it is as yet unclear which species, in what numbers and when, might arrive in the CAO waters [6]. Fish governance in the CAO has, however, become a more demanding problem as regards the governance of the Arctic Ocean, beyond national jurisdiction. The five Arctic states signed the Declaration to Prevent Unregulated Deep-Sea Fisheries in the Central Arctic Ocean [7], in July 2015, including noting their intention to develop further comprehensive international agreement(s) based on these principles [8].

Usually, such issues are addressed as social or economic issues, which subsequently create political interests and lead to final planning and policymaking; fishing in the open waters of the Bering Sea, known as the Donut Hole, shows evidence of this pattern [9]. Scientific efforts have helped to establish governance goals for fish stocks and support effective management [10]. The signing of the Agreement to Prevent Unregulated High Seas Fisheries in the Central Arctic Ocean by Arctic states, together with other non-Arctic states (China, Korea, Japan, and Iceland and the European Union), has developed a legal euphoria [11]. These five Arctic coastal states joined a group of non-Arctic states for the first time, to reach a legally binding agreement concerning specific issues in the Arctic

region; this legal development recognises that there is currently no ongoing commercial fishing within the high seas of the Arctic region [12]. As a result of the aforementioned, a distinguishing feature of this agreement can be identified as acceptance of the precautionary principle of international law.

On the other side of the coin, China has perceived itself as a "Near Arctic State"; what occurs in the Arctic Ocean region is having a progressively substantial impact on China, and it is also true that climate change and the ecosystems in the Arctic Ocean can have an impact on the Chinese climate, which in turn could have a significant impact on overall living conditions, especially concerning agricultural production in China [8]. In addition to potential navigation through the Arctic, the commercial exploitation of the Arctic Sea lanes also has potential implications for trade and economic development in China. Such developments as those concerning the oil and mineral resources in the Arctic Ocean region are of significant Chinese interest, as an important manufacturer of industrial goods, as well as a consumer of raw materials [13].

Concerning the participation in the Arctic Ocean region, China claims to have a long history, as evidenced by the signing of the Svalbard Treaty 1925 [14], and the opening of the Huang He research station in Ny-Ålesund in 1925 and 2004, respectively [15]. In addition, since 1999, China has led six scientific tours to the Arctic region and committed to running similar trips every two years, from 2012 onwards. Later, Chinese scientists made the state's first transaction voyage to Iceland from Shanghai, aboard the Xuelong (Snow Dragon) icebreaker, in August 2012 [16]. There are several goals of Chinese scientific expeditions to the Arctic Ocean region, including marine biological research, aurora observations, and environmental concerns.

China understood in earlier years that working with Arctic coastal states was the ideal way for it to participate in various Arctic-related issues [17]. For this purpose, China has also been periodically and significantly investing in various fields of Arctic states, e.g., in March 2015, in cooperation with Russian gas company, Novatek, China made available USD 15 billion to finance a USD 27 billion plant for liquefied natural gas (LNG) on the Russian Yamal peninsula [18]. Furthermore, in collaboration with London Mining in the UK, a Chinese company attempted to create an Isua iron ore mine in Greenland. That venture failed, however, with the bankruptcy of London Mining resulting from plunging iron ore prices, but the Chinese corporation retained the exploration rights of Isua and acquired the subsidiary of London Mining, which was based in Greenland. Later, in 2015, a Chinese private trading company (the General Nice Group) took over a large iron ore mine in Greenland, which was valued at around USD 2 billion [19]. In addition to this, some Chinese corporations have also been concerned about making significant investments in local infrastructure in the Arctic states [20].

Moreover, the potential of the fishery stocks in the CAO is also a great source of attraction for the growing Chinese economy and its global diplomatic mission of expanding and growing peacefully. Chinese demand for fish has grown significantly with the rapid rise in income of many of the Chinese population, as well as the collapse of fish stock resources in its near-shore areas [8]. These demands have led to the recent improvements in and the expansion of the deep-sea fishing fleet in China. It is also notable that experts from the Chinese Academy of Social Sciences have suggested that overseas fishing could best suit the long-term priority of agricultural development in China [21]. China may, thus, wish to increase its presence in fishing around the globe, including participating in governance, conservation, and resource development activities in the Arctic Ocean region.

The methodology employed in this article is based on the qualitative data analysis of working papers, national policy documents, international and regional agreements, academic journals, books, key newspaper articles, reports, and other important relevant electronic materials including international organisations. It draws on the literature and content analysis method to qualitatively analyse the Arctic governance policies of the Arctic states and other major stakeholders. By doing so, however, the main focus of this article is China's role in Arctic governance as represented by its Arctic policy and future prospects,

i.e., China's White Paper—Arctic Policy, which is highly representative of how China deals with Arctic governance and supports its claim of being a near-Arctic state promoting its stances of co-existence and the sustainable future use of the Arctic fisheries. To this end, Section 2 provides insight into China's views on the Arctic Ocean. Section 3 examines Chinese Arctic policy as laid down in its white paper, including its participation in the governance, conservation, resource development and protection, and utilisation of fish stocks and other living resources, as well as the routes of the Arctic Ocean as part of the Polar Silk Road (PSR) and the Belt and Road Initiative (BRI). Section 4 provides an analysis of the available existing international treaties and legal agreements concerning fishing issues in the Arctic Ocean region. Similarly, Section 5 presents the logic and reasoning of China's future role in the Arctic, followed by concrete concluding remarks in Section 6.

2. China's Views on International Cooperation in the Arctic Ocean

The fact of the continuing melting of the Arctic sea ice poses grave security and sovereignty challenges, which are gradually manifested in developing relationships between both the Arctic states and non-Arctic states such as Japan, China, India, and South Korea [22]. International cooperation concerning the Arctic Ocean region needs to be strengthened. Most Arctic issues are critically national; however, some are also regional and international, i.e., problems related to resource development, navigation, and environmental effects of climate change. These problems need deeper consideration of the causes and effects of natural variability and man-made ecological variations in the Arctic Ocean. Global cooperation in the Arctic region is increasingly expanding over time, creating significant challenges as well as enormous potential in the area. The history of such international collaboration in the Arctic goes back to the early 1990s, emphasising scientific research and environmental protection, but this swiftly extended to include sustainable development [23]. International cooperation among the states around the Arctic and other non-Arctic states has developed on some levels bilaterally or within the framework of the existing regional forums and international organisations, in the sphere of sustainable development, ecological protection, and scientific research.

In 2015, at the third meeting of the Arctic Circle held in Iceland, the then Deputy Foreign Minister of China delivered a keynote address entitled "China in the Arctic: Policies and Practices" [24]. The next year, China's chief climate change negotiator delivered another speech at the Fourth Assembly of the Arctic Circle on China's vision of working together in the Arctic [25]. These speeches and the way forward used the key word "cooperation" in the Arctic, which highlighted an emerging Chinese Arctic policy. Recognition and respect for mutual rights is the basis for international legal cooperation between the Arctic and non-Arctic states. The United Nations Convention of the Law of the Sea (UNCLOS) [26] provides the Arctic states with the rights over jurisdiction as well as sovereignty, as regards their particular coastal areas of the Arctic Ocean. Similarly, non-Artic states also enjoy the rights of navigation and scientific research [27]. In order to develop a partnership in the Arctic region, all these states should act primarily based on mutual recognition and respect for the relevant provisions of international law.

Secondly, trust and mutual understanding offer political assurance for cooperation between these states. Arctic states, which have a greater interest in Arctic-related affairs, claim to be entitled to play a more dominant role in these affairs than that of non-Arctic states. Given the supra-regional impact of some Arctic-related problems, such as environmental impact, non-Arctic states also claim to have legitimate interests in matters relating to the Arctic Ocean [28]. There is no doubt that all these states will perform a progressively important part in Arctic affairs, with all interests being linked. In order to strengthen cooperation, all the concerned states should strive to improve their trust and mutual understanding, strengthen communication, mutual assistance and support, and seek convergent areas of interest, based on mutual respect for their rights.

Thirdly, the treatment of supra-regional problems through joint research efforts is an important field of cooperation among various states which claim their interest in the Arctic

Ocean. Increased trust and mutual assistance in scientific research will enable these states to consider supra-regional problems from a broader perspective, sending a broader message to the global scientific community while also appropriately simplifying the processes of resolution of pertinent problems. This collaboration model has already produced promising results in addressing issues, for example, Artic shipping and climate change [22]. The problem for the Arctic Council members is now to include the non-Arctic states in related scientific research and other comprehensive discussions at an early stage [29].

There are different specific interests, rights, and concerns between the Arctic and non-Arctic states concerning Arctic affairs: sustainable development, stability, and peace in the Arctic Ocean, however, serve the common interests of all states concerned. International cooperation and partnerships concerning mutual benefits that strengthen and promote these interests will certainly be the most suitable path in this region of increasingly internationally significance. Given the situation, "respect" is the fundamental basis for Chinese participation in Arctic-related affairs; therefore, "cooperation" could be an effective vehicle for Chinese Arctic policy. This can be a win-win situation for Chinese participation in various affairs or activities in the Arctic Ocean, by encouraging the message that all parties involved in all areas of activity should seek mutual benefit and mutual progress. China's interests typically range from promoting bilateral Arctic diplomacy to participating in the governance of Arctic affairs, as well as access to resource exploitation opportunities and exploration [30]. So far, Chinese involvement in the Arctic region has been relatively modest. In 2013, China gained observer status with the Arctic Council and slightly strengthened its bilateral relationships with some of the surrounding states, especially Iceland and Finland, while participating in various Arctic-related activities, i.e., resource development in the region [31].

The newly issued Chinese white paper concerning its Arctic policy indicates that the Arctic's political goals concern four basic principles—understanding, protection, development, and participation in Arctic governance. This stresses the need for "cooperation, sustainability, respect, and win-win results" to achieve these political goals. Chinese strategy concerning the Arctic is just beginning to evolve and is still facing several challenges, including the natural environment in the Arctic Ocean, coupled with technological constraints, disputes among the Arctic states on the issues concerning territorial sovereignty, and security activities between certain states. In sum, with the recently published Chinese Arctic policy, the white paper, China strategically highlighted a crucial issue in the future of Arctic affairs, that of cooperation.

3. China's Arctic Policy—'White Paper'

China published its first white paper concerning its Arctic policy in January 2018. China has stated that its political goals as a major stakeholder as well as a "Near Arctic State" are to participate, protect, understand, and develop Arctic governance, in order to protect the common interests of the international community concerning the communities in the Arctic and, eventually, to promote sustainable development [32]. Thus, as a rising power, China primarily wants to understand the Arctic to use and protect this resource-rich region [11]. However, the question arises as to how China will attempt to reconcile the use and protection of natural resources in the Arctic region, bearing in mind progress to date.

As indicated in the white paper, Chinese Arctic policies should not, however, be seen as a revelation but as a confirmation of its existing policy. Chinese officials formulated the content of the white paper in previous years; these basic principles and political goals of its participation in the Arctic have already been raised several times by Chinese officials [33]. It is pertinent to mention here that all Arctic and some observer states have published their corresponding strategy documents concerning their Arctic policies. The conclusion of Chinese Arctic politics is relatively new, as compared to those of the other Arctic states, and is still in progress [34]. In contrast to its Western counterparts, China only outlines its policy in writing where it is obliged to do so or when it is in its best interests. The publication of the white paper, therefore, shows how important the Arctic is to policymakers.

In the above discussion and guidelines, it appears that the white paper stresses Chinese adherence to international law and the framework of international treaties. For example, with regard to scientific research, China expressed respect for the sovereign rights and jurisdiction of the Arctic states while, simultaneously, the freedom of scientific research and exploitation, as well as exploration of all high seas in the Arctic Ocean region, are essentially respected [33]. Similarly, it argues that further developments of shipping routes in the Arctic must also comply with international law, UNCLOS, and the freedom of navigation [27].

3.1. Chinese Participation in the Governance, Conservation, Resource Protection, and Utilisation of Fisheries and Other Living Resources in the Arctic

It is an acknowledged fact that the Arctic Ocean region has the potential to become a new fishing area, with fish stocks tending to move north due to various factors, including climate change [35]. With regard to deep-sea fishing in the Arctic region, China has continuously taken a strong stance in favour of scientific research, resource protection, and sustainable utilisation. While China enjoys the legitimate right to conduct marine scientific research and development in the Arctic region, all relevant states should continue to meet their legal obligations to conserve the ecosystem and fish stocks in the region [36].

As part of China's most recent Arctic policy, the country is supporting efforts to draft a legally binding universal treaty on the conservation and governance of fish stocks concerning the Arctic Ocean. China also supports the creation of an organisation concerning the protection and governance of Arctic fisheries or other similar institutional measures, on the basis of relevant provisions of UNCLOS. In this way, China will increase the study and exploration of deep-sea fishing resources in the Arctic, conduct appropriate fishing activities, and form a productive part in the organisation of deep-sea fishing in the Arctic. It is a fact that China hopes to support mutual cooperation with the Arctic States in the areas of governance, resource development, conservation, exploration, and the use of potential fish stocks in the Arctic Ocean. China is also committed to the appropriate protection of Arctic biodiversity, clear and sensible exploration and exploitation, sustainable use of the genetic resources of the Arctic region, and reasonable sharing and exploitation of the benefits arising from the use of these Arctic resources.

Globally, China claims to actively participate in formulating the rules relating to deep-sea fishing governance, the global environment, international marine affairs, and climate change, and fulfils its international obligations under international law. China is expanding its support and collaboration with several states and global organisations in promoting energy-saving and environmental protection, low carbon development, and emission reduction [37]. China also encourages cooperation in combating the issues of climate change and maintains the principles of fairness and shared but differentiated responsibility under the Paris Agreement [38], the Kyoto Protocol [39], and the UN Framework Convention on Climate Change [40], and supports developing countries in combating the issues of climate change [41]. Similarly, China also claims to play a productive part in various activities under the International Maritime Organisation (IMO) and is making significant efforts to meet its global obligations to ensure the safety of shipping by preventing its ships from creating marine environmental pollution, while supporting greater global cooperation in the area of marine technology and research as regards the shipping industry, within the framework of the IMO [42]. China is actively participating in negotiations on the regulation of deep-sea fish stocks in the Arctic region and is calling for a legally binding international treaty for the development, protection, and governance of fish resources on the high seas in this region [43]. It urges that such a globally binding treaty should enable exploratory fishing activities and appropriate scientific research on the high seas in the Arctic region, as well as protecting the freedom of all states' rights on the high seas under the pertinent provisions of UNCLOS and international law.

The white paper underscores Chinese interests in the lawful and rational use of Arctic resources. China reaffirms that it respects the Arctic states' sovereign rights over minerals, gas, and oil and fishery resources in the areas for which they are responsible

under international law and respects the concerns and interests of the residents of the residents Arctic region [22]. Of the five Arctic coastal states, Canada is most concerned about the impact of the Chinese Arctic policy, as laid down in the white paper. Canadian experts caution that the Chinese Arctic policy may try to draw a fine line between respecting the sovereignty of the Arctic states and the possibility of benefiting from international disputes [44]. An expert, Robert Huebert, sees the use of language such as "respect for international law" in the Chinese Arctic policy in the white paper as an attempt to articulate the limits of the sovereignty of the Arctic states [45]. Among the issues about which Canada is most concerned is whether China will have the same legal position as the European Union (EU) and the United States (US): to treat the Northwest Passage as a "road for international use", contrary to what Canada claims as "internal waters" [46]. By means of its Arctic policy, however, China claims that it largely avoids this complicated problem and instead focuses on the significant opportunities as well as possible challenges that may arise from environmental and economic considerations. As shown in Table 1, China holds a long history of engagement in the various aspects concerning the Arctic Ocean, including science and technology, management, cooperation, ocean governance, and sustainable fisheries across the region.

Table 1. Chinese chronological history of engagement in the Arctic Ocean.

Description	Year
Chinese scientists took part in the first International Polar Year	1882
China signed Spitsbergen Treaty	1925
First Chinese participation in Soviet research in the Arctic	1951
State Oceanic Administration was established, with a brief to "engage in polar expeditions in the future"	1964
China took a seat in United Nations and Security Council	1971
Visits to the Arctic—Chinese Academy of Sciences sets up Polar Science Committee	1995
China Arctic and Antarctic Administration was set up	1996
China joined International Arctic Science Committee	1996
China Arctic and Antarctic Administration dispatched Xue Long (ship) on the first Arctic expedition	1999
Opening of the temporary research station China Yilite-Mornring Arctic Scientific Expedition and Research Station on Svalbard, Norway	2001
Opening of permanent Arctic Yellow River Station on Svalbard, Norway	2004
China accepted for the first time as a temporary observer on the Arctic Council	2007
China accepted as a permanent observer on the Arctic Council	2013
Chinese President, Xi Jinping, says China strives to be a "polar great power"	2014
Chinese Communist Party identified the polar regions, the deep seabed, and outer space as China's new strategic frontiers	2015
Xue Long sets off on seventh Arctic expedition	2016
Chinese Communist Party reshuffle integrates Arctic and maritime policy within geopolitical strategy making	2018
Chinese Arctic Policy White Paper announced the Polar Silk Road	2018

Source: Created by this research.

3.2. The Routes of the Arctic Ocean as Part of the BRI

Scientific researchers such as Camilla Sørensen and Yağci (2018) have argued that the Arctic Ocean routes have been the central element of Arctic diplomacy in China for some time and its Arctic policy in the recent legal development is inadequate in the current situation [47]. In a related area, however, the Arctic states are opening up the novel

and unique opportunities for trade and development. This concerns China's political goal of contributing to the development of the routes of the Arctic Ocean, which China believes may become a reality possible for commercial purposes earlier than is generally expected. China claims that the routes of the Arctic Ocean can be an attractive alternative to the strategically endangered routes passing through the Suez Canal and the Straits of Malacca, on which the country currently depends for its international trade with European countries [48]. In June 2017, China officially declared the routes of the Arctic Ocean as part of its BRI and, since then, has started to cooperate with Arctic states, i.e., through high-level Chinese officials' visits to the Arctic Ocean [49].

3.3. The Ground of Polar Silk Road (PSR) Gains

The Chinese have engaged in cooperation and dialogue with Russia in developing the infrastructure related to the routes of the North Sea for the major Chinese–Russian natural gas projects on the Yamal peninsula [50]. In addition, China has intensified cooperation and dialogue in the region with regard to Iceland and Finland. Iceland is also considering identifying itself as a logistical "hub" on the PSR, which, according to China's white paper, has become the term for the Chinese vision of Arctic Ocean routes [51]. Preliminary negotiations are currently underway in Finland to create a 10,500 km cable through the Arctic to ensure the fastest data connection between Europe and China [52]. In addition, Norway and Finland have started collaboration on an "Arctic Corridor", comprising railway lines from Kirkenes in Norway to Rovaniemi in Finland, which has been indicated as a possible terminus of the PSR [53]. In addition, China also has growing interests in Sweden (in Lysekil), where Chinese corporations want to invest in the expansion project of ports and the construction of roads, bridges, and railways, concerning the necessary surrounding infrastructure of the port of Lysekil, which links to the PSR [54].

All these are potential major Chinese investments; these projects are linked to the recognition of the BRI, which is likely to lead China's commercial banks and companies, as well as other involved parties, having a greater chance of obtaining funding, i.e., from the Silk Road Fund, the Chinese state investment fund, and will probably mean they can count on political support. The Arctic policy of China through the white paper clearly encourages Chinese corporations to prioritise involvement in the construction of infrastructure related to routes of the Arctic Ocean and stresses that China is willing to work with any Arctic state interested in developing the PSR [47].

The aforementioned shows that China intends to cooperate with all stakeholders to construct the PSR by developing various shipping routes in the Arctic Ocean [55]. The recent Chinese white paper emphasised the special status of the Arctic Ocean, as it is an oceanic region that includes areas within states' jurisdictions as well as areas within universal scope, making it a region that has the interest of both Arctic and non-Arctic states. Intrinsically, Arctic problems are not only national or internal problems for the Arctic states but also international concerns. As stated in China's Arctic policy, the current situation concerning various activities in the Arctic Ocean not only affects the Arctic states internally or the relations between Arctic states. Beyond the Arctic states, it has "global impact" and "critical impact" on the development, sustainability, and survival of all states, including China [56].

4. Existing International Treaties Regarding Fishery Issues in the Arctic Ocean

UNCLOS provides that any coastal state has a right over fishing and other coastal activities extending up to 200 nautical miles from its coastal baseline. According to Article 87 of UNCLOS, vessels of all states have the right to fish in the areas on the high seas, unless they have entered into an international agreement in which otherwise is stipulated. Several international legal instruments, in some way, address issues concerning fishing in the Arctic Ocean region. Among these, the most recent development is that, on 3 October 2018, the governments of China, Korea, Japan, Canada, Norway, Iceland, Denmark, the Russian Federation, the EU, and the US, signed an agreement to prevent unregulated

commercial fishing on the high seas in the Arctic region [57]. This is the first agreement of its kind to apply a legally binding precautionary approach for the protection of the Arctic Ocean from commercial fishing before fishing begins in that area.

According to this agreement, the contracting parties undertake not to participate in commercial fishing in the CAO until a better understanding exists concerning the current fish stocks in the Arctic Ocean region. The parties under the agreement will set up joint monitoring and scientific research programmes to enhance understanding of the ecosystems of the Arctic region and determine whether the fish stocks can be harvested sustainably [58]. This programme should provide the contracting parties appropriate time to develop a better understanding of the marine species and ecosystems in the region in order to inform them about protection and governance measures. After this agreement is enforced, it will actively last for 16 years and be renewed every five years thereafter, subject to the mutual consent of the parties and must address any party objecting [59,60]. It is perceived that the CAO fisheries administration covers much beyond the fisheries, including cooperative Arctic governance and relations between the Arctic and non-Arctic states, as well as among the Arctic states [8]. Any fishing activity in CAO will couple with some negative impacts on the fish stock and the agreement creates an unusual avenue of participation that is based on caution rather than response. Eventually, such an arrangement could be more of a matter of diplomatic relations and states' politics. In addition, some scientists and states have shown their concerns and indicated that a CAO fisheries agreement is not necessary or urgent as there is no fishing activity or evidence that such activity could start in the foreseeable future [6]. Similarly, Young and Kim (2013) argued that the level of activity in the Arctic Ocean, particularly in relation to the high seas, was overestimated—the level of fear concerning gaps in the governance system of the Arctic Ocean region is largely predictive of diverting the world's energies to a grey area [17]. Such a scenario comprising the lack of scientific knowledge of the CAO species coupled with the unpredictable marine ecosystem could be catastrophic. Since China has a diplomatic history to carefully consider, it must address all reservations before ratifying any global agreement it has signed in light of best national interests. Nine out of ten signatories of this agreement had already ratified it, and in May 2021, after due consideration, China has also ratified this agreement, thus it came into force in June 2021 for the next 16 years [61]. Many regional authorities have already considered and developed measures concerning the governance and conservation of exploration fishing [62]. A collection evaluation of the present measures will represent a first step in the additional development of the governance and conservation measures for the control of exploratory fishing in the Arctic region.

4.1. The US–Canada Bilateral Fisheries Management Agreements

The US shares coastal borders with Canada at the Great Lakes and in three oceans—the Atlantic, the Pacific, and the Arctic Ocean. In these economically and ecologically significant regions, they share several important fishing resources and, at the same time, also face complex challenges in terms of conservation and governance. Given this situation, the US has been negotiating with Canada to sign several formal treaties and agreements that will facilitate collaboration on these shared fishing resources in the Arctic Ocean region. These governance measures also include three bilateral commissions, namely the Pacific Salmon Commission (PSC), the International Pacific Halibut Commission (IPHC), and the Great Lakes Fisheries Commission (GLFC) [63]. They have also made arrangements to ensure sustainable governance and fair access to other important marine resources, including Pacific hake/whiting and Pacific albacore [64]. Similarly, various activities and recent legal developments concerning the Arctic Ocean region and the newly discovered fish resources due to the rapid ice melting over recent years are also of great importance and concern not only to the US and Canada but to all the Arctic states.

4.2. International Instruments Concerning Fishing Regulations

International fishing law has emerged as a body of law on the basis of some binding and nonbinding global legal instruments on appropriate regulations [65]. There are some legally binding instruments: treaties and agreements that are concluded in writing by states and international organisations to affix obligations and create legal rights. Such instruments are known as "hard laws" since the provisions of such instruments are legally binding on the contracting parties once they come into force. In contrast, nonbinding legal instruments offer guidelines for states and are generally known as "soft laws" because the provisions of these instruments do not bind the contracting parties [65]. The UN has played a key role in facilitating the adoption of some global instruments concerning the conservation and governance of fisheries resources through its specialised agencies, including the Food and Agricultural Organisation (FAO), and even directly [66].

In addition to the above, the FAO has also put in place four International Action Plans (IPOAs) to address the various issues raised in its negotiations. These are generally non-legally binding measures, such as the Code of Conduct for Responsible Fisheries, that contain measures to primarily address several persistent issues, including combating Illegal, Unreported, and Unregulated (IUU) fishing, the bycatching of seabirds in longline fisheries, the governance and conservation of marine species such as sharks, fishing, and capacity management [67,68]. These different IPOAs address various pertinent issues, which include IPOA-IUU fishing, IPOA-fishing capacity, IPOA-sharks, and IPOA-sea birds. By accepting any IPO, states can ensure that other states increase the measures they are taking. The implementation of any IPO is voluntary and it is left to states to take explicit appropriate measures, including addressing problems that arise both in the exclusive economic zone (EEZ) and on the high seas [65]. Several international treaties deal with specific Arctic issues and are particularly relevant to the treatment of various Arctic issues. These agreements are presented here in chronological order, in Table 2.

Table 2. International agreements that directly or indirectly concern fisheries in the Arctic Region.

Sr. No.	Name of the Agreement
1	Svalbard Treaty, Paris, 9 February 1920
2	The International Convention for the Regulation of Whaling, Washington 1946
3	Geneva Conventions on the Law of the Sea, 1958
4	UN International Convention on the Elimination of All Forms of Racial Discrimination, 1965
5	UN International Covenant on Civil and Political Rights, 16 December 1966
6	International Covenant on Economic, Social, and Cultural Rights, 16 December 1966
7	Convention on International Trade in Endangered Species of Wild Fauna and Flora (also called the CITES or Washington Convention), Washington, US, 1973
8	Agreement on the Conservation of Polar Bears, Oslo, 15 November 1973
9	The Convention on Long-range Transboundary Air Pollution, Geneva, 1979
10	The Convention on the Conservation of Antarctic Marine Living Resources, 1980
11	UN Convention on the Law of the Sea (UNCLOS) Montego Bay, Jamaica, 10 December 1982
12	Indigenous and Tribal Peoples Convention, (also called the ILO Convention No. 169 or C169), 1989
13	Convention on Environmental Impact Assessment in a Transboundary Context (Espoo Convention), Espoo, 1991
14	UN Framework Convention on Climate Change (UNFCCC), New York City, US, 4 June 1992
15	UN Convention on Biological Diversity, Rio de Janeiro (BR), May 1992
16	Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas, 1993
17	FAO Code of Conduct for Responsible Fisheries, 1995
18	The UN Fish Stocks Agreement, 1995

Table 2. *Cont.*

Sr. No.	Name of the Agreement
19	Kyoto Protocol to the UNFCCC, Kyoto, Japan, 11 December 1997
20	Stockholm Convention on Persistent Organic Pollutants, 2001
21	Reykjavik Declaration on Responsible Fisheries in the Marine Ecosystem, 2001
22	International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004
23	Agreement on Port State Measures to Prevent, Deter, and Eliminate Illegal, Unreported, and Unregulated Fishing, 2009
24	Agreement on Cooperation on Aeronautical and Maritime Search and Rescue in the Arctic, Nuuk, Greenland, 2011
25	UN Environmental Programme Minamata Convention on Mercury, 2013
26	Agreement on Cooperation on Marine Oil Pollution Preparedness and Response in the Arctic, Kiruna, Sweden, 2013
27	IMO—International Code for Ships Operating in Polar Waters (Polar Code), 2015
28	Agreement on Enhancing International Arctic Scientific Cooperation, signed at the Fairbanks Ministerial meeting, 11 May 2017
29	International Agreement to Prevent Unregulated High Seas Fisheries in the Central Arctic Ocean, 3 October 2018

Source: Created by this research.

5. The Logic and Reasoning of China's Future Role in the Arctic

China identifies itself as a near-Arctic state and emphasises that "China is an important stakeholder in Arctic affairs." Based on these two important narratives, China is primarily concerned with Arctic environmental conditions and the possible impact the region has on the Chinese climate system, the environment, and related economic interests [56]. With a forward-looking vision, China claims to lead the way towards a shared future for humanity by increasing involvement in Arctic affairs and contributing to Arctic knowledge and development in its economic and research activities [43]. It can be seen in China's recent five-year plan for 2016–2020, which closed the gap between itself and many Arctic states. For example, China now has two polar icebreakers and more scientific infrastructure capacities in the Arctic than any other non-Arctic state, including the Yellow River Station in Svalbard, the China-Island Arctic Observatory, and the Xuelong and Xuelong 2 icebreakers [69].

5.1. Current Arctic Legal Regime and the Future Role of China

Changes to fishery stock compositions and distributions can result in conflicts between stakeholders of the Arctic due to various reasons, including unregulated fishing, overlapping jurisdictional claims, and a lack of multiregional agreements. The current Arctic fisheries management model is not flexible enough to meritoriously address the challenges of future fisheries caused by climate change. It merits a comprehensive law and order regime in the high seas in connection with environmental protection, especially to vulnerable indigenous peoples and the whole world at large.

Climate change has been challenging the effectiveness of the existing structure of international resource management in the Arctic Ocean. For example, in fisheries management, the matters relating to quota allocation and access to the EEZs tend to be a highly controversial issue anytime; therefore, this problem should be resolved by a broader and more robust set of compliance mechanisms. Presently, the basis for a legal framework in the region is the UNCLOS of 1982 and the United Nations Fish Stocks Agreement (UNFSA) of 1995 (broadly followed by the recent CAO Agreement in 2018); however, these provide principles of international cooperation in conservation and fisheries management but do not formalise the way states use them [70]. Therefore, considering the fact that the Arctic is warming faster than any other area on Earth [71], this complex region requires a special and shared legal regime to achieve sustainable development goals.

China's future Arctic policy as demonstrated by Chinese officials includes six specific points, namely (1) exploring and further understanding the Arctic, (2) protecting and using the Arctic rationally, (3) respecting the internal rights of the Arctic states and indigenous

peoples, (4) respecting the rights of non-Arctic states and the general interests of the global community, (5) building a multilevel framework for cooperation in the Arctic for win-win outcomes, and (6) supporting the Arctic governance system on the basis of existing international law [33]. The Arctic has the potential to provide solutions to domestic problems, including food production and energy security. This is because the Arctic, which is warming twice as fast as the rest of the world, provides a unique environment for food security research and options for importing food sources such as uncovered fish and Arctic seafood, as well as active oil and gas mining projects in China [72].

In addition to natural resources, China has a great practical interest in developing a long-term transport infrastructure through its vision of the PSR—an extension of the Chinese BRI [73]. The principle of the BRI is to create a network of roadways, railways, oil pipelines, and ports that may connect Beijing to Europe via the Middle East [73]. To this end, China has identified around 900 projects with an estimated cost of USD 900 billion within the framework of the BRI [74]. However, China's Arctic strategy on fishery resources is only beginning to evolve and still faces many challenges. Therefore, it underlines a key issue—cooperation—to mutually recognise the right of states to discover and release the potential of Arctic fish [22].

The white paper combines two provocative components of Chinese politics: adherence to the principles formulated by the Arctic Council and existing laws, while also aiming to defend the legitimate rights of non-Arctic states and improving legislation favouring better openness. The logical and practical approach that enabled China to develop diverse diplomacy towards the Arctic states implies clear arguments for interpreting the laws and key instruments—participation in Arctic governance, access to Arctic fishery resources, and global transport via the Arctic route [56]. Incidentally, despite its commitments to the existing legal system, China will be an activist for the rights of non-Arctic states in a situation conducive to legal change. Ultimately, if successful in this area, it will dramatically impact awareness of China's new role both in the Arctic and globally.

5.2. The Exploitation of Fishery Resources in the CAO

It is a fact that the Arctic periphery is exceptionally rich in fishing resources: the Bering region, Baffin Bay, the Chukchi, and the Barents Sea are fishing areas with an abundance of commercial species—they provide around 20% of the world catch—such as cod, which are targeted by Spanish fishermen [75]. Therefore, it seems clear that as the ice recedes, the newly opened waters will be just as rich. However, the worst part is that the waters are very stratified, with cold, soft water from the melting ice remaining on top of the warmer and saltier water, inhibiting the increase of nutrients from the soil. This is combined with the lack of ports to unload, ship, and process the catches, along with the Arctic Ocean's acidification because, paradoxically, cold water absorbs more CO2 than warm water, and the misunderstood phenomenon of anomalous abundance and pollutants, meaning the apparent promise of bountiful catches has little support [76].

China is committed to improving and complementing the Arctic governance regime [36]. It should be noted that Arctic governance must be an integrative, holistic, and adaptive ecosystem with transboundary dimensions due to its complexity in the Arctic [77]. The governance of maritime transport is, in fact, one of the dimensions of Arctic governance. In a broader sense, China believes that the UN Charter and UNCLOS are essential elements of the basic legal framework for navigation in the Arctic [43]. Specifically, China considers the IMO as the global standard-setting authority for international maritime transport security, safety, and environmental performance and recognises that IMO plays an active role in formulating navigation rules for maritime transport in the Arctic. At present, actively participating in the governance of Arctic maritime transport is China's strategy for action at a global and a regional level [78].

5.3. China's Future Attitudes Reflected by Its Arctic Policy

The impacts of developments and climate change in the region have pushed China to step up its efforts in the far north for a longer perspective [79]. In 2013, China became an observer to the Arctic Council with clear interests in the Arctic: use of the northern route, access to the natural resources of the Arctic, and working together to strengthen its image as one of the major powers. To this end, China has been investing heavily in projects in almost all Arctic countries [80]. In addition, China is expanding its research capabilities in this region; the Arctic strategy includes highlighting the two icebreaker research vessels and research stations in Norway and Iceland [81].

It has been reported that China is building or has built several hard-hull cargo ships. Additionally, at a recent trade fair in Shanghai, China showed models of its newly built ice-resistant LNG carriers [82]. The design and construction of polar ships have been China's political objective since 2016, starting with the thirteenth five-year plan [80]. It is due to the fact that regular use of the northern route would be an economic boom for China because the distance between German and Shanghai ports via the northern route is over 4600 km shorter than via the Suez Canal [83].

It can be said that China's interests concerning the various activities in the Arctic are principally economic, particularly energy cooperation with Russia. To this end, in order to strengthen energy security and reduce its dependence on coal for power generation, in December 2019, China inaugurated the 3000 km "Power of Siberia" gas pipeline connecting northeast China with Russia's Siberian fields [84]. In addition, Chinese enterprises are also playing a significant role in building the Arctic LNG 2 project, which is the second largest natural gas project presently undergoing development phase within the Russian Arctic [85].

5.4. Why China Needed an Arctic Policy

First, climate change is a major concern in the Arctic and an important rationale for China's involvement in Arctic affairs. Indeed, the Arctic suffers from human-induced climate change and is witnessing the rapid melting of permafrost and the collapse of sea ice [86]. Meanwhile, China is the world's largest emitter of greenhouse gases [87], while also faces major climate change challenges, such as extreme weather conditions [88]. China's Arctic policy in 2018 promised to tackle climate change in the Arctic and protect its fragile environment, but details are lacking. In 2020, Chinese President Xi Jinping announced to the UN General Assembly that China is committed to being carbon neutral by 2060 [89]. This is a very ambitious step in the fight against climate change. However, some questions remain unclear and will be answered in the subsequent research concerning how this will affect the Arctic. What kinds of projects on the Polar Silk Road in China can help achieve this ambitious goal? Would Chinese investment in Arctic resource development conflict with China's zero greenhouse gas emissions roadmap? These are key issues that require clarification in China's Arctic policy [90].

Second, sustainability is another important theme for the future of the Arctic. China stresses the need to strike a balance between economic development and environmental protection in the Arctic. This is reflected in the negotiations of collective labour agreements, where China speaks of "wise use". However, terms like "sustainable development" and "balance" are subject to potentially conflicting interpretations. What exactly does China mean by equilibrium? It is not just about deep-sea fishing, but almost all Chinese activities in the Arctic. Given the fragile Arctic ecosystem, one would expect a balance between use and protection to shift towards the environment.

In sum, it is time for China to expedite and clarify its constructive ambitions as outlined in the Arctic Policy to shed light on the order that it would like to address the issues in the Arctic with its emerging power. Suppose China, the world's second-largest economy, can develop a vision based on a reinvention of the relationship between humans and nature, supported by a concrete plan. In this case, it will not only help propel the Arctic towards a peaceful and sustainable future, but will also benefit the rise of China in the region and across the globe.

5.5. Criticism of China's Arctic Policy and Global Concerns

Over the last decade, China's Arctic engagement has increased considerably, aiming to offer plentiful economic opportunities. On the other hand, some critics believe that by doing so, China is likely to create new risks and concerns among the eight Arctic states [91]. Similarly, the US has been seriously concerned as China expands its engagements in the Arctic Ocean region; the implications of its activities and even its presence are an increasingly debated topic among the Arctic states, in the US, and across the globe [92]. The US Secretary of State and the Department of Defence publicly raised concerns on China's self-proclaimed status as a "near-Arctic state" [83]. China has claimed compassionate intentions in sustainable development, peace, and improving Arctic governance [93]. However, given the opacity of China's decision making and capability development, many observers and policymakers in the US remain sceptical or even hostile toward China's potential interests in the Arctic; strategic thinkers in the US worry that China's economic engagement in the region could be a precursor to much more invasive political and strategic ambitions [94]. The fact that China's Arctic infrastructure development has the potential for dual-use facilities increases the insecurities that China may intend to have a permanent security presence in the region.

In addition, the fact that Some Arctic states have welcomed chinese economic activities in the Arctic is worrying to the European Parliament and thinktanks too, and they believe that China is interested in a narrow interpretation of its claims and the largest possible interpretation of maritime space in the Arctic Ocean considered as the high seas and international seabed, where non-Arctic states have the same rights as Arctic states [95]. They also believe that China is interested in expanding its BRI into the Arctic to facilitate the strengthening of its claims of co-existence with economic and sustainable development coupled with its participation in Arctic governance affairs, including respect, cooperation, and win-win outcomes. Despite all the critics, if China keeps its word and focuses only on promoting research, peace, and sustainable development, it would obviously be a win-win situation for China, Arctic states, and other stakeholders in the long run.

6. Conclusions

The world, including the Arctic and non-Arctic states, is looking for fisheries resources to meet the requirement for more food and are now considering the potential of the Arctic Ocean as a result of increasing access, due to the melting of the ice cap. Similarly, China is also strategically considering this area from the perspective of the economy as well as ecological and resource governance measures. To this end, China's emerging interest in the circumpolar north was established with the Chinese Arctic policy, as laid down in its white paper. The clear and articulated objectives, priorities, and principles have become a guide for the further development of Arctic politics and international cooperation, concerning all political actors' efforts. More notably, the white paper confirmed China's aim to construct the PSR and identified Arctic participation, conversation, protection, and governance as the crucial areas of Arctic policy, being on par with other regional development since the creation of the PSR will combine economic effort, while also confirming China's national interest in the implementation of such policies in the Arctic. As a result, Arctic governance will tie together the development of intangible mechanisms: legislative and institutional involvement and contribution, which include China's "discursive power".

In addition, the analysis of China's Arctic policy white paper enables the establishment of principles that will form the core of Chinese Arctic policy in the future. The first component that reflects the image is that China is an "important and legitimate stakeholder", a "responsible power" and a "near-Arctic state". The second is an affirmation of the Chinese right to participate in the governance of the Arctic Ocean and to develop Arctic shipping and marine resources, and, consequently, China's obligation to defend the legal rights of a "near-Arctic state", creating a right to access the Arctic resources including fishing, as with the other Arctic states. Thirdly, the intention to make a contribution toward an "Arctic

community with a shared future" [96] through the implementation of the PSR. Such a combination will be at the centre of China's Arctic policy both now and in the future.

Additionally, it is also pertinent to note that China has become one of the major stakeholders in Arctic Ocean governance as adhered by the Agreement to prevent unregulated commercial fishing on the high seas in the Arctic region. However, there is still enough room for improving the effectiveness of the legal framework governing the Arctic—the absence of a shared legal regime. This status will not only enable China to influence environmental governance but also provide access—as one of the key players—to the Arctic fisheries resources in the future. To this end, China has long been focusing on this area through investing in various sectors, including infrastructure development and economic and food security research and development, contributing towards novel shipbuilding technologies, i.e., ice-resistant LNG carriers and polar ships, which is a positive and peaceful strategy towards participation in resources development, protection, and ocean governance across the regions and the globe. If China handles these transactions successfully and peacefully, sustaining them with mutual cooperation in the future, it may enable China—a resourceful continental state closest to the Arctic circle—to obtain a legal right to fish in the Arctic considering its significant stake and contribution to building a sustainable future Arctic, including huge investments in the development of relevant sectors, research and governance endeavours, and efforts towards ensuring environmental security, as well as sustainable use of the Arctic fisheries resources, and so on. Concluding, China has shaped its Arctic policy very tactfully, claiming legal rights over fisheries resources and gaining global acknowledgement of its co-existence in Arctic governance; it will also be backed by and considerably strengthen China's strategic Polar Silk Road vision as well as the Belt and Road Initiative in the long run.

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Introducing the Seasonal Closure into the CCAMLR Fishery Management Framework: Problems, Methods, and Prospects

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Abstract: In June 2020, China unilaterally announced two seasonal closures on squid fishing in certain areas of the high seas that apply to the Chinese distant water fishing fleets. Such closure refers to the withdrawal of the Chinese distant water fishing fleet from part of the high seas where they regularly operate. It is an innovative conservation measure initiated by a nation-state with the significance for global ocean governance and meeting the requirements from the UN Sustainable Development Goals. This paper is designed to seek the possibility, through a qualitative study and interpretive analysis, of whether such an innovative conservation measure can be introduced into the fishery management in the Southern Ocean, currently mainly under the framework of CCAMLR. This paper attempts to answer some questions with this new introduction. First, whether this kind of seasonal closure is applicable or feasible within the framework of CCAMLR. Second, whether this kind of seasonal closure would infringe upon or disrupt existing regimes, such as marine protected areas (MPAs) created by CCAMLR. Third, how and to what extent such a measure is supported by best scientific evidence so as to reach optimal effectiveness. In this regard, firm support from contracting parties is necessary to enforce the seasonal closure within the coverage of CCAMLR. The paper concludes that the seasonal closure feasible under the CCAMLR legal framework, which, like the measures of MPAs, will facilitate the fulfillment of best scientific evidence and eventually contribute to the SDG-14 progressively in the Southern Ocean.

Keywords: seasonal closure; CCAMLR; MPAs; RFMOs; conservation measures; China

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1. Introduction

On 2 June 2020, the Ministry of Agriculture and Rural Affairs of the People's Republic of China (MARA) issued the "Notice to enhance the conservation of squid stocks on the high seas in order to promote the sustainable development of China's distant water fishing" (hereinafter referred to as the Notice) [1]. According to the Notice, Chinese fishing vessels were not allowed to enter into certain areas or engage in any fishing activities in the east-western Atlantic and east Pacific during two separate periods of time, respectively, from 1 July to 30 September (32° S–44° S, 48° W–60° W) and from 1 September to 30 November (5° N–5° S, 110° W–95° W) [1]. The Notice essentially imposes the seasonal closure of squid fishing in certain parts of the high seas on a Chinese voluntary basis without regulation from any Regional Fishery Management Organizations (RFMOs) and only binds the Chinese fishing vessels [2]. After the successful completion of the first phase, the MARA was going to facilitate and promulgate this policy into different RFMOs [3]. This policy initiated by China, one of the largest distant water fishing (DWF) nations in the world, is probably helpful for the purpose to better conserve squid stocks on the high seas and contribute to the achievement of the UN Sustainable Development Goals (SDGs), especially SDG-14 [4]. Besides, this policy reflects China's intention to actively participate in global ocean governance and take more responsibility for global fisheries conservation and management.

Despite China's intention to introduce this innovative conservation measure into international fishery management organizations [5], many specific questions in scientific, legal, and political perspectives need to be asked, and they are, *inter alia*, the rationale between science and law, legal applicability, transnational cooperation, and the effectiveness of such a proposal. Preliminary studies shall be conducted while adopting seasonal closure in terms of RFMO/As, such as the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR Commission). The CCALMR Commission, established by Article VII of the Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR) [6], has adopted a series of conservation measures to maintain fisheries management in CCAMLR Area [7], mainly targeting krill (*Euphausia superba*), toothfish (*Dissostichus* spp.), and icefish (*Channichthyidae*), which are under commercial harvesting currently [8]. States Parties of CCAMLR can participate in the decision-making process and submit proposals to the fisheries management in the CCAMLR Area [9]. China is a member of the CCAMLR Commission [10] and one of the fishing states in the Southern Ocean [11]. Furthermore, China has its long-term interests in commercial exploitation of marine living resources in the Southern Ocean, especially krill [12].

This paper primarily aims to find any possibility to introduce China's recent seasonal closure practice into the CCAMLR regime based upon a qualitative process of a legal analysis of the rationale, legal basis, and foundations of such a proposal. Specifically, this paper attempts to answer relevant questions with this introduction. First, whether and how seasonal closure is applicable or feasible with CCAMLR. Second, why and how seasonal closure could strengthen existing conservation measures adopted by the CCAMLR Commission. Third, how and to what extent this seasonal closure proposal could be consistent with other regimes inside and outside of CCAMLR. Besides, this paper will finally explore a possibility of a proposal by China to push forward this conservation measure within the CCAMLR framework. To conclude, this paper tries to offer some preliminary observations on China's seasonal closure proposal in global ocean governance, especially for global fisheries management and sustainable fishing development.

2. Applicability of Seasonal Closure in the Southern Ocean

Abundant fishery resources exist in the Southern Ocean in which krill is the cornerstone of the food chain in Antarctica and also the key component of the whole Antarctic ecosystem [13]. Ecological and economic risks potentially caused by large-scale harvest of krill accelerated the law-making process of conservation of Antarctic marine living resources in the 1970s [14–17]. Efforts have been made by the Antarctic Treaty Consultative Parties (ATCPs) since 1975 [18]. After several sessions of negotiation, the final act was adopted unanimously by fourteen countries in 1980. Unlike other RFMOs, the goal of CCAMLR focuses more on conservation of marine living resources than sustainable exploitation through the ecosystem approach [19], which can be proven by the absence of catch allocation in conservation measures of CCAMLR [15] (pp. 139–140).

Article IX is the key clause with regard to conservation measures under the CCAMLR regime, which, in a uncompromising tone [14] (p. 356), provides that the CCAMLR Commission shall formulate, adopt, and revise conservation measures on the basis of the best scientific evidence available in order to give effect to objectives and principles of Article II [20] and subject to the provisions of paragraph 5 of Article IX, which requires consistency externally between CCAMLR measures and relevant measures established by other RFMOs that CCAMLR Contracting Parties acceded to [21]. In the meantime, recommendations and advice of the Scientific Committee (SC-CCAMLR) shall be taken under full consideration of the CCAMLR Commission exercising its functions [22]. Of course, designating open and closed seasons for harvesting, for instance, a seasonal closure, is one of the conservation measures confirmed by paragraph 2 of Article IX [23]. From the contextual perspective, paragraph 2 of Article IX also implicitly requires to ensure the internal consistency between conservation measures [24].

In practice, fishery regulations, as categorized by the CCAMLR Commission, comprise a series of measures for managing marine living resources in the CCAMLR area, including general measures, fishing season, closed areas and prohibition of fishing—by-catch limits—for toothfish, icefish, and krill [25]. Directed fishing over various kinds of species in different areas, subareas, and divisions [26] covering several marine areas of CCAMLR Area [27], and in the 2020/21 season for toothfish fishing in Subarea 48.5, is prohibited [28]. Besides, directed fishing on shark species in the CCAMLR Area is banned as well, with the exception of activities for scientific research purpose [29]. Such seasonal closures could be revised by the CCAMLR Commission on the basis of reports prepared by the Working Group on Fish Stock Assessment (WG-FSA) of SC-CCAMLR (see Figure 1).

As available options of conservation measures are provided by paragraph 2 of Article IX, it is hard to totally differentiate the seasonal closure that is also referred to as "open and closed season for harvesting" and the closed area that means "open and closing of area" [30]. Normally, three elements at least must be acquired if an appropriate management rationale is to be presented by the legitimate seasonal closure: respectively targeted species, certain marine areas, and specified period of time from the perspective of common practices. The Commission offers the definition of closed area as certain subarea and division where directed fishing on various taxa is prohibited, primarily in CM 32-02 [26]. The only term relating to the seasonal closure given by the Commission is the CCAMLR fishing season (CM 32-01) [31]. Another relevant term is the marine protected areas (MPAs), which can be found in several conservation measures (CMs 91-02, 03, 04, and 05) that will be well discussed below.

Accordingly, three basic requisites should be fulfilled if a seasonal closure would be adopted by the CCAMLR Commission. First, a conservation measure shall be subject to the objectives and principles set out in Article II of CCAMLR. Second, such a conservation measure ought to be made on the basis of the best scientific evidence available, which means the advice of the SC-CCAMLR plays an important role in this process. Third, the consistency, whether internal or external, must be tested prudently. The test of consistency is designed to determine, from the perspective of international law, whether a new conservation measure is compatible with other relevant existing measures, arrangements, and regimes. To fulfill the legitimacy of a proposal, it is necessary to do this test before submitting. There are two categories of consistency tests in this regard: the internal consistency and the external one. The internal consistency refers to the situation that a new measure proposed must not be in conflict with current provisions within a specific legal regime, while the external consistency means that such measure cannot hamper relating arrangements of similar regimes other than the Antarctic Treaty System (ATS), including CCAMLR.

3. Objectives and Principles of CCAMLR

The Preamble of CCAMLR emphasizes the importance of ensuring the conservation of Antarctic marine living resources [32]. Article II defines one objective of CCAMLR as conservation which includes "rational use" [33]. Fishing countries wanted the CCAMLR to concentrate on utilization with limited conservation measures, while non-fishing states called on the comprehensive preservation and protection of the Antarctic marine environment as a whole [34]. The introduction of the term "rational use" apparently represents the intention that the CCAMLR Commission desired to reconcile different interests between fishing and non-fishing countries [35]. The provisions of principles correspondingly attempted to make a compromise in terms of conservation standards between the two groups in exploitation and use [36]. Fishing states wished to introduce the concept of Maximum Sustainable Yield (MSY) that other RFMOs apply, whereas non-fishing states suggested that explicit conservation standards should be expressly defined in the provisions of Article II other than those revised by the Commission time by time [34]. However, paragraph 3 of Article II indicates a neutral position held by CCAMLR concerning conservation rules, which provides three principles, neither MSY or explicit conservation standards,

applying to all harvesting and associated activities in the CCAMLR Area [37]. In other words, CCAMLR does not prohibit harvesting of available marine resources but rather formulates a compromise between rational use and conservation [38]. It is well recognized that the neutral position of CCAMLR definitely contributed to its long-term success.

On the other hand, however, this neutral position, unfortunately, does not eliminate all disputes over the objectives and principles of CCAMLR. Relevant debates among ATCPs remain till now. Arguments over the objective concentrate on the characteristics of CCAMLR itself. It leads to the key question in theory of whether CCAMLR is a conservation-oriented regime or an RFMO. Justifiably speaking, the CCAMLR contains some provisions beyond those of traditional RFMOs, for instance, the International Whaling Commission (IWC). However, the position expressed by paragraph 2 of Article II shall be upheld as well.

Three principles set out in paragraph 3 are to be summarized as the ecosystem approach. As early as 1977, Recommendation IX-2 firstly underlined the importance to achieve an effective conservation of marine living resources in the Antarctic ecosystem as a whole [39]. This approach was recognized by most Contracting Parties during the negotiation of CCAMLR [40]. Rather than merely designating single species or certain marine areas under conservation, CCAMLR defines its Convention Area according to its indigenous resources, having taken into account species interaction and comprehensive preservation of the entire ecological system [41]. The CCAMLR Convention Area is described as following:

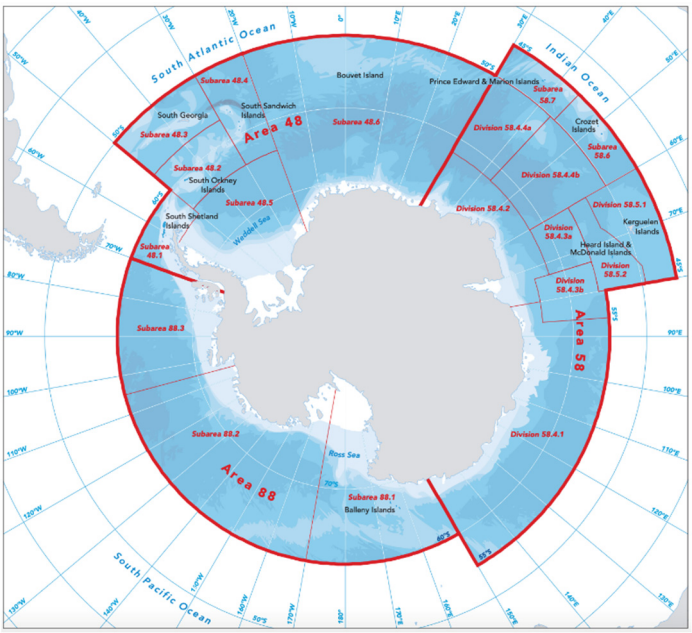

Figure 1. CCAMLR Area [42].

Therefore, CCAMLR was designed to including all living resources within the Convention Area but more so by the extent of their ecological wanderings [43]. It is fair to conclude that the ecosystem approach expressed in Article II sets CCAMLR apart from a typical fishery convention [36] (p. 229). While the interactions between species have been well considered, the interpretation of Article II is extremely complicated and challengeable to policymakers, however. It should be clarified that, distinct from the MSY normally adopted by the United Nations Convention on the Law of the Sea (UNCLOS) and other RFMOs, the ecosystem approach is an extraordinary innovation created by CCAMLR to conserve all renewable resources [44]. Given the nutrient level in the Antarctic marine ecosystem and other facts of the scientific complexities of fully understanding the interactive ecosystem, scientific information remains fundamental in implementing this approach.

The core of the ecosystem approach links closely with the precautionary approach/principle. Arguments over whether this term is an approach or principle have lasted for decades [45]. However, this concept has been incorporated by a number of international instruments, for instance, the Rio Declaration [46] and the Convention on Biological Diversity (CBD) [47]. Moreover, one thing is for sure: the burden of proof concerning the possible impact of a given activity under the precautionary approach/principle is reversed [48]. The precautionary approach/principle is an overall requirement for all activities engaged in the Antarctic, including the Southern Ocean. Accordingly, the burden of proof shall rest with people who are going to fish in the Southern Ocean, which means fishing states must prepare some environmental impact evaluations before fishing. Meanwhile, in order to better implement the ecosystem approach, the burden of proof shall rest with fishing states so as that prudence of scientific uncertainty supplies a true ecosystem approach in CCAMLR.

The scientific certainty can hardly be gained in the Antarctic, as scientists are still struggling to discover more and more facts about this mysterious region. The same is true of the ecosystem of the Southern Ocean. However, the scientific uncertainty shall not be the excuse of delaying the adoption of active conservation measures, as expressed by the precautionary approach/principle. By this logic, more adventurous measures could be carried out in data-poor areas. The measure of seasonal closure happens to be an appropriate choice in this regard and can perfectly fit into the precautionary approach/principle when scientific data are insufficient. Consequently, the seasonal closure is not only in accordance with but also to safeguard the objectives and principles of CCAMLR in a more proactive way.

In fact, the CCAMLR Commission is responsible to seek mutual understanding of objectives and principles through working out conservation measures over the past four decades, which also reflects the ATCPs' consensus of a step-by-step approach in developing the conservation regime of Antarctic marine living resources [40].

4. Strengthening the Existing Conservation Measures

Current conservation measures in force, as mentioned above, divided into four categories by the Commission, are compliance, general fishery matters, fishery regulations, and protected areas [49]. The seasonal closure proposal tightly relates to the conservation measures of general fishery matters and fishery regulations, including CMs 31-01, 31-02, 32-01, 32-02, 32-09, and 32-18. CM 31-02 provides general rules for the closure of all fisheries in which vessels under the closure notice issued by the Secretariat of the Commission shall depart from closed areas and remove all fishing gear from water by the notified time [50]. The flag state bears main responsibilities in implementing this measure [48]. The fishing season for all CCAMLR Area species is from 1 December to 30 November of the following year (CM 32-01) [31]. Directed fishing on taxa in areas is prohibited (CM 32-02) [27]. According to CM 32-02, various kinds of finfishes [51] are not allowed to be harvested in Subareas 48.1 and 2 around the Antarctic Peninsula and South Orkney Islands [27]. In the Amundsen Sea (Subarea 88.3) and parts of the western Ross Sea [52], only toothfish shall be prohibited for directed fishing [27]. Toothfish and grey rockcod are non-harvested species near the Ob Bank and Lena Bank (Divisions 58.4.4 a and b) [27]. Patagonia toothfish is subject to prohibition around the Kerguelen Islands (Division 58.5.1), Heard and McDonald Islands (parts of Division 58.5.2 [53]), Crozet Islands (Subarea 58.6), and Prince Edward and Marion Islands (Subarea 58.7), adjacent to areas under national jurisdiction of coastal states [27]. Most of these prohibitions, however, are subject to the exception of scientific research permitted under CM 24-01 and the review by the WG-FSA on the basis of surveys of stock biomass so as to be amended by the Commission [27]. It should be noted that, in the South Georgia (Subarea 48.3), where the first conservation measure was adopted [54], the above two conditions cannot apply (*Electrona carlsbergi* not included), and the Commission can decide reopening based on the advice of the SC-CCAMLR [27]. The strict prohibition in South Georgia does not regulate any fishing of Patagonia toothfish, toothfish, and other

finfish [27]. Furthermore, directed fishing for toothfish in the Weddell Sea (Subarea 48.5) is prohibited [28]. In addition, in response to the FAO International Plan of Action for the Conservation and Management of Sharks, directed fishing on shark species for purposes other than scientific research is prohibited by the Commission [29]. Despite these measures, exploratory fisheries of toothfish, icefish, and krill are subject to the catch limits set out by the Commission [55]. By adopting the above conservation measures, the Commission essentially creates numbers of closed areas within the CCAMLR Area, mainly referring to CM 32-02. Similarly, toothfish fishing has been banned around the Weddell Sea by CM 32-09 annually since 2003, which probably has already turned into a closed area. As for sharks, the whole CCAMLR Area becomes de facto a closed area, or sanctuary, for sharks by CM 32-18.

The critical point is the MPAs regime created by the Commission. In 2002, CCAMLR committed to creating a network of MPAs following recommendations from the United Nations World Summit on Sustainable Development [56]. So far, there are two MPAs in the Southern Ocean established by the Commission, respectively, the South Orkney Islands southern shelf MPA (SOIMPA) and the Ross Sea Region MPA (RSRMPA). Three other MPAs are still under discussion and negotiation within CCAMLR [57]. The SOIMPA was created by the CM 91-03 in 2009, covering a 94,000-km square in Subarea 48.2 [58]. All fishing, discharges, dumping, and transshipment activities are prohibited within that area, with the exception for scientific fishing research activities under CM 24-01 [59]. SOIMPA is unprecedently pioneering in conserving marine biodiversity, although it leaves many gaps to fill in. However, the MPAs regime cannot and shall not exclude any rationale use of marine living resources in relevant areas [60]. Accordingly, by 2011, three principles of establishment of MPAs at least had been recognized by CCAMLR, and they are protection of the environment, freedom of scientific research, and rational use [59].

The following general framework for establishment of CCAMLR MPA adopted by CM 91-04 in 2011 is definitely a milestone in the proceeding of CCAMLR MPA. CM 91-04 connects the seasonal closure with closed areas, as it reads: "[D]esiring to implement Article IX.2(f) and 2(g) of the CCAMLR . . . " [61]. This is the first time that the relationship between seasonal closures, closed areas, and MPAs has been clarified in CCAMLR's legally binding documents. In 2016, The RSRMPA was agreed upon by CCAMLR and had been the largest MPA in the world since its establishment [62]. Three zones, each of which allows certain activities and restricts others, are divided in the RSRMPA [61]. CM 91-05 confirmed the relationship between seasonal closures (Article IX.2(f)), closed areas (Article IX.2(g)), and the MPAs regime. Overall, the RSRMPA is much more sophisticated than the SOIMPA, including different functional zones to achieve distinct purposes, respectively.

After a full consideration of Article IX.2 and relevant existing measures, some observations can be made. First, seasonal closure, as one form of conservation measures expressly provided by Article IX of CCAMLR, is a legitimate way to conserve relevant marine living resources. Any member has the right to propose a seasonal closure in accordance with provisions of CCAMLR. Second, there are some connections between seasonal closure, closed areas, and MPAs. In general, the CCAMLR Commission would endeavor to set up a seasonal closure in a certain area during a period of time, mainly focusing on one species, then extend the closing time of such seasonal closure so as to turn such closed season into a closed area, and finally seek possibilities to develop a MPA based on proper scientific evidence. Third, such relationship between seasonal closure, closed areas, and MPAs does not represent that seasonal closure is necessarily standing against the MPAs regime, and in fact, they could probably coexist and even mutually support each other for the conservation purpose.

Arguments always arise from the different roles that seasonal closures and MPAs play in the conservation of marine living resources in the Southern Ocean. Indeed, seasonal closures only refer to single-specie fishery, while the MPAs regime is an overall conservation of the whole ecosystem of the CCAMLR Area. The question is which one is better. It is hard to answer that comprehensively. Advocators of the MPA regime would claim that

the MPA regime could provide a more holistic and integrated measure in accordance with the ecosystem approach, whereas others would support seasonal closures as a pragmatic way to initiatively develop further conservation measures, if possible. On the other hand, it remains unknown which one could gain more support amongst CCAMLR members, as little discussion has occurred around the relationship between these two measures so far. Thus, it is necessary to conduct more research on this subject-matter in advance before more discussions happen in the future.

It is generally concluded that seasonal closure is in essence able to play as a bedstand to test whether the applied area should be transferred or upgraded to a closed area or turned into an MPA that includes seasonal closure and/or closed area. Adoption of seasonal closure would constantly bring out scientific understanding of certain aspects of the Antarctic ecosystem, which could be helpful to develop a more comprehensive and sophisticated regime to conserve fishery resources in the Southern Ocean. Besides, seasonal closure is also in conformity with the ecosystem approach, and such closure urges countries concerned to take actions before it is too late while no scientific certainty exists, as required by the precautionary approach. Overall, seasonal closure is a good way to strengthen existing measures under the CCAMLR, and it is feasible and reasonable to propose the seasonal closure in order to achieve the objective and principles of the CCAMLR, especially with consideration of SDG-14.

5. Consistency Test

According to the provisions of Article IX.5, conservation measures shall be consistent with any relevant measures, regulations, or recommendations made by the Antarctic Treaty Consultative Meetings (ATCMs) or by existing fisheries commissions. Two international treaties, the International Convention for the Regulation of Whaling (ICRW) and the Convention for the Conservation of Antarctic Seals (CCAS) [63], are specifically provided in Article VI. The consistency between the seasonal closure and other regulations could be divided into two categories. The internal consistency test is to examine whether such seasonal closure is consistent with regulations within the Antarctic Treaty System, while the external is to ensure this seasonal closure is in conformity with regimes outside the ATS.

5.1. Internal Consistency Test

5.1.1. CCAS

The CCAS was adopted to fill the gap with regard to sealing outside of the regulation of the 1964 Agreed Measures for the Conservation of Antarctic Fauna and Flora (AMCAFF) [64]. The protected seal stocks expand to crabeater seals (*Lobodon carcinophagus*) and Weddell seals (*Leptonychotes weddelli*) [65]. The area that CCAS applies, which strictly adheres to the area south 60° S provided by Article VI of the Antarctic Treaty, is narrower than the CCAMLR Area [66]. Again, Article 3 of the CCAS provides that conservation measures under this Convention include opening and closing of sealing seasons [67]. The outstanding regime created by the CCAS is the "special permit" system which allows sealing countries to issue permits to kill or capture seals in limited quantities and in conformity with certain objectives and principles of CCAS [68]. The Annex of CCAS provides in detail permissible catch, protected species, closed season and sealing season, sealing zones, etc. Ross seals (*Ommatophoca*), Southern elephant seals (*Mirounga leonina*), and fur seals (*Arctocephalus*) are protected from sealing, and Weddell seals (*Leptonychotes weddelli*) are not allowed to be killed or captured during breeding time (1 September to 31 January inclusive) [69]. Sealing from 1 March to 31 August in the area south 60° S is forbidden [70]. The provisions of the Annex could be amended by Contracting Parties in accordance with Article 9 of the CCAS.

Given the arrangements stipulated by CCAS, it is well accepted that CCAS is a typical RFMO targeting one single species and is slightly distinct from CCAMLR. In fact, since the enforcement of the CCAS, large-scale sealing has never occurred in the Antarctic [71].

There is currently no market need for seals, either [72]. Suspension of commercial sealing, as Julia Jabour viewed, is more a sort of response to public emotions than a practical effort before [71] (p. 11). In 2002, the number of seals in the South Georgia only reached three million [73].

However, for the purpose of keeping internal consistency, the seasonal closure under the CCAMLR should not derogate any measures adopted by the CCAS. Such seasonal closure should not deal with any sealing activities, although sealing in the Antarctic is not in the ambit of international discussion anymore [74]. Frankly speaking, due to the clear nutrient level of the Antarctic ecosystem and that the seal is one of the top predators in the Southern Ocean, it is probable to indirectly manage and conserve seals through seasonal closures over krill, toothfish, and icefish. Accordingly, there is no problem to propose seasonal closures targeting zooplanktons and fishes in the Southern Ocean only if such measures would not mandate sealing.

5.1.2. The Madrid Protocol

The 1991 Protocol on Environmental Protection to the Antarctic Treaty (the Madrid Protocol) is a milestone in the international management of Antarctica and widely for the global environment by the creation of an integrated environmental protection regime [75]. Regimes relating to the seasonal closure are provided by Annexes II and V to the Madrid Protocol, both of which derive from the AMCAFF. Obviously, conservation of Antarctic marine living resources constitutes part of the comprehensive environmental protection regime [76].

Annex II was amended by Measure 16 (2009) during ATCM XXXII [77]. This amended version of Annex II is mainly to protect native fauna and flora [78]. However, zooplankton or fish is not within the ambit of Annex II [79], although native mammal is subject to Annex II, not jeopardizing provisions of ICRW [80]. Conservation of marine mammal might still be under the long-term regulation of the IWC, and thus, seasonal closures over krill and two kinds of fishes would not be in conflict with Annex II to the Madrid Protocol.

According to Annex V, two relevant arrangements developed by the ATCMs have to be taken into full account, namely Antarctic Specially Protected Areas (ASPAs) and Antarctic Specially Managed Areas (ASMAs). ASPAs refer to areas, whether marine or terrestrial, where outstanding environmental, scientific, historic, aesthetic, or wilderness values, any combination of those values, or ongoing or planned scientific research shall be well protected [81]. ASPAs include Specially Protected Areas and Sites of Special Scientific Interest designated by past ATCMs [82]. Any entry into ASPAs shall be prohibited, with exceptions provided by Article 7 of Annex V [83]. It is not difficult to find that fishing vessels are not allowed to sail into any ASPAs, which means seasonal measures shall not apply in marine areas that have been designated as ASPAs. The other one, ASMAs, include marine areas in which activities are being conducted or are to be conducted to assist in the planning and co-ordination of activities, avoid possible conflicts, improve co-operation between Parties, or minimize environmental impacts [84]. The purpose of ASMAs is to avoid risks of mutual interference or cumulative environmental impacts caused by relevant activities and protect sites or monuments of recognized historic value [85]. However, fishing vessels do not need a permit to entry into ASMAs [86]. Therefore, seasonal measures can be conducted in ASMAs. However, the size of each ASPA or ASMA is quite small, especially compared with closed areas or MPAs [87], and the influence from ASPAs and ASMAs towards determination of seasonal measures therefore seems minor.

5.2. External Consistency Test

5.2.1. Whale Sanctuary

Whale Sanctuaries are developed by the IWC in accordance with the provisions of the ICRW in order to conserve the whale stocks. The first IWC whaling sanctuary, the Indian Ocean Sanctuary (IOS), was established in 1979 [88]. The Southern Ocean Sanctuary (SOS) was designated by the IWC in 1994, approximately covering the waters of the

Southern Ocean [88]. Commercial whaling is prohibited in the SOS as illustrated below (see Figure 2).

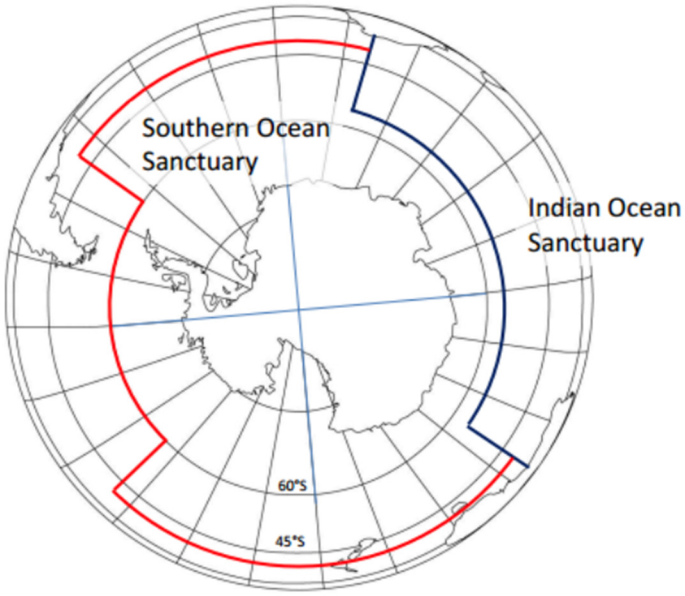

Figure 2. Southern Ocean Sanctuary [89].

Three principles have been highlighted by the IWC. First, scientific reasons to designate such sanctuary must be definite and clear. Second, temporary functional duplications caused by the sanctuary cannot undermine the validity of long-term scientific and conservative values. Third, the precautionary principle will be applied if there is no consensus with regard to certain affairs of the sanctuary [90]. Legal effects and outcomes of the SOS have been further demonstrated by the International Court of Justice in the *Whaling in the Antarctic (Australia v. Japan: New Zealand intervening) Case* in which the Court found that Japan has not acted in conformity with its obligations under the SOS in pursuance of Phrase II of Japanese Whale Research Program under Special Permit in the Antarctic (JARPA II) [91].

As discussed above, even though all marine living resources are under the regulation of CCAMLR, the Convention shall not derogate from the rights and obligations of the Contracting Parties under the ICRW [92]. Whales, therefore, cannot be the targeted species directly managed by conservation measures of the Commission in the Convention Area. The nutrient level within the Antarctic ecosystem, however, determines that the conservation of whales, heavily relying upon krill, is not possibly unaffected by the conservation of krill, which is one of the main targeted species of CCAMLR. It is paradoxical that single-species conservation and comprehensive preservation of the marine ecosystem shall be maintained simultaneously in the Antarctic, and, as Erik Molenaar argued, understanding the functional relationship between target species and non-targeted species might be one of the biggest challenges for conservation and management of CCAMLR [93].

Thus, according to the provisions of Articles I, VI, and IX.5, the seasonal closure in the Southern Ocean shall not be inconsistent with the regulations adopted by the IWC, primarily the SOS. In other words, such seasonal closure cannot directly mandate conservation of whales in the Convention Area, whereas it is entitled for CCAMLR to regulate other species, such as krill, toothfish, or icefish, the conservation of which is closely related to the conservation of whales.

5.2.2. Voluntary Restricted Zones (VRZs)

Another notable regime relating to the seasonal closure is the Voluntary Restricted Zones (VRZs) proposed by the Association of Responsible Krill-Harvesting Companies

(ARK) and other NGOs [94]. The VRZs represent the main conservation effort from ARK companies to protect critical habitat for krill-dependent predators, manly penguins, during the summer season [94]. The implementation of this voluntary restriction on fishing is as follows:

1. Antarctic Peninsula will be closed to krill fishing (40 km buffer) between 1 October and 1 February;
2. Gerlache Strait will be closed to krill fishing (30 km buffer) between 15 October and 15 February;
3. South Shetland Islands will be closed to krill fishing (40 km buffer) between 1 November and 1 March [94].

But the VRZs have two major problems. On one hand, the VRZs are located in areas where there is little krill fishing. On the other hand, the VRZs are outside of CCAMLR's monitoring and evaluation, and some members, such as Australia and the UK, prefer to consider such issues under the MPAs regime [95]. Besides, the VRZs partially overlap with the proposed D1MPA jointly submitted by Chile and Argentina [96]. The true deficiency of the VRZs is that this regime is developed by non-governmental organizations that governments seldom submit themselves to. Additionally, the VRZs are not legally binding. The foundation of such voluntary action is different with any conservation measures proposed by state parties based on state commitments. However, this effort might partly contribute to the formulation of the seasonal closure initiated by states in terms of seasonally closing krill fishing. Furthermore, two major problems of the VRZs might remind policymakers to develop a seasonal closure in areas where substantive krill fishing activities existing. To solve these two problems, seasonal closure, if proposed by states, should be subject to monitoring and evaluation of CCAMLR in form of conservation measures.

5.2.3. Agreement on the Conservation of Albatrosses and Petrels (ACAP)

There is an argument that seasonal closure was already established in the Southern Ocean by the Agreement on the Conservation of Albatrosses and Petrels (ACAP) [97]. The ACAP [98] is to conserve listed albatrosses, petrels, and shearwaters by coordinating international activities to mitigate known threats to their populations [99]. Incidental mortality of birds resulting from interactions with fishing gear is one of the most significant threats facing albatrosses and petrels, which is also regulated by relevant conservation measures adopted by the Commission, including CMs 25-02 and 25-03 [100]. According to the Memorandum of Understanding (MOU) between the CCAMLR Commission and the ACAP Secretariat, which was signed on 1 November 2018, these two bodies are committed to facilitate cooperation in supporting efforts to minimize the incidental by-catch of listed albatrosses and petrels in the CCAMLR Area [101].

There is no doubt that the conservation of birds promoted by the ACAP is directly related to conservation measures adopted by the CCAMLR Commission in which the removal of certain fishing gear does inevitably result in the prohibition of fishing during some periods of time during each fishing season. That argument is fairly reasonable to some extent. However, efforts made by the ACAP do not diminish the necessity of proposing seasonal closures under CCAMLR in the Southern Ocean. On the contrary, the common interest to conserve albatrosses and petrels implicitly represents the urgency to conduct seasonal closures. In order to better minimize incidental mortality of birds, the fishing activities concerned should be forbidden in the form of seasonal closures in the Southern Ocean, which is obviously a stronger measure than mere removal of fishing gear.

Accordingly, proposed seasonal closure can probably target krill, toothfish, or icefish, which are allowed to be fished in the marine areas except the areas of special protection, such as ASPAs, ASMAs, and MPAs. IWC sanctuaries can also be the area where seasonal closure applies. To avoid unnecessary duplication in the management and conservation of fishery resources, it is not feasible to adopt seasonal closures in existing MPAs or VRZs. As for the chosen period of time, the breeding time seems a better choice. After all, details of all these conditions shall be finally determined by the standard of best scientific

evidence available, but such standard will not prevent the policy-making process from being formulated by CCAMLR, as demonstrated by past experiences of the adoption of most conservation measures.

6. Further Considerations

After examining the legal applicability of the seasonal closure in the Southern Ocean, the next question concerns why it is a wise choice for China to jointly propose such seasonal closure. Any strategy is basically rooted in state interests as well as the status quo of state practice in that regard. On the surface, the true intention of China's proactive participation into Antarctic affairs is not so clear at least in comparison with many traditional Antarctic countries. Rapid growth of capacity to explore and exploit Antarctic resources undoubtedly results in enhancing its role in Antarctic governance. However, misunderstandings have risen from this shift in which traditional Antarctic countries (original signatory states in 1959) will definitely be concerned about wider participation of newly involved Antarctic countries (acceding states after 1959). Adherence to existing rules in Antarctic governance, primarily the ATS, may be the wisest choice for making contributions to good governance of Antarctica. In terms of CCAMLR, any constructive proposals, whether concerning seasonal closures, closed areas, or MPAs, can be beneficial with mutual understanding between old members and newcomers.

China is a member of the CCAMLR Commission and has been engaged in the conservation of fishery resources for decades. From the perspective of capacity, China has advanced marine scientific technologies and excellent scientists and conducted many marine research expeditions both individually or jointly. In addition, China is an important DWF state with large-scale fishing fleets. Additionally, in 2020/21 season, six Chinese fishing vessels for krill were notified to the Commission in the CCAMLR Area [102].

In terms of geopolitical considerations in Antarctic governance, several basic conflicts or tensions must be carefully kept in mind. Conflicts between claimant states and non-claimant states [103], between fishing states and non-fishing states, and between traditional Antarctic countries and newly involved Antarctic states. Notably, tensions between claimant states and non-claimant states have recently concentrated on the MPAs regime, particularly the East Antarctic MPA and D1MPA that were proposed by claimant states (Australia, Chile, and Argentina) [96]. It is unacceptable to connect the establishment of MPAs to claims of maritime zones claimant states. Since the MPAs issue is highly political and hardly to facilitate agreements between CCAMLR members in the near future, the seasonal closure might be a pathway to engage some essential cooperation between those members.

7. Conclusions

China has its discretion and rights to submit a joint seasonal closure proposal within the framework of CCAMLR. Such seasonal closure shall be required to be subject to the objectives and principles of CCAMLR and adherent to conservation, including a rational use and an ecosystem approach based on the precautionary approach/principle. The seasonal closure could be adopted with no scientific certainty in the context of the precautionary approach/principle. More importantly, seasonal closure is not necessarily in conflict with the establishment of MPAs, and in some ways, these two will mutually supplement each other. In order to fulfill the consistency test, such seasonal closure shall not be inconsistent with other measures, regulations, or regimes, such as CCAS, ASMAs, ASPAs, IWC Sanctuary, VRZs, or ACAP.

The wider involvement of China into Antarctic affairs cannot be ignored. Though it seems too early to consider China as a big power in Antarctic governance given its late participation, China is rising rapidly, especially in science, fisheries, and tourism [104]. The rise of China is a fact and causes considerable concern of some Western countries. When the active attitude behind the seasonal closure was conducted by the Chinese government, it was a surprising signal of China's willingness to make progressive and constructive

contributions to the global ocean governance; many countries are not happy with China in this respect.

Nevertheless, nothing will stop China from repeatedly pursuing any means to protect the Antarctic environment and conserve Antarctic marine living resources. The conservation, including rational use, is always the main objective of the management of Antarctic marine living resources. It is completely legitimate for members to propose a seasonal closure with specific targeted species, certain marine areas, and durations of time. Therefore, the analytical finding in this paper indicates that seasonal closures are a viable and sound proposal to achieve the objectives and principles of the CCAMLR and the furtherance of good governance for Antarctic marine living resources.

However, it should be noted that the final purpose of seasonal closure is not only the concern of the CCAMLR, but also of any other suitable RFMOs. The seasonal closure in CCAMLR, once established, should inspire and facilitate the introduction of such seasonal closure into other RFMOs. In doing so, the seasonal closure could eventually contribute to the SDG-14 in the long run.

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Dilemma of Multisubject Co-Governance of Global Marine Ecological Environment and Implementation Path

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Abstract: The governance of the global marine ecological environment is closely related to human life and needs to adopt a multisubject co-governance system. There is a lack of understanding of the need for co-governance by multiple subjects for global marine ecological environment protection. Global marine eco-environmental multisubject governance is characterised by fragmentation, lack of coordination, and other issues. It should be recognised that global marine ecological environment protection is a task for all to protect humankind's common heritage ergaomnes. At the same time, the idea of a global marine ecological environment protection led by an ocean community with a shared future should be established. A global marine ecological environment multisubject co-governance model is set up by establishing a global marine ecological environment governance model alongside a multisubject co-governance committee.

Keywords: marine ecological environment; multiple subjects; co-management; ocean community with a shared future

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1. Current Status of Global Marine Ecosystem Governance

1.1. Current Situation of Marine Ecological Environment Pollution

With the increasing exploitation and exhaustion of land resources, deep-sea exploitation has become inevitable for human beings. The ocean is the largest natural ecosystem on earth and key to human survival and development. There is no doubt that the 21st century is the century of the ocean. With the rapid development of the marine economy, each country's marine ecological environment faces more risk than they can bear. Advances in technology and ocean transportation have aided deep human exploration of marine life. It has resulted in an increased number of marine surveys, deep mining of the seabed and remote areas, a sharp drop in fishery resources, and the rapid expansion of global maritime trade, which has led to an increased use of the oceans outside the national jurisdictions [1]. Surveys show that human use of the oceans outside national jurisdictions has gone beyond traditional navigation and fishing activities. It has extended to marine genetic resources, bioexploration, deep-sea mineral exploration, scientific research and exploration, seismic experiments, etc. [2]. Although some progress has been made in international marine governance since the 1994 United Nations Convention on the Law of the Sea (UNCLOS) came into force, it still faces enormous challenges. Human activities in international waters that pose actual or potential threats to the marine environment include illegal, unreported, unregulated, and disruptive fishing practices, invasive species, excessive mineral mining, oil pollution from ships, waste dumping, and microplastic pollution. They lead to warm waters, increase water acidity, and reduce marine biodiversity. The "tragedy of the commons" occurs in the ocean [3], and there is a worsening trend that is threatening marine life, coastal and island regions, and national economies

According to statistics, the oceans absorb 93 percent of the extra heat stored by warmer air, sea, land, and melting ice; moreover, increased carbon dioxide concentrations in the atmosphere contribute to artificial climate change and ocean acidification [4]. According to the National Oceanic and Atmospheric Administration (NOAA) data, the concentration of carbon dioxide in the atmosphere rose 32.62 percent from 1959 to April 2021 [5]. Ocean

acidity has increased by an average of 30 percent and is expected to increase by 170 percent by 2100 to a pH of around 7.75 [6]. The warming and acidification of seawater directly affect marine biodiversity. The distribution of most marine species will shift to the polar and deeper waters, resulting in the redistribution of the fishing potential of fish and invertebrates [7]. Pollution from land has a significantly negative impact on the oceans. For example, there are nearly 10,000 land-based sources of pollution in the seas in China, with an average of one pollution source per 2 km of coastline, which is a serious issue. Marine-based industrial development, including the ever-changing marine science and technology, has also brought new ocean-related problems while promoting the development of marine natural resources. Many claim that "mankind is destroying the ocean" [8].

In a theoretical sense, the damage caused by human activities to the marine ecosystem mainly includes pollution damage and exploitation damage. Pollution damage, also known as input damage, is damage caused by inappropriate human discharge and the input of environmental pollutants into the ocean. These include ship oil pollution, which accounts for 12 percent of marine pollution. Exploitation damage, also known as removal damage, refers to damage caused by improper removal or development of a substance or energy from the ocean [9]. However, in reality, these two kinds of damage are often inseparable and have no strict boundary. The interaction between human activities and the marine ecological environment, especially the uncertainty and unpredictability of the impact itself, increases the damage degree of marine ecological environment pollution. Given this, the United Nations Division for Ocean Affairs and the Law of the Sea issued Resolution 70/235, "First Global Integrated Ocean Assessment", in January 2016. According to the assessment report, both pollution damage and development damage have caused irreversible damage to our marine ecosystem, and the carrying capacity of the marine ecosystem and its ability to clean itself arenearing theirlimit [10]. Therefore, no matter the perspective, be it human self-protection or marine ecological environment protection, there is an urgent need to control these two kinds of damage.

1.2. The Current Situation of Multisubject Governance of Marine Ecological Environment

Oceans cover approximately 71% of the earth's surface, playing a significant role in climate regulation, biodiversity conservation, and sustainable development of the earth. The marine ecological environment itself has unity and mobility, and its governance has raised great concern in the world. As early as the 1950s, to combat the pollution of the oceans by oil discharged from ships, the International Convention against Oil Pollution at Sea was adopted at the London Conference on 12 May 1954. The International Maritime Organization has been responsible for the implementation of the Convention. Since the Convention's adoption, relevant international organisations have formulated and adopted a series of treaties on marine environment protection. They include the 1969 Convention on International Intervention in Oil Pollution Accidents on the High Seas, the International Convention on Civil Liability for Oil Pollution Damage, the 1971 International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage, the 1972 Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matters and its 1996 Protocol, the 1973 International Convention for the Prevention of Pollution from Ships and its 1978 Protocol, the 1982 UNCLOS, the 1990 International Convention on Oil Pollution Preparedness Response and Cooperation, the 1995 Convention on Biological Diversity, and more. In 1972, the Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP) first discussed and defined marine pollution [11]. Since then, many international conferences, such as the United Nations Conference on the Human Environment and the Third United Nations Conference on the Law of the Sea, whichdiscuss marine environment issues, have laid the institutional foundation for marine ecological environment governance.

In recent years, to strengthen the governance of the global marine ecological environment and achieve sustainable development goals, the United Nations and its relevant institutions have adopted a series of resolutions. For example, the UN General Assembly

(UNGA) adopted the UN 30 year Agenda for Sustainable Development on 25 September 2015, in which Article 14 aims for the sustainable utilisation and development of the oceans and their resources. On 9 June 2017, the United Nations convened another important meeting to support implementing the 14th Sustainable Development Goal (SDG) on oceans and seas, adopting a declaration entitled Our Ocean, Our Future: Call for Action [12]. It was the first time the United Nations convened a meeting on advancing a single goal in the 2030 Agenda for Sustainable Development, which has been hailed as a historic conference on ocean governance. The resolution of 10 May 2018, "Towards a Global Pact for the Environment", which was adopted by the UNGA, was sponsored by the Clubdes Juristes and supported by jurists, stakeholders, and representatives of environmental groups from more than 40 countries and regions around the world, to establish a framework for the development of a global environmental convention to consolidate the effectiveness of global environmental governance and open the negotiation process for a treaty [13].

At present, the main modes of multisubject governance of marine ecological environment include unilateral governance by the governing countries, bilateral or multilateral agreements between the governing country and other governments or international organisations, contractual cooperative governance between intergovernmental and nongovernmental international organisations, and the "Unilateral Authorization" governance model, which demonstrates an expansion of the competencies of EU institutions towards its member states. However, the EU approach, largely regarded as a success, has also been criticised as tending towards unilateralism [14]. In any case, it is clear that the international governance of the marine environment, which used to be characterised solely by state actors or a coalition of state actors, is beginning to shift to a global governance model as a result of the inclusion and increasingly deeper involvement of nonstate actors, such as nongovernmental organisations (NGOs) and multinational corporations.

It is worth pointing out that with the rapid development of the international shipping industry, cooperation on the marine ecological environment has been continuously promoted and deepened, and some achievements have been made in the control of marine oil pollution. For example, oil pollution caused by ships was reduced by about 60% in the 1980s, and oil spillage has also decreased significantly in the past 20 years [15]. However, despite this, marine ecological environment governance is still problematic. Even in recent years, the progress in marine pollution control cannot keep pace with the pollution rate, and some marine ecological environment governance problems have not been fundamentally and effectively curbed. For example, pollution from land-based sources, oil pollution from ships, acidification of seawater, and pollution from seabed activities will be spread to the whole ocean through ocean currents, which will do irreparable damage to the global marine ecosystem. Bilateral or multilateral agreements for the governance of marine ecological environments are often regional, one-sided, and postpreventive. For example, the Action Plan for Environmental Protection, Management, and Development of the Marine and Coastal Areas of the Northwest Pacific Ocean, in which China participates, is an integral part of the United Nations Environment Programme regional seas project that includes Russia, Japan, Korea, and China. The program aims to manage the ocean and its resources in the Northwest Pacific region to achieve human health, ecological integrity, and sustainable development for future generations. Although the program has played a positive role in protecting marine ecosystems in the Northwest Pacific, the regional nature of the program makes it "powerless" in the face of global marine ecosystem issues [16]. The main reason for this is that the global marine ecological environment does not need unilateral or multilateral local or regional governance, but a high degree of joint and common governance at the international level; this is the only way to avoid the marine "tragedy of the commons ".

This paper analyses the existing problems in marine ecological environment governance and focuses on realizing the path of global marine ecological environment shared governance by multisubjects.

2. The Dilemma of Achieving Multisubject Co-Governance of Global Marine Ecological Environments

2.1. Lack of Awareness of the Necessity of Global Multisubject Co-Governance

There is no doubt of the strategic position of oceans in the 21st century. Though global, governance of the marine ecological environment is still dominated by countries or international intergovernmental organisations, with global NGOs playing a limited role. This stage is characterised by the diversification of the members of marine ecological environment governance. However, there is a lack of a mutual coordination mechanism among the various subjects, especially among countries and international intergovernmental organisations.

Multisubject co-governance is closely related to Hermann Haken's synergetics and Ostroms' polycentric governance theory. For the former, synergy occurs between subsystems when external energy or aggregation of matter reaches a critical value, while the core of Ostroms' polycentric governance theory is that it is possible for a group of interdependent individuals to "organize themselves for autonomous governance"; by contrast, "multisubject co-governance" combines the core connotations of synergy and polycentricity, linking multiple subjects at a node and producing better results than fragmented subjects [17].

The international marine ecological environment governance system is mainly based on the United Nations as the centre and the regional countries as the system's main body. For example, as of 2020, the number of parties to the UNCLOS was 168; the number of parties to the 1994 agreement relating to the implementation of Part XI of the Convention of 10 December 1982 was 150; and the number of parties to the 1995 agreement for the implementation of the provisions of the Convention of 10 December 1982 relating to the conservation and management of straddling fish stocks and highly migratory fish stocks reached 91 after the addition of Cambodia, on 6 March 2020 [18]. To effectively govern the marine ecological environment, the international framework and guidelines established by international organisations and agencies for this purpose mainly include the 21st century agenda adopted by the United Nations Conference on Environment and Development in 1992. The agenda contains 21 sustainable development action plans on global governance, the seventeenth chapter of which specifically discusses the ocean, marine protection, and the exploitation and utilisation of seabed resources [19]. Since then, more documents on global governance have dealt with ocean governance. These include Guidelines for Integrated Coastal Zone Management issued by the World Bank in 1993, Code of Conduct for Responsible Fisheries by the United Nations Agriculture and Food Organization (FAO) in 1995, Global Plan of Action for the Protection of the Marine Environment from Land-Based Activities by the United Nations Environment Programme in 1995, a review of the Convention on Biological Diversity 2000 on the existing instruments for implementing the Convention's integrated management of marine and coastal areas and their implementation, Implementation Plan of the World Summit on Sustainable Development in 2002, the outcome document of the 2012 United Nations Conference on Sustainable Development entitled "Our Future", 2030 Sustainable Development Plan in 2014, and the Agenda for Action for Addis Ababa of the Third International Conference on Financing for Development by the United Nations. This is in addition to regional organisations' document such as the European Commission's Demonstration Programme on Integrated Coastal Zone Management, which was launched in 1996 to promote sustainable development of the EU coastal zone [20], and An Agenda for the Future of Our Oceans, which is the first joint statement document on global ocean governance at the EU level [21]. Of course, the main actors involved also include global NGOs who have contributed to the global marine ecosystem governance, such as the World Conservation Union (IUCN), the only international organisation in the field of natural environment protection and sustainable development that is a permanent observer to the United Nations General Assembly, which adopted the Intersectoral Integrated Plan for Coastal Areas in1993.

In summary, from a horizontal perspective, there is no lack of relevant action program documents for marine ecosystem governance worldwide; from a vertical perspective,

relevant documents are issued almost every year, and their contents cover different dimensions of marine ecosystem governance. However, the discussion of global governance has so far been limited to various proposals for improving its governance. For example, Markus Jachtenfuchs and NicoKrisch, in their article "The Application of the Principle of Subsidiarity in Global Governance" [22], make a good argument about the role of the principle of subsidiarity in global governance but do not address the principle of application to marine ecological environment governance with the participation of multisubjects in the global governance framework. Some scholars still focus on their neighbours or local areas for marine ecosystem governance [23]. However, the unity of theocean determines the limitations of such regional multisubject governance. Indeed, as early as 1967, in a speech to the United Nations General Assembly, Arvid Pardo argued that "all aspects of ocean space are interrelated and should be treated as a whole". [24]. It is undeniable that the space for marine ecological resources and the use of resources require "comprehensive governance" by countries or regions. With the ocean taken as a whole—the high seas, international seabeds, resources, etc.—and the common heritage of humankind, there is a need for multisubject participation in the global governance of the ecological environment. In other words, marine ecological environment governance needs to be carried out under a global governance framework. Countries or regions need to raise awareness of the need for multisubject global marine ecological environment protection to speed up itsrealisation.

2.2. Concept of Global Marine Ecosystem Governance Lags Behind

Thought is the forerunner of action, and ideas determine the direction of practices. However, because some countries emphasise the supremacy of their own or group interests, adopting a policy system based on confrontation or exclusion, there is bound to be conflict with the reality that solving global marine ecological environment problems requires cooperation among all subjects. Moreover, in the distribution of the achievements of global governance, looking horizontally, there are problems of unreasonable, unbalanced, and unequal distribution among countries and a lack of consideration of sustainable development for future generations. Thus, it is difficult to share the achievements of global governance across generations. These are all issues that need to be addressed in the reform of the global governance system [25].

Global marine ecological environment governance is a key topic in global governance. The concept of co-governance of global marine ecological environments is the premise and foundation for multiple subjects to participate in the governance of marine ecological environments and the construction of a negotiation mode. The key to solving this dilemma lies in replacing the traditional idea with the modern concept of an ocean community with a shared future [26].

In recent years, a series of "black swan" incidents represented by Britain's exit from the European Union and the "antiglobalisation" measures taken by the United States have made the neoliberal and individualistic global governance values established in the West since the 1980s nearly bankrupt. Although neoliberalism originated in the field of economics, it has been practiced in social, political, cultural, and social labour movements [27]. Neoliberalism is based on individualism and over emphasises "self-interest". In this regard, some scholars have pointed out that neoliberalism has from the beginning viewed globalisation as a historical process of ensuring wealth creation and profit distribution across national borders through global resource allocation by weakening arbitrary interventions imposed by sovereign governments [28]. This concept is manifested in the zero-sum game, winner-takes-all national strategy and way of doing things and, in the marine ecological environment, the excessive plundering of marine resources for the sake of transient achievable benefits that cause irreversible damage to the global marine ecological environment. In this regard, Professor David Lane of Cambridge University believes that one of the inherent flaws of neoliberalism is that it "creates environmental unsustainability" [29].

For these reasons, the last century witnessed many marine pollution incidents. From the Exxon Valdez oil spill in 1989 to the Gulf of Mexico oil spill in 2010, then Japan's

Fukushima nuclear power plant incident in 2011, and the oil spill accident on the Penglai 19-3 oil field jointly developed by Conoco Phillips and CNOOC, each pollution event was large scale, wideranging, and caused serious damage to the marine ecological environment. On 13 April 2021, the Japanese government disposed of the nuclear wastewater from the Fukushima nuclear plant accident by discharging it into the sea, which has had far-reaching implications on the marine environment. The liberal values that underpin the marine ecological environment governance have a natural latent effect of latency. Therefore, the concrete manifestation is the damage prevention mode of marine ecological environment governance. Damage prevention mode in marine ecological environment governance aims to "prevent" the damage of marine ecological environment when the damage cannot be determined, has already occurred, or the damage is further expanded. However, this kind of prevention cannot completely change the current marine ecological environment governance situation nor can it reverse the damage that has already occurred. Therefore, the backward nature of marine ecological environment governance is also one of the causes of frequent marine ecological environment pollution incidents.

It is worth noting that it is difficult to effectively deal with the existing crisis of marine ecological environment governance because of the neoliberal underpinnings of marine environment governance. After all, human marine resources are limited, and the safety of the marine ecological environment is closely related to human development. Therefore, human activities greatly impact the marine ecological environment, and various marine ecological environment face an increasing risk of damage. For example, the "dead zones" in near-shore waters caused by seawater eutrophication have continued to expand over the past five decades. To date, there are more than 400 "dead zones" worldwide, covering an area of 240,000 square meters [30]. As far as local waters are concerned, the ability of the ocean to rid itself of pollution is approaching its limit. Suppose we want to realise the sustainable development of limited marine ecological environments and achieve intragenerational equity and regional equity. In that case, the original dominant value of international governance must be abandoned for transformative global governance values. Based on this, the participation of multiple marine ecological environment governance subjects must not remain the neoliberal-dominated damage prevention type of marine ecological environment governance concept. Instead, it should be based on an ocean community with a shared future, targeting the existing marine ecological environment situation to provide a conceptual basis for the construction of multisubject marine ecological environment governance mechanisms.

2.3. Unilateralisation or Regionalisation of Marine Ecological Environment Governance

Global multisubject marine ecological environment governance is a holistic and integrated approach to marine environment governance. However, the current marine ecological environment governance is underpinned by "new regionalism" such as unilateralisation or regionalisation. Throughout the world, marine ecological environment governance mainly includes unilateral governance by sovereign states, bilateral cooperation among governments, regional governance by multilateral agreements between organisations and governments of coastal countries, and regional governance by intergovernmental organisations. James H. Mittelman conducted a typological analysis of contemporary "new regionalism" and proposed a typology of subnational microregional governmental cooperation, transnational subregional governmental cooperation, and supranational macroregional governmental cooperation [31].

It is worth emphasising that unilateral or regional governance by sovereign governments is still the basic form of marine ecological environment governance. For example, Costa Rica announced a new marine protected area on the country's Pacific coast, home to 37 high-value marine species, three turtle-hatching sites, and three areas of importance for dolphins, whales, and other aquatic mammals. The country also launched a National Wetlands Policy (2017–2030) and recently outlined a long-term National Sanitation Policy to prevent further water pollution [32]. The Regional Agreement on Access to Informa-

tion, Public Participation, and Justice in Environmental Matters in Latin America and the Caribbean was adopted on 4 March2018 and came into force on 22 April 2021, per Article 22(1). There are currently 12 contracting parties. According to Article 2 of the present agreement, one of the objectives is to guarantee the creation and strengthening of capacities and cooperation, contributing to the protection of the right of every person of present and future generations to live in a healthy environment and to sustainable development [33].

Furthermore, the Palagos Marine Reserve in the Mediterranean, the South Shelf Marine Reserve in the South Orkney Islands, and the network of marine reserves in the high seas of the Atlantic Ocean have been established [34]. It is clear that when facing global marine environmental governance issues, establishing marine protected areas is one of the best options for maintaining the health of the oceans and avoiding further marine degradation. The United Nations and its subsidiary bodies and relevant specialised agencies also play a significant role in promoting global marine ecological environment governance. The United Nations Environment Programme, the United Nations Development Programme, the United Nations Commission on Sustainable Development, the Office of Legal Affairs of the Administrative Department of the Law of the Sea, the World Food and Agriculture Organization, the International Maritime Organization, and the International Seabed Authority play active roles. Under the coordination and management of the "Ocean and Coastal Area Network", they have made great contributions to maintaining marine biodiversity and sustainable development.

By dividing marine areas into different spaces, regional international organisations, such as the Arctic Council and the Indian Ocean Tuna Commission, govern specific problems in different sea areas. However, regional organisations have natural disadvantages, such as fragmenting the integrity of the world's oceans and forming a situation of self-interest-based self-administration and exacerbating fragmentation of governance [35].

Of course, spontaneous nongovernmental marine environmental organisations, NGOs, and multinational corporations have also played key global marine ecological environment governance roles. These international NGOs include the Marine Stewards Committee for the Conservation of Marine Ecosystems, International Marine Conservation and Coastal Cleanup Organization, the Inuit Arctic Circle Council, which governs the polar seas, Scientific Committee for Antarctic Research, Greenpeace International, and the International Union for Conservation of Nature and Natural Resources. According to the 2018 Conservation of the Earth Report published by the International Union for Conservation of Nature (IUCN), more than 7 percent of the world's marine areas iswell protected, a rise of 3.2 percent over 2016. In the case of China, according to the latest survey report by the China Marine Environmental NGO Capacity Development and Network Building Project, as of 2017, there were 191 organisations in the field of marine environmental protection in China, including 18 foreign-related marine environmental protection organisations [36]. Apart from Beijing, these organisations are mainly located in Hainan, Guangdong, Fujian, Shandong, and other major coastal provinces in China that are committed to the conservation of marine resources, environmental protection, and the protection of biodiversity in China's coastal waters.

There is no denying that countries worldwide are committed to strengthening marine-protected areas to achieve the sustainable development goals, but the borderless state of the ocean is original, permanent, and unavoidable [37]. It is still the tip of the iceberg compared to the overall marine ecological protection. The main reason for this is the emergence of populist and nationalist tendencies in the international community, which has led to a certain shift in globalisation and the return of the diluted role of government in many countries, which has been given a new mission by populism and nationalism. For example, individual countries have insisted on unilateralism and continuously adopted "antiglobalisation" measures, no longer emphasising multilateralism, and even unwilling to participate in the World Environment Convention. Thus, worldwide, pessimistic arguments such as the "collapse", "end", and "death" of the existing international order gradually

established after the Second World War have become rampant, and the international community is struggling to fulfil its "obligation ergaomnes" in environmental protection.

Some countries have chosen to withdraw from relevant international treaties or form regional interest chains based on their interests, showing a negative turn of unilateralisation or regionalisation, which is not conducive to the promotion of global marine ecological environment governance. As mentioned above, the global marine ecological environment governance should realise the joint participation and co-governance by multisubjects, which is the optimal choice for the governance of marine ecological environment. The substantive multisubject coordination mechanism is the premise and foundation of multisubject participation in global marine ecological environment governance. Considering this, some countries are paying attention to strengthening regional environmental cooperation in Northeast Asia and jointly formulating and implementing the Northwest Pacific Action Plan and East Asian Maritime Plan. However, the distribution of member states of each action plan is still concentrated in the region, which has no essential significance for the protection of the global marine ecological environment. Based on this, the fragmentation of the marine ecological environment governance system also requires the international community to strengthen global multisubject co-governance mechanisms. This is the only way to create the possibility of and realise co-governance of the global marine environment by multiple subjects.

2.4. The Lack of Coordination in the Global Marine Ecological Environment of the Multisubject Co-Governance Committee

As mentioned earlier, the states as the subject of global marine ecological environment governance, intergovernmental organisations, and NGOs are diverse, but the role of each governing subject is not balanced. Thus, the status and role of state actors and nonstate actors are different. The sovereign state is the dominant force, while the NGOs, as auxiliary forces, mostly play their role through intergovernmental organisations and are relatively weak. Moreover, developed countries have strong roles and influence in setting topics, formulating and implementing rules, while developing countries have a relatively weak position [38]. As sovereign states, regional governance and global governance have different values, interests, and rulemaking and governance modes. Therefore, the governance of the global marine ecological environment still exists in the out-of-the-corner pattern of pollution, while in governance, even in some areas, there is a lack of governance rules, the lack of effective integration, and a co-governance consultative governance model.

Despite this, the international community has made considerable efforts to improve the marine ecological environment through relevant legislature designed to protect against marine ecological environment system damage globally. Chapter XII, Article 194, Paragraph 2 of the UNCLOS is a general provision for protecting marine ecological environment systems from damage. However, in practical operation, protection against marine ecological environment system damage often goes beyond marine ecological environment governance, incorporating sea power and maritime rights and interests disputes. However, if the international system wants to create an optimal design, various subjects' interests, demands, and values must be considered. While a series of bilateral, multilateral, and regional treaties, with the 1982 UNCLOS at their core, have shaped the new international maritime order, the diversification of governing subject inevitably results in the decentralisation of power from one centre to multiple centres. However, there is no platform for consultation, collaboration, and interconnection for multiple centres. Because the marine ecological environment system's damage is characterised by crossregional coverage, a long incubation period, and irreversible damage results, global marine ecological environment governance needs a coordinated multisubject co-governance committee to serve as a practical platform for building an ocean community with a shared future. In other words, such an organisation can integrate the unilateral marine ecological environment governance plans centred on a few countries or regional marine ecological environment governance plans dominated by some countries into a comprehensive and interrelated plan.

Although the international community generally agrees that an ecosystem approach is needed to improve ocean governance, its application value in practice is still limited. To a large extent, this is due to considerable implementation difficulties, including the lack of appropriate data and scientific and analytical tools to support the process. Therefore, to realise multisubject co-governance of the global marine ecological environment, the key point is not limited to the construction of the marine environmental rule of law itself. The main difference between global governance and previous international governance is that the former is based on the global governance mechanism, rather than the government in a traditional sense. It breaks from the previous single-governance model, emphasises diversity, pluralism, and polymorphism of actors, and forms a complex structure that is flexible and coordinated [39]. Certainly, the key to dealing with the current global marine ecological environment governance is establishing an appropriate platform to realise the co-governance of global marine ecological environment with the participation ofmultisubjects.

3. Path to Realisation of Multisubject Co-Governance of Global Marine Ecological Environment

3.1. Protection of Global Marine Ecological Environment Is the Natural Requirement of Humankind's Common Heritage

The ocean belongs to all humankind. Global marine ecological environment protection is underpinned by protecting the common heritage of humankind and the awareness of the need for multisubject co-governance of global marine ecological environment protection. The fulfilment of this mission requires the joint participation of all humankind: global cooperation. In 2012, former UN Secretary-General Ban Ki-moon said the theme of World Oceans Day is "Our Oceans, Our Responsibility", emphasising our individual and collective duty to protect the marine environment and carefully manage its resources. Safe, healthy, and productive seas and oceans are integral to human well-being, economic security, and sustainable development [40].

International law is essentially the international legal system that governs relations between states. It is based on reciprocity, protects interests, considers the legitimate rights and interests of other countries, shoulders international responsibilities, and seeks to achieve win–win results through international cooperation, consultation, and collaboration. Article 136 of the 1982 UNCLOS established the principle of a common heritage of humankind, which emphasised that all persons could benefit from such places in a peaceful manner and for peaceful purposes. It also excluded unilateral application by countries, groups, enterprises, and individuals [41]. This mode breaks from the conventional thinking and path dependence of traditional governance and provides a theoretical basis for multisubject co-governance of global marine ecological environment protection.

Over the years, China has attached an importance to and actively participated in global marine ecological environment governance. In essence, the concept of "sharing common resources" as emphasised in the principle of the common heritage of humankind in UNCLOS coincides with China's global governance concept featuring "extensive consultation, joint contribution, and shared benefits". In recent years, there have been differences on the subject and scope of application of the principle of the common heritage of humankind in the world, but scholars generally agree that marine environment resources are part of the common heritage of mankind [42]. Though multisubject co-governance of global marine ecological environment governance is based on the UNCLOS, it should achieve "extensive consultation, joint contribution and shared benefits", not only because the marine ecological environment resources are the common heritage of humankind but also because strengthening the protection of the marine environment is humankind's "obligation ergaomnes". It is worth emphasising that the principle of the common heritage of humankind means that the protection of the global marine ecological environment is humankind's "obligation ergaomnes". From 1973 to 1982, during negotiations on the Convention on the Law of the Sea, insufficient attention was paid to maritime issues outside national jurisdiction. The focus was on maritime rights and interests, while marine ecological environment

protection was relatively secondary.With the development of marine transportation and international trade, disputes about marine trade environment have increased, and the international community is paying more attention to the marine ecological environment. Based on this, the scope of the "obligation ergaomnes" concept in international law has gradually expanded from international crimes to protecting the human environment. Marine ecological environment protection has become an absolute international legal obligation recognised by every country to perform certain acts or omissions per the basic norms of international law, which is necessary to safeguard the basic moral values of humankind and the common interests of the world. Therefore, as an important "obligation ergaomnes" in the 21st century, global marine ecological environment protection reflects the basic value of human society and safeguards the international interests of the international community [43]. Moreover, this obligation is not premised on bilateral or multilateral reciprocity, which is consistent with the core idea of the common heritage of humankind. Thus, we should first realise that the global marine ecological environment is the common heritage of humankind, and humankind has aunshirkable "obligation ergaomnes" to the marine ecological environment. In this way, awareness can be raised on the need for multisubject co-governance of global marine ecological environment protection.

3.2. Establishing the Concept of Global Marine Ecological Environment Governance Led by the Concept of an Ocean Community with a Shared Future

Pollution damage and exploitation damage caused by human activities are pushing the bearing capacity of the oceans to the limit. Marine ecological environment problems have transcended national and regional limitations and become global problems. It is thus necessary to establish an advanced concept of global marine ecological environment governance with multiple subjects. However, the current global marine ecological environment governance system is West-centric and embeds the values and intentions of major Western powers. Therefore, it is difficult to create shared values for a global community. The liberalism-based international governance has been unable to meet the existing needs of global marine ecological environment governance to deal with environmental issues, coordinate intergenerational equity, and promote the sustainable development of marine ecological environment. In the face of these problems, neoliberalism and individualism must be abandoned, the rigid boundaries of administrative divisions between countries broken, and the "obligation ergaomnes" fulfilled as citizens of the earth. This is why the United Nations General Assembly adopted the 2030 Agenda for Sustainable Development on 25 September 2015, along with a set of 17 bold global goals to end poverty, protect the planet, and ensure prosperity for all, including SDG14 on the conservation and sustainable use of the ocean's resources. It called on each country, private organisation, and individual to develop green and sustainable consumption and production patterns to protect the environment. Thus, protecting and restoring our environment is at the heart of the 2030 Agenda for Sustainable Development. To achieve these targets, the overall theme of the fifth session of the United Nations Environment Assembly was "Strengthening Actions for Nature to Achieve the Sustainable Development Goals". The session was held online on 22–23 February 2021 and called for strengthened action to protect and restore nature and nature-based solutions to achieve the SDGs in its three complementary dimensions: social, economic, and environmental [44]. Human beings live in a global village, in the same space and time where life history and reality converge, increasingly becoming a community with a shared future. The concept is extensive and its essence includes five pillars, "lasting peace, universal security, common prosperity, openness, inclusiveness, cleanliness and beauty", which all have rich connotations of international law [45].

On 10 February 2017, the 55th UN Commission for Social Development approved a resolution that called for more support for economic and social development in Africa by embracing the spirit of building a human community with a shared future. It can be said that the UN has once again adopted ideas initiated by China, following the "Five Cardinal Principles of Peaceful Coexistence", the "Three World Theory", and the concept of a "Harmonious World", which reflect China's initiative. There is no doubt that the concept

breaks national, race, cultural, and ideological barriers. It provides a new perspective and feasible action plan to focus on the future and destiny of humankind and realise "the free union of man". Of course, the concept of a community with a shared future for humankind is also open and inclusive. It is not about building a community with a shared future for humankind with China at the centre but building a beautiful home for humankind that embodies the international view of power, common interests, sustainable development, and global governance, featuring "inclusive development and shared rights and responsibilities". China will always be a builder, an important contributor, and a major defender of this homeland.

The concept of a community with a shared future for humankind is multidimensional, covering political, economic, social, cultural, and ecological aspects of the international community. The development of science and technology has accelerated economic integration, increased globalisation, and increased interdependence. However, with the rise of nationalism and populism, there is also a strong undercurrent of antiglobalisation, such as the US government's recent withdrawal from the Paris Climate Change Agreement and later rejoining under the Biden regime. The issues of survival and environmental protection and how to live in harmony with nature have engendered extensive thinking in the international community. The realisation of the concept of a community with a shared future for mankind needs a practical platform, and the construction of a regional community with a shared future for humankind and new organisations and new mechanisms are indispensable platforms. On this basis, the blue planet we live on is not divided into isolated islands by the oceans. Rather, it is linked by a shared future where people of all countries share weal and woe. This shows that global marine ecological and environmental governance should be based on the common destiny of humankind, sustainable development of the marine environment, and the common interests of all countries. Only by sharing the same breath and issues and building a global model of marine ecological and environmental governance can we truly form an ocean community with a shared future for the sustainable development of the marine ecological environment. Based on this, under the guidance of an ocean community with a shared future, the existing global marine ecological environment governance should shift from damage prevention to risk prevention.

As mentioned above, protection against damage to the marine ecological environment has the colour of "mending the damage after it is too late", the concept of risk-prevention marine ecological environment protection requires multisubjects to carry out risk assessment for a series of planned marine activities, including the exploration of marine resources, the application of marine science and technology, and the possible effects of dumping on the marine ecological environment. In the past, marine ecological environment governance was that if there is an undetermined risk of marine ecological environment damage caused by human activities in the ocean [46], theresulting current situation of serious marine ecological environment pollution would also damage the intergenerational equity.

The declaration "Our Oceans, Our Future: A Call to Action" adopted by the United Nations General Assembly in July 2017 calls on states to take a preventive approach and enhance the resilience of the oceans to better protect and sustainably use marine biodiversity. The declaration emphasises taking a risk-prevention approach to protecting the marine ecological environment while implementing SDG 14 of the 2030 Agenda for Sustainable Development. In short, for the sustainable development of humankind and common maritime interests and seeking a new trend in global governance that features "extensive consultation, joint contribution and shared benefits", global marine environment governance should be guided by the concept of an ocean community with a shared future for global marine environment protection.

3.3. Establishing a Global Mechanism for Coordinating Marine Ecological Environment Governance

According to the French scholar Godane, governance is not a concept put forward by a certain person, nor is it the concept of a specialised discipline, but a collective product, more or less with the characteristics of negotiation and hybridity [47]. As discussed above, the

realisation of a community with a shared future for humankind requires new organisations and new mechanisms, which is an indispensable platform for practice. As a subordinate concept of a community with a shared future for humankind, an ocean community with a shared future has regional characteristics. It is particularly necessary to build a global coordination mechanism for marine ecological environment governance to implement the concept of a community with a shared future for the oceans. Due to the unifying nature of the ocean, global marine ecological environment pollution often affects many countries and subjects along the coast; therefore, it is not just a governance problem for one country or region. In the face of the current regionalised and fragmented of marine environmental governance system, coordinating the multisubject marine ecological environment governance and establishing a global multisubject co-governance coordination mechanism is important.

The governance model should be considered first to transform the global marine ecological environment governance from regional governance to global multisubject governance. Although the Montevideo project has made great progress, it is still fragmented. Territorial and maritime disputes may lead to ecological environment protection issues. Taking biodiversity and natural resource protection in the South China Sea as an example, some scholars believe establishing a multisubject co-governance coordination mechanism for the marine ecological environment requires shelving sovereignty disputes [48]. This view reflects the consultative governance model of shelving disputes, pursuing joint development, and safeguarding the marine ecological environment. Compared to the traditional dialogue and consultation model, it is worth pointing out that a network governance coordination model can also be considered to introduce a monitoring and evaluation mechanism with public participation to prohibit individual subjects from predatory exploitation of the ocean. This model breaks away from the traditional hierarchical governance model within a country and the discrete state of divided governance rather than shared governance among various governance actors in the international community.

The establishment of a consultation mechanism should be based on the parallel structure of the international community. The marine regional governance mechanism as a bureaucratic mechanism has played an important role at the domestic level. However, due to the existence of too many administrative levels, there is information asymmetry, resulting in a poor governance coordination and slow response. In addition, a strict division of labour leads to "strict barriers" between departments, making it difficult to realise communication and cooperation among various subjects truly. Therefore, this kind of hierarchical governance mechanism is unsuitable for the complex, dynamic, and pluralistic marine environment [49]. By contrast, because the international community belongs to a parallel structure dominated by states, hierarchical mechanisms cannot be applied. However, some developed countries regard the international community's interests as an exclusive zero-sum relationship; therefore, they believe that there wouldbe disagreements and conflicts between countries competing for interests. Without the concept of "harmony without uniformity" and "obligation ergaomnes" and upholding the hegemonic logic of putting national interests first, it is difficult to achieve "harmony between human and sea" and "harmony between man and nature" to address global ecological environment governance issues. For that reason, the governance mechanism of the global marine ecological environment governance should be based on the parallel structure of the international community rather than the hierarchical or vertical structure, establishing a dialogue and consultation mechanism featuring extensive consultation, joint contribution, and shared benefits.

Finally, it is also necessary to consider the balance of rights and the duality of identities of multisubjects in the marine ecological environment. For the former, some scholars point out that the construction of a global coordination mechanism for shared governance by multisubjects needs to take into account power preferences and that achieving an "ideal balance of rights" is an important prerequisite for providing an environment for international law to create a sense of legal obligation. Such a balance can create "added value" for international law and thus encourage compliance with the UNCLOS [50]. Thus, co-

governance of the marine environment from regional to global governance is necessary to overcome geopolitical barriers and achieve a balance of rights among multiple governance subjects. As for the latter, it should be said that in the global marine ecological environment governance, there is a duality of "profit-seeker" and "governor" identities for all governance subjects. If actors overemphasise their "profit-seeking" identities in an interdependent world, it wouldbring about noncooperation and create a bad image in the international community. Therefore, the successful realisation of global ocean governance also needs to deal with the contradiction of identity duality of governance actors [51]. For this reason, each governance subject should abandon the discrete governance concept of fragmented governance and actively learn marine life community, gather the points of convergence, and merge them into one, while pursuing their interests, taking corresponding international responsibilities, and fulfilling their "obligation ergaomnes" for environmental protection.

In summary, it is undeniable that the construction of a coordination mechanism for the participation of multisubjects in the governance of the global marine ecosystem is not easy. Therefore, the construction of a coordination mechanism for the co-governance of the global marine ecosystem should be based on the UNCLOS and the implementation of regional marine project plans as a model, on top of which the balance of interests and points of convergence for the shared governance of marine ecosystem by multisubjects should be analysed and a high degree of joint, integrated planning and management should be realised, based on unilateral governance by countries and regional subgovernance. However, governance does not mean possession and ownership, and the coordination mechanism of a global marine ecological environment with multisubjects should also be based on the concept of an ocean community with a shared future, through friendly consultation and reaching consensus on global cooperation to solve marine ecological environment problems jointly.

3.4. Establishing the Global Commission for the Co-Governance of Marine Ecological Environment with Multisubjects

At present, the governance of marine ecological environment by multisubjects has become a reality, but various subjects involved are constrained by many factors that include different governance objectives, methods, and contents, a lack of effective synergy among various subjects or power centres, and competition and conflict among them. For example, according to the UNCLOS, the oceans are divided into nine regions, and several regions have their international organisations for the oceans. In addition, various ocean actors, including countries, international organisations, and NGOs, have different worldviews, values, and interests, while various regional ocean organisations have a certain degree of exclusivity. Therefore, the diverse and fragmented international ocean governance has not yet formed a truly meaningful global ocean governance system. Moreover, various power centres or subjects of governance also lack a platform for common discussion, interconnection, and win-win cooperation based on the concept of an ocean community with a shared future.

Based on analyses, the fate of the world should be jointly held by all countries; international rules should be jointly written by all countries; global affairs should be jointly governed by all countries; and the fruits of development should be jointly shared by all countries. Promoting the reform of the global governance system is a common cause of the international community. Only by working through extensive consultation, joint contribution, and shared benefits can we build consensus and take concerted actions to reform the global governance system. It should be said that the historical role of the law of the sea has always been to balance competing international interests. The approach to achieving this balance in the face of new challenges and potential threats remains the same: realistic achievability based on cooperation, consultation, and mutual compromise [52].

The realisation of an ocean community with a shared future requires a corresponding practice platform, and the construction of regional communities of human destiny and new organisations and mechanisms is essential. For this reason, no single country, organisation,

or institution can take on the responsibility of global marine ecosystem governance on its own to form a holistic and clear approach to solve the multiple problems facing the ocean. A study conducted by Di Jin (2019) mentioned that fragmented sea governance approaches are illsuited to handling the multifaceted interrelationships between the marine ecosystem components and anthropogenic activities [53]. Bycontrast, integrated management practices, such as marine spatial planning (MSP), integrated coastal zone management (ICZM), and ecosystem-based management (EBM), are relatively progressive and advanced approaches [54]. However, fragmentation continues even with the new initiatives, largely because of a lack of institutional and policy reforms [55]. In this regard, MarjoVierros believes that MSP can take on this responsibility [56]. The plan can integrate current human behaviour in marine ecosystem management without compromising controversial values to achieve sustainable development of the global marine ecosystem. However, although the scholar argues that the MSP can enable stakeholders to make full use of the sea area and prevent existing or potential conflicts at sea, it lacks sufficient theoretical analysis and practical operational recommendations and is therefore not feasible. ChristerJönsson and Anders Johnsson provide a comprehensive analysis of the role of the IPU in global governance, covering mainly cooperation with the WTO, counterterrorism actions, and refugee protection. They point out that marine ecosystem governance is an integral part of global governance [57], but their article does not provide an in-depth analysis on how to achieve a co-governance path for multisubjects in the global marine ecosystem.

By contrast, Chinese scholars Liang Jarei and Qu Sheng took ocean governance in the South Pacific region as an inspiration and posited that the key to global marine ecosystem governance lies in strengthening coordination and cooperation among organisations, building global ocean governance partnerships, and strengthening the effective docking of regional ocean governance concepts with global ocean governance concepts [58]. It should be said that they have attempted to construct a relatively complete theoretical system for global marine ecosystem governance, but only based on a large number of existing regimes and treaty provisions, and failed to note that since World War I, there has been an increasing number of international conventions with global scope but without any substance or representativeness. Some scholars believe that there are three main points of marine ecological environment governance: firstly, to build a crossregional trust and rules guidance mechanism for the marine environment; secondly, to deepen the "regional sea" system in international regions; and thirdly, to improve the "strong system" of regional governance of the domestic marine environment [59]. Although these scholars focused on the construction of the relationship between multisubjects and the deepening of the existing system of marine ecology, it is obvious that the goal of co-governance by multisubjects of marine ecology cannot be achieved because it is confined by the existing framework but lacks the overall construction of marine ecology governance rules. Thus, the plurality of global marine governance subjects inevitably causes the power to be dispersed from one centre to many centres, and there are potential governance conflicts. For example, for the restoration of marine ecosystems, countries far from the marine commons and countries near the sea have different environmental governance needs.

However, it is worth pointing out that global ocean governance also needs leaders to overcome difficulties to solve common human problems. Decentralisation and the lack of leaders are structural contradictions in global ocean governance. There are many difficulties in managing the whole-ocean governance process and coordinating the interests of governance subjects. Based on this, we can consider establishing a global international organisation for global marine ecological environment governance, the global commission for the co-governance of marine ecological environment with multisubjects, which is dedicated to coordinating and solving the many problems in marine ecological environment governance. The main mission of the commission is to coordinate and integrate the regionalised and fragmented marine ecological environment governance systems in the initial stage and build a healthy "blue ocean economy". The latter's mission is to carry out planned and purposeful governance of the marine ecosystem as the common heritage

of humankind globally to achieve sustainable development of the global ecosystem. In this regard, a multisubject committee on shared governance can be established under the authority of the UN General Assembly, and the members of this committee can include states, intergovernmental organisations, international nongovernmental organisations, and multinational corporations. At the same time, specific subsidiary bodies, including a council, a secretariat, a compulsory dispute settlement body, and an executive board, should be set up, drawing on the structure of international institutions such as the World Trade Organization and the International Seabed Authority. Given the possible intertwining of interests, conflicts and contradictions among various governance subjects, and even behaviours that are contrary to the value goal of co-governance under an ocean community with a shared future, it is possible to draw on the dispute settlement mechanism of the World Trade Organization to establish a corresponding compulsory dispute settlement body and to resort to legal means to resolve disputes that occur in the process of co-governance. Meanwhile, an executive board wouldbe set up to enforce the judgment delivered by the dispute settlement body, and members who refuse to enforce the judgment wouldapply for sanctions or authorised retaliation by the Council. A logical roadmap of the specific concept is shown in the diagram below (Figure 1).

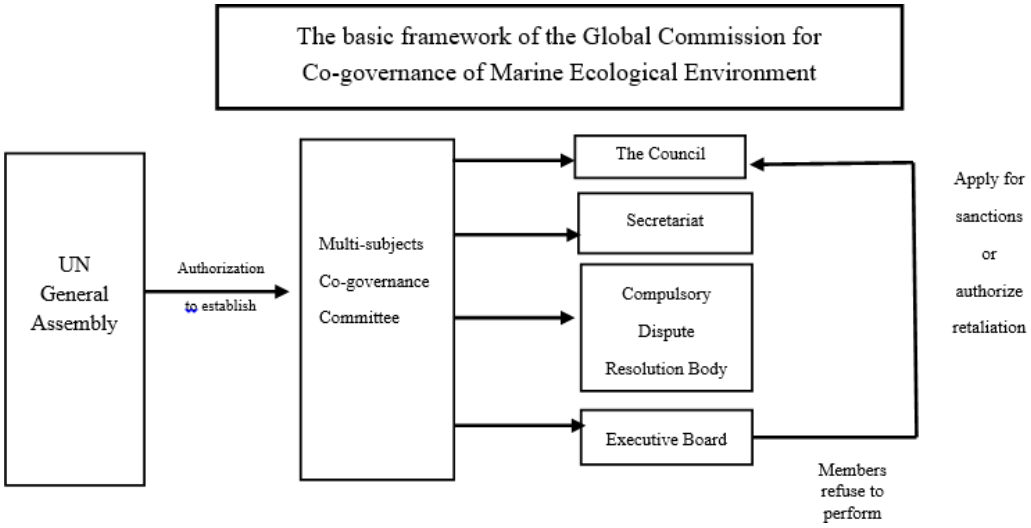

Figure 1. The basic framework of the Global Commission for Co-governance of Marine Ecological Environment.

Considering the current fragmentation, ineffectiveness, and absence of a uniform global governance system for the marine environment, the author believes that if the proposed global commission for the co-governance of marine ecological governance is successfully set up under the auspices of the United Nations General Assembly, it could benefit the world in a time when it is much needed. However, it could serve as an ice-breaker and may be feasible for all the coastal states to accept, as a starter, reaching out at a uniform and mutual agreement to ensure that the global marine ecological environment is being governed by a well-planned and safer system under the proposed global commission of the United Nations. The main idea of this proposal is to let the global stakeholders realise that the world should join hands together to mutually protect the marine ecological environment before it may becometoo late. To this end, a reference can be made with the establishment of framework for a pan-Arctic network of marine protected areas (MPAs) by the Arctic Council in 2015 [60], which logically responded and provided a global solution to the urgency of safeguarding and restoring marine ecosystem function, biodiversity, and sustenance of the available natural resources to make them sustainable for the future generations [61]. Similarly, research conducted by Christina Kelly et al. (2010) also demonstrated that the negative impacts of fragmented sea governance still exist under the new governance measures mainly due to the fact that the different organisations are

still working separately [54]; thus meriting the need forone uniform commission under the United Nations.

4. Conclusions

The global marine ecological environment multisubject co-governance is an inevitable requirement of human beings for the continuous deepening of marine development and utilisation, marine ecological environment protection, and the rightful meaning of building an ocean community with a shared future. The key to the realisation of the global marine ecological environment is not only the accurate recognition of the current situation of marine ecological environment damage but also how to combine the international political, economic, and social situation to make rational analysis, break through the ideological barriers of master and subordinate, different camps, and separate policies, and realise the optimal institutional model design for global marine ecological environment protection under the non-zero-sum game of multicorporate governance. Only when the international community is fully aware of the limitations of the traditional marine ecological environment governance concept and the inadequacy of unilateral or regional marine ecological environment governance can it truly realise the necessity of global marine ecological environment co-governance by multisubjects guided by the concept of an ocean community with a shared future. At the same time, only through the global marine ecological environment governed by multisubjects can we effectively achieve the sustainable development of the marine ecological environment, protect the common heritage of all humankind, achieve intergenerational equity, and build a community with a shared future and other major goals, and an open, inclusive, clean and beautiful world with lasting peace, universal security, and common prosperity.

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Preserving Community's Environmental Interests in a Meta-Ocean Governance Framework towards Sustainable Development Goal 14: A Mechanism of Promoting Coordination between Institutions Responsible for Curbing Marine Pollution

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Abstract: The United Nations has recently recognised the global community's environmental interests in ocean governance through the Sustainable Development Goal 14. The marine environmental protection targets stand in need of rejuvenating international environmental law, which fosters interconnection between oceans, climate, and terrestrial ecosystems. The existing literature on this aspect of ocean governance, however, is segregated and lacks an ecosystem-based approach. Therefore, a comprehensive review of the literature on ocean governance with an ecosystem-based approach becomes essential and is conducted through this research. This research has proposed that ocean governance programmes and plans need to be re-arranged under established legal frameworks at national and regional levels. Such a challenge can be addressed by taking the elements of governance provided by the list of targets of sustainable development goals. This research has facilitated the given hypothesis via a meta-ocean-governance framework that incorporates a deliberate regional monitoring system, intergovernmental review, capacity building techniques, national action through strong institutions, scientific decision making, and policy coherence. The idea is to fit the conceptualisation of ocean governance under international environmental law in the existing initiatives within a box of institutions to coordinate and encourage an ecosystem-based approach.

Keywords: ocean governance; sustainable development goals (SDGs); SDG 14; marine environment; international environmental law; Law of the Sea; ocean acidification; rising-sea-levels; meta-governance; ocean action

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1. Introduction

In 2018, the United Nations (UN) launched a formal intergovernmental consultation about a proposed global environmental treaty under the principles set forth the rights of *erga omnes* (towards all) and *ius cogens* (compelling law) to a healthy environment [1]. The right to a healthy environment with the principles of *erga omnes* and *ius cogens* was also recognised by the Inter-American Court of Human Rights in its recent advisory opinion [1]. The Republic of Colombia referred to this advisory opinion during a consultation session under the Cartagena Agreement (Convention on the Protection and Development of the Marine Environment in the Wider Caribbean Region) in the UN. The panel's experts interpreted and elaborated the fundamental general obligation outlined in the United Nations Convention on the Law of the Sea (UNCLOS), recognising the principles of *erga omnes* and *ius cogens* for oceans ecosystems [2,3]. As the UNCLOS and its associated International Environmental Law (IEL) is the compelling law (*ius cogens*), oceans are considered as the common heritage of mankind (*erga omnes*) [4]. This purports that fisheries,

marine ecosystems, international trade, leisure, and ocean resources are shared interests of the global community.

From both historical and contemporary perspectives, a single global ocean is geopolitically divided and recognised as a common interest of the global community [5]. Preservation of the ocean ecosystems is essential for human civilisation and future generations. The principles of *erga omnes* and *ius cogens* for oceans ecosystems depict that the global community is putting forth the vision of integrated, holistic, and spatial governance. Previously, in protecting the global community's interests through effective implementation of the law, more comprehensive cross-border actions for preserving ocean ecosystems were established after developing the regional-multilateral environmental agreements (MEAs) under the auspices of the UNCLOS [6]. Similarly, since the promulgation of the United Nations Conference Declaration on Environment and Development (Rio Declaration), many states adopted integrated policies and strategies of ocean governance under Chapter 17 of Agenda 21 [7,8]. With the Sustainable Development Goals (SDGs) emergence, the updated community's interests in ocean governance were submitted under an integrated Sustainable Development Goal 14 to preserve life below water (SDG 14) [9].

SDG 14 intersects almost all the SDGs because life below water is an essential part of the global ecosystems and requires conservation and restoration of terrestrial and atmospheric environments [10]. While recognising the shared competence over the oceans, SDG 14 depicts that most marine pollution emerges from land-based activities (SDG 6 Clean Water and Sanitation and SDG 11 Sustainable Cities and Communities), and the climate crisis (SDG 13 Climate Action) is devastatingly impacting marine ecosystems [11]. Thus, SDG 14 is an environmental goal with the most critical and enduring target of preserving the community's environmental interests. In order to achieve the given targets, SDG 14 underpins compelling (international) law for collaboration among and between the international, regional, and national institutions for the global governance of one common ocean [12]. Therefore, from a comprehensive view, ocean governance under SDG 14 calls for a complex mechanism of coordination/adaptation at various levels and requires the elements driven by SDGs 16 (peace, justice, and strong institution) and SDG 17 (Partnerships for Goals) [13].

Based on the aforesaid, the literature related to ocean governance from ecosystem perspectives significantly deals with the interconnections among marine environment, land-based sources of pollution, and climate change [14,15]. Furthermore, the emerging literature on SDG 14 suggests several prospects of integrating ocean governance with atmospheric and terrestrial environmental governance involving regional and international organisations based on the old architecture [16]. However, notwithstanding the complexities related to the implementation of SDG 14 with an ecosystem-based approach, much of the up-to-date academic literature has focused on marine environmental protection through ocean governance under soft law [17]. Moreover, the geopolitical influence of the states with interests in marine spaces is not highlighted to explain the fragmentation issues, which is the major cause behind the failure of ecosystem-based approach in ocean governance [18]. Reasons for these relative paucities in describing the ocean governance with geopolitical influence and under SDGs is perhaps their informal recognition. Moreover, the literature focusing on ocean governance under soft law argues that UNCLOS and IEL helped design the plans and programmes for marine environmental protection [17]. Nevertheless, a precise impact on ocean governance has been discussed in a limited fashion because the emergence of SDG 14 has revealed that marine environmental protection still lacks a comprehensive ecosystem-based approach at various levels.

The ecosystem-based approach in governance generally is rationalised through SDG 16 and 17 (SDGs for meta-governance), with the elements fostering cooperation and coordination [19]. The rational application of the elements of SDGs for meta-governance provides detailed prescriptions and a comprehensive approach considering specific ecosystems placed under ocean governance [20]. This research aims to analyse the gaps and disparities among various ocean governance mechanisms at different levels through a methodology

of comprehensive literature review (CLR). This CLR synthesises the literature that has been published regarding the elements of adaptation of ocean governance with atmospheric and terrestrial environmental governance under the UNCLOS, IEL, and soft law declarations. Consequently, this CLR aims to and will drive marine environmental protection targets of SDG 14 through a governance framework that proposes specific mechanisms of adaptation among and between international, regional, and national ocean governance mechanisms.

2. SDG 14 and Ocean Governance

Before comprehensively analysing the literature on ocean governance, it is pertinent to understand the role of SDG 14 in developing the future of ocean governance. SDG 14 primarily aims for healthy and productive ecosystems to sustain the services of oceans and focuses on "planetary health" to preserve the global community's environmental interests [21]. As oceans are the most critical ecosystem in the earth's environment, they produce oxygen, perform critical processes in the hydrological cycle, and preserve marine life [22]. The climate crisis has recently thrown into sharp focus the importance of depleting marine ecosystems and linking it with human health. Certainly, emissions cause devastating impacts on marine life and trigger ocean warming, sea-level rise, acidification, de-oxygenation, and disposal of wastes into the oceans create significant problems for the fisheries and the well-being of fishers [23]. The requirement here is to take a broader approach for SDG 14 and form adaptations in diverse ecosystem governance through a transparent and accountable mechanism. Such an approach shall create a multilevel system of governance capable of developing coordination among and between the institutions governing diverse but common ecosystems [10,24].

It should be noted that the concept of ocean governance is not easy to pin down, and with the evolvement of SDG 14, the concept has become more complex. As ocean governance under SDG 14 is a long-term agenda accompanied by regulations for interactions between the institutions, the policy relates to guidelines and objectives [25]. The reference to IEL and precisely to the UNCLOS in the achievement of SDG 14 requires improvement and harmonisation in policies and programmes within the existing legal frameworks by considering the current and future challenges. Although there are institutional frameworks of ocean governance, they are organically assembled to form a network of self-arranging patterns [26]. Such organic arrangement characterised as polycentricity contains multiple governing institutions rather than a monocentric system. The polycentric arrangements for ocean governance are flexible because they operate with a general legal framework under UNCLOS and IEL [27]. The existing arrangements suggest that when examining the opportunities to improve ocean governance for SDG 14, the inherent polycentricity is viable.

The polycentric systems of ocean governance are mainly developed after establishing various regional MEAs and national ocean policies reinvigorating UNCLOS and IEL under the Rio Declaration [28]. The regional MEAs for ocean governance are the second-tier instruments for inter-state coordination and harmonise the horizontal and vertical coordination among relevant national institutions [29]. The main problem with the regional MEAs is the weak hierarchal mechanism of coordination, i.e., bottom-up integration with global institutions and top-down integration with local institutions. Another cause behind such poor ocean governance at regional levels is the political interests of the states, which also causes fragmentation in national mechanisms [30,31]. Moreover, although the existing legal frameworks for oceans in various states are sustainable, there exists an intersectoral approach due to weak oversight and ineffective monitoring. Such lack of integration has caused a typical failure that lacks structure and reliability at regional levels, inflexibility, and inadequate governance procedures at national levels.

It can be argued, and it is argued, that regional MEAs, UNCLOS, and IEL should be redesigned considering the interconnectedness of ocean governance [32]. However, the conduct of this CLR remains quite pragmatic and, without idealism, prefers that the regional MEAs under existing UNCLOS and IEL are vital for ocean governance and can fix

the problems of fragmentation at the national levels. The challenge in implementing SDG 14 is not legal; it is a multilevel governance task, and the challenges are different at each level, and regional MEAs are capable of promoting adaptation and ecosystem integration [33]. The fragmentation at national levels is due to differentiated governance of environmental commons, and under existing national policies, the oceans as one of the commons can be responded through the principle of "common but differentiated governance" (CBDG) [34]. Therefore, it is essential to convert polycentricity into adaptation to fix the multilevel ocean governance by formalising the existing patterns rather than devising new policies.

3. Comprehensive Literature Review

3.1. Methodology

This CLR aims to reveal the existing state of the academic acumen in ocean governance and, for this purpose, has followed the sustainable development interpretation methodology (SDIM) [35]. As required, the basis of this CLR is driven by the theory of "reconceptualization of institutional coordination and environmental interconnectedness in governance" [36,37]. This theory is core phenomena of SDGs and Anthropocene, which interlinks diverse ecosystems under earth system governance and shall provide effective means of interlinking the marine environmental protection with atmospheric and terrestrial environmental governance (as provided in Figure 1) [13]. Therefore, the articles were selected, emphasising the elements of interdependence and interconnectedness among and between national (inter-sectoral and hierarchal), regional, and international ocean governing institutions. The search criteria for the articles were based on the combinations of search terms, namely "ocean governance + climate, water, sanitation, and waste", and "oceans + SDGs and SDG 14" are used for data extraction. Initially, the search criteria produced plenty of articles; after selecting the articles on law and institutions, environmental diplomacy, and geopolitics of international, regional, and national ocean governance, the articles fostering cooperation and coordination were discussed and analysed, reported on below.

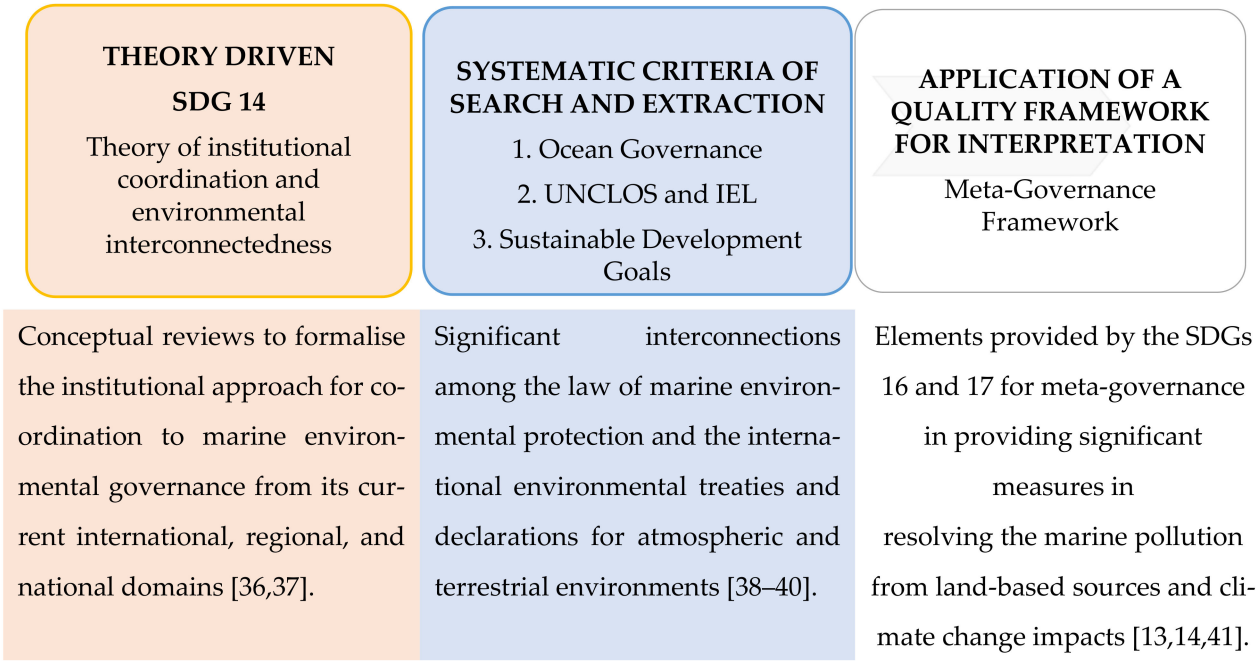

Figure 1. Sustainable Development Interpretation (CLR) Methodology [13,14,36–41].

To better understand the existing mechanisms of ocean governance, a simple step-by-step approach was adopted, starting with mapping the global and regional mechanisms, conducting critical analysis, and defining the challenges at various levels. Few and good

examples from regional initiatives and national plans were discussed in order to keep the CLR within the customisation limits. The explored literature on regional and national ocean governance practices with the elements provides that implementation exists but with weak coordination. Therefore, the discussion following the analysis put planning options in place with adaptation elements and by formalising SDGs for meta-governance applicable on oceans.

3.2. Early Decades of Environmental Diplomacy and Its Impacts on Global Ocean Governance

The geopolitical interests of the states and the influence of large and dominant coastal states have caused the institutional challenges to form ecosystem ocean governance approaches at the global level [42]. This is evident from the Rio Declaration, which was negotiated by the Conference for Parties (COP) two decades after the Declaration of the United Nations Conference on Human Environment (Stockholm Declaration) urged to form an ecosystem-based approach for marine, coastal, and terrestrial environments, and its effective implementation as soft law is still questionable [43–45]. Notwithstanding the conflict of interests, the ongoing negotiations between COP resulted in the Convention on Biological Diversity (Biodiversity Convention) at that time, and its implied consideration for the protection of the marine environment with UNCLOS produced effective results in the formation of ecosystem-based ocean governance in Regional MEAs [46,47]. From the ocean's perspective, besides UNCLOS, the important developments between the progress of the IEL as mentioned earlier are the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (London Dumping Convention) and the International Convention for the Prevention of Pollution from Ships (MARPOL Convention), which deals with the ship and dumping sources of pollution [48,49].

The birth of environmental and ocean diplomacy emerged when the global geopolitical system was navigating, and this provided an opportunity to the nation-states to form functional regulations for oceans. Thus, it could be argued that the fragmentation in IEL for ocean governance was manageable by the states at that time to avoid mitigation and pollution control regulations. As the global environmental and ocean governance negotiations were conducted during the development of the new world order, there were conflicting interests among the states regarding oceans and their resources [50]. Moreover, the influential states and even the developing and vulnerable states were not recognising the severity of the marine environmental issues. However, the pressure on states through international environmental organisations, academia, and UN bodies was increasing to formulate a stringent corpus for IEL. Therefore, further positive developments include the United Nations Fish Stock Agreement and Highly Migratory Fish Stocks (UNFSA) for fisheries preservation and, most recently, the draft convention for the conservation and sustainable use of Biodiversity Beyond National Jurisdiction (BBNJ Convention), which will enter into force soon for marine environmental protection at high seas [34,51].

3.3. The Last Two Decades of Environmental Awareness for Global Ocean Governance and Establishment of UN-Oceans (An Interagency Global Mechanism of Ocean Governance)

Over the last two decades, the UN increasingly recognised the importance of ocean governance, and after the Declaration of the World Summit on Sustainable Development (Johannesburg Declaration), it was already in the process of developing an inter-agency mechanism for ocean affairs [52,53]. However, the 2004 tsunami in the Indian Ocean triggered renewed interest in establishing coordination between various UN bodies in the ocean's ecosystems. Thus, the UN established the UN Oceans as an inter-agency mechanism on ocean affairs, covering a wide range of issues and comprises the relevant programmes, entities, and specialised agencies [16,54]. The agencies of UN, such as the International Seabed Authority (ISA), United Nations Environment Programme (UNEP), International Maritime Organization (IMO), International Oceanographic Commission (IOC), UN Development Programme (UNDP), and Intergovernmental Panel on Climate Change (IPCC) and within the UN Secretariat, the Division of Social and Economic Affairs (UN-DESA) and the Division on Ocean Affairs and Law of the Sea (UN-DOALOS), are

a perennial part of UN-Oceans [55]. The mandate of UN-Oceans is to ensure cooperation and sharing in knowledge, information, good practices, and experiences and aims to strengthen and maintain an overview of synergies between ongoing and upcoming ocean-related activities within the UN System [16,54].

The involvement of the diverse environmental and developmental bodies within the UN-Oceans domain depicts that the corpus of IEL is apparently expanding for positive outcomes in ocean governance. As consistent with the above-mentioned UN-Oceans mechanism (as provided in Figure 2), the UN-DOALOS, according to its mandate, monitors UNCLOS implementation, reports to the UN-Secretariat, and ensures that the UN system has the responsive capacity to assist the states [56]. UNEP is responsible for monitoring the effective implementation of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), Biodiversity Convention, Aichi Bio-Diversity Targets, and Jakarta Mandate Indicators [57–60]. The IMO governs shipping under the London Dumping Convention and the MARPOL Convention [61]. Additional UN entities, ISA for marine mining and IOC for ocean scientific research, are heavily involved within the UN Oceans mechanism [55].

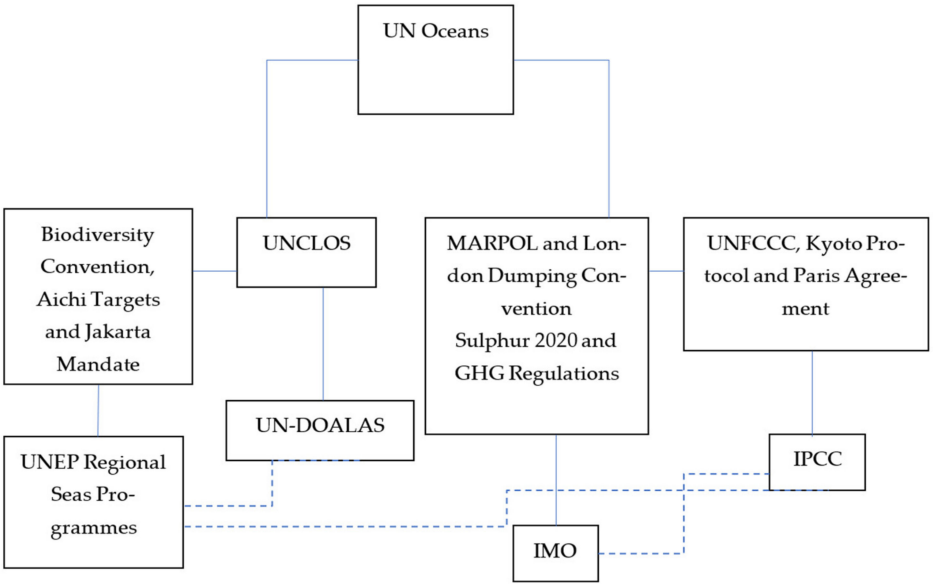

Figure 2. Mechanism of Global Ocean Governance in Marine Environmental Protection.

The most important aspect of ocean governance is information sharing to keep effective monitoring of implementation processes at the global level. The UNCLOS and related IEL places obligations on the nation-states to cooperate through international organisations for information sharing and effective monitoring and establish scientific criteria for any such collaboration [38]. Such mechanisms exist, but with insufficient information sharing and reporting systems, each UN agency focuses on its domain rather than oceans [62]. Although the Convention on Access to Information, Public Participation in Decision-Making, and Access to Justice in Environmental Matters (Aarhus Convention) has been ratified by a limited number of nation-states, it has provided effective means of information sharing systems [63]. The institutionalisation through directives and plans under Aarhus Convention brings opportunities to systematically work for interconnected marine environmental concerns, including climate change and land-based pollution [64].

Apart from problems in information sharing related to land-based pollution, the key issue observed is that the IPCC faces severe obstacles in developing information sharing mechanisms on an ecosystem basis under the United Nations Framework Convention for Climate Change (UNFCCC) Kyoto Protocol and Paris Agreement [65–68]. Although the UNFCCC and its associated regimes, along with IEL, has established measures for the systematic observation that supports scientific decision making across local and global

levels, it has been characterised by a lack of coordination among the policy areas for climate action [69]. This has also caused ineffectiveness in implementing a specific framework in handling ocean acidification and rising sea levels because the climate-change strategies are not well aligned with ocean governance mechanisms at regional and national levels [22]. Even though various nation-states are willing to occupy leadership in global climate governance, there is a lack of capacity to address the anthropogenic climate interconnectedness, and the threats due to climate change are not fully integrated at all levels [60].

3.4. UNDP Strategic Plan towards SDG 14 and the Future of Ocean Governance

Despite an ambitious and ever-expanding international legal framework embodied in the various IEL treaties and declarations, the global mechanism of ocean governance is still ineffective. As ocean governance is embedded in the international geopolitical system, it requires geostrategic redressal. Thus, UNDP has recently reviewed the existing global ocean governance and proposed a Strategic Plan towards SDG 14 to redesign the mechanisms of sharing knowledge, information, management capacity, and programme development to implement a global ocean policy [70]. UNDP's ocean vision "to achieve integrated, climate-resilient, sustainable, and equitable management of water and ocean resources and universal access to safe water supply and sanitation, through improved water and ocean governance", is critical for the future of SDG 14. Furthermore, the UNDP has the mandate to convene and coordinate within UN systems and assist nation-states in improving governance through capacity development under the Rio and Johannesburg Declarations [71]. Thus, considering the significance of the UNDP plan, a task group working under the UN Oceans encouraged the development of new partnerships and the renewal of old coordination mechanisms.

Climate-resilient access to water supply and sanitation and integrated approaches to coastal management and sustainable ocean management are the priority areas identified by the UNDP. For these purposes, the UNDP proposes a framework of coordination between the IPCC, UN-Oceans, UNEP, and its Regional Seas Programmes under MEAs at the global level and cooperation among institutions governing sanitation and waste, water-ecosystems, and atmospheric environment at the national levels [70]. The proposed framework emphasises that ocean governance is obsolete if there is a weak coordination system among cross-border (regional) and national (hierarchal and horizontal integration) mechanisms under a global governance system. The ocean action is a global agenda that requires national and local action, regional coordination, and inter-regional cooperation (global collaboration) under a hierarchal framework and demands partnerships at all levels.

The UNDP framework recognises the importance of the elements of meta-governance and endorses that environmental justice through the development of strong institutions with the principles of the rule of law, accountability, and transparency is essential for effective national ocean governance. Furthermore, scientific information in decision making with the principles of equity, inclusiveness, participation, representativeness, and policy coherence, which identifies linkages, other areas for cooperation, and needs for further action with the principle of CBDG, both are of indivisible value [19,34,37]. The UNDP framework indeed acknowledges that regional partnerships for capacity building, information sharing, monitoring, and evaluation steer the holistic mechanism of ocean governance. As UNDP recognises that SDG 14 combines bottom-up and top-down approaches and aims to make networks in hierarchal and horizontal governance mechanisms [71]. The principles proposed under the UNDP's framework are reflected in a global shift of awareness due to the increasing diversity in and institutions involved in ocean action and promote joint programming, harmonisation, and cooperation at different levels.

3.5. Regional Partnerships (MEAs) for Ocean Governance

The contemporary ocean governance with UNCLOS and IEL, as evidenced by the establishment of many international organisations and adoption of a large number of MEAs, is the most influential system for marine environmental protection [72,73]. The UNCLOS

and IEL are regarded as an overarching framework for regional observation and governance plans in the scope of intergovernmental arrangements [74]. Nevertheless, under the zonal approach, UNCLOS's implementation is non-institutional because of providing a separate state jurisdiction [75]. Although the UNCLOS urges to promote regional coordination concerning the implementation of rules for marine environmental protection, it remains incapable of developing the institutional mechanisms at regional levels [76]. The main challenges for institutional coordination under UNCLOS at regional levels are the same as at the global levels, including geopolitics, conflict of interests, and economic development [77]. Presumably, the states, for obvious security and developmental concerns, disregard the regional institutional arrangements. In all probability, the conflicts raise questions of the legitimacy of the regional mechanisms, leading to UNCLOS's effectiveness issues [78]. The given problems confronting regional ocean governance somehow leaves prescriptive solutions for existing arrangements and could be solved by considering the importance of regionalism in global ocean governance.

The significance of the Rio Declaration increases while considering the geopolitics mentioned above at the regional levels, as it establishes new approaches to marine environmental protection across the territorial sea [17]. Moreover, the Biodiversity Convention, London Dumping Convention, MARPOL Convention, and Jakarta Mandate, as a global consensus on the importance of marine ecosystems, insists on regional and global cooperation, including technical assistance and transfer of technology among nation-States for monitoring and environmental risk assessment and compliance with UNCLOS and IEL regarding pollution from particular sources [72]. Although the inclusive success of the given IEL is questionable, the UNEP has helped transform the institutional arrangement under regional mechanisms. This exercise of UNEP has promoted significant measures in polycentricity of ocean governance to counter marine pollution.

The UNEP's Global Programme of Action for the Protection of the Marine Environment from Land-based Activities is programmed in accordance with Rio Declaration and Jakarta Mandate [79]. This was an interesting networking aspect, as 108 governments and the European Union started working under the collaboration and designed research programmes to improve the knowledge-sharing mechanisms. The impetus was to understand the processes that form the basis for restoring and preserving marine ecosystems, including interactions with the atmosphere and the land. Such sharing of knowledge resulted in partnerships that increase access to knowledgeable advice, facilitate the work, and integrate new findings into a coherent policy. The aim was to cover practically all regions of the world, implying that learning between regional actors may lead to both the top-down and bottom-up approaches for effective ocean governance. That restructured the approach of UNEP's 13 regional seas programmes and five partner programmes that utilised networks in assessing the marine environmental conditions now focuses on the information sharing and capacity building for managing land-based sources of pollution [80].

3.5.1. Information Sharing

UNEP has helped in the adoption and effective implementation of UNCLOS and IEL, and most constructive programmes are binding through conventions and protocols, requiring that the information related to the state of the maritime area or activities in the area should be made available (summarised in Table 1). Information sharing based on the UNCLOS and associated IEL and specifically through Aarhus Convention is more precisely adopted by the regional programmes of Europe and Central Asia [64]. The significant development through Aarhus Convention was initially made in the Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR Convention), which makes it mandatory that the information related to the state of the maritime area shall be available [81]. Later, many other UNEP programmes, such as the Convention on the Protection of the Marine Environment of the Baltic Sea (Helsinki Convention), Convention for the Protection of the Mediterranean Sea Against Pollution (Barcelona Convention), and Nairobi Convention through Protocol for the Protection of the Marine

and Coastal Environment of the Western Indian Ocean from Land-Based Sources and Activities, made this requirement mandatory [23,82]. This development enabled a self-structuring or polycentric arrangement of different institutions in a governance system to ensure the principle of transparency. The available information also helps international organisations know the state of the marine environment in any specific maritime area [28].

Table 1. The utilisation of elements of SDGs for meta-governance in Existing Regional MEAs for Ocean Governance.

UNEP Administered Programmes			
Programmes under Binding Conventions	**Instruments for the Protection of Marine Environment from Land-Based Sources**	**Climate Adaptation Strategies**	**Elements of Governance**
The Convention for the Protection and Development of the Marine Environment in the Wider Caribbean Region (Cartagena Convention)	Protocol Concerning Pollution from Land-Based Sources and Activities to the Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region	None	Joint Monitoring and Evaluation and Information Sharing [83].
Nairobi Convention	Protocol for the Protection of the Marine and Coastal Environment of the Western Indian Ocean from Land-Based Sources and Activities	Joint Assessment for Climate Change.	Joint Monitoring and Evaluation, and Information Sharing [23].
Convention for the Protection of the Mediterranean Sea Against Pollution (Barcelona Convention)	The Protocol for the Protection of the Mediterranean Sea Against Pollution from Land-Based Sources	Integrated Climate Change Adaptation Mechanism.	Joint Monitoring and Evaluation and Information Sharing [82].
The Convention for Cooperation in the Protection, Management and Development of the Marine and Coastal Environment of the Atlantic Coast of the West and Central Africa Region (Abidjan Convention)	Protocol concerning the Cooperation in the Protection and Development of the Marine and Coastal Environment from Land-Based Sources and the Activities (LBSA) in the Western, Central, and Southern Africa Region was signed and officially adopted in 2012.	Climate Change Partnership among the relevant government departments.	Joint Monitoring and Evaluation and Information Sharing [84].
Framework Convention for the Protection of the Marine Environment of the Caspian Sea (Tehran Convention)	Protocol on the Protection of the Caspian Sea against Pollution from Land based Sources and Activities (Moscow Protocol)	None	In process of developing joint monitoring and evaluation programmes [85].
Nonbinding UNEP Administered Programmes			
Partnerships in Environmental Management for the Seas of East Asia (PEMSEA)—Action Plan	Strategic Direction for reducing land-based pollution.	None	Joint monitoring and evaluation [86].
Northwest Pacific Action Plan	In process of developing adaptative measures against land-based pollution.	In progress, general coordination.	General coordination programme [87].
Independent Programmes Partnered with UNEP			
Convention on the Protection of the Black Sea Against Pollution (Bucharest Convention)	Protocol on the Protection of the Black Sea Marine Environment Against Pollution from Land-Based Sources (LBS Protocol)	None	Monitoring and evaluation with top-down and bottom-up approach [88].
Convention for Cooperation in the Protection and Sustainable Development of the Marine and Coastal Environment of the North-East Pacific (Antigua Convention)	Article 6 of the Convention	None	Monitoring with top-down and bottom-up approach [89].

Table 1. *Cont.*

Regional Convention for the Conservation of the Red Sea and Gulf of Aden Environment (Jeddah Convention)	Protocol Concerning the Protection of the Marine Environment from Land-Based Activities in the Red Sea and Gulf of Aden	Cooperation in Scientific Research.	Monitoring with top-down and bottom-up approach [90].
Kuwait Regional Convention for Cooperation on the Protection of the Marine Environment from Pollution	Protocol for the Protection of the Marine Environment against Pollution from Land-Based Sources (1990)	On-going negotiations	Partnerships with International Organisations and Other Seas Programmes—monitoring and evaluation with cooperation [91].
Convention for the Protection of the Natural Resources and Environment of the South Pacific Region (Noumea Convention)	Article 7 of the Convention	Climate Change Resilience Programme—Partnerships with the Governments in the Region	Monitoring with top-down and bottom-up approach [92].
Nonbinding Independent Programmes Partnered with UNEP			
The Colombo Declaration on the South Asia Co-operative Environment Programme	Regional Marine Litter Action Plan.	None	In process of developing mechanisms [93].
South-East Pacific Action Plan	Protocol for the Protection of the Southeast Pacific against Pollution from Land Sources	In process of developing policies on climate change.	Adoption measures and information sharing mechanisms [94].
UNEP Partner Programmes			
Ottawa Charter	Regional Action Plan on Marine Litter in the Arctic	None	Monitoring and evaluation with top-down and bottom-up approach [95].
The Convention on the Conservation of Antarctic Marine Living Resources	None	None	Focus marine biodiversity. Monitoring and evaluation with top-down and bottom-up approach [96].
Convention on the Protection of the Marine Environment of the Baltic Sea (HELCOM or Helsinki Convention)	Article 2 of the Convention	None	Monitoring and evaluation with top-down and bottom-up approach [97].
The Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR Convention)	Annex 1 of the Convention	Recently considered—in process.	Monitoring and evaluation with top-down and bottom-up approach [98].

3.5.2. Joint Monitoring and Evaluation

Most UNEP Programmes mutually formalised joint monitoring and evaluation mechanisms for policy enforcement in preserving the marine environment. The impetus is placed on the prevention and mitigation of land-based sources of pollution. Such approaches in regional mechanisms also help to monitor the effective implementation of IEL at the global level. In such a mechanism, the bottom-up and network approach is adopted; for example, the UNEP programme for Partnerships in Environmental Management for the Seas of East Asia (PEMSEA) conduct joint monitoring and evaluate the current state of the marine environment and share the reports with international organisations [86] (as provided in Table 1). In addition, effective monitoring programmes exist in the frameworks of OSPAR and Helsinki Conventions. Both the conventions require that state-parties must assemble lists of characteristics, pressures, and impacts related to the marine environment in the regions [97]. Moreover, the efficiency of joint-monitoring programmes is compatible with other programmes within the schemes set down in other EU legislation as an umbrella framework [99].

3.5.3. Capacity Building

Capacity building is common among all the UNEP programmes, provided that there is support for policy dialogue among governments and stakeholders and the development and promotion of good practices in the governance of land-based pollution. There are further activities conducted under the UNEP programmes, including but not limited to the public awareness, education, knowledge management, advocacy campaigns, and database platforms. Such programmes are primarily available through the Convention for the Protection and Development of the Marine Environment in the Wider Caribbean Region (Cartagena Convention), OSPAR Convention, Convention for the Protection of the Natural Resources and Environment of the South Pacific Region (Noumea Convention), and Northwest Pacific Action Plan [92,98,100] (as provided in Table 1). However, there are specific weaknesses regarding public awareness and education in other areas, specifically in the Southeast Asian and South Asian Seas, due to lack of obligation through any legal framework.

3.5.4. Climate Change Adaptation

Ocean acidification and rising sea levels are still with profoundly negative environmental links because the international and regional efforts at the level of climate change are more general [101]. Thus, most UNEP programmes are limited in curbing the land-based sources of pollution. A relatively more minor focus is on the integrated mechanism for climate adaptation strategy in the mitigation of ocean acidification [29]. Although the nation-state-parties under the Regional Convention for the Conservation of the Red Sea and Gulf of Aden Environment (Jeddah Convention), The Convention for Cooperation in the Protection, Management and Development of the Marine and Coastal Environment of the Atlantic Coast of the West and Central Africa Region (Abidjan Convention), Nairobi Convention, Barcelona Convention, and the Noumea Convention share the information regarding rising sea levels (coastal flood risk), they are weak regarding the capacity in implementation of mechanisms for ocean acidification mitigation [23,82,84,90,92] (as provided in Table 1). Thus, in the climate change governance arena, there shall be serious efforts to address adaptation issues in mitigation of ocean acidification and to develop measures specific to address rising sea levels. More strategic responses to climate change and the marine environment are proficiently responded under the Barcelona Convention and Noumea Convention. The nation-states under both the mentioned conventions coordinate through their respective institutions for climate change and oceans for joint mitigation strategies for ocean acidification and sea-level rise.

Climate change is often poorly understood while developing its relationship with ocean ecosystems and requires effective monitoring with learning the marine biodiversity [102]. Ocean ecosystems are even more complex in areas beyond territorial jurisdictions in which the emissions cause more destructive impacts on underwater habitats [103]. Hence, research for continuous learning, information sharing, exploration, and science is essential for better monitoring systems. The role of environmental non-governmental organisations (NGOs), scientific governmental institutions, and academia is crucial in order to provide scientific information related to oceans. At regional levels, therefore, the existing governance systems in their ongoing interactions shall consider the role of the aforesaid institutions. For an effective approach in mitigating the climate change impacts on oceans, shared goals and cooperation among and between the regional and sectoral institutions shall play a key role.

3.5.5. SDGs for Meta-Governance in Regional Coordination for Ocean Governance

The element of multilevel partnerships provided by SDGs for meta-governance is well utilised in UNEP programmes, and the provisions of UNCLOS and IEL support that the primary trend in global ocean governance is an increasing emphasis on regionalism [104]. Regional coordination is an indispensable part of SDG 14 and could be and is used for knowledge and information sharing and capacity building to ameliorate the degradation of

the marine environment and effectively solve common cross-border problems [105]. However, the existing coordination requires expansion of cooperation in water- and sanitation- as well as in waste-management-related activities and programmes as provided under SDG 6 and 11 [106]. Such coordination includes information sharing, monitoring and evaluation, capacity building for desalination and efficiency improvement of water ecosystems, and wastewater and waste treatment through recycling and reuse.

The discernible and recent challenge in ocean governance is disconnection among regional coordination mechanisms on marine and atmospheric environments [107]. However, the primary challenge already points to the same approach that the UNFCCC and its associated regimes can create for ocean and climate networks through harmonisation among existing governance arrangements [108]. Indeed, the SDGs for meta-governance have provided means to reorganise the existing processes and structures that shall allow international organisations, such as UNEP and IPCC, along with regional and national institutions and stakeholders, to make mutual adjustments in their ongoing work. It is further anticipated that such cooperation could provide a channel of dialogue among nation-states to restore and preserve the larger ecosystems by means of utilising regional governance.

3.6. Mechanisms of Ocean Governance at National Levels

A number of nation-states have in the recent decade taken concrete steps to evolve and implement an integrated vision of ocean governance under the UNCLOS and IEL [15]. The integration, however, is limited to the policy-making processes or within the policy itself and lacks coordinated implementation mechanisms [109]. Inter-governmental ocean governance is vertically oriented, seeking enhanced coordination and communication between several institutions, including local institutions. Such a realm of adaptation is especially pertinent to developed nation-states in which there is a certain level of flexibility in ocean governance [109–111]. In this context, at national levels, polycentricity exists; the institutions directly or indirectly governing oceans get involved in implementation but without or with weak coordination. SDGs for meta-governance, while realising the existing approaches, call for more scientific and participatory decision making to ensure that there is a more holistic approach in implementation mechanisms [13]. Moreover, SDGs for meta-governance provide effective means of implementation by developing and strengthening the notions of law, accountability, and transparency in existing institutions [112]. Decisive, accountable, and transparent institutions would provide open and stable implementation mechanisms for ocean governance and work for more coherent policies or plans [113].

3.6.1. SDG 16 for Ocean Governance in Development of Strong Institutions (Rule of Law, Transparency, and Accountability)

The rule of law, transparency, and accountability are principles that necessitate certain instruments for regulation, standards, and sanctions and are used repletely in the theory and practice of UNCLOS and IEL [38]. SDG 16, however, has connected the principles by requiring that the instruments that are basically for impartial implementation of law further need to establish transparent and accountable mechanisms [112,114] (as provided in Table 2). For example, the "polluter pay" principle with concepts of liability and compensation brings the economic force on the problem of environmental protection and in any such implementation, different institutions are involved at different levels [115]. In this context, ocean governance as an opaque mechanism involving various institutions that may compete in various circumstances confuses fulfilling the given duties.

Table 2. Elements of SDGs for Meta Governance and their Connections with Elements of National Mechanisms of Ocean Governance.

Elements of SDGs for Meta Governance	Principles	Legal Framework	Exemplars
Strong Institutions	Rule of Law [17,38] Transparency [116,117] Accountability [118]	UNCLOS and Aarhus Convention.	Canada's National Programme of Action for Marine Environmental Protection

Table 2. *Cont.*

Scientific Decision Making	Participation [97,119] Inclusiveness, Representativeness, Responsiveness [116] Systemic integration [116]	UNCLOS, Aarhus Convention, and Biodiversity Convention.	Fiji's Marine Pollution Law Series under Pacific Regional Waste and Pollution Management Strategy 2016–2025
Policy Coherence for CBDG	Adaptation (Holistic and ecosystem-based approach) [34] Precautionary approach [120,121]	Soft Law Declarations and Biodiversity Convention.	Basic Plan on Ocean Policy of Japan The Marine Environment Management Act of Korea Medium and Long-Term Development Plans for Addressing Climate Change in the Marine Field (2011–2020).

As provided by the UNCLOS, the nation-states have the right to decide the best and practicable means at their disposal and follow their capabilities to prevent and control marine pollution [122]. In many nation-states, this problem is responded to by environmental institutions and non-government organisations (NGOs) through available information, enabling them to hold development institutions to account for progress [123]. The recent ocean policy development in Canada is an excellent example of having strong institutions, such as the Environment Canada, which works in close collaboration with Fisheries and Oceans Canada and local institutions to protect the marine environment [124–126]. The policy is designed to re-arrange the polycentric arrangement under Canada's National Programme of Action, establishing that the institutions can conduct a more impartial implementation of the law through greater transparency and accountability because marine environmental protection is a shared responsibility. For such purposes, Environment Canada, through local institutions, applies the "polluter pay" principle and works with private stakeholders to arrange large-scale recycling of waste [127].

3.6.2. SDG 16 for Ocean Governance in Developing Processes for Scientific Decision-Making (Responsiveness, Inclusiveness, Participation, and Representativeness)

Scientific decision making under SDG 16 is substantial in ocean governance, and it requires broad participation, inclusiveness, and representativeness of institutions and public and private organisations [19,114] (as provided in Table 2). Oceans are a universal common; their governance is based on broadening and strengthening participation at the global level and demands local participation through national and regional mechanisms [128]. Within the nation-states, multiple actors bring their ideas for their own interests, which emerges in a shared vision because a participatory process to prevent, control, and mitigate adverse impacts on the marine environment helps to restore the global ecosystems [129,130]. As emphasised under UNCLOS and IEL, scientific decision making needs to consider the relevant interests of all the stakeholders in oceans with consensus, and all the participants should be aware of these processes [38].

At the national level, scientific decision making also enhances the institutions' responsive capacity in a manner bringing out competitive advantage [17]. It is a continuous, iterative, and dynamic process to allow adaptations among diverse but common ecosystems [131]. Moreover, it works through a transparent system that enables the environment for accountability and impartial implementation of the law [132]. For example, in Fiji, under the marine pollution law series programme, the ministry of environment and its constituent institutions makes decisions with participation that influence stakeholders, and it is based on a common agreement [133–135]. Through this approach, the Fijian ministry of environment responds appropriately to the marine pollution issues by involving various institutions working for diverse ecosystems. This law series in Fiji is developed under the Noumea Convention and the Cleaner Pacific Strategy (Pacific Regional Waste and Pollution Management Strategy 2016–2025) and is undoubtedly essential in managing land-based pollution by involving various stakeholders and institutions [136].

3.6.3. SDG 17 for Policy Coherence for CBDG of the Oceans

As already established, an effective ocean governance mechanism places further requirements of a coherent policy. However, the policy coherence under SDG 17 does not mean integration, and it means enhancing rationality in order to address the systemic issues [113]. Therefore, practical conduct of scientific decision making under IEL is conducted through the principle of "systemic integration", which requires harmonisation in diverse policy instruments for common goals [114,137] (as provided in Table 2). Nevertheless, harmonisation is for planning through existing policies. In this context, the holistic, ecosystem, and precautionary approaches are very important and recognised as rules of UNCLOS and IEL for marine environmental protection and are driving forces for the governance mechanisms [24,138,139]. Thus, integrated ocean governance in preserving the marine environment has been identified as interlinking sectoral governance (of water-ecosystems, sanitation, waste, and climate with oceans) [140].

The given approach requires a mixture of bottom-up and top-down methods of intersectoral governance to preserve the marine environment [141]. Multiple institutions and stakeholders become involved in decision making and form a network for implementation because numerous sectors are regulated independently by diverse institutions and under different rules and procedures [142]. Adaptation to respond to any such issues through holistic and ecosystem approaches is a recognised rule of IEL and is defined as the integrated governance based on knowledge of ecosystem dynamics to achieve sustainable development and ecosystem integrity [143]. Such an approach has many implications for ocean governance, and the need is to establish effective marine pollution monitoring [39]. The programme for ocean governance shall be designed to meet clear goals by providing solid information through multiple institutions. Basically, adaptation has the implicit normative aim to organise institutional framework to preserve ecosystems in multiple ocean governance problematic conceptualisations. Therefore, adaptation forms a network of institutions in ocean governance, those directly or indirectly get involved in marine environmental protection.

In order to resolve the uncertainty related to adverse environmental impacts on the marine ecosystem, a precautionary approach is necessary [34,119,121]. It is for effective prevention against degradation of the marine environment, and it requires where there are threats of serious and irreversible damage, scientific certainty shall be used. Moreover, if it is acknowledged that the risk is irreversible, then preventive action is applied to avoid degradation to the marine environment [144]. This approach has also been forwarded through the Jakarta Mandate by stating that the precautionary principle and ecosystem-based approach are applied to the marine environment through integrated governance of local and national institutions [72]. The ambitious approach of the Jakarta Mandate reflects that CBD link restoration and conservation in every sector calls for major changes in existing programmes, and its practices in nation-states are discussed below.

CBDG of Oceans, Water-Ecosystems, Sanitation, and Waste

The local institutions conduct the governance of sanitation and waste in the nation-states (also referred to as municipal authorities or councils). Several nation-states recycle waste, dump the unrecyclable to landfill sites, and treat sanitation water so that it can flow with the freshwater falling in the oceans [145]. This employs a certain level of responsibility to local institutions and forms their relationship with national environmental or ocean governing institutions [116]. For example, in China, the local environmental protection institutions directly under the Central Government governs the waste and sanitation and responsible for organising, coordinating, overseeing, and checking the marine environment in collaboration with the central ocean governing institution (China's State Oceanic Administration) [111].

Further examples of this aspect can be found in Japan and Korea. The Basic Plan on Ocean Policy of Japan and the Marine Environment Management Act of Korea insists the local institutions must coordinate with relevant administrative institutions for marine

environmental protection from land-based sources of pollution [110,146]. The governing systems have incorporated the laws for waste and sanitation in the marine environmental protection regimes with an ecosystem approach [147]. The expansion of the legal regimes is now starting to come about because responses are being demanded to question the need for conservation of the marine environment through the need for more ocean anti-pollution measures.

In relation to land-based pollution control, the objective of any national legislation is to ensure that pollution levels are not so high as to cause harm to the marine environment [141]. Although these objectives of marine environmental protection are not necessarily complementary, they may interfere or compete. For example, sanitation and water governance intersect at different levels, while flowing down to the sea overlaps with ocean governance [148]. This requires a sizeable integrated mechanism of governance, which must govern water ecosystems, sanitation, and oceans. However, in most nation-states, the mechanisms of water governance are limited and do not necessarily involve the local institutions.

CBDG of Atmospheric-Environment and Oceans

Generally, nation-states have already taken several measures in tackling climate change under the UNFCCC and its associated regimes [149]. Even in the developing states, there are significant policy-driven initiatives to reduce emissions and promote the environment-friendly installation of energy. For example, in Pakistan, recently there has been constituted a special institution (Alternative Energy Development Board) at the national level, which provides subsidies for the development of renewable means of energy [150]. The climate policy of Pakistan has promoted several initiatives for green energy and aims to reduce the significant amount of coal- and petroleum-based energy projects [151,152]. Similarly, China has devised a special policy in the field of atmospheric environmental governance that stipulates the standards, statistics, monitoring, and low-carbon technology of emissions.

However, the UNFCCC remains incapable of inducing effective governance mechanisms at national levels to curb ocean acidification and rising sea levels. Although solving the interconnected problems does not require new legislation or institutions, it demands co-operation between the institutions governing atmospheric and marine environments [153]. There already exists a reflection of synergies in the UNFCCC with UNCLOS that prompts the requirement of national action for ocean acidification [154]. Such synergies require cooperation in monitoring sea level and ocean levels between the climate, local, and ocean-governing institutions. Given that, China has taken the lead in this task through a policy document, "Medium and Long-Term Development Plans for Addressing Climate Change in the Marine Field (2011–2020)" [107]. Further good examples are the United States of America (USA) and Australia, as both have recently developed a nested mechanism within governance structures related to climate policy and ocean acidification [155,156].

The required cooperation also highlights the importance of leveraging efforts that better align international climate and ocean governance with national capacities [156]. At national levels, warning and emergency response to rising sea levels with an information-sharing mechanism shall advance global climate governance and guide ocean problems. The two pertinent national examples given in this section are China and the USA [157]. The two most significant contributors of emissions can possibly be key players if they render their efforts to mitigate climate change. Joint schemes for the promotion of renewable energy, emission trading, and regional energy interconnections may provide effective solutions [158].

4. Meta-Governance-Bottom-Up Approach in Ocean Governance: Ocean Action Is Local

The existing sequence of ocean governance is vertical from the international level down to the national level; this has resulted in a patchwork of regional MEAs and national policies on different levels [159]. This fragmentation in ocean governance mechanisms at

global and regional levels is because of the crumbling processes of negotiations for IEL and has caused gaps in implementation. The idea of integrated ocean governance exists within the legal system and is subject to transfer into the domestic policies, and existing mechanisms provide only sectoral governance structures [160]. The existing practices among nation-states in ocean governance are still source based, specifically responsive rather than protective, and are a combination of polycentric national-level arrangements [161]. Most of the international and regional frameworks for ocean governance are flexible and leave the prescriptive targets and detailed descriptions to nation-states [142]. Furthermore, the institutional framework is composed of administrative mechanisms that include limited coordination and cooperation between the institutions that directly or indirectly protect the marine environment [162]. In order to avoid the fragmentation of decision-making and exclusion of stakeholders as well as in implementing an ocean governance framework, the approaches provided under SDGs for meta-governance with UNCLOS, IEL, and Regional MEAs for coordination and cooperation should be taken into consideration [105].

SDGs for meta-governance envisions the holistic and ecosystem approaches that work as direction or even driving force for the system and shall be accorded for meta-governance-ocean-framework [13]. The elements provided for coordination are the nation-states' impetus in focusing on the broader notion of the marine environment as an ecosystem rather than on specific types of marine pollution. This development seems to be in response to the broad obligations imposed generally by UNCLOS and IEL, such as Rio and Johannesburg Declarations and Jakarta Mandate, and reinvigorated through SDG 14. SDG 14 is internationally codified with the IEL and is the realisation that a wide range of land-based activities, including emissions, impacts marine ecosystems' functioning [60]. The predictions of the UN are now more sharply in focus and suggest that the sectoral approaches to the marine environment were with meaningful shortcomings [163].

Furthermore, SDG 14 opened the stage for international, national, and local ocean actors to coalesce and propose ocean actions to tackle the effects of land-based pollution and emissions [164]. As it has already been recognised, vast oceans can absorb the waste, and local institutions do not have enough sites available for mounting disposal of waste. Thus, more cooperation is required at local levels from national and regional levels. Moreover, the objectives of the UNFCCC and associated regimes need institutionalisation at the local level with specific targets that can be coaligned under SDG 13 and 14 [165]. The responses shall be levelled here through nation-states and in becoming conservation oriented and regionally cooperative. This shall also highlight the importance of leveraging sustainability efforts through the assistance of technical means to reduce and recycle waste that better align global governance capacities with local capacities as provided under SDG 6 and 11 [21]. The provided considerations support the development of compatible programmes while fostering robust partnerships among local institutions.

Based on the aforesaid, ocean governance under SDG 14 needs national and local governmental interdisciplinary adaptation, wherefore IEL emphasises the need for coherence of national ocean policy to develop coordinating programs for preserving the marine environment [166]. Each nation-state needs to find out or further develop plans and programmes of effective implementation for SDG 14 while combining the development of strategies at local levels with the UNCLOS and IEL [17]. Within each nation-state, local institutions span across jurisdictions that can facilitate coordination between national and regional ocean-related institutions and promote a collaborative decision-making system linking all ocean stakeholders, including international institutions [162]. There shall be specific targets at local levels given by national, regional, and international institutions on monitoring of progress and against these targets by the comprehensive indicator set could be achieved [140]. An additional requirement is an appropriate reflection of the interdependence between the atmospheric and blue economies based on productive marine ecosystems [22].

In the achievement of SDG 14 through regional implementation, the explicit endorsement provided by the targets 17.16 for regional partnerships and 16.a for the international

capacity building provided under targets and indicator set of SDGs is critical for regional ocean governance [9,25,30,128]. The given targets provide means to share information and technology, conduct joint monitoring and evaluation, and strengthen the relevant national institutions through regional cooperation. These targets to minimise and address the impacts of ocean acidification, rising sea levels, and reduce land-based pollution through enhanced scientific cooperation at regional levels require (as provided in Figure 3):

1. (SDG 13.1) Promotion of mechanisms for raising capacity and strengthening resilience and adaptation for effective climate change-related governance in all countries [11,165,167];
2. (SDG 11.a) Positive environmental links by strengthening regional governance [9,166]; and
3. (SDG 6.3, 6.5, and 6.a) Implementation of integrated water resources governance through transboundary cooperation and through expanding international cooperation and capacity-building support in water- and sanitation-related governance, including water harvesting, desalination, water efficiency, wastewater treatment, recycling, and reuse technologies [9,168].

At the national level, a much broader, ecosystem-based approach is required for SDG 14 provided under the targets 16.3 for promoting the rule of law to ensure equal access to environmental justice, 16.6 for developing effective (accountable and transparent) institutions, and 16.7 for scientific (responsive, inclusive, participatory, and representative) decision making [9,13,38,166]. The set targets for SDG 14 are also provided by UNCLOS and IEL and are applicable to address adaptive governance of atmospheric, terrestrial, and ocean ecosystems by the provision of the following means (as provided in Figure 3):

4. (SDG 13.2) Integration of climate change policies into national planning and resilient and adaptive capacity to tackle climate-related hazards [107];
5. (SDG 11.6) Reduction of the adverse per capita environmental impact of cities, including by paying special attention to the governance of atmospheric environment and municipal and other waste [145]; and
6. (SDG 6.3, 6.5, 6.a, and 6.b) Participation of local communities in improving governance of water and sanitation and improvement in water quality by reducing pollution, eliminating dumping and minimising release of hazardous chemicals and materials, halving the proportion of untreated wastewater, and substantially increasing recycling and safe reuse globally [9,139].

The areas of policy coherence under SDG 17.14 with the principles of systemic integration, adaptation, and precaution shall establish (as provided in Figure 3):

7. Regional monitoring system through cooperation in information sharing and evaluation of ocean health by an adequate set of indicators for measuring ocean health at the local level to comprehensively assess the progress [169];
8. Intergovernmental review systems through a continuous system to consider the progress of implementation of any marine environmental programme through local institutions and ocean-related institutions at the national level, compared with the results of the assessments, to provide directions in responding to new challenges and ensure that existing initiatives are coherent and performing effectively [125,170];
9. Mechanisms to organise and expedite the exchange of capacity building techniques, information, experience, and expertise to help local institutions through regional cooperation in mitigation of land-based sources of pollution and national institutions for reducing emissions [128,165];
10. Scientific decision making by involving the institutions directly or indirectly involved in ocean governance [171];
11. Plan of action at national level considering UNCLOS, IEL, and Regional MEAs as well as the documents defining objectives, such as indicator set of sustainable development goals, with policy coherence in the protection of the marine environment with diverse ecosystems as provided above [71]; and

12. Constitution of mechanisms to diagnose problems through coordination among national and local institutions in identifying appropriate solutions for mitigation of marine pollution and providing appropriate solutions of the problems through institutional coordination for providing minimum safe standards supplementing the targets of emissions to maintain ocean health and conducting a scientific assessment of the marine environment on periodical basis at national level by involving all the relevant institutions [171,172].

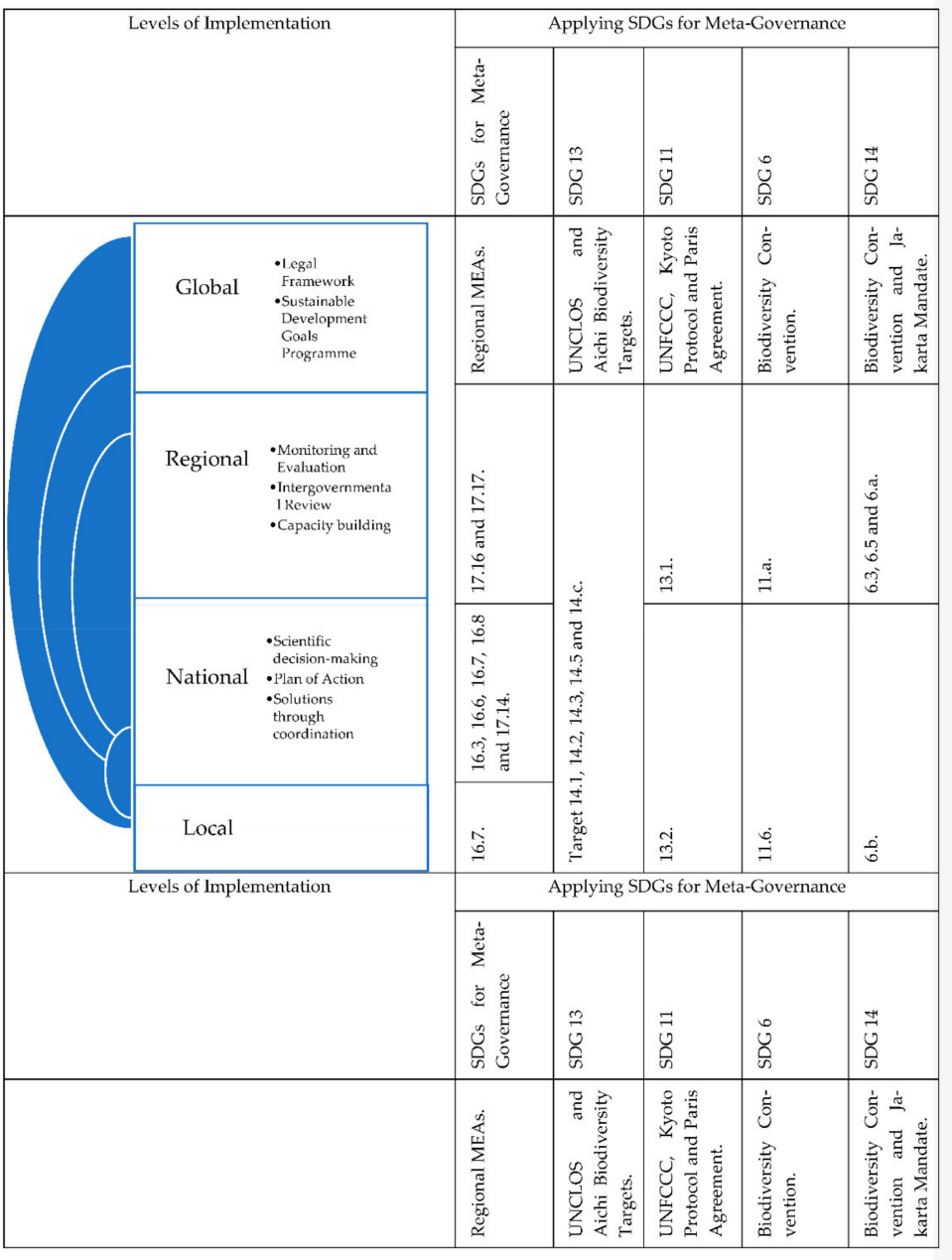

Figure 3. Meta-governance of the oceans under the indicator set of SDGs.

5. Conclusions

As evident from the above analysis and discussion, innumerable literature has focused on ocean governance with the approach of "oceans as common community's interest" with the principles of *erga omnes* and *ius cogens*. Such literature suggests that the treatment of SDG 14 through ocean governance as a policy issue is virtually about disconnected silos, and due to absence of plans and programmes, creates a clear need for re-arrangement.

All the existing processes and structures allow international and regional organisations, nation-states, and stakeholders to make mutual adjustments in their ongoing work. The literature also suggests that policy coherence, strong institutions, scientific decision making, and regional partnerships shall reflect the ecosystem-based approach in ocean governance and address with great care the substitution between atmospheric, terrestrial, and marine environments.

Hence, it could be assumed that the structure of ocean governance in future shall be based on the idea of "the ocean as a global common pool of resources and a space of shared responsibilities", which essentially seeks stable and equitable geopolitical power. The perception of a need for change that motivated SDG 14, consisting of environmental targets, links it with all SDG 6, 11, and 13, comprehensively redressed through a meta-governance framework. Plans and programmes by using innovative policy instruments and extending efforts to mainstream impacting governance mechanisms at national levels are essential for marine environmental protection. Identification of new pathways for ocean governance requires examining and developing specific legal rules and flexible plans, considering that international cooperation is essential for the advancement of the institutionalised mechanisms. A complex web of binding and nonbinding strategic frameworks of ocean governance exists at global and regional levels. Mainly, the UN specialised agencies wholly or partially involved in ocean affairs under the UN-Oceans is a good example of network governance. Thus, regional cooperation, particularly on the commons, looks like a possible alternative that could work as a provisional arrangement for ocean governance in the near future.

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The Implementation of the Precautionary Principle in Nuclear Safety Regulation: Challenges and Prospects

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Abstract: The precautionary principle has been implemented in many fields including environment protection, biological diversity, and climate change. In the field of international nuclear safety regulation, the implementation of this principle is in an ongoing process. Since Japan declared to discharge Fukushima nuclear waste water into the ocean, the precautionary principle was put on the stage, and some debates are invoked on it. As is observed by this article, the precautionary principle has not been effectively implemented in nuclear safety regulation, specifically in nuclear safety law making, law enforcement, and judicial application. The reasons can be found from two main challenges: indeterminacy of perceived risk level required to justify precautionary action and hard balance of national interest and community interest in nuclear safety. In a long-term perspective, the framework of international nuclear safety regulation has to respond to these challenges, both by clarifying the precautionary principle in legal binding nuclear safety documents and moving towards a more transparent, fair, and effective enforcement regime in order to promote safer, more sustainable, and efficient civilian nuclear utilization around the world.

Keywords: the precautionary principle; nuclear safety regulation; community interest; UNCLOS; international law

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1. Introduction

The civilian applications of nuclear energy are widespread in the contemporary word, among which, the development of nuclear electric power has attracted significant public and private investment [1] (p. 36). Nuclear power stations use nuclear fission to generate energy, and the reactors use nuclear fuel, the atoms of which are split in the process of fission, releasing a large amount of energy. However, the operation of nuclear installations is a process with high risk. In human history, there were several significant nuclear accidents, such as the Windscale Reactor accident in 1957, the Three Mile Island accident in 1979, the Chernobyl accident in 1986, and the Fukushima Daiichi nuclear accident in 2011. These accidents occurred in different areas but caused direct, indirect, material, invaluable, or trans-boundary damage. All these accidents raised great global concern on nuclear safety and aroused people's fear of nuclear power [2] (p. 1938).

Ten years after the 2011 Fukushima accident, on 13 April 2021, the Japanese government decided to start releasing treated radioactive water from the wrecked Fukushima nuclear plant into the Pacific Ocean two years later [3]. Divergent standpoints rose on the same event. The US [4] and officers of IAEA [5] supported the decision immediately. In contrast, South Korean [6] and Chinese authorities [7] expressed serious concern and began to discuss the legality of this decision. The Tokyo Electric Power Company ("TEPCO") demonstrated that the nuclear wastewater from Fukushima accident would be treated in multinuclide removal equipment ("ALPS") before being released and claimed it will not damage the environment [8]. Although there are still doubts involving the possible negative consequences caused by the released nuclear waste water [9], current scientific evidence is not comprehensive enough to demonstrate that the nuclear waste water release

will damage human health and the ocean environment. A lack of well-recognized scientific evidence makes the precautionary principle particularly relevant in this case. The disagreement on the nuclear waste water recharge behavior provides a good chance to reconsider how the precautionary principle works to manage environmental and human health risks in nuclear safety fields. With this background, this article is not intended to discuss the scientific debates behind the nuclear waste water release but to focus on some legal issues: what role the precautionary principle plays in nuclear safety regulation and whether it has been implemented effectively, and, if it is not the case, why and how can we change the situation?

In the following part, this article will firstly review the relevance of the precautionary principle to nuclear safety regulation. Then, a primary evaluation of implementation of the principle during the nuclear safety law making, law enforcement, and the judicial application processes is provided. The evaluation results reveal that the precautionary principle has played a limited role in nuclear safety regulation in the last few decades despite its increasing significance. Subsequently, some key challenges accounting for the weak implementation of the principle are discussed in the next part. Lastly, this article will provide some insights on possible development and reformation prospects from legislation to law enforcement to enhance the implementation of the precautionary principle in international nuclear safety regulation.

2. The Precautionary Principle and Nuclear Safety Regulation: An Overview

2.1. Risks during Civil Nuclear Energy Production

Risks surround virtually every aspect of civil nuclear energy production. As no industry is immune from accidents, the nuclear energy industry is no exception. The first aspect is the reactor safety. There have been evolving technologies on reactors since the inception of nuclear power on an industrial scale in the mid-20th century. The Three Mile Island, Chernobyl, and Fukushima accidents were all reactor accidents and demonstrated that reactors used in these plants were not safe enough [10,11] (pp. 2, 1236). Nuclear fission reactor technologies have developed from Generation I to Generation III, and Generation IV is under research and projected to be deployed after 2030 [12] (pp. 325–343).

The second is decommissioning and clean-up, which involve programs to decontaminate, decommission, and clean up legacy facilities. Relevant technologies include robotics, radionuclide detection, and understanding the chemical, physical, and mechanical nature of the waste forms and their likely interactions with the materials in which they are encapsulated [13] (p. 175). Limitations on human knowledge on the qualities of nuclear atoms and the effects of radiation contribute to uncertainty during this stage.

The third is nuclear waste and spent fuel management and disposal, which encompass a sequence of activities from the management of spent fuel in nuclear reactors to the safe disposal of the unusable radioactive substances [14]. Scientists have revealed some defects in management of spent nuclear fuel by drawing lessons from the Fukushima accident [15] (p. 1225). For example, interim storage of spent fuel needs to be rethought, as densely packed spent fuel in pools may pose a radiation-release risk. Moreover, a long-term plan for the disposal of nuclear waste is required for nuclear energy production projects. In short, the way to manage spent fuel and nuclear wastes requires further examination, careful planning and well-executed policy.

2.2. The Precautionary Principle as a Tool to Manage Risks

The precautionary principle tells people what to do beyond the current state of knowledge and technology. It traces back to the German concept "Vorsorgeprinzip". The concept was included in German environmental policy in the 1970s [16]. The precautionary principle has become increasingly prevalent in international environmental law since the 1980s [17,18] (pp. 9, 297). There are different versions of the precautionary principle in different documents, among which the most famous one is principle 15 of the Rio Declaration on Environment and Development ("the Rio Declaration"). From these versions,

scholars abstracted the core elements of the precautionary principle. Arie Trouwborst called "threats; uncertainty; actions" as Apollo's Tripod [19]. Per Sandin proposed four dimensions of the precautionary principle, including the threat dimension, the uncertainty dimension, the action dimension, and the command dimension [20]. Deborah Katz listed four fundamental elements for the precautionary principle: level of risk, action to take, acknowledgment of benefits, and level of uncertainty/lack of consensus [21] (p. 957). Despite different views on the definition and elements, the essence of the principle is common and simple: Uncertainty should not be a reason for inaction in the face of serious environmental threats [22] (p. 11333). Daniel Steel called this essence a meta-precautionary principle and viewed it as the fundamental part of the principle [23] (p. 9). The precautionary principle functions as a framework of fundamental regulatory policies and provides broad guidelines to guide the formulation of more specific laws and public policy [24] (p. 29). It embodies that anthropogenic harm to human health and the environment should be avoided or minimized through anticipatory, preventive regulatory controls [25] (p. 13). The status of the precautionary principle in international law has been argued for many years. Some scholars hold the view that the precautionary principle has become customary international law [26,27] (pp. 262, 229–235), while others believe that it is still an emerging customary international law [28] (p. 88). Most scholars accepted it as a principle of law [29–32] (p. 57, p. 54, p. 6, p. 4), although it has no universal binding force itself and needs to be implemented through legally binding documents [16] (p. 22).

The precautionary principle is of immediate and widespread relevance in the nuclear safety context: firstly, it is a fact that human society has accepted risks brought by nuclear power in exchange for the gained benefits. It means the society has to pay for the costs and deal with the risks. Consequences of mass nuclear release after accidents can be devastating to both the environment and human lives, so measures should be developed by states and other actors to prevent nuclear accidents before accidents happen [33] (p. 721). Secondly, states have the responsibility of avoiding risks, especially when the decision may have a global impact. When states have to make decisions on construction of nuclear plants or management of nuclear wastes, a precautious and prudent consideration of environment is necessary, because these decisions pose risks to the rest of the world. Lastly, the requirement of sustainable development also makes it natural to implement the precautionary principle in nuclear safety. The realization of sustainable development requires the incorporation of environmental considerations in each industry. States are required to take actions to prevent the harmful impact to the environment in developing nuclear energy.

3. A Preliminary Evaluation of the Implementation of the Precautionary Principle in Nuclear Safety Regulation

3.1. The Implementation in Nuclear Safety Law Making

Current international nuclear safety law and other normative instruments were shaped by significant accidents and disasters in the past [34], with most of the documents adopted under the host of International Atomic Energy Agency ("IAEA"). During a reflection on how to avoid these accidents, the idea of precaution emerged and developed gradually. At the very beginning, preventive ideas dominated civilian nuclear safety regulations. It was not until the end of 1980s, prompted by the waves of environmental campaigns worldwide and reflections to the Chernobyl accident, that the precautionary principle began to be incorporated in international nuclear safety documents.

The implementation of the precautionary principle in IAEA documents has undergone four stages.

In the first stage, initial nuclear safety guidelines only reflected preventive ideas. After the Three Mile Island accident, IAEA began to consider development of an assistance framework for nuclear accidents since 1982. With continuous efforts, IAEA published two guidelines in 1984 and 1985: Guidelines for Mutual Emergency Assistance Arrangements in Connection with a Nuclear Accident or Radiological Emergency ("Mutual Emergency Assistance Guidelines"), and Guidelines on Reportable Events, Integrated Planning and Information Exchange in Transboundary Release of Radioactive Materials ("Integrated

Planning and Information Exchange Guidelines"). Aimed at prevention of radiological consequences of nuclear accidents, the two guidelines marked a start of notification and assistance regimes in nuclear safety regulation. Although these guidelines do not impose any legal obligations on states, they appeal to prevent serious consequences of nuclear accidents and promoted adoptions of regional and bilateral treaties to enhance nuclear safety such as the 1963 Nordic Mutual Emergency Assistance Agreement [35] (p. 658).

In the second stage, Convention on Early Notification of a Nuclear Accident ("the Early Notification Convention") and Convention on Assistance in the Case of a Nuclear Accident ("the Assistance Convention") made a breakthrough from preventive logic towards precautionary logic. A few months after the Chernobyl accident, in September 1986, IAEA prompted the conclusion of the two important conventions. A precautionary idea is shown in article 1 of the Early Notification Convention, which stipulates that the convention shall be applied "in the event of any accident from which a release of radioactive material occurs or is likely to occur and which has resulted or may result in an international trans-boundary release that could be of radiological safety significance for another state" [36]. Different from previous guidelines, the Early Notification Convention requires contracting parties to notify before a radiological release may occur, which means that potentially affected states are entitled a legal right to obtain information and assistance.

In the third stage, the precautionary principle was defined in a more explicit way. In June 1992, Agenda 21 was launched at the United Nations Conference on Environment and Development. Article 5 of chapter 22 of the agenda, under the title of "safe and environmentally sound management of radioactive wastes", says,

> "*Not promote or allow the storage or disposal of high-level, intermediate-level and low level radioactive wastes near the marine environment unless they determine that scientific evidence, consistent with the applicable internationally agreed principles and guidelines, shows that such storage or disposal poses no unacceptable risk to people and the marine environment or does not interfere with other legitimate uses of the sea, making, in the process of consideration, appropriate use of the concept of the precautionary approach* [37]."

The precautionary approach relates to the precautionary principle closely. It is thought that generally they are the same in meaning and can be replaced by each other [38] (p. 239).

In the same year, IAEA began drafting a nuclear safety convention and organized an extended group of technical and legal experts from almost fifty states and international organizations such as the European Commission, the Organization for Economic Co-operation and Development ("OECD"), and the Nuclear Energy Agency [39]. Two years later, the Convention on Nuclear Safety was open to signature. The convention recognizes the great safety risks posed by nuclear facilities due to the magnitude of stored energy and the inventory of radioactive isotopes, and it also establishes a comprehensive framework to ensure the safety of nuclear installations. The precautionary principle was reflected in many provisions. Firstly, article 1(3) of the Convention on Nuclear Safety defines that one of its objectives is to "prevent accidents with radiological consequences and to mitigate such consequences should they occur", which is consistent with the "uncertainty" dimension of the precautionary principle. Secondly, in the preamble, the convention defines the purpose to ensure the use of nuclear energy to be "safe, well regulated and environmentally sound", which means there are "threats" if the nuclear energy safe use is not well regulated. In the preamble, it also states that "accidents at nuclear installations have the potential for trans-boundary impact", and according to the ordinary meaning, the potential for trans-boundary impacts composes a threat to other states. These expressions reflect the "threats" dimension of the precautionary principle. Lastly, article 14 obligates contracting parties to implement comprehensive and systematic safety assessments before construction and commissioning of nuclear installation, which is consistent with the "action" dimension of the precautionary principle. The requirement of "comprehensive and systematic safety assessments" is to ask states to be precautious before starting nuclear related activities. The standards for "comprehensive and systematic safety assessments" can be found in the

Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management ("the Joint Convention") and systematic safety standards published by IAEA.

In March 1995, the IAEA convened a board of governors, and the group adopted "the Principles of Radioactive Waste Management", which laid a good foundation for subsequent convention negotiations. Two years later, the Joint Convention was adopted in December 1997. Understood as a whole, the Joint Convention also reflects the precautionary principle. It conceives "threats" behind radioactive materials as background knowledge and prohibits the unplanned and uncontrolled release of them into the environment. Furthermore, the "actions" dimension of precautionary ideas lies in the requirement of "systematic safety assessment" in paragraph 1, article 8 of the Joint Convention [40], which is consistent with the Convention on Nuclear Safety. In the following paragraph 2 of article 8, it further stipulates the requirement of safety assessment, "updated and detailed versions of the safety assessment and of the environmental assessment is required to be prepared before the operation of a spent fuel management facility". Other standards for a qualified safety assessment include "International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources (1996)", the IAEA Safety Fundamentals entitled "The Principles of Radioactive Waste Management (1995)", and the existing international standards related to the safety of the transport of radioactive materials, as is listed in the preamble of the Joint Convention [41].

In the last stage, 4 years after the 2011 Fukushima accident, the Vienna Declaration on Nuclear Safety on Principles for the Implementation of the Objective of the Convention on Nuclear Safety to Prevent Accidents and Mitigate Radiological Consequences ("the Vienna Declaration on Nuclear Safety") was adopted by the IAEA contracting parties in 2015 [42]. The declaration emphasizes the deficiency of the effectiveness of the Nuclear Safety Convention [43] (p. 35) and proposes three principles to strengthen its implementation, with "comprehensive and systematic safety assessments" as the second principle. Compared with previous conventions, this document does not go further in terms of implementing the precautionary principle.

It is clear to see the increasing awareness of the precautionary principle in nuclear safety documents during the last few decades. A primary conclusion is that the precautionary principle has been implemented in a flexible way in nuclear safety legislation. The principle is embedded in different terms in nuclear safety documents, although its meaning is not articulated in legally binding nuclear safety treaties or conventions.

3.2. The Implementation in Nuclear Safety Law Enforcement

Current enforcement mechanisms in nuclear safety regulation mainly refer to mechanisms maintained by IAEA. IAEA is responsible for organizing review meetings for contracting parties of the Nuclear Safety Convention every year. Both the Convention on Nuclear Safety and the Joint Convention have established an annual review meeting mechanism. Many issues have been discussed at review meetings in the past. IAEA also set up the Commission on Safety Standards ("CSS"), which is a standing body of senior government officials holding domestic responsibilities for establishing standards and other regulatory documents relevant to nuclear, radiation, transport and waste safety, and emergency preparedness and response. Since its establishment, CSS has convened 50 meetings, and the 51st meeting will be held during 19 to 22 April 2022 [44]. IAEA created the Operational Safety Review Team ("OSART") program in 1982. Until December 2020, IAEA conducted 210 OSART missions at 118 nuclear power plants in 37 Member States [45].

Peer review is a primary way to implement nuclear safety principles and standards. In the context of nuclear safety, peer review is manifested in two different forms: safety review services provided by OSART and review meetings under the nuclear safety conventions [46] (pp. 430–431). However, the review meetings only examine the report submitted by states in a very weak sense. Contracting parties of the Nuclear Safety Convention either did not

submit their national report or did not submit their national report to the secretariat in time to support effective review by other contracting parties [47]. Even if the report is submitted, the validity of data on the report cannot be verified.

Furthermore, the gaps in technology and economic developing level between states make it impossible for OSART to supervise the domestic implementations. Article 8 of the Nuclear Safety Convention stipulates that contracting parties should establish or designate regulatory bodies to implement the legislative and regulatory framework, and these bodies should be provided with adequate authority, competence, and financial and human resources to fulfill its assigned responsibilities. The reality is, for some states, the competence and financial and human resources of regulatory bodies can hardly be guaranteed, so that it is impossible for them to implement the precautionary principle. According to the World Nuclear Association, about 30 states are considering, planning, or starting nuclear power programs, and a further 20 or so states have, at some point, expressed interests. In Asia, major economies including China and India are expanding nuclear energy to help meet their growing power needs. Bangladesh and Turkey have begun construction of their first nuclear power plants, and in Egypt, nuclear power is well into its development phase [48] (p. 1131). These states new to nuclear enterprise may not have the capability to safely manage and regulate civil reactors [11] (p. 1236). Differences in national economic development level imply not all states can support independent, qualified, and responsible regulatory bodies.

These observations reveal that IAEA has weak executive power, and current peer review mechanisms in nuclear safety regulation have many deficiencies. It is not difficult to imagine that not all domestic regulatory bodies will shoulder their responsibility strictly. A natural conclusion is the implementation of the precautionary principle cannot be ensured in such problematic enforcement mechanisms in nuclear safety regulation.

3.3. The Implementation in International Judicial Application

The judicial application of the precautionary principle in nuclear safety has been dealt with by international tribunal in the mixed oxide fuel ("MOX") plant case between Ireland and the UK. In late October 2001, Ireland instituted proceedings against the UK and required the adjudication of the tribunal under the arbitration provisions of the United Nations Convention on the Law of the Sea ("UNCLOS"). Before the arbitral tribunal was set up, Ireland also submitted a request that the International Tribunal for the Law of the Sea ("ITLOS") prescribe for provisional measures. The hot debates between the two parties before the tribunal on the precautionary principle as well as the judgement presented whether and how the precautionary principle can be applied in nuclear activities.

In that case, Ireland claimed the UK had a policy of discharging nuclear wastes directly into the Irish Sea by authorizing the MOX plant and thermal oxide reprocessing plant ("THORP") plant to operate, which brought great risks to Ireland and caused pollution in the marine environment. One focus of the debates is whether the nuclear release from the MOX plant and THORP plant comprises an "irreversible or serious harm". Ireland believes the nuclear waste release is no doubt a substantial pollution and the precautionary principle should apply, which means the UK needs to take proper precautionary actions or stop the nuclear release. The arguments of Ireland include: firstly, substantial pollution should be not judged only by volume, but also the continuous and persistent nature and the longevity of the radionuclides [49] (pp. 27–58). Ireland argued that, considering that plutonium was one of the most radioactive materials known to man, the half-life of Pu-229 was 24,065 years, and the discharge was projected to be continuous till 2020 or 2024, so it could cause severe consequences. Then, Ireland provides evidence to show living organisms can be affected even at low dose radiation [50] (p. 57). According to research results by scientists, low dose radiation could cause a pulsed or acute exposure and create a phenomenon of genomic instability and bystander effect [50] (p. 58). With the bystander effect, cells exposed to low and very low doses of radiation can produce a factor that affects the survival and function of unexposed cells. Another study also shows that all daughter

cells of the parent cell had an increased probability of developing a totally unpredictable and random mutation somewhere in the DNA. Some may be lethal. From the perspective of the UK, the fact that radionuclides have a long half-life cannot demonstrate a likelihood of irreparable damage or serious harm [50,51] (pp. 24–31, p. 16–20). The UK defends that during the assessment period (1986–2002), the estimated dose rates to marine biota in the vicinity of Sellafield were found to be even lower than the levels suggested in the literature, at which effects on aquatic organisms at a population level would be unlikely [50] (p. 9). Substantial pollution means the introduction of substances into the marine environment that result or are likely to result in harm, where likelihood means 50.1 per cent or more. If Ireland cannot prove it, the precautionary principle does not apply [50] (p. 84).

On 3 December 2001, ITLOS issued its order. The order shows that ITLOS adopted a constraint attitude to fortify the status of the precautionary principle by avoiding mentioning it in conclusion part. A main reason was that it is not appropriate for ITLOS to decide on it. Nevertheless, judges provided their views on application of the precautionary principle in separate declarations. Most judges believed there was lack of sufficient scientific evidence on possible consequences of the operation of the MOX plant on the marine environment of the Irish Sea [52] (p. 113), and only one judge believed the precautionary principle should apply. Specifically, judge David Anderson, Thomas A. Mensah, and Tullio Tieves believed that the scientific evidence is not substantial enough, and the evidence did not suffice to show irreversible or serious harm to the marine environment so the tribunal should not consider the precautionary principle [53–56]. Judge Rüdiger Wolfrum acknowledged the high relevance of the precautionary principle in this case, and the result of applying this principle would be that "a state interested in undertaking or continuing a particular activity has to prove that such activities will not result in any harm, rather than the other side having to prove that it will result in harm [56] (p. 133)". A different standard can be found from judge ad hoc Alberto Székely, who showed the strongest support for the application of the precautionary principle in this case. In his view, the tribunal should give the benefit of the doubt on the risk of harm alleged by Ireland to Ireland rather than the UK [57] (p. 147).

Overall, by scrutiny of the case, two observations can be listed here: On the one hand, the separate opinions of judges showed applicability of the Precautionary Principle in nuclear safety field, which could benefit the future judicial implementation of the principle in this field. On the other, the debates of parties and the judgement showed the complexity and difficulties to apply the precautionary principle in the nuclear activities, as there are no clear, agreed standards in the principle itself.

4. Key Challenges behind the Implementation of the Precautionary Principle

Having examined the implementation of the precautionary principle in law making, law enforcement, and judicial application, it can be concluded that the principle has not been effectively implemented, at least not in law enforcement and judicial application stages. Before proposing any recommendations to improve the situation, this article identified two key challenges behind current implementation status. One is about the complexity of the principle itself, and the other is about the political willingness.

4.1. Indeterminacy of Perceived Risk Level Required to Justify Precautionary Action

It is known that the precautionary principle aims to deal with serious uncertain risks for the natural environment and public health. However, one of the key challenges of implementing the precautionary principle in nuclear safety regulation is how to draw the line of threshold of precautionary actions.

4.1.1. How to Define Uncertainty and Risks

It is clear that, in the MOX plant case, the two parties had different opinions on whether the precautionary principle can be applied, facing similar scientific evidence. Behind the dispute, the true question is in which level risks perceived in nuclear activities

can justify the precautionary actions to regulate them, and what types of precautionary actions are necessary.

To address the question, firstly, it should be made clear how uncertainty and risks are presented in nuclear related policy-making. Risk is a concept closely related to uncertainty [58] (p. 317). In a social sense, the fact that people need to make decisions under uncertainties means risks are unavoidable. Complexity in practice means a compulsion to select, and contingency means danger of disappointment and the necessity to take risks [59] (p. 25). Wynne clarifies risk as a state that "system behavior is basically known, and outcomes can be assigned a probabilistic value [60]". Risk analysis is a process combined with objective calculation and a subjective estimate of the consequences [61]. In the nuclear safety field, the risks can be characterized by complexity, spatial and temporal extent, potential catastrophe, improbability, diverse uncertainties, plurality of perspectives, and learning-with-time [62] (p. 127).

Considered from a scientific lens, the notion of uncertainty derives from probability theory and quantum physics [63]. In a "post-modern" appreciation of science, uncertainty always exists [64] (p. 501), which is based on the limitation of scientific knowledge and human activities [65] (p. 92). The validity of scientific knowledge may change with time [66]. Due to different development levels of science and technology, the level of uncertainty vary in different fields. There is an entire spectrum of different levels of knowledge, ranging from the unachievable ideal of complete deterministic understanding to total ignorance [67] (p. 11). The certainty of damage brought by radioactive materials are somewhere in the middle. However, one important factor to consider is the increased availability of scientific evidence. A common criticism of the precautionary principle is that it may lead regulators to make bad choices because the public tends to be overly fearful of certain immediate risks that are statistically far less dangerous [68,69] (p. 33, pp. 177–178). This is often not the case today. Firstly, now much more materials are available for the public with the continuous efforts of organizations, such as International Commission on Radiological Protection. The nuclear pollution has become a common debate, which no doubt helps the public to form a relatively objective opinion about nuclear atoms. Secondly, the consequence of radiation on animals and plants has been elaborated by much more sophisticated assessment technologies. Much more evidence is given of the potential impact of radionuclides than in the past, when the MOX plant case was challenged. For example, impact on an organism resulting from a given absorbed dose of ionizing radiation has been experimentally quantified and reported as relative biological effectiveness of specific radiation types [70].

4.1.2. The Strictness of the Precautionary Principle

For policy-makers, uncertainty exists in practically all policy making situations. It cannot be eliminated, but confusion can be arguably best reduced to a minimum by drawing a line using law and policy as a tool [66] (p. 195). Then, a further question is where policy-makers should draw the line of perceived risk level for a defensible precautionary [71] (p. 63), i.e., how strict the precautionary principle should be. After many years' debates, the precautionary principle was classified into strong form and weak form [72] (p. 68), according to the strictness of the requirement of actions [25] (p. 20). In its strong form, where a very low level of perceived risk is permitted, a "morally unacceptable harm" with "scientifically plausibility" will trigger the precautionary principle. By contrast, in its weak form, a larger level of perceived risk is tolerated [73] (p. 10892), and only "threats of serious or irreversible damage" can trigger it.

Deville and Harding proposed a rule to help determine the strictness of the precautionary principle, which is "the more significant and uncertain the threat is, the greater the precaution required [74] (pp. 121–122)". This provides an indication of how to locate the threshold level of the precautionary principle in nuclear safety. In nuclear safety fields, the threat known is increasing, and the uncertainty is decreasing. On the one hand, new impacts of the radiation brought by low dose radionuclides are being better demonstrated

and disclosed. On the other, scientific uncertainty is decreasing a the scientific evidence becomes more sufficient, which means that the precautionary principle allows less uncertainty. Overall, a moderate perceived risk level is required by the precautionary principle. In other words, in nuclear safety, a moderate form of the precautionary principle should be adopted, and the perceived risk level should be between "morally unacceptable harm that is scientifically plausible" and "threats of serious or irreversible damage when lack of full scientific certainty".

4.2. The Hard Balance of National Interest and Community Interest in Nuclear Safety

Another significant challenge to the implementation of the precautionary principle in international nuclear safety regulation is the hard balance between national interest and community interest. A significant deficiency of the current nuclear energy law is that it only encourages states to implement the nuclear safety rules themselves, therefore giving broad discretionary power to policy-makers [44] (p. 28). It is easy to understand the unwillingness of states to pay costs of precautionary actions to assure community interest, especially the interests of potentially affected states and non-nuclear states.

4.2.1. Inconsistency between the Beneficiaries and Risk Takers

In terms of nuclear activities, there is an inconsistency between the beneficiaries and risk takers. An important character of nuclear safety regulation is its special type of decision-making options. The beneficiaries of approval of nuclear facility constructions are nuclear states, mostly developed states [75], while the cost of damage risk is borne by the international community. Compared with other areas such as biodiversity conservation, where "multiple risks" are involved [76], the situation in nuclear safety regulations faced by decision-makers is often a one-in-two choice: "national interest first" or "community interest first". A "national interest first" situation means that states prioritize their economic benefits and the health of nationals. States are motivated to build more nuclear reactors and installations, produce carbon-free electricity, lower the average retail price of electricity, and achieve industrial upgrading. Meanwhile, in terms of risks brought by nuclear accidents and nuclear waste release, they seek to protect their industry and domestic victims [77] (p. 209), regardless of risks posed to the international community. In this way, they can achieve a maximum of national interest. A "community interest first" situation means that, when risks are involved during nuclear activities, states seek to ensure the interest of most vulnerable groups of the world and can take actions to control the threats, even at the cost of prohibition of the nuclear activity.

From a realistic perspective, states always choose to develop their nuclear infrastructures on a self-benefit basis and neglect the environmental interest of the international community. This leads to political maneuvering involving the implementation of the precautionary principle [25] (p. 14). For example, the plants may adopt a wrong way of calculation of radioactivity to make the operation more permissible, and the regulatory bodies indulge them in pursuit of national economic interests. In the MOX plant case, the UK claimed that discharges from the THORP plant were very small, far lower than specific or site limits set in accordance with domestic and European regulations. The doses from the THORP plant were a fraction of 1 percent of natural background radiation [50] (p. 7). Ireland argued that the MOX plant used a wrong method of calculation that underestimated the "total beta" radioactivity actually discharged. It was not based on the Environmental Agency approved method for complex sites such as Sellafield. In this way, it underestimated the "total beta" radioactivity actually discharged. If the accusation of Ireland is true, the behavior of the UK would be a typical example of "national interest first" behavior and infringes community interest.

4.2.2. The Insufficient Protection of Community Interest

Community interest is also not protected adequately under current peer review mechanisms. Under current peer review mechanisms, experts will examine the safety of nuclear

installations and activities according to nuclear safety standards made by CSS. The composition rules of CSS indicate the potential inequality in discourse of standards-making between developed states and less developed states. The discourse power of economically less developed states may be deprived by the cost of participation. According to the rule on CSS conferences, "all costs involved in the participation of each CSS member, including travel and per diem expenses, will be borne by the nominating member State" [78]. It means less developed states may have a poor access to CSS and standards-making. Obviously, the CSS members from developed states will be present on behalf of their national interests. For instance, when they are defining what is "best available scientific information and technologies", they may firstly consider the available technologies in their states. In this case, the difference of development levels among states may lead to a hegemonic standards-making and substantial inequity. Lack of participation of less developed states leads to neglect of their interests. The effective implementation of the precautionary principle in these states is therefore adversely affected.

To conclude, the "national interest first" logic of states hinders the implementation of the precautionary principle in nuclear safety regulation. It necessitates a more effective, fair, well designed implementation framework in nuclear safety fields.

5. Future Prospects for Better Implementation of the Precautionary Principle

As global concerns for nuclear safety and sustainable development increase, the demand to promote implementation of the precautionary principle in nuclear safety will only become more and more strong. The effective implementation of the principle depends on the responses to the challenges mentioned above. Two possible directions can be considered to address the challenges: clarify the precautionary principle in nuclear safety law making and move towards more transparent, fair, and effective law enforcement regimes.

5.1. Clarifying the Precautionary Principle in Nuclear Safety Law Making

5.1.1. The Precautionary Principle Established in Formal Documents of Other Fields

Some scholars criticize the precautionary principle as paralyzing, because it is widely varying, often incredibly vague [79,80] (p. 10790, p. 7). Sonia Boutillon describes it as an "unsettled formulation" [81] (p. 433). A solution is to elaborate the precautionary principle in each specific situation, based on its general meaning under principle 15 of the Rio Declaration. For example, in biological diversity, the precautionary principle has been clarified by Convention on Biological Diversity. In climate change, it has been clarified by 1992 United Nations Framework Convention on Climate Change. It is feasible to define such a principle in nuclear safety regulation. The clarification of the precautionary principle in nuclear safety regulation can refer to the established precautionary rules in other fields such as environment protection.

From Table 1, it can be seen that four provisions involving the precautionary principle are legally binding, which include: article 206 of the 1982 UNCLOS, article 3.3 of the 1992 United Nations Framework Convention on Climate Change, article 3 of the 1996 Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter ("1996 Protocol to the London Convention"), and article 2(2)(a) of the OSPAR Convention. These legally binding documents provide a reference for establishing an exclusive rule of the precautionary principle in nuclear safety conventions.

Table 1. Different Expressions of the Precautionary Principle.

Types of Documents	Name of the Document	Expression	Level of Perceived Risk
Declaration	1987 Ministerial Declaration on Second International Conference on the Protection of the North Sea (Article 7)	"Accepting that, in order to protect the North Sea from possibly damaging effects of the most dangerous substances, a precautionary approach is necessary which may require action to control inputs of such substances even before a causal link has been established by absolutely clear scientific evidence."	possibly damaging effects of the most dangerous substances; before a causal link has been established by absolutely clear scientific evidence
Convention	1982 UNCLOS (Article 206)	"when States have reasonable grounds for believing that planned activities under their jurisdiction or control may cause substantial pollution of or significant and harmful changes to the marine environment, they shall, as far as practicable, assess the potential effects of such activities on the marine environment."	have reasonable grounds; may cause substantial pollution of or significant and harmful changes to the marine environment
Declaration	1992 Rio Declaration (Principle 15)	"In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation."	threats of serious or irreversible damage; lack of full scientific certainty
Convention	1992 Convention on Biological Diversity (preamble)	"Noting also that where there is a threat of significant reduction or loss of biological diversity, lack of full scientific certainty should not be used as a reason for postponing measures to avoid or minimize such a threat."	a threat of significant reduction or loss of biological diversity; lack of full scientific certainty
Convention	1996 Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (article 3)	"Contracting Parties shall apply a precautionary approach to environmental protection from dumping of wastes or other matter whereby appropriate preventative measures are taken when there is reason to believe that wastes or other matter introduced into the marine environment are likely to cause harm even when there is no conclusive evidence to prove a causal relation between inputs and their effects"	appropriate preventative measures; likely to cause harm; no conclusive evidence to prove a causal relation

Table 1. *Cont.*

Types of Documents	Name of the Document	Expression	Level of Perceived Risk
Convention	1992 United Nations Framework Convention on Climate Change (article 3.3)	"The Parties should take precautionary measures to anticipate, prevent or minimize the causes of climate change and mitigate its adverse effects. Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing such measures, taking into account that policies and measures to deal with climate change should be cost-effective so as to ensure global benefits at the lowest possible cost."	threats of serious or irreversible damage; lack of full scientific certainty
Convention	1998 Convention for the Protection of the Marine Environment of the North-East Atlantic ("the OSPAR Convention") (Article 2(2)(a))	the precautionary principle, by virtue of which preventive measures are to be taken when there are reasonable grounds for concern that substances or energy introduced, directly or indirectly, into the marine environment may bring about hazards to human health, harm living resources and marine ecosystems, damage amenities or interfere with other legitimate uses of the sea, even when there is no conclusive evidence of a causal relationship between the inputs and the effects.	reasonable grounds for concern; take preventive measures; hazards to human health, harm living resources and marine ecosystems
Report of Non-Governmental Organization	1998 Wingspread statement	"When an activity raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause and effect relationships are not fully established scientifically."	raises threats of harm to human health or the environment; cause and effect relationships are not fully established scientifically
Report of United Nations	2005 COMEST report	"When human activities may lead to morally unacceptable harm that is scientifically plausible but uncertain, actions shall be taken to avoid or diminish that harm."	may lead to morally unacceptable harm; scientifically plausible but uncertain

5.1.2. Reference Significance of Article 206 of UNCLOS

Actually, the purpose of nuclear safety regulation entails the consideration of marine environment protection. There are some similarities between environment pollution and nuclear radiation. For example, nuclear release seems to comprise pollution under UNCLOS. Article 1 of UNCLOS defines:

> "*Pollution of the marine environment" means "the introduction by man, directly or indirectly, of substances or energy into the marine environment, including estuaries, which results or is likely to result in such deleterious effects as harm to living resources and marine life, hazards to human health, hindrance to marine activities, including fishing and other legitimate uses of the sea, impairment of quality for use of sea water and reduction of amenities; which imposes a restraint on the discharges or releases of toxic materials*."

According to the ordinary meaning, radionuclide is a kind of substance that is likely to result in deleterious effects. This indicates that the precautionary requirements between

marine environment protection and nuclear safety regulation are consistent. Therefore, the wording of the precautionary principle in nuclear safety can be similar to article 206 of UNCLOS. On the other hand, the threshold defined in article 206 of UNCLOS is "may cause substantial pollution or significant and harmful changes to the marine environment", which is too vague in the nuclear safety context to help with its implementation, so criteria of the precautionary principle in nuclear safety should be made more clear based on article 206 of UNCLOS.

5.2. Moving towards More Transparent, Fair, and Effective Enforcement Regimes

As more and more states and regions including less-developed ones show the tendency to develop nuclear energy to hold the promise of decarbonizing transport and industry, as well as electricity, the concerns and discussions on nuclear safety will be more and more widespread. It is a long-term sustainable development goal to "ensure access to affordable, reliable, sustainable and modern energy for all" [82], and it is no doubt important for nuclear safety to be given more attention.

Therefore, a complete and effective implementation regime of the precautionary principle is indispensable. New regimes should take community interest into account substantially and balance the interests of developed and less developed states. For example, the monopoly of discourse by developed states in peer review and standards-making processes could be improved by designing a mechanism that ensures neutrality of CSS members. Capacity building programs also help to implement the precautionary principle in nuclear safety regulation, as the monopoly of technology by developed states hinders the adoption of advanced nuclear technologies in less developed states. Differences in technology development level make it difficult to implement the same standards to states all over the globe. Capacity building of least developed states should be given more priority, as is required in the United Nations Declaration "Transforming Our World: The 2030 Agenda for Sustainable Development" ("Agenda 2030") [82]. Furthermore, the deficiencies of self-regulation of states must be taken into account to protect community interest and achieve a higher level of nuclear safety.

Based on all these considerations, some prospects of regime reformation are proposed here:

Firstly, enhancing the executive power of IAEA is a possible effective way to maintain nuclear safety on a global level. The current safety examination regime operated by OSART based on voluntary invitation of states may be replaced by a mandatory examination regime in certain circumstances in the future, which is crucial for implementing the established nuclear safety standards and the precautionary principle. Secondly, formal regimes of nuclear capacity building should be further developed. Lastly, CSS could engage scientists and experts who are financially independent from states to overcome the interference of national interests.

6. Conclusions

Although scientific knowledge and technologies on nuclear energy production have made many breakthroughs, humans still do not know what precautionary measures are proper to avoid nuclear accidents effectively. That is why the precautionary principle should be developed and implemented. However, after scrutiny in law making, law enforcement, and judicial application stages, it is found the principle stagnated on the surface of the nuclear safety documents, without being carried out strictly in enforcement and being applied widely in judicial cases in the last few decades.

Actually, the limited role of the precautionary principle in nuclear safety can be attributed to at least two deep-rooted sources, from both the inside aspect of the principle and the outside one about political preference of national interests, respectively. For the inside reason, the threshold of the precautionary principle is not very clear in nuclear safety regulation currently. For the outside reason, the meaning of community interest in nuclear activities tends to be neglected and calls for further definition.

To respond to the challenges, improvements in the legislation level and the enforcement level should be considered. During the next diplomatic conference to consider proposals to amend the Convention on Nuclear Safety, the incorporation of Precautionary Principle into the Nuclear Safety Convention can be discussed. The focal point of the discussion should be clarification of the principle in a technical sense, considering that increasing knowledge of nuclear impact has reduced the extent of uncertainty and more risks are identified. Additionally, enforcement regimes reformation in international nuclear safety regulation can be initiated based on fair balance of national interest and community interest. Specifically, under current the IAEA enforcement framework, the executive power of IAEA needs to be strengthened, and the monopoly of developed states on discourse and technology should be eliminated by more capacity building programs.

As more and more states are planning to develop nuclear energy and construct their own nuclear plants, there are practical needs to promote comprehensive implementation of the precautionary principle in nuclear safety regulation. With the background that the nuclear waste water recharge decision of Japan induces global concern for its impact on the global marine environment, it is time for the international community to stop and consider promotion of the implementation of the precautionary principle to achieve a higher level of nuclear safety.

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Compensation for Marine Ecological Damage: From 'Tasman Sea' to 'Sanchi'

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Abstract: The research on marine ecological compensation is aimed to protect the marine environment and sustainably utilize marine ecosystem services, and is an important institutional instrument for coordination of the relationships among environmental, economic and other social interests. The legal mechanism of marine ecological compensation should be an important way to effectively deal with the contradictions (for examples: the value loss of marine ecosystem services, destruction of marine biodiversity, etc.) in marine eco-environmental protection. This paper firstly introduces the case of the "Sanchi" ship accident, which is regarded as the first collision case of a tanker carrying gas condensate in world shipping history, and also provides a detailed analysis of the "Tasman Sea" ship case which is regarded as the first compensation claim for marine ecological damage in China, and makes some related discussions on marine ecological compensation concerning the two cases. Then, the paper probes into the research theme from four aspects: China's legislative deployment, the legal connotation of marine ecological damage (including the current legal status of compensation claims, subjects of compensation claims, the compensation scope and the evaluation system.), major challenges in legal practice, and remediation of marine ecological damage in China. Finally, the paper provides some suggestions on marine ecological damage compensation for the final settlement in the "Sanchi" case, and tries to explore the future trend of the research theme based on the China's marine strategy.

Keywords: Sanchi ship; oil spill accident; marine ecology; ecological damage compensation

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1. Introduction

The Panamanian oil tanker "Sanchi" collided with the Hong Kong cargo ship "CF Crystal" on 6 January 2018, about 160 nautical miles east to the Yangtze Estuary. The Sanchi caught fire and exploded; and finally sank after nine days of the explosion. According to the information from the Ministry of Transport in China, the "Sanchi" tanker carried about 111,300 tons of gas condensate on board, which is the first collision and explosion accident of oil tanker carrying gas condensate in world shipping history [1]. The East China Sea Branch of the State Oceanic Administration (SOA) has submitted a complaint to the Shanghai Maritime Court, and filed a lawsuit against Hong Kong Changhong Group, the owner of the "CF Crystal" ship, for a huge amount of marine ecological damage compensation of RMB 1.28 billion yuan. As there is no precedent for the emergency disposal and follow-up work of a gas condensate spill accident, it poses a challenge to the relevant laws of marine environmental protection in China.

1.1. Impact of the "Sanchi" Ship Accident on Marine Environmental Damage

Generally speaking, the impact of oil spill on the environment will be evaluated from two aspects: one is the degree of the impact on the environment; and the other is the duration of the impact on the environment [2]. The consequence of such damage to the marine environment caused by a combination of various factors including the amount of oil spill, types of oil products, and weather conditions at the time of the accident and

the geographical environment of the sea area where the accident occurred [2]. Various factors may lead to completely different damage results. Taking the tanker "Braer" oil spill accident in 1993 as an example, although the oil spill amount was as high as 84,700 tons, most spilled oil was naturally dispersed due to the oil's own nature and severe weather conditions at the time the accident occurred. Therefore, compared with other oil spill accidents of the same scale (like the tanker "Sea Empress" oil spill accident in 1996) [3], the Braer incident had a relatively minor impact on the ecological environment of the incident locality: the Shetlands and its surrounding waters, and most of the damage were short-term. However, in the Exxon Valdez accident in 1989, the 38,000 tons of spilled oil were less than half the amount of oil spilled by the Braer accident, but as the spilled oil was hard to disperse in nature plus weather conditions, the incident eventually caused serious ecological damage to marine mammals and birds on the coast and in the surrounding sea areas at the incident site [2].

In the "Sanchi" accident, about 113,000 tons of gas condensate and more than 1000 tons of fuel oil were leaked and exploded. The total area of pollution clearance reached 107.2 square nautical miles. Although the exact damage result of the accident has been undisclosed to the public so far, on account of the wreckage of the ship sunken with a huge amount of gas condensate and the accident site located in the East China Sea with rich marine ecological resources, it is reasonably estimated that the accident has caused serious damage to the marine environment.

Compensation for damage caused by marine pollution has always been a controversial issue in the claims for oil spill accidents, as it often concerns the assessment of marine ecological imbalance and biodiversity reduction [4]. Chinese law traditionally aims to indemnify personal injuries or property damage and has no coverage for ecological damage compensation [5]. This legal loophole has brought difficulties to judicial practice in dealing with marine environment protection cases. However, the issue of adequate compensation for damage to the marine ecological environment is significantly important and challenges the polluter-pays principle in environmental law. In addition, it is unfair and unjust if the victims of oil spill accidents could not get adequate protection and sufficient indemnification. Therefore, the discussion on several critical issues concerning the Chinese compensation mechanism of marine ecological environment damage in relation to the "Sanchi" accident is necessary and helpful for the improvement of relevant Chinese rules.

1.2. Literature Review

Ecological compensation is a compensation mechanism for damaged marine ecosystems, in order to realize the paid and sustainable use of marine resources in the process of marine development and utilization [6]. Through the carding and analysis of research at home and abroad for the last decades, it shows that at present, there are three main ecological compensation modes in the world: (1) economic compensation, (2). resource compensation, and (3) habitat compensation [7]. However, the research focus varies between domestically and internationally.

Foreign countries (mainly the developed countries) incline to protect the environment and maintain ecological balance through government subsidies, financial assistance, eco-taxes (green environmental taxes) and varied funds; and to a large extent, the theme research is carried out around these methods [8]. International governance of marine ecological compensation, quantification of inter-generational compensation of marine resources and improvement of applicability ecological compensation mode are the key points of the theme research by present. Correspondingly, due to the relatively late start of domestic research on ecological compensation, Chinese research [9] mainly focuses on the basic theory of marine ecological compensation, the construction of compensation mechanisms, the quantification of marine ecosystem service value standards, the quantification of marine ecological damage restoration standards, inter-generational compensation of marine resources, and practice reference for international governance of marine ecology [10].

In summary, ecological compensation is not only conducive to the protection of marine resources, but also conducive to the sustainable development of the marine economy. Since 2015, the research on marine ecological compensation in the social sciences has continued to expand, including marine protected areas, marine ecological management, marine ecological compensation scope, marine policies and other aspects [11].

Many studies on marine ecological compensation management show that policy intervention is the most effective method [12] and the system payment for ecological services is a kind of powerful economic tool [13]. In recent year, more attention has been paid to the research of habitat restoration at home and abroad, especially for oil spill accidents, land reclamation and other damage to marine ecology. In this regard, some Chinese scholars divide habitat restoration into two categories: (1) stop loss compensation; (2) gain type compensation [14]. Such classification may promote the theme research in terms of normative and operability.

Although the selection of (marine) ecological compensation modes will be affected by many factors like technical feasibility and economic efficiency, no matter which mode is concerned, effective laws and policies are key factors in the successful implementation of marine ecological protection. There is great practical and theoretical significance for in-depth research of the legal mechanism construction on marine ecological compensation.

2. Chinese Laws Applicable to Damage Compensation for Marine Pollution

China's specialized legislation on marine environmental protection began in the 1970s. The Law on Marine Environmental Protection (MEPL) was first passed in 1982 and amended substantially in 1999 [15], as the first comprehensive legislation to protect the marine environment. However, over the past three decades, the relevant Chinese legislation mainly focused on marine pollution, especially in respect of oil-pollution from ship sources, without sufficient attention paid to marine pollution caused by other pollution sources such as drilling platforms. Moreover, up to now, China has not yet promulgated a complete specialized legislation on compensation for damage to marine environmental pollution [16]. Therefore, the legal basis of marine pollution damage compensation in China needs to be discussed from three aspects: international law, domestic legislation, and the choice and application of relevant laws.

2.1. Application of International Law

In the international sphere, the 1982 United Nations Convention on the Law of the Sea (UNCLOS) [17] provides a global legal framework for the protection of the marine environment [18], especially creating a legal regime for the prevention and control of vessel-source pollution [19]. According to Churchill and Lowe, "Under UNCLOS, the legislative or enforcement jurisdiction that a State may exercise in respect of a particular vessel varies according to whether it is a flag, coastal or port State" [20]. In other words, UNCLOS has stipulated the legislative and enforcement jurisdiction over a particular vessel respectively in order to balance the interests between flag and coastal States [21].

Since the birth of the UNCLOS, the international community has entered into an era of systematizing legislation on the prevention and control of marine pollution, which means there are corresponding conventions to deal with different stages of oil-spilled accidents. These conventions can be well categorized by each different purpose and function respectively, such as safety regulations for oil spill prevention, emergency preparedness regulations, treaties on pollution damage compensation schemes, etc. [22] In addition to UNCLOS, the International Maritime Organization (IMO) is responsible for formulating international conventions on the prevention and control of ship-source pollution [23]. Through these conventions, state parties can fully recognize the importance of precautionary and preventive measures to avoid oil pollution in the first instance, and further recognize that in the event of an oil pollution incident, prompt and effective action can minimize the damage which may result from such an incident [24].

China is a signatory to many of these international conventions, particularly with respect of marine environmental protection. Take conventions on prevention and control of ship-source pollution as an example, China ratified UNCLOS in 1996; ratified MARPOL and its Annex I and II in 1983; also ratified MARPOL Annex III in 1994, Annex IV and VI in 2006, Annex V in 1988; ratified SOLAS in 1994; ratified the Anti-Fouling Convention in 2011, which came into force on 17 June 2011. At present, China has signed the following international conventions on civil compensation for oil pollution damage: the 1992 International Convention on Civil Liability for Oil Pollution Damage from Ships and the 2000 Protocol (hereinafter referred to as "92CLC" and "2000 Protocol") [25], the 1992 International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage and the 2003 Protocol [26] (hereinafter referred to as the "92 Fund Convention" and the "2003 Protocol") and the 2001 International Convention on Civil Liability for Fuel Pollution Damage (hereinafter referred to as the "Fuel Convention").

2.2. Domestic Legislation

At present, the basic legal framework for damage compensation on marine environmental pollution in China is the model of "general law + departmental regulations", which can be divided into four categories [27]: laws, administrative regulations, departmental rules including national standards or norms formulated by relevant departments of the State Council, and local laws adopted by provincial (or other competent) legislators [28] (please refer to Table 1 given as follows for the details of Chinese laws on marine environmental protection). The previous three levels have a universal binding force in China, but the fourth one only works in local areas. Additionally, in order to smooth the working system in judicial practice, the Supreme People's Court of China has also promulgated several judicial interpretations on compensation for marine pollution damage, especially the Provisions of the Supreme People's Court on Trial of Disputes over Compensation for Marine Natural Resources and Eco-environment Damage which was just implemented in 2018. It shows that Chinese legislation has valued marine ecological interests more and more, and the working mechanism of marine eco-environment damage compensation in China has been gradually established.

Table 1. List of laws, administrative regulations, departmental rules and judicial interpretation concerning marine environmental protection and pollution prevention in China.

Laws and Regulations (Effective and Latest)	Adoption Date	Effective Date	Level of Authority
Law of the People's Republic of China on Marine Environmental Protection **(2017 Amendment)**	25 December 1999	5 November 2017	**Laws**
Fisheries Law of the People's Republic of China **(2013 Amendment)**	31 October 2000	28 December 2013	
Maritime Code of the People's Republic of China	7 November 1992	1 July 1993	
Law of the People's Republic of China on the Administration of Sea Area Use	27 October 2001	1 January 2002	
Law of the People's Republic of China on the Exploration and Development of Resources in Deep Seabed Area	26 February 2016	1 May 2016	
Tort Law of the People's Republic of China [29]	26 December 2009	1 July 2010	
Civil Code of the People's Republic of China [30]	28 May 2020	1 January 2021	
Special Maritime Procedure Law of the People's Republic of China	25 December 1999	1 July 2000	
Regulations of the People's Republic of China Concerning Environmental Protection in Offshore Oil Exploration and Exploitation	29 December 1983	29 December 1983	**Administrative Regulations**
Regulations of the People's Republic of China on the Dumping of Wastes at Sea (2017 Amendment)	6 March 1985	1 March 2017	

Table 1. *Cont.*

Laws and Regulations (Effective and Latest)	Adoption Date	Effective Date	Level of Authority
Regulations on the Prevention and Control of Marine Environmental Pollution by Land-based Pollutants	25 May 1990	1 August 1990	
Administrative Regulation on the Prevention and Treatment of the Pollution and Damage to the Marine Environment by Marine Engineering (2017 Amendment)	06-25-1990	1 March 2017	
Regulations of the People's Republic of China on the Prevention of Environmental Pollution from Ship Recycling **(2017 Amendment)**	18 May 1988	1 March 2017	
Regulation on the Prevention and Control of Vessel-induced Pollution to the Marine Environment (2017 Amendment)	9 September 2009	1 March 2017	
Regulations of the People's Republic of China on the Protection of Aquatic Wild Animals (2013 Amendment)	5 October 1993	7 December 2013	
Regulations of the People's Republic of China on Nature Reserves **(2017 Amendment)**	9 October 1994	7 October 2017	
Measures of the People's Republic of China for the Implementation of Civil Liability Insurance for Vessel-induced Oil Pollution Damage (2013 Amendment)	19 August 2010	31 August 2013	**Departmental Rules by the Ministry of Transport**
Recommended Methods for Environmental Damage Assessment (2nd Version)	24 October 2014	24 October 2014	**Departmental Rules by the Ministry of Environmental Protection**
Measures for State Compensations for Losses Caused by Marine Ecological Damage	21 October 2014	21 October 2014	**Departmental Rules by the State Oceanic Administration**
Measures for the Implementation of the Regulation of the People's Republic of China on the Administration of Environmental Protection for Offshore Oil Exploration and Exploitation (2016 Amendment)	20 September 1990	8 January 2016	
Measures for the Implementation of the Regulations of the People's Republic of China on the Dumping of Wastes at Sea (2017 Amendment)	25 September 1990	29 December 2017	
Administrative Measures of the People's Republic of China for Nature Reserves for Aquatic Plants and Animals (2014 Amendment)	17 October 1997	25 April 2014	**Departmental Rules by the Ministry of Agriculture**
Provisions of the Supreme People's Court on Several Issues Concerning the Trial of Cases of Disputes over Compensation for Vessel-induced Oil Pollution Damage	4 May 2011	1 July 2011	**Judicial Interpretations**
Interpretation of the Supreme People's Court on Several Issues concerning the Application of Law in the Conduct of Environmental Civil Public Interest Litigations	6 January 2015	7 January 2015	
Interpretation of the Supreme People's Court of Several Issues on the Application of Law in the Trial of Disputes over Liability for Environmental Torts	1 June 2015	3 June 2015	
Interpretation of the Supreme People's Court on Several Issues Concerning the Trial of Cases of Disputes over Compensations for Damage to Marine Natural Resources and Eco-environment Damage	29 December 2017	15 January 2018	

Source: prepared by the authors.

Generally speaking, China's legislation on marine environmental protection is centered on the Marine Environmental Protection Law (the MEPL). The adoption of several amendments of the MEPL is China's domestic response to legal developments at the international sphere [31]. Through the MEPL, relevant treaty obligations of UNCLOS and the IMO's conventions for the prevention and control of marine pollution are well reflected in the Chinese law. For example, Chapter 8 of the MEPL specifically stipulates the prevention and control of pollution damage to the marine environment caused by vessels and the related operations, and lays particular stress on the technical provisions in respect of ship equipment and facilities. In addition, the Regulations on the Prevention and Control of Vessel-Induced Pollution to the Marine Environment, implemented in 2010, are also on marine environmental protection and ship-source pollution control in China. Thus, China is gradually forming a three-in-one model of oil-spilled accident management system, which is "prevention–emergency–compensation", despite the fact that there is still a large workload for constructing a complete legal compensation mechanism for marine environmental damage.

Furthermore, it is noteworthy that the Civil Code of PRC has come into force since the beginning of the year of 2021. The implementation of the Civil Code is not only the landmark event of Chinese legislation, but also has meaningful implications in regard to (marine) eco-environment protection. Firstly, Article 9 of the Civil Code sets up the green principle [32], by which resource saving and environment protection have become legal obligations for each civil subject. It shows that newly enacted Chinese Civil Code accentuates the dependency of human society on its natural environment, and pays more attention on the environment value. Secondly, Chapter 7 of Book Seven Tort Liability of the Civil Code specifically stipulates the liabilities for environmental pollution and ecological damage [33] which breaks the limit of the compensation scope by traditional tort liabilities. By the polluter-pays principle, traditional tort liabilities for environment pollution aim to indemnify personal injuries or property damage; and the environment is just regarded as a legal object, which people treat it as a media to trigger tort claims caused by environment pollution or environment damage. As for the damage to the environment per se, it is basically beyond the compensation scope stipulated by tort laws. However, Chapter 7 of Book Seven Tort Liability of the Civil Code illustrates that the Civil Code values the equity and justice to ecology and provides the institutional guarantee for the ecological protection.

2.3. Choice and Application of Laws

In dealing with marine pollution damage compensation cases, especially when there are foreign-related factors involved, it raises an issue on the choice and application of rules between international conventions and domestic laws.

Usually, treaty obligations in international conventions shall be introduced into specific domestic laws to be applied and implemented at the national level. A typical example is that, in order to adopt and implement UNCLOS properly, China promulgated the Law on the Territorial Sea and the Contiguous Zone and the Law on the Exclusive Economic Zone and the Continental Shelf. In addition, taking the prevention of vessel-source pollution as an example, China's implementation of the obligation on "Prevention of Operational Pollution by Ships" under MARPOL Convention is through fulfilling "the emission standards about abandonment of ship sources such as garbage, sewage and ballast water in the sea areas under China's jurisdiction" as stipulated in Article 15 of the Regulations on the Management of Marine Environment for the Prevention and Control of Marine Pollution by Ships in 2010 (the Regulations on MMEPCMPS). Article 11 of the Regulations on MMEPCMPS "to strengthen China's jurisdiction as a flag state by establishing a safety operating-system to prevent ship-source pollution" is also reflecting China's fulfillment of the obligation to apply ISM Code under the SOLAS Convention [34].

However, what if an international convention has not yet been internalized into domestic law, or what if the provisions of the Convention are inconsistent with related domestic law in China? The Constitution of China does not stipulate the relationship

between international treaties and domestic laws. For a long time, the applicable norms of China's foreign-related civil laws are attached to the civil substantive law. Therefore, the choice and application of laws largely depend on the judges to decide in judicial practice. Usually, before 2021 when the Civil Code came into force, international conventions and domestic laws could run in parallel with their respective legal effects, and the choice and application of relevant rules had to refer to the provisions of Articles 142 and 146 [35,36] of the General Principles of Civil Law. However, after the entry into force of the Civil Code, which has replaced the General Principles of Civil Law, international treaty status becomes a legal lacuna as it is not mentioned in the Civil Code [37]. Hence, the choice and application of laws either can refer to the Law on Application of Laws to Foreign-Related Civil Relations [38], or follow judicial precedents. In short, China adopts the "internal and external dual system" on the application of laws in maritime and commercial cases [39]. That is to say, in foreign-related cases within the scope of civil and commercial affairs, when the international treaties concluded by China differ from domestic laws, international treaties may take precedence over domestic laws and both parties can directly apply international treaties. For example, the Maritime Code of PRC does not make any specific provisions on oil pollution damage compensation; instead, it spares Chapter 8 and Chapter 11 for the provisions of the ship collision and limitation of liability respectively. However, the 92CLC imposes strict liability on the owner of a ship [40], and in order to ensure that the Maritime Code is compatible with the Convention, Article 208 [41] stipulates that the provisions on limitation of liability shall not apply to the claims for oil pollution damage stipulated by the 92CLC. In addition, when there are disputes arising over the understanding of the provisions of the Convention, the guidance both given by the Oil Pollution Guide and Claims Manual issued by the International Maritime Committee (IMC) in 1994 can be referred to [42].

3. Critical Issues on Marine Ecological Damage Compensation in Chinese Legal Practice—"Tasman Sea" Ship Case

The "Tasman Sea" Case handled by Tianjin Maritime Court in 2004 [43] is the first compensation claim for marine ecological damage in China [44]. This case took 7 years to be decided, and the final result of Tasman Sea Case on compensation nearly broke China's judicial records: 10 groups of plaintiffs (including Oceanic Administration, Fisheries Bureau, about 1500 fishermen and farmers) submitted indemnity claims for RMB 170 million in total against the two defendants for oil pollution damage by ship collision, but it was not until 2009 when a mediation agreement was made through the Supreme People's Court that the defendants received the order to compensate RMB 15.1342 million following the final ruling. With such a great disparity between the claims and judicial result, it was deemed as a failure for the first case of "claim against marine ecological pollution damage" in China. Some issues exposed during the trial are worthy of consideration, which may have precedential significance for the subsequent proceedings of marine ecological damage compensation for the "Sanchi" ship accident.

3.1. Difficulties That SOA Faces When Claiming Ecological Environment Damage on Behalf of the Nation

To succeed in compensation for marine eco-environment damage, the first issue to be dealt with is the pending standing of claimant and plaintiff under the environmental public litigation in China. As international conventions on oil pollution damage do not define the standing for the claims on oil-spilled ecological damage, countries have to establish corresponding domestic laws to cope with this issue, for example, in the United States, the "public trust doctrine" provides legal basis for the qualification of claimant in action for ecology by the federal or state governments.

Both the 69 and 92 CLC do not specify the scope of victims suffering from oil pollution damage. As per Clause 2 and Clause 6 of Article 1 of the 69CLC, victims can include "person suffering from pollution damage who can submit compensation claim against such pollution damage". The definition of "person" given by Clause 2 above refers to

"any individual or partnership or any public or private body, whether corporate or not, including a State or any of its constituent subdivisions". In China's legislation, with regard to the claimant qualification as state subject for (marine) resources loss and environment degradation in public litigation of marine environment, Clause 2 of Article 89 in the MEPL provides that: "For any damages caused to marine ecosystems, marine aquatic resources or marine protected areas that result in heavy losses to the State, the interested department empowered by the provisions of this Law to conduct marine environment supervision and control shall, on behalf of the State, claim compensation to those held responsible for the damages." This clause not only lays down the legal foundation of claim for damage to the marine ecological environment against the person liable, but also endows national administrative bureaus with the qualification of plaintiff to file a claim for compensation on behalf of the nation.

Furthermore, as per regulations of Article 5 of MEPL [45], there are a large number of government departments that have supervision authority of the marine environment including the national environment protection department, the national marine department, the national maritime department, the national fishery department, the military environment protection department, and the coastal local-governments above the county level. With the fact that many governmental departments can file a lawsuit for ecological damages against the person liable for marine ecological environment; such a litigation mode of multiple (claim) subjects leads to issues like vague delimitation of duties, overlap claims for compensation and lawsuit inefficiency [46], emerging in ecological damage litigation. For examples, in the Tasman Sea Case, SOA and the fishery department respectively filed the lawsuits for ecological environment damage in terms of loss of ocean ecological function services, loss of marine environment capacity and loss of national fishery resources [47]. Hence, in the "M/V Ocean Success" oil spill case in 1997 [48], it was the fishery department who claimed for the loss of natural fishery resources on behalf of the Chinese government. Besides, overlapping claims for compensation by different governmental departments, might affect an in-time redress for eco-environment damage. For instance, in the Tasman Sea Case, the defendants defended themselves and declaimed that there were overlap claims for ecological damage indemnities from various plaintiffs, so that the defendants could disclaim the most of compensation requirements by this key reason. Lastly, multiple subjects of litigation may increase costs of liability investigation and give the court the burden of a heavier workload, and thus it shall finally affect the court efficiency.

In spite of defects in litigation by multiple subjects, at present it still hardly makes possible a litigation mode of a single subject, such as the SOA representing the Chinese government to file the claims of compensation for marine eco-environment damage against the plaintiff, because the current legislation in China seems to prefer the mode of multiple subjects of litigation. The litigation subjects under Clause 2 of Article 89 in China's MEPL and Article 3 [49] of the newly implemented Judicial Interpretations of the Supreme People's Court on Several Issues Concerning the Trial of Cases of Disputes over Compensations for Damage to Marine Natural Resources and Eco-environment Damage (SPC Interpretation of CDMNRED) are denoted with "departments with supervision authority of marine environment". Furthermore, the latest judicial interpretation shows a tendency of strengthening the mode of multiple subjects of litigation [50].

3.2. Scope of Compensation for Ecological Damage

The issue of the scope of compensation for a claim in marine pollution caused by ship oil-spilled accidents always raises great controversy worldwide. Neither 92CLC or the Fund Convention (also the Bunker Convention and the HNS Convention) clearly defines the accurate definitions of "environment damage" and "pollution damage", nor clearly identifies the damage categories [51–53]. In the context of the related conventions, the international legislation almost confirms that any direct actual and quantifiable economic loss and cost caused by pollution damage should be included in the compensation scope.

As for Chinese laws like the MEPL and tort law included in the Civil Code, they also only provide for the general framework of marine environment damage compensation without specifying the scope of compensation for oil pollution damage [54]. Hence, due to the ambiguity in the legal definitions of "pollution damage", it is deemed that the compensation for environment damage remains quite contested. For example, Louise de La Fayette opines that the damage to the environment is not clearly included; meanwhile it is not evidently excluded [55]. Jiayi Liu, a Chinese scholar expressed that the loss of environmental value as part of the marine ecological damages and the loss of natural resources should be included in the scope of the compensation as a claim of public interest [56,57].

In the Tasman Sea Case, the court, as per the regulations of 92CLC, constructed five categories to cover the scope of "marine pollution damage": (1) cost for decontamination and prevention measures; (2) property damage and its subsequent damage; (3) pure economic loss (including pure economic loss from fishery and tourism, etc.) and cost for prevention measures; (4) environment damage; and (5) cost for related research and investigation after the occurrence of pollution accident [58]. However, such general inductive definitions of scope of compensation for oil pollution damage gave rise to a series of controversies in judicial practice.

Firstly, "reasonable cost for restoration" for "marine environment damage" indeed conforms to the definition of "environment damage" by the related conventions. However, what about the "environment capacity loss" and "ecological service loss" claimed by the SOA? This was also the litigious issue in the Tasman Sea Case at that time.

Secondly, it is disputable to bring claims of reduced fishery, as put forward by the fishermen and maricultural farmers into the category of "pure economic loss". Because, despite the plaintiffs taking the responsibility to decrease the loss or reduction in production, there might be various reasons which cause the loss of production besides the production halt itself. Oil contamination might be one of the reasons for the loss of production.

The Tianjin Maritime Court heard the case with reference to related domestic laws and the 92CLC, disregarding defendants' request to apply the IOPC Found Handbook and Guideline of CMI Oil Pollution Damage. As for the 92CLC, the damage to marine eco-environment is supposed to be out of the scope of compensation, since the damage to the environment is beyond any legal relationship traditionally regulated by the civil tort law, in which the environment is generally treated as a legal object rather than a legal subject. However, in the Tasman Sea Case, the Tianjin Maritime Court finally classified the polluted sea area as the important sea area regulated by pollution control policies namely Action Plan for Clean Bohai Sea and Ocean Agenda 21 of China, based on Article 3 [59] of the MEPL. Then the court partially supported the plaintiffs' claims for "marine environment damage", and deemed that the measures taken and to be taken for reduction of oil pollution and environment recovery for Bohai Sea fall within the scope of "pollution damage" defined by Clause 6 of Article 2 of the 92CLC. In a word, the Tianjin Maritime Court gave a broad understanding of "pollution damage" defined by 92CLC, and acknowledged the marine environment capacity loss. However, at the same time, the court dismissed several claims by plaintiffs for recovery fees for ocean sediments, biotic environment of tidal flat, phytoplankton, and nekton with the reason that the plaintiffs neither provided persuasive evidence for the existence of such damage, nor confirmed the accurate amount of damages. It seemed that the adjudication organs in China still keeps a conservative attitude towards (marine) environment damage.

Thirdly, in the Tasman Sea Case, the Chinese court indirectly admitted "marine ecological damage" by recognizing "the loss of marine environment capacity" for the first time, but the court did not give an explicit definition of "ecological damage" as well as the scope of compensation. Besides, "the loss of marine environment capacity" is not a standard terminology in international law but created by the Chinese court in judicial practice; hence, any direct support cannot be found from the related conventions for such damage compensation. In addition, in spite of the fact that the Tasman Sea Case attracted great attention and "marine ecological damage" was admitted in this case, China is not

a case law country, and any judgment on each individual case is only taken as reference without binding force for similar cases in future. Therefore, if the matters like the legal status and the scope of "ecological damage" cannot get a clear and definite answer, future claims for marine eco-environment damage in China shall still face the predicament of getting insufficient compensation due to lack of adequate legal grounds.

3.3. Quantification of Marine Environment Damage

As mentioned previously, a full set of complete legislation regarding marine environment damage compensation is still absent in China, and related laws and regulations are scattered in different laws, administrative regulations and judicial interpretations. Correspondingly, uniform regulations on specific quantification procedures and calculation methods for environment damage assessment are also absent, and the relevant settlement mechanism is inconclusive as well.

Taking quantification in loss of fishery resources as an example, there exists legal lacuna in both related conventions and Chinese laws. Therefore, how to make economic pricing for fishery resources is a difficulty in judicial practice. In the Tasman Sea Case, the defendants claimed that the spilled oil did not cause medium and long term effects on marine eco-environment, because the fishery resources had recovered since the 11th months since the accident occurred. Hence, the defendants insisted that the plaintiffs should not claim for the fishery resources loss of the medium and long term. However, the court applied Provisions for the Calculation of Fishery Losses in Water Pollution Accidents (the CFLWPA Provisions) issued by Ministry of Agriculture [60] and by this calculation method, the compensation not only includes the direct economic loss, but also covers the loss of natural fishery resources, and the two kinds of loss are deemed to be indispensable to each other [61]. Although the CFLWPA Provisions issued by Ministry of Agriculture is of great practicability and guidance for the calculation of fishery loss, the legal status of such documents issued by government ministries and commissions is unclear. So, it remains uncertain whether it is feasible to apply such documents as a legal basis for court ruling. Moreover, the fishery department affiliated to the Ministry of Agriculture and marine administration department have different calculation methods regarding the loss. Thus, it is necessary to clarify the legal status of these documents issued by government ministries and commissions so as to avoid difficulties in application.

3.4. Interest Remedy Claims Mixed with Public and Private Interests

In the Tasman Sea Case, the claims for damage remedies by plaintiffs from different groups show a feature of private interests tangled with public interests. For example, the claim filed by SOA, as one of the plaintiffs, reflects a significant characteristic of public interests litigation: the claim for the loss of marine environment capacity, the claim for the loss of national fishery resources and the claim for the loss of marine ecological service. Meanwhile, the claims from the local fishermen and the representatives from fishery associations are mostly for proprietary rights being injured due to the accident (e.g., loss of drift netter, loss of shellfish on tidal flat, and loss of fixing netting gear). The mixture of claims of public–private interests should be adverse to the precise characterization of cases in judicial practice and bring obstacles to the joint trial of separate cases of the same origin, thus affecting the court's efficiency.

4. Reflections on the "Sanchi" Ship Case

The "Sanchi" ship burned in the East China Sea for nine days and sank with a large amount of leaking gas condensate with contaminative oil deposited on the wide area of the seabed. A series of work on decontamination, salvage, confirmation of accident liability, loss evaluation and environmental recovery make it a complex and challenging issue. Several suggestions, from the viewpoint of systemic improvement of Chinese marine ecological damage compensation, are put forward for a better protection of the Chinese

marine eco-environment as well as consideration of the ecological damage compensation awarded in the "Sanchi" Ship case.

4.1. Introducing Pure Ecologic Damage into the Scope of Marine Ecological Damage Compensation

It is recommended that the reimbursable damages in marine environment pollution cases should be categorized so that the pure ecological damage can be included into the scope of compensation. On the one hand, it conforms to the mega-trend with increasing attention to the ecological environment in international environment law; and on the other hand, it reduces the ambiguities in the definition of "pollution damage" in related conventions. Such ambiguities often cause parties in dispute not only to be confused with the definition of "pollution damage" with the compensation standard, but also be confused between decontamination fees and recovery fees in practice. Such confusion leads to an insufficient remedy for the environmental interest which should have deserved sufficient compensation.

With regard to compensation for damage to the (marine) eco-environment itself caused by oil pollution, definitions of "environmental damage" by oil pollution in conventions are mostly aimed at excluding the compensation for the damage of the environment itself. Since the demarcation and position of the concept "pollution damage" by *92CLC*, *International Convention on Civil Liability for Bunker Oil Pollution Damage* and *HNS Convention* are essentially in agreement, it's safely concluded that the formulation of "environmental damage" has the following evolutionary process: not clearly considered items (in other words, items that are neither explicitly included nor explicitly excluded in conventions)–damage of the environment itself is excluded in principle–only compensation for reasonable decontamination fees and environment recovery fees [62]. Louise de La Fayette even commented that 'no matter the purposes of environment protection conventions which aim at preventing or alleviating damage to the environment, most of international conventions on civil liability aim at constructing the compensation liability for properties and the economic loss, rather than for the environment damage. As for the damage of environment itself, it only can be accessible via "cleanup fees for dangerous substance" and "environment recovery fees". Once the cleanup and recovery fail, then the compensation for environment damage becomes impossible [55]'. However, in contrast to a strict attitude towards damage compensation for environment in international law, the judicial practice in some countries shows a kind of approval of the (marine) eco-environment damage compensation. For example, in the Erika oil spill case in

France in 2008 [63], the channeling of liability was applied for oil pollution damage, and it broke through the limit of liability subjects (normally ship owners and managers) stipulated by the 69/92 CLC [64]; the Patmos Case in Italy in 1991 made marine environment damage an independent reimbursable item [65]; and in the Haven Case also in Italy in 1991 [65,66], both the measurable and immeasurable factors were included into the compensation for marine environment damage. In the Chinese Tasman Sea Case, the Tianjin Maritime Court also gave a broad understanding of "pollution damage" defined by the 92CLC, and the admission of "the loss of marine environment capacity" substantially reflected the court's approval for "damage on marine environment itself", although such admission was subject to the Clause 6 of Article 2 of the 92CLC.

4.2. Constructing an Effective Remedy-Mechanism for Marine Ecological Damage

The main purpose to implement marine ecological compensation is to restore the ecosystem service functions by the measures of ecological restoration and conservation. Scholars have discussed the global ecosystem services and functions. For example, Robert Costanza grouped ecosystem services into 17 major categories, including nutrient cycling, food production, genetic resources, raw materials, recreation, and cultural service [67]. Despite the fact that economy, specifically monetary compensation, has been given a key role in ecosystem protection, the redress of pure economic means cannot resolve all issues of ecological loss caused by marine pollution, such as biodiversity loss, extinction of rare

or endangered species, decrease of seawater self-purification capacity and marine habitats deterioration. Hence, some environmental specialists have regarded monetary valuation as a retrogressive step in ecosystem conservation, and commented such retrogression as "undoing important sustainability principles and practices that should have been embedded in environmental policy and management action" [68].

It is recommended that restoration in kind should be applied as a pivotal remedy for (marine) eco-environmental damage. The degradation of ecosystem services in polluted sea area can be restored by means of constructing artificial reefs and wetland, mangrove planting, and establishing marine ecosystem reserves, etc. Being an ecosystem approach, ecological restoration can bridge a gap between the loss of ecological value and the reasonably adequate compensation for ecological damage so that the sustainable utilization of marine resources will be guaranteed. Beside of ecosystem restoration, other remedies played a subsidiary role at the national scale are also recommended, in that in financial and administrative terms, the government may increase financial support for ecological protection by environment and resource taxation; moreover, China can strengthen the policy support in respect of marine ecology through tax credit, tax preference and green-credit policies. These tools incorporated into national planning processes will facilitate the government to develop an omnibus redressing-mechanism for the loss of (marine) ecosystem value and the degradation of ecosystem services [69].

4.3. Improving the Assessment System of Marine Environment Damage

The scope of marine ecological damage and its assessment have always been a challenge. To some extent, even with legal regulations on the full scope of ecological damage compensation, compensation will be insufficient if there are no sound assessment methods and procedures.

In recent years, SOA issued various documents on marine ecological damage assessment, and they include the 2007 Technical Guideline for Ecological Damage Assessment on Marine Oil Spilling (Technical Guideline), the 2013 Technical Manual of Marine Ecological Damage Assessment (trial implementation) (Technical Manual) and the 2014 Measures for State Compensations for Losses Caused by Marine Ecological Damage (Measures) [70–72]. Besides, the Ministry of Environment Protection and Fishery bureau affiliated to the Ministry of Agriculture also issued assessment methods for environment damage and the damage loss calculation methods respectively. Among these documents, Technical Guideline classifies objects damaged by marine oil pollution into six categories: seawater quality, environment of ocean sediments, environment of tidal flat, marine organism, typical ecosystem and marine ecosystem. Total loss of marine ecology damage by oil pollution equals to the sum of direct loss of marine ecology damage, fees for ecological restoration, recovery fees and investigation/assessment fees for biotic population. However, these policy documents only work as technical criteria. Besides, due to the lack of a uniform and systematic management of various policy documents issued by various departments and commissions, these documents could bring about conflicts and difficulties in practice.

Therefore, it is suggested that the government needs to start the construction of comprehensive and systematic legislation for a compensation system of marine ecological damage, to prepare explicit definitions for scope of compensation, and to set out standards and procedures for ecological damage and the compensation management in order to deal with practical issues with regard to marine ecological damage compensation [73]. At the same time, it is suggested that the construction of Chinese environment damage assessment should get public participation and information disclosure in the assessment system so as to guarantee an objective and neutral position of the evaluating institution as well as fair and transparent procedures generally. The *Oil Pollution Act* of the United States can be used as a reference to construct the standardized assessment procedures of "pre-assessment–recovery planning–recovery implementation."

4.4. Setting up a Public Interest Litigation System in the Compensation Mechanism of Marine Eco-Environment Damage

The revised Environmental Protection Law of the People's Republic of China (EPL) was passed in April 2014. According to Article 58 of it [74], qualified social organizations are entitled to file lawsuits against environment pollution, ecological damage and damage to social public interest. It indicates that the public interest litigation system regulated by Article 55 of Chinese Civil Procedure Law has been implemented in ecological environment protection, and has greatly encouraged the passion of environmental protection organizations in public litigation for eco-environment protection [75].

The MEPL as a special branch of environment law, should keep the same pace with the EPL to set up its own public litigation mechanism for marine eco-environment protection. Besides, as discussed previously, the cases on oil pollution in judicial practice showed some characteristics of mixed claims for public–private interests. Therefore, it is suggested that Article 58 of the EPL can be introduced into the MEPL so that it not only can provide systematic institution of public litigation for the better protection of the marine environment, but also coordinate the unification of different laws in Chinese legal system in this respect.

5. Conclusions

The "Sanchi" ship accident raised the alarm on shipping safety for the shipping industry. However, opportunity sometimes emerges along with a risky occurrence: the Torrey Canyon accident which facilitated the enactment of the International Convention on Civil Liability for Oil Pollution Damage [76]; the Amoco Cadiz accident which urged the amendments of the International Convention on Civil Liability for Oil Pollution Damage 1969 and the Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage 1971 [77]; and the Exxon's Valdez accident which facilitated the enactment of the Oil Pollution Act of United States [78]. The "Sanchi" ship accident could be a moment for China to make essential progress in Chinese legislation on the compensation mechanism for marine eco-environment damage. It is evidenced by the 2018 judicial interpretation which is specially dealing with cases of damage compensation for marine natural resources and ecological environment, and promotes the increasing emphasis on ecological environment protection in Chinese law. It must be emphasized that the building up of a comprehensive and effective compensation mechanism for marine ecological/environmental damage is a necessity during the current construction of marine ecological civilization in China.

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Potential Contribution of Sponsoring State and Its National Legislation to the Deep Seabed Mining Regime

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Abstract: Companies and legal persons intending to conduct activities in the Area must be sponsored by a State Party of the UNCLOS, which constitute a "dual-track mechanism" with ISA as a primary regulator and sponsoring state as a secondary regulator. This regime setting places companies and legal persons subject to international and national legislation simultaneously. The sponsoring state's national legislation is thus an integrated part of the DSM regime. This resolves the defects that private entities in DSM are not subject to international law and weak enforcement of international organizations. However, UNCLOS neither draws a clear line of competence between the sponsoring state and the ISA nor provides compulsory components that national legislation should contain, resulting in the disparity between the objective of the establishment of sponsorship and the status quo of the sponsoring state's role and its national legislation. This paper analyzes the competence of a sponsoring state and regulatory aspects it should focus on to assist the ISA and further proposes such components of the national legislation contributing to the DSM regime.

Keywords: law of the sea; deep seabed mining; national legislation; sponsoring state

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1. Introduction

The United Nations Convention on the Law of the Sea (UNCLOS) [1] and the Agreement Relating to the Implementation of Part XI of the United Nations Convention on the Law of the Sea (1994 Implementing Agreement) [2] provide the framework of the international Deep Seabed Mining (DSM) regime. The Area and its resources are designated as the common heritage of mankind (CHM) [1] (art. 136). CHM implies that all activities in the Area not only consider for the current generation but also respect the future generation [3] (p. 195), which requires sustainable exploitation or use of mineral resources in the Area. The International Seabed Authority (ISA) is mandated to manage activities in the Area on behalf of mankind as a whole. However, the contractors are those private or state-owned companies and persons that are not subjects under international law, and thus the UNCLOS made use of the mechanism, sponsorship, under which companies and persons intending to explore or exploit resources in the Area must be sponsored by states parties [1] (art. 153(2)). A sponsoring state has the responsibility to ensure its sponsored contractor's compliance with provisions under the UNCLOS and to assist the ISA to ensure such compliance by adopting laws and regulations and taking administrative measures concerning DSM within its domestic legal framework [1] (arts. 139(1), 153(4), and Annex III, art. 4(4)). Therefore, the sponsoring state, as far as its sponsored contractor is concerned, is also a regulator. The Seabed Disputes Chamber (SDC) concludes in its first Advisory Opinion regarding responsibility and liability of the sponsoring state that the inclusion of sponsorship serves to achieve the goal of ensuring entities' compliance with the obligations set out in the UNCLOS and related instruments by way of transferring them from international convention to states parties' national legislation [4] (para. 75). Furthermore, the ISA needs the sponsoring state's assistance in controlling and supervising the contractor's activities by establishing monitoring and enforcement measures within

its domestic legal system. In this sense, the sponsoring state's national legislation is an integrated part of the DSM regime, i.e., national legislation and international convention and regulations together contribute to the DSM regime. Interestingly, at the end of June 2021, Nauru requested the ISA Council to complete the adoption of the rules, regulations, and procedures necessary to facilitate the approval of plans of work for exploitation in the Area pursuant to Section 1(15) of the Annex to the 1994 Implementing Agreement [5], triggering the so-called "two-year rule" [6]. Under this rule, the Council must consider a submitted application for exploitation activities and provisionally approve it regardless of whether the exploitation regulations have been completed in two years pursuant to Section 1(15) of the Annex to the 1994 Implementing Agreement. If the exploitation regulations are not in place in two years and one of the contractors applies for an exploitation contract, potential applications would need to be reviewed based on the general principles and provisions in the UNCLOS and 1994 Implementing Agreement [2] (Annex, Section 1(15)(c)). Under the circumstance of lacking detailed rules for exploitation at the international level, a sponsoring state's national legislation could be essential to block unqualified applicants, even to control the potential contractors' activities.

According to article 139(2) of the UNCLOS, a sponsoring state that adopts the necessary and appropriate measures to ensure its sponsored contractor's compliance with international obligations can be exempted from liability even if its sponsored contractor incurs damage. Sponsoring states are not requested to achieve the result in each and every case; rather, they should "deploy adequate means, to exercise best possible efforts, to do the utmost, to obtain this result." [4] (para. 110) The SDC concludes that it is an obligation of conduct, and of "due diligence" [4] (para. 110). Such a stipulation gives sponsoring states the impetus to take action on the one hand and makes them confused due to a lack of further instructions on the other hand. Neither the UNCLOS nor the 1994 Implementing Agreement stipulates the division of competence between the sponsoring state and the ISA as well as compulsory components that national legislation shall contain, resulting in the disparity between the objective of the establishment of sponsorship and status quo of the sponsoring state's role and its national legislation. An unintended scenario is that most sponsoring states have national legislation required by the UNCLOS, but they are still not certain about their competence and components that their legislation shall contain to assume the obligation of assisting the ISA to ensure its sponsored contractors' compliance with the UNCLOS and related legal instruments. Evidence as such is that only the legislation of Japan, Nauru, and Singapore have the most explicit provisions regarding access for third parties to domestic courts for settlement of claims for environmental harm [7] (p. 8). In contrast, most sponsoring states do not include such a provision in their legislation [7] (pp. 6–7). That is partially because the fora for settlement of DSM disputes is still under discussion [8] so that the sponsoring state is unsure whether such a dispute is within its competence. This paper dwells on the regime per se, analyzing the competence and regulatory focus of a sponsoring state (Section 2) and components of the national legislation that should be included in the sponsoring state's legislation to achieve such control by referring to state practice (Section 3). A comparative method is used in this section. Section 4 provides concluding remarks.

2. Sponsoring State's Competence and Regulatory Focus

The sponsoring state's competence comes from the mandate of the UNCLOS. The UNCLOS indicates that the ISA is mandated to manage and control activities in the Area as is necessary for the purpose of securing compliance with the relevant provisions of UNCLOS, 1994 Implementing Agreement, rules and regulations of the ISA, and the plans of work approved, whereas state parties shall assist the ISA in ensuring such compliance [1] (art. 153(4)). It is clear that the ISA is the primary regulator, whereas the sponsoring state is the secondary regulator and is being mandated to "assist" the ISA. Under the "dual-track mechanism", division of the regulatory burden between the two regulators must be clear, avoiding waste of administrative resources caused by duplicated regulatory

burdens. Further, that the sponsoring state is the secondary regulator determines that the sponsoring state has no absolute decision-making power. To be specific, even if the sponsoring state approves the application, the application is invalid without the approval of the ISA. Similarly, even though the sponsoring state wants to add more to its domestic legislation, it is ineffective if it is inconsistent with the UNCLOS and rules and regulations of the ISA. In other words, the legislation of the sponsoring state must be carried out within the framework of the UNCLOS and the rules and regulations of the ISA. For example, in the Draft Exploitation Regulations (March 2019), there is no mechanism as to appeal for the cancellation of preference and the priority of an applicant who has an approved exploration contract and wants to apply for an exploitation activity in the same area. If the sponsoring state is willing to set up such a mechanism, it can only have effect at the national level and cannot change the decision of the ISA. However, the objection of the sponsoring state is absolute if the objection means no sponsorship is provided. Its regulatory tool is granting or withdrawing the sponsorship. Without the sponsorship, the application cannot be approved since sponsorship is the necessary requirement of the application. From this point of view, the sponsoring state has absolute power over negative matters and only partial powers for affirmative matters and rights-giving matters (subject to the decision of the ISA).

Regarding the regulatory aspects a sponsoring state should focus on, the SDC Advisory Opinion provides some reference. Assisting the ISA is a direct obligation of a sponsoring state, which requires the sponsoring state to take necessary and appropriate measures to ensure its sponsored contractor's compliance. The reference provided by SDC in its advisory opinion lies in its answers to the third question, i.e., the necessary and appropriate measures that a sponsoring state must take. Although it is not comprehensive and systematic, the SDC gave some specific examples. For instance, (1) the financial viability and technical capacity of sponsored contractors; (2) conditions for issuing a certificate of sponsorship; and (3) penalties for non-compliance by such contractors. They may also include the establishment of enforcement mechanisms for active supervision of activities of the sponsored contractor and for co-ordination between the activities of the sponsoring state and those of the ISA [4] (paras. 21–241).

Moreover, to assume the obligation of assisting the ISA, the sponsoring state has to know which aspects of an international organization need the assistance of a state, i.e., shortcomings of the international organization in regulating a private actor. As is known, the international organization has limited mechanisms to enforce compliance, such as persuasion, incentives, disincentives, force, and legally binding sanctions [9] (p. 837). The enforceable power of the ISA is related to its oversight mandate. Annex III, article 18 describes the enforcement jurisdiction of the ISA, which includes three categories of penalties (warning, monetary penalty, suspend or terminate a contract). The UNCLOS strictly stipulates two circumstances under which the ISA has competence to suspend or terminate a contract: (a) the contractor's operations result in serious, persistent, and willful violations of the fundamental terms of the contract, Part XI and the rules, regulations, and procedures of the ISA; and (b) the contractor has failed to comply with a final binding decision of the dispute settlement body on it [1] (Annex III, art. 18(1)). The ISA Exploration Regulations further develop this article by specifying the competent organ for imposing penalties (Council) and by adding a third circumstance in which a contract may be suspended or terminated [10–12] (Annex IV, Section 21.1). The third circumstance refers to the contractor's bad financial situation [10–12] (Annex IV, Section 21.1(c)). Not all cases of non-compliance, but only violation of "fundamental terms", can result in the suspension or termination of a contract. In case of other violations, the ISA may impose monetary penalties in proportion to the seriousness of non-compliance [1] (Annex III, art. 18(2)). As Gwénaelle Le Gurun said, "grave penalties such as suspension and even more termination of a contract will be imposed as a last resort, as the ultimate point of an escalation process, in case of very grave and repeated violations by a contractor of its essential contractual undertakings." [13] (p. 2253). Additionally, even if one of these

three circumstances does occur, the Council "may", but not "shall", suspend or terminate this contract [1,10–12] (art. 18(1); Annex IV, Section 21.1). Suspension or termination may be substituted by monetary penalties under the discretion of the ISA [1] (art. 18 (2)). In any case, no penalty may be executed until the contractor has had the possibility to exhaust the judicial remedies available under Part XI, Section 5, of the UNCLOS [1] (art. 18 (3)). The ISA's enforceable competence is highly restricted by those provisions. By contrast, a state is able to utilize incremental approaches, which is all the state practice for sponsoring the state's legislation [14] (p. 21). Likewise, the contractor's behavior needs to be monitored, which the ISA may lack capacity for due to limited personnel. The ISA only requests the contractors to submit an annual report and modify the plan of work every five years [11] (reg. 30). Regarding the inspections, the organs of the ISA have discrete responsibilities, i.e., the Council shall "establish appropriate mechanisms for directing and supervising a staff of inspectors" [1] (art. 162(2)(z)); the Legal and Technical Commission (LTC) is responsible for making such recommendations [1] (art. 162(2)(m)). It is noteworthy that the ISA, as of now, has not carried out any inspection activities. Therefore, a sponsoring state should focus on monitoring and enforcement in its national legislation for the purpose of assisting the ISA. To sum up, to assist the ISA, national legislation should be centered on assessing qualified applicants and taking procedural measures to ensure sponsored contractors' compliance with the UNCLOS, 1994 Implementing Agreement and ISA Regulations, including monitoring, corrective measures and sanctions for non-compliance, compensation, and enforcement of decisions of international courts or tribunals.

3. Potential Elements of National Legislation Contributing to the DSM Regime

Sound national legislation incorporates a wide range of elements, such as objectives, obligations and rights of a contractor, monitoring, and liability. Literature and policy papers have discussed a favorable model for national legislation [15–18]. This paper focuses on the sponsoring state's role assisting the ISA and national legislation's potential contribution to the DSM regime. Hence, this section illustrates five main components by referring to existing sponsoring states' national legislation in this regard.

3.1. Conditions to Issue a Certificate of Sponsorship

The first irreplaceable function of the sponsoring state and its national legislation is that it sets an initial threshold for the potential applicants by way of issuing a certificate of sponsorship, although approval of a plan of work is beyond its competence. In this procedure, a sponsoring state issues a pass to the controllable company or person with sufficient financial and technological capability, assisting the ISA to block unqualified applicants.

3.1.1. Controllable Applicants

The most important requirement for applicants, whether they are a natural or legal person, is that they must be nationals of or controlled by a state party, which is also the essence of sponsorship. Thus, in a sponsoring state's national legislation, the applicants who want to access to deep seabed mining activities must be controllable. The specific requirements of being "controllable" may vary according to the individual situation of the sponsoring state. Nationality is an easy parameter. Most states, such as Belgium, China, Czech Republic, Fiji, Japan, Kiribati, Nauru, New Zealand, Singapore, Tonga, and Tuvalu, adopt "nationality" or registration in those states as a necessary requirement to apply for a certificate of sponsorship [14] (para. 33). By contrast, only Belgium and Germany include "effective control" as a criterion of the applicant [14] (para. 33). Obviously, the criterion of "nationality" is easy to check, whereas the criterion of "effective control" is difficult to check since there is no explicit definition in the UNCLOS and any other relevant legal instruments. At first glance, taking "nationality" as a criterion of the applicants seems to be a very effective way to control applicants. However, this approach ignores a situation where an applicant is registered in a developing state yet remains a wholly owned

subsidiary of an experienced mining company in a developed state [19] (para. 6). Such an entity may repatriate profits to the parent company. Under this situation, the sponsoring state must be very careful about the controllability of such an entity despite nationality or registration. Regarding the definition of "effective control", the LTC of the ISA is of the view that the definition of "effective control" needs to be clarified but it falls "under the competence of the State that exercises it" and it "is left to municipal law" [19] (para. 21). This being said, the sponsoring state that utilizes this criterion is obliged to clarify this concept.

Rojas and Phillips propose two interpretations of "effective control" from the analysis of comparative legal sources and of the way in which ISA organs have treated the issue: an economic approach (control or influence over the entity) or a regulatory approach (jurisdiction of incorporation) [20] (p. 9). The economic control approach considers factors, such as ownership of a majority of the applicant's shares, ownership of a majority of the applicant's capital, holding a majority of the applicant's voting rights, holding the right to elect a majority of the applicant's board of directors or equivalent body, having an influence over the applicant sufficient to determine its decisions, or any combination or variation of the above [20] (p. 9). Under the regulatory control approach, the LTC notes that nationality, "combined with the undertakings given as a sponsoring State" can be sufficient [21] (para. 22). It should be pointed out that these two approaches are not mutually exclusive. On the contrary, the sponsoring state can combine the two approaches to different degrees according to the actual situation.

3.1.2. Financial and Technological Capability

The financial capability of the applicant is an important factor considered by the LTC when approving an application. It determines whether an applicant has the capacity to consistently use the best available technology in the process of mining; whether it is capable of committing or raising sufficient financial resources to cover the costs of the mining activities, monitoring plan, and closure plan; whether it can promptly and effectively deal with emergencies or damages; and whether it can afford insurance products [22] (reg. 13(2)). The SDC Advisory Opinion highlights that the financial viability and technical capacity of sponsored contractors are necessary components of the domestic law of sponsoring states [4] (para. 234). However, merging this requirement into domestic law is problematic due to the lack of off-the-shelf quantitative standards. The UNCLOS does not set out specific standards for the financial and technical capabilities of the applicant, albeit that Annex III, article 4 (4) of UNCLOS stipulates that qualification standards shall relate to such capabilities. Based on this instruction, the ISA Exploration Regulations further developed standards in which provisions do not quantify financial standards. Instead, it requires discrete financial information according to the nature of the firms [10–12] (reg. 12(4)–(7); reg. 13(3) and (4); reg. 13(3)–(6)). To be specific, a state or a state enterprise merely provides a statement by the state or the sponsoring state certifying the applicant's financial capacity; members of the private sector must provide audited financial statements for three years, certified by a duly qualified firm of public accountants in conformity with internationally accepted accounting principles. Borrowing for supporting approval of a plan of work for exploration is permitted if detailed information, such as the amount, the repayment period, and the interest rate, is submitted [10–12] (reg. 12(4)–(7); reg. 13(3) and (4); reg. 13(3)–(6)). Since the ISA Regulations shifted the burden of checking an enterprise's financial capability to the sponsoring state (in case of a state enterprise as an applicant), the sponsoring state should have several mechanisms to ensure it. The sponsoring state can also check the financial capability of private enterprises, as it has a clear understanding of the national economic level and enterprise strength under its control. Hence, the legislation of a sponsoring state must be designed to set specific financial standards for applicants. These might include a minimum amount of operating capital, appropriate insurance, or other certification of financial responsibility, undertakings that relevant industry standards are adhered to by the operator. It is worth mentioning that the relevant national legislation

of Germany and Japan requires the applicant to submit credibility records as one means of ensuring the applicant's financial capability [23,24] (Section 4(6)2(a); article 29(ii)(iii)). Importantly, it is suggested for the sponsoring state to check the sponsored contractor's financial situation regularly even after issuing a certificate of sponsorship, by reviewing its audit reporting, to ensure a contractor's continued financial capability of carrying out mining activities. Once the contractor's financial capability is found to have a problem, appropriate and incremental measures should be taken, from warning to terminating the contractor's certificate of sponsorship, if deemed necessary.

The requirements of an applicant's technological capability have been stipulated by the ISA Draft Exploitation Regulations (March 2019) [22] (reg. 13(3)) stipulate Execution of the plan of work, the Environmental Management and Monitoring Plan (EMMP), and the closure plan requires a certain degree of technical ability, the standard of which is the capability to meet the good industry practice, best available techniques, and best environmental practices [25]. The most important aspect is the technology that the applicant acquires, including the technology at the time of application and the potential to apply advanced technology, which needs the sponsoring state's scrutiny. At the time of application, the applicant must have the appropriate technical skills as well as the potential to make adjustments as the standards of good industry practice change. In addition to the technology, per se, financial capability and the expertise of personnel are also fundamental to being able to meet the standards of good industry practice. Personnel are essential as people are operators of equipment and technologies. All the staff should be systematically trained. Sponsoring states' legislation should require applicants to provide evidence of technological capabilities. For instance, a general description of the applicant's previous experience, knowledge, skills, technical qualifications, expertise, equipment, and methods is the main reference of technical capacity. The Czech Republic Act gives an example in this regard. It sets a specific provision regarding the expertise of personnel [26] (art. 6).

3.2. Monitoring

The second field that the ISA needs the assistance from the sponsoring state is monitoring. According to the UNCLOS, the contractor is expected to prepare a monitoring program, based on the recommendations of the LTC, to observe, measure, evaluate, and analyze the risks or effects of pollution on the marine environment resulting from activities in the Area, from which the adequacy of existing regulations is examined as well [1] (arti. 165(2)(h)). Additionally, whether the contractor complies with these regulations can be monitored [1] (arti. 165(2)(h)). This provision is reiterated and developed by the ISA Exploration Regulations and Draft Exploitation Regulations (March 2019), from which the latter provide useful details [10–12,22] (reg. 32 and Annex IV, Section 5; reg. 34 and Annex IV, Section 5; reg. 34 and Annex IV, Section 5; reg. 38(2)(9) and Annex VII, Section 2 (g)). Under the Draft Exploitation Regulations (March 2019), three methods are used to monitor the environmental impacts of mining activities and the contractor's compliance, namely self-reporting, inspection, and remote monitoring.

The main monitoring method is self-reporting. The contactor is required to submit annual reports with details of the exploitation work and many other reports [22] (regs. 38(1) and (2), 48(1), 52(3)). If it appears to the Secretary-General, on reasonable grounds, that a contractor is in breach of the terms and conditions of its exploitation contract, he will issue a compliance notice describing the alleged breach and the factual basis for it. He will request that remedial action or other appropriate steps be taken within a specified time period. Failure to implement the measures set out in a compliance notice as to result in serious, persistent, and willful violation of the fundamental terms of the UNCLOS and ISA Regulations may lead to the suspension or termination of the contract [22] (reg. 103). However, the operational factors of mining activities require the contractor to "perform some degree of self-regulation" especially in monitoring, since "it would be almost impossible, and certainly cost prohibitive, for [the ISA] to analyze such a large amount of data in a meaningful way" [25] (p. 4). Likewise, it is difficulty for the ISA to assess the authenticity

for dozens of reports from contractors. Instead, the sponsoring state is able to pre-scrutiny these reports as it has the capacity.

Self-reporting from the deep seabed mining operator should be supplemented with other methods of oversight, including a complaints/whistle-blower procedure, inspection by the monitoring agency, or remote monitoring [17] (para. 14.42). The UNCLOS indicated the "Authority shall have the right to inspect all installations in the Area used in connection with activities in the Area" and further indicated the Council to establish appropriate mechanisms for directing and supervising a staff of inspectors; the LTC is mandated to make such recommendations. Annex 4, Section 14, of the ISA Exploration Regulations provides procedures of inspection. The Draft Exploitation Regulations (March 2019) provide a full description of the appointment and responsibilities of the inspector [22] (regs 96–100). The sponsoring state is required to assist the Council, the Secretary-General, and inspectors to discharge their functions [22] (reg. 96(2)). However, the above legal instruments do not specify how an inspection can be invoked. The sponsoring state can play a more significant role in this regard if the national legislation of the sponsoring state authorizes the monitoring body to conduct inspections regularly, or when it deems them necessary, or under complaint.

3.3. Corrective Measures and Sanctions for Non-Compliance

The third aspect that a sponsoring state and its national legislation assist the ISA is regarding corrective measures and sanctions for non-compliance. It does not mean the ISA's shortage of such power. The advantage is, in the face of a contractor's non-compliance, that the sponsoring state is able to incrementally utilize corresponding mechanisms in the national legislation to adequately respond. It includes incentives to compliance and sanctions against non-compliance [17] (para. 14.46). When the national monitoring agency finds that the contractor has breached the provisions of sponsoring states' legislation, it should submit a written warning to the contractor to correct its wrongful act, which might include a request to undertake, or to cease, or to not undertake a specific activity within a certain period. Specified actions or outcomes, picked up by the reporting and monitoring measures or by a third-party complaint, are assessed as providing evidence of non-compliance, such as (a) waste and pollution not being properly managed, (b) exploration or exploitation activities being conducted outside of the boundaries of approval, (c) performance assessments or reports not being submitted, (d) environmental monitoring not being done, (e) unauthorized mining methods being used, or (f) other material and un-notified deviation from the plan of work or certificate of sponsorship terms [17] (para. 14.48).

Where there is continued non-compliance or breaches are not remedied or there are new breaches of the action plan, sanctions would have to be imposed, namely, further and more serious enforcement action, such as, suspension, termination, or amendment of the certificate of sponsorship. Most states expressly illustrate situations that lead to suspension, revocation, and termination of a license or certificate of sponsorship. For example, the national legislation of Japan, Singapore, and the United Kingdom indicates that the violation of the conditions of the license or provisions of national laws leads to suspension or revocation of license; Kiribati, Nauru, and Tonga indicate where there has been a serious, persistent, or willful breach by the rules of the ISA or national laws [14] (para. 49). On the other hand, the Czech Republic indicates where the contractor refuses to submit to an inspection, the regulatory agency shall revoke the certificate of sponsorship [26] (art. 17(1)(b)). The authors believe this is an effective incentive to encourage the sponsored contractor to comply with the relevant international and national regulations, since without certificate of sponsorship it is impossible to conduct activities in the Area. However, it should be noted that those actions will lead to serious results. Not only is the appeal process extremely complex and rigorous, and even though a certificate of sponsorship is withdrawn, the contractor remains subject to any ongoing obligation or liability previously incurred.

Financial penalty mechanisms are used by almost all sponsoring states that have relevant legislation, excluding France and Russia. The amounts of the fines can vary depending on the sponsoring state and type of offence. In addition, the failure to comply with an enforcement order made by the regulating agency may lead to the suing or prosecution of the operator's directors or other personnel. In any case, "the approach to sanctions is incremental . . . and is subject to the principle of proportionality (the fines are always given as a maximum amount)" [14] (para. 77).

3.4. Enforcement of Decisions of International Court and Tribunal

Providing procedure to enforce decisions of an international court and tribunal is an indispensable function of the sponsoring state and its national legislation. Article 187 together with article 289(2) of the UNCLOS grant the SDC a compulsory jurisdiction in some regard. Furthermore, some cases could be delivered to commercial arbitration [1] (art. 188(2)(a)). As far as cases before the international court or tribunal are concerned, the issue is related to the implementation of the decision of the international court or tribunal at the national level. In practice, the compliance record with decisions of international courts and tribunals is relatively good, and most non-compliance can be solved through an enforcement mechanism at the international level, mostly a political process [27] (p. 349). Nevertheless, it is suggested that a sponsoring state should provide a legal basis for such enforcement in the relevant national legislation so that the decision can be enforced successfully. Among existing national legislation of sponsoring states on activities in the Area, the United Kingdom and Singapore expressly stipulate that the decision of the SDC and an arbitral award of the commercial arbitral tribunal referred to in article 188(2)(a) of the UNCLOS can be enforced internally [28,29] (arts 18–20; art 8A–C). New Zealand, a non-sponsoring state, also stipulates that every decision of the SDC "shall be enforceable in New Zealand as if it were a decision of the High Court, and all the provisions of the law of New Zealand shall apply accordingly with any necessary modifications" [30] (art. 14(3)).

3.5. Prompt Compensation: Access to Domestic Courts

Given that the UNCLOS does not exhaust situations of disputes for activities in the Area, and thus, apart from cases to the international courts or tribunals, a domestic court may also have jurisdiction of some disputes arising from activities in the Area [8]. Ensuring "recourse is available under their legal systems for prompt and adequate compensation" [1] (art. 235(2)) is another important assistance that a sponsoring state provides. The SDC denotes that that article ensures that the contractor can live up to its obligation to provide compensation for damages caused by its wrongful acts [4] (para. 140). The International Law Commission (ILC) also states "[e]ach State should take all necessary measures to ensure that prompt and adequate compensation is available for victims" [31] (principle 4(1)). All these international instruments require the sponsoring state to establish mechanisms to ensure promptness and adequacy of compensation within its domestic legal system.

Promptness refers to "the procedures that would govern access to justice, and that would influence the time and duration for the rendering of decisions on compensation payable in a given case" [31] (comment 7 to the principle 4). In general, damage claims may be brought in the courts of the place where damage occurs (i.e., the transboundary victim's own state), or in the place where harmful activity occurred, or in the place where the defendant is domiciled [32–34] (p. 312). Although jurisdiction is the court of the defendant's residence, domicile, or place of business [35] (Chapters 1,4,12), the claim brought by foreigners may be declined in some legal systems due to the principle of forum non conveniens [32] (p. 313). When claims are brought in the early stage of the deep seabed mining, it is not clear whether that situation will apply. In any case, in the context of deep seabed mining, the national court could be the court in the injured party's state or in the contractor's state, namely, the sponsoring state [8] (p. 3). Currently, only three sponsoring states, namely, Japan, Nauru, and Singapore, have provisions that give the claimant the right to access domestic courts for environmental damage in their national legislation [7]

(p. 8). They, respectively, empower a national court (Japan) [36] (art. 27–28), the Supreme Court (Nauru) [37] (Section 46), and the national high court (Singapore) [28] (Section 17) to hear third-party claims made against its sponsored contractor. Japan also stipulates the limitation of adjudication (three years of becoming aware of the damage or within 20 years of occurrence of damage). It also applies mediation as an approach to the settlement of disputes. An interesting observation on this point is that unlike Nauru and Singapore, Japan does not provide details in its legislation on activities in the Area. Rather, it refers to the relevant parts of the Mining Act [24]. For example, article 27(5) describes issues relating to adjudication, thus "[p]rovisions of Article 11 and Article 113 to Article 116 of the Mining Act (Act No. 289 of 1950) shall apply mutatis mutandis to compensation for damage ... deep seabed mining in Japan". For states with limited legislative capacity or limited practice (early stage of deep seabed mining activities), Japan's example provides a cost-effective approach that can be used as a model for other sponsoring states. Furthermore, promptness can be achieved by a clear procedural arrangement. As ILC stated, given the often protracted nature of compensation claims in domestic courts, consideration ought to be given to the establishment of special national environmental courts [31] (commentary 7 to the principle 4). The Law Commission of India made a very persuasive case for the establishment of national environmental courts in India [38]. Australia and New Zealand already have environmental courts [39,40].

Last, but not least, strict liability of the contractor within the national legislation is also an effective way to provide prompt compensation, since "a strict standard relieves the claimant of the burden of proving fault" [41] (p. 327). Annex III, article 21(3) of the UNCLOS stipulating that a sponsoring state's national legislation is allowed to take more stringent conditions than the UNCLOS provides the legal basis for a sponsoring state to apply strict liability. Additionally, the SDC expects the sponsoring state to "further deal with the issue of liability in future regulations on exploitation" [4] (para. 168). Hence, the sponsoring state is encouraged to set strict liability in its national legislation according to its actual situation and legal traditions. The difficulty lies in how to motivate a sponsoring state to do so. One impetus is that it can be deemed solid evidence that the sponsoring state is executing its due diligence obligation. Nevertheless, the decision is the discretion of the sponsoring state.

4. Conclusions

Mining activities in the Area are governed by a complex regime. As far as the contractor is concerned, it is subject to two series of laws, namely, the UNCLOS and related legal instruments and rules, procedures, and regulations of the ISA, and its sponsoring state's national legislation. They together contribute to the DSM regime. It also faces two regulators, i.e., the ISA is the primary regulator with full power, whereas the sponsoring state is the secondary one with restricted power. The role of the assistant of the sponsoring state decides its competence and core of national legislation. As for the competence, the sponsoring state has absolute power over negative matters by rejecting to issue a certificate of sponsorship, since companies and persons are not qualified to apply for approval of a plan of work from the ISA. By contrast, the sponsoring state has only partial powers for affirmative matters and rights-giving matters, since it is subject to the decision of the ISA. As for regulatory aspects, the sponsoring state should focus on assisting the ISA, as it is able to play a role in fixing the shortcomings of the international organization, namely, monitoring and enforcement. Potential elements of national legislation contributing to the DSM regime are therefore deduced: conditions to issuing a certificate of sponsorship, monitoring, corrective measures and sanctions for non-compliance, enforcement of decisions of the international court and tribunal, and accessing the domestic court. Among others, the sponsoring state's national legislation is able to make indispensable contributions in blocking unqualified applicants, enforcement of decisions of international courts and tribunals, and approach accessing domestic courts. It also has important functions in monitoring and

sanctions for contractors' non-compliance, supplementing provisions of the UNCLOS and rules, procedures, and regulations of the ISA.

The sponsoring state's motivation to incorporate the elements mentioned above into its national legislation can be deemed as one of the measures taken to fulfill its obligation of due diligence and obligation of assisting the ISA, and it is also a way for the sponsoring state to be exempt from potential liability. Two potential risks may arise from the unclear boundaries of competence between the ISA and the sponsoring state. First, duplicated regulatory burdens may result in unnecessary waste of administrative resources. Second, it is difficult to determine the responsible party between the ISA and the sponsoring state in case of serious harm to the marine environment attributing to a regulator. However, the sponsoring state needs an explicit instruction of the boundary of its competence and regulatory aspects it should focus on to assist the ISA, which may come from the primary regulator, the ISA. Under such a "dual-track mechanism", both international conventions and regulations and national legislation are essential parts of the DSM regime; working together leads to an effective regulatory synergy.

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Assessment of the Mechanism for Mining Technology Transfer in the Area: Loopholes in ISA Practice and Its Mining Code

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Abstract: Draft commercial exploitation regulations have been on the agenda of the ISA since several 15-year exploration contracts expired a few years ago. Given the ineffective implementation in practice and the ignored chapter in several mining regulations on the transfer of mining technology, the future Enterprise and developing countries may take a more positive approach to the transfer of mining technology by striking a delicate balance between the provisions on the protection of intellectual property and those on capacity building under the framework of UNCLOS and the 1994 Agreement, through reciprocal and mutual beneficial means such as direct technology purchasing and investment cooperation. The International Seabed Authority, as the competent inter-governmental organization, has the duty to foster favorable conditions for such transfer.

Keywords: transfer of mining technology; commercial condition; protection of intellectual property; direct technology purchasing; investment cooperation

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1. Introduction

By now the international community has gradually realized the economic and strategic value of the mineral resources in the deep seabed. After decades of negotiations to balance the interests of industrialized countries and developing countries, the principle of common heritage of mankind had been established to govern human activities in the international seabed beyond national jurisdiction. For a long time in history, marine technologies were mainly in the hands of industrialized States. In order to facilitate capacity building for developing States, a regime of technology transfer was set up in Part XIV of and Annex III to the United Nations Convention on the Law of the Sea of 10 December 1982 (UNCLOS), as well as Agreement relating to the Implementation of Part XI of the United Nations Convention on the Law of the Sea of 10 December 1982 (the 1994 Agreement). In addition to the general regulations in Part XIV 'Development and Transfer of Marine Technology', Article 144 is especially applicable to the Area under UNCLOS. However, after the adoption of Section 5 of the 1994 Agreement, the provisions of Annex III, Article 5 of UNCLOS shall not apply, which means that the transfer of technology in the Area is no longer mandatory.

In order to regulate activities in the Area, the International Seabed Authority (the Authority/ISA), as the competent international organisation, has formulated three Exploration Regulations, namely Regulations on Prospecting and Exploration for Polymetallic Nodules in the Area (ISBA/19/C/17), Regulations on Prospecting and Exploration for Polymetallic Sulphides in the Area (ISBA/16/A/12/Rev.1) and Regulations on Prospecting and Exploration for Cobalt-rich Ferromanganese Crusts in the Area (ISBA/18/A/11) [1]. Article 3 of the above Exploration Regulations all advocate training programmes in technology transfer under the context of Article 144 of UNCLOS. To date, ISA has signed 30 exploration contracts [2]. Some of these contracts will expire in the near future. It may suggest that certain contractors will commence commercial deep seabed mining soon which will eventually generate direct economic benefits [3] (p. 486). In accordance with UNCLOS and the 1994 Agreement, since 2014, ISA has been working to develop regulations for exploitation of mineral resources in the Area [4]. ISA has also received some comments on the "Draft Regulations on Exploitation of Mineral Resources in the Area (ISBA/25/C/WP.1) (Draft

Exploitation Regulations)" [5]. Throughout the Draft Exploitation Regulations, there are two provisions which directly refer to technology transfer. In Regulation 2, technology transfer is treated as one of the fundamental policies and principles. Additionally, Regulation 63 requests the Council to provide incentives, including financial incentives, to stimulate technology transfer.

In the process of negotiation by the Council on exploitation regulations, the Assembly approved a Strategic Plan for the International Seabed Authority for the period 2019–2023 (ISBA/24/A/10) [6]. In this Strategic Plan, Strategic Direction 5 titled "Build capacity for developing States" stressed on the needs of developing States and funding. It is noted that Strategic Direction 5 refers merely to capacity building while Part XIV of UNCLOS stipulates capacity building as well as transfer of technology. Similarly, Strategic Direction 6.3 focuses on marine scientific and technological training provided by Article 144(2)(b) of UNCLOS and in the meantime, it ignores transfer of technology provided by Article 144(2)(a).

None of the above-mentioned legal documents defines technology transfer and enumerates specific implementation measures, except for training programmes. As Ariel W. Gonzalez pointed out, the key reason for the failure to implement the re-gime of transfer of technology lies in that the thirteen articles of Part XIV of UNCLOS do not set out a clear-cut regime, especially the rights and obligations [7]. Following the generation of economic benefits from commercial exploitation of deep seabed mining, how to implement the transfer of technology to the Enterprise and developing States will be the focal point of commercial exploitation era on top of the issue of benefit sharing. The key to untying the knot in the implementation of the transfer of technology is to clarify the rights and obligations of donors and recipients. The article focuses on solving the intellectual property issues which are the top concerns for donors, and solving the transaction price and flexible cooperation that recipients are most concerned about.

2. The Lack of Transfer of Technology in Practice and Documents of ISA

What is technology transfer? UNCLOS, as "a Constitution for the Oceans" [8,9] (pp. xxxiii, vii), has not given a definition. The provisions of Annex III, Article 5, of UNCLOS provides a definition about "technology" in the context of technology transfer. However, the definition was considered too broad [10] (p. 244), and this article has no longer applied according to the provisions of the 1994 Agreement.

2.1. Transfer of Technology and Transfer of Scientific Knowledge

Part XIV of UNCLOS provides general provisions on technology transfer for all maritime areas. In accordance with Article 268 in Part XIV, technology transfer should include "the acquisition, evaluation and dissemination of marine technological knowledge" [11] and "the development of appropriate marine technology" [11]. Article 144, as the provision specialized in technology transfer in the Area, is consistent with the whole provisions of UNCLOS [11]:

> *"Article 144 Transfer of technology*
>
> 1. *The Authority shall take measures in accordance with this Convention:*
>   (*a*) *to acquire* ***technology*** *and* ***scientific knowledge*** *relating to activities in the Area; and*
>   (*b*) *to promote and encourage the* ***transfer*** *to developing States of such* ***technology*** *and* ***scientific knowledge*** *so that all States Parties benefit therefrom.*
> 2. *To this end the Authority and States Parties shall cooperate in promoting* ***the transfer of technology and scientific knowledge*** *relating to activities in the Area so that the Enterprise and all States Parties may benefit therefrom. In particular they shall initiate and promote:*
>   (*a*) *programmes for the* ***transfer of technology*** *to the Enterprise and to developing States with regard to activities in the Area, including, inter alia,*

> *facilitating the access of the Enterprise and of developing States to the relevant technology, under fair and reasonable terms and conditions;*
>
> (*b*) *measures directed towards the advancement of the technology of the Enterprise and the domestic technology of developing States, particularly by providing opportunities to personnel from the Enterprise and from developing States for* ***training in marine science and technology*** *and for their full participation in activities in the Area."*

This provision has two requirements: one is the transfer of the technology, and the other is the transfer of scientific knowledge.

Clearly, in the context of "technology transfer (in broad sense)", whether in the titles of Part XIV or Article 144, there are two essential elements: "transfer of technology" (the key term in the concrete provisions) and "transfer of scientific knowledge" (the key term in the concrete provisions). In other words, technology transfer in broad sense includes not only the transfer of technology itself, but also the transfer of scientific knowledge related to technology. To be viable, the Enterprise would get access to seabed mining technology and the technical expertise necessary to effectively utilize that technology [12] (p. 176). Compared with Article 268(d), we can conclude that training personnel from developing States or of the Enterprise is a means of scientific knowledge transfer. In addition, although Annex III, Article 5 of UNCLOS is no longer applicable, and its scope of "technology" is considered to be too broad, the connotation of "technology" including "technical know-how" listed in this provision may be used as a reference to better interpret the whole provisions relating to technology transfer in the context of UNCLOS.

As is well known, the opposition to mandatory transfer of technology from major industrialized States (such as Italy, the United States, the United Kingdom) still continues. In order to facilitate wider participation in UNCLOS, the 1994 Agreement modified the compulsory provisions. The transfer of technology is no longer mandatory according to the 1994 Agreement [13] (p. 198). In addition to the provisions of Article 144 of UNCLOS, transfer of technology relating to the activities in the Area shall be governed by Section 5 of the 1994 Agreement [14]. Without exception, the provisions of Section 5 of the 1994 Agreement emphasize the commercial conditions for acquisition of deep seabed mining technology by the Enterprise and developing States. In addition, the provisions provide that States Parties shall promote international technical and scientific cooperation by training, technical assistance and scientific cooperation [14].

Through the above provisions, we can see that technology transfer in a broad sense, under the context of UNCLOS, includes both of the transfer of technology itself and the transfer of scientific knowledge relating to relevant technology, and training is one of the main patterns of transfer of scientific knowledge. In combination with Articles 273 and 274, the "transfer of technology itself" involves skills [11] as well as technical documentation on the relevant equipment, machinery, devices and processes [11], while the "transfer of scientific knowledge" contains training [11] and the acquisition of necessary equipment, processes, plant and other technical know-how [11].

2.2. Focus on Training and Neglect of Transfer of Technology in ISA Practice

After the entry into force of UNCLOS, many international organizations have taken measures to promote the transfer of technology. Such as, the Intergovernmental Oceanographic Commission (IOC) adopted Criteria and Guidelines on the Transfer of Marine Technology, United Nations General Assembly (UNGA) stresses the rationale for facilitating transfer of marine technology in several Resolutions. It is worthy to note that many references of documents of these international organizations which only stressed "training activities" were insufficient to install capacity-building—and even less transfer of marine technology—in the multilateral agenda [7] (p. 356). For example, ISA has paid more attention to training activities for personnel of the Authority as well as of developing States and has ignored the transfer of technology itself in practice, especially the patented mining technology which is the key technology in exploration and exploitation in the Area.

Since 2013, a total of 134 training locations have been provided [15]. The training obligation is set out in the exploration contracts. In other words, the right to explore mineral resources in the Area and the duty to provide training opportunities for personnel of the Authority and of developing States go hand in hand. The training programme has developed into various types, which is helpful for developing States to get access to technical knowledge about activities in the Area, and thus contributes to improve human resources for developing States. Compared with the training obligation, there is no concrete duty about transfer of technology itself in each exploration contract.

However, a phenomenon which cannot be ignored is that those developing States accepting training opportunities still have no capability to explore or exploit mineral resources in the Area. For instance, Nigeria is such a state. This country has seized many training opportunities, such as provided by Companhia De Pesquisa de Recursos Minerais (CPRM) [16], but Nigeria still lacks the mining technology to take part in activities in the Area. Kenya too. Michael Lodge, the then Deputy to the Secretary-General of the ISA, expressed concerns over the lack of participation by African States in recent years especially with the fact that among 26 deep sea exploration contracts approved by the Authority, none was sponsored by an African State [17]. The technology involved in the mineral recovery from the sea is complex, expensive, and relatively recent [10] (p. 173). Most developing States, like African States, do not possess the mining technology. It appears that almost only developed States have the institutions, vessels, instruments, expertise, and financial resources to undertake marine scientific research [18] (p. 308). It is obvious that the lack of expertise or technical knowledge by developing States will constrain their engagement in mining activities, however, only if they possess relevant mining technology, can they fully participate in the activities in the Area.

2.3. Ignored Chapter on Transfer of Technology in Several Important ISA Documents

So far, the mining technology has mainly been controlled by the developed States. Acknowledging the challenges during the transition from exploration to exploitation, how to effectively organize and control activities in the Area and ensure developing States to fully participate in the activities are urgent tasks for the Authority.

2.3.1. Strategic Plan and Other Relevant Documents

The Assembly of the Authority adopted the International Seabed Authority's Strategic Plan for the period 2019–2023 (the Strategic Plan) at its twenty-fourth session [19]. One of the expected outcomes of this strategic plan is "the ability to acquire technology and scientific knowledge relating to activities in the Area and to promote and encourage the transfer to developing States of such technology and scientific knowledge so that all States Parties benefit therefrom" [20]. Notwithstanding the expected outcome, the strategic directions which are critical for the Authority to realize its mission have not completely reflected it. Among the nine strategic directions, Strategic Direction 5 and Strategic Direction 6 are closely related to the regime of technology transfer (in broad sense). The title of Strategic Direction 5 is to "build capacity for developing States" [20]. However, the title of Part XIV, the corresponding part in UNCLOS, is "development and transfer of marine technology" [11]. They both emphasize the development of technology/capacity-building; nevertheless, Strategic Direction 5 does not highlight the chapter on the transfer of marine technology of UNCLOS. Specifically, in Strategic Direction 5.4, the Authority regarded training programmes as a means of realizing capacity-building and solely paid attention to the training programmes provided by Contractors. In Strategic Direction 6.3, it refers directly to Article 144 of UNCLOS, but regrettably, this provision also only focuses on training which refers to Article 144(2)(b), and neglects the transfer of technology and acquirement of such technology in Article 144(2)(a).

In response to the Strategic Plan, a draft High-Level Action Plan is developed to implement and achieve the Strategic Directions. The corresponding High-Level Actions identify the needs of developing States and stress the means for promoting training oppor-

tunities. Additionally, the draft Performance Indicators (PI) has been conceived to enable monitoring and measuring the achievements of the Strategic Plan throughout its five-year life [21]. PI 5.5 provides that particular attention should be given to the number of qualified personnel who have benefited from training funded through the Endowment Fund for Marine Scientific Research in the Area [21]. The quality and quantity of personnel benefited from training programmes is the focus in the documents of the Authority. All of the above documents neglect the transfer of technology itself.

2.3.2. Draft Exploitation Regulations

In order to regulate effectively mining exploitation in the Area, the Legal and Technical Commission of the Authority prepared Draft Exploitation Regulations. In this document, the Authority regards "participation in revenues by the Authority and the transfer of technology to the Enterprise and developing States" [22] as one of fundamental policies and principles. However, throughout the whole document, there has no provision on concrete rules about the transfer of technology. What the Authority may be advocated to do about the transfer of technology is only providing incentives including financial incentives to those Contractors and developing States or their nationals to stimulate the transfer of technology [22]. The document does not even enumerate the specific content of the transfer of technology as Article 274 of UNCLOS. In contrast, the Contractor's training obligation is specified in more detail in Part III, Section 7 in this document. Every exploitation contract should be attached with the approved training plan. The training plan can be modified or amended when the Contractor, the Authority and the sponsoring State or States have concluded mutual agreement, and the new training plan should be conducted by the Contractor [22]. In other words, providing training opportunities to the personnel of the Authority or of developing States is a mandatory obligation for Contractors if they want to conduct exploitation of mineral resources in the Area. As UNCLOS is a package deal, for attracting more industrialized countries to join, the 1994 Agreement actually has amended the provisions of Annex III, Article 5 of UNCLOS, which means that the transfer of technology is no longer a compulsory obligation, but it still advocates transfer of technology, as Article 144 of UNCLOS. Furthermore, this Draft Exploitation Regulations also has not provided any concrete measures about the transfer of technology. Therefore, how to implement the regime of transfer of technology provided by UNCLOS is a real problem especially during the transition from exploration to commercial exploitation.

3. Patented Mining Technology Purchasing: Direct Solution

The Intergovernmental Oceanographic Commission of UNESCO (IOC), as a competent international organization in the field of transfer of marine technology recognized by the United Nations, has developed the Criteria and Guidelines on Transfer of Marine Technology (CGTMT) for States Parties to implement the regime of transfer of marine technology in Part XIV of UNCLOS [23]. In the CGTMT, IOC recognized that "such transfer should be done free of charge, or at a reduced rate for the benefit of the recipient country" [23]. Transfer of mining technology in the Area is a specific pattern of transfer of marine technology, so such transfer should also be guided by the CGTMT as a general rule. However, the potential significance of the ability to exploit the mineral riches of the deep seabed is considered by many experts to be critical for the further industrial expansion of the world's economy [10] (p. 173). Do the industrialized States have probability to transfer mining technology to the Enterprise or developing States free of charge or at a reduced rate under the context of no mandatory obligation? The provisions of Section 5 of the 1994 Agreement changed from Annex III, Article 5 of UNCLOS can tell us the answer.

3.1. On Fair and Reasonable Commercial Terms and Conditions

As for mandatory obligation under Annex III, Article 5 of UNCLOS, the provisions of Section 5 of the 1994 Agreement provide that the transfer of technology should be "on fair and reasonable commercial terms and conditions" [14]. In addition to the provisions

of Article 144 of UNCLOS providing transfer of technology should be "under fair and reasonable terms and conditions" [11] and provisions of Article 266 stipulating "fair and reasonable terms and conditions" [11], transfer of technology should be governed by principles offered by the provisions of Section 5 of the 1994 Agreement which requires transfer of technology should be conducted "on fair and reasonable commercial terms and conditions" [14].

3.1.1. The Meaning of "Commercial"

The term "commercial" we should draw special attention to stands for the condition of transfer accepted by developed States. In general sense, "commercial" is mainly for the exchange of goods or for money [24,25] (pp. 38, 485). In the commercial condition, it is unlikely to accept that the transfer of technology is conducted "free of charge or at a reduced rate for the benefit of the recipient country" [23]. It demands reciprocal interests.

Long before the Third UN Conference on the Law of the Sea, polymetallic nodules were considered as an important source of strategic mineral resources in the future by industrialized countries [26] (p. 339). Due to the economic benefit resulted from mineral resources in the Area, the relevant technology is developed interest-oriented. The industrialized States have invested a lot of money and human resources in mining technology and they are not willing to transfer such technology to developing States without any return. Both for practical reasons and for reasons of principle, industrialized States would not agree to any system requiring the mandatory transfer of technology that had largely been developed by private enterprises operating under free market principles [12] (p. 176). Inversely, they usually tend to apply for a patent to protect such mining technology from infringement, especially the core technology [27].

3.1.2. Purchasing by Paying a Certain Price and Establishing Dedicated Fund

In order to obtain the patented mining technology, one of the advised ways is to purchase such technology under fair and reasonable commercial terms and conditions. Directly, the developing States purchase the patented mining technology by paying a certain price. The price should be determined by both parties to the transaction under the guidance of ISA. Additionally, one of the interpretative terms to help us to understand the condition of transfer is the provision "on the open market" [14]. The price should follow the basic principle of open market for encouraging such scientific research, at least not to discourage the enthusiam for such invention. As a proposal by the Federal Republic of Germany noted during the ninth session of the Third UN Conference on the Law of the Sea, "Fair and reasonable commercial terms and conditions are conditions of the kind actually agreed in practice in comparable cases. In absence of any comparable case, the price agreed should be such as to make an adequate contribution towards recouping development costs. This includes the cost of development work which has not been successful as well as the cost of work necessary to establish a basis of knowledge for carrying out a given project." [12] (p. 679–680) Surely, the price should be certainly favorable for developing States or the Enterprise under the principle of the open market, at least cheaper than transferring to others.

Nevertheless, developing States just lack capital. In order to solve the problem for better implementation of transfer of technology, the Authority should establish dedicated fund to assist developing States in purchasing such patented technology. A long time ago, the International Maritime Organization (IMO) formulated the 1971 International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage—although this was not to facilitate implementation—more to provide a common safety net [28] (p. 316). The Authority should learn the lessons from this practice of the IMO. At present, the Authority provides Endowment Fund to promote and encourage the conduct of collaborative marine scientific research in the Area for the benefit of humankind through two main activities: (a) by supporting the participation of qualified scientists and technical personnel from developing countries in marine scientific

research programmes and activities; (b) by providing opportunities to these scientists to participate in relevant initiatives [29]. The Endowment Fund aims at facilitating developing countries' participation, but furthermore, ISA should offer the assistance to developing States to purchase patented mining technology which they hardly develop. The dedicated funding mechanism for purchasing patented mining technology shall have two ways: (a) by providing fund directly; (b) by offering loan arrangement. The Dedicated Fund shall consist of voluntary donations by member States and partial fees paid by Contractors. An Advisory Panel shall be appointed by the Authority to specialize in evaluating such applications. The application shall submit to the Secretariat and be determined by the Legal and Technical Commission according to the advice from the Advisory Panel. The applicants must be the member States of the Authority.

(a) Providing fund directly. For purchasing fundamental devices or observation equipment and facilities, the Authority can provide a certain fund (for example, not exceed 20% of total price) for a developing country. The developing country should submit an application with detailed information (such as, purpose, method of utilization, transaction price, comparison of transaction price and develop cost or the reason of can't develop, etc.) under each kind of transaction. The purchasing willingness and price must be demonstrated to be accepted by counterparty. Moreover, the developing country should stipulate it has qualified scientists and technical personnel to better utilize, even develop, such devices or equipment. However, ISA should give prior consideration to offer loan unless the developing country in a poor condition to repay the loan.

(b) Offering loan arrangement. For purchasing other patented mining technology, the Authority shall offer a certain loan for a developing country if it applies. The amount of loan should be based on the total transaction price, the debt paying ability of the developing country and the debt paying plan submitted by the developing country. Additionally, the issuance of loan cannot impact the integral operation of the Fund and the potential loan application of other developing countries. The loan application should be submitted accompanied by detailed information (such as, purpose, method of utilization, transaction price, the demonstration of debt paying ability, the reasonable debt paying plan, etc.). Besides, the Authority can operate with other international organizations, such as IOC and World Bank, for providing such fund to assist developing States more systematically to obtain patented mining technologies.

3.2. The Effective Protection of Intellectual Property Rights

With the more and more prominent role of technology on economy as well as other aspects, the world community pays more and more attention to protection of intellectual property rights. The establishment of World Intellectual Property Organization (WIPO) which has 193 member States nowadays is the best example. WIPO developed the International Patent System to assist applicants in seeking patent protection internationally for their inventions and to facilitate public access to a wealth of technical information relating to those inventions [30]. Whether developed countries or developing countries have legislated a series of regulations to protect intellectual property rights. Patent right is one of critical intellectual property rights, which should be protected for incentive to develop technology accordingly beneficial for economy. Although the protection of patent rights should contribute to the transfer of technology according to article 7 of TRIPS, we hardly find an example of successful patent assignment or licence in deep seabed mining technology through searching in the website of WIPO, ISA as well as IOC [27].

3.2.1. The Meaning of "Patent"

The sense of granting "patent" is granting the right to exclude others from making, using, marketing, selling, offering for sale, or importing an invention for a specified period (generally 20 years from the date of filing) [24] (p. 1234). It is intended to protect the rights of the appropriate technology of the states, enterprises, or individuals who have developed

the technology and hold the patent [12] (p. 189). Paragraph 1(b) of Section 5 of the 1994 Agreement which aimed at improving participation of developed States stipulates that the Enterprise or its joint venture or developing States seeking to acquire deep seabed mining technology should obtain such technology "on fair and reasonable commercial terms and conditions, consistent with the effective protection of intellectual property rights" [14]. This provision not only reflects the requirements of developed States on the patented mining technology transfer, but also is a compromise between interests of developing States and developed States. Patented mining technology is that technology holders (states, individuals or enterprises) have invested lots of asset and human resources to develop and have intended to earn the benefit from utilizing this technology in mining or selling to others. Therefore, effective protection of intellectual property rights seems to be an integral element of deep seabed mining regime.

3.2.2. Patent Assignment and Patent Licence

ISA can cooperate with other international organizations, especially specialized in intellectual property rights protection, such as WIPO, to implement the effective protection of patented mining technology, including facilitating patent assignment and patent licence.

(a) Patent assignment. A transfer of rights of ownership is known as an "assignment", which might include all rights in the patent or a more limited interest such as the exclusive right to a geographical area [31] (p. 60). Throughout the practice of countries, patent assignment usually occurs in the case of employment relationship [32] (p. 447). In the scope of deep seabed mining technology, there are two patterns of patent assignment. The first and most critical pattern is that individuals or corporates as patentees or inventors transfer their entire rights to developing countries who have assistance relationship but not essential employment with them. Taking an example, some scientific researchers or skilled personnel from developed States assisted developing States to do some marine research, and during the period of assistance, these scientific researchers or skilled personnel have invented relevant deep seabed mining technology and therefore have a patent, and then ISA shall accelerate the patent assignment to developing States under reasonable payment. In the context of assistance, because developing States offer certain research conditions for these inventors, similarly with employment relationship, it is easier to reach an agreement on such assignment. This way is helpful for developing States to obtain such patented mining technology and relating know-how, and beneficial for their capacity-building. Another is patent transferring from a Contractor directly to others. Such assignment is almost impossible to take place because of assignment covering entire rights of a patent, unless the profit from assignment exceeding the profit from deep seabed mining according to rationalism and market mechanism. However, as long as the view "mining resources in deep seabed regarded as important strategic assets" has not been changed, such assignment is unlikely to occur. On the contrast, patent licence is more practical.

(b) Patent licence. Compared with assignment, patent licence authorizes licensee limited rights to practice the invention in respective area. Yet the inventor still retains the ownership of the patent. A licence can be exclusive (only one licencee has the right to practice the claimed invention) or nonexclusive [31] (p. 61). Sometimes, under the circumstance of an exclusive licence, a licencee may sublicense others, but it is not the main pattern. In order to benefit more developing counties and effectively activate technology market, we advise ISA to foster favorable conditions for nonexclusive licence, particularly some mining technologies associated with environmental protection in the process of deep seabed mining. It is worthy to note, due to the principle of sovereignty, compulsory licence cannot be applied in all circumstances, even related to environmental protection. However, ISA might have rights to authorize a Contractor to utilize certain patented technology under the situation of urgent environmental protection for the interests of mankind as a whole. Definitely, this needs a further

discussion and agreement authorizing such power among member States. The following conditions shall be respected under the consideration of such authorization: (i) The Contractor has already taken all measures as possible as he can to prevent such pollution; (ii) The proposed user has made efforts to obtain patent licence from the patentee on reasonable commercial terms and conditions and that such efforts have not been successful within a reasonable period of time [33]; (iii) Such authority shall be considered on its individual merits [33], and determined by the Council of ISA; (iv) The patent holders, suppliers and respective sponsoring State or States (if has), should be informed as quickly as possible, and they shall be paid adequate remuneration taking in account the economic value of the authorization [33] and the reason of such emergency; (v) The scope and duration of such use shall be limited to the purpose for which it was authorized [33], and the patented technology cannot be applied on other activities even invention of other technologies based on such patented technology, otherwise it will be regarded as an infringement; (vi) If the proposed user has been aware that his mining activities might cause such pollution without taking such patented technology but still were carried out, and thus resulted in the emergency, at the same time of taking measures of such authorization, ISA shall impose on him a punitive payment.

The next noteworthy problem is the situation that holders and suppliers of patented mining technology sometimes are not the same. That is to say, the Contractors are sometimes not the patent holders. There are practical difficulties for the commercial operators to transfer patented mining technology, especially if they are not owners of the technology in question [12] (p. 188). In the era of legalization of intellectual property protection, a Contractor, obtaining the patented mining technology on the premise of following relevant patent law, for example, through patent assignment or patent licence with certain payment, shall not transfer such technology in violating the protection of intellectual property.

As noted in TRIPS, the protection and enforcement of intellectual property rights should contribute to the transfer of technology [33]. Only through collaboration of free market principle and protection of intellectual property as well as the common heritage of mankind principle, can transfer of technology operate effectively and eventually benefit mankind as a whole.

4. Investment Cooperation: Indirect Solution

Either the Enterprise or most developing States lack both funds and technologies to conduct mining activities in the Area. Under the guidance of basic principle of the common heritage of mankind, how to better implement the regime of transfer of marine technology, in particular the patented mining technology, so that all States may benefit therefrom, especially developing States, is one of the problems that need to be solved urgently, particularly in the coming era of commercial exploitation. In addition to purchase patented mining technology directly, operating a joint venture to obtain the necessary mining technology within the present framework provided by UNCLOS and the 1994 Agreement is a practical choice.

4.1. Seize the Superiority on Activities in "Reserved Areas" to Negotiate: for the Enterprise

In October 2012, a proposal aimed at entering into negotiation to form a joint venture with the Enterprise based on sound commercial principles, to develop eight of the reserved area blocks in the Clarion-Clipperton Zone in the Pacific, was submitted by Nautilus Minerals Inc. (Nautilus), a company incorporated in Canada [34]. After a series of debates during the 19th Session of ISA, the Council reached agreement which reads "it is premature for the Enterprise to function independently" [35]. This is the first proposal related to form a joint venture with the Enterprise. To date, there has been no joint venture with the Enterprise. Nevertheless, with the exploitation era is coming, the Enterprise, as the mechanism through which the Authority can fulfill its mandate of generating benefits from

the Area as the common heritage of mankind, should consider how to possess necessary funds and technologies to commerce commercial exploitation.

As is known, "the Enterprise shall conduct its initial deep seabed mining operations through joint ventures" [14] according to the provisions provided by Annex, Section 2 of the 1994 Agreement. Additionally, the Enterprise has no capacity to operate mining activities due to the shortage of capital and technology. The proposal by Nautilus has presented us a good cooperation model, though it failed for a number of reasons. Via a joint venture with Contractors (not limited to developing States, although taking into consideration the benefit of developing States, according to UNCLOS and the 1994 Agreement) who have been proved to have necessary funds and mining technologies, the Enterprise can solve the practical problems to explore and exploit, especially accessing the patented mining technologies through certain designed provisions, at least the non-exclusive patent licence. Let us take the example based on the discussion on the first joint venture proposal, irrespective of other factors. In Business Proposal Heads of Agreement by Nautilus, there are several concrete clauses providing approximate costs of each programme and funds supported by Nautilus, and it refers that they shall focus on participating interests, financial and technical contributions and others in the 2015 Programme [34]. As well, in related report by the Secretary-General, he noted the costs incurred by the Enterprise associated with this proposal would be borne by Nautilus [36]. It is a pity that both parties, mainly the Enterprise, have no mention of anything about transfer of marine technology to the Enterprise. Although capital is really very important in conducting mining activities, the Enterprise should draw more attention to the patented mining technology which is more vital and harder to obtain. In accordance with UNCLOS and its Annex III, the reserved area is exclusively for the Enterprise and developing States. Other countries or entities who are eligible to conduct mining operations shall only manage to build up a joint venture with the Enterprise or partnership with developing States. Furthermore, the priority of the Enterprise with regard to mining activities in the reserved area is for every State and every entity, including developing States. This is the biggest negotiating asset possessed by the Enterprise. Maybe the Enterprise should seize the superiority to negotiate with Contractors on transfer of marine technology, especially the patented mining technology. Because only when the Enterprise grasps the necessary patented mining technologies, could it have ability to operate independently in the Area, other than to cooperate with other countries for no other reason than technology. As a representative of Tonga noticed, if the Enterprise could not fulfill its mandate of ensuring the resources of the deep seabed were preserved as the common heritage of mankind, it would serve no purpose [37]. Definitely, both the reserved area and the Enterprise are served for the benefit of mankind as a whole, so only when the Enterprise or developing States directly master such mining technology can they fully participate in the activities in the Area and benefit therefrom. Why not the Enterprise make concessions in terms of financial benefits and pay more attention to the acquisition of mining technology? As the view of Siyoong Yoo, the main question in deep seabed mining development is if we do have the right technology available at the right time and with the right price [38] (pp. 1078–1083). For the Enterprise, utilizing a joint venture to access to the necessary technology is the best choice. Similarly, if an applicant decided to offer shares in a joint venture with the Enterprise instead of reserved area in the case of polymetallic sulphides (PMS) and cobalt-rich crusts (CRC) [39], the Enterprise should be more inclined to acquire the patented mining technology than purely monetary benefit in considering the shares.

Besides, when the Enterprise possesses the mining technologies, it shall prefer to transfer to developing States which may need and request under the principle of common heritage of mankind.

4.2. Utilize "Reserved Areas" to Build up Partnership with Developed States: for Developing States

As stated above, the reserved area is served exclusively for the Enterprise and developing States to realize the equitable benefit-sharing from the Area. If the Enterprise has

no intention to conduct activities in applied reserved area, such area should be solely for developing States.

As of January 2019, six developing countries have taken advantage of the provisions in UNCLOS to sponsor exploration activities in the reserved areas, covering 427,495 sq. km, in the circumstance of a total of 1,315,633 sq. km originally contributed to polymetallic nodules (PMN) reserved areas and 3000 sq. km to CRC [39]. Complying with the provisions of UNCLOS and its Annex, as well as the 1994 Agreement, the allocated reserved areas have been provided for developing States without exception. As for those developing States lacking of financial and technical capacity to enter into exploration or exploitation independently, the system of "reserved areas" is the greatest advantage for them to utilize to seek for partnership with developed States.

In fact, both the first and second contractor with exploration rights in the reserved areas are the combination of developing States and developed States (actually the entities from developed States). For instance, the first contractor Nauru Ocean Resources Inc. (NORI) benefited in its technical team from the experience of leaders of four international consortiums (Ocean Management Incorporation, Kennecott Exploration Consortium, Ocean Minerals Company and Ocean Mining Associates) which developed and successfully carried out trial deep-sea mining systems to collect nodules in the Clarion-Clipperton Zone in the 1970s [40]. This is the most direct cooperation means by which developing States can utilize relevant technologies to carry out activities. However, the ownership of such patented mining technologies still belongs to these entities. Fortunately, Nauru, as a sponsoring state, has been aware of the importance of access to marine technology. At the beginning of the sponsorship agreement drafted by Nauru and NORI, Nauru insisted on scientific and technical assistance, in addition to training and recruitment programmes for its nationals to effectively participate in the exploration activities. Such scientific and technical assistance should include "promoting and funding programmes of scientific, educational and technical assistance" [41], which is different from pure technical assistance free of charge and take sponsorship as consideration. This is de facto transfer of marine technology in UNCLOS. Despite the purpose of such technical assistance is for "increasing the State's capacity to protect and preserve the marine environment within the State's own exclusive economic zone" [41], marine technology applied on activities in marine area under national jurisdiction and beyond national jurisdiction have something in common, so that such marine technology might be applied on activities in the Area directly. Besides, Nauru can further develop mining technology on the basis of such technology and thus save a number of research grant and time. Definitely, it is better that if Nauru can propose NORI to transfer some patented mining technologies, even at the expense of part of royalty payments. In any case, NORI represents a pattern for developing States taking advantage of reserved areas to build up partnership with developed States (entities) to access the necessary mining technology. Analogous to NORI, while Tonga should not focus merely on participation in deep seabed activities nominally or monetary benefits, such as royalty payment, it lacked political will and awareness of proactive acquisition of transfer of marine technology, in particular the patented mining technology, as a transaction term. It is exactly a need to move from the passive approach of waiting for the transfer of marine technology to active attitude for access to such technology through a more dynamic, integrated and forward-looking marine technology policy [42,43] (pp. 692, 326). Developing States, like Tonga, should make full use of "reserved areas" to quest for the transfer of marine technology under mutual benefits, only through which can they effectively and actually participate in deep seabed mining in accordance with the spirit of UNCLOS and the 1994 Agreement as well as mining codes.

4.3. South-South Cooperation with Approximate Political Benefits

Comparatively, the possibility of success for South-South Cooperation is bigger since they are likely to have approximate political benefits, at least against the predominance of developed countries in deep seabed mining. So far, there are so many organizations or

programmes operated for promoting collaboration amongst developing countries, such as the Group of 77.

On the one hand, developing countries can seek cooperation with developing States possessing deep seabed mining experiences and technologies. It is worth pointing out, there have been 2 Contractors sponsored by developing States, namely China and India, as pioneer investors in a total of seven Contractors in the Area, despite one intergovernmental consortium composed of developing States and developed States. In addition, among the total 30 contracts related to exploration in the Area, 14 of these contracts are sponsored by developing States, accounted for nearly half. India is a well-known developing country rich in technology in respect of deep seabed exploration. Take the cooperation between African countries and India as an example. Most African countries are poor in economy and technology, due to various reasons including political and historical, but this does not indicate that they have no interest in deep seabed mining. Thus, they have been proactive in seeking cooperation with other countries, in particular with India for the geographical and political reasons. The Indian Ocean Rim Association (IORA) is one of the best platforms, which is established on the basis of promoting cooperation in the Indian Ocean Region, since several African countries and India are the member states of IORA. Especially, academic, science & technology and blue economy, including but not limited to minerals, are the two dominant priorities and focus areas identified by India during the period of its chairmanship. On a morning meeting during the first familiarization visit to India by IORA members' journalists, which several African countries, like Indonesia and South Africa, have taken part in, Mohan Shukla, the chief of the external affairs at Bharti Enterprises Ltd., said capacity building initiatives of IORA region countries was possible through technology transfer [44]. African countries shall set up workshops or forums with India to obtain skilled expertise and technology under the framework of IORA. Meanwhile, dialogue partners, including China and Egypt, of IORA, provide valuable assistance in the field of technology transfer, technical cooperation and so on [45]. African States also shall take measures to acquire technology transfer via the platform.

On the other hand, developing States can collaborate with each other which need and request the necessary mining technology. Though some developing countries have no enough capacity to conduct deep seabed mining activities independently, they have exactly developed some basic related marine technology. They shall take cooperative action by various means, such as technology exchange, patent licence including exclusive and non-exclusive. The complexities of surveying, prospecting, exploration and eventual exploitation and processing merely point to the fact that deep seabed mining requires immense technological capabilities [42] (p. 692). For example, Country A possessed unmanned research submersible which can withstand water pressure at a depth of 5000 meters but cannot handle the incidence of submarine thermal energy. Whilst Country B developed one technology which can solve the problem of surveying against submarine thermal energy, and on the contrast, it just lacks the technology workable under water pressure at such depth. The two countries can set up collaboration by technology exchange in respect of the research cost with mutual interests. It is so important that developing States can save a lot of research cost and time, and thus accelerates their whole deep seabed mining process.

5. Conclusions

Conducting mining activities in the Area needs a number of funds and complex high-technologies, which actually constraints developing States' participation. Reviewing the practice and several mining regulations, the regime of transfer of technology seems to be a loophole. With the coming era of commercial exploitation, how to effectively implement the transfer of mining technology for facilitating full participation of developing States and thus beneficial for mankind as a whole shall be one of the main focuses. Since UNCLOS and the 1994 Agreement definitely have stipulated the commercial conditions and protection of intellectual property on transfer of technology, the Enterprise and developing States

should shift their passive waiting to active acquisition by utilizing various cooperation under the setting conditions. For the Enterprise and developing States, they should take full advantage of the regime of "reserved areas" to seek cooperation means with developed States for access to necessary patented mining technologies. Furthermore, developing States can try their best to build up partnership with other developing States possessing certain patented mining technology though such technology is not enough mature to be applied to mining activities, especially under the framework of relevant organizations. Such partnership will be comparatively easier to foster because they usually have some common political targets and benefits. Besides, the Authority, should foster favorable conditions to facilitate technology transfer, and collaborate with other organizations, such as IOC, World Bank, WIPO, to effectively and actually implement the transfer.

It is not impossible to implement the transfer of technology under the framework of UNCLOS and the 1994 Agreement. The pivot is reciprocity. On the premise of free market and intellectual property protection, the Enterprise and developing States should abandon their view of obtainment at a reduced rate or even free of charge, due to the massive financial and human resources in developing such technology. Only when the transfer of technology, in particular the patented technology, has been conducted in the context of commercial conditions and protection of intellectual property, can the regime of technology transfer be effectively implemented. Only when the transfer of technology has been effectively implemented, can the regime of deep seabed mining operate comprehensively, and can the principle of common heritage be realized in the future.

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On the Legal Status of Marine Genetic Resources in Areas beyond National Jurisdiction

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Abstract: The question of how to define the legal status of marine genetic resources (hereinafter MGRs) in areas beyond national jurisdiction (hereinafter ABNJ) is one of the important issues in the negotiation of the International Legally Binding Instrument under United Nations Convention on the Law of the Sea on the Conservation and Sustainable Use of Marine Biodiversity of Areas beyond National Jurisdiction. According to the theory of the order and justice value of the law, in combining the experiences of the international community in handling global ocean problems and characteristics of MGRs in ABNJ, it can be said that MGRs in ABNJ have the legal attribute of being the common heritage of mankind (hereinafter CHM). From the perspective of the principle of CHM, in applying the subject, object and content elements of legal relations as the research approach, the legal status of MGRs in ABNJ should be defined as follows: Firstly, an international management body should be established and the scope of actual resource developers should be defined in terms of subject elements. Secondly, the temporal scope, geographical scope and material scope of MGRs in ABNJ should be clarified in terms of object elements. Thirdly, the disposition of rights and obligations in the process of development and utilization of MGRs in ABNJ should be defined in terms of content elements.

Keywords: marine genetic resources; common heritage of mankind; BBNJ

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1. Introduction

Marine genetic resources (hereinafter MGRs) in areas beyond national jurisdiction (hereinafter ABNJ) refers to the genetic resources derived from the high seas and the Area [1]. In recent years, MGRs in ABNJ have increasingly attracted the attention of the international community. Its potential economic value has aroused the need to establish new regimes of international law [2]. Reviewing existing international legal documents, the 1992 Convention on Biological Diversity only regulates genetic resources in areas within national jurisdiction. The 1982 United Nations Convention on the Law of the Sea (hereinafter UNCLOS) established the high seas regime in Part VII and the Area regime in Part XI, respectively, based on the principle of freedom of the high seas and the principle of common heritage of mankind (hereinafter CHM) in ABNJ. However, the specific legal regimes concerning MGRs in ABNJ are still absent. The International Legally Binding Instrument under the United Nations Convention on the Law of the Sea on the Conservation and Sustainable Use of Marine Biodiversity of Areas beyond National Jurisdiction (hereinafter ILBI), as the latest legislative process in the field of the law of the sea, is intended to fill the legal gap. MGRs in ABNJ, including questions on benefit-sharing, is one of the core issues in negotiating the ILBI [3]. The two regimes concerning ABNJ established by UNCLOS have caused uncertainty in terms of the applicable regimes. The question of whether the new regimes of the law of the sea concerning MGRs in ABNJ apply to the principle of freedom of the high seas or the principle of CHM has always been the focus of argument in negotiating the ILBI.

At present, only a few developed states have the funds and technical conditions to develop and utilize MGRs in ABNJ [4]. They advocate the principle of freedom of the high

seas and benefit from MGRs in ABNJ. The potential value of MGRs in ABNJ is tremendous. It seems that the claim of freedom of the high seas does not set up development barriers. However, it will result in disordered competition, which will result in some problems such as maritime hegemony, uneven opportunities, the tragedy of Commons and intergenerational inequality. It will face an ethical dilemma and realistic questioning, which in contrast to the order and justice value of law. Therefore, to ensure fairness, stability and predictability of MGRs allocation in ABNJ, it is necessary to establish the new regimes relative to the law of the sea. The premise of establishing the new regimes is to reasonably define the legal status of MGRs in ABNJ [5]. The core issue in negotiating the ILBI is to choose the position to define the legal status of MGRs in ABNJ and then establish the legal regimes regarding access to and benefit-sharing of MGRs in ABNJ.

Given their own interests, there are four positions of the international community on this issue: Firstly, developed states believe that the principle of freedom of the high seas should be applied. Secondly, developing states advocate the application of the principle of CHM. Thirdly, some states such as South Africa assume that the principle of freedom of the high seas should be applied in the high seas and the principle of CHM in the Area. Fourthly, other states and international organizations represented by the European Union hold that the ILBI negotiations do not depend on determining the legal status of MGRs in ABNJ [6]. These four different positions reflect the different interests of different states. In order to realize the order and justice value of the law, the conservation and sustainable use of marine biodiversity of areas beyond national jurisdiction (hereinafter BBNJ) and the common interests of mankind ensure intra-generational equity and intergenerational equity [7]; the legal regimes regarding access to and benefit-sharing of MGRs in ABNJ should not only stimulate financial investment, technological research and the development of enthusiasm of the developed states, but also ensure equal opportunities and benefits-sharing for all states.

By evaluating the existing four different positions, the standpoint of the principle of CHM is the most consistent one out of the above legislative ideas. The principle of CHM has its institutional foundation of the law of the sea and its legal connotation has constantly evolved in practices of the law of the sea. Consequently, the principle has the potential to become the applicable principle of the ILBI. Firstly, this paper analyzes the necessities of defining the legal status of MGRs in ABNJ and admits the unified legal status of MGRs in ABNJ. Secondly, this paper justifies the legal attribute of CHM of MGRs in ABNJ in the context of the law of the sea. Lastly, taking the subject, object and content elements of legal relations as the research approach, this paper analyzes methods for defining the legal status of MGRs in ABNJ in ILBI from the perspective of the principle of CHM.

2. Preview of Defining the Legal Status of MGRs in ABNJ

In order to define the legal status of MGRs in ABNJ in the context of the law of the sea, the following premise questions should be answered: (1) demonstrate the necessities of defining the legal status of MGRs in ABNJ and (2) to figure out whether to endow MGRs in high seas and the Area with a unified legal status.

2.1. Necessities of Defining the Legal Status of MGRs in ABNJ

The legal gap on regulating MGRs in ABNJ means that there is a need to establish new regimes to maintain order and distribute benefits equally. The ILBI, which regards MGRs in ABNJ, includes questions on benefit-sharing as one of the core issues and is the institutional response to this realistic need. The reasonable definition of the legal status of MGRs in ABNJ is not only related to the establishment of the new regimes and the formation of marine order in ABNJ but also a reflection of the evolution of the trend of thought relative to the law of the sea and the value direction of distribution of the residual right in the law of the sea in ABNJ.

2.1.1. Institutional Core of the ILBI

The value of marine biodiversity is mainly reflected in the use of existing biotechnology for the biodiversity prospecting of MGRs and then developing some new varieties of resources and various biotechnological products. The exploitation of MGRs in ABNJ is the focus of attention for the conservation and sustainable use of BBNJ. As a result, the legal regimes concerning MGRs in ABNJ are also at the core of the ILBI. As an object of the law of the sea, defining the legal status of MGRs in ABNJ is a key issue and is the legal basis for the establishment of legal regimes regarding access to MGRs and benefit-sharing of MGRs in ABNJ.

The reasonable definition of the legal status of MGRs in ABNJ is the basis for establishing legal regimes regarding access to and benefit-sharing of MGRs in ABNJ, ensuring the good legal nature of the ILBI. Moreover, the domino effect will have a decisive impact on the institutional construction of the other three core issues of the ILBI: area-based management tools, environmental impact assessments, capacity building and marine technology transfer [3].

2.1.2. Internal Foundation for Establishing a New Marine Order in ABNJ

According to current international practices, there are three main types of marine resources in ABNJ: fishery resources in high seas, mineral resources in the Area and MGRs in ABNJ. There are mature legal regimes on fishery resources in high seas and mineral resources in the Area, which have formed a relatively stable, definite and predictable marine order, while legal regimes of MGRs in ABNJ are still absent. In practice, some developed states such as United States, Japan and Russia have developed and utilized MGRs in ABNJ using their technological and financial advantages [4]. These states advocate the principle of freedom of the high seas, causing a state of disorderly competition in the development and utilization of MGRs in ABNJ.

Order is one of the values of law. In social interaction, order always overwhelms disorder, which stems from human demands for continuity of life arrangements and the tendency to place social interaction under the regulation of rules. In the field of exploitation and utilization of MGRs in ABNJ, the current disordered competition has caused the realistic problems of marine hegemony, the tragedy of commons, unequal opportunities and inter-generational inequality. New legal regimes are needed to establish a new order to ensure the continuity and certainty of regulating MGRs in ABNJ. A reasonable definition of the legal status of MGRs in ABNJ is the precondition for establishing relevant legal regimes and also the internal foundation for establishing this new marine order in ABNJ.

2.1.3. Value Direction of Distributing Residual Rights in the Law of the Sea

The term of residual rights in the law of the sea refers to those rights which are not explicitly stipulated or prohibited by the law of the sea [8]. MGRs in ABNJ are a kind of object of residual rights in the law of the sea. As mentioned above, there is a realistic need to establish a new order in ABNJ and to form a rational distribution pattern on MGRs in ABNJ. On the legal status of MGRs in ABNJ, different standpoints represent different interests' pursuit. Legal regimes regarding access to and benefit-sharing of MGRs in ABNJ designed based on those standpoints may have similarities, but the interests maintained and the values embodied are far from one another. The definition of the legal status of MGRs in ABNJ affects the distribution pattern of MGRs in ABNJ and implies the value direction of the modern law of the sea in allocating residual rights in the law of the sea.

As to the issue of the distribution of rights or interests, justice is another value of law, which includes intra-generational equity and inter-generational equity. For the sake of the justice, it is necessary to uphold the correct value direction of the distribution of residual right by the law of the sea.

To define the legal status of MGRs in ABNJ and to establish relevant international legal regimes, it important to aim at guaranteeing intra-generational and inter-generational eq-

uity, balancing the interests between developed states and developing States and balancing the interests between contemporary and future generations.

2.2. Justifications for the Unified Legal Status of MGRs in ABNJ

Since it is necessary to define the legal status of MGRs in ABNJ, which covers both the high seas and the Area, the question of whether to follow the divide-rule approach of UNCLOS or admit MGRs in ABNJ with a unified legal status should be investigated. This paper chooses the latter one for the following reasons.

2.2.1. Integrity of MGRs in ABNJ

UNCLOS divides the oceans into various types of sea areas and places the marine living resources in different sea areas under different legal regimes, which, to some extent, ignores the integrity of marine ecosystems and the mobility of marine organisms. In practice, the flaws derived from the divide-and-rule system of UNCLOS for marine living resources have manifested in the conservation and management of straddling fish stocks. The Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, which is the second implementing agreement of UNCLOS, is a response to this problem.

The integrity of MGRs in ABNJ is more obvious. In practice, it is generally difficult to distinguish whether MGRs come from the high seas or the Area because many marine living resources, even if they usually remain in the deep sea, are closely linked to the Area environment and are inseparable from one another [9]. As the latest progress of the law of the sea, the negotiation of the ILBL should sum up the past experiences, eliminate the gap between the system and reality, provide full consideration to the integrity of MGRs in ABNJ and admit its unified legal status.

2.2.2. Feasibility of International Law-Making

If MGRs in ABNJ are placed under two different institutional frameworks according to the divide-and-rule approach of UNCLOS, namely, the high seas regime and the Area regime, the contradiction between the above classification of sea areas and the conservation and management of marine living resources will be extended to ABNJ. Moreover, two sets of different regimes regarding access to and benefit-sharing of MGRs in ABNJ should be constructed according to the high seas and the Area, which not only increases the difficulty of the negotiation of the ILBI but also the difficulty of law application.

Bodenheimer, an American jurist, mentioned that, in addition to the inherent requirement of justice, the construction of a legal system should also be based on the standards of expediency, utility and feasibility [10]. International law-making is a game process of the international community. From the perspective of the negotiation of the ILBI, admitting MGRs in ABNJ a unified legal status is more conducive to reaching an agreement among the international community.

3. Justifications for the Legal Attribute of CHM of MGRs in ABNJ

There is an institutional basis for the law of the sea to admit the legal attribute of CHM of MGRs in ABNJ. In addition, the principle of CHM is of significance for the negotiation of the ILBI.

3.1. Having the Institutional Basis of the Law of the Sea

As the foundation of the Area regime, the principle of CHM has been legalized by UNCLOS. The application analysis of the principle in the law of the sea belongs to the interpretation of empirical law. According to the methods of interpretation of treaties defined by Articles 31 and 32 of the Vienna Convention on the Law of Treaty, the analysis of semantic interpretation, systematic interpretation, objective interpretation and historical interpretation is stated in the following subsections.

3.1.1. Semantic Interpretation

Article 136 of UNCLOS stipulates that: "The Area and its resources belong to the common heritage of mankind." From the perspective of semantic interpretation, the scope of application of the principle of CHM includes the Area in the sense of the space and the resources in the Area [11]. At the very least, MGRs in the Area have not been explicitly excluded. By means of the semantic interpretation, the conclusion is still undefined and this needs to be further elucidated by the following methods of interpretation of treaties.

3.1.2. Systematic Interpretation

Reviewing the provisions of Part XI of UNCLOS, it can be observed that the provisions of this part refer to the provisions of the Area as a space in articles such as Articles 138, 141, 143 (1) and 143 (3), the provisions of resources in the Area such as Article 137 (2), the provisions of the Area and its resources such as Articles 137 (1) and 143 (2), as well as the provisions of activities in the Area such as Articles 139, 140, 142, 144 and 148. These particular regulations of UNCLOS can support the interpretation of MGRs accessed in the Area independent of the Area in the sense of space relative to the CHM.

In addition, according to Article 77 (4) of UNCLOS, the natural resources of the continental shelf include living and nonliving resources. There is no essential difference in the natural structure between the Area and the continental shelf except for their geographical location. Considering the inherent consistency of the law of the sea, it is appropriate to interpret the natural resources of the Area as including living resources and nonliving resources; the former also includes MGRs accessed in the Area.

3.1.3. Objective Interpretation

The principle of CHM is introduced into UNCLOS to prevent disorderly competition among states in developing MGRs in ABNJ and to avoid unilateral actions by a few developed states relying on the advantages of science, technology and capital that would result in unequal opportunities and inter-generational inequality [12]. The essence of CHM is to realize the common interests of all mankind through good ocean governance.

Firstly, in its preamble, UNCLOS states that the purpose of the Convention is to "promote the peaceful uses of the oceans, and the equitable and efficient utilization of their resources" and "the achievement of these goals will contribute to the realization of a just and equitable international economic order which takes into account the interests and needs of mankind as a whole and, in particular, the special interests and needs of developing States, whether coastal or land-locked". To define the legal attribute of MGRs in ABNJ as CHM would result in the promotion of peaceful utilization, equal opportunities and fair benefit-sharing, which is in line with the purpose of UNCLOS.

Secondly, UNCLOS emphasizes the promotion of "the conservation of their living resources and the study, protection and preservation of the marine environment" in its preamble. The principle of CHM seeks a balance between the efficient exploration and development of MGRs in ABNJ and the prevention of the tragedy of Commons and further aims to maintain inter-generational equity and pays attention to the needs and rights of future generations for resources, which is in line with the purpose of UNCLOS.

3.1.4. Historical Interpretation

During the Third United Nations Conference on the Law of the Sea, the international community knew little about other living resources in ABNJ except for high seas fishery resources. Even after the discovery of the hydrothermal vent communities in 1977, the huge economic potential of MGRs in ABNJ did not attract the general attention of the international community [13]. The international community's focus on developing resources in the Area is on mineral resources [5]. In response to the practical needs, Part VII of UNCLOS has set up a regime of conservation and management of high seas living resources for fishery resources. Part XI of UNCLOS has set up a regime of exploitation and management

of mineral resources in the Area without taking the relevant regimes of the MGRs in ABNJ into account.

Legislative gaps do not mean that the law of the sea negates the legal attributes of CHM of MGRs in ABNJ. When Arvid Pardo proposed to the United Nations General Assembly the institutionalization of CHM, the scope of application advocated by Pardo was not limited to the mineral resources in the Area. A review of the content of General Assembly resolution 2749 (XXV) would result in the same conclusion [14]. The preamble of UNCLOS also reaffirms General Assembly resolution 2749 (XXV) and advocates the development of the principles established in this resolution. Although Article 133 of UNCLOS defines resources in the Area as mineral resources, this is for historical reasons and it does not constitute an institutional obstacle for defining the legal attributes of MGRs in ABNJ as CHM. The scope of application of CHM should not be limited to the existing provisions of UNCLOS.

3.2. The Significance of the Principle of CHM for the ILBI

Since the principle of CHM was confirmed by Part XI of UNCLOS, it has not been implemented as expected in international practice. In response to this practical dilemma, based on coordination and compromise between developed and developing states, the recent law-making on the law of the sea has induced further evolution of the legal connotations of CHM. Looking back on the development of the modern law of the sea, the principle of CHM is not only the reflection of the evolution of thought relative to the law of the sea but also the foundation of future regimes of the law of the sea.

3.2.1. Conforming to the Ideological Trend of the Law of the Sea

Mare Liberum, published anonymously in 1609 by Hugo Grotius, laid the theoretical foundation for freedom of the high seas in the field of the law of the sea. Then, the winds of land domination blew into the sea and gradually shaped many of the fundamental features of the modern law of the sea. The principle of freedom of the high seas is increasingly restricted by treaty law and international customary law. The ideological trend of the law of the sea has the following impacts on international law-making: Firstly, the trend of regulation in ABNJ by the modern law of the sea has transferred from absolute freedom to reasonable restriction. Secondly, the value direction of modern law of the sea with regard to the distribution of maritime rights and interests has shifted from "first-come, first-served" individual benefit to unified management and shared benefit. The principle of the CHM has gradually replaced the long-cherished principle of the freedom of the high seas in ABNJ [15]. The Area regime established by Part XI of UNCLOS and the Agreement Relating to the Implementation of Part XI of the United Nations Convention on the Law of the Sea of 10 December 1982 (hereinafter 1994 Agreement) based on the principle of CHM is one of the examples of this trend.

Recognizing MGRs in ABNJ with the legal attribute of CHM, establishing legal regimes regarding access to and benefit-sharing of MGRs in ABNJ based on the principle of CHM conforms to the development trend of the law of the sea in the negotiation of ILBI. It also conforms to the ideological trend of the law of the sea, namely the regulation of the activities in ABNJ from absolute freedom to reasonable restriction.

In the first place, as a kind of resource in the global commons, MGRs in ABNJ are of the sharing characteristic, which means that the development and utilization of MGRs in ABNJ by various states requires explicit or implicit consent by other members of the international community. In addition, these activities should be implemented to achieve and enhance the common well-being of all mankind [7]. Determining MGRs in ABNJ with the legal attributes of CHM can activate the awareness of common interests in the international community and guide states to consider the rights and interests of other states while being self-interested in implementing ABNJ activities. Compared with the principle of freedom of the high seas, the principle of CHM is more in line with the sharing characteristics of the resources.

In the second place, the value of MGRs in ABNJ is concentrated in the intangible genetic information it carries, which requires plenty of funds and advanced technology to obtain it. Only developed states have the conditions to implement such exploitation and utilization activities currently. Therefore, defining the legal attributes of MGRs in ABNJ as CHM and establishing unified management of access to and benefit-sharing activities by the international community could ensure equal development opportunities for all states, promote peaceful use and achieve fair and equitable benefit-sharing.

3.2.2. Promoting the Establishment of New Regimes of the Law of the Sea

By reviewing the process of international law-making, even if the initial meaning of a legal term is vague and general, the legal term may evolve into a legal concept or even a legal principle with maturity in its connotation. UNCLOS and the 1994 Agreement established the Area system based on the principle of CHM. In the game of the international community, the legal connotation of the principle of CHM has been developing continuously. Currently, 168 States or regions have ratified or acceded to UNCLOS [16]. Consequently, the principle of CHM has been widely accepted and recognized by the international community because of its institutional basis of UNCLOS. It provides a good example for the international community to abandon "first-come, first-served" and advocate peaceful and cooperative development. Based on the status and role of the principle of CHM in ABNJ, it has the rationality and legitimacy to be the core of the new ABNJ system and can promote the establishment of the new regimes.

Looking back on the development of the law of the sea, it can be observed that the formulation of a convention or agreement is the product of compromise in complex international relations. Establishing new international legal regimes requires long-term historical accumulation and national game playing. The negotiation of ILBI is an obvious example. Currently, after 17 years of negotiations, there are still a lot of disputes in the international community, which means that the negotiation of ILBI is a long-term and difficult process.

At present, there are mainly two camps formed by developed states and developing states based on their respective interests in negotiating the ILBI. The principle of CHM aims to safeguard the common interests of all mankind and emphasizes sustainable development. The following system design based on this principle can effectively mediate the interest conflicts between developed states and developing states and is conducive to reaching an agreement in negotiating the ILBI. Firstly, setting up a relatively loose regime regarding access to MGRs in ABNJ to ensure equal development opportunities can loosen the constraints for developed states. Secondly, developing states are guaranteed to receive the benefits arising from the utilization of MGRs in ABNJ and can meet their reasonable demands by establishing a fair and equitable benefit-sharing regime. Thirdly, paying attention to the protection and balance of knowledge related to MGRs in ABNJ can mediate the tension between equity and efficiency in developing MGRs in ABNJ.

4. Definition of the Legal Status of MGRs in ABNJ from the Perspective of the Principle of CHM

MGRs in ABNJ, including questions on benefit-sharing, is one of the core issues in negotiating the ILBI. It is crucial to define the legal status of MGRs in ABNJ in the ILBI, which is the direction of the international law-making and the basis of the follow-up regimes. As mentioned above, MGRs in ABNJ have the legal attribute of CHM. It should be made clear that CHM is not a natural attribute of MGRs in ABNJ, but a legal attribute that needs to be to be affirmed by the ILBI. The establishment of the ILBI should take into account the practical experiences of the Area regime fixed by UNCLOS and define the legal status of MGRs in ABNJ with the revised legal connotation of CHM. Meanwhile, the establishment of the ILBI will also have far-reaching impacts on the development of the legal connotation of CHM.

On 18 November 2019, the United Nations issued the revised draft text of an agreement under the United Nations Convention on the Law of the Sea on the conservation

and sustainable use of marine biological diversity of areas beyond national jurisdiction (A/CONF.232/2020/3, hereinafter the Revised Draft of the ILBI) [17]. Article 5 (c) of the Revised Draft of the ILBI affirms the principle of CHM as the general principle of the ILBI. However, a large number of square bracket clauses exhibited in the Revised Draft of the ILBI indicates that the negotiation of the ILBI is long-term and arduous. In light of the Revised Draft of the ILBI, this paper analyzes methods to defining the legal status of MGRs in ABNJ from the perspective of the principle of CHM. The legal connotation of CHM in the Context of the Law of the Sea can be discussed from three aspects: subject, object and content elements of legal relations [18]. This paper applies the above approach as an analytical framework to provide suggestions for the negotiation of the ILBI.

4.1. Subject Elements: Establishing the International Management Body and Defining the Scope of Actual Resource Developers

In the international legal relations in which MGRs in ABNJ are located, its main subject elements involve the international management body and actual resource developers, which is analyzed in the following paragraphs.

4.1.1. International Management Body

In view of the inefficiency and conflict of ocean governance caused by the fragmentation of the existing ABNJ management mechanisms under the framework of UNCLOS, the ILBI needs to establish a horizontal coordinated international management body to promote integrated ocean governance in terms of effectively managing the activities regarding MGRs in ABNJ.

As for the establishment modality of the international management body, there are four modalities that have attracted the most attention in negotiating the ILBI: the modality of Conference of the Parties, the modality of association of existing institutions, the modality of setting up a new international organization and the modality of expansion of the authority of the International Seabed Authority [19].

Part VI of the Revised Draft of the ILBI adopts the modality of Conference of the Parties: Firstly, the Conference of the Parties should be established as the international management body addressing the conservation and sustainable use of BBNJ. It should adopt appropriate rules, guidelines or a code of conduct for the utilization of MGRs in ABNJ. As a general rule, decisions of the Conference of the Parties should be taken by consensus. Decisions of the Conference of the Parties should be made publicly available by the secretariat and should be transmitted to all States Parties in a timely manner. Secondly, a Scientific and Technical Body should be established under the authority and guidance of the Conference of the Parties. It should provide scientific and technical advice to the Conference of the Parties, monitor the utilization of MGRs in ABNJ and perform other functions as may be determined by the Conference of the Parties or assigned to it under the ILBI. Thirdly, a secretariat should be established to convene and service the meetings of the Conference of the Parties and of any other bodies that may be established by the Conference and perform other functions that may be determined by the Conference of the Parties or assigned to it under the ILBI. Fourthly, a clearing-house mechanism serving as a centralized platform should be established. The specific modalities for the operation of the clearing-house mechanism should be determined by the Conference of the Parties.

4.1.2. Scope of Actual Resource Developers

As to actual resource developers, Article 9 (1) of the Revised Draft of the ILBI provides that activities with respect to MGRs in ABNJ may be carried out by all States Parties and their natural or juridical persons. Meanwhile, Article 56 of the Revised Draft of the ILBI states that States Parties shall encourage non-parties to the ILBI to become parties and to adopt laws and regulations consistent with its provisions.

The definition of the scope of actual resource developers as the States Parties and their natural or juridical persons by the Revised Draft of the ILBI is consistent with the provisions of Article 3 (1) of Annex III of UNCLOS on the subjects of activities in the Area.

However, the relationship between the actual resource developers and the international management body needs to be further clarified. In this regard, the regulation provided by Article 153 (1) of UNCLOS is worth learning from, that is, the Conference of the Parties shall make unified arrangements and control in accordance with relevant provisions of the ILBI. Nevertheless, this does not mean that it is basically consistent with the UNCLOS. It is necessary to carry out specific system design according to the purposes and objectives of the ILBI and the characteristics of the development and utilization of MGRs in ABNJ.

4.2. Object Elements: Clarifying the Temporal Scope, Geographical Scope and Material Scope

In the international legal relations in which MGRs in ABNJ are located, the object elements, that is, the temporal scope, geographical scope and material scope of MGRs in ABNJ need be clarified in negotiating the ILBI.

4.2.1. Temporal Scope

Article 28 of the Vienna Convention on the Law of Treaties establishes the principle of non-retroactivity of treaties. Unless Contracting States grant retroactivity to a treaty, there is no retroactivity. In order to maintain the stability of international relations, reduce opposition and resistance by developed States and to respect the established legal status, the provisions of the ILBI should apply to the MGRs in ABNJ accessed after its entry into force. However, to achieve the purpose of fair and equitable sharing of resources based on the principle of CHM, the MGRs in ABNJ accessed in situ before its entry into force but accessed ex situ or in silico after its entry into force still need to bear the burden of the benefit-sharing responsibility according to Article 8 (3) of the ILBI.

4.2.2. Geographical Scope

UNCLOS divides the sea into internal waters, territorial waters, contiguous zones, exclusive economic zones, continental shelves, high seas and the Area. According to these regulations of UNCLOS, ABNJ includes two types of sea areas, namely, high seas and the Area. The Revised Draft of the ILBI defines ABNJ in Article 1 (4): "Areas beyond national jurisdiction means the high seas and the Area." In Article 3 (1), The Revised Draft of the ILBI also makes it clear that the scope of application of the ILBI includes the high seas and the Area. At present, the international community has basically reached a consensus on the geographical scope of MGRs in ABNJ, which is regulated by the ILBI, including the high seas and the Area. However, the question of how to deal with MGRs straddling and overlapping between ABNJ and areas within national jurisdiction still entails further discussion.

With regard to how to address this problem, suggested approaches in the second session of the intergovernmental conference of the ILBI (hereinafter IGC-2) included the following: Firstly, nothing should prejudice the rights, jurisdiction and duties of states under UNCLOS. Secondly, measures for the conservation and sustainable use of MGRs in ABNJ and those adopted for areas within national jurisdiction should be compatible in order to ensure the conservation and sustainable use of MGRs found in areas both within and beyond national jurisdiction. Thirdly, activities with respect to MGRs in ABNJ that are also found in areas within national jurisdiction should be conducted with due regard to the rights and legitimate interests of any coastal state under the jurisdiction of which such resources are found. Consultations, including a system of prior notification, should be undertaken with the state concerned, with a prioritization of avoiding infringement of such rights and interests. In cases where activities with respect to MGRs in ABNJ may result in the exploitation of MGRs that are found in areas both within and beyond national jurisdiction, the prior consent of the coastal state concerned should be required. Fourthly, the adjacent coastal states that have made a submission to the Commission on the Limits of the Continental Shelf should also be consulted [20].

The Revised Draft of the ILBI affirms the outcomes of the above negotiations. Article 9 (2) provides the following: "In cases where marine genetic resources of areas beyond

national jurisdiction are also found in areas within national jurisdiction, activities with respect to those resources shall be conducted with due regard for the rights and legitimate interests of any coastal State under the jurisdiction of which such resources are found." Article 10 (5) provides the following: "States Parties shall take the necessary legislative, administrative or policy measures, as appropriate, to ensure that activities with respect to marine genetic resources of areas beyond national jurisdiction that may result in the utilization of marine genetic resources found in areas both within and beyond national jurisdiction are subject to the prior notification and consultation of the coastal States and any other relevant State concerned, with a view to avoiding infringement of the rights and legitimate interests of those States."

4.2.3. Material Scope

During the first session of the intergovernmental conference of the ILBI (hereinafter IGC-1), there seemed to be convergence towards distinguishing between the use of fish and other biological resources for research into their genetic properties and their use as a commodity, with the ILBI applying only to the former. In that regard, suggestions in IGC-1 were made to develop a traceability regime to allow for benefit-sharing in the case of changes in use.

During the IGC-2, the president's aid to negotiations (A/CONF.232/2019/1) proposed two options: Firstly, fish and other biological resources that are collected beyond a threshold amount shall be considered as a commodity. Secondly, if a species of fish is found to have value for its genetic material, that species of fish shall be treated as a marine genetic resource, regardless of the volume of the catch [20]. These suggestions are finally reflected in the Revised Draft of the ILBI such as Articles 8 (1) (a) and 8 (2) (a).

In addition, during the IGC-1 and IGC-2, participants raised the question on whether the ILBI would also be applicable to MGRs in ABNJ accessed ex situ and in silico. The Revised Draft of ILBI referred to the question in square bracket clauses in Articles 10 (3) and 10 (4), which requires further exploration and negotiation. As to whether MGRs in ABNJ contain derivatives, the square brackets clauses of Article 8 (1) (c) and 8 (2) (c) are still in place and need to be further negotiated.

4.3. Content Elements: Making Clear the Disposition of Relevant Rights and Obligations

Content elements refer to the disposition of rights and obligations in the process of development and utilization of MGRs in ABNJ. The definition of the legal status of MGRs in ABNJ should include but not be limited to the following contents in terms of content elements.

4.3.1. No Claim of Sovereignty or Sovereign Rights nor Be Appropriated

According to Article 9 (3) of the Revised Draft of ILBI, no state shall claim or exercise sovereignty or sovereign rights over MGRs in ABNJ, nor shall any state or natural or juridical person appropriate any part thereof. No such claim or exercise of sovereignty or sovereign rights nor such appropriation shall be recognized.

The regime of access to MGRs in ABNJ should be established to ensure equal opportunities for all states. It should also be recognized that the development and utilization of MGRs in ABNJ are phased. The initial access is the investment stage and the commercial utilizations are subject to a long research and development cycle. States with the ability should be encouraged to invest funds and technologies as much as possible to promote the generation and innovation of relevant knowledge, so as to advance the common well-being of mankind.

4.3.2. Used for Benefit of Mankind

Ensuring the fair and equitable sharing of benefits arising from the utilization of MGRs in ABNJ is for the benefit of mankind as a whole in order to contribute to the realization of a just and equitable international economic order. Moreover, the interests and needs

of developing states should be taken into consideration, in particular the least developed states, landlocked developing states, geographically disadvantaged states, small island developing states, coastal African states and developing middle-income states, in order to achieve substantive fairness [17].

The protection of rights and interests of resource developers should also be the focus of the regime of benefit-sharing of MGRs in ABNJ. Developed States with advanced technology play a major role in the development and scientific research of MGRs in ABNJ. The economic benefits of MGRs in ABNJ mostly come from follow-up scientific research products, while the scientific research process is time-consuming and expensive, which does not necessarily guarantee the expected benefits [21]. There are no equal exchanges between the access to and benefit-sharing of MGRs in ABNJ. The purpose of benefit-sharing is to redress the injustice and the imbalance of benefits caused by technological and capital asymmetry. When designing the regime of benefit-sharing, it should be realized that the purpose of the regime is to benefit the general rather than to exchange the benefits. The regime should be inclined to resource developers and promote the development activities of MGRs in ABNJ by means of incentives and rewards.

In addition, the regime of benefit-sharing should be coordinated with the regime of intellectual property protection of the MGRs in ABNJ. Intellectual property rights are the private rights of all states, which are designed to protect the intellectual achievements in the research and development of MGRs in ABNJ, while CHM is introduced in the law of the sea for the purpose of protecting benefits of the mankind as a whole. As a result, it requires the effective protection of the relevant intellectual property rights of resource developers on the premise of taking into account the benefits of the mankind as a whole.

4.3.3. Used Exclusively for Peaceful Purposes

All state parties shall use MGRs in ABNJ exclusively for peaceful purposes [17]. Non-peaceful use means non-use for the benefit of mankind as a whole [7]. States shall respect and properly take into account the rights, obligations and interests of other states affirmed by UNCLOS in the development of MGRs in ABNJ. State Parties shall fulfil, in good faith, the obligations assumed under the ILBI and exercise the rights recognized therein in a manner that would not constitute an abuse of right [17].

4.3.4. Conservation and Sustainable Use

Conservation and sustainable use of MGRs in ABNJ based on inter-generational equity should be guaranteed. As one of the core issues of the negotiation of the ILBI, the establishment of legal regimes of access to and benefit-sharing of MGRs in ABNJ aims to promote the conservation and sustainable use of MGRs in ABNJ. In view of the extraterritorial and international character of MGRs in ABNJ, the ILBI shall assume the cooperation obligations of each Contracting Party in the conservation and sustainable use of MGRs in ABNJ. In addition, area-based management tools as well as environmental impact assessments, as the other two core issues of the negotiation of ILBI, are institutional tools to ensure the conservation and sustainable use of MGRs in ABNJ.

5. Conclusion

As a new type of marine biological resources, the utilization value and development prospects of MGRs in ABNJ are gradually attracting international attention. However, due to the absence of relevant international regulations, only a few developed states with developing capacities currently advocate the principle of freedom of the high seas for the development and utilization of MGRs in ABNJ. The status quo has resulted in some practical problems such as disordered competition, uneven opportunities and inter-generational injustice in ABNJ and then faced with the questions of the order and justice value of the law. The ILBI aimed at regulating the conservation and sustainable use of MGRs in ABNJ came into being. A reasonable definition of the legal status of MGRs in

ABNJ is a prerequisite to ensure the good legal nature of the ILBI and to achieve good ocean governance, which is also one of the focuses of the current negotiations of the ILBI.

It is necessary to define the legal status of MGRs in ABNJ reasonably, which is the institutional core of the ILBI, the internal foundation for establishing a new marine order in ABNJ as well as the value direction of distributing residual rights in the law of the sea. At present, there are four positions of the international community on this issue: The position of freedom of the high seas held by developed states has no institutional basis in UNCLOS; the position of divide and rule held by some states, such as South Africa, is challenged due to the integrity of MGRs in ABNJ and the legislative feasibility of the ILBI; the position of avoiding controversy held by other states and international organizations represented by the European Union is also challenged due to the avoidance of the institutional basis of the ILBI. According to the theory of the order and justice value of the law and combining the experiences of the international community in dealing with global ocean problems and the characteristics of MGRs in ABNJ, it can be said that MGRs in ABNJ have the legal attribute of CHM.

From the perspective of the principle of CHM, taking the subject, object and content elements of legal relations as the research approach, the legal status of MGRs in ABNJ should be defined as follows: Firstly, an international management body should be established and the scope of actual resource developers should be defined in terms of subject elements. Secondly, the temporal scope, geographical scope and material scope of MGRs in ABNJ should be clarified in the aspect of object elements. Thirdly, the disposition of rights and obligations in the process of development and utilization of MGRs in ABNJ should be defined in terms of content elements.

In addition, it is of essential importance to balance the contradictions between fairness and efficiency in negotiating the ILBI. The principle of CHM aims at safeguarding public interests and the equitable sharing of marine interests. However, if there is an overemphasis on fairness but neglects the development of incentive mechanisms, it may sacrifice efficiency and even result in a situation where a few developed states work against the principle. Above all, it becomes a practical problem that whether the legal regimes formed under the principle of CHM are actually conducive to the fair development and rational distribution of resources. This can only be resolved by achieving consensus.

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Land and Sea Coordination: Revisiting Integrated Coastal Management in the Context of Community Interests

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Abstract: At present, the ecological environment and resources of the global coastal zones are facing great pressures. Climate change leads to sea level rise, environmental change, stressful population increases and changes in demographics, all of which affect existing coastal management systems. Therefore, all coastal countries begin to increasingly attach importance to the integrated management of coastal zones. How to better adapt to current changes in global coastal zones is a question that every coastal country should think about. From sea- and land-partitioned management to land and sea coordination and from simple coastal management to the integration of the ecological environment and society, integrated management has been planned from many perspectives and levels. It plays a role in promoting the construction of a community with a shared future for mankind.

Keywords: integrated coastal management; land and sea coordination; ecological environment; ocean law; sustainable development

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1. Introduction

A coastal zone is a zone where the land, sea and atmosphere intersect. Due to rich material resources, human development and construction, maritime transportation, fishery and aquaculture have progressed in these areas [1]. In the 21st century, population migration from inland areas to coastal zones has increased not only in developed countries but also developing countries. Populations and economies converging towards the sea will inevitably increase pressure on the coastal zones and their resources and aggravate the problems of the overuse of marine resources, loss of biological habitats and water pollution. The coastal zone has become the most densely populated area in the world, with the highest degree of development and utilisation and the most fragile ecological environment. In order to protect the coastal environment and promote its sustainable development, it is necessary to implement mechanisms to meet and manage its challenges. In last 50 years, the integrated coastal management (ICM) method has been generally adopted by coastal countries to effectively deal with and sustainably develop the coastal zone.

The concept of "land and sea coordination" was first proposed in China at the beginning of the 21st century. The concept is derived from the idea of "sea-land integration". Compared with ICM, land and sea coordination has a larger actual implementation area and richer implementation means. ICM aims to put economic development and coastal ecosystem protection in equally important positions and focuses more on the realisation of ecological growth. On the other hand, land and sea coordination is more inclined to aid in the economic development of coastal areas and pays more attention to the realisation of social growth. Therefore, the main intent of land and sea coordination is to guide and solve coastal resource allocation and management problems intelligently.

At present, the development of the integrated coastal zone is not balanced. Developed countries have reached a relatively high overall governance level due to their strong economic strength, relatively small populations, and well-developed systems. However, the developing countries have been unable to implement because of various constraints [2].

The existing problems of ICM are still relatively prominent. In view of the theoretical orientation of ICM and the practices of various countries, the academic community has conducted systematic research on ecological perspectives and social relations [3]. Faced with the lack of top-down guiding ideology in coastal zone management, it is worth further exploration of how to use land and sea coordination as the theoretical foundation for practices, and to find an excellent management method that will improve laws and regulations, improve law enforcement efficiency and enhance public participation, thereby benefiting the whole world.

2. The Relationship between Integrated Coastal Management and the Overall Planning of Land and Sea

2.1. Concept of Coastal Zone

A coastal zone is a geographic unit that connects ocean systems and land systems and connects to human survival and development [4]. Scholars believe that the scope of a coastal zone depends on its purpose, which varies with different management responsibilities [5]. In order to achieve the goals of a management plan, all land affected by the sea and all coastal waters affected by the land are included, which also includes coastal river basins, extending for hundreds of kilometres inland and extending to the edge of the continental shelf at sea [6].

2.2. Concept of Coastal Zone Management

As early as the 1930s, American experts first put forward the concept of ICM [7]. With the development of society, the connotation of ICM began to change. ICM refers to the coordination, supervision and management of space, resources and ecological environments and governmental development and utilisation through planning, legislation, law enforcement and supervision in order to achieve the sustainable utilisation of coastal zones. Through planning and project development, future-oriented resource analysis and sustainable concepts should be applied to test each stage of development, with the goal of preserving resources in coastal areas [8].

2.3. Purpose and Tasks of Integrated Coastal Zone Management

The main purpose and tasks of ICM are to protect the health of the marine environment and to utilise and sustain marine resources. It concerns itself with how to prevent and solve the problems of marine ecological environment change in the face of natural disasters; it also concerns itself with how to plan the economic development of coastal and land areas, and how to develop and manage the social economy, etc. [9]. Chinese scholars believe that ICM, as a continuously enriched and maturing management practice, is a full practice of land and sea coordination strategy [10]. Even though there are still some differences in opinion between researchers at home and abroad on the hierarchical relationship between ICM and the land and sea coordination, it must be admitted that there are similarities between the two and they promote each other in development.

The concept of land and sea coordination is similar to the concept of ICM, but not exactly the same, and they influence each other. China proposed the concept of land and sea coordination, which borrowed from the core idea of ICM and sublimated it, shifting the focus from the coastal environment to the economy of the entire coastal region. Because ICM has been developed for a long time, its means of implementation are richer than land and sea coordination, and it is more mature in terms of legislation, law enforcement, evaluation and supervision.

3. Current Problems in Integrated Management of Coastal Zones

3.1. Insufficient Legal Basis

Effective coastal zone management requires laws and regulations. In this regard, developed countries such as some European countries and the United States have put relevant coastal zone management laws into action as early as the 1970s [11]. After years of development in terms of prevention, protection, evaluation, punishment and other aspects, a complete legal system has been formed [12]. However, some developing countries have not yet promulgated targeted coastal zone management laws due to late starts and complex national conditions. This leads to a serious imbalance in the standards of coastal zone management on a global scale. From the perspective of globalisation, the fundamental reason for this imbalance is a lack of unified legal norms.

For example, compared with Western developed countries, China started its research on ICM very late. Since the proposal on formulating the Coastal Zone Management Law in 1979, China has not yet successfully promulgated a national and integrated Coastal Zone Management Law. In addition, there are some conflicts between China's domestic law and international law. For example, according to the United Nations Convention on the Law of the Sea (UNCLOS) and other international laws concerning the sovereignty of resources in sea areas under national jurisdiction, sea areas are owned by the state. China's Constitution stipulates that natural resources such as tidal flats belong to the state. However, according to the Regulations for the Implementation of the Land Administration Law, woodland, grassland, wasteland, tidal flats and other land not owned by the collective shall be owned by state. Based on the above-mentioned laws and regulations, when tidal flats belong to sea areas, they belong to the state. When tidal flats belong to land, they may be owned by either the state or the collective. Thus, in the Chinese law, the boundary is not clear as to whether tidal flats belong to land or sea [13].

3.2. Law Enforcement Equipment and Efficiency

Within the jurisdiction of a country, law enforcement agencies usually deal with violations and crimes. However, in developing countries, the development of maritime law enforcement forces is relatively insufficient, and law enforcement equipment is not yet adequate; these things need to be further improved. There are many national marine law enforcement departments with overlapping functions and decentralised law enforcement. The quality of law enforcement personnel needs to be improved, and there are defects in law enforcement methods and procedures. In ICM, the above-mentioned problems and contradictions will become more prominent due to the many administrative departments and maritime laws involved, driven by the interests of various industries [14].

Looking around the world, there is no law enforcement agency with absolute authority in the international community. The implementation of international law can only be determined based on its legitimacy and significance to the international community. Under this common presumption, those international norms that can best demonstrate the common interests of the international community will have higher "effectiveness" in their actual implementation. However, in many maritime countries, the economic development is uneven. Many countries develop slowly and invest much less in ICM than that of developed countries. Therefore, the effect of law enforcement is bound to be unsatisfactory.

3.3. Lack of Public Participation

The current ICM policies of most countries emerge from government-led thinking systems; coastal residents and fishermen, etc., are not widely involved, which leads to the inability to prioritise the demands of local residents when formulating policies. It is precisely because of the low level of public participation that the formulated policies may encounter considerable resistance in the later implementation process. The law is a tool to serve the society, but the essence of society is the people's sense of identity [15]. Therefore, a system lacking that foundation will reduce the scientific nature and rationality of the system on some level.

4. Analysis of National Practice under the Land and Sea Coordination

This section deals with the aspect of laws and regulations. For example, the different national conditions that lead to laws and regulations of each country have different formulations in terms of main body and content. In the development of ICM in Europe and America, developed countries have a very long history of such laws and the relevant regulations are somehow concrete. In contrast, ICM in China has a rather short history, so the content of the regulations is more dispersive and mainly focuses on the development of local measures. Although China is short of specific laws to deal with ICM issues, it has made some efforts in the data collection regarding law enforcement and has made full use of the advantages of video surveillance systems to ensure full coverage of data in coastal zones. In terms of public participation, both the coastal tourism in Cambodia and community activities in Australia provide positive examples. It is observed in this section that only when coastal residents participate in management can the effectiveness of ICM be fundamentally guaranteed.

4.1. State Practice to Improve Laws and Regulations

Compared with the ICM developed by European countries for decades, China's legal support in this area is obviously weaker [16]. Since China has never issued a National Coastal Zone Management Law, some problems in the coastal zone can only be solved by referring to other similar laws. For example, in China, the Law on the Administration of Sea Areas promulgated in 2001 covers marine functional zoning, the right to use sea areas and the compensation systems for the use of sea areas [17]. The Law on Ports in 2003 also filled the legal gap in port management, and the Port Law has so far undergone three amendments in 2015, 2017 and 2018, respectively [18]. The Notice of the State Oceanic Administration on Issuing the Measures for the Protection and Utilization of Coastlines was issued by the Former State Oceanic Administration in 2017 [19]. The legal deficiencies have been adjusted by these national laws, which have made up for the ICM national legislative gap to some extent. Moreover, coastal provinces can supplement the legislation according to their own conditions. For example, on 27 September 2019, the 14th meeting of the Standing Committee of the 13th People's Congress of Shandong province approved the Regulations on the Protection of Coastal Zone in Dongying City [20]. Dongying is the second largest petroleum industry base in China. The Regulations focus on the supervision of key areas such as oil and gas exploitation and set forth requirements for oil and gas exploration and development projects in Dongying. Accordingly, the plan should be formulated according to the duration of the mining rights so that the existing oil and gas development projects in the key protection areas exit in an orderly way; in general, environmental impact assessment should be conducted for oil and gas exploration and development projects in the protection areas, environmental protection equipment and emergency equipment should be equipped in accordance with standards and regulations, environmental risk assessments should be carried out regularly, emergency drills should be strengthened and potential environmental accidents should be eliminated. At the same time, the principle should be stipulated on how to dispose of the pollutants produced by oil and gas exploration and development in the coastal zone [21].

Similar regulations are also made in other provinces. For example, Zhoushan City of Zhejiang Province issued the Administrative Regulations of Zhoushan National Marine Special Reserve in 2016 [22], and the Guangxi Zhuang Autonomous Region issued the Regulations on the Protection of Uninhabited Islands in 2016, among other local regulations [23]. Although coastal zone management laws and regulations in coastal provinces are still relatively scattered and the coastal zone has not been legislated as a holistic environmental unit (it is impossible to unify laws and regulations to coordinate and supervise the coastal zone's space, resources, ecological environment and its development and utilisation), these places have accumulated valuable experience in formulating special legislation at the national level.

In 1972, the United States enacted the Coastal Zone Management Act. It is an important milestone in the marine field, and it is also the first integrated marine management law in the world [24]. After that, along with development, the Continental Shelf Land Act was successively revised and many laws such as National Environmental Policy Act, the National Marine Pollution Planning Act and the Fisheries Protection and Management Act were formulated, forming a relatively complete ICM legal system. The act has played a positive role in effectively controlling the excessive development of the coastal zone and continuous deterioration of the environment [25]. The relevant laws of coastal zones in the United States are relatively complete, which can control the process and effects of coastal zone development and governance more effectively.

Although the United States has enacted the Coastal Zone Management Act, the collaboration among federal, state and local entities has not yet been institutionalised. For example, California's Coastal Law and other state and federal laws indicate that the roles [26], responsibilities and privileges of different levels of government across states are overlapping and require frequent coordination [27]. Therefore, even if the laws are in the same country, more coordination is needed to achieve the high effectiveness [28].

The UK has also made efforts in terms of ICM for a long time. Before the promulgation of the Marine and Coastal Access Act [29], the UK used many cross-cutting laws and regulations to restrict marine development activities. However, this decentralised management system gradually exposed its shortcomings. More and more problems are emerging, which is mainly reflected in the ambiguity of the powers and responsibilities of various institutions and low government management efficiency under this system, which directly affects the advancement of marine development and utilisation activities.

The Marine and Coastal Access Act was promulgated in 2009 after several years of discussions and consultations among government departments, non-governmental organisations and all sectors of society. The law upholds the consistent concept of comprehensive governance and the original intention of encouraging the sustainable development of the ocean and detailed planning from eleven angles. For example, the Marine Management Organisation has been set up to plan maritime areas in detail and implements the United Nations Convention on the Law of the Sea.

4.2. National Practice to Improve the Efficiency of Law Enforcement

Dongying in Shandong Province, with a coastline length of 413 km, is the central city of the Yellow River Delta, located at the intersection of the Yellow River Delta Efficient Ecological Economic Zone and the Shandong Peninsula Blue Economic Zone [30]. It has the youngest coastal wetland in China, and the second largest oil industry base—Shengli Oilfield in China. In 2005, Dongying joined the PEMSEA's SDS-SEA Sustainable Development Strategy Project, as the experimental site of ICM Programme. One of the important steps for the success of Dongying ICM is to ensure the establishment and operation of an efficient inter-agency coordination mechanism. To this end, Dongying National Task Force (NTF) set up an inter-departmental coordination committee in 2010 to reduce inter-agency or inter-department conflicts and reduce the inefficient use of financial resources, thereby greatly improving the efficiency of management.

In terms of implementation, in order to vigorously promote coastal zone restoration projects and solve the prominent problem of coastal zone ecosystem degradation, Dongying has issued detailed government regulations, known as the Dongying Bohai Integrated Management on Detailed Implementation Plan for Ecological Restoration Project. It is also conducive to the implementation of integrated management in place from the details. The project implemented the removal of abandoned ponds in the reclaimed wetland marine ecological restoration project area in Kendong Xiansui Gou and completed the reclaimed wetland restoration of 478 hectares, renovating and rehabilitating the shoreline of 4 kilometres; in the coastal wetland ecosystem restoration project area on the north side of Xiaodao River, 60.27 hectares of abandoned ponds were removed and restored to wetlands. The Yongfeng River-Xiaodao River Bank Ecological Restoration Project completed the

restoration of 7.6 hectares, and completed the first planting of Suaeda salsa vegetation, covering an area of more than 1800 hectares [31].

In terms of operational supervision, Dongying has built a video monitoring system for key sea areas, which can conduct video surveillance on key sea areas such as oil and gas, wharves, fishing ports, seawalls etc., with a monitoring radius of 15 km. Through the network, administrative departments at all levels can check the current situation of the sea area under their jurisdiction anytime, and transmit video wirelessly in the coastal areas without semaphore resources (such as Chengdong Seawall of Dongying and Guangrao Seawall). Dongying Ocean and Fishery Administration purchased one set of shore-based radar equipment, agreed to share one set with the North Sea Monitoring Center of the State Oceanic Administration, and agreed to share six sets with Dongying Border Defense Detachment, and a total of 8 sets of shore-based radar equipment, and built a shore-based X-band radar monitoring system to carry out marine oil spill detection, ship identification, etc. [32].

In the global view, in the absence of a unified law enforcement agency in the international community, how to effectively improve the law enforcement is the goal of the joint efforts of all countries. Through the case of Dongying, it can be analysed to increase investment in the following ways: first, to increase investment and improve the law enforcement equipment. Building of large-scale and advanced marine patrol ships and aircraft can further strengthen the construction of marine surveillance network, and accelerate the satellite and ground data transmission network, wireless video transmission systems between ships and aircraft, data centre, etc. Second is to further clarify and coordinate the responsibilities and division of labour of law enforcement teams to avoid repeated law enforcement. Third is to improve the maritime law enforcement supervision, conflict resolution mechanism and emergency response mechanism. Fourth, the successful law enforcement experience of some developed countries shows that building of a multi-functional marine law enforcement team can improve the efficiency of law enforcement and avoid the waste of manpower, material and financial resources [33].

4.3. National Practice to Increase the Participation of Coastal Residents

The impact of ICM on the livelihood of coastal residents is more obvious than that on inland residents. ICM emphasises an overall plan, reflecting not only the impact on the ecological environment of coastal zones, but also the impact on social environments [34]. The impact of ICM on coastal cities penetrates all aspects of residents' life.

Most of the world's coastal cities are areas with relatively developed tourism, so the beach tourism will change as management methods adjust. Beach management in Sihanoukville, Cambodia, provides a good example.

As early as 2004, Ochheuteal beach was occupied by randomly separated sheds. The land around it was mainly used as a parking lot, a temporary garbage dump, and a temporary toilet facility. These facilities lacked proper wastewater treatment links, and the wastewater was discharged directly into the ground. As a result, the overall environment of the beach is chaotic. To solve the beach problem, an integrated tourism development and management plan was launched, mainly from the perspective of zoning planning. PEMSEA provided technical assistance and 4.6% of the financial support for the entire project, the government provided 27% and the remaining funds were donated by the vendors. Through a series of zoning management efforts, the effect of the beach environment management is remarkable, and the beach attracts more and more tourists: 144,995 in 2004 and 1,327,748 in 2014. This increases the daily income of the vendors by USD 80 to USD 100. So, they invested an average of USD 20,000 in kitchens and sheds and expected to get a return within four to five years [35].

The successful case of Ochheuteal beach management shows that ICM has a great impact on the work and income of coastal residents. In the governance policy of Sihanoukville, not only the regional organisations and the government but also the local residents participate in promoting ICM in the form of investment first and then profit. This kind of

local resident participation and use of the crowdfunding model to jointly invest in ICM can be extended to the world, especially to developing countries. Under the premise of limited funds, this model can solve the problem of governance funds to the greatest extent by making a joint investment and benefiting from it.

Unlike Cambodia's resident investment, Australia started by organising rich community activities, which also increased public participation [36]. In Victoria, through the National Coastal Action Plan, which started in 1995, community-based activities have received assistance and attention. Diving clubs manage reef health; coastal parks are responsible for weed control; Fishermen's Associations manage regional fishing, etc. [37]. Coastal conservation has set up a number of non-governmental voluntary organisations to implement coastal zone restoration, community education, management and protection plans. Most organisations cooperate with local councils or government agencies. Sponsoring groups include conservation groups, civic progress associations and local service groups [38].

5. Integrated Coastal Management Measures under the Perspective of Land and Sea Coordination

As can be seen from the above analysis on the practices of different countries, different solutions are put forward under different environmental conditions. However, although the practices of each country do not directly mention that they are under the guidance of land and sea coordination, the core ideas and practical measures of each country coincide with that theory. By analysing the practical cases in various countries, some excellent practices suitable for global promotion can be summarised.

5.1. SOC Report

Land and sea coordination is essentially a guiding ideology and strategic deployment for balancing the overall development of land and sea at the national macro level while dealing with the relationship between land and sea development. After this strategic deployment is implemented, regular reports are needed to evaluate the correctness of the deployment. According to the recommendation of ICM, the Dongying Municipal Government decided to prepare and make a State of Coast Report (SOC Report) to measure the input, output and results of the implementation of the plan and find the weaknesses, gaps and deficiencies in order to make improvements. The SOC is a comprehensive reporting system based on a range of performance indicators to identify changes in the socioeconomic and environmental conditions of a particular coastal area due to policy and management interventions. Therefore, it can be seen that the SOC report, as an effective summary of regular evaluation, can reflect the implementation of ICM to the greatest extent. The 2010 SOC selected a total of 32 performance indicators to identify the trends from 2005 to 2010. Among them, 13 reports are related to coastal management and the other 20 are related to sustainable development, such as the prevention and management of natural disasters, the conservation and management of ecosystems and the management of biodiversity, pollution, fisheries and aquaculture, etc. The evaluation report reflects the effect of ICM over a period of time from an objective perspective. As a basis for review, the value of the SOC report is obvious. Government organisations can make timely policy adjustments based on the situation reflected in the report [39].

In recent years, the Dongying Municipal Government has made corresponding planning and deployment efforts through different SOC reports at various levels. For example, in April 2020, three provincial-level Marine ranches were established in Lijin county, Kenli district and Hekou district [40]. These three Marine ranches can maximize the development and utilization of coastal zones and bring more economic benefits regardless of their geographical location or ecological environment.

5.2. Maritime Video Surveillance System

From the perspective of land and sea coordination, it is necessary to actively obtain land and sea data and establish an increasingly complete database. Dongying adopts a combination of various forms of sea video monitoring through radar monitoring, video transmission, etc. to grasp of the status of the coastal zone in real time. This monitoring system can help relevant departments obtain first-hand data, so that they can develop a more scientific coastal zone management plan.

The use of maritime video surveillance can dynamically monitor the status of the jurisdictional sea area in real time. Using this technology, Dongying has carried out monitoring of oil platforms, ports, seawalls, etc. The marine stereo monitoring command vehicle has advantages for marine disaster emergency monitoring and is the first to be equipped in China. The command vehicle can realise business tasks such as data transmission, image processing, command and communication, etc. X-band radar is an effective means to monitor oil spills and sea ice. The X-band radar monitoring system built in Dongying is used for oil spill detection, ship recognition and other work. At present, coastal prefecture-level cities in Shandong Province have accumulated successful technical experience in the application of the above-mentioned monitoring technology, which can be promoted and applied in coastal cities nationwide or even globally.

Since the Shengli oilfield is located in Dongying, more attention needs to be paid to oil spill accidents. If an oil spill is found, it can be dealt with in time, and the maritime video surveillance system can play a powerful role in monitoring oil spill accidents. For example, in 2011, the Penglai 19-3 oilfield's oil spill accident caused seawater pollution in the surrounding and northwestern area of about 6200 km^2 (exceeding the Class I seawater quality standard), among which 870 km^2 of seawater was seriously polluted (exceeding the Class IV seawater quality standard), and the highest concentration of petroleum in seawater (station) appeared on June 13, which exceeded the background value by 53 times. The polluted area reached 3750 km^2 in late June 2011, the seawater and petroleum polluted area reached 4900 km^2 in July and the seawater and petroleum pollution decreased to 1350 km^2 in August. The seawater and petroleum pollution area around the Penglai 19-3 oilfield decreased significantly in September. At the end of December, there was still some sporadic oil film on the surface of the Penglai 19-3 oilfield [41]. On 22 November 2013, a deflagration accident occurred in the Sinopec Donghuang oil pipeline, which caused crude oil spill into the Jiaozhou Bay of Qingdao. The oil spill caused pollution to the marine environment of Jiaozhou Bay and the sea area around the mouth of the bay. The oil spill on the beach was obvious enough to be seen near Dashou in the Huangdao District. Oil films and oil spills were also found in parts of the water area of Qingdao [42].

5.3. Demonstration Zone for Integrated Coastal Management

The land and sea coordination regards the land and the ocean as two interdependent and interactive and indivisible systems and the content contained in it is comprehensive and extensive. Therefore, the establishment of an integrated demonstration area is conducive to the comprehensive layout of practical results. Dongying's ICM project is an integral part of the blue economy development in Shandong Province. Shandong Province has designated some areas to focus on and demonstrate creating an excellent coastal zone. In the South China Sea, an ICM demonstration area has been established. Through typical demonstrations, it will give a full play to the point-to-surface effect and promote the comprehensive development and management of coastal resources in the South China Sea. In 1997, the supporting project "ICM Capacity-building in the Northern South China Sea" was approved by the United Nations Development Programme (UNDP). The project aims at applying the sustainable development theory and ICM to improve the integrated coastal zone management capacities of developing countries and promote the development and utilisation of marine resources in developing countries [43]. Since the implementation of ICM capacity building in the northern part of the South China Sea, three ICM demonstration models have been established in three demonstration areas, namely: the sustainable

development model of marine fishery resources in Hailing Bay in Yangjiang City, Guangdong Province; the port development and management model in Fangchenggang City, in the Guangxi Zhuang Autonomous Region; and the comprehensive utilisation management model of marine resources in Qinglan Bay, Wenchang City, in Hainan Province. Through the exploration of the ICM mechanism, the governments of the three demonstration zones have improved their understanding of ICM, and the staff have been trained, which greatly improved the comprehensive management of the demonstration zones and improved the comprehensive management and rational use of the resources of the South China Sea coast and the ability to protect the marine environment, bringing benefits and demonstration effects to the neighbouring regions [44].

6. The Way Forward

6.1. Improve the Global Coastal Zone Management Plan

ICM is not a job that pays off immediately; instead, it requires scientific planning and year-round persistence. ICM emphasises the coordination of multiple departments from multiple perspectives, focusing on the word "comprehensive". ICM is implemented through decentralised management of departments and industries. Conflicting policies from different departments make coordination between various departments difficult, prone to interest conflicts, overlapping functions and duplication. Only standing at an absolute height can better complete the overall planning.

From a global perspective, ICM needs relatively systematic planning, which should take into full account the different characteristics of the coastal zones of each country. As such, different management methods should be adopted. In Latin America, for example, the Andes mountains traverse the west coast, and most of them are cliff coasts, making the west coast availability for exploit extremely low compared with most of the island countries of South Asia which have coastlines and natural harbours. There must be a substantial difference when implementing ICM methods. Latin America should be more inclined to the development of the east coast, while the west coast focuses more on developing tourism [45]; South Asia can take advantage of the natural coastlines to vigorously develop the fishery and shipping industry.

6.2. The Positive Effect of Integrated Coastal Zone Management on the Development of Legal System in the International Community

The problems related to the coastal zone prompt countries to use scientific and comprehensive management methods, understanding the large ecosystems, in order to fundamentally change this situation. Legal means are undoubtedly the most effective [46].

As early as the 1930s, some countries enacted legislation to protect their coastlines. The United States, the pioneer of ICM special legislation, passed the Coastal Zone Management Act in 1972. In the early 1990s, the United States extended the scope of Coastal Zone Management Project to non-point source pollution that affects coastal water quality. These developments have provided the impetus for other countries to start implementing management systems that recognise the interrelationship between pollution and the environment [47]. Agenda 21 adopted by the United Nations Conference on Environment and Development (UNCED) formally includes ICM on the agenda of international organisations in Chapter 17. In particular, the United Nations Conference on the Human Environment held in 1972 guided ICM development with its comprehensive principles, although the focus of the conference was not on coastal zone management but on addressing the broader environmental policies and sustainable development goals [48]. The United Nations' organisations have also adopted the International Convention on the Prevention of Pollution from Ships (MARPOL), the Convention on the Prevention of Marine Pollution, the Dumping of Wastes and Other Matters and the International Convention on Wetlands as Waterfowl Habitat, etc.

ICM projects are not limited to developed countries. Many developing countries have implemented projects through the efforts of international organisations and non-

governmental organisations. The International Food and Agriculture Organisation (FAO) and the World Meteorological Organisation (WMO) also advocate for ICM for different reasons. For example, the World Meteorological Organisation became involved in the ICM programme because of its concerns about climate change. Many developing countries also put forward a series of laws and regulations, which enriched the legal connotations of ICM [49].

Countries and international organisations are paying more and more attention to the legal management of coastal zones. The cultural and natural environment of coastal zones can be fundamentally improved through legal means. Therefore, ICM has played a positive role in the development of legal systems in the international community.

6.3. The Integrated Coastal Management Plays a Promoting Role in Building a "Land and Sea Coordination"

Human beings live and multiply on land. In early civilisations, convenient navigation on fishing boats and ships appeared. After all, they all extended from the land to explore the edge of the ocean. The concept of "land and sea coordination" is a change in how humans observe their living area, requiring researchers to abandon the limited land-centred vision and reflect on major issues in human history and reality. "Land and sea coordination" works to coordinate the central and local governments, coastal areas and inland areas. It is necessary to strengthen market measures such as ecological compensation and the differentiated management of land emission quotas to coordinate marine and terrestrial environmental governance policies and to clarify the distribution of interests and responsibilities between inland and coastal areas. "Land and sea coordination" is precisely the result of changes in human society and the enhancement of human capacity to develop and utilise the ocean. It links with the ocean to form a shared future for mankind, with distinct integrity and social organisation.

Global coastal zones are inseparable from each other, and ICM is an indispensable part in building a maritime community with a shared future. Although the coastal zones owned by countries vary in scope, each part is interconnected and affects the other. Starting with complex cooperative action, ICM explores the interrelation and interaction among humans, the land and the ocean. It studies and enriches the coordination of land and sea both practically and theoretically, in terms of time and space, as well as from the technical and institutional perspectives. It provides support for the planning and implementation of land and sea coordination. Under the premise of coordinated development, in order to solve the contradictions that arise between coastal resources and environment, an ICM development strategy is formulated to control human activities dynamically and continuously and reduce the impact on coastal areas so as to promote sustainable development of marine regional economies [50].

7. Conclusions

This paper shows that the concept and means of ICM in different regions are different [51]. The entire international community is paying increased attention to coastal zone issues. ICM is the symbiosis between human beings and their environment, playing an indelible role in enriching land and sea coordination. The idea of land and sea coordination could be promoted to the whole world with the right scientific management methods. Based on the analysis of multi-country practices and cases, this paper summarises ICM experiences that can be extended to the international community from various perspectives. These valuable experiences can better reflect the importance and operability of land and sea coordination and provide a wealth of theoretical support for the future development of global coastal zones.

First, improve laws and regulations. In terms of local provinces, targeted and detailed regulations should be formulated in accordance with different environments of each region; at the national level, basic laws should be formulated. Thereby, ICM can be better implemented only if there are laws in place, observed and strictly enforced, on an international level. This would help to unify and coordinate ICM globally.

Second, improve the efficiency of law enforcement. Develop detailed ICM implementation plans for each area before enforcement. For law enforcement, a maritime video surveillance system can clearly and digitally control coastal environmental data in real time. Next, the SOC report should be carried out to summarise the operational results of this stage and make judgments for policy adjustments. Finally, the establishment of ICM demonstration area should be established to promote the successful experience to society.

Third, increase the participation of coastal residents in order to maximise participation in ICM of residents living in coastal zones. Do not only listen to residents' opinions in the legislative process; also let residents join as governance investors. Meanwhile, ICM activities in coastal communities should be increased to heighten residents' sense of responsibility and mission.

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Legal Instruments for the Integration and Cooperation in the Guangdong-Hong Kong-Macao Greater Bay Area (GBA): Better Implementation of the SDGs

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Abstract: The 17 sustainable development goals (SDGs) adopted by the UN provide a blueprint for a more sustainable future for all. The implementation of the SDGs largely depends on the action taken by national and local governments. The Guangdong-Hong Kong-Macau Greater Bay Area (GBA) is an area in China with special economic conditions and political support. This paper aims at exploring the legal issues concerning the integration and cooperation among different regions in the GBA and the implementation of the SDGs. It concludes that the GBA could perform an important role in the future exploration of sustainable development and opening-up of China. Clearer and systematic legislation is needed to provide more legal instruments and a more solid legal basis for integration and cooperation in the GBA. Chinese policymakers should fill the legal gaps and provide more legal support for the integration. This could shed light on China's further exploration of sustainable development both domestically and internationally.

Keywords: Guangdong-Hong Kong-Macao Greater Bay Area (GBA); regional integration and cooperation; SDGs

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1. Introduction

In 2015, the UN adopted 17 sustainable development goals (SDGs), aiming at providing a blueprint for a more sustainable future for all. Issues including poverty, hunger, health and well-being, education, gender equality, sanitation, energy, job opportunities, infrastructure, equalities, sustainability, recycling, climate change, ocean and land environment, justice, and partnerships are all listed in the agenda [1]. Under current circumstances, the implementation and fulfilment of the SDGs largely depend on the action taken by national governments [2]. Therefore, the incorporation of the goals into national and local legislation and the implementation of it are vital. The Chinese government has increasingly paid attention to sustainability issues. In recent years, the Chinese government has adopted development-oriented poverty reduction programs and environmental protection policies to enhance sustainable development [3,4]. In particular, in 2019, the central government proposed a scheme to integrate Guangdong Province, Hong Kong Special Administrative Region (HKSAR), and Macau Special Administrative Region (MSAR) to establish a Greater Bay Area. In the Outline Development Plan for the GBA (herein after the Outline Development Plan), several points relating to the SDGs are highlighted, for instance, coordinated regional development, infrastructure support, green and sustainable way of production and lifestyle, the well-being of residents, and ecological environment protection [5]. The central government has high expectations for the GBA to foster new economic drivers, long-term prosperity, innovation-driven development, deeper reforms, further opening-up, and a support area for the Belt and Road Initiative (BRI). The GBA performs as a pilot area for China to explore a better integration and cooperation of societies with different economic, political, and legal structures. It helps to shape China's practice of pursuing better and more balanced domestic development. It also contributes to China's practice

of encouraging greater involvement and participation of other states on the sustainability issues under China's geopolitical strategies, such as the BRI.

The BRI is a strategy proposed by China in 2013. Inspired by the ancient trade route "Silk Road", the BRI aims to connect Asia, Europe, and Africa via two networks: the land-based Silk Road Economic Belt (the belt) and the 21st-century Maritime Silk Road (the road) (Figure 1). The strategy pays special attention to five priorities: policy coordination, infrastructure connectivity, unimpeded trade, financial integration, and communication of people. Thus far, more than 100 countries from Europe, Asia, Africa, and Latin America have signed agreements with China to cooperate in BRI projects [6]. The BRI plans to connect the economically developed area (the EU), economically active area (East and Southeast Asia), and the broad area with the great economic potential of the three continents. Duplicating China's experience of poverty alleviation that "if you want to get rich, build roads first", the BRI aims at helping the countries along the belt and road to improve infrastructure and open up new opportunities in a sustainable way. It conforms to the SDGs, especially concerning poverty, sanitation, job opportunities, infrastructure, and partnership. The GBA is important for the BRI. Firstly, its location is crucial. The GBA has a close connection with many Southeast Asian countries, both economically and culturally. It owns busy harbors and is important for China's cross-border trade, connecting China with the world market. Secondly, the GBA has a financial center, Hong Kong, and an active financial market. The implementation of the BRI greatly depends on the investment and financial market. Thirdly, the GBA has long been a pilot area for China's reform and new policies. In the past decades, China's development has largely been based on its adoption of the trial-and-error approach. Many policies are firstly applied in the GBA and then adopted nationwide. This tradition helps the GBA to become an important area for the exploration of policies concerning the BRI.

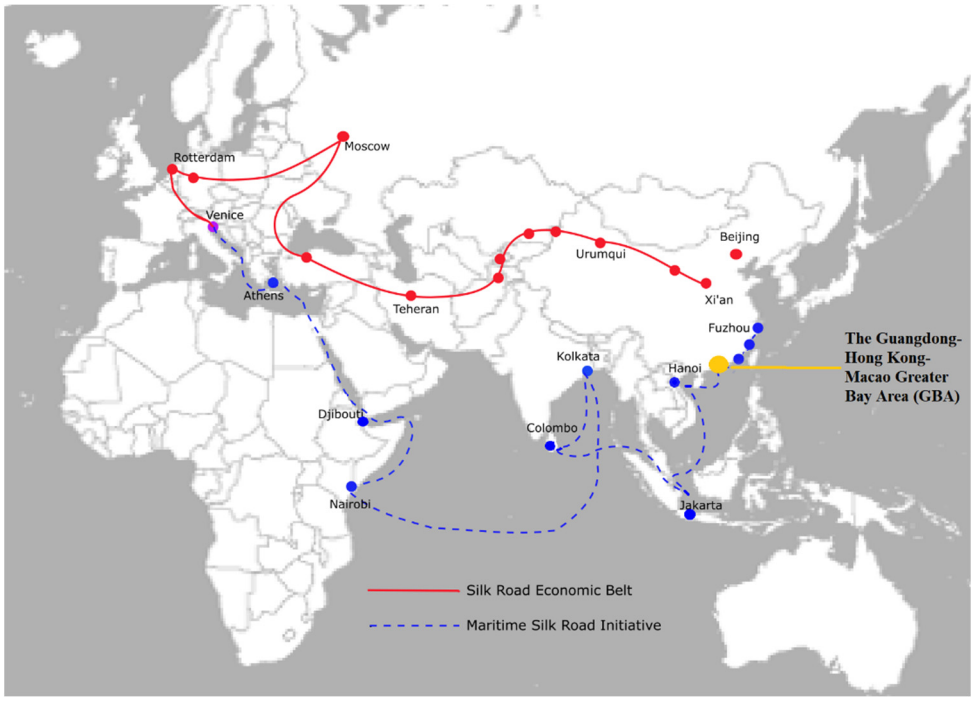

Figure 1. The GBA and the BRI. Source: adapted from Wang L. et al. (2019) [7].

Despite the excellent location and ambitious plan, the GBA faces both opportunities and challenges. Among them, unbalanced development between different regions and insufficient legal instruments for integration and cooperation are the key issues. Although there are strong and collective political wills of the central and local governments to promote the regional integration and cooperation, solid legal bases and available legal

instruments are relatively lacking. China has already realized this problem and has been committed to promoting "law-based governance" [8], particularly in the last decade.

This paper aims at exploring the integration and cooperation among different regions in the GBA and the implementation of the SDGs. In the first section, a brief introduction is given. The second section examines in detail the past, present, and plans for the future of the GBA. It demonstrates that the GBA has always been a special area in China, and it can be an ideal place for China to further explore sustainable development. However, there are also challenges facing the GBA to improve sustainability, especially concerning unbalanced development. The third section firstly explores China's incorporation of the SDGs into the policies and then elaborates the big challenge faced by the GBA to fully implement the policies: unbalanced development during the urbanization in the GBA. To foster regional high-quality development, integration and cooperation should be encouraged and legal instruments are crucial for it. Therefore, the fourth section examines in detail the current legal framework concerning the integration and cooperation in the GBA. Problems existing in current legal instruments are identified. Based on the above analysis, some policy recommendations are given in the fifth section and a conclusion is given at the end of the paper. It concludes that the GBA could perform an important role in the future exploration of sustainable development and opening-up of China. Although several legal instruments at the national, regional, local, and international levels have been provided, clarification and systematization are needed. Chinese policymakers should fill the legal gaps and provide more legal support for the integration and the implementation of the SDGs in the GBA. This could shed light on China's further exploration of sustainable development both domestically and internationally.

2. The GBA: Past, Present and Future

As one of the most open and economically vibrant regions in China, the GBA is a good example and experimental region for China to explore high-quality and sustainable development. The GBA has special geographic, economic, and social conditions. Furthermore, history brings this area a unique political structure—leading to both problems and advantages.

In the 19th Communist Party of China (CPC, the current ruling party in China) National Congress, the Chinese government proposed "high-quality development", which demonstrates a fundamental change of China's long-term goal. In the past several decades, the Chinese government has concentrated more on development speed instead of development quality. The proposal of high-quality development marks a shift of focus from "whether or not" to "good or not". This new development philosophy particularly emphasizes five aspects: innovative, coordinated, green, open, and shared development [9]. Several policies have been adopted correspondingly. The Chinese government has encouraged the development of city clusters to implement the goal of high-quality development, of which sustainable development is an important part [10]. Among the planned city clusters, the GBA is an important one. The GBA enjoys unique favorable conditions to foster sustainable development. From a geographic perspective, the GBA includes two special jurisdictions, the HKSAR and the MSAR, and the "nine Pearl River Delta (PRD) municipalities", Guangzhou, Shenzhen, Zhuhai, Foshan, Huizhou, Dongguan, Zhongshan, Jiangmen, and Zhaoqing in Guangdong Province [11] (Figure 2). The two special jurisdictions are separated jurisdictions because of historical reasons and have considerable autonomy concerning economic, social, and legal issues. The GBA covers a total area of 56,000 square kilometers with a population of approximately 70 million. With good ports and easy access to busy shipping routes such as the Strait of Malacca, economic activities in the GBA have been largely increasing with the opening-up of China. In terms of the economic aspect, the GBA has played leading roles in China. The two SARs have been highly developed. The HKSAR is a free port and international financial, transportation, and trade center. The MSAR is a global tourism and leisure center. Guangdong Province has been the largest province by GDP in Mainland China since 1989 and its economy

is highly vibrant. According to a report issued by Beijing University, Guangzhou ranks third concerning the business environment in China in 2020, with Beijing ranking first and Shanghai second [12]. A strong and vibrant economy means better financial, technology, and intellectual support to the implementation of the SDGs. From the social aspect, the GBA has an open environment for innovation and technology development. Guangdong has ranked high concerning the "openness of the society" in the past several decades according to the Openness Index Report of China issued by the National Development and Reform Commission (NDRC) [13].

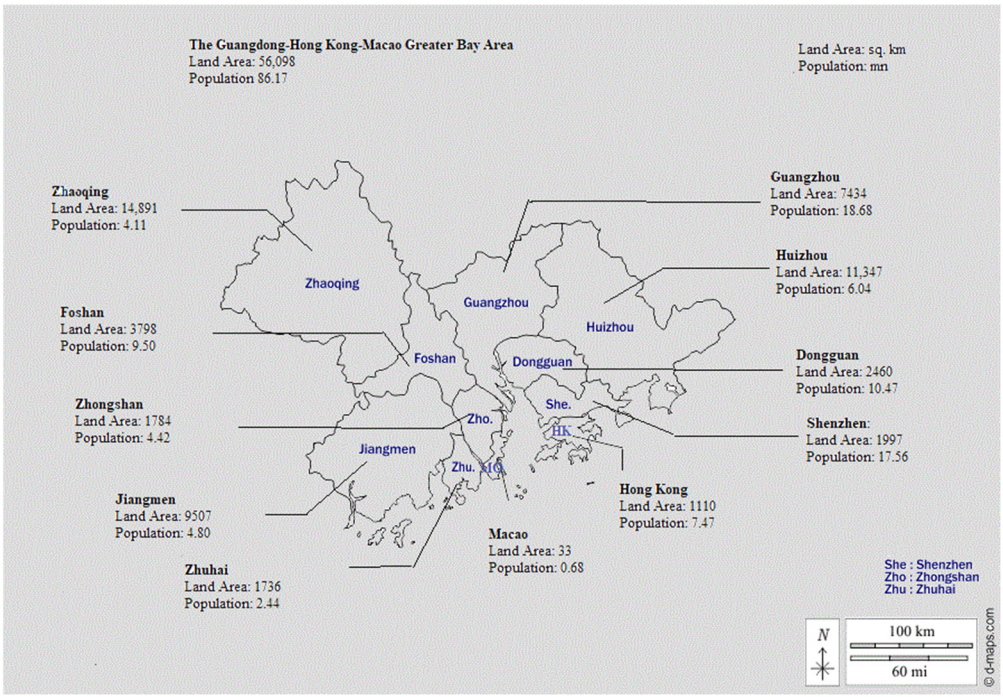

Figure 2. Basic information of the GBA. Data Source: Bureau of Statistics of Guangdong, Hong Kong, and Macao; The figure is adapted based on the map at https://d-maps.com/carte.php?num_car=20983&lang=zh, accessed on 1 October 2021.

Other significant factors affecting the adoption and implementation of the SDGs in the GBA are the political and legal aspects. The GBA has always been a special area in China since the late Qing Dynasty. Between 1842 and 1898, Hong Kong was ceded to the British through the Treaty of Nanjing (the Hong Kong Island was permanently ceded to Britain), the Convention of Beijing (the southern tip of the Kowloon Island was permanently ceded to Britain), and the Kowloon Extension Agreement (the New Territories were "leased" to Britain for 99 years). In 1887, the Qing Dynasty gave Portugal perpetual colonial rights to Macau in the Sino-Portuguese Treaty of Beijing. After the founding of the People's Republic of China in 1949, the Chinese government took a consistent position that China does not recognize the unequal treaties imposed on it by imperialism. Since the 1980s, the Chinese governments have gone through many rounds of negotiation with the British and Portuguese governments concerning the handover of Hong Kong and Macau, respectively. Two Joint Declarations were concluded in 1984 and 1987. The jurisdiction of Hong Kong and Macau was transferred back to China in 1997 and 1999, respectively [14]. When governed by Britain and Portugal, British and Portuguese Laws were applied in Hong Kong and Macau. From the legal perspective, British law is Common Law and Portuguese Law is Civil Law. Both have significant differences with the socialist law applied in the mainland. Considering this situation, the then Statesman, Deng Xiaoping, proposed the policy of "one country, two systems". It was believed that adopting this policy not only aimed at providing a leeway for the two SARs but also exploring China's future path for

opening to and integrating with the world. The policy was incorporated in the Chinese Constitutional Law in 1982. As a result, the GBA has a unique characteristic: "one country, two systems, and three jurisdictions". Under the current structure, the two SARs maintain their economic, social, and legal systems and the governments of the two SARs enjoy the executive, legislative and judicial power.

In 2017, the central government, Hong Kong government, Macau government, and Guangdong government signed the Framework Agreement on Deepening Guangdong-Hong Kong-Macao Cooperation in the Development of the Greater Bay Area (hereinafter the Framework Agreement), which suggests that to build the city cluster of the GBA is the common will of the central government and the three regions. Briefly speaking, each region faces different problems and has the need to integrate and better allocate the resources. In 2020, affected by the pandemic, the economic activities of the two SARs shrank dramatically, and the unemployment rate rose rapidly [15]. Deeper causes include the limited market, high dependence on the service sector, and lack of physical space and natural resources [16]. In addition, thinking of the bigger picture, the two SARs largely benefit from the opening-up of China to the world, especially Hong Kong. With more competitive metropolis developing and less restrictive policies concerning the market in Mainland China, the importance of the two SARs are decreasing. Guangdong Province, on the other hand, can benefit from the capital and high-educated human resources after the development of the GBA. In addition to the benefit for the two SARs and Guangdong, the central government also considers further exploration of the central–local relations, regional central cities, and cross-border integration.

Therefore, for future development, the GBA has gained consensus from the local governments and special support from the central government to do experiments and innovation to improve the institutional framework of sustainability management. It is required to adopt an "early and pilot implementation approach", which means that more flexibility is given to the local governments. To be more specific, the two SARs are granted considerable autonomy. They are separate customs territories and have maintained independent finances and taxation systems. Previous laws are mostly maintained, and the two SARs exercise their administrative, legislative, and independent judicial power. Guangdong Province has been a pilot zone for China's reform and opening-up. In 2015, the State Council issued a Notice to establish the Guangdong Pilot Free Trade Zone, which requires the Guangdong government to "be bold in practice and active in exploration . . . to give support to the pilot programs of Guangdong Free Trade Zone". Three pilot zones in three Guangdong cities, Guangzhou (Nansha), Shenzhen (Qianhai), and Zhuhai (Hengqin) were established to promote the legal environment and innovate the regulatory mode. In 2019, the State Council issued Opinions on Supporting Shenzhen in Building a Pioneering Demonstration Zone, in which Shenzhen was expected to be a "model city of the rule of law" and "pioneer of sustainable development". Shenzhen was required to "make full use of its legislative power as a special economic zone" and was given the power to "make adaptions to laws, administrative laws and regulations, and local laws and regulations under the premises of abiding by the Constitution, laws and administrative laws and regulations".

In summary, the geographic location and unique history have brought the GBA special economic, social and political problems and conditions for pursuing high-quality development. Against the background that China has been paying more and more attention to sustainability development, the GBA performs as an ideal area for policy experimentation and innovation.

3. SDGs in the GBA: Why Legal Instruments Are Important

The goal of high-quality development proposed by the Chinese government largely conforms to the SDGs. Both the central and local governments have realized the importance of it and have incorporated some key points of it into the policies and plans. However, to achieve the goals, the GBA confronts a significant challenge: unbalanced development.

Integration of markets and cooperation of governments are needed to remedy the problem. As President Xi Jinping indicated, it is both very important to "make a bigger cake" and "better divide the cake" [17]. Legal instruments can perform an important role in addressing this problem. This section examines the incorporation of the SDGs in the GBA, the challenge faced by the GBA, and the significance of the legal instruments to respond to the challenge.

3.1. Incorporation of the SDGs in the GBA Policies

The SDGs have been explicitly incorporated in the policies developed by the Chinese central and local governments. In the Framework Agreement, to prioritize ecology and pursue green development was included in the principles of cooperation. A specific key cooperation area identified by it emphasizes the promotion of infrastructure connectivity, the coordinated development, and the quality of life, in particular, better education, health, and ecological environment. In the Outline Development Plan, more coordinated development, green development, ecological conservation, and the improvement of people's livelihood have been adopted as basic principles. It also provides a timetable and specific objectives to implement the sustainable development goals. By 2022, more coordinated regional development, innovation, upgrading of traditional industries, infrastructural support, and a green way of production and lifestyle shall be enhanced. By 2035, the GBA is expected to be a highly connected and coordinated area, with wealthier residents, more efficient use of resources, and a better ecological environment in comparison with today. The above discussion demonstrates that both the central and local governments have devoted much attention to the SDGs in the GBA, especially concerning balanced development, the well-being of the residents, and energy conservation and ecological environment.

3.2. The Challenge to the GBA: Unbalanced Development

Notwithstanding the favorable conditions and strong will of the governments to develop a better community fulfilling the SDGs, a significant challenge confronts the GBA: the unbalanced development during urbanization. The HKSAR and the MSAR were occupied by Western countries in history and developed earlier than Guangdong. The differences between the GDP and GDP per capita of the cities in the GBA are huge. The composition of the GDP also varies. According to the latest statistics, the primary, secondary, and tertiary sectors contribute 0.1%, 6.5% and 93.4% to the GDP in HKSAR, respectively [18]. Primary sectors (raw materials) include any industry involved in the extraction and production of raw material, while secondary sectors (manufacturing) take the output of the primary sector and create finished goods and tertiary sectors (services) provide services instead of end products. While in the MSAR, the secondary and tertiary sections count on 4.2% and 95.8%, respectively [19]. In Guangdong, the numbers are 4.0%, 40.2%, and 55.8% [20]. The three jurisdictions are at different development stages. While Guangdong is still developing and modernizing fast quantitively, the HKMSAR and the MSAR have relatively slowed down and need to pay full attention to the quality of the development [21]. Even considering the situation in Guangdong, unbalanced development is obvious. Guangdong has experienced a remarkable urban expansion in the past decades, especially driven by the income increase, infrastructure improvement, and population growth, but the differences among the municipalities are still significant [22] (Table 1).

Unbalanced development and the different degrees of urbanization have a significant impact on the implementation of the SDGs in the GBA. Firstly, barriers in the GBA are still significant, especially concerning the movement of labor and capital. The two SARs enjoy independent jurisdiction and residents of them enjoy different citizen rights associated with the right of abode. These include not only evident rights such as border entry, working permission, social welfare, etc., but also indirect differences such as public services and social environment. Regarding Guangdong Province, because of the Hukou system (the Chinese household registration system), a citizen's benefit is largely affected by where he or she registers, including housing, children's education, social security programs, etc. [23]. Pointing out that there are significant barriers in the GBA is not aiming at

pursuing a complete removal of all barriers and differences, but rather reminding scholars and practitioners that problems associated with it should be carefully addressed.

Table 1. Main Indicators of cities in the GBA (2020).

City	GDP (US$ bn)	Per-Capita GDP (US $)	GDP Share of Tertiary Industry (%)	Export (US $)
Hong Kong	349.5	46,707	93.4 *	550.50
Macao	24.3	35,714	95.7 *	1.35
Guangzhou	362.72	19,579	72.5	78.22
Shenzhen	401.16	23,096	62.1	245.33
Foshan	156.81	16,550	42.1	59.79
Dongguan	139.91	13,364	45.9	119.52
Huizhou	61.21	10,176	44.3	24.39
Zhongshan	45.69	10,363	48.3	26.21
Jiangmen	46.41	9711	49.8	16.26
Zhuhai	50.48	21,115	54.9	23.24
Zhaoqing	33.51	8165	42.1	4.35

* 2019 figure. Data Source: Guangdong Statistical Yearbook (2021), Bureau of Statistics Hong Kong and Macao.

Secondly, research concerning the situations in the GBA has proven that urbanization is related to sustainability issues [24]. The past 40 years have seen rapid urbanization in China. However, the degree of urbanization in different districts is different. Except for the central cities, there are still large rural areas in the GBA. In more developed areas, pillar industries are likely to be the service sector, which creates less pollution and causes fewer environmental problems [25]. The situation is the opposite in the less developed areas. Different regions are facing different problems. The regional central cities may face over-urbanization with crowd problems, the rising cost of living, and shortage of land and other resources [26]. In contrast, small cities in this region may face a brain drain, low-efficient usage of resources, and a lack of financial support to foster sustainable development [27]. Gaps between each other and disaccord are unavoidable. In brief, the needs and vital interests of different regions are significantly different.

Thirdly, although authorities are paying increasing attention to the quality and sustainability of the development, the abilities of the authorities to manage the sustainable issues are different. Goals such as health and well-being, education, sanitation, energy, sustainability, recycling, ocean and land environment, and justice are mostly public goods, which largely depend on the capability of the local governments. Authorities in richer areas have a better financial situation based on a bigger population, stronger industries, efficient productivity, higher land sales revenue, and higher tax revenue [22]. They also develop more solid technology and intellectual support from society [28]. As mentioned above, the two SARs have considerable autonomy. Economic, social, and judicial affairs are all managed by the SAR governments. Normally, they neither turn in revenues nor enjoy transfer payments from the central government. In terms of Guangdong Province, central–local relations in Mainland China are an important factor affecting the public service. At present, in general, matters concerning social insurance, education, medical resources, and sanitation largely depend on local finance in the eastern provinces [29]. In short, public services are provided by different regions and the capabilities of governments significantly affect the implementation of sustainable development.

3.3. The Need for Integration and Cooperation in the GBA to Implement the SDGs

The challenge of unbalanced development in the GBA has been examined above. To deal with it, regional integration and cooperation are needed. The need can be analyzed from two aspects, the central government perspective, and the local perspective.

In terms of the central government, integration in the GBA is pursued to fulfil the strategic need, both domestic and international. Domestically, it fits the goal of high-quality development proposed by the central government. "Regional coordinated and balanced development" have been involved in the recent five-year plan. In the past several decades, urbanization in China has been significantly improved and economics has been growing fast. The development, however, features massive quantity rather than high quality [30]. It may lead to interest conflicts, incompatible policies, and difficulties in coordination. Competition prevailed over coordination in China [31]. Competition exists among cities, provinces, and regions. Local governments in China compete for capital, human resources, public goods, investment, tax, and payment, etc. [30] Motivations for the competition include both economic incentives (financial revenue and personal income) and political incentives (personal promotion) [32]. Research has shown that instead of the quantity and quality of the public goods provided, local governments cared more about the efficiency of resource allocation and economic performance [33]. This type of competence may cause many problems, such as parallel construction, inefficient industry distribution, local protectionism, and a larger amount of local government debt [30]. More importantly, if competition instead of integration and cooperation dominate the relations between governments, bigger differences among regions may occur, which is called the Matthew effect [34]. Emphasis on integration and cooperation instead of competition and speed with appropriate policies help to better allocate resources and solve problems that are commonly faced, especially problems mentioned above: barriers between regions, gaps between urbanized and rural regions, and different abilities and resources of local governments.

Internationally, China's global influence has significantly increased in the past several years. However, China's ability and available instruments of participating in global governance and dealing with global affairs still need improvement. In recent years, China has been dedicated to regional cooperation and market integration in the Asia-Pacific area. However, lack of experience may be a disadvantage for the Chinese government to deal with issues involving various societies with different economic, political, social, and cultural conditions. The GBA can be an area for the Chinese government to explore integration in a sustainable way with a trial-and-error approach considering the complicated economic, social, and political differences of the three jurisdictions. This helps China to enhance its ability to deal with international and regional affairs and better participate in international cooperation. With the development of the GBA, China wants to establish an international city cluster and set an example of an integrated and coordinated area consisting of societies with different economic and political structures.

Regarding the local level, there are also incentives for the HKSAR, MSAR, and Guangdong governments to promote integration and cooperation in the GBA. For the two SARs, the development of the GBA contributes to the solution of their problems. Firstly, the two SARs have limited markets, populations, resources, and land. These factors decided that the development of the two SARs depends on their accessibility to larger markets and resources. Secondly, the economy of two SARs largely depends on the service sectors and has relatively fallen behind compared with some mainland cities concerning technological development. In addition, the special advantages of the two SARs compared with other regions in Mainland China are less over time. The two SARs have long been an open gate for China to the world because of their special statuses. They used to enjoy significant advantages especially because of the different legal and financial policies. With the market-oriented reform and openness of Mainland China, as well as the growing competition with mainland cities such as Beijing, Shanghai, and Shenzhen, the two SARs need to take a more active position to facilitate regional integration to fully utilize the market and resources in the GBA for their future development. Thirdly, the changing policies of the central

government also require the SARs to better integrate with the neighboring regions. The two SARs have enjoyed some one-sided preferential policies from the mainland, for example, housing, education, labor market accessibility, etc. [35]. This is so not only because of the special advantages and conditions of the SARs but also because of the historical and political factors. From a long-term perspective, however, one-sided preference is not sustainable. With more resources and policy preferences given to other regions such as Hainan, the two SARs have to relocate their positions. In a word, all the above physical, economic, and political factors create incentives for the two SARs to integrate into the GBA.

For Guangdong Province, the regional integration of the GBA can also produce huge benefits. Firstly, Guangdong has a close connection with the two SARs. It enjoyed great benefit from the two SARs during its development in the last several decades, especially concerning investment and intelligence. Its future development also largely depends on the investment it gains and China's integration into the world. Therefore, its long-term and sustainable development are largely influenced by the integration in the GBA. Secondly, the problem of unbalanced development among regions is particularly serious in Guangdong. Therefore, making comprehensive plans and better allocating resources are important for Guangdong. In this regard, the local government should concentrate on further unlocking the potential of the less-developed regions and using technologies and market-based measures to pursue sustainable, balanced, long-term, and high-quality development. Integration of the GBA and cooperation among local governments can contribute to the removal of market barriers, and further urbanization and capacity building of the governments.

In short, the unbalanced development may significantly affect sustainable development of the GBA. The old style of development, in which competition is more emphasized, is no longer in line with China's goal of pursuing high-quality development. According to Perroux's growth pole theory, regional growth poles can promote regional economic growth with spill-overs to neighboring areas [36]. However, only with a healthy regional competition environment and long-term plan can the theory be realized [37,38]. The need has been recognized by not only the central government but also the local governments in the GBA. The governments should look for tools to foster integration and cooperation among different regions in the GBA. Among them, legal instruments are of great significance.

3.4. Use Legal Instruments to Encourage Integration and Sustainable Development

The above section examines the incentives and benefits for the central government, HKSAR, MSAR and Guangdong to engage in the integration and cooperation in the GBA. Legal instruments should play important roles to encourage regional integration and sustainable development. The following two reasons deserve special attention. First, currently, legal instruments constitute a weak point for further integration in the GBA. China has less-developed legislation concerning the relations between public authorities [39]. While China has developed more systematic private laws and criminal laws, the exploration of rules regulating relations between private parties and public authorities is relatively lagging, not to say legal cooperative mechanisms between public authorities [40]. In Mainland China, a vertical structure has been established concerning the executive authorities where the higher-level bodies perform a leading and monitoring role. The system guarantees the effectiveness of the executive activities [41]. Where the two SARs are involved, however, a loophole was created. As the two SARs are granted autonomy and most of the administrative regulations are not applied in the two SARs, this vertical administrative system creates fewer political incentives for the local governments to take active positions promoting integration and cooperation, especially when the two SARs are more developed than the mainland cities. Current Chinese constitutional and administrative law involves no legal instruments encouraging and monitoring the implementation of the GBA integration and cooperation.

Second, the special situation in the GBA calls for an improvement of the legal tools. Generally speaking, the central government has given considerable autonomy to the

two SARs and executed observation rather than direct intervention [42]. The GBA faces a complicated situation as there are three jurisdictions involved the "one country, two systems", uniquely designed based on the historical and then-situation in Hong Kong and Macao. It was an invention of China, which has helped to effectively solve Hong Kong/Macao's historical reunification problem and guaranteed a smooth transition from Britain/Portugal to China [43]. However, although the change of legal status can be done immediately, the economic, social, and cultural integration has to be done step by step. Both the two SARs have more mature legal cultures, and the spirit of the law is highly respected. On the other hand, in Mainland China, the development of the socialist legal system is still under exploration, and the "rule of law" has been consistently emphasized by the central government [8]. Compared with high-sensitive political tools, legal instruments can better help the regions in the GBA to find common interests, establish a cooperation framework, and guarantee the implementation.

Overall, the high-quality development proposed by the Chinese government is consistent with the SDGs, and both the central and local governments have incorporated some important points into the plans and policies. However, unbalanced development is a big challenge for the implementation of the SDGs. Integration and cooperation rather than competition should be emphasized in the future development in the GBA. Legal instruments are of great significance to the integration and cooperation of the GBA, as it has been a weak point that needs substantial improvement and the special situation in the GBA calls for better legal instruments. In the next section, available legal instruments and their current problems are explored.

4. An Examination of the Legal Instruments

The existing legal framework for the integration and cooperation in the GBA is examined in this section, including legislation and policies at different levels: constitutional legislation, national legislation and policies, interregional cooperation arrangements, local legislation, and international law. Generally speaking, constitutional laws are the Basic Laws, which provide fundamental principles for the governments. National laws mostly concern different issues and can provide more detailed rules and indications for the relations of the central government, the SARs, and Guangdong Province. Interregional cooperation arrangements can perform an important role in addressing regional issues and specific matters concerning different regions. However, this form of rule has not gained a clear legal basis in Chinese law. Local laws are adopted by local governments to implement high-level laws and policies and better address local issues. Some international laws can be applied considering the special status of the SARs, especially international trade law, the cases of which are mostly initiated by private parties.

4.1. Constitutional Legislation

The GBA covers the two SARs and Guangdong Province in Mainland China. The legal status and competence of the regions are stipulated in the constitutional legislation. The "one country, two systems" policy is an innovative institutional design based on the specific situation in the two SARs. Article 31 of the Constitution provides the constitutional basis for it: "The State may establish special administrative regions when necessary. The systems to be instituted in special administrative regions shall be prescribed by law enacted by the National People's Congress in the light of specific conditions." In accordance with this provision, the HKSAR and MSAR Basic Laws are established by the People's Congress. According to the Basic Laws, the two SARs have a high degree of autonomy and enjoy executive, legislative, and independent judicial power, including that of final adjudication. The socialist system and policies are not practiced in the two SARs and the previous capitalist system and way of life shall remain unchanged for 50 years. The laws previously in force in the two SARs are maintained if not contravene the Basic Laws. It is provided that national laws shall not be applied in the two SARs except for those listed in Annex III. In a word, the Constitution grants considerable autonomy to the two SARs.

The local government of Guangzhou also has legislative, executive, and judicial power granted by the Constitution. According to Article 100 of the Constitution, the legislature at the provincial level is able to adopt local regulations which do not contravene the Constitution and other laws and administrative regulations. Article 72–74 of the Legislation Law provides that legislature at the provincial level, of the comparatively larger cities, and of the provinces and cities where special economic zones are located may formulate regulations subject to certain conditions. The legislative power is limited to "matters requiring the formulation of specific provisions in light of the actual conditions of an administrative area for implementing the provisions of laws or administrative regulations", "matters of local character that require the formulation of local regulations" and some matters for which "the State has not yet formulated any laws or administrative regulations". Subject to certain procedures, the legislature at the municipal level has the competence to make rules on matters concerning urban and rural development and management, environment protection, historical culture protection, and so on.

In summary, all administrative regions in the GBA have certain competency to adopt legislation concerning local affairs. However, the degree of autonomy is different. Under the current vertical system, Guangdong has less autonomy, as the legislature can only make rules concerning certain matters subject to certain conditions and certain procedures. They must not contradict the Constitution, the law, and the administrative regulations. By contrast, the two SARs have more autonomy on economic, administrative, social, and cultural issues. This leads to unequal competence and power for the three regions.

4.2. National Legislation and Policies

As mentioned above, national laws are generally not applied in the two SARs. There are basically two categories of national legislation. The first category includes the laws promulgated by the People's Congress concerning the SARs' affairs, for example, the laws on measures for the election of deputies to the National Congress and the decision authorizing the HKSAR and the MSAR to exercise jurisdiction over Port Zones in Shenzhen and Zhuhai. The number of such laws is small, and the subject matter is limited.

The second category covers regulatory documents issued by the central government or its departments. As mentioned above, the two SARs are vested with executive power to conduct administrative affairs on their own. In practice, however, the central government has involved the two SARs in several arrangements and policy documents. In particular, after the proposal of the GBA in 2015, several department documents have been issued. Among them, the most relevant authority concerning the planning of development in the GBA is the National Development and Reform Commission (NDRC). In 2017, the Framework Agreement in the development of the GBA was signed among the NDRC and the governments of Guangdong, Hong Kong, and Macao. In 2018, the arrangements for supporting Hong Kong/Macao in fully participating in the Belt and Road Initiative were signed between the NDRC and the governments of the two SARs. Several other departments, such as the Ministry of Finance, the State Taxation Administration, the People's Bank, the Banking and Insurance Regulatory Commission, the Securities Regulatory Commission, the Ministry of Transportation, and the State Administration of Foreign Exchange, have also issued documents supporting and facilitating the development of the GBA on issues concerning their competence. The most important document issued at the national level concerning the GBA is the Outline Development Plan issued by the CPC Central Committee and the State Council. It is a programmatic document for the GBA. It includes 11 Chapters: background, overall requirements, spatial layout, developing an international innovation and technology hub, expediting infrastructural connectivity, building a globally competitive modern industrial system, taking forward ecological conservation, developing a quality living circle for living, working, and travelling, strengthening cooperation and joint participation in the Belt and Road Initiative, jointly developing Guangdong-Hong Kong-Macao Cooperation Platforms, and implementation of the plan. It provides a blueprint for the development of the GBA and includes specific guidelines and techniques.

Based on different leading authorities, cooperation in the GBA can be divided into three types. In the first one, the central government is the leading authority. It performs as a higher-level institution and the three local governments as participants and implementing institutions. The national legislation and policies can be seen as this type. The other two types are examined in the next two sections. The current system is an embodiment of the "one country, two systems" policy. Under this system, there is debate on the legal basis of the national legislation in relation to the GBA. Because it is provided in the Basic Laws that national laws do not apply in the two SARs except for those listed in the Annex III, the documents issued by the central administrative authorities do not create a binding force on the two SARs. Some scholars argue that the non-objection or active participation of the SARs concerning the GBA policies or plans has provided ground for the central government to involve the two SARs in the plan [44]. The current system causes another problem, which is the different political pressures and incentives given by the central government to the local governments. In the mainland, the local governments are a part of the vertical institutional system. They are greatly influenced by the policies adopted by the central government and have more political incentives to implement the strategy of the GBA. In addition, the different economic systems may also lead to an unequal devotion to regional integration and cooperation as the Hong Kong government is a limited government.

4.3. Interregional Arrangements

Another important legal source for the integration and cooperation in the GBA is interregional legislation. In 2003, the Closer Economic Partnership Arrangement (CEPA) was signed between the HKSAR/MSAR and the mainland, which is an "FTA-like arrangement" but between "two separate customs territories of a single sovereign state" [45]. As the original CEPA only provides a general guide for the cooperation, a series of Supplement to CEPA were signed in the following several years. Under the CEPA framework, agreements concerning the liberalization of trade in services in Guangdong, trade in services, investment, economic and technical cooperation, trade in goods, and the amendment to CEPA were signed in 2014, 2015, 2017, 2017, 2018 and 2019, respectively. CEPA framework covers broad areas of trade in goods, trade in services, investment, and economic and technical cooperation, including rules of origins, tariffs, services suppliers, mutual recognition of professional qualification, investors, investment disputes, key areas of cooperation, and sub-regional cooperation. Except for agreements on economic affairs, the two SARs and the mainland have also concluded several judicial cooperation arrangements. These are mainly concerning civil and commercial proceedings, mutual services for judicial documents, mutual enforcement of arbitral awards, reciprocal recognition and enforcement of judgments, mutual taking of evidence, and mutual assistance in court-ordered interim measures.

In 2010, the Framework Agreement on Hong Kong/Guangdong Cooperation was signed by the governments of the HKSAR and Guangdong. In 2011, the Framework Agreement on Macao/Guangdong Cooperation was signed by the governments of the MSAR and Guangdong. These two Framework Agreements were directly signed between the regional governments and provide detailed and concrete provisions concerning the cooperation. In the following years, the governments have issued annual work plans or major tasks of the Framework Agreements to implement the framework with detailed measures. In addition to the agreements mentioned above, the governments of Guangdong, Hong Kong and Macao have also signed a series of cooperation agreements on cultural issues, environmental protection, intellectual property rights, customs, youth development, etc. In summary, in the GBA, interregional agreements signed by the local governments have established a comprehensive system, from general principles and guidelines to specific measures and annual work plans.

The interregional cooperation arrangements are the second type of cooperation mechanism based on agreements between local governments. The problem with the interregional arrangements is that there is no clear legal basis in the constitutional and administrative law [46]. As mentioned above, the Chinese administrative system is vertical with an

obvious hierarchy. In the US, there are inter-state compacts as each state enjoys relatively independent legislative, administrative and judicial power. The institutional design in China leads to less exploration of agreement or arrangement between local governments. This further leads to a lack of monitoring mechanisms concerning the cooperation arrangements. Existing interregional agreements include both general provisions and specific measures, but there are neither strong political constraints nor legal mechanisms to guarantee the implementation of the agreements.

4.4. Local Legislation and Policies

The last domestic important legal source concerning the integration and cooperation in the GBA are laws and policies adopted by the local governments concerning the integration and cooperation in the GBA. As mentioned in Section 4.1, local governments in all three jurisdictions have legislative power subject to certain conditions and procedures. Local governments in Guangdong have issued several administrative regulations and policy documents, including the Outline of the Reform and Development Plan for the Pearl River Delta Region (2008–2020), Overall Development Plan of Hengqin, Overall Planning for the Development of the Qianhai Shenzhen-Hong Kong Modern Service Industry Cooperation Zone, Regulations on the Qianhai Shenzhen-Hong Kong Modern Service Industry Cooperation Zone, etc.

Incorporation of cooperation intension into local legislation is the third type of cooperation mechanism. However, the current situation of the local regulations adopted by the three regions demonstrate the problem mentioned above; that is, the governments in the mainland have more incentives to adopt laws facilitating the integration and cooperation in the GBA, while the Hong Kong government and the Macao government have less motivation to actively take actions. With the development of the mainland, this kind of unequal cooperation may lead to more and more problems.

4.5. International Law

Under the "one country, two systems" policy, the two SARs gain special status as separate customs territories and are able to participate in some international inter-governmental organizations with the name of Hong Kong/Macao, China. The two SARs are able to maintain signature parties of international agreements applied to them before the reunification if the People's Republic of China (PRC) is not a party. If the PRC is a party to the international agreements, the central government of China decides whether the two SARs can maintain or become a party of international agreements. In this regard, the two SARs are able to participate in international organizations concerning sustainability issues such as the WTO and the IMO. Relevant international laws are therefore binding to the three jurisdictions and theoretically can be the legal basis for regional integration and cooperation. International law can provide important guidance for cooperation on some issues concerning sustainable development. Theoretically, some provisions of international law can be applicable for the integration and cooperation issues in the GBA. For example, the three jurisdictions can resort to the WTO dispute mechanisms if there are disputes on tariffs, etc. In practice, however, international law is rarely applicable. Its effect on the integration of the GBA is invisible since the three jurisdictions are in "one country".

4.6. Summary

In summary, the current framework provides several legal instruments for the integration and cooperation in the GBA. The table below summarizes the available legal instruments and the existing problems (Table 2). However, some problems exist concerning these legislation and policies. Further clarification and systematization of the legal instruments are needed, and the Chinese policymakers should pay attention to these problems. In the next section, some policy recommendations are provided concerning the facilitation of integration and cooperation in the GBA.

Table 2. Available Legal Instruments and Problems.

Available Legal Instruments	Existing Problems
Constitutional legislation	Unbalanced legislative power granted to the different regions in the GBA
National legislation and policies	Unclear relations between the central government and the SARs; different incentives for the different regions to implement the integration and cooperation
Interregional arrangements	Insufficient legal basis for the arrangements; lack of monitoring mechanisms
Local legislation and policies, international law	Unequal incentives of local legislators to adopt laws rarely applied considering it is domestic problem

Source: created by this research.

5. Policy Recommendations

Based on the discussion above, this paper gives several policy recommendations for the policymakers.

5.1. Improve the Implementation of the SDGs through Integration and Cooperation in the GBA

In the past several years, competition among municipalities has prevailed over coordination and collaboration in the GBA. Without an overall plan, the Matthew effect may lead to larger differences between regions [34]. To implement the SDGs, the potential of the 11 cities must be unlocked at the different development stages, facilitating the central cities' spill-overs to benefit the neighboring areas, and improving a balanced development, integration and cooperation are necessary. The GBA covers three jurisdictions and two systems, but there are no effective regional higher-level authorities that can directly coordinate the three regions yet. Therefore, the design and planning of the regional integration and cooperation mechanisms are crucial. First, sufficient intellectual support is important. Scientific advice from different areas should be collected and assessed, especially concerning the long-run sustainability. Second, institutional construction is important. Some experience in China has shown that the establishment of a regional joint committee of the governors is a way to coordinate legal and administrative issues [47]. Periodical meetings and the exchange of information are also important. Third, equal and long-term mechanisms are needed. It has been pointed out that the incentives and activities concerning regional integration and cooperation among the three regions are unequal. This may decrease the effectiveness and outcome of the cooperation in the long run. To introduce a benefit-sharing and compensation mechanism may be a good method of addressing these issues [48].

5.2. Provide More Legal Instruments for the Integration and Cooperation

It has been more than 20 years since the reunification of the two SARs. The further legal exploration of the "one country, two systems" policy has been little. With the fast development of the mainland, especially the two big cities in Guangdong Province, both China and the GBA are facing a new stage and different challenges. With an emphasis on "law-based governance", the development of the rule of law has been improved in China especially in the last decade. The construction of private laws and criminal law has made big progress. The development of administrative law, however, is relatively lagging. The GBA, undertaking the responsibility of "early and pilot implementation", can significantly contribute to China's legal construction.

First, the legislature should take a more active position adopting legislation encouraging the SARs to integrate into and collaborate with the mainland. In the past, the SARs not only performed as China's opening windows to the world but also a proving ground for different systems. They have benefited from the reunification and the integration [49]. The situation in the GBA and emphasis of the governments have changed. On the one hand, China has been opened up more than ever and the unique advantages of the two SARs are reducing. On the other hand, the prime need of the GBA has become the promotion

of integration to unlock the potential of the region as a whole. Half of the time (50 years) provided in the Basic Laws of keeping the social system unchanged has passed. An early discussion and exploration of further integration of the two SARs should be put on the agenda. Second, the legislature should provide a clarification of the status and competence of the central government and the local governments, including those of the SARs. The People's Congress has the power to interpret legislation including the constitutional and administrative law. Clear laws and legal interpretation help to reduce ambiguity and improve applicability. Third, the legislature should explore interregional cooperation mechanisms and encourage participation of local governments [50]. Several cooperation agreements and arrangements have been concluded by the three governments. The legal basis for them, however, is not clear. There is no stipulation concerning the interregional cooperation arrangements in Chinese law and therefore neither legal basis nor monitoring mechanisms for the behavior of the participating governments can be found. Fourth, the local legislature should take more active actions to adopt local laws promoting integration and cooperation. The legislature of all three regions is granted legislative power, although to different degrees. Local governments have the most knowledge of the specific situation, local needs, and problems to be addressed. With the support of the central governments, extensive exploration of legal issues concerning integration and cooperation should be carried out in the GBA. A summary of the instruments is provided below (Table 3).

Table 3. Recommendations concerning different legal instruments.

Legal Instruments	Recommendations
Constitutional legislation	Explore the future constitutional status of the SARs and their integration with the mainland
National legislation and policies	Clarify the relations between the central governments, the governments of the SARs, and the local governments of Guangdong Province on concrete issues; create mechanisms to increase the incentives of the different governments to implement the integration and cooperation
Interregional arrangements	Provide legal basis for the interregional arrangements between local governments; establish mechanisms to guarantee the implementation of the interregional arrangements
Local legislation and policies	Explore the delegation of powers to local governments in a more flexible way while guaranteeing the monitoring power and responsibility of higher-level governments; local governments should take a more active position in promoting the integration

Source: created by this research.

5.3. Establish a Complementary and Effective System Improving the Regional Integration and Cooperation

The 2019 Outline Development Plan has provided a guidance for the GBA. Its implementation, however, depends on the establishment of an effective system and the actions taken by the governments. First, different characteristics of the governments' institutional structures should be taken into consideration. In Mainland China, the government is still exploring functional transformation and institutional reform to seek a balance between government interference and market mechanisms [51]. That being said, the mainland governments generally enjoy more power than the governments of the two SARs. The integration and cooperation in the GBA must take the different roles and competence of the governments into consideration. Second, key areas and major tasks concerning the integration and cooperation must be identified. Some issues are essential and vital, and some other issues need a long-term and step-by-step effort. The necessity of integration and cooperation on specific matters should be examined. A proportional examination should be given to assess the number of resources that need to be dedicated. For example,

issues such as environmental protection and financial regulation are both important and commonly faced, and therefore should be identified as prime issues. Third, a timetable and evaluation mechanism should be established. From the experience of the integration in the EU, it can be learned that annual tasks and evaluations are very important for the implementation. The central government or a joint committee of the GBA could perform this function.

6. Concluding Remarks

At the 19th National Congress of the CPC, President Xi Jinping declared that China is facing a "new era" and is at a time point where China's economy is transitioning from a phase of rapid growth to a stage of high-quality development [10]. This is consistent with the proposal of the SDGs of the UN. The GBA has location advantages, a vibrant economy, and special political support from the Chinese central government to explore better and sustainable development based on urban agglomeration. It is of special significance for China's future development and opening-up. Domestically, the unbalanced development confronting the GBA is an epitome of the whole country. Many reforms and experiments are conducted first in this region and then are being adopted nationwide. Internationally, the exploration in the GBA gains China precious experience in the promotion of regional integration and cooperation. In particular, China has proposed geopolitical strategies such as the BRI and needs to seek international cooperation with societies with different economic, political, and legal structures. In this process, legal instruments are very important, as embodied in China's recent emphasis on the "rule of law".

This paper illustrates the integration and cooperation in the GBA and the implementation of the SDGs, with a detailed examination of the existing legal framework and identification of its problems. Based on the analysis, it gives several policy recommendations. Firstly, integration and cooperation should be promoted to facilitate sustainable development. Sufficient intellectual support, wisely-designed institutional arrangements, and equal and long-term mechanisms are needed. Secondly, more legal instruments should be adopted to support the integration and cooperation in the GBA. A more active stance on the integration of the two SARs into the mainland, a clarification of the competence and relationships between the governments at different regions and different levels, an introduction of interregional cooperation mechanisms, and better incorporation of relevant rules into local laws should be adopted by the legislature. Third, a complementary and effective system improving the integration and cooperation in the GBA should be established. Differences among regions should be considered, major cooperation areas should be identified, and a practical schedule and assessment mechanism should be introduced. China's exploration implementing the SDGs in the GBA can shed light on high-quality development both domestically and internationally.

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Strengthening Universal Jurisdiction for Maritime Piracy Trials to Enhance a Sustainable Anti-Piracy Legal System for Community Interests

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Abstract: Although universal jurisdiction over piracy has long existed in customary international law and international conventions, such as the Convention on the High Seas (HSC) and the United Nations Convention on the Law of the Sea (UNCLOS), the piracy situation has been changing. The subsidence of Somali piracy provides an opportunity for rethinking how to strengthen universal jurisdiction for maritime piracy trials to enhance a sustainable anti-piracy legal system. The incidents of Somali piracy have resulted in some new developments in exercising universal jurisdiction: the separation of seizing, prosecuting, and imprisoning States; the consideration of creative piracy prosecution mechanisms; the increased focus on land-based facilitation of piracy; enhanced international cooperation; and expanded universal jurisdiction. This leads to several main challenges in existing legal frameworks, including weaknesses in UNCLOS, the disharmony among international instruments, and defects in domestic piracy legislation. In order to sustain and improve the anti-piracy legal system, universal jurisdiction over piracy should be incrementally strengthened to support the prosecution of pirates by States. To address the trends and challenges, this article explores how the legal system can be enhanced in two respects: adjusting the basic provisions of universal jurisdiction over piracy and refining the relevant measures in exercising that jurisdiction to prosecute pirates.

Keywords: universal jurisdiction; maritime piracy; piracy trials; Somali piracy; maritime crime; sustainability; community interests

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1. Introduction

Piracy is the oldest international crime, and yet despite considerable global efforts, it persists and continues to evolve in various ways and contexts. The international community is equally persistent in its response, building on longstanding international legal frameworks and adopting new approaches to meet the challenge. Piracy has significant impacts on multiple aspects of sustainability.

The United Nations (UN) Sustainable Development Goal (SDG) 16 (Peace, Justice and Strong Institutions), for example, seeks to, inter alia, "significantly reduce all forms of violence and related death rates everywhere" (16.1), "significantly reduce illicit financial and arms flows, strengthen the recovery and return of stolen assets and combat all forms of organized crime" (16.4), and "strengthen relevant national institutions, including through international cooperation, for building capacity at all levels, in particular in developing countries, to prevent violence and combat terrorism and crime" (16.A) [1]. According to SDG 16, piracy, which poses a serious threat to freedom of navigation, maritime security, and human life, is the target of repression. Strengthening anti-piracy law will significantly contribute to the achievement of SDG16.

As a transnational organized crime at sea, piracy could impact other SDGs [2]. For example, maritime transport is "fundamental to sustaining economic growth and spreading prosperity throughout the world" [3]. Piracy negatively impacts on economic aspects of

shipping and transport. Therefore, it directly affects economic growth in SDG 8 (Decent Work and Economic Growth) [4] and then prevents achieving the goal of poverty eradication (SDG 1: No Poverty) [4]. Since disruptions to supply chains may harm sustainable cities and communities [5], piracy also negatively impacts on SDG 11 (Sustainable Cities and Communities) [4]. Piracy threatens the lives and health of seafarers and passengers, which is related to SDG 3 (Good Health and Well-Being) [4]. When seafarers do not have a safe working environment, the goal of decent work in SDG 8 is affected. Piracy also poses a threat to food security [3]. Just as Somali pirates had an impact on the food transportation of the World Food Program [6], so anti-piracy may contribute to SDG 2 (Zero Hunger) [4]. Furthermore, piracy is potentially environmentally harmful, as vessels are attacked and lost, which leads to negative impacts on SDG 6 (Clean Water and Sanitation) and SDG 14 (Life below Water) [4]. Consequently, the anti-piracy legal system is conducive to achieving these SDGs. The enactment and implementation of anti-piracy laws and regulations needs partnerships among States and international organizations, which itself strengthens partnerships (SDG 17: Partnerships) [4,7]. Under international law, States have universal jurisdiction over piracy [8]. However, with the rapid expansion of Somali piracy, the international community faced tremendous challenges in exercising this universal jurisdiction over piracy. In many cases, approaches have involved "catch and release", and many pirates have not been prosecuted and have gone unpunished [9]. In this context, it is valuable to explore why this may be the case and how anti-piracy law can be strengthened for the future. Many scholars have researched various aspects of universal jurisdiction over piracy. They have addressed a range of issues including the history and basis of universal jurisdiction over piracy [10–14], definitional issues of piracy [15,16], the conflict of jurisdictions and weaknesses in domestic law [17], and the application and use of universal jurisdiction [18–20]. However, this scholarship frequently involves only certain aspects of the universal jurisdiction over piracy and does not analyze the anti-piracy legal system as a whole, nor does it examine the challenges brought by the current situation of piracy and the development trend of universal jurisdiction. The relationship between the anti-piracy legal system and the sustainable development goals, as well as the sustainability of the legal system itself, are not particularly concerned, either.

This article aims to enhance an anti-piracy legal system that is helpful for achieving the goals of the SDGs and that has its own sustainability issues. By investigating the legal provisions and the actual situation, this article comprehensively analyzes the problems of the lack of sustainability of the anti-piracy legal system related to universal jurisdiction and puts forward systematic solutions.

According to the definition of sustainable development in the Report "Our Common Future", which is considered to be the most accepted definition [3], sustainable development means "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" [21]. The definition emphasizes the intergenerational aspects of development. It can be seen that solutions to sustainability problems need to have a long-term perspective and should be able to cope with new situations that arise, or at least should be agile enough to be adjusted in accordance with the evolving situation. The universal jurisdiction over piracy is stipulated in the Convention on the High Seas (HSC) and the United Nations Convention on the Law of the Sea (UNCLOS). Nonetheless, great changes have taken place in the situation of piracy compared with that at the time of the conclusion of the Conventions (Part Two), and new trends have emerged in the exercise of the universal jurisdiction over piracy (Part Three). In addition to the deficiencies of both international and domestic piracy law (Part Four), the existing anti-piracy legal system cannot fully and effectively respond to modern piracy and lacks sustainability to a certain extent. In this context, it is valuable to explore a long-term and comprehensive solution for the future. Therefore, various relationships must be balanced (Part Five). This article also explores approaches to enhance a sustainable, international anti-piracy legal system and how national level implementation and enforcement can be supported (Part Six).

It should be recognized that there are many factors, other than law, affecting the sustainable exercise of universal jurisdiction over piracy. States may face tremendous financial burdens and capacity issues in prosecuting and incarcerating pirates [18], and they encounter the problem that pirates may seek asylum in these States after their release [22]. Some States even lack political will to take action to counter piracy [23]. Additionally, the rise of piracy is a complicated problem, rooted in poverty and instability, which must be addressed comprehensively if long-term success is to be achieved [24]. All these issues remain important, but the scope of this article is limited to strengthening universal jurisdiction for piracy trials through legal means.

As background, the main international piracy legal framework is set out in Appendix A.

2. The Necessity of Strengthening Universal Jurisdiction over Piracy to Enhance a Sustainable Anti-Piracy Legal System

UNCLOS sets out the legal framework of universal jurisdiction over piracy. Its provisions on piracy originated from HSC, which has not been changed, and there is no new global convention specifically aimed at piracy (especially universal jurisdiction over piracy). Contrarily, piracy activities and contexts are always changing. Based on the yearly statistics of piracy incidents that occurred between 1984 and 2019, and statistics of piracy and armed robbery incidents in international waters since 2008 (see Table 1) (For statistical purposes, the data do not distinguish between piracy and armed robbery), the following conclusion can be drawn:

Table 1. Statistics of piracy and armed robbery incidents in international waters since 2008.

Year	Number of Incidents in International Waters	Total Number of Incidents	Proportion of Incidents in International Waters Out of the Total
2008	154	306	50%
2009	250	406	62%
2010	294	489	60%
2011	330	544	61%
2012	125	341	37%
2013	66	298	22%
2014	82	291	28%
2015	36	303	12%
2016	58	221	26%
2017	52	203	26%
2018	50	223	22%
2019	34	193	18%

Source: Based on data from IMO piracy annual reports [25–36].

2.1. The Threat of Pirate Attacks Has Increased Significantly Since UNCLOS Was Formulated

The provisions on piracy in HSC and UNCLOS were once considered obsolete. As early as in the First UN Conference on the Law of the Sea, representatives of the Ukrainian Soviet Socialist Republic and Poland held that the draft provisions of the International Law Commission (ILC) on piracy were anachronistic because piracy in the strict sense was rare, and piracy had not been a real problem for a long time [37]. Czechoslovakia and Romania both believed that the draft used too many provisions to regulate the problems related to the concept of piracy in the 18th century [37]. The representative of Uruguay also said that the relevant provisions on piracy should be deleted [37]. The representative of The Union of Soviet Socialist Republics even believed that most members of the Second Committee of the First UN Conference on the Law of the Sea, which was in charge of the discussion about the general regime of high seas, supported excluding piracy-related provisions from the draft convention [37]. Likewise, in the Third UN Conference on the Law of the Sea, the representative of the Khmer Republic also pointed out that the provisions on piracy had become a dead letter due to the lack of application scenarios [38]. It can be seen from this that the relevant anti-piracy provisions were not believed to reflect the actual "dangerous

forms" of maritime security threats that existed at that stage [37]. Therefore, the provisions cannot be expected to be sustainable enough to fully adapt to modern piracy (this does not mean to deny the status of the conventions as the core international instruments against piracy).

The yearly statistics of piracy incidents that occurred between 1984 and 2019 are recorded in the International Maritime Organization (IMO) Piracy Annual Report 2019 [25]. Although the accurate quantity of pirate incidents at the time of the enactment of UNCLOS in 1982 is not available here, with reference to the opinions of representatives of the above States and the situation in the years since 1984, it is judged that the piracy activities at that time were relatively infrequent. From 1984 to 1989, the average annual number of piracy incidents was only 23.8, which was in sharp contrast to the highest of 544 in 2011 [25]. Since 1995, the number has remained at a high level, hovering between 200 to 500 [25]. The number of incidents did not fall back to less than 200 until 2019 (193) [25]. Nevertheless, the number is much higher than that in 1984 (32) and the average annual number of incidents from 1984 to 1989 (23.8) [25]. Although the practical application value of the provisions on piracy in UNCLOS was not prominent at the time of its enactment, since then, piracy activities have increased significantly and are still at a high level. These provisions not only contribute to the integrity of UNCLOS as a maritime regime, but they also play the role of guiding and regulating the international law basis for anti-piracy actions, which have proven to be successful in countering Somali pirates.

2.2. The Number of Piracy Incidents Fluctuates in General, Often with Dramatic Changes

The number of piracy incidents has frequently expanded after a period of relatively low number of incidents. The number in 1987 (29) increased by 61% compared with 1986 (18); the number in 1990 (50) increased by 257% compared with 1989 (14); and number in 1991 (79) increased by 58% compared with 1990 (50) [25]. The growth rate was obviously high, but due to the small base at that time, the total number of incidents was relatively small. Since 1994, with the increase of the base and the surprising growth rate, the number of piracy incidents rapidly reached a new height. From 48 in 1994 to 132 in 1995 and 227 in 1996, the latter two years increased by 175% and 72%, respectively, compared with their previous year, with an overall growth rate of 373% [25]. The period from 2006 to 2011 is also a period of rapid growth, with an increase of 126.67% in 2011 (544) compared with 2006 (240) [25]. The largest increase in number occurred in 2000, with 162 more incidents than 1999 [25].

Therefore, the international community should always be vigilant against piracy and be prepared to deal with the explosive growth of piracy at any time, rather than slacken efforts with the decrease of the number of piracy incidents. Otherwise, as occurred with the outbreak of Somali piracy, the shortcomings and unsustainability of the legal system will be exposed. The temporary cessation of piracy provides an opportunity for seeking sustainable, long-term solutions to the piracy problem [39]. It is still necessary to build a sustainable anti-piracy legal system, especially in the areas that need long-term and large investment, such as legislation, law enforcement, prosecutions, and trials relating to universal jurisdiction over piracy.

2.3. The Number of Piracy Incidents in Seas Beyond Territorial Waters Is Considerable

As shown in Table 1, before 2012, when Somali piracy was rampant, the number of incidents in international waters and the total number of piracy incidents around the world were both at a high level, and the proportion of the former out of the latter was extremely considerable, reaching more than 50% from 2008 to 2011. Since 2012, with the gradual reduction of Somali piracy, the number declined accordingly. However, the number of incidents in international waters and its proportion out of the total number of incidents are still far from negligible. The average annual proportion from 2013 to 2019 is 22%. According to the definition of piracy, attacks in international waters may constitute piracy, thus universal jurisdiction will apply. Additionally, universal jurisdiction

can also be applied to armed robbery in special circumstances. The UNSC resolutions have authorized navies of all States to enter Somali territorial waters to counter both piracy and armed robbery [6]. Therefore, although maritime attacks mainly occur within the scope of national jurisdiction, universal jurisdiction is still an important means to combat piracy. This implies that the universal jurisdiction over piracy is still an essential part of a sustainable anti-piracy legal system.

3. New Trends in the Use of Universal Jurisdiction over Piracy

Before the fight against Somali pirates, the application of universal jurisdiction was very rare. Many States had not prosecuted pirates for hundreds of years. For example, US v. Ali Mohamed Ali in 2012 was considered as the first US piracy prosecution invoking universal jurisdiction in approximately 200 years [40]. In 2012, Germany had the first piracy trial, in which 10 Somali pirates were convicted, in more than 400 years [41]. The expansion of incidents of Somali piracy and the fight against it have resulted in several new developments, each of which is examined below.

3.1. Separation of Seizing, Prosecuting, and Imprisoning States

Under Article 105 of UNCLOS, "the courts of the State which carried out the seizure may decide upon the penalties to be imposed" [42]. In this case, the seizing State is the same as the prosecuting State and, generally speaking, criminals serve their sentences in the prosecuting State. In combating Somali piracy, a new trend arose, especially in the regional piracy prosecution model, by which multilateral naval forces played the main role in seizing pirates, and other States within the region (regional States) accepted and prosecuted pirates [43]. After conviction, some pirates remained in the prosecuting States to serve sentences, and some were repatriated to Somalia [43]. Three different functions (arrest, prosecution, and imprisonment), originally performed by a same State, are now implemented by three different States. This form of separation has been positively affirmed in UNSC resolutions, facilitating prosecutions and strengthening international efforts by encouraging regional States to accept suspected Somali pirates for trials and to "incarcerate pirates in a third State after prosecution elsewhere" [44]. The Djibouti Code of Conduct concerning the Repression of Piracy and Armed Robbery against Ships in the Western Indian Ocean and the Gulf of Aden (DCoC) clearly provided that the courts of the seizing State may determine the penalties for piracy and the action relating to the ship or property and allowed that State to abandon its primary right in exercising jurisdiction and to authorize another State to "enforce its laws against the ship and/or persons on board". [24] The separation also led to a cooperative mode of allowing the prosecuting States' officers to board the ship of the seizing State for investigation [45].

3.2. Consideration of Creative Piracy Prosecution Mechanisms

To fight against impunity for pirates, the international community has called for creative piracy prosecution mechanisms. The UN Secretary-General proposed seven options for piracy prosecutions with varying degrees of international participation (The seven options are: (1) enhancing UN assistance to build capacity of regional States to prosecute and imprison pirates; and establishing (2) a Somali court sitting in another regional State, either with or without UN participation; (3) a special chamber within the national jurisdiction of a State or States in the region, without UN participation; (4) that special chamber with UN participation; (5) a regional tribunal on the basis of a multilateral agreement among regional States, with UN participation; (6) an international tribunal on the basis of an agreement between a State in the region and the UN; (7) an international tribunal by SC resolution under Chapter VII of the UN Charter) [46]. Apart from the first one, which was to strengthen the existing domestic trial mechanism, the other six options required new courts, chambers, or tribunals [46]. In addition to those options, others suggested the expansion of the jurisdiction of existing international courts, such as the International Criminal Court and International Tribunal for the Law of the Sea, to include

piracy prosecutions [46–48]. The courts in some new piracy trial mechanisms, such as international and regional tribunals, are not purely domestic courts, and their jurisdiction will extend beyond universal jurisdiction exercised by a single State.

3.3. Increased Focus on Land-Based Facilitation of Piracy

Article 101 (c) of UNCLOS, and land-based piracy, have gained greater attention. Whereas Article 101 (a) and (b) refer to piracy occurring at sea, subparagraph (c) refers to "any act of inciting or of intentionally facilitating an act described in subparagraph (a) or (b)", literally, without the geographical restriction. This is also reflected in judicial practice. In US v. Ali, the court noted that the UNCLOS Article 101(c) does not refer to a geographical limitation [49]. Universal jurisdiction over piracy originally aimed to prevent pirates on the high seas from escaping punishment because their activities occurred beyond any given State's jurisdiction [50]. However, for Somali piracy, its character as organized crime has become increasingly obvious. In addition to the "foot soldiers" (usually the persons in subparagraph (a) and (b)), the piracy network includes, at least, organizers, planners, leaders, financiers, facilitators, and ransom negotiators [51]. Some local Islamist militia and government officers also supported Somali piracy and participated in ransom allocation [52]. Those persons almost always acted on land. Thus, UNSC resolutions repeatedly reiterated the necessity to exercise jurisdiction over, and to prosecute, not only suspects caught at sea but also the above-mentioned persons [53], as well as the necessity to prevent the illicit financing and laundering for piracy [44].

3.4. Enhanced International Cooperation

International cooperation in anti-piracy law enforcement and judicial processes has been strengthened. Piracy at sea itself has a wide range of international characteristics, as the people, property, and ships involved in an attack may come from different States or may relate to interests of individuals or entities in different States. In order to reduce difficulties in collecting evidence, the UNSC urged States to allow their citizens and vessels to undergo forensic investigations at the first port of call immediately following an act or attempted act or release from captivity [45]. It also called upon all States to cooperate in the determination of jurisdiction and in the investigation and prosecution stages [54]. Simultaneously, the onshore part of piracy has gradually developed, and transnational criminal networks have formed. For example, part of the ransom money was laundered through the khat trade in Kenya [55]. It is necessary for Somalia and regional States to cooperate with other States, the UN Office on Drugs and Crime (UNODC), and the International Criminal Police Organization (INTERPOL) in strengthening their onshore anti-piracy law enforcement capabilities, such as implementing anti-money laundering laws and establishing Financial Investigation Units [56]. Moreover, due to the inadequate capacity of Somalia and regional States, external support is needed. IMO, INTERPOL, the UN Office of Legal Affairs, the UN Development Programme, UNODC, other States, and regional organizations have assisted Somalia and regional States in developing their capacity for arresting, detaining, prosecuting and incarcerating pirates, as well as for sharing information [57]. These developments both signal the need for enhanced cooperation and demonstrate how greater collaboration can be achieved.

3.5. Expanded Universal Jurisdiction

The scope of universal jurisdiction may be expanded under certain conditions. Under UNCLOS, the scope of anti-piracy actions by States is limited to the high seas and in a place outside the jurisdiction of any State. Since UNSC resolution 1816 (2008) came into effect, States have been authorized to enter Somali territorial waters to fight piracy [6]. Resolution 1851 (2008) further authorized States to enter the land of Somalia [45]. Although the UNSC resolutions repeatedly stressed that it was temporary, occurring only at the request of the TFG, and did not constitute customary international law [6,45], the practice established by the resolutions provides a model that might be followed again under certain conditions.

In such cases, actions in Somali territorial waters should be consistent with such actions permitted by relevant international law to combat piracy on the high seas [6]. That means it is necessary to consider the compatibility of existing legal provisions with that situation.

3.6. Newly Involved Private Sector

The legitimacy of privately contracted armed security personnel (PCASP) on board ships has been recognized at the international level. The UN Security Council resolution commends the measures taken by flag States to allow vessels flying their flags transiting the High-Risk Areas to deploy PCASP [53]. IMO's attitude is relatively conservative. While formulating relevant regulations for PCASP, IMO has emphasized that this does not constitute an endorsement or institutionalization of their application [58]. As for its legitimacy at the national level, IMO and its member States agree that the decision to allow the deployment of PCASP on board ships should be decided by the flag State [41]. The activities of PCASP should be managed by States in accordance with international law [53]. The task of PCASP is defined as applying necessary and reasonable force to protect the ship and persons on board from illegal attacks [59]. For this reason, the way and degree of its use of force are strictly limited. They are required to take all reasonable measures to avoid the use of force, and PCASP should only use weapons in self-defense or protection of others [59]. The force should be used in a manner that is in accord with applicable law [60]. The use of force should not exceed the extent strictly necessary and reasonable in such circumstances, and attention should be paid to minimizing damage and injury, respecting and protecting human life [59]. There is also a viewpoint that due to the limited number of guards with limited weapons, the function of PCASP can only be self-defense [61]. In conjunction with Article 107 of UNCLOS on "ships and aircraft that have the right to arrest due to piracy", although PCASP is considered to be a sustainable way to combat piracy [61], they are not authorized to exercise enforcement jurisdiction. However, in theory, improper behavior of PCASP may still occur. Once the actions go beyond the necessary and reasonable use of weapons, the nature of the behavior and the applicable jurisdiction should be identified. As Article 94 of UNCLOS requires States to exercise effective jurisdiction and control over administrative, technical, and social matters over ships flying their flags [42], the interim guide related to PCASP issued by IMO holds that the incidents occurring on ships served by PCASP are subject to flag State jurisdiction and applicable domestic law (including criminal law) of the flag State [59]. However, if the behavior of PCASP is beyond reasonable self-defense and meets the definition of piracy itself, the flag State jurisdiction conflicts with the universal jurisdiction over piracy, which has not been resolved in the existing anti-piracy legal system.

4. Main Challenges in Exercising Universal Jurisdiction over Piracy

Based on the evolution of international law before, and developments after, the spike in Somali piracy, many current challenges can be identified.

4.1. Weaknesses in UNCLOS

The definition of piracy in UNCLOS (Piracy is defined in UNCLOS Art. 101 as follows:" (a) any illegal acts of violence or detention, or any act of depredation, committed for private ends by the crew or the passengers of a private ship or a private aircraft, and directed: (i) on the high seas, against another ship or aircraft, or against persons or property on board such ship or aircraft; (ii) against a ship, aircraft, persons or property in a place outside the jurisdiction of any State; (b) any act of voluntary participation in the operation of a ship or of an aircraft with knowledge of facts making it a pirate ship or aircraft; (c) any act of inciting or of intentionally facilitating an act described in subparagraph (a) or (b)" [42]), especially the elements of private ends, two ships requirement, and geographical restrictions, has been widely criticized for its limitations [62–64]. These limitations have been dealt with by other scholars but are explored again here in light of the developments highlighted in the previous section.

Some provisions of UNCLOS relating to piracy are ambiguous. Article 101(a) mentioned "any illegal acts of violence or detention", without specifying the meaning of the word "illegal". What kind of law does it refer to, international law or domestic law? If it refers to international law, what are the sources of it? If it refers to domestic law, which State's domestic law is it? There is no clear answer. There is a view that the word "illegal" here means the absence of either "grounds negating criminal liability despite the use of violence" (e.g., self-defense) or "situations in which private detention may be lawful" (e.g., citizen arrest) [65]. This position lists two situations that should be understood as "legal", but it does not answer the above questions, such as the reasons for exemption from criminal responsibility and the legal basis for allowing private detention. The draft guidelines for national legislation on maritime criminal acts, proposed by the Comité Maritime International (CMI), has already considered that two categories of acts that may contain violence but with justifications should not be held as maritime criminal acts or piracy. Justifiable violence proposed by CMI includes: (1) "reasonable acts to rescue a person or to recover stolen property or regain lawful control of a ship or maritime structure"; and (2) "reasonable or proportionate acts to protect a person, ship or maritime structure, or related property, against a maritime criminal act or act of piracy". [66] Nevertheless, these provisions have not been formally endorsed. With the increasing use of privately contracted armed security personnel on board ships to counter piracy, both situations may be more likely to occur as the defensive capabilities of the ship increase. Due to the lack of specific laws on which self-defense is based, the legal meaning is still vague. It is difficult to determine the legitimacy and moderation of self-defense and how to deal with the seized pirates and their property. When a merchant ship seizes pirates as self-defense or for another "legal" reason, does it have the right to hand them over to a warship or the authority of any State, and does the State have the obligation to accept the seized pirates? There is no relevant regulation.

Another ambiguity is whether "private ends" means "private/political" or "private/public" [65]. Recalling the process of codification of piracy-related provisions by ILC, the United States suggested that "acts of piracy are committed in pursuit of private, as contrasted with public ends" [67]. Gerald Fitzmaurice pointed out that submarines without government authorization were considered to be carrying out private ends [68]. It implied that piracy was essentially a crime committed by private individuals, rather than performing government or authorized duties. Zourek also mentioned that if the condition of "private ends" remained, then if the perpetrator could prove that his act was committed under the instigation or instruction of public authority, the act would be considered lawful [68]. Therefore, according to these views, acts for private ends should refer to acts opposite to those of government. Several cases involving environmentalists demonstrate a similar understanding of "private ends". In Castle John v. NV Mabeco (1986), a Greenpeace ship attacked other ships, claiming that the latter caused pollution [69]. The court ruled that Greenpeace's act constituted piracy because it was for private ends and "purely in support of a personal point of view concerning a particular problem" [69]. Even if the purpose of the private subject is related to a political reason, it can be classified as private ends [69]. In Institute of Cetacean Research v. Sea Shepherd Conservation Soc., licensed whalers sued environmentalists who interfered with whaling activities. The Ninth Circuit ruled that such environmental activities constituted piracy, since private ends "include those pursued on personal, moral or philosophical grounds" [70]. However, the "private/political" divide has many supporters [8,71]. It is generally agreed that UNCLOS excludes politically motivated terrorist acts from the piracy [72–76]. Somali pirates alleged that they attacked to defend against illegal fishing and dumping of toxic wastes in Somali waters [56], the aim of which was to protect their own rights [77], or was simply to help the poor [78]. Somali armed groups engaged in piracy once considered themselves as coastguards [77], and some Somali pirates were welcomed as national heroes [78]. If the above-mentioned purpose for attack claimed by Somali pirates was true (according to United Nations, the reason for Somali piracy is only a cover-up [53]), and the understanding of "private/political" is

accepted, their acts do not constitute piracy. A similar scenario may emerge in the growing piracy tide in the Gulf of Guinea. Some commentators are concerned that maritime attacks in the Gulf of Guinea may be committed for political ends by using piracy as a weapon to influence political developments in specific States in the region [79].

A further issue is relating to the application of universal jurisdiction over piracy in the exclusive economic zone (EEZ). UNCLOS has almost absorbed the provisions on piracy of HSC. At the time of the formulation of HSC, the ocean beyond internal waters was generally divided into territorial seas and high seas, and there was no concept of exclusive economic zones. Therefore, the geographical limitation of piracy could form a logical self-consistency then. There was no intermediate zone between the high seas and the jurisdictions of States. The EEZ system was newly established in UNCLOS, but the provisions on piracy were not adjusted correspondingly. Many scholars believe the geographic scope of Article 101(a) should be read to include the EEZ of any State in line with Article 58(2) [17,63], and many UN agencies hold the same view [46,80]. However, while acknowledging universal jurisdiction over piracy in EEZs, there are still problems to be solved. First, States may still not be obligated under Article 100 to cooperate in the repression of piracy there [17]. Second, in the process of exercising universal jurisdiction, the actions of warships may cause damage to the sovereign rights and jurisdiction of coastal States under special circumstances. For example, (1) the rescue or expulsion by warships of other States may affect the exploration, development, conservation, and management activities of coastal States; (2) the navigation or exchange of fire of warships of other States may cause pollution of the marine environment or may cause damage to artificial islands, facilities and structures, marine scientific research facilities and equipment, etc. or; (3) the actions of warships of other States may be affected by the exploration, development, conservation, management, and activities of coastal States exercising their exclusive jurisdiction. Third, the coastal State's understanding of the peaceful purpose of the EEZ may affect the enforcement of universal jurisdiction over pirates in this zone. According to UNCLOS, all States enjoy freedoms of navigation in EEZs, and these zones should only be used for peaceful purposes [42]. In other words, non-peaceful navigation should be prohibited. However, there is no unified understanding of peaceful purposes, such as whether it means banning all categories of military activities [81]. Although countering maritime piracy should be through law enforcement rather than military activities, the nature of the act is still easy to be confused because the main resource used to counter piracy is warships [82]. Some States prohibit foreign warships from engaging in military activities in their EEZs [81]. If a State considers that countering piracy has the attribute of military activities, it may be difficult for foreign warships to implement universal jurisdiction over piracy in that State.

UNCLOS does not explicitly criminalize attempts to commit piracy. Some scholars believe that in this case, corresponding acts do not apply to universal jurisdiction [16,76], and only the actual pirate attack can be prosecuted under UNCLOS [83]. The UN Division of Ocean Affairs and Law of the Sea (UN-DOALOS) also stated that attempts to commit piracy do not meet the definition of piracy in UNCLOS [84]. However, the opposite view holds that piracy in international law should include attempts to commit piracy. The UNSC called for all States to emphasize the importance of criminalizing attempts to commit acts of piracy [56]. In US v. Hasan, the court ruled that unsuccessful attempts to commit piracy acts formed piracy jure gentium [85]. Italy, the Netherlands, Germany, and Japan have also regarded attempted attacks as breaches of the law in many cases [86]. In addition, the demarcation between "preparatory" and further action is a difficult point in defining an "attempt to commit piracy" (See section I (I) of English Criminal Attempt Act 1981: "if, with intent to commit an offence to which this section applies, a person does an act which is more than merely preparatory to the commission of the offence, he is guilty of attempting to commit the offence"). It is easy to understand that if the pirates engage the target ship, their acts can be regarded as attempting to commit piracy, and thus may be punished. In US v. Hasan, the defendants mistook the navy frigate Nicholas for a merchant ship and opened fire [85]. In the cases of Topaz and Nave Atropos in Seychelles, pirate ships

launched attacks on other ships, but failed [87,88]. All of those defendants were found guilty. However, the ambiguity lies in whether pursuing a ship for the purpose of carrying out a pirate attack, but not yet in contact with the chased ship, constitutes an attempt to commit piracy. At this time, the pirate ship has shown an obvious intention to attack and has begun to take action against specific targets, but it has not met the standard of "engaging criminal targets". It is suggested in Oppenheim's International Law that actually completed violence is not needed and that chasing a ship for the purpose of attacking can constitute piracy [89]. The judgement of the case of Draco in Seychelles demonstrated that a conviction can be successfully achieved for chasing a ship as an attempt to commit piracy [90]. Conversely, some scholars argue that an attempt to attack should begin with some kind of violence [16]. Another scholar holds that if offenders do not use violence but only chase ships and fail to board them, they do not commit piracy under UNCLOS Article 101(a) and are treated as pirates only when it can be proven that they know it is a pirate ship and participate in its operation voluntarily, as defined in Article 101(b) [91]. Cruising at sea with weapons in order to carry out pirate attacks could also be understood as an attempt to commit piracy. Since no specific target has been found and no specific attack has been carried out, this stage is closer to preparation to commit a crime. According to Oppenheim's International Law, it is not clear whether armed cruising with the aim of committing piracy constitutes piracy [89]. There is also the opposite view that cruising at sea only for the purpose of piracy is not piracy in State practice [16].

There are different understandings on whether the threat of violence, if not actually committed, constitutes piracy. Oppenheim's International Law holds that piracy is carried out by unauthorized acts of violence, whether such violence is the direct use of force or threat [89]. That is, the threat of violence can constitute piracy. However, in the literal sense, the threat of violence itself is not within the stipulated circumstances of piracy. If the threat of violence is accompanied by detention or depredation, this will undoubtedly constitute piracy because of detention or depredation. If the purpose of the threat of violence is to force the State, organization, individual, or other subject to carry out or not to carry out a certain act, and it is not accompanied by detention or plunder, it does not fall under the definition of piracy. Perhaps because of the lessons of UNCLOS, in order to eliminate such ambiguity, when the IMO formulated the definition of armed robbery, it added "or threat thereof" after "any illegal act of violence or detention or any act of depredation", which clearly includes the threat act [92].

There are also different opinions on whether there are territorial restrictions "on the high seas" or "beyond the jurisdiction of any State" on the act of Article 101 (b) and (c) of UNCLOS. There is a view that there are no such restrictions in the acts of subparagraph (b) and (c) [93]. Unlike Article 101(a) that clearly defines the region, subparagraph (b) and (c) themselves do not stipulate a specific geographical scope. Therefore, it should be understood that the provisions are not intended to impose geographical requirements [94]. Notwithstanding this, according to Harvard's 1932 Draft Convention (Art. 3: Piracy "is any of the following acts, committed in a place not within the territorial jurisdiction of any State: . . . any act of instigation or intentional facilitation (of piracy) . . . ."), to which the ILC mainly referred when drafting the piracy-related provisions of the HSC, all persons, including the perpetrators and facilitators of the attack, must appear on the high seas [95], which seems to reveal the original legislative intent of the provisions. US v. Ali fully reflects the collision of the two views. The defendant, Ali Mohamed Ali, did not participate in the hijacking at sea. Instead, he boarded the ship two days after it docked in Somalia and acted as an interpreter and a negotiator for remuneration. The District Court ruled that it did not have jurisdiction on the ground that his acts did not take place on the high seas [49], while the Court of Appeals held that UNCLOS does not require that subparagraph (c) have a geographical limit, and that incitement and facilitation do not need to take place on the high seas [49]. In US v. Shibin, like Ali, Mohammad Saaili Shibin only played the role of negotiator on Somali land and in territorial waters. He argued that according to UNCLOS, facilitation should take place on the high seas, and the court lacks personal jurisdiction and

subject-matter jurisdiction. However, both the District Court and the Court of Appeals found that aiding and abetting ("functionally equivalent" to "facilitating") piracy can occur anywhere, even in the territory of another State, and that any State has jurisdiction under international law [96].

Further problems arise concerning the facilitation of piracy. Some acts of intentional facilitation usually need to be committed in the specific context of piracy, such as providing financial support to pirates, assisting pirates with taking care of hostages, and translating and negotiating for pirates. The other parts of intentional facilitation themselves are illegal and can constitute independent crimes. For example, providing illicit weapons for pirates involves illegal transportation and arms trafficking, legalizing piracy income involves money laundering, selling or handling depredated property for pirates involves selling stolen goods, and providing an umbrella of protection for pirates by administrative personnel involves crimes of corruption and dereliction of duty. For the latter, if a perpetrator is prosecuted for an independent crime, rather than piracy, it causes controversy as to whether universal jurisdiction can be applied.

UNCLOS does not oblige States to exercise universal jurisdiction [97]. Article 100 only obliges States to cooperate in the suppression of piracy. According to Articles 105 and 110, a State "may" rather than "shall" exercise the right to board, seize, arrest, enforce the law, and impose penalties on pirates. Moreover, UNCLOS does not mention domestic legislation on piracy at all, and this has resulted in a fragmented national legal landscape (discussed in detail below). However, in 2019, Annex C of the ILC Annual Report noted that it could be assessed whether States were obliged, or could only choose, to establish such jurisdiction [98], which means that it is necessary to reconsider whether States must or are simply permitted to adopt national law exercising universal jurisdiction over piracy.

Turning to the adjudicative jurisdiction, according to Article 105, the right to prosecute pirates only applies to the courts of the seizing State. As a result, although a large number of Somali pirates, captured by foreign escort navies, were sent to regional States for trial, some scholars believe this was contrary to UNCLOS [47,99].

4.2. Disharmony among International Instruments

Although both UNCLOS and the Convention for the Suppression of Unlawful Acts against the Safety of Maritime Navigation (SUA) are vital legal bases for anti-piracy, their relationship is controversial. Mixed views include: (1) Crimes defined in SUA (SUA offences) "are complementary to UNCLOS provisions on piracy [78]"; (2) SUA enlarges the scope of piracy [100]; and (3) The original piracy crime has been replaced with "illegal acts endangering the safety of navigation" in SUA [101].

Relatively speaking, SUA has a broader scope of offences. As for the geographical element, unlike UNCLOS, SUA offences apply if the ships are crossing jurisdictional boundaries, including waters between States [102]. This indicates that it is applicable within the territorial seas. SUA does not stipulate the two ships requirement and private ends. Instead, it regards attempting to commit an offence as an offence [102]. Additionally, unlike UNCLOS, which does not oblige States to adopt domestic anti-piracy laws and exercise universal jurisdiction over piracy, SUA not only requires each State Party to punish the SUA offences but also establishes more detailed operational measures for this purpose, including the circumstances in which a State should and may establish its jurisdiction, as well as the obligation of "extradition or prosecution" [102]. Due to the fact that SUA more clearly stipulates the obligation of States to establish and exercise jurisdiction, it makes up for the deficiency of UNCLOS in this aspect to a certain extent. Therefore, although SUA is not specifically aimed at piracy, and the word "piracy" does not even appear in it, the UNSC resolutions on Somali piracy often require States to establish jurisdiction based on SUA [9].

However, UNCLOS and SUA actually belong to different systems. The original aim of SUA was combatting "the world-wide escalation of terrorism in all its forms" [102]. Seen from the types of SUA offences, these concern the safety of maritime navigation, which is

not entirely consistent with piracy. Even if these offences (especially those stipulated in Article 3.1 (a) and (b) of SUA) overlap with piracy under UNCLOS in certain situations, it seems that the interrelation between them has not been considered in drafting SUA [78]. Article 3.1 (a) and (b) of SUA only contain the seizure or control over ships and violent activities possibly endangering the safe navigation of ships. When violent acts against persons or property are not aimed at seizing or controlling ships and are not at a level that endangers the safety of navigation, they may conform with the piracy definition under UNCLOS, but they do not constitute SUA offences.

The nature of jurisdiction determined under UNCLOS is different from that under SUA. The latter does not involve universal jurisdiction over piracy but quasi-universal jurisdiction over SUA offences (The "extradition or prosecution" established in SUA can be regarded as a quasi-universal jurisdiction. According to Anthony Aust, the "universal jurisdiction" that only applies to parties to those treaties is known as quasi-universal jurisdiction) [103]. For example, if an attack takes place on the high seas when the victim ship is scheduled to navigate into a State's territorial sea, this attack constitutes piracy under UNCLOS and the offence under SUA simultaneously. If the attack is seen as piracy and subject to jurisdiction under UNCLOS (that is, universal jurisdiction), any State has the right to seize and prosecute the pirates in its courts. If the attack is seen as a SUA offence and subject to jurisdiction on that basis, SUA does not provide that the State has the right to seize offenders on the high seas because there is no universal jurisdiction that authorizes the State to enforce the law on the high seas. Although Article 8 of the SUA Protocol of 2005 (SUA 2005 Protocol) specifies the circumstances in which a State Party (the requesting Party) may board a ship flying the flag of another State Party (the flag State) located seaward of any State's territorial sea, it sets many preconditions. For example, the requesting Party shall require the flag State to confirm the nationality of the ship and obtain its authorization for boarding the ship and taking appropriate measures against the ship. The requesting Party shall not board the ship or take measures without the express authorization of the flag State [104]. The adoption of the SUA 2005 Protocol also needs to be further improved. By 2020, compared with 166 parties to SUA, there were only 51 parties to the Protocol [105–107]. Furthermore, according to UNCLOS, the seizing State has the right to prosecute pirates without reporting to any other State, while according to SUA, any State Party should immediately notify the States that have established compulsory jurisdiction and any other interested States (if advisable) after taking the offender or the alleged offender, who is present in its territory, into custody [102].

Except UNCLOS and SUA, other relevant existing international legal frameworks are regional instruments, such as the Regional Cooperation Agreement on Combating Piracy and Armed Robbery against Ships in Asia (ReCAAP), DCoC, the Code of Conduct concerning the Repression of Piracy, Armed Robbery against Ships, and Illicit Maritime Activity in West and central Africa (Yaoundé Code of Conduct), and the Memorandum of Understanding on the Establishment of a Sub-regional Integrated Coast Guard Network In West and Central Africa (MOWCA MOU). Since most of their parties come from corresponding regions, their content mainly concerns the rights and obligations of respective States' parties. As of 23 February 2019, only 6 of the 20 ReCAAP contracting parties were not regional States [108]. In DCoC, Yaoundé Code of Conduct, and MOWCA MOU, there are few or no States' parties from outside the region [24,109,110]. These instruments facilitate cooperation between the State parties in each region, but cooperation with non-regional States that bring pirates back for trial, which is typically in the form of exercising universal jurisdiction, is not fully stipulated. Although the two codes of conduct request that the participants cooperate with interested States and other stakeholders to facilitate rescue, interdiction, investigation, and prosecution [109,111], there are no further specific provisions.

The two codes of conduct are comparatively consistent and have drawn lessons from the fight against Somali piracy, so that they are more advanced than ReCAAP in the breadth and details of cooperative measures. For example, in order to clarify the anti-

piracy measures at the national level, the two codes of conduct elaborate which kind of national maritime security policies, domestic legislation, practices and procedures, national maritime security committees, or other systems and security plans a State should develop and implement [109,111]. They also build on the "embarked officer" mechanism entitling a State, with the authorization by another State, to nominate law enforcement or other authorized officials to embark on the latter's patrol ships or aircraft [24,109]. In contrast, ReCAAP mainly focuses on the establishment of an information-sharing center and the sharing of information, transmission, and acceptance of cooperation requests through that center, rather than the specific design of cooperation measures in other areas. It has provisions regarding extradition, mutual legal assistance, capacity building, cooperative arrangements, and protection measures for ship [112]. However, these provisions are relatively simple.

4.3. Defects of Domestic Piracy Legislation

Somali piracy has revealed the shortcomings of domestic piracy legislation in many States [113]. Naval forces were often forced to release suspects without any sanctions, no matter whether there was sufficient evidence to prosecute them or not [9]. That has weakened the international efforts against Somali pirates [53]. Failure to criminalize piracy and to establish universal jurisdiction in domestic law directly results in the lack of a basis for combating piracy at the national level. Even in States that have criminalized piracy and established universal jurisdiction over piracy in their domestic law, there are still various deficiencies in the legislation.

First, the definition of piracy is not uniform among States' domestic legislation and between domestic law and international law. Scholars have analyzed the definition of piracy in 19 States and regions and found that only 21.2% held two ships requirements; 31.6% required "private ends"; and 26.3% required that piracy occurs outside the scope of national jurisdictions [114]. This inconsistency will lead to operational difficulties in applying universal jurisdiction. Even if an act constitutes "piracy" under domestic law, it does not necessarily mean that universal jurisdiction applies, and there is a need to distinguish whether the so-called "piracy" conforms to the UNCLOS definition. This also means that, if the State signs a new international instrument on piracy with the requirement to implement the instrument in its domestic law, it has to distinguish the applicable part from the existing domestic "piracy" definition first and then amend the domestic law relevant to this part to comply with the instrument. That will increase the difficulty of implementation and can easily confuse.

Second, the sentences imposed on pirates vary greatly between States. The universal jurisdiction prosecutions over piracy are public goods that serve the whole international community [115]. Consequently, it is necessary to analyze the sentences for piracy in different States comparatively. Sentences for similar crimes should not differ largely, otherwise they can lead to unfairness [116]. However, as of 2010, the longest maximum sentence was a life sentence (e.g., in the US, UAE, and Kenya), and the maximum sentence in Seychelles was 30 years, while the ones in Europe were significantly shorter (e.g., 15 years in Germany; 12 or 15 in Holland; 14 or 20 in Italy) [116]. In practice, the sentences for similar piracy offences range from a life sentence to 4.5 or 5 years [116].

Third, the domestic legal basis for universal jurisdiction over piracy is not well established. Many States have not fully adopted domestic legislations and a jurisdictional framework based on the concept of universal jurisdiction stipulated in UNCLOS [117]. Some States tend to exercise universal jurisdiction only when certain links exist [61]. In this respect, it seems that other traditional jurisdiction principles are enough to meet the needs of States to combat piracy, if they are not interested in punishing piracy that has no nexus with them. According to Jack Lang, in light of general international law, the State of nationality of the pirates, the State of nationality of the victims, and the flag State of any ship concerned can claim jurisdiction over the suspected pirates [23]. However, as ships on the high seas are generally considered to be under the exclusive jurisdiction of

the flag State, with the universal jurisdiction over piracy and a few other circumstances as exceptions [103], whether there is still the space for other traditional jurisdiction is confusing. Moreover, by using a flag of convenience, the flag State may not be the State of the company that genuinely owns or operates the ship. The legal link between the latter State and the piracy incident may be weak. Therefore, some States prosecute pirates having nexus with them on the ground of universal jurisdiction. For example, Japan's first piracy trial, which involved an attack on a Bahamian ship operated by a Japanese company, applied universal jurisdiction [118]. A similar but confusing situation existed in the Republic of Korea v. Araye, the first trial of Somali pirates in Korea related to the piracy attack on a Maltese ship operated by a Korean company [119]. The jurisdiction ground of the case is controversial. The court ruled that, according to the domestic criminal procedure law, it has territorial jurisdiction over the case due to the current location of the defendant [19]. One scholar believes that Korea does not recognize universal jurisdiction, and only when the suspected pirates are Korean nationals or the piracy takes place on a Korean ship can they be prosecuted for piracy in its domestic courts [120]. However, other scholars regard the trial as a typical case in which Korea exercised universal jurisdiction over piracy [19]. This issue is important because if there is a positive conflict of jurisdiction, the jurisdiction principles the State applies may affect the priority of different jurisdictions because universal jurisdiction is often considered to be subsidiary [121]. Moreover, if the seizing State does not recognize the jurisdiction ground proposed by other States, it will not cooperate [122]. For example, if the seizing State believes that only flag State jurisdiction and universal jurisdiction are applicable to piracy, and does not recognize other traditional jurisdiction claims, it will not transfer pirates. However, in the current situation of the overall negative conflict of jurisdiction over piracy, regardless of the jurisdiction ground applied, it usually will not incur protests from other States. In special circumstances, it may restrain interested States from asserting jurisdiction over a whole case. In the Republic of Korea v. Araye, because the criminal law of Korea does not clearly provide for universal jurisdiction, there was a debate about whether the criminal acts against foreign crew can be applied under Korean law [123]. Those acts against foreign crew were not ultimately prosecuted [119]. From a global perspective, universal jurisdiction is a justice-based measure [124] and an important means to protect global public goods [121]. Although it is not a legal obligation to establish and exercise universal jurisdiction over piracy, as Cedric Ryngaert claims, there are many jurisdiction principles so that at least one can be applied in any given situation [121]. Positively asserting jurisdiction can be regarded as a responsibility of States in some circumstances [122]. Without a clear stipulation of universal jurisdiction over piracy, negative conflicts of jurisdiction will undoubtedly occur, which is not conducive to the solution of global problems and the realization of SDG 16 (Peace, Justice and Strong Institutions). Fourth, domestic legislation lacks procedural provisions on extraterritorial law enforcement. For instance, in the Republic of Korea v. Araye, the pirates claimed that their transfer to Korea lacked a proper procedural basis [19]. Generally speaking, the essential procedural elements, such as time of detention, the treatment and the rights of pirates in the transfer, the procedures for boarding, and visiting and evidence collection processes, have rarely been included in the domestic law. Failure to deal with those issues may lead to violations of human rights. In the case of Hassan and Others, France was charged with illegality due to the extent of time the alleged pirates were kept in detention [125]. The French courts tried to explain this with "wholly exceptional circumstances", but the European Court of Human Rights decided that there had been a violation of the right to liberty and security in that case [125].

Fifth, domestic legislation may be unable to meet new trends in exercising universal jurisdiction. The separation of seizing, prosecuting, and imprisoning stages, the proposal of new piracy trial options, and enhanced international cooperation all mean that the exercise of universal jurisdiction is no longer limited to the conduct of a single State. Therefore, cooperation with other States and other international entities (including international organizations and international or regional tribunals) is hindered by differing domestic

legislative regimes. Harmonizing the law between States will assist with maritime law enforcement cooperation, the transfer and reception of pirates, the identification of evidence collected by other States, and the application of law before and after the transfer of pirates, which are rarely reflected in existing domestic legislation. Efforts to harmonize laws between jurisdictions can have the further benefit of enhancing global best practice.

5. Balanced Relationships to Be Sought in Strengthening Universal Jurisdiction over Piracy to Enhance a Sustainable Anti-Piracy Legal System

In order to sustain a strong anti-piracy legal system, incremental enhancements are needed to support universal jurisdiction over piracy, including the achievement of a better balance in the three key areas explored below.

5.1. Balance between Benefits and Costs

The exercise of universal jurisdiction over piracy is regarded as a public good [115]. Although repressing pirates, the hostis humani generis [126], benefits all humankind, for the States that exercise universal jurisdiction over piracy, their benefits may be indirect and limited. Many States have a low passion for prosecuting pirates who do not directly harm their nationals or national interests [127] since exercising universal jurisdiction over piracy does not directly safeguard the interests of the States. Even the flag State of the attacked ship and the State of nationality of the kidnapped crew may be not active in intervening or prosecuting piracy [23,128]. In the international community, a State rarely receives financial reward for providing such public good. The State's gains in other areas are not significant either. The data show that the exercise of the legislative jurisdiction of universal jurisdiction over piracy—namely, the domestic anti-piracy legislation—does not protect the ships flying the State's flag from pirate attack [113].

The high costs of exercising universal jurisdiction is an important aspect. All the costs for piracy prosecutions, including but not limited to the costs of the trial and imprisonment, evidence and witnesses, translation and logistics, shall be borne by the State exercising universal jurisdiction, unless there are special arrangements on external assistance. The State exercising universal jurisdiction may also have to bear other risks alone, such as Kenya's intention to withdraw from the handover agreement to receive pirates in March 2010 when it claimed that it was threatened with retaliation from pirates' allies [23]. In this regard, a large number of regional States that exercise universal jurisdiction over pirates in combating Somali piracy have proposed that they need to share the burden of imprisonment with third States [46] or hope to send pirates back to Somalia to serve their sentences [128] and do not bear the costs of repatriation of suspected pirates who have not been convicted [46]. However, the State of nationality of the pirate does not always cooperate effectively on the imprisonment issue. Somaliland, a region in Somalia that was dominated by its own authorities, once withdrew from the agreement on accepting convicted pirates from Seychelles and released the pirates in Hargeysa prison without explanation [128].

The imbalance of cost-sharing is another important reason. At present, universal jurisdiction over piracy is usually understood as a kind of right, rather than an obligation. Therefore, the subject of responsibility for exercising the jurisdiction to fight against pirates is not clear. Although all States have the right to exercise universal jurisdiction over piracy, they often take a negative attitude because of the convenience of giving up their rights and their belief that they are not the most appropriate providers of the public goods. This, in turn, undermines the enthusiasm of States that have already provided public goods, thus forming a vicious circle. In 2010, Moses Wetangula, then Kenya's foreign minister, said, "We discharged our international obligations. Others shied away from doing so. And we cannot bear the burden of the international responsibility [129]." If only a few States continue to work hard without sharing the burden, problems will inevitably arise [23].

It can be predicted that it is unrealistic to expect the State to actively invest too much in exercising universal jurisdiction over piracy before the status quo of benefits and costs changes. From the perspective of benefits, the States that have relatively more benefits

from universal jurisdiction over piracy are those with interests in pirate attacks. In addition to calling on all States to exercise universal jurisdiction over piracy and to prosecute and imprison pirates [56], the UNSC further points out the more appropriate States to exercise universal jurisdiction, which are particularly the flag, port, and coastal States; States of nationality of victims and perpetrators of piracy; and States with relevant jurisdiction under international law and domestic legislation [53]. However, the UNSC can only use the non-mandatory phrase "call upon", and whether to respond to the call depends on States themselves. Additionally, great powers also have a certain advantage in gaining benefits from providing public goods. Great powers are often the key factor in determining war and peace, and they also bear greater responsibility for regional and world peace and development [130], and therefore, they should make greater contributions to global governance. Although there may not be a direct interest relationship between a specific pirate attack and a great power, and there is no direct economic benefit, the exercise of universal jurisdiction over piracy helps the State to show its power and manners, so as to enhance its international image and voice. Therefore, it is necessary to encourage more interested States and great powers to provide the public goods needed in exercising universal jurisdiction over piracy.

From the perspective of costs, the absolute costs of exercising universal jurisdiction over piracy are almost fixed. It seems more appropriate to reduce the relative costs and share the costs. The same costs will put more pressure on weaker States, such as Somalia and regional States, than on more powerful States. This is not only because the same costs account for a larger proportion of the economic aggregate in weaker States but also because these States lack the infrastructure needed to exercise universal jurisdiction over piracy, such as a comprehensive legal system, qualified judicial personnel, adequate prison facilities, etc., which are needed to meet the corresponding requirements through new or large-scale improvement, with a large marginal cost. In the more powerful States, such infrastructure is usually relatively fit for purpose and need only be directed or slightly adjusted to be used for exercising universal jurisdiction over piracy; thus, the marginal cost is smaller. In terms of cost-sharing, providing financial and capacity-building support to States exercising universal jurisdiction over piracy can directly reduce and distribute the costs. During the period of countering Somali piracy, the support of the international community to Somalia and regional States, the Trust fund to Support Initiatives of States Countering Piracy off the Coast of Somalia under the auspices of the Contact Group on Piracy off the Coast of Somalia, and the IMO Djibouti Code Trust Fund initiated by Japan are all types of arrangements that objectively and effectively promoted the piracy trials in Somalia and regional States. Moreover, enabling more States to exercise universal jurisdiction over piracy can spread the burden on a global scale and avoid concentrating the costs of activities benefiting the whole international community on a few States. Jack Lang, the Special Adviser to the Secretary-General of the UN on legal issues related to piracy off the coast of Somalia, said in his report that only with the participation of all States can the commitment of each State be strengthened, and he affirmed that the Netherlands still exercises universal jurisdiction over piracy without directly involving its national interests, saying that "continuing such mobilization is essential" [23]. Although it is not realistic to require all States to exercise universal jurisdiction over piracy in the short term, it is an effective direction to take to increase the providers of such public goods as much as possible.

5.2. Balance between Right and Obligation

To a certain extent, increasing the costs of refusing to exercise universal jurisdiction over piracy will enhance the willingness of States to exercise such jurisdiction. To regard universal jurisdiction over piracy as an obligation is an approach. Different from the pure welfare rights, the necessity and urgency of exercising universal jurisdiction in anti-piracy activities is obvious. The high seas have the characteristic of not belonging to the jurisdiction of a single State "but within the collective responsibility of all States";

thus, crimes on the high seas must be properly dealt with through a coordinated and comprehensive approach [131]. In other words, as far as a single State is concerned, it has no legal obligation to exercise universal jurisdiction over piracy; however, as far as the international community as a whole is concerned, the exercise of such jurisdiction is an essential measure to safeguard the common interests, which cannot be avoided blindly. While recognizing that the exercise of universal jurisdiction over piracy is an optional right, Jack Lang also pointed out in his report that although UNCLOS uses the phrase "to the fullest possible extent" to limit the obligation of cooperation in combating piracy, such flexibility should not be used as an excuse for not prosecuting [23].

However, such implied obligation attribute is not conducive to the effective implementation of universal jurisdiction over piracy. SUA has provisions on compulsory jurisdiction and facultative jurisdiction. In the case of compulsory jurisdiction, each State Party has the obligation to establish the corresponding jurisdiction. In the case of facultative jurisdiction, State Parties can decide whether to establish the jurisdiction for the corresponding offences [102], which is more similar to a right enjoyed by State Parties. According to the Legal Committee of IMO, most of the State Parties of SUA incorporate compulsory jurisdiction into their domestic legislation but lack provisions on facultative jurisdiction [117]. This comparison shows the importance of explicitly stipulating that it is an obligation to exercise jurisdiction.

Although a SUA offence does not always coincide with piracy, to some extent, the establishment of compulsory jurisdiction in domestic law still reflects the willingness of States to bear the responsibility of combating maritime crimes at sea. The increase and then reduction of Somali piracy makes the international community more aware of the importance of participating in international cooperation against piracy and undertaking corresponding international responsibilities. The signing of regional anti-piracy legal instruments, such as ReCAAP, DCoC, Yaoundé Code of Conduct, and MOWCA MOU, further reflects the initiative of the international community in combating piracy. On this basis, it is feasible to set the exercise of universal jurisdiction over piracy as an obligation under certain conditions.

In terms of the content of the obligation, there are differences in the exercise of legislative jurisdiction, law enforcement jurisdiction, and judicial jurisdiction. There is a view that the national legislation on piracy is an obvious prerequisite for the implementation of "the obligation to cooperate in the suppression of piracy" in Article 100 of UNCLOS [132]. The obligation of legislative jurisdiction is very common in international legal instruments, such as SUA, International Convention against the Taking of Hostages, and UN Convention against Transnational Organized Crime, which all require State Parties to take necessary measures to establish jurisdiction over related crimes. Therefore, if a new anti-piracy international legal instrument is concluded, there is no technical difficulty in establishing universal jurisdiction over pirates in domestic law as the obligation of State Parties.

The enforcement of universal jurisdiction over piracy has its particularity. It usually occurs on the high seas or in any other place outside the jurisdiction of any State. The vast geographical scope makes it unrealistic to obligate a State to exercise law enforcement jurisdiction over every piracy case as it exercise jurisdiction over criminal offences committed within its territory. Whether law enforcement can be actually carried out on the high seas or in any other place outside the jurisdiction of any State and its enforcement effect depends on many factors, such as the strength of a State's Navy or Coast Guard, the comprehensive strength of the State, the specific situation of the pirate attack, etc. Additionally, in the absence of a unified and authoritative global governance institution, it is obvious that there is no international treaty, customary law, and legal basis for requiring any State to undertake the obligations of "international police" on the global commons such as the high seas or any other places outside the jurisdiction of any State. Therefore, the enforcement jurisdiction should still exist in the form of rights.

The judicial jurisdiction over piracy can be compulsory in the form of "extradition or prosecution". The primary purpose is to put an end to the phenomenon of "capture

release" or "only drive but not capture" and ensure that pirates are subject to judicial trials. Secondly, the "extradition or prosecution" of pirates is in line with the current State practice of transferring pirates to a third State for trial in the process of fighting against Somali pirates.

5.3. Balance between Innovation and Stability

The global governance of the ocean needs to respond to changing, new, and emerging issues through the creation of new governance rules according to new circumstances, new requirements, and new trends in ocean affairs. The development of law should be a continuous and dynamic process. The better way to protect common interests through international law is to adapt rather than to abandon the existing legal systems, and revolutionary new concepts should be constituted consistent with the recognized legal frameworks [133]. Turning to the reform of the legal system of universal jurisdiction over piracy, it is mainly reflected in the balance between the innovative anti-piracy legal measures and the existing relevant provisions of UNCLOS, as well as the balance between the exercise of universal jurisdiction and respect for national sovereignty.

Combined with the public goods attribute of universal jurisdiction over piracy, it can be anticipated that the improvement of the legal system should be cautious and gradual. To be specific, it should be noted that although the narrow definition of piracy in UNCLOS is considered by some scholars as a defect, the possibility of amending it in the near future is relatively slim. The deletion of the two ships requirement will blur the distinction between piracy and other maritime criminal offences committed within a ship under the exclusive jurisdiction of the flag State. In that case, violent crimes on board ships can be included in the scope of piracy, and only non-violent crimes remain under the exclusive jurisdiction of flag States, which is obviously contrary to the exclusive jurisdiction of flag States on the high seas with universal jurisdiction over pirates as only an exception. The deletion of private ends will have the consequence that maritime terrorism can also constitute piracy and be subject to universal jurisdiction. Although that result may be welcomed by some scholars [134,135], it would completely change the nature of the concept of piracy and may arouse much controversy. The geographic limitation is closely related to national sovereignty. It can be predicted that sovereign States would be reluctant to abolish or loosen the geographic limitation, unless they cannot address piracy by themselves [83]. The UNSC made a breakthrough in its resolution on combating Somali piracy, calling on capable States to enter the territorial waters and land of Somalia to combat piracy. However, the UNSC is conservative and is unlikely to normalize such arrangements by breaking through the existing international law system. Resolutions repeatedly emphasize the respect for national sovereignty, stating that allowing access to the territory of Somalia to combat piracy, even though with the consent of the Transitional Federal Government of Somalia, is only temporary and does not constitute customary international law [6]. This concern continued in the fight against piracy in the Gulf of Guinea. When the UN assessment mission on piracy in the Gulf of Guinea assessed the threat of piracy in the Gulf of Guinea and explored the effective response measures that UN and the international community could take, the respondents in Central Africa and West Africa had different opinions on whether to allow foreign warships to enter the Gulf of Guinea and take actions similar to those against Somali pirates [79]. As the region with the largest number of pirate attacks at present, States in the Gulf of Guinea have not fully allowed other States to enter their own territory to exercise universal jurisdiction over piracy as Somalia has. Additionally, the right of reverse hot pursuit mentioned by some scholars [100,136] is not likely to be widely implemented in a short period of time because it involves restrictions on the sovereignty of coastal States and law enforcement in other States. In addition to the above-mentioned issues on the scope of universal jurisdiction, other radical or subversive reform programs, or those requiring huge investment, are less likely to be supported. For example, the UN Secretary-General proposed seven options for a creative piracy trial mechanism, but the

UNSC did not reach a consensus on which option to choose. Jack Lang believed that this meant more aggressive options should be put aside [23].

6. Approaches to Strengthening the Application of Universal Jurisdiction over Piracy to Enhance a Sustainable Anti-Piracy Legal System

The following measures in Sections 6.2 and 6.3 are the specific improvement objectives proposed in response to the actual needs of anti-piracy and the inadequacy of the existing legal system. They are the necessary legal technical support for international cooperation, aimed at increasing the applicability and sustainability of the anti-piracy legal system relating to universal jurisdiction. Considering the differences and diversity among States, the path in Section 6.1 will help to ensure the operability of achieving the goals of Sections 6.2 and 6.3 to the greatest extent.

6.1. Take Advantage of Both Hard Law and Soft Law

The improvement of the existing anti-piracy legal system involves the revision and new formulation of legal instruments. UNCLOS is a comprehensive treaty on maritime activities, rather than being solely aimed at piracy; reform is difficult, and it is unlikely to be supported. Other alternative approaches, such as adopting an international treaty on piracy to clarify relevant matters, is a possibility. Considering the three pairs of balancing issues mentioned above, and realizing that the reform of the anti-piracy legal system should be incremental, a soft law approach can also be contemplated.

In the existing anti-piracy legal system, there are many soft law arrangements, including but not limited to: (1) Non-legally binding intergovernmental regional cooperation arrangements, such as DCoC under the auspices of IMO and Yaoundé Code of Conduct under the auspices of the Economic Community of West African States, Economic Community of Central Afraican States, and Culf of Guinea Commission. (2) Model laws, such as the Model National Law on Acts of Piracy and Maritime Violence and the Draft Guidelines for National Legislation on Maritime Criminal Acts proposed by CMI, as well as the African Union Model National Law on Universal Jurisdiction Over International Crimes. The Elements of National Legislation pursuant to UNCLOS submitted by UN-DOALOS and Establishment of a Legislative Framework to Allow for Effective and Efficient Piracy Prosecutions submitted by UNODC, although the term "model law" is not used, aim to assist States in establishing uniform and consistent legislations on piracy [84], which is similar to the function of model law in this sense. (3) Codes of practice, guidelines, and recommendations, such as IMO's Code of Practice for the Investigation of the Crimes of Piracy and Armed Robbery against Ships, Guidelines to Assist in the Investigation of the Crimes of Piracy and Armed Robbery against Ships, and Recommendations to Governments for preventing and suppressing piracy and armed robbery against ships. On the one hand, these instruments urge governments to improve the necessary legal frameworks for universal jurisdiction over piracy; on the other hand, they also promote the unification of national legislation through detailed suggestions at the operational level.

The use of soft law is helpful in offsetting the shortcomings of the exercise of universal jurisdiction over piracy as a public good. With benefits to all States, people, and generations [137], public goods help to achieve sustainable development. However, due to the main characteristics of public goods (non-excludability and non-rivalry) [138], free-riding is easy [139], which means that individual States enjoy the benefit without contibuting to it [140]. Thus, in conjunction with the analysis of the distribution of costs in Section 5.1, public goods are often under-produced. Moreover, it is often the great powers that have the ability and willingness to provide public goods. Richer and larger States have more advantages than poorer and smaller ones in the negotiation and conclusion of agreements [122], which is not conducive to the achievement of SDG 10 (reduced inequalities) [4]. The influence of great powers, by providing the public goods of universal jurisdiction over piracy, may also cause the concern that these more powerful States police the oceans and define standard enforcement procedures. Soft law may be able to remedy these adverse effects:

(1) The intervention of international organizations in soft law can improve professionalism and ensure a balance between fairness and efficiency. Many soft laws are proposed by or under the auspices of international organizations. Some international organizations have sufficient expert resources to provide professional and scientific guidance for law reform [141]. In addition, international organizations contribute to equity, fairness, and efficiency. In order to achieve sustainable development, policy formulation, decision-making, and implementation require broad participation [3]. Competing interests among a wide range of participants is inevitable. The consensual structure in international law is considered to be the main obstacle to solving the key problems of global public goods [139]. International organizations usually cover or represent the most interested stakeholders, which ensures broad participation to a certain extent. Moreover, international organizations undertake convening and coordinating functions, thus providing a forum for negotiating, reducing costs [139], and increasing the efficiency of instrument-making.

The UN and its Security Council were regarded as international organizations that guarantee the global public good related to international peace and security [142]. In terms of public goods and SDGs in the maritime domain, IMO, among others, can also be a powerful actor. IMO takes the realization of SDGs in the maritime domain as an important goal, and correspondingly created the concept of a Sustainable Transportation System, of which marine security is a vital part [143]. The IMO has contributed to the adoption of many international conventions, regulations, and policies that help in achieving the SDGs [7], which shows that it has the capability and rich experience to support the cooperation and good operation of the Maritime Transport System [3]. The IMO also emphasizes the promotion of sustainable development through full consultation and coordination. To be specific, it recognizes that one of its functions is to coordinate "maritime policies worldwide" by setting global standards for international shipping and to "ensure 'level playing fields' across the world" [3]. Therefore, IMO can be an appropriate forum for anti-piracy legislation reform and law enforcement coordination.

(2) Soft law provides flexible guidance to States to avoid the injustice caused by the imbalance of power between stronger and weaker States. Although international organizations usually cover or represent the States with the most relevant interests, the representation of diverse States is not always completely balanced due to the distribution of seats and the setting of voting mechanisms, as well as the different adoption procedures for different variations of soft law. Even so, since soft law does not have legally binding force, States will not suffer from the limitation of sovereignty or the damage of interests caused by unfair binding obligations. Under the principle of cooperation, all States have equal rights to participate, but their tasks and obligations may be differentiated according to their abilities and needs [144]. The guiding role of soft law in assisting States in forming views and shaping behavior helps to improve the practice and opinio juris of States and to urge States to comply with the soft law on their own initiative when they have the ability. This is also consistent with the important content of SDG 17: to "build upon principles and values, a shared vision, and shared goals" [145].

(3) The costs of developing soft law are lower than those of hard law, and the formation of soft law is more convenient and faster, which responds to the nature of public goods in the exercise of universal jurisdiction over piracy. Piracy is an international crime applicable to universal jurisdiction. If a hard law is established for it, its "universality" character needs to be embodied. Therefore, it is necessary to strive for global recognition by the international community and to reach a comprehensive agreement on relevant matters. Formal international lawmaking is usually costly [139], and it is obviously difficult to achieve in the short term with the current lack of a unified understanding of many problems. By comparison, making soft law is less costly [146]. It can avoid the long and arduous negotiation stage and domestic ratification process required for the conclusion of treaties, and it does not need to go through the lengthy and consistent practice process required for the formation of customary international law [147]. Furthermore, considering the exercise of the universal jurisdiction over piracy as a public good, States, as rational economic

actors, are often unwilling to invest high costs to set up restrictions (e.g., hard laws related to the universal jurisdiction over piracy) themselves. Soft law can mitigate such concerns of States.

This does not mean that hard law is unnecessary. After all, the authority and binding force of hard law cannot be achieved with soft law. Some effects, such as establishing universal jurisdiction as a real legal obligation within a certain range, can only be realized through hard law. It would be best if relevant hard laws could be concluded immediately. However, as previously analyzed, in light of the practical reality, soft law can be regarded as a transitional measure before the establishment of hard law. The implementation of soft law can also provide a trial basis for the conclusion of hard law.

6.2. Adjust the Basic Provisions of Universal Jurisdiction

As mentioned above, UNCLOS is the vital foundation for universal jurisdiction over piracy, but it has its shortcomings. Therefore, it would be valuable if some basic provisions concerning universal jurisdiction could be amended or at least be further clarified.

Things to be clarified include: (1) While any State has universal jurisdiction over piracy, the seizing State has the right to transfer pirates to appropriate courts of the States or other piracy trial fora that are willing to receive them, and the place of imprisonment after the conviction may be located in a State other than the seizing State and prosecuting State. (2) The ambiguities in UNCLOS should be clarified, including but not limited to clarifying the meaning of the word "illegal" preceding "acts of violence and detention", and expounding the meaning of "private ends". (3) The attacks occurring in EEZs also can constitute piracy. Consequently, States bear the duty to cooperate in repressing piracy in EEZs, and foreign warships and law enforcement ships are enabled to enter the EEZ of another State to seize pirates. According to the provisions of Article 58 (3) and Article 56 (2) of UNCLOS, coastal States and other States are required to make joint efforts to take into account each other's rights and obligations. Thus, foreign warships and law enforcement shall regulate their own behaviors, abide by the laws and regulations formulated by coastal States in accordance with UNCLOS and other rules of international law that are not in conflict with Part V of UNCLOS, strengthen the communication with coastal States, reasonably plan navigation routes, and coordinate law enforcement action. (4) The threat of violence and an attempt to commit piracy should be regarded as piracy; to this end, the definition of "attempt to commit piracy" should also be clearly defined to articulate, for example, whether it only includes initiating violent action against the target vessel or whether it also includes chasing a vessel before using violence or even only cruising for piracy. (5) Article 101 (b) and (c) of UNCLOS do not limit the place of occurrence of acts to the high seas and a place outside the jurisdiction of any State. For this purpose, it is necessary to further clarify the extension of the "intentionally facilitating" act in subparagraph (c). For example, it should be clarified whether offences, such as arms trafficking, money laundering, sale or disposal of stolen goods, corruption, and dereliction of duty, which may constitute independent crimes, fall under universal jurisdiction because in effect they provide facilitation to pirates. (6) States have the obligation to enact domestic laws related to establishing and exercising universal jurisdiction over piracy, as well as the obligation to prosecute or extradite the seized pirates.

6.3. Refine Relevant Measures in Exercising Universal Jurisdiction over Piracy

First, harmonize the definitions of piracy in national laws as far as possible. Piracy offences established in the domestic laws of a State are the acts that the State considers should be criminalized and punished, so it is not realistic to require States to unify the definition of piracy. As a compromise, the offences that is consistent with UNCLOS and other "piracy" offences in domestic law can be stipulated in different provisions or in different subparagraphs of one provision, so as to distinguish piracy offences that attract universal jurisdiction from other "piracy" offences subject to other jurisdiction principles. However, if a State's definition of "piracy" occurring on the high seas or in a place outside

the jurisdiction of other States is too broad, such as omitting the "two ships requirement" or "private ends", it may be necessary to restrict the definition.

Second, it would be beneficial to coordinate sentences imposed on pirates in domestic laws as far as possible. In determining the sentence, a State usually considers comprehensively both the nature of the crime and the gravity of its social harm. The penalty also has to be in harmony with sentences for other crimes in that jurisdiction. Therefore, it is not realistic to request the unification of the sentences imposed on pirates in different States. However, a State can evaluate its own provisions relating to sentences by an understanding of those of other States, and it can adjust its own penalties if they are not appropriate. For example, the United States prescribes a uniform sentence of life imprisonment for pirates [148], but that sentence was established in 1909, which was earlier than the signing of UNCLOS. The concept of piracy was obviously dissimilar then from the current concept of piracy, and the social background was also different from now, so there may be room for adjustment. Additionally, the States that are without domestic anti-piracy legislation and that are willing to enact it can also take into account the sentences of other States as a reference.

Third, inciting and intentionally facilitating piracy (especially by piracy sponsors and money launderers) within the territory of the State should be criminalized, and the jurisdiction over piracy sponsors and money launderers should be coordinated with other States. The destruction of land-based aspects of piracy, such as pirate finance and organizational networks, should be an essential sustainable anti-piracy approach [61]. As for land-based piracy offences within the territory of other States, a State has no power to enter the territories of the coastal States to enforce the law. At most, that State can seize and try the suspects when they enter its own territory. However, as for the land-based piracy committed within its territory, the State surely has the right to take measures against suspects. Since such land-based piracy activities usually serve the piracy activities at sea or are part of a criminal network jointly with land-based piracy activities of other States, clarification is needed in domestic legislation as to whether other States can claim jurisdiction over these land-based activities and request extradition to prosecute suspects in conjunction with other related piracy activities on the high seas or in a place outside of the jurisdiction of any States or in territories of other States.

Fourth, the jurisdictional issues should be harmonized for a variety of situations. For example, domestic anti-piracy legislation should explain under what conditions the State needs to transfer pirates to other States or other judicial mechanisms for trial, or needs to receive pirates transferred by other States for trial, and what kind of application, decision-making, and transfer procedures are required for transfer and reception.

Fifth, when seizing, prosecuting, and imprisoning pirates are not completed by the same State, the links between the relevant legal practices should be addressed. Domestic anti-piracy legislation should address problems including: (1) as a prosecuting State, how to determine the effectiveness of the evidence collected by the seizing State; (2) which State's law should be applied to determine the validity and legality of law enforcement actions taken before the seizing State transfers the pirate to the prosecuting State (such as the seize process, the time limit of detention, the treatment conditions, the protection of human rights); (3) whether the detention time in the former State needs to be deducted from the sentence determined in the latter State; (4) which State, prosecuting State or imprisoning State, has the power to decide prison management matters, such as commutation of sentence; and (5) whether the imprisoning State bears the obligation to hand over pirates to other States for trial if the pirates are found to have committed other piracy offences before imprisonment.

Sixth, the issue of mutual legal assistance among States should be considered. In addition to assistance in investigation, evidence collection, and extradition, which are usually included in judicial assistance, the content of assistance can also include urging citizens to testify, improving video and other technical means of remote testimony, and clarifying its validity. In special circumstances, a State may appropriately allow other States

to investigate and obtain evidence in its territory. As mentioned, UNSC has urged States to allow their citizens and vessels to undergo forensic investigations at the first port of call immediately. If the first port of call is not the seizing State or prosecuting State, the State in which the port is located shall permit the seizing State or prosecuting State to investigate within its territory.

Seventh, the procedural law for extraterritorial law enforcement should be developed and perfected, mainly to establish the legal frameworks for boarding and inspecting ships at sea; seizing, arresting, and detaining suspects of piracy; confiscating ships, property on board, and the arms of piracy; collecting and preserving evidence, etc. This will ensure that there are reasonable procedures in domestic law, which can be followed by maritime law enforcement.

Eighth, the human rights of pirates should be guaranteed in accordance with applicable international human rights law. The issues related to human rights of pirates relate to various anti-piracy measures, such as the time of detention, guaranteeing litigation rights, the conditions of detention or imprisonment, and anti-torture, etc. Therefore, human rights should be taken into account in the authorization of relevant measures.

The above recommendations should ultimately be enacted in a State's domestic legislation to directly support anti-piracy activities. To achieve this goal, relevant anti-piracy treaties that establish global obligations or soft laws on anti-piracy could be adopted at the international level to guide the development of domestic legislation.

7. Conclusions

The international law of piracy has a long history, and it has developed in response to challenges across hundreds of years. As a result, universal jurisdiction over piracy, which existed in customary international law, is reflected in the HSC and UNCLOS. However, it was rarely applied until the fight against Somali pirates. In combating Somali piracy, the anti-piracy legal system related to universal jurisdiction over piracy has also exposed the shortcomings in dealing with practical challenges, which means that the sustainability of the system needs to be improved. The rampancy of Somali piracy should be a trigger to rethink and develop universal jurisdiction over piracy. On the one hand, new trends in the practices of universal jurisdiction over piracy have been revealed and need to be considered in enhancing the law. On the other hand, the emphasis on universal jurisdiction over piracy has required re-examination of the relevant legal system, and it is found that there are several main challenges in exercising that jurisdiction that could usefully be focused upon. In other words, compared with the period when the HSC and UNCLOS were adopted, the current situation of piracy and the demand for combating piracy have changed. Correspondingly, the anti-piracy legal system needs to be adjusted to support sustainable marine security and promote the sustainable development of the shipping industry and the ocean. To address those trends and challenges, as well as to establish a sustainable anti-piracy legal system, it is necessary to strengthen universal jurisdiction, and this article has explored the issues and outlined how this might be achieved. Sustainability is usually associated with SDGs and the phrase "long-term" [149]. Therefore, a sustainable solution should be SDGs-oriented and durable in time or effect. In order to achieve this, a sustainable solution should be responsive to changes, comprehensive in analyzing problems, and diversified in means. It should not only be forward-looking but should also be practical and operable (e.g., both ideal goals and transitional means are needed). Meanwhile, political and economic sustainability should be taken into account [61] (e.g., considering various balance relationships is necessary). Above all, piracy is a crime subject to universal jurisdiction, which needs all States to continue to develop a "comprehensive legal regime to prosecute pirates, consistent with international law" [150]. At the same time, universal jurisdiction is a significant measure but not the whole answer to addressing piracy. As noted in the UNSC resolutions, the international community needs to adopt comprehensive measures to solve the problem of piracy and eliminate its root causes [44], which is also a significant topic related to sustainability.

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Appendix A

Table A1. Chronology of main international piracy legal framework.

Date	Development	Details
1958	Convention on the High Seas (HSC)	• First international convention to define piracy • Incorporate universal jurisdiction over piracy
1982	United Nations Convention on the Law of the Sea (UNCLOS)	• Basically, adopted the provisions on piracy in HSC • The most widely accepted international legal basis of universal jurisdiction over piracy (e.g., inter alia, Article 101 definition of piracy, Article 105 universal jurisdiction over piracy)
1988	Convention for the Suppression of Unlawful Acts against the Safety of Maritime Navigation (SUA)	• Defined many violent acts endangering maritime safety as crimes • Established "extradition or prosecution" • The 2005 Protocol revised 1988 SUA, expanding the SUA offences in light of specific forms of terrorist activities
2004	Regional Cooperation Agreement on Combating Piracy and Armed Robbery against Ships in Asia (ReCAAP)	• First regional anti-piracy agreement • For Asia
2008	Memorandum of Understanding on the Establishment of a Sub-regional Integrated Coast Guard Network In West and Central Africa (MOWCA MOU)	• A regional MOU for West and Central Africa to establish an integrated coastguard network against piracy and other unlawful acts
2008–2018	United Nations Security Council Resolutions on Somali Piracy	• Authorized States and organizations enter the territorial waters and territory of Somalia to repress piracy and armed robbery • Relevant resolutions include, inter alia, SC Res 1816(2008), 1838(2008), 1846(2008), 1851(2008), 1897(2009), 1918(2010), 1950(2010), 1976(2011), 2015(2011), 2020(2011), 2077(2012), 2125(2013), 2184(2014), 2246(2015), 2316(2016), 2383(2017), 2442(2018), 2500(2019) and 2554(2020). There are also resolutions on piracy in the Gulf of Guinea, such as SC Rec 2018 (2011) and 2039(2012), which are not as innovative as those on Somali piracy.

Table A1. *Cont.*

Date	Development	Details
2009	Djibouti Code of Conduct concerning the Repression of Piracy and Armed Robbery against Ships in the Western Indian Ocean and the Gulf of Aden (DCoC)	• A regional anti-piracy agreement for the Western Indian Ocean and the Gulf of Aden • The Revised DCoC ("Jeddah Amendment to DCoC 2017") was adopted in 2017 in Jeddah, widening the scope of the Code to address other aspects of maritime security, such as other illicit maritime activities, and maritime law enforcement
2013	Code of Conduct concerning the Repression of Piracy, Armed Robbery against Ships, and Illicit Maritime Activity in West and central Africa (Yaoundé Code of Conduct)	• A regional agreement on piracy and other illicit maritime activities for West and Central Africa

The International Convention against the Taking of Hostages, International Convention for Safety of Life at Sea, and UN Convention Against Transnational Organized Crime are also important conventions in fighting against piracy, but they do not directly address piracy. Therefore, this article does not analyze them.

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IMO's Marine Environmental Regulatory Governance and China's Role: An Empirical Study of China's Submissions

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Abstract: The International Maritime Organization (IMO) plays a significant role in global marine environmental governance, providing a forum of regulatory oversight for member states. Member states are the main actors of the IMO and exert considerable influence on the process of lawmaking. Among these member states, China is unique due to its multiple identities. There are various factors influencing interests behind China's multiple identities, which fully engage the country in various shipping and maritime trade activities. This article examines China's role in the IMO marine environmental regulatory governance. It identifies the impact of China on global ocean governance and indicates the development and reforms in the global governance system. China enacted the China Ocean Agenda 21 for its strategy of ocean development. Thus, China is the object of study in this examination of empirical research that collects submissions from 2001 to 2020 related to marine environmental governance. The findings reveal that the extent to which China participates in such governance has considerably increased, and although the contribution of China's submissions is still in development, its role in the IMO is no longer merely that of a follower, and the efforts of the country have had a positive influence on the IMO's marine environmental regulatory governance, including its legal instruments.

Keywords: global environment; regulatory governance; IMO; China's role; submissions' adoption

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1. Introduction

Shipping accounts for nearly 75% of international trade by volume [1]. The marine environment is deeply affected by shipping activities, in particular, vessel-source pollution [2]. Two types of vessel-source pollution affect the marine environment, voluntary and accidental. Dumping and discharging pollution, the most common source, constitutes voluntary pollution, while spilling is a source of involuntary or accidental pollution [3]. On 21 April 2021, the United Nations issued the Second World Ocean Assessment, a comprehensive evaluation of global oceans from an economic, societal, and environmental perspective. The report indicated that joint efforts by states and international organizations mitigated pollution from traditional vessel sources to a certain extent, including accidental spills and waste dumping. According to the International Tanker Owners Pollution Federation (2019), the average number of annual spills between 2009 and 2018 was 6.4, while that for the period of 1990 to 1999 was 35.8. In 2011, 0.6 million tons of sewage sludge was dumped, falling to only 0.00041 million tons in 2016. Organic and inorganic waste dumping also declined from 3.82248 million tons (2011) to 1.229620 million tons (2016) [4].

However, with the development of enhanced shipbuilding technology and increased shipping activity, new challenges are emerging in marine environmental governance. The first problem results from discharged ballast water and its harmful effect on biological ecosystems. Although ballast water is beneficial in stabilizing ships for safety, local aquatic species and pathogens inside the discharged water are transported to other areas, harming their ecosystems and diversity, resulting in grave socioeconomic consequences [5]. The second problem stems from climate change and air pollution triggered by the emission of

sulfur and NOx. Carbon dioxide emissions from the global maritime industry rose by 8% between 2014 and 2019, per the latest analysis by Marine Benchmark [6]. Air pollution from ship emissions is a hot topic on an anvil in contemporary society. The burning of heavy fuel oil (HFO) emits black carbon, sulfur oxides, nitrogen oxides, and greenhouse gases (GHGs), thereby aggravating global warming [7]. Specifically, it results in enormous damage to the highly vulnerable Arctic environment ecosystems. Black carbon emissions and the introduction of alien species in the Arctic Ocean from ships threaten the Arctic environment and intensifies the necessity of environmental protection [8]. The next problem emanates from the impact of the COVID-19 epidemic. Because of the global pandemic, the number of port state control (PSC) inspections decreased dramatically. Meanwhile, the risk of ships violating applicable conventions increases, posing an environmental threat. These emerging issues demand enhanced global governance over the marine environment.

The International Maritime Organization is known as "the organization that has probably had the most substantial direct effect upon the law of the sea." [9]. Its governance structure is composed of the assembly, the council, and five main technical committees. The IMO plays a significant role in governing the global marine environment. As a specialized agency of the United Nations, its purpose is to promote technical cooperation in shipping among the states, encourage shipping safety, enhance the efficiency of shipping navigation, and prevent marine vessels from polluting the oceans [10]. Regulatory governance is a way of governing by employing legal instruments. The role of the IMO in regulatory governance and the dimensions of marine regulatory governance concerning legislative, institutional, and executional aspects are profound [11]. Regulatory governance was featured using legal regulations and institutions, and the current regulatory governance of the IMO is based on international instruments, numerous codes, and guidelines [12]. To ensure the smooth implementation of these legal instruments, the IMO also plays a supervisory role in governing marine environmental regulations.

The Marine Environment Protection Committee (MEPC) is one of the most important committees of the IMO, and it is responsible for protecting the marine environment. It is composed of all member states and convenes at least once a year. The MEPC is equipped to enact or enhance legal instruments concerning marine environmental protection and is heavily engaged in promoting the implementation of these instruments. In particular, some legal documents that the MEPC has developed are submitted to the council, including proposals, recommendations, guidelines, and reports [13]. At present, the IMO's binding treaties related to the marine environment have come into effect, which effectively regulates vessel-source pollution. In addition, the MEPC and Marine Safety Committee (MSC) possess their own subcommittees to deal with specific matters. Several subcommittees are directly or indirectly associated with marine environmental governance, such as the Sub-Committee on Pollution Prevention and Response(PPR), the Sub-Committee on Carriage of Cargoes and Containers(CCC), and the Sub-Committee on Implementation of IMO Instruments(III). Member states present submissions to these subcommittees, and then the reports made by the subcommittees are referred to the MEPC or MSC for consideration.

The IMO primarily consists of 174 member states and three associated members (Hong Kong, Macau, and the Faroe Islands). In formulating legal instruments, the member states can put forward new submissions, revise existing laws, and discuss any issues related to international shipping before referral to the IMO, which makes further recommendations to the member states for the adoption of legal instruments. When it comes to the IMO implementing and enforcing these instruments, compliance of the flag state is essential to achieve effective regulatory governance, and PSC inspection provides a significant guarantee. The member states of the IMO are divided into coastal states, port states, and flag states, or they are divided into developed, developing, and least developed states based on different standards [14]. Some member states possess various kinds of status and also actively participate in various kinds of shipping and maritime activities, such as China. Due to its particularity, studying the role of China in the IMO's marine environmental regulatory governance is meaningful to indicate various factors behind China's multiple

identities. The study can also explain how the periodical change of China's submissions influences the IMO's marine environmental regulatory governance.

China has been fully engaged in various shipping and maritime activities according to the Review of maritime transport annually released by the United Nations Conferences on Trade and Development (UNCTAD). As a council member of IMO, classified A, China has the world's second-largest economy. It is both a large flag state and a major port state in addition to being a coastal state with a long coastline of 18,000 km as well. Between 2006 and 2010, China ranked fourth in the world top ten countries' (or regions') scale of fleet. Then, China ranked third in the period between 2012 and 2017. In 2019, China had a fleet of 296.4 million deadweight tonnages, accounting for 15.1% of the world's fleet, and was ranked second in the world. In terms of port transport, cargo throughput in China between 2005 and 2019 shows an increasing trend, which varies from 485388 ten thousand tons to 139.51 million tons, and container throughput in the same period was from 7564 ten thousand TEU to 2.61 million TEU (20 feet equivalent unit) [15]. The initiative of "the 21st Century Maritime Silk Road Initiative" by China indicates its emphasis on the international shipping economy, which possesses the potential for achieving broader and deeper shipping economic cooperation [16]. Recently, China has been active in the IMO practice of marine environmental lawmaking. China engages in regulating specific areas of the marine environment through the MEPC and relevant submissions, aiming at reducing GHG emissions, governing polar environments, and applying remote PSC during the pandemic.

Based on the introduction above, the key aim of the study is to investigate the role of China in the IMO's marine environmental regulatory governance. Marine environmental protection is gaining more attention in the 21st century, and Agenda 21 was made by UNCTED for the better implementation of the United Nations Convention on the Law of the Sea (UNCLOS). In order to keep up with Agenda 21, China enacted the China Ocean Agenda 21 for its strategy of ocean development [17]. Thus, the article selected the period between 2001 and 2020. To realize this research purpose, a case study of China is carried out to conduct an empirical analysis of the country's submissions to the MEPC and some other subcommittees related to marine environment protection between 2001 and 2020, providing an answer to the question regarding whether the member states influence the lawmaking process of the IMO. In order to find out the answer to the foregoing question, it is necessary to conduct a literature review for summarizing relative previous research and adopting a proper methodology for credible research results. During the application of research methods, quantitative analysis helps explore the degree of China's participation, while the qualitative analysis facilitates the study about the extent of submissions' acceptance on the IMO forum. Therefore, the paper is structured as follows: Section 2 is a literature review regarding research achievement related to essential issues, which provides the development of interactive relations among the IMO, the United Nations Convention on the Law of the Sea (UNCLOS), and states. Section 3 briefly introduces the research methodology regarding China's submissions by way of quantitative and qualitative analyses. Section 4 scrutinizes China's influence during different periods, considering background factors of policies and the economy, as well as actor-oriented factors of its changing role in global governance, various behaviors of presenting submissions and finalizes China's implementation and consolidation of marine environmental regulatory control. Section 5 presents the conclusion.

2. Literature Review

This study focuses on the relationship between the states and the IMO in the aspect of marine environmental regulatory governance, particularly the states' influence on regulation formulation, promotion, and enforcement of marine environmental governance on the platform of the IMO. After consulting the databases, including HeinOnlion, Wiley, Taylor & Francis, EBSCO, and ScienceDirect, the paper classified previous research into three topics: (1) global environmental governance and the international rule of law at sea,

(2) the functions and methods of the IMO's regulatory governance, and (3) states' role (China as a case study) in regulatory governance by IMO.

2.1. The Role of the IMO on Global Marine Environmental Governance and the International Rule of Law at Sea

Our goal is to indicate the influence of the IMO on global marine governance and the international rule of law at sea in this process, especially the relationship between UNCLOS and the IMO. The essence of the current study is the interaction between global governance and the international rule of law. Therefore, the terms in title "global marine governance", "international rule of law", "law of the sea", and "IMO and UNCLO" are selected as search objects thereof. After a thorough database search, the major research of articles was found to differ in different periods. In the early stages, the research focus shifts from "global marine governance" to the study on the "international rule of law at sea" and "IMO marine environmental governance." Subsequently, with the formulation and promotion of UNCLOS, research interests include the formation and development of UNCLOS. In recent years, the relationship between UNCLOS and the IMO has been a major research focus. Among these studies, those conducted by Tanaka, Y. and Rothwell, R. D. are highly cited. Because of the high quote rate, their research studies underpin the future development of the IMO and UNCLOS. Considering the limited space of the article, the literature highly relevant to and representative of the research focus is selected. In order to comment on the literature, it is necessary to conduct an analysis of the relevant studies.

The international rule of law is an essential mechanism in global governance, where ocean governance plays a critical role. The law provides the "parameters or minimum thresholds" for governance and helps to achieve the acceptable and minimum goals [18]. Regarding the interplay of ocean and global governance, ocean governance defines the extent and nature of global governance, and global governance makes ocean governance more meaningful [19]. The IMO is the subject of global marine environmental governance. International organizations contribute to the ends that the law pursues, building order and promoting common interests [20]. As a competent international organization, the IMO serves as a forum for representatives of its member states and observers from international non-governmental organizations concerned with shipping and environmental protection [21]. It has developed from an organization that was utterly dominated by the interests of a few maritime states to a "proactive" organization with almost universal membership aimed at improving the safety of shipping and marine environment protection [22].

The international marine rule of law is an effective structure to govern global marine environments. Global marine environmental governance requires well-functioning organizations and legal frameworks for individual countries to enforce responsible and effective marine and maritime management [23]. A holistic approach also plays a critical role in ocean governance [24]. Moreover, the core of global ocean governance is the establishment of a comprehensive and unified legal system, and UNCLOS represents the most important legal milestone in global ocean governance reform [25].

As for the relationship of UNCLOS and the IMO, Article 211(1) emphasizes the "international rules and standards" established by "States acting through the competent international organization (IMO)." [26]. UNCLOS regulated vessel-source pollution in Article 211 for two main purposes: one is that it defines the IMO as a "competent international organization," and the other is that it establishes a jurisdictional framework for IMO [27]. In terms of legal instruments' enforcement, the key instruments for the regulation of vessel-source marine pollution are MARPOL and the UNCLOS, which provides three regimes (regulation by flag states, coastal states, and port states) for legal instruments' enforcement. MARPOL regulates the concrete measures adopted by the IMO [28]. In brief, some of the IMO's mandates originate from UNCLOS, and under the framework of UNCLOS, the IMO enacts treaties and other regulatory instruments [29].

Consequently, the international marine rule of law is one of the most effective ways of achieving global marine governance, and global marine regulatory control requires

a comprehensive legal system. In summary, UNCLOS provides a legal framework for the IMO to exert its authority, and the IMO makes imperative supplements for UNCLOS through its authorities.

2.2. Research on the IMO Marine Environmental Regulatory Governance Regarding Its Functions of Lawmaking

Concerning the interaction between global governance and the international rule of law, as mentioned above, good law serves as a prerequisite for the realization of good governance. This subsection focuses on the lawmaking of international organizations. Thus, "global marine lawmaking of IMO", "IMO legal instruments", "the structure of IMO", and "the enforcement of IMO" are selected as objects. After a thorough search of the databases, it was noted that the study of IMO lawmaking, IMO structure, and the role of the MEPC emerged early. Then, articles regarding legal instruments of the IMO appeared. With the enhancement of IMO legal instruments, the focus of the research shifted in that direction. The studies conducted by Chircop, A., Louise de La Fayette, and Harrison, J. are highly cited and lay the basic foundation for the research on the IMO's functions, especially the function of lawmaking. Limited by the length of the article, only nine articles with a high quote rate and highly related to the IMO environmental governance are selected as materials for this part of the literature review.

The function of marine environmental regulatory governance by the IMO is to promote the formulation and revision of marine regulations and facilitate member states' implementation and enforcement. The IMO is successful at its task as an international lawmaking forum, providing a proper legal framework for controlling marine pollution and monitoring member states' compliance with regulations [30]. Furthermore, it can be considered a lawmaking institution to an extent because it can promulgate and promote generally accepted international shipping standards [31]. One of the most important UNCLOS functions of the IMO is the quasi-legislative power, which regulates maritime safety and environmental impacts from ships [32].

The IMO uses hard or soft legal instruments. It enacted a series of treaty-based legal norms and rules designed to protect marine environments from pollution and determine compensation liability in the event of pollution [33]. The IMO plays a significant role in marine environmental protection by issuing nonbinding recommendations and convening diplomatic conferences for states to adopt legally binding instruments. Its functional competence relies on the specific structure of five major committees to take charge of each area of work. In some areas, the IMO has exclusive competence, such as maintaining maritime safety and preventing vessel-source pollution. As one of the IMO's committees, the MEPC has developed treaties, codes, and guidelines for the purpose of marine environment protection, which have made an essential and valuable contribution to the progressive development of international environmental law, as well as to the law of the sea [34].

The enforcement of IMO's legal instruments requires coordination to be conducted by member states. The implementation of convention undergoes the process from treaty to law and then to compliance [35]. In developing international regulations, the IMO is already encouraging the enforcement and implementation of existing regulations [36]. The IMO assists flag states with implementing the IMO instruments and ensures that member states comply with regulations by developing soft law resolution guidelines that are not legally binding [37].

We conclude that as the central authority of global marine environmental governance, the IMO enacts hard or soft legal instruments in its mission of regulatory management and is devoted to promoting the enforcement of its legal instruments.

2.3. Research on the States' Role in Marine Environmental Regulatory Governance on the IMO Forum

The establishment of international organizations is endowed by the member states, and member states exert significant influence on the regimes and institutions of international organizations. This subsection highlights the role of member states in the process

of international organizations' lawmaking and selects "IMO and states" and "IMO and China" as search terms in the study. In addition, "China and GHG emissions," "China and Arctic shipping," and "China and the International Convention on Harmful Anti-Fouling Substances 2001, the International Convention for the Control and Management of Ships' Ballast Water and Sediments (BWM Convention)" regarding China's practice in some concrete fields, were also selected as search objects. After a thorough database search, it was found that the research starts from "the effect of IMO on states," and then research regarding the "states' role in IMO" appears. In terms of the role of China in the IMO, the number of articles is small. Current research focuses on specific areas, such as GHG emissions and revision of the International Code for Ships Operating in Polar Waters (Polar Code). The studies conducted by Mukherjee, P. and Blanco-Bazan, A. provide fundamental materials for studying China's role in the IMO. Finally, the literature irrelevant to the study on the states' governance role in IMO maritime rules is excluded, and ten articles are selected for the literature review.

Before carrying out the research on the states' role in the IMO's marine environmental regulatory governance, it is important to understand the relationship between states and international organizations. According to the principal–agent (PA) theory, member states, as principals, are major actors of international organizations, and international organizations are regarded as agents to balance various interests [38]. The development of states and international organizations is in the process of mutual construction. Wendt's constructivism theory holds the view that the identities and interests of purposive actors are constructed by these shared ideas, representing a holistic approach [39].

To address issues emerging at the international level, international organizations provide efficient forums, strengthen the connection among states, and enhance policies and plans for global governance [40]. As for the relationship between the IMO and its member states, the IMO provides states a forum to participate in marine environmental regulatory governance. That is, the IMO is not merely a player in international marine lawmaking but also provides member states with a stage for discussion and negotiation [41].

Member states form one factor influencing the IMO's marine environmental regulatory governance. The influence of states depends on the issue involved rather than its size, and critical groups tend to be shipowner states in marine governance [41]. However, developing countries showed initiative at IMO. For example, developing countries play constructive roles in the process of formulating UNCLOS [42]. In addition, flag states and port states influenced the implementation and enforcement of IMO's marine environmental regulatory governance. Flag states must ensure that their ships comply with international maritime standards. Moreover, PSC performance is a compelling criterion for any flag administration assessment [43].

In relation to the IMO, China's role within marine environmental regulatory governance is still a work in progress. Regarding the prevention of vessel-source pollution, China has been attempting to facilitate the implementation of IMO instruments by legislation, but it needs to catch up and increase its procurement of ships and technology [44]. For the reduction in GHG emissions, China is making significant efforts to alleviate GHG emissions by adopting energy conservation and efficiency measures [45]. In the past, China acted in a similar manner to that of a developing country, pursuing the development of IMO conventions. However, China is increasingly active in the governance of Arctic shipping and influences the decisions of the Arctic council after gaining observer status [46]. In managing discarded ballast water, China is suggested to transfer BWM Convention into the domestic legal system by adopting a domestic regulation [47].

The results can be summarized as follows: the IMO provides states a forum for marine environmental regulatory governance. In turn, states receive a special status that allows them to participate in the IMO's lawmaking. However, China's role in the IMO's marine environmental regulatory management is at an immature stage and is still developing.

2.4. Insufficiency of Current Research and Theoretical Framework

Previous research plays a fundamental role in achieving the current study's key aim and responding to China's active participation in various shipping and maritime trade activities. Although it is enlightening and meaningful for the present research study, several problems in previous research must be addressed. First, it emphasized the relationship between the member states and the IMO's marine environmental regulatory governance. However, while it uncovered how states promoted the IMO's regulatory governance progress, it did not analyze or research China's submissions. Therefore, the primary issue remains unsolved. Second, the literature on China's influence on the IMO's regulatory governance needs updating. The view holds that China's IMO regulatory governance function is still under development, but there are no articles concerning function enhancement. Third, China participates in the IMO's marine environmental regulatory governance through submissions and provides materials for the IMO's lawmaking. In terms of methodology, the empirical study method has yet to be adopted, in neglect of quantitative and qualitative analysis of China's submissions. Therefore, the current study examines China's submissions related to marine environmental governance on the platform of the IMO during the period of 2001–2020. On the basis of these findings, our research focuses on the role of China in the IMO's marine environmental regulatory governance.

3. Methodology

This section primarily introduces the research methodology, including quantitative and qualitative data analysis, and it also provides the analytical mechanism for the study of China's submissions.

3.1. Quantitative Data Analysis

The extent to which China participates in the IMO's marine environmental governance is reflected in the quantitative data analysis. The first method is to conduct a quantitative data analysis by describing the number and type of China's submissions.

Collecting sufficient data is an essential step in conducting quantitative data analysis. In order to study China's role in the IMO, the authors collected China's submissions related to marine environmental governance between 2001 and 2020. China submitted proposals to the MEPC and several subcommittees. The data collected in full came from the official website of the IMO (docs.imo.org). The data collection scope is a significant factor in data generation. Proposals on various areas are submitted to different committees or relevant subcommittees, given that several special committees within the IMO are assisted by subcommittees. Therefore, if we want to carry out a credible empirical analysis of China's submissions, it is crucial to identify the proposal related to the marine environment and the subcommittees that are involved in its governance.

In 2013, the IMO carried out the reconstruction of sub-committees, whose quantity is down from nine to seven. Among these sub-committees in Table 1, the function of CCC and the Sub-Committee on Dangerous Goods, Solid Cargos and Containers (DSC) is to regulate cargoes and containers, which may cause potential pollution. The sub-Committee on Flag State Implementation (FSI), which is the predecessor of III, and III facilitate the implementation and enforcement of IMO instruments by flag states. The Sub-Committee on Standards of Training and Watchkeeping relates to the elements of human, which is the predecessor of the Sub-Committee on Human Element, Training and Watchkeeping (HTW). The Sub-Committee on Radiocommunications and Search and Rescue(COMSAR) and the Sub-Committee on Safety of Navigation (NAV) are both predecessors of the Sub-Committee on Navigation, Communications and Search and Rescue(NCSR) that regulates navigation for safety.

Table 1. Reconstruction and development of sub-committees of the International Maritime Organization.

Sub-committees of the International Maritime Organization							
Current	CCC	HTW	III	NCSR	PPR	SDC	SSE
Former	DSC	STW	FSI	COMSAR/NAV	BLG	DE/FP/SLF	DE/FP/SLF

Several subcommittees assist MEPC, including the Sub-Committee on Bulk Liquids and Gases (BLG) and the Sub-Committee on Pollution Prevention and Response (PPR). BLG is the predecessor of the PPR. Member states present submissions directly connected with marine environmental governance to the MEPC, PPR, or BLG.

The function of the Sub-Committee on Ship Design and Equipment (DE) regarding ship design transformed to the Sub-Committee on Ship Design and Construction (SDC). The function of DE regarding ship equipment, the Sub-Committee on fire protection (FP), the Sub-Committee on stability and load lines and on fishing vessels safety(SLF) transferred to the Sub-Committee on Ship Systems and Equipment (SSE).

From the chart of IMO's subcommittees and its notes, it can be observed that proposals from member states to the DSC, CCC, FSL, III, or SLF are indirectly related to marine environmental governance.

After researching submissions, it was noted that there are five procedures for the quantitative analysis of the periodical change in China's participation. In this process, the quantitative data analysis firstly identifies "the number of submissions" as a single variable and draws a histogram to demonstrate trends between year and number, which is a relatively generic reflection. According to the general trend illustrated by a histogram, the change in submission number can be divided into several periods, and the subsequent research is on the basis of different stages.

Second, it is necessary to illustrate the proportion of the number of submissions presented by China in regards to the overall number of submissions presented by states with the same category on the IMO platform. The analysis selects member states in Category A to make a parallel comparison. There is one common characteristic of member states in Category A; that is, they possess the largest interest in providing international shipping services. The parallel comparison between China and other member states in Category A using pie charts reflects the number change in China's submissions and demonstrates China's contribution by way of submissions in different periods.

In this paper, we conduct a descriptive analysis of China's submissions using SPSS, including central tendency, dispersion, and nominal level measurement, in order to indicate the extent and level of China's participation. Maximum, minimum, mean, variance, and standard deviation are used for the descriptive analysis. Among these variations, the mean represents the overall condition of the statistics level, signifying a central tendency of the data. Variance and standard deviation represent the concentration and dispersion of statistics. The descriptive analysis shows the upward trend of the number of submissions by vertical comparison between the above variations.

Specifically, in order to predict the trend of the number of submissions in the future, the analysis draws a histogram with a tendency line to reflect the extent of China's participation in various stages. The histogram contains the average number of submissions in each stage because the average number of submissions can objectively demonstrate the condition of China's participation in each stage. Meanwhile, there is an automatically generated tendency line in the histogram. The tendency line represents index analysis, which can predict the trend of the number of submissions.

Finally, nominal level measurement is also a method of descriptive analysis, which describes each variable categorized by different attributes [48]. There are various types of submissions, such as proposals, comments, information, and mixed proposals, which can be determined via the nominal level measurement. The percentage of each type of submission in different periods is presented in pie charts. A comment is a type of submission that is a comment on other submissions and legal instruments. Information is a

submission that provides information about the implementation and enforcement of IMO instruments. Mixed submissions consist of more than one type of content. Proposals are instructive suggestions made to solve issues by states' engagement in negotiating regarding the substance or procedural issues of legal instruments [49]. Thus, proposals have the most far-reaching impact among the submissions. The percentage of the number of proposals demonstrates the extent of China's participation.

In general, it is helpful to present China's initiative in the IMO's marine environmental regulatory governance by these five procedures of quantitative data analysis.

3.2. Qualitative Data Analysis

The extent of China's participation in the IMO's marine environmental governance can be revealed by the quantitative analysis shown above. However, the descriptive analysis of a single variable cannot reflect the relationship between China's submissions and China's role in the IMO's marine environmental regulatory governance. To determine the adoption of China's submissions and its impact on the IMO's marine environmental regulatory management, the qualitative analysis of China's adopted submissions is carried out in four procedures.

First, it is a prerequisite to analyze the condition of submission adoption, which is an important indicator that can be used to explicitly reflect China's role in the IMO's marine environmental governance. The whole situation of submissions' adoption is presented in a table. The table contains the type of submission adoption and its number. China's submissions have been adopted in four main ways: (1) agree, (2) review of the draft with consideration, (3) considered or noted, and (4) further consideration. Additionally, there is also a "refuse" option for China's submissions. Among these types, "agree" of a submission means the submission will exert substantial influence on the lawmaking of the IMO and promote the formulation or enhancement of a resolution. The periodical number of each type generally indicates the influence of China's submissions.

Second, the analysis presents the rate of submissions' adoption using a line chart and compares the rates of adoption in different periods. The information in the line chart not only contains the increasing number of adopted submissions but also includes the increasing number of overall submissions. The line chart can demonstrate to what extent the number of adopted submissions occupies the whole number. A comparison made via a line chart can precisely indicate the role or limitations of China's submissions comprehensively rather than a single variable.

China's role in the IMO's marine environmental governance can be identified by observing its joint submissions. It is particularly important to analyze joint proposals, as they reflect objective common interests in marine environmental management. In order to clearly present the number and contents of joint submissions, different types of charts are used in the analyses. The conditions of joint submissions for the MEPC are denoted by a diagram, and those for sub-committees are shown in the table.

Finally, the analysis uses concept mapping to identify the condition of regulations promoted by submissions, which can reflect China's efforts and progress in the process of the IMO's lawmaking. Concept mapping is a measurement of qualitative data analysis to consider relationships among conceptions in graphical format. A table displaying the relationships between China's submissions and the formulation of regulations can denote whether the effect of China's submissions on the IMO's regulatory governance is positive.

In summary, China's initiative and influence on the IMO's marine environmental regulatory governance can be manifested by these four procedures of qualitative data analysis.

4. Results

4.1. The Periodical Change of China's Participation in Degree

The data in Figure 1 is depicted as the number of submissions made by China in relation to marine environmental governance between 2001 and 2020. The histogram in the figure directly displays the relation between year and number and the trend in proposals.

It shows that the number of submissions by China presents a periodical tendency with four phases. From 2001 to 2005, there were only a few submissions, and the annual quantitative change was stable. The number of proposals increased dramatically between 2006 and 2010; however, its overall quantity was still small. Between 2011 and 2015, the number of submissions rose further. Then, between 2016 and 2020, the number of proposals remained high, peaking in 2016.

Figure 1. Changes in number of submissions by year.

Figure 2 presents the percentage of China's submissions submitted to the MEPC in the overall submissions of Category A member states between 2001 and 2020. The analysis divides the whole period into four stages, and the proportion of China's submissions in each stage is gradually increasing. Between 2001 and 2005, the proportion accounted for merely 1%. Then during the period of 2006–2010, the proportion of China's submissions rose to 5%, ranked seventh among the overall submissions in Category A. In the following five years, the proportion was 12%, and the ranking rose to fifth among these member states. In the period of 2011–2015, the proportion increased to 16%, ranking third. The rate of rising is steady and progressive.

In terms of quantity, the change shows that the extent of China's participation has been considerably deepened, and its in-depth participation further indicates China's increasing willingness to contribute to the IMO's regulatory governance.

Table 2 shows the descriptive statistics denoting the central tendency and dispersion. When compared with previous stages, each "mean" statistic became higher, and the number of China's submissions achieves steady growth. "Variance" and "Std. Deviation" represent the concentration and dispersion of statistics. In the early stage, the variance and standard deviation are low. The statistics are stable because the number of submissions is small. Later, due to the increased number of submissions and their randomness, the maximum and minimum of each stage are higher than those at the previous level.

Table 2. Descriptive analysis of changes in submission numbers over time.

	Amount	Minimum	Maximum	Mean	Std. Deviation	Variance
2001–2005	5	0	2	1	0.707	0.476
2006–2010	25	1	12	5.00	4.359	19.000
2011–2015	76	10	20	15.20	4.438	19.700
2016–2020	117	18	29	24.60	4.336	18.800

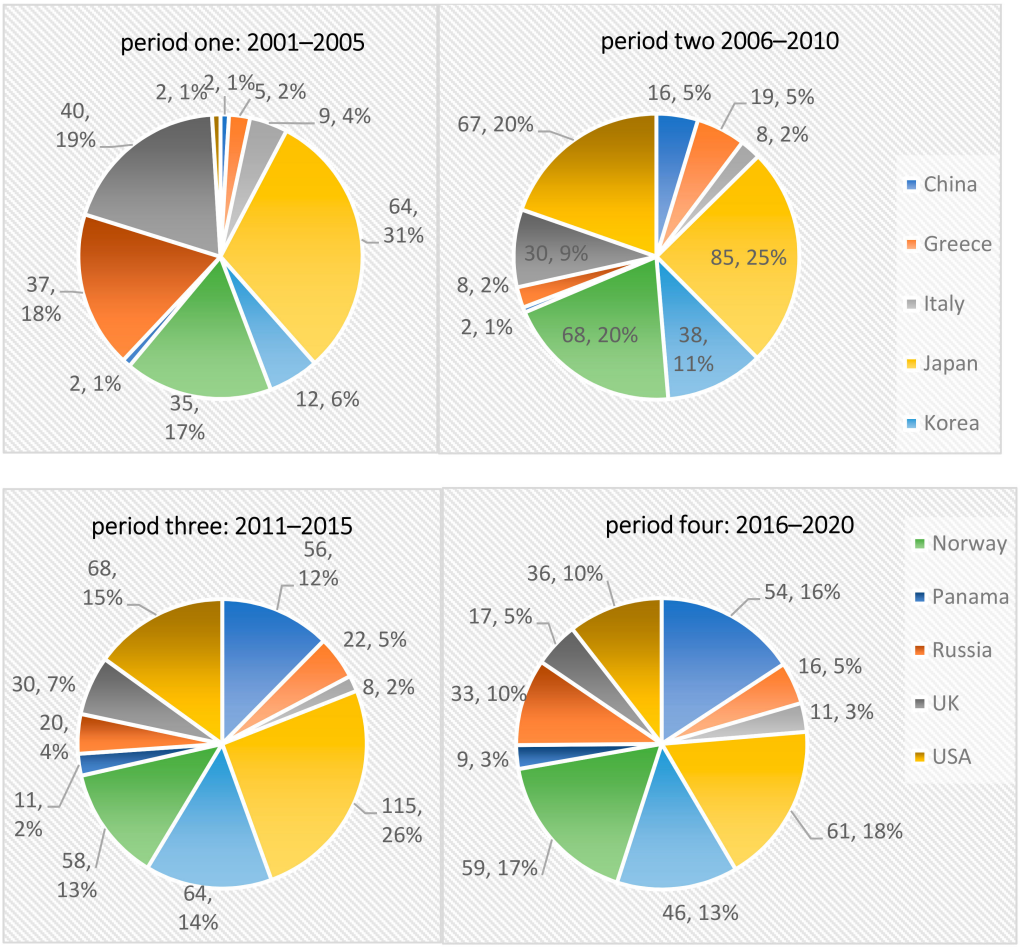

Figure 2. Number and Proportion of China's submissions in the overall submissions of classified A member states. (The number prior to "," means quantity, and the one after "," means proportion).

The data in Figure 3 shows the tendency of submissions to change periodically. The tendency line in Figure 3 predicts the trend in the future using an index. According to the automatically generated tendency line, the figure shows an upward trend in submissions over time.

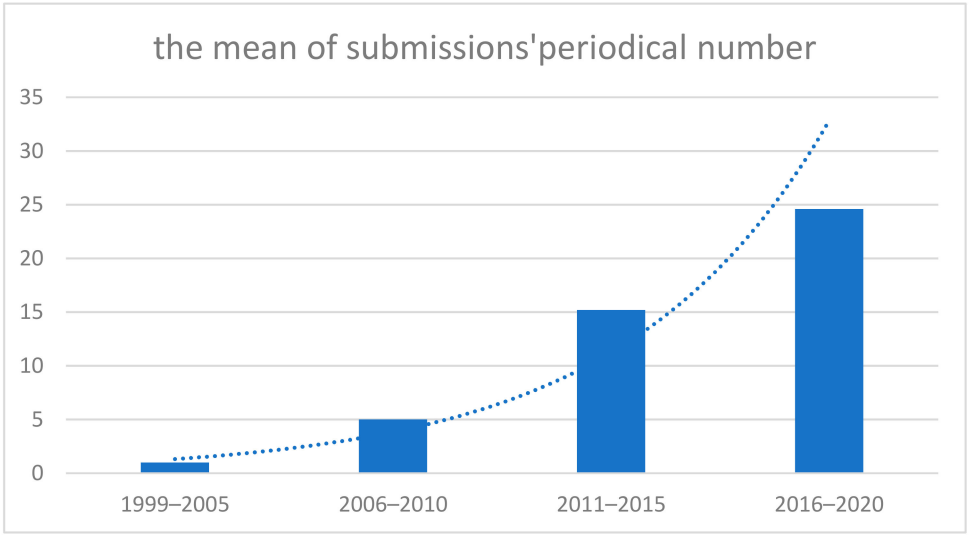

Figure 3. The tendency of submissions' periodical number changes.

After summarizing China's submissions to the MEPC and seven subcommittees (the PPR, BLG, CCC, DSC, FSI, III, and SLF) from 2001 to 2020, the submission types can be classified as proposals, comments, information, and mixed submissions, as shown in Figure 4. It includes the number and proportion of each type of submission. The data in Figure 4 indicate that submission type increasingly varies with time. Mixed submissions appeared during the period of 2011–2015. The proportion of proposals is the largest among the submissions in each stage, and the quantity continually grows, indicating the great extent of China's participation in the IMO's marine environmental regulatory governance.

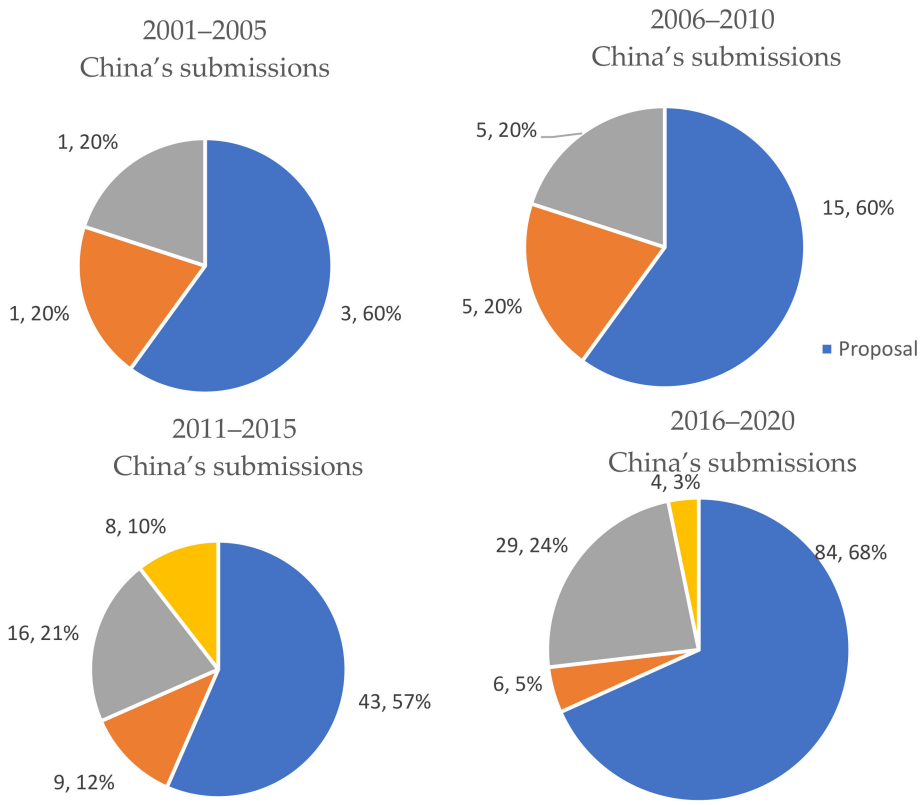

Figure 4. Nominal level measurement: type of submissions. (The number prior to "," means quantity, and the one after "," means proportion.)

4.2. China's Efforts and Progress in the Process of IMO's Lawmaking

The data in Table 3 also show the number of cases in which China's submissions were adopted. Thirty-five proposals related to marine environmental governance were supported and adopted. As the final reports made by the CCC and III were not available on the IMO official website until 16 June 2020, and the statistics of submissions' adoption were incomplete, the existing number of adoption ("agree") is lower than it ought to be.

Table 3. Adoption of China's submissions.

	Agree	Further Consideration	Considered or Noted	Review/Draft with Consideration	Refuse
2001–2005	1	2	1	0	0
2006–2010	7	8	0	4	1
2011–2015	13	7	28	14	3
2016–2020	14	33	23	24	5

The trend of submission adoption is visible in the line chart in Figure 5. The line chart shows that the number of "agree" is rising steadily, and there is a significant increase in

"further consideration" and "review or draft with consideration." The number in "refuse" continuously maintains a relatively low level. The orange line means the tendency of the number of China's submissions.

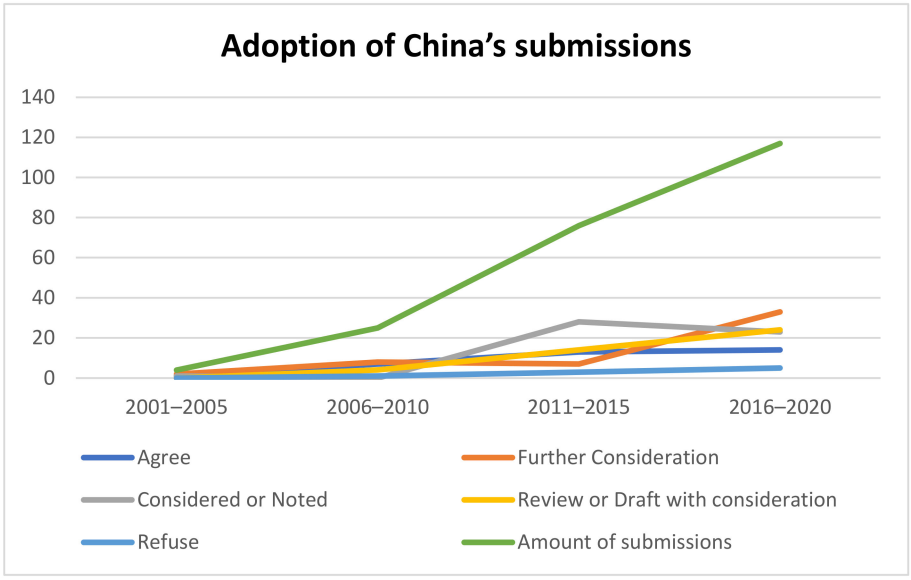

Figure 5. Adoption of China's submissions.

Table 3 and Figure 5 illustrate the importance of China's submissions to the IMO. Due to the increasing number of adopted submissions, China plays an active role in the IMO's marine environmental regulatory governance. However, the increasing rate of the number of submissions is much higher than the rate of the number of adopted submissions. Thus, the influence of China's submissions is still in the elementary stage.

Joint proposals submitted by China and other states or organizations appeared in 1999 and were submitted by Hong Kong, China, and Australia. The number of joint submissions is steadily increasing since the first submission by mainland China and India in 2010.

The primary concerns of the joint submissions submitted to the MEPC are shown in the bar diagram in Figure 6. Between 2001 and 2020, there were nine joint submissions on air pollution and energy efficiency and nine on reducing GHG emissions from ships. There were two joint proposals on cargo hold discharge of bilge water and one joint submission for the draft of Polar Code, the form of International Ballast Water Management Certificate (IBWMC), and the prevention of air pollution from ships, respectively.

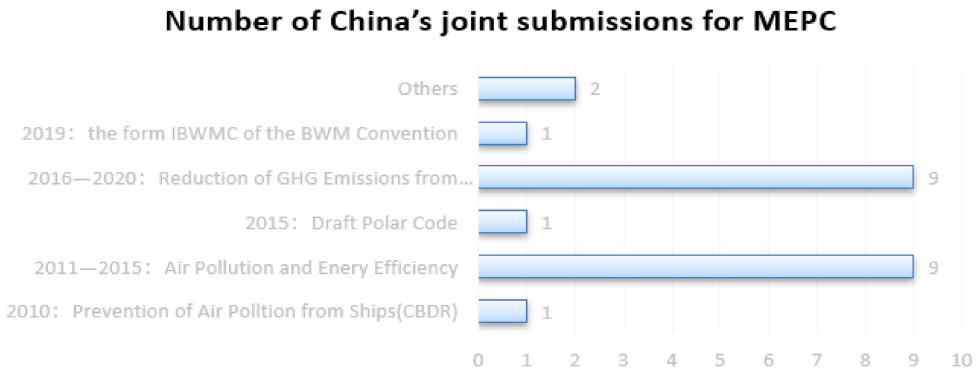

Figure 6. Number and concerns of China's joint submissions for the MEPC.

Among the 25 joint proposals submitted to the MEPC between 2010 and 2020, most were centered on air pollution, energy efficiency, and preventing air pollution from ships. Reducing GHG emissions and energy efficiency have been the focus issue for a few decades.

Table 4 details joint submissions related to marine environmental governance submitted to several IMO sub-committees, including the PPP, III, and CCC.

Table 4. Number of China's joint submissions to the IMO subcommittees.

	2015	2016	2018	2019
PPR	none	none	None	Rules and Guidance on the Discharge of Liquid Effluents from EGCs into waters (one submission)
III	none	2009 Guidelines for port state control under the revised MARPOL Annex VI (one submission)	exemption of UNSP barges under the MARPOL Convention (three submissions)	none
CCC	Amendments to the IMSBC Code and supplements (two submissions)	Amendments to the IMSBC Code and supplements (one submission)	None	none

In 2015, two joint submissions were submitted to the CCC by Australia, Brazil, China, Malaysia, the Marshall Islands, and the Baltic and International Maritime Council (BIMCO) on evaluating Bauxite properties in Amendments to the IMSBC Code and Supplements. In 2016, a joint submission in regard to the revision of existing individual schedules for Seed Cake and Grain Screening Pellets was submitted to CCC by Australia, Canada, China, Italy, Spain, the United States, and the BIMCO. In the same year, China, the Republic of Korea, and the Tokyo MoU submitted and proposed amendments to the 2009 Guidelines for PSC. Three proposals were submitted to the III in 2018 concerning drafting guidelines for exempting unmanned non-self-propelled (UNSP) barges from the survey and certification requirements under the MARPOL Convention. In 2019, China, Malaysia, Singapore, and the United Arab Emirates submitted some information to the PPR about factors requiring consideration when assessing the impact of wastewater discharge from exhaust gas cleaning systems (EGCS) operating in ports and coastal areas.

Briefly, the number and content of joint submissions are summarized in Table 4, demonstrating the major current concerns of marine environmental governance by the international society. China's significant efforts to realize common interests reflect the formulation and promotion of joint submissions.

Table 5 illustrates the role of China's submissions role in promoting the formulation of regulations. Some separate submissions contributed to the revision and perfection of regulations. The submissions' content regards the field of BWM Convention, MARPOL 73/78, and the Energy Efficiency Design Index (EEDI), especially regarding China's response to the potential environmental impact caused by the COVID-19 pandemic.

The MEPC instructed the working group to consider the proposed draft amendments to the 2014 EEDI Calculation Guidelines using document MEPC 70/5/4 as the basis of the calculation method for the EEDI of ships with dual-fuel engines that use gas as the non-primary fuel at the 70th session of the MEPC. Given the calculation's complexity, another constructive and more simplified approach was proposed to consolidate different scenarios of ships fully and partially equipped with dual/gas fuel engines. Therefore, the f_{DFgas} formula was incorporated in the proposal. To facilitate the understanding, each parameter, especially the parameter of V_{gas}, was defined below in the f_{DFgas} calculation [50]. Subsequently, the working group revised paragraph 2.1 in the 2014 EEDI Calculation Guidelines, which incorporated the f_{DFgas} formula and its parameter as follows: "Meanwhile, gas fuel

shall be identified as to whether it is regarded as the "primary fuel" in accordance with the formula below." [51].

Table 5. The status quo of regulations promoted by submissions.

	Submission Name	Submission Content	Final Resolution or Regulation
Separate submissions	MEPC 70/3/2	Draft amendments to MARPOL Annex VI	Resolution MEPC.278 (70)—Amendments to MARPOL Annex VI (Data Collection System for Fuel Oil Consumption of Ships)
	MEPC 70/5/4	Air pollution and energy efficiency-EEDI calculation method for ships using gas fuel as non-primary fuel	Resolution MEPC. 281 (70)—Amendments to the 2014 Guidelines of the Method of Calculation of the Attained Energy Efficiency Design Index (EEDI) for new ships (Resolution MEPC.245 (66), as amended by Resolution MEPC.263 (68))
	MEPC 71/4/15	Amendments to section E of the BWM Convention related to endorsements of additional surveys on the International Ballast Water Management Certificate	Draft Amendments to Regulations E-1 and E-5 of the BWM Convention (Survey and Certification Requirements for Ballast Water Management)
Joint submissions	MEPC 62/7/3 (Hong Kong, China, and IACS)	Interpretations of, and amendments to, MARPOL and related instruments, the scope of application of regulation 12 of MARPOL Annex I as amended by resolution MEPC 189 (59)	Draft Amendments to MARPOL Annex I, II, IV, V, and VI on Regional Arrangements for Port Receptions Facilities
	MEPC 65/24 Annex 5		Statements by the Chairman of the Committee and Delegations of Argentina, Australia, Brazil, Canada, Chile, China, Denmark, Japan, India, the Netherlands, Nigeria, Norway, Peru, Saudi Arabia, the United Kingdom, the United States, and Venezuela on Resolution MEPC. 229 (65) on the Promotion of Technical Cooperation and Transfer of Technology relating to the Improvement of Energy Efficiency of Ships
	MEPC 68/6/4 (China and Republic of Korea)	Draft International Code for Ships Operating in Polar Waters (Polar Code)	Resolution MEPC. 264 (68)—International Code for Ships Operating in Polar Waters (Polar Code)

China's submissions (MEPC66 6/11) attained critical agreement at the 66th session of the MEPC in the revision of MARPOL 73/78. The comments on Document MEPC 66/6/3 seek clarification on "hybrid propulsion" and provide proposals to amendments to MARPOL Annex VI. Different understandings of hybrid propulsion led to inconsistency in the EEDI calculations and industry confusion. Therefore, it was necessary to clarify "hybrid propulsion" to eliminate the inconsistency. Based on industry practice, China identified possible combinations of different propulsion systems and made unified interpretations with respect to MARPOL Annex VI to ensure smooth and efficient energy implementation requirements [52]. The MEPC agreed to replace the words "a ship" in the first sentence

of regulation 5.4.2 of MARPOL Annex VI with the words "a new ship," and agreed to clarify "hybrid propulsion" used in the definition of "non-conventional propulsion," which invited Member Governments and international organizations to submit relevant comments and proposals to MEPC 67 for detailed consideration [53]. At the 70th session of the MEPC, China's submission commenting on the draft amendments to MARPOL Annex VI related to a data collection system for fuel consumption also received majority agreement [54]. Because of the inaccurate estimation of transport work, had the proxy of distance traveled through water been applied, the effectiveness of weather routing would have been significantly distorted. Thus, the "distance traveled from berth to berth" listed in Appendix IX of MARPOL Annex VI was interpreted as "overground" rather than "through the water," and Footnote 5 was removed to develop a concrete definition in the SEEMP Guidelines [55]. Finally, the footnote of "distance traveled" was deleted from Appendix IX of MARPOL Annex VI—Information to be submitted to the IMO Ship Fuel Oil Consumption Database.

The Ballast Water Review Group (BWRG) was established and instructed to revise section E of the BWM Convention using the text set out in Annex 1 of document MEPC 71/4/15 as its basis [56]. This document seeks clarification on survey and certification requirements for ballast water management in section E of the BWM Convention and proposes relevant amendments. Due to the inconsistencies between the survey requirements and certification in section E on the IBWMC, it was inconvenient for some flag state administrations to conduct surveys and issue certifications to ships in advance based on the consideration of the date of coming into force. China believes that survey and certification requirements for the IBWMC should be consistent with either the International Oil Pollution Prevention (IOPP) Certificate or International Air Pollution Prevention (IAPP) Certificate under the MARPOL Convention. Therefore, it is unnecessary to require an additional survey of an endorsement on the IBWMC [57]. After consideration, E-1.1.5 and E-5.9.1 of the BWM Convention were deleted by the committee [58].

For the sake of decreasing the risk to the marine environment as posed by the COVID-19 pandemic, China submitted information on remote PSC inspections during the crisis to the III. The IMO issued a series of circulars to provide guidance on pandemic prevention, health protection, and impact reduction. China actively conducted studies on remote PSC inspections, identifying ships suitable for such inspections on the basis of the principles of ship selection, and made remote contact with ships using real-time communication, video recording, or photography to check the technical and safety management status of the ships and determine whether they conform to applicable conventions without boarding them [59]. Annex 1 of the document introduces the experience of China's application on remote PSC inspections.

According to the foregoing analysis, China's submissions influence the IMO's environmental regulatory governance in a positive way. Upon comparing the content of these submissions with that of original legal instruments of the IMO, it can be seen that China's submissions provide constructive approaches, enhance procedural regulations, and make legal instruments more precise. Document MEPC 70/5/4 provided a constructive and more simplified approach for the EEDI calculation method pertaining to ships with dual-fuel engines. Document MEPC 66/6/3 clarified "hybrid propulsion" and made unified interpretations to eliminate the inconsistency in MARPOL 73/78 Annex VI. Document MEPC 70/3/2 also made a contribution to the revision of MARPOL 73/78 Annex VI to ensure the accurate estimate of transport work. Document MEPC 71/4/15 enhanced consistencies between the survey requirements and certification in Section E of the IBWMC. Thus, the contents of China's submissions boost and benefit the IMO's environmental regulatory governance.

In recent years, joint submissions have been adopted by the IMO. The paradigm in the law of the sea has been changing from divided oceans to our common oceans, which highlights common values and interests. Accordingly, the concerns regarding common

interests will influence the development of the law of the sea. Joint submission is a type of submission submitted by several states jointly, which can effectively reflect joint interests.

Joint proposal issues mainly involve common but differentiated responsibilities (CBDR), the reduction of GHG emissions, and the revision of the IBWMC form and content. In CBDR, China and India submitted a proposal regarding the principle of "common but differentiated responsibilities" to reduce greenhouse gas emissions from international shipping to the 58th session of MEPC [60]. In this session, China made a statement on the principle or policy concerning the GHG issue and stated that the IMO is obliged to address GHG emission reduction from international shipping under the legal basis of the UNFCCC and its Kyoto Protocol. China also stated the inappropriateness of enacting unanimity of treatment [61]. This statement gained favor with many developing countries, including United Arab Emirates, Argentina, North Korea, Peru, Egypt, Belgium, Ghana, Chile, Namibia, Uruguay, Bolivia, Indonesia, and Colombia. The issue got postponed to the 59th session of the MEPC and was then discussed at the 60th session of the MEPC, where China highlighted the principle of CBDR. It is the fundamental political and legal principle guiding the international community on climate change. China also took a positive and constructive attitude toward participating in the discussion and consideration of all agenda items and supported the consideration of the IMO/MEPC on technical issues to achieve a consensus. [62] At the 61st session of the MEPC, China stated the IMO is a technical organization rather than a political organization and that GHG emission is a political agenda item attracting significant attention from all counties rather than a sheer technical or environmental issue. Moreover, China is against including EEDI, EEOI, and SEEMP into Annex VI of MARPOL for mandatory application. China suggested that if these measures are to be compulsory in the future, a new treaty or a new MARPOL protocol be developed to solve the CO_2 issue, which sets clear provisions on developed countries' responsibility to provide financial, technical, and capacity-building support to developing countries. This position also received the support of developing countries [63]. At the 65th session of MEPC, Resolution MEPC.229(65) was included in the MEPC report with statements by the Chairman of the Committee and Delegations from Argentina, Australia, Brazil, Canada, Chile, China, Denmark, Japan, India, the Netherlands, Nigeria, Norway, Peru, Saudi Arabia, the United Kingdom, the United States, and Venezuela. Resolution MEPC.229(65) was on the Promotion of Technical Cooperation and Transfer of Technology relating to the Improvement of Energy Efficiency of Ships. The resolution recognized the principle of CBDR into the IMO and provided the IMO with a solid foundation for further discussions on reducing GHG emissions from international shipping [64]. The cooperation and transfer of technology to developing countries in improving the energy efficiency of ships will reduce GHG emissions gradually and effectively.

In the revision of MARPOL 73/78, the committee agreed with the proposal submitted by Hong Kong, China, and the IACS (MEPC 62/7/3) [65]. First, Regulation 12.2.2 of MARPOL Annex I should not be retroactively applied to ships delivered before 1 January 2014. Second, they added a new Unified Interpretation to "Sludge tank discharge piping" in Regulation 12.2.2 [66]. As for drafting the Polar Code, the committee considered the submission (MEPC 68/6/4) made by China and the Republic of Korea. This document provides comments on Document MEPC 68/6/2 regarding the requirements of oil cargo tank protection in regulation 1.2.2 of Chapter 1 of the Polar Code draft, part II-A and proposes modifications to Regulation 1.2.2 [67]. After consideration, the committee agreed in principle with the proposed alterations to regulations 1.2.2 and instructed the drafting group to modify the text according to the submission text: "For category A and B, ships other than oil tankers constructed on or after 1 January 2017, all cargo tanks constructed and utilized to carry oil shall be separated from the outer shell by a distance of not less than 0.76 m." [68]. China's efforts and progress in joint submissions show its concerns for shared values and interests.

Notably, the adoption of proposals in lawmaking is also influenced by the organization's rules of the procedure [69]. In addition to the submission itself, other factors might be

influencing the acceptance of China's submissions, such as the precise size and composition of the Chinese delegation to the IMO. According to the principal–agent (PA) theory, PA relationships involve more than one principal and a single agent in international politics. Member states are major actors of international organizations, and they play an essential role in the process of rule-making [70]. Moreover, the size and composition of a country's delegation in an international organization also reflects their countries' influence on the IMO's regulatory governance to some extent. However, these factors only play a secondary role in the acceptance of submissions. The primary consideration of submission acceptance still relies on the content of proposals that pursue the shared interests of member states, which are also embodied as the theme orientation of the international organizations.

In conclusion, both separate and joint submissions contribute to the formulation of marine environment regulations. Indeed, China's submissions play an increasingly important role in the IMO's progress on marine environmental regulatory governance.

5. Discussion

This section divides the critical concerns into two secondary issues: China's influence on time in the IMO's marine environmental governance and China's practice to strengthen its regulatory management. First, we summarize China's functions and its characteristics regarding marine environmental regulatory management following the quantitative analysis of the periodical change in China's submissions presented in Section 3. Then, we analyze the background and actor-oriented factors of China's changing functions regarding the IMO's marine environmental regulatory governance. Finally, we demonstrate China's efforts to strengthen IMO's marine environmental regulatory management.

5.1. Periodic Changes in China's Role in IMO's Marine Environmental Regulatory Governance

China's role in the IMO changed over time. Its evolution divides into four periods: 2001–2005, 2006–2010, 2011–2015, and 2016–2020. The influence and characteristics for each period are adequately reflected by submission quantity, type, and content.

During 2001–2005, the number of submissions by China was low, and there were only five proposals, concerning a few topics, such as preventing vessel air pollution. Only one was adopted but did not promote the formulation of concrete regulations. Thus, during this period, China was relatively passive in the IMO's Marine environmental regulatory governance, and its function was still in a gestational stage.

In 2006–2010, the number of submissions increased. Proposal topics began to diversify regarding the prevention of vessel air pollution, management of ballast water, and CBDR application in shipping GHG emissions. Technical proposals appeared during this period. In 2008, China's submissions of MEPC 58/4/33 and MEPC 58/4/3 comments were of a technical nature (Design and Operational CO_2 Indices and baselines) and proposed suggestions. Although the submission of the CBDR application raised heated discussion, it failed to go into practice. In summary, China initiated a grander role in the IMO's marine environmental regulatory governance.

In 2011–2015, there was a significant increase in submission numbers, particularly joint submissions. The submissions became varied, and mixed submissions appeared for the first time. Technical topics increased, focusing on ship energy efficiency. Thirteen submissions were adopted, three of which contributed to the enactment of legal instruments. In this period, China's participation in the IMO's marine environmental regulatory governance gradually became more prominent. China paid a considerable amount of attention to the reflection and expression of common interests by joint submissions.

During 2016–2020, the number of submissions remained relatively high. China also responded to emerging issues regarding remote PSC inspections caused by the COVID-19 pandemic. It presented a stable trend of adopted submissions. Fourteen submissions were adopted by the IMO, and three separate submissions promoted regulation formulation. In this period, China strengthened its influence by facilitating resolution enactment and

enhancing specific regulation revisions to substantively contribute to marine environmental regulatory governance.

It is an obvious argument for China to participate in the IMO's marine environmental regulatory governance. In this process, China's participation started from the gestational stage and gradually increased. Currently, China plays a positive role in marine environmental protection.

5.2. Influential Factors in China's Growing Role in the IMO's Marine Environmental Regulatory Governance

The core issues of discussion are the factors influencing the periodical change of China's submissions. Generally, there are two main factors that affect the behaviors of member states when they participate in international organizations, namely, background factors and actor-oriented factors [71]. With regard to the role of member states in the international scene, actors' objectives can be analyzed by two approaches—one stresses internal factors, while the other emphasizes the external factors of goal formulation [72]. The following subsection discusses different periods of China's characteristics and functions in the IMO's marine environmental regulatory governance by analyzing background factors and actor-oriented factors.

5.2.1. Background Factors

The analysis of background factors adopted the internal factors approach. The background factors affecting the behaviors of member states rely on the states' inherent characteristics, such as their economy and politics.

The adoption of domestic policy is one of the factors influencing China's functions in the IMO's marine environmental regulatory governance. The full name of the "Five-Year Plan" is "The Five-Year Plan for the economy and social development of the People's Republic of China", which is a critical part of China's long-term economic plan. During the period of the 10th Five-Year Plan (2001–2005), China's ocean governance highlighted national interests concerning the areas of resource management, protection, and technical development. The plan required strengthening marine investigation, exploitation, and control to safeguard national ocean rights and interests [73]. At that time, China stressed economic development but did not pay a lot of attention to the engagement in global marine environmental governance. Thus, the number of submissions was low during this period, and China's marine environmental governance was in its gestational stage.

During the 11th Five-Year Plan (2006–2010), China initiated efforts to protect the marine environment. The length of marine governance requirements in the plan was magnified, where the general requirement was to strengthen marine awareness, safeguard rights and interests, and protect the marine ecosystem [74]. The number of adopted submissions was higher than it was in the previous period.

During the 12th Five-Year Plan (2011–2015), domestic marine environmental protection was emphasized. China actively participated in global climate governance under the principle of CBDR and required international negotiations to be enhanced and promoted the establishment of equitable international systems for climate governance [75]. The number of proposals increased further, and submission content focused on ways to reduce shipping GHG emissions. China played an active role in marine environmental regulatory governance at this time.

During the 13th Five-Year Plan (2016–2020), China fully participated in global climate governance and contributed toward responding to climate change [76]. In 2016, China's submissions peaked, and during 2016–2020, some proposals promoting legal instruments were enacted. China made substantial contributions to the marine environmental regulatory governance during this period.

The growth in the shipping economy created a solid foundation for China's engagement in the IMO's marine environmental regulatory governance. Due to its emphasis on an improved shipping economy, the level of shipping power increased over the past ten years. In 2019, the total number of container throughput in China's major ports reached 230.92 mil-

lion TEU, increasing by 84.96 million TEU when compared with 2011 numbers [77]. With the enhancement of its shipping economy, China gradually realized the importance of developing marine sustainability. The goal of marine economic development is to pursue quality instead of quantity to achieve sustainable development and protect the marine ecological environment [78]. China is projected to become a significant player in green shipping [79]. In August 2017, China's Ministry of transport issued guidelines regarding green shipping development in the Yangtze River Economic Belt, aiming at facilitating its pilot project [80]. To this end, the Ministry of Transport drafted an Action Plan for Further Promoting Green Port Construction (2018–2022) (draft for opinions) designed to improve the construction of green ports [81]. These actions benefit China's role in marine environmental regulatory governance and promote the idea of marine governance on a global scale.

During the 1990s–2000s, China carried out sustainable development strategies and proposed marine ecological restoration projects, such as the clean Bohai sea action plan on marine pollution [82]. The submission topics concentrated on the traditional field of vessel source pollution. Along with the proposal titled "A Community with Shared Future for Humankind", China proposed the notion of ocean governance by creatively putting forward "a maritime community with a shared future". To realize the sustainable development of humankind and the oceans, the establishment of a maritime community with a shared future requires that the international society should be based on shared interests and jointly assume the responsibility of global marine governance [83]. From 2011 to 2020, joint submissions have continued to grow, and the content focused on the emerging field of vessel source pollution, such as ballast water management. Three joint proposals promoted the enactment of IMO's legal instruments.

Above all, these factors were a catalyst for the increase in China's engagement while optimizing domestic marine environmental governance.

5.2.2. Actor-Oriented Factors

The discussion regarding actor-oriented factors adopted the external factors approach. States' behaviors are also affected by actor-oriented factors. These factors refer to states' preferences and perceptions, attitudes, and reflections when they face changes and challenges from an external environment [84].

A crucial element for China to engage in the IMO's marine environmental governance is the shared interest in humankind. There is an increasingly close relationship between China and the rest of the world, and China aspires both for a better world and to be seen as a benevolent country. Building a community with a shared future that benefits humankind reflects the willingness of China to contribute toward a better world [85]. It is of utmost importance for international cooperation to be concerned about humankind's shared interests, and China's investment in humankind's common interests is imperative for international cooperation with marine environmental governance.

The changing role of China in global governance is one of the external factors influencing China's marine environmental regulatory management. In the development of IMO conventions, China was formerly a follower rather than an active initiator. Currently, emerging countries are moving gradually from the periphery to the center stage in global governance. They are becoming great forces in politics and world economies [86]. China plays an essential role in this new, multipolar world [87]. Given China's role in global governance, it needs to be an active participant and promoter rather than being a passive recipient and follower [88].

China's submissions to international organizations also affect the functions of China's marine environmental governance. With China's increasing level of engagement in the IMO's marine environmental regulatory governance, the number of adopted submissions is increasing, especially joint proposals with common interests. The increase in adopted proposals indicates the enhancement of submission contents, and the rise in joint proposals is evidence of a stronger perception of shared identity. However, after comparing the

increasing number of adopted submissions and overall submissions, it is clear that China's capability of agenda-setting still needs to be strengthened, and China's influence on the IMO's marine environmental regulatory governance remains in the primary stage.

Thus, the aforementioned factors enable China to sufficiently exert its function of governing the marine environment. China made a substantial contribution to the enactment of IMO's legal instruments by setting proposals in collaboration with other states.

5.3. China's Practice Regarding Consolidating the Function of Marine Environmental Regulatory Governance

The IMO's effectiveness is reflected by the implementation and enforcement of the IMO's legal instruments related to the marine environment. Apart from boosting the enactment of IMO's marine environmental regulations, China takes the initiative to adopt and comply with these regulations. China is one of the major flag states and shipping nations in the world [89]. Its practice of compliance consolidates the IMO's function regarding marine environmental regulatory governance.

To solve the long-standing problem of vessel source pollution, a variety of laws and regulations regarding marine environmental protection have been enacted by China, including the prevention of pollution sources from land construction, land manufacturing, vessels, waste dumping, offshore oil, and gas development [90]. China adopted several legal regulations for implementing UNCLOS and the IMO's conventions to prevent vessel-source pollution, such as the Regulation on the Prevention and Control of Marine Pollution from Vessels (2010). Under the framework of the 2010 Regulation, the Ministry of Transport adopted a set of detailed rules for implementation between 2010 and 2012. Furthermore, China accelerated the process of enacting and revising basic laws for adapting to the new requirements of marine ecological environment protection. *Marine Environment Protection Law of the People's Republic of China (Amendment 2017)* came into effect on 5 November 2017 [91]. To address the issue of vessel source pollution, China approved the BWM Convention, which came into force on 22 January 2019. Its purpose was to prevent biological invasion and protect the global marine ecological environment.

China is playing an active role in addressing the issue regarding GHG emissions from vessels and energy efficiency. GHG emissions as a result of international shipping are currently a hot topic. Regarding technical and operational measures, the IMO's adoption of energy efficiency measures represents a significant process [92]. To advance domestic green shipping, China is keeping in line with international standards on shipping emission reduction. In 2012, China issued Fuel Consumption Limits and Validation Methods for Operating Ships and Limits and Verification Methods for CO_2 Emission from Operating Ships with reference to IMO's adoption of EEDI. Considered the policy of Emission Control Area (ECA) under MARPOL 73/78, in 2015, China began to set up ECAs in coastal waters, according to the Atmospheric Pollution Prevention and Control Law and continually increased the sphere of waters that limit sulfur controls for fuel oil consumed by ships since 2017 [93].

6. Conclusions

There is an interaction between the IMO and member states in the marine environmental regulatory governance. The IMO provides a forum for states to interact and negotiate in relation to shared interests of protecting the marine environment and states exert their roles in IMO's lawmaking through the process of submissions, adoption, formulation, and compliance with legal instruments. To assess the degree of impact exerted by these states, this paper examines China as a case study. As the second-largest economy, China is playing an increasingly significant role in IMO's marine environmental regulatory governance. This paper summarized China's growing role and impact over time on the IMO's marine environmental regulatory governance and its background and actor-oriented factors by analyzing the changes and adoption of China's submissions. Regarding the IMO's marine environmental regulatory governance, our study concluded that: (1) based on China's increased level of participation in global marine governance, China transitioned

from a follower to a critical participator and contributor, and it can be predicted that in this progress, China will further strengthen the capability of agenda setting for marine environmental protection; (2) although the influence of China's submissions is still at the elementary stage, China has shown great efforts and made progress in the process of IMO's lawmaking, which can be reflected by the periodical changes in submission numbers and gradual increase in adoption numbers; (3) considering that several of China's submissions promote the formulation of regulations regarding marine environmental protection, China actually has some influence on the IMO's marine environmental regulatory governance through continuous efforts; (4) China's role is not merely directed by background factors, including its policies, shipping economy development, and the idea of marine governance, but it is also influenced by actor-oriented factors and concerns about shared interests, a shifting role in global governance, and an increased submission practice; and (5) China is executing a serious compliance practice, which strengthens the effectiveness of the IMO's marine environmental regulatory governance. In sum, China is actively taking part in marine environmental governance, which positively impacts IMO's marine environmental regulatory governance mission.

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Public Health and International Obligations of States: The Case of COVID-19 on Cruise Ships

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Abstract: Against the backdrop of the COVID-19 outbreak onboard the cruise ship *Diamond Princess*, both the flag State and the port State should act according to international obligations during the sailing stage, quarantine period after ships' berthing, and the time when the quarantine period expires. However, the potential danger of the absence of a "genuine link" between the cruise shipowners and the flag State, the lack of coordination of jurisdiction in different sea areas and between different States, and also the lack of special or systematic regulations for infection prevention and control (IPC) at sea and for cruise ships increase the risk of a State's breach of international obligations. Therefore, it is deemed necessary to improve the responsive measures in international law. This paper, after review and analysis, sheds light on various recommendations on how to improve the responsive measures in international law, including (i) strengthening of the jurisdiction of the flag State, (ii) establishment of a special international cooperation mechanism with an alliance between the WHO and the IMO, and (iii) construction of an IPC mechanism for home ports of cruise ships.

Keywords: cruise ships; public health emergency of international concern (PHEIC); international obligations; rule of law; COVID-19

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1. Introduction

After the COVID-19 pandemic spread over China and other regions from December 2019, the World Health Organization (WHO) listed COVID-19 as a public health emergency of international concern (PHEIC) on 31 January 2020, and as a pandemic on 11 March 2020 [1]. The virus also hit cruise ships, such as the *Diamond Princess*, with the number of infection cases increasing sharply during the quarantine period. The aforementioned situation rapidly stirred up international concern as it became a "large-scale human-to-human transmission place outside the land". While attention was paid to the life and health of the isolated people, many States were more concerned about whether the countermeasures of the relevant States, such as the port State and flag State, were appropriate and sufficient in the context of current international law.

In retrospect, this paper will review the concrete infection prevention and control (IPC) measures taken by States and their effects, in order to analyze (i) whether the actions of these States are in accord with the related international law of the sea, maritime law and pubic health law, and (ii) how to improve the current legal mechanisms to effectively control the spread of infection onboard in future.

2. Review of the Diamond Princess Case

2.1. States' IPC Measures on the Cruise Ship

2.1.1. Quarantine Onboard

On 3 February 2020, the cruise ship berthed at its home port, Yokohama Port, Japan [2]. Passengers retained on the ship were instructed to stay in their cabins from 5 February for 14 days, and were allowed to leave the cabin for about one hour a day. Besides, the patients who tested positive by reverse transcription-polymerase chain reaction (RT-PCR) were taken off the cruise ship and isolated in a hospital in Japan [3]. Since 11 February

2020, the Japanese Ministry of Health, Labour and Welfare (MHLW) allowed disembarking of elderly passengers and those with pre-existing conditions from the cruise [4].

2.1.2. Virus Detection

The MHLW began to test passengers onboard for virus infection before the cruise ship berthed at Yokohama Port and passengers were officially quarantined. During the quarantine period, in addition to virus detection, the temperatures of passengers were measured on a daily basis.

2.1.3. Information Release

After the cruise ship docked at Yokohama Port, especially after the formal isolation period, the MHLW announced, mainly on the official website, the daily increase of infection cases onboard as well as the entertainment and medical measures taken for the isolated people.

2.1.4. Evacuation of Nationals

Near the end of the quarantine period, China, the United States, the UK, Canada, Australia, and other States took measures to keep their infected citizens in Japan for further treatment and sent chartered airplanes to take other uninfected citizens back to their own homelands.

2.2. The Problems Contained in These Measures

2.2.1. The Isolation Decision Was Not Timely

The basic reproduction number (R0) of COVID-19 ranges from 2 to 3.5, which is higher than those of SARS and MERS previously transmitted in many States [5]. According to the interim guidance of the WHO, in order to get early recognition of possible COVID-19, once a case is found, immediate isolation of patients with suspected disease in an area separate from other patients (source control) is needed [6]. Such a measure should be adopted for cruise ships too. The first confirmed case was diagnosed on 1 February and the lockdown decision was made on 5 February, during the 4-day "window period". The captain waited nearly 48 h to inform the *Diamond Princess* crew and its passengers about what he had learned, which left the virus with ample time to spread [7]. The model research suggests that transmission mainly occurred before the onboard lockdown [8]. Japanese public health expert Shigeru Omi, head of the Japan Community Health Care Organization, said that, "most passengers were infected before the start of the quarantine" [9].

2.2.2. The Isolation Measures were Not Professional

The first problem was the air conditioning system. After the pandemic outbreak on the cruise ship, there was a claim that there was no obvious sign that the ship's air conditioning and wastewater systems had exacerbated the virus transmission [10]. Yet according to some reports, the cruise ship circulated 70% of the air supply to the cabins by circulating the air discharged from other cabins. The air conditioning systems that circulate air inside buildings have been widely adopted in domestic commercial facilities and hospitals, and experts' groups pointed out that "the virus may spread" through them [11].

Second was the problem of the air density of the cruise ship. The first infected passenger was reported 4 days before isolation. As there are many public places on a cruise ship, the virus may have been brought into other passengers' rooms through public gathering before the lockdown. Most of the cruise cabins were airtight, which was not conducive to the dissipation of virus; it may seem obvious to say that a virus will spread more easily in confined spaces [12].

Third was the insufficiency of isolation rooms. The cruise ship had 1337 passenger cabins in total, 748 of which had private balconies. The remaining passengers were isolated for 14 days in a small confined space without natural light. The accommodation of crew

was even worse, with one room for two and no windows [7]. Such isolation conditions may exert great pressure on the physical and mental health of the isolated people.

Fourth, there was no distinction between isolated spaces. According to the control and disposal of SARS and other infectious diseases, zone separation is usually needed, but on the *Diamond Princess* cruise ship, there was no distinction between infection-free "green zones" and potentially contaminated "red zones", and people were coming and going between the zones with and without personal protection equipment. The lack of zone separation extended to the ship's medical center and even to the medical officer, and only a zone for taking off protective gear such as gowns contaminated by sample collection was provided and clearly separated from other business areas [13].

Fifthly, the case screening was not effective enough. As the rigid isolation conditions on the cruise ship were not as good as those on land, it should have been a top priority to make virus detection in time and take appropriate isolation measures. However, 8 days after the cruise ship was isolated, only 19% of people had been tested. When the quarantine expired, Japan admitted that it had missed the detection of 23 people [14].

2.2.3. The Information Disclosure Was Not Transparent

The information released by the MHLW and the cruise company was limited to the data statistics of daily new cases. Except for invoking the national law of Japan, there was no official explanation about the international legal basis and implementation effects of onboard ship isolation [15]. The isolated passengers publicly petitioned, pointing out that they did not know the specific content of any assistance [16].

From the above analysis, the media claimed that the spread of infection was caused by the failure of onboard lockdown [17].

3. Analysis of International Obligations of States for IPC on the Cruise Ship

3.1. The Performance of International Obligations of States

3.1.1. The Sailing Stage of the Cruise Ship

Under the international law of the sea and maritime law systems, the International Convention for the Prevention of Pollution from Ships (MARPOL) [18], the International Convention on Tonnage Measurement of Ships [19] and other maritime conventions primarily regulate the management of the flag State in respect of the safety of ships and crew and the prevention of marine environmental pollution without involving health and IPC issues of ships.

The cruise ship may pass through different sea areas such as high seas, exclusive economic zones, contiguous zone, territorial sea, and internal waters (port of call) of coastal States on the voyage. According to the United Nations Convention on the Law of the Sea (UNCLOS) [20], the system of exclusive economic zones does not involve IPC issues. The system of contiguous zones endows coastal States with the right to exercise the control necessary to (a) prevent infringement of its sanitary laws and regulations within its territory or territorial sea, (b) and punish infringement of the above laws and regulations committed within its territory or territorial sea. The system of territorial seas and internal waters stipulates that the coastal State may adopt laws and regulations in respect of all or any measures for the prevention of infringement of the sanitary laws and regulations of the coastal State. Foreign ships exercising the right of innocent passage through the territorial sea shall comply with all such laws and regulations. In this regard, the coastal State has the right to prohibit foreign ships from entering its territorial sea and internal waters for public sanitary reasons.

The Convention and Statute on the International Regime of Maritime Ports (CSIROMP) [21] provides that a contracting State may prohibit the entry or transit of passengers or goods, in case of any emergency affecting the safety of the State or the vital interests of the country.

The UNCLOS and CSIROMP are the main conventions in the law of the sea which may refer to IPC issues. The systems of contiguous zones, territorial seas and internal waters mainly stipulate the rights but not the obligations of the coastal State to refuse the

ships which violate its sanitary laws to transit or enter these waters, and these rights derive from territorial, quasi-territorial, or extra-territorial principles [22]. The CSIROMP also endows the port State with similar rights. The main regime to bind States to fulfill their obligations is that of the high seas in the UNCLOS, which provides that:

1. Ships shall sail under the flag of one State only and, save in exceptional cases expressly provided for in international treaties or in the convention, shall be subject to its exclusive jurisdiction on the high seas;
2. Every State shall effectively exercise its jurisdiction and control in administrative, technical, and social matters over ships flying its flag;
3. In particular, every State shall assume jurisdiction under its internal law over each ship flying its flag and its master, officers, and crew in respect of administrative, technical, and social matters concerning the ship.

The above articles do not clearly define if the flag State is responsible for public health issues which occur on ships on the high seas, or if the public health issues are contained in the aforementioned social matters. In this regard, the International Tribunal for the Law of the Sea (ITLOS) explained as follows:

> The ship, everything on it, and every person involved or interested in its operations are treated as an entity linked to the flag State. The nationalities of these persons are not relevant [23].

The opinion of ITLOS contains the meaning that when public health events occur on ships on the high seas, the flag State assumes the main responsibility for IPC.

The first infected passenger on the cruise ship *Diamond Princess* was confirmed on 1 February 2020. Between 1 February and 3 February, the cruise ship was in the voyage from Okinawa Port to Yokohama Port in Japan. Although the specific coordinates of the route have not been released, according to the route map [24] and the scope of the exclusive economic zone claimed by Japan [25], the sea areas of the navigation of the cruise ship may involve the high seas in addition to the internal waters (Okinawa Port, Yokohama Port), territorial sea, and exclusive economic zones of Japan. As a contracting party to the UNCLOS and the CSIROMP, Japan may not have had any obligations regarding the IPC issues, but may have had rights to refuse the cruise ship to berth.

The situation of the UK, as the flag State, however, may be different. The cruise ship sailed to the high seas after the pandemic occurred and COVID-19 was declared a PHEIC on 31 January 2020. The first infected passenger was confirmed on 1 February 2020. Thus it could be suggested that the UK may have had cause to infer the infectivity and seriousness of the pandemic situation onboard the cruise ship. As a contracting party to the UNCLOS, the UK should have taken measures in accordance with its IPC obligations, besides organizing an evacuation flight to bring 35 passengers from the cruise ship back to the UK [26]. The inaction of the UK during the "window period" from 1 February to 5 February indicated that it may have failed to take effective measures.

3.1.2. After Reaching the Port

As mentioned above, Japan has the right to refuse entering or berthing of ships which are in breach of its sanitary law. Even though Yokohama Port was the home port of the cruise ship, the "home port" is mainly a commercial rather than legal concept; it fails to set legal obligations for the home port State. During the adverse time and the urgency of the situation caused by COVID-19, a ban has also been imposed by various countries on the entry of containers and vessels that are being operated from other ports [27]. Nevertheless, once Japan accepts the berthing of a cruise ship, it should be regulated by the International Health Regulations (IHR) [28] and fulfill its international obligations.

First of all, for the conveyances, IHR stipulate that conveyances with "clinical signs or symptoms and information based on fact or evidence of a public health risk, including sources of infection and contamination" are "affected conveyances" and the "competent authority may implement additional health measures, including isolation of the conveyances,

as necessary, to prevent the spread of disease". For the passengers and travellers, IHR also provide that State parties shall not refuse passengers' embarking or disembarking on public health grounds except due to the need to respond to a PHEIC. If there is evidence of an imminent public health risk, the State party may enforce additional established health measures that prevent or control the spread of disease, including isolation, quarantine, or placing the travellers under public health observation. The *Diamond Princess* was regarded as an "affected conveyance" because of its infection cases and Japan had the right to take isolation measures; COVID-19 was listed as a PHEIC and Japan could implement additional measures under IHR to prohibit passengers from embarking or disembarking and place them under public health observation. IHR also provide that States parties shall base their determinations of above additional health measures upon:

(a) Scientific principles;
(b) Available scientific evidence of a risk to human health, or where such evidence is insufficient, the available information including from WHO and other relevant intergovernmental organizations and international bodies;
(c) Any available specific guidance or advice from WHO.

"Scientific principles" means the accepted fundamental laws and facts of nature known through the methods of science, and "scientific evidence" means information furnishing a level of proof based on the established and accepted methods of science. Under these three requirements, the "scientific" standards mainly aim to avoid unnecessary interference with international traffic and trade, when States prevent, protect against, control, and provide a public health response to the international spread of disease [29]. In the interim guidance published by the WHO, it also requires that State parties implementing any additional health measure that significantly interferes with international traffic (such as refusal of entry or departure of international travellers and/or ships, or their delay for more than 24 h) shall provide to the WHO the public health rationale and relevant scientific information [30].

The joint statement of the IMO and WHO also explains Article 43 as measures interfering with international maritime traffic subject to provisions of the IHR, including the specific requirements set out in Article 43 [31].

The *Diamond Princess* was not engaged in trade transportation, and the Yokohama Port was the port of destination, so the isolation measures taken by Japan did not in fact interfere with trade and traffic significantly.

> Secondly, Annex 1 of the IHR provides: (a) core capacity requirements for surveillance and response; and (b) core capacity requirements for designated airports, ports, and ground crossings. The requirements for a public health response at the primary level and even at the intermediate level are contained in part (a) of Annex 1. The requirements listed in part (b) of Annex 1 for ports to respond to events that may constitute a PHEIC mainly include the capacity to provide an appropriate public health emergency response by establishing and maintaining a public health emergency contingency plan, and the assessment, care, and isolation of affected persons (There are seven requirements which includes (a) to provide appropriate public health emergency response by establishing and maintaining a public health emergency contingency plan, including the nomination of a coordinator and contact points for relevant point of entry, public health and other agencies and services; (b) to provide assessment of and care for affected travellers or animals by establishing arrangements with local medical and veterinary facilities for their isolation, treatment and other support services that may be required; (c) to provide appropriate space, separate from other travellers, to interview suspect or affected persons; (d) to provide for the assessment and, if required, quarantine of suspect travellers, preferably in facilities away from the point of entry; (e) to apply recommended measures to disinsect, derat, disinfect, decontaminate or otherwise treat baggage, cargo, containers, conveyances, goods or postal parcels including, when appropriate, at locations specially designated

> and equipped for this purpose; (f) to apply entry or exit controls for arriving and departing travellers; (g) to provide access to specially designated equipment, and to trained personnel with appropriate personal protection, for the transfer of travellers who may carry infection or contamination.). In this regard, IHR stipulate that each State party shall send to WHO a list of ports authorized to offer issuance of Ship Sanitation Control Certificates and the provision of the services referred to in Annex 1.

Yokohama Port, the home port of the *Diamond Princess*, was in the list of ports authorized to issue ship sanitation certificates [32], thus the port also satisfies the requirements for responding to a PHEIC. According to the indicators in part (a) of Annex 1, and the requirements in part (b) of Annex 1, [33] the Yokohama Port may need to develop a public health emergency contingency mechanism which is capable of accommodating thousands of passengers and crew of ships such as the *Diamond Princess* in isolation on land [9].

3.1.3. After the Quarantine Expired

After the end of quarantine, Japan, the port State, was not relieved of its obligations. According to IHR, the port State is responsible for monitoring baggage, cargo, containers, conveyances, goods, postal parcels, and human remains departing from affected areas, so that they are maintained in such a condition that they are free of sources of infection or contamination, including vectors and reservoirs, and for supervision of service providers for services concerning travellers, baggage, cargo, containers, conveyances, goods, postal parcels, and human remains at points of entry, including the conduct of inspections and medical examinations as necessary. In other words, Japan has an obligation to ensure that the health testing of the disembarking persons and medical service providers is carried out so as not to spread the virus to areas outside the cruise ship.

As mentioned above, Japan missed virus detection in 23 quarantined persons and allowed the staff members of the cruise ship to return to work directly without taking any isolation measures. Some of them who tested negative in the first place were later tested positive after returning home due to the virus latency, which may have caused the spread of the virus inside and outside Japan [34].

3.2. The Legal Problems Reflected in the Performance of International Obligations of States

3.2.1. The Potential Danger of Registration to the "Genuine Link" Principle

According to the United Nations Convention on Conditions for Registration of Ships of 1986 [35], the "genuine link" principle requires the nationals of a State of registration to participate in the ownership and manning of ships so as to realize the duties of the flag State to exercise effectively its jurisdiction and control over ships. Contrary to the "genuine link" principle is open registration or the flag of convenience, in which system the crewing and ship ownership by foreign nationals is allowed, and the States with open registries lack either the political will or administrative competence to effectively enforce and impose national requirements or international maritime laws and standards [36]. The largest States which almost exclusively cater for foreign ships are Panama, Liberia, Bahamas, Marshall Islands, Malta, Cyprus, Isle of Man, Antigua and Barbuda, Bermuda, etc. [37]. With open registration, the wider shipping community is concerned about the safety implications of registers without any substantive national attachment between shipowner and flag State, because in case of public health incidents and other emergencies, an "ambiguity" in jurisdiction easily appears.

Until now, the above convention of 1986 has not entered into force, so the State parties are not bound by the "genuine link" principle. This principle is also stipulated in the UNCLOS, which provides that:

Every State shall fix the conditions for the grant of its nationality to ships, for the registration of ships in its territory, and for the right to fly its flag. Ships have the nationality of the State whose flag they are entitled to fly. There must exist a genuine link between the State and the ship.

However, this provision does not specify the definition of the "genuine link" principle, which weakens the binding force of it. Just as the ITLOS concluded that the purpose of Article 91 was not to establish criteria by reference to which the validity of the registration of ships in a flag State may be challenged by other States, the determination of the criteria and establishment of the procedures for granting and withdrawing nationality to ships are matters within the exclusive jurisdiction of the flag State. Therefore, it is hard to say open registration is illegal in international systems.

The *Diamond Princess* cruise ship was registered in the UK. Even though the UK does not adopt the flag of convenience, the registration system of the State is much more open under the amendment of the Regulations of Registration of Ships with the foreign shipowners allowed (From the Merchant Shipping Act of 1995 and the Merchant Shipping (Registration of Ships) Regulations of 1993, to The Merchant Shipping (Registration Of Ships) (Amendment) Regulations of 2019, the UK Registry of Shipping and Seamen (the UK Registry) has expanded eligibility for the UK flag in order to accept a wider category of shipowners.). Being operated by a US company and sailing on Asian seas, the UK's jurisdiction over the cruise ship may have been weakened by these objective conditions.

3.2.2. The Lack of Coordination of Jurisdiction in Different Sea Areas and between Different States

As mentioned above, except on the high seas and internal waters where the port of call for ships is located, the current international law system has no explicit provisions under which the State should bear responsibility when public health emergencies happen on ships in different sea areas. Japan's *Nikkei Business Daily* pointed out that in the *Diamond Princess* event, the UK should have been the main responsible State; this point referred only to the high seas but not other sea areas [38]. Different legal systems for different sea areas are disintegrated, which makes it difficult for various States to exercise effective and timely jurisdiction after a pandemic outbreak.

Another defect is the weak coordination of jurisdictions between different States, especially between the flag State and port State. In the UNCLOS, there is a relevant stipulation that:

A State which has clear grounds to believe that proper jurisdiction and control with respect to a ship have not been exercised may report the facts to the flag State. Upon receiving such a report, the flag State shall investigate the matter and, if appropriate, take any action necessary to remedy the situation.

This article may provide a solution to link the flag State and other States and urge the flag State to exercise its jurisdiction, but there are still some doubts on whether the right to report under Article 94(6) alone would be adequate to secure effective implementation of the duties of the flag State even on the high seas [39]. After the pandemic outbreak on the cruise, the port State, flag State, the State of the cruise operator and of nationality of people on the ship were involved. These States need to help control the pandemic situation onboard the cruise ship to the fullest extent possible to prevent its spread in the global scope. Due to the lack of coordination between these States, effective cooperation was not realized and many ships that were refused entry to a port of call were afloat at sea. For instance, as a consequence of the COVID-19 crisis, Malta and Italy declared their ports not to be places of safety, and Alina Miron pointed out that "the obligation of disembarkation after mass rescue has too often been the victim of lack of solidarity among the Mediterranean States" [40].

3.2.3. The Lack of Special or Systematic Regulations for IPC at Sea and on Cruise Ships

The *Diamond Princess* was not the first cruise ship with a large scale pandemic outbreak. During the (H1N1) 2009 influenza pandemic, many passengers were infected on the Australian cruise ship *Pacific Dawn* [41]. The failure to respond to the high risk of the developing pandemic (H1N1) led to a widespread dissemination of the virus, particularly in Victoria [42]. Cruise ships are all highly crowded so that the registration mechanism, the construction structure of cruise ships, the lifestyle onboard, and the complexity of the port

State control mechanism can lead to an increasing risk of large scale spread of infectious disease, which requires special or systematic IPC regulations. The lack of these regulations is due to the following factors.

First, the lack of laws formulated by the WHO. The Constitution of the World Health Organization (The Constitution of the World Health Organisation (New York, 22 July 1946, in Force 7 April 1948)14 UNTS 186 [IHC]. Amendments adopted by the Twenty-sixth, Twenty-ninth, Thirty-ninth and Fifty-first World Health Assemblies (resolutions WHA26.37, WHA29.38, WHA39.6 and WHA51.23) came into force on 3 February 1977, 20 January 1984, 11 July 1994 and 15 September 2005 respectively and are incorporated in the present text.) endows the WHO with the right to adopt conventions, agreements, and regulations as well as to make recommendations to members. However, legally binding instruments usually take a long time to come into force, which makes it hard to adapt to public health emergencies which are variable and sudden. The WHO has traditionally appeared to play an inactive legislative role [43].

International public health law also does not pay enough attention to the characteristics of the ocean and cruise ships. The history of international public health law shows it mainly applies to the land, including the ports where public health events such as plague, yellow fever, and cholera have occurred, but not to the ocean [29]. The international law of the sea and maritime law focus on States' activities, such as the development of marine resources, navigation safety, and the protection of marine environment, but rarely IPC issues.

Therefore, the differences between highly crowded cruise ships which have higher requirements for IPC issues and general ships are also overlooked. For instance, IHR treat ships as a means of transportation without further distinguishing between the two kinds of ships. Annex 1 of IHR, which proposes seven core capacity requirements for designated ports' response to a PHEIC, does not take the construction of home ports into consideration and thus it fails to guide the port State to take IPC measures onboard cruise ships. The WHO published two interim sets of guidelines to control the COVID-19 spread on ships, which only provide guidance for general ships and ports [44].

4. Further Improvement of the Rule of Law

1. The Strengthening of Jurisdiction of the Flag State

As mentioned above, the "ambiguity" of the jurisdiction of the flag State is an important reason for the pervasion of the pandemic on cruise ships. The fundamental measure is the application of the "genuine link" principle and strict national registration in order to establish the effective jurisdiction of flag States over ships. However, because of the low taxes, lower crewing costs, less regulatory control, and relative anonymity, open registration is of great attraction to shipowners. Besides, the problem of flags of convenience seems, broadly, to derive from international competition in the shipping and fishing industry, in which case, it is debatable whether the tightening of the requirement of a genuine link would provide an effective solution [45]. Therefore, appropriate solutions to strengthen jurisdiction of the flag State should be further considered.

At present, the port State is mainly in charge of health and quarantine matters when a ship berths at the port. When ships sail on the high seas, and in the exclusive economic zones of other States, the flag State should be asked to fulfil the international obligations of IPC on ships. The Paris Memorandum of Understanding on Port State Control can be regarded as a reference. The port State can conduct inspections on ships of other States at the port. These inspections examine compliance with requirements pertaining to the condition of the ship, its equipment, operations, and social conditions. In case of non-compliance, ships can be refused entry to a port, inspected at length, or detained when attempting to enter a port [46]. The memorandum was reached to maintain the flag State's important role in enforcing sustainable shipping, such as ensuring the safety of life at sea, the protection of the marine environment, and the provision of decent working and living

conditions for seafarers. Similar inspections could also be agreed for IPC issues onboard cruise ships.

2. The Establishment of Special International Cooperation Mechanism with Closer Coordination and Cooperation between WHO and IMO

In response to the COVID-19 pandemic, the IMO and WHO cooperated to issue a Joint Statement on the Response to the COVID-19 Outbreak, insisting on the necessity to avoid severe disruption of maritime traffic, and the two international organizations will consider further cooperation in the future.

In light of the large number of maritime conventions concluded over the years, systems for the positioning of ships, flag State control (FSC) and port State control (PSC), were established by the IMO to ensure it is capable of implementing the obligations of conventions rapidly through the emergency response mechanism of the concerned States. Accordingly, the ideal mode of the cooperation mechanism should be jointly led by the WHO and the IMO to organize the Cruise Lines International Association (CLIA) and International Groups of P&I Clubs (IG) to establish a special international cooperation mechanism for cruise IPC so as to construct the information notification mechanism between the maritime departments of the flag State, the State of the cruise operator, traditional or regular ports of call and expected ports of call, and IPC coordination between maritime departments of ports of call and the local health and pandemic prevention departments on land.

Thus, the relevant experience of the WHO in response to PHEICs will be utilized sufficiently to play an active role in global information sharing and the coordination of IPC measures. It will also make up for the disadvantage that the WHO cannot be granted enough legislative power because most State parties are endeavoring to maintain freedom of action in public health, for fear of economic and social consequences [47], and fully utilizes the IMO's sufficient network resources in ship management and control to make the IPC measures better suited to the characteristics of ships and marine activities.

Based on the authorization of the IMO's member States, it is the WHO and not the IMO that is mainly responsible for the sanitary and anti-pandemic affairs of ships (In the Convention on the International Maritime Organization of 1948, the mainly matters authorized by Member States to IMO include the co-operation relating to technical matters of all kinds affecting shipping, the highest practicable standards in matters concerning the maritime safety, efficiency of navigation and prevention and control of the marine environment, etc.). Due to the suddenness and precariousness of the pandemic outbreak onboard cruise ships and the severity of the consequences, the attempt at collaboration between the IMO and the WHO can be mostly limited to cruise ships while the WHO is still in charge of other ship-related matters.

3. Construction of an IPC Mechanism for the Home Ports of Cruise Ships

The *Diamond Princess* is certainly not the only ship that has been affected by COVID-19. More than half the passengers onboard a small cruise ship touring the Antarctic were recently discovered to have caught the disease, for instance, and another Italian cruise ship was quarantined in Nagasaki, Japan, with 48 staff testing positive for COVID-19 [12]. Moreover, the cruise ship *Costa Serena*, with 3706 passengers and 1100 crew members onboard, was launched from Tianjin International Cruise Home Port in China on 20 January 2020, with 15 people on the ship developing feverish symptoms. The cruise ship then returned to the Dongjiang Harbor Area of Tianjin Port. The enforcement department of Tianjin Municipality boarded the cruise ship and tested all passengers on the cruise ship. No infection case was found so all people onboard disembarked. In this case, China acted more rapidly than Japan, but if there were people infected, it is difficult to guarantee that Tianjin home port could have provided sufficient medical equipment and isolation facilities for the nearly 5000 people on the cruise ship.

Under the impact of the pandemic, home ports are running at a low capacity, and the storage facilities have been highly overcrowded, thus the maritime transport and shipping

industry is faced with major challenges during these challenging times. To achieve the highest level of effectiveness in response to the COVID-19 outbreak on cruise ships, an IPC program with a dedicated and trained team or at least an IPC focal point should be in place and supported by national and facility senior management [48].

Based on the incidents of the cruise ships *Diamond Princess* and *Costa Serena*, coastal States should make up for the shortcomings of the pandemic prevention and isolation facilities in home ports of cruise ships as soon as possible and strengthen the construction of medical and health institutions and emergency isolation places near home ports. A home port of cruise ships must have a pandemic prevention and isolation place that is able to accommodate all passengers and crew of at least one cruise ship and meet the requirements of the WHO on pandemic prevention. During periods without a pandemic, this place could be leased to other institutions to operate business hotels or be used as office places. Once a pandemic breaks out, the isolation function should be restored unconditionally. The minimum standards for pandemic prevention and control of home ports should be "no rejection" and "no infection", thus playing an irreplaceable role in the recovery of the global cruise industry. Ultimately, security systems of emergency disposal with timely and appropriate isolation and nearby medical treatment should be developed for both non-pandemic and pandemic use in home ports. Additionally, the WHO may adopt new appendices to direct development of an IPC mechanism for the home ports of cruise ships.

5. Conclusions

Based on the case of the *Diamond Princess* and problems presented in controlling the spread of the COVID-19 pandemic—such as the isolation decision not being timely, the isolation measures not being professional, and information disclosure not transparent—the international obligations of states regarding IPC on cruise ships should be scrutinized. From the case of the *Diamond Princess*, it is obvious that the States' performance of international obligations in the stages of sailing, reaching the port, and on the quarantine period expiring is inconsistent with international law or lacks an international legal basis, which reflects several legal problems, such as the potential danger of registration to the "genuine link" principle, the lack of coordination of jurisdiction in different sea areas and between different states, and the lack of special or systematic regulations for IPC at sea and on cruise ships. To further improve the rule of law, it is advised to strengthen the jurisdiction of the flag State, establish a special international cooperation mechanism with closer coordination and cooperation between the WHO and the IMO, and construct an IPC mechanism for the home ports of cruise ships.

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