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Special Issue Reprint

Preserving Community Interests in Ocean Governance towards Sustainability 2nd Edition

Edited by
Keyuan Zou and Yen-Chiang Chang

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**Preserving Community Interests in
Ocean Governance towards
Sustainability 2nd Edition**

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Editors

Keyuan Zou

Yen-Chiang Chang



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Editors

Keyuan Zou	Yen-Chiang Chang
School of Law	School of Law
Dalian Maritime University	Dalian Maritime University
Dalian	Dalian
China	China

Editorial Office

MDPI
St. Alban-Anlage 66
4052 Basel, Switzerland

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About the Editors

Keyuan Zou

Keyuan ZOU is a Distinguished Professor of Law, Dalian Maritime University, China. He specializes in international law, in particular law of the sea and international environmental law. He has published over 200 books, book chapters, and journal articles in English. His latest books include *The Belt and Road Initiative and the Law of the Sea* (2020), *Routledge Handbook of the South China Sea* (2021), and *Law of the Sea in the Twenty-First Century: State Practice in East Asia* (2021). He is a member of the Editorial Boards of the *International Journal of Marine and Coastal Law*, *Ocean Development and International Law*, *Journal of International Wildlife Law and Policy*, *Marine Policy*, *Journal of Territorial and Maritime Studies*, and *Chinese Journal of International Law*. He is also a member of the Advisory Boards of the *Global Journal of Comparative Law*, *Asia-Pacific Journal of Ocean Law and Policy*, and *Korean Journal of International & Comparative Law*.

Yen-Chiang Chang

Yen-Chiang Chang, LLM (National Taiwan Ocean University), PhD (University of Dundee, UK). After leaving the Taiwanese Coast Guard, having served as a legal enforcement officer, he accepted a research position at the Centre for Marine Policy Studies, Sun Yat-Sen University, Taiwan. Subsequently, having moved to the UK whilst carrying out his PhD research, he remained a research assistant at the School of Law, University of Dundee. He has also interned with the British Institute of International and Comparative Law. In August 2007, he started to work for the Marine Institute, University of Plymouth, UK. His work involved a European project, which brought together a partnership of 27 investments, the strategic public sector, and research partners from Belgium, England, and France. His role was primarily concerned with promoting and facilitating sustainable port-based development and distribution, focusing on the economic, social, and environmental benefits. In 2009, he took up an associate professorship at the Shanghai Maritime University. In 2010, he joined the School of Law, Shandong University, and was subsequently promoted to full professor in 2011. In 2018, he started a new journey at the School of Law, Dalian Maritime University. According to Elsevier, Professor Chang was the most cited legal scholar in China in the years 2020 and 2021. His current research focuses on legal governance framework regarding the exploration of marine renewable energy and dispute settlement mechanisms.

Editorial

Preserving Community Interests in Ocean Governance towards Sustainability: An Editorial Note

Keyuan Zou and Yen-Chiang Chang *

School of Law, Dalian Maritime University, Dalian 116026, China; kzou@uclan.ac.uk

* Correspondence: ycchang@dmlu.edu.cn

1. Introduction

It is becoming increasingly evident that the preservation of the marine environment and the sustainable development of marine resources stand as the most critical elements of global ocean governance. These aspects are intricately linked to the fundamental interests of the entire 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 promoting national interests. Individual states continue to exploit marine space and resources in an unsustainable manner without due consideration for the collective interests of the international community and the interests of future generations. Such national selfishness has resulted in severe environmental risks and disasters in the ocean, particularly in the maritime areas beyond national jurisdiction, including the high seas, Antarctica, and the international seabed (the area), commonly known as the ‘global commons.’ These areas are of vital interest to both the present generation and future generations. Consequently, the need to preserve community interests in ocean governance towards sustainability has become increasingly urgent.

This Special Issue is designed to focus on 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 the SDGs. It contains a diverse range of papers. First, it examines relevant legal issues concerning ocean governance in the context of the SDGs for the long-lasting benefits of the international community. Second, it identifies new legal obligations to safeguard navigation and maritime security by considering the marine environment. Third, it evaluates effective legal frameworks for the sustainable use of marine resources, both living and non-living. Fourth, it discusses regulations for marine scientific research and new developments in marine technologies for environmental protection. The overall purpose of this Special Issue is to highlight the concept of community interests in sustainable ocean governance, which is fully reflected in the series of published papers. Additionally, this volume fills relevant gaps in the existing literature and aims to attract more academic research on these important topics.

2. Preserving Community Interests towards Sustainability

In recent decades, the international community has increasingly recognized the critical importance of establishing a peaceful and sustainable order for the world’s oceans. As nations expand their maritime activities, addressing common challenges and safeguarding the marine environment have become paramount. Sustainable development, a concept that seeks to meet present needs without compromising the ability of future generations to meet their own needs, has emerged as a guiding principle in this effort.

Since the 1950s, coastal states have increasingly recognized the necessity of cooperation in various maritime domains. Collaborative mechanisms have been established to

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address issues like maritime safety, marine environmental protection, fisheries management, and sustainable marine development. These mechanisms have aided coastal states in mitigating jurisdictional disputes. Countries should take more effective measures to protect the marine environment, both within and beyond national jurisdiction. In the pursuit of common societal interests, the international community should address issues of universal concern with a spirit of solidarity [1]. One significant aspect of this cooperation has been the management of fisheries resources. Overfishing and unsustainable fishing practices have posed a threat to the sustainability of marine ecosystems, leading to severe economic, social, and environmental challenges. In response to this issue, coastal states, regional organizations, and the international community have collaborated to set sustainable catch limits, create protected marine areas, and promote responsible fishing practices. These efforts have started to yield positive results, as more fish stocks are showing signs of recovery.

Another critical area of cooperation has been marine environmental protection. Increasing pollution, habitat destruction, and the effects of climate change have placed immense pressure on the marine environment. The international community, acknowledging the interconnectedness of marine ecosystems and human well-being, has launched global initiatives to safeguard and restore the health of the oceans. This encompasses addressing concerns such as plastic pollution, ocean acidification, and the preservation of marine biodiversity. International agreements like the Paris Agreement and the Convention on Biological Diversity have played a pivotal role in establishing global targets for marine environmental protection. The maintenance of maritime security and the pursuit of secure oceans are fundamental pillars of international cooperation. Maritime safety, law enforcement, and collective efforts in this realm constitute a vital nexus that underpins global stability and promotes marine sustainability.

In summary, sustainable ocean development remains a complex and dynamic challenge. Addressing emerging issues, adopting innovative technologies, and strengthening international cooperation are essential for safeguarding the oceans and ensuring their long-term health. As the international community continues to strive for sustainable development, it is vital to prioritize the oceans and the well-being of both current and future generations.

3. Main Insights of This Volume

This volume contains 11 papers focusing on preserving community interests in ocean governance towards sustainability. These papers can be broadly categorized into four main themes: (1) marine fisheries; (2) marine environmental protection; (3) maritime security; and (4) marine sustainable development. Turning to marine fisheries, in the four decades since the signing of UNCLOS, the evolution and development of international fisheries law has gained significant momentum. As reflected in the paper ‘The Impact of Globalisation on the Development of International Fisheries Law’, the international approach to marine resources has shifted from ‘possession and use’ to ‘conservation and management’. This shift involves setting sustainable catch limits and promoting cooperation among coastal states and fishing nations at regional levels to reduce conflicts and foster harmony. This transition represents the emergence of ‘ocean governance’, aimed at ensuring the sustainable and effective use of ocean space and resources [2]. The focus is on establishing and enforcing sustainable catch limits to prevent overfishing and the depletion of marine resources. This not only safeguards the livelihoods of coastal communities and the global seafood industry but also preserves the biodiversity and ecological balance of our oceans. To better implement SDG14 and its sustainable fisheries targets, ‘Revisiting Traditional Fishing Rights: Sustainable Fishing in the Historic and Legal Context’ argues that the balance between theory and practice in traditional fishing rights for sustainable ocean exploitation involves dynamic changes in the rights and obligations of coastal and fishing states. Bilateral negotiations are the most suitable approach for addressing these changes, ensuring mutual benefit and a sustainable ocean as the international law of the sea and marine environmental standards evolve [3].

Furthermore, in response to the issue of illegal, unreported, and unregulated (IUU) fishing, China has taken several positive measures to combat IUU fishing in the South China Sea. In the paper entitled 'China's Incentives and Efforts against IUU Fishing in the South China Sea', it is suggested that, while China's actions against IUU fishing have faced criticism, the efforts made by the country to combat IUU fishing, particularly in the South China Sea, should not be underestimated. China has established various forms of fisheries cooperation at the bilateral level and is dedicated to finalizing agreements in the South China Sea region. The Centre for Strategic and International Studies (CSIS) Fisheries Blueprint proposes several measures for China to enhance fisheries resource management, including strengthening enforcement capacity, improving data collection and sharing, promoting sustainable fisheries practices, and enhancing international cooperation [4].

Marine environmental protection is a pressing global concern. To secure the oceans for the well-being of future generations, it is imperative to safeguard the marine environment and rejuvenate the health of marine ecosystems. In addressing the legal framework for the sustainable administration of high-seas marine protected areas (MPAs), the agreement on the conservation and sustainable use of marine biodiversity of areas beyond national jurisdiction (BBNJ Agreement) proves better suited for comprehensive and sustainable governance of high-seas MPAs, capable of surpassing the constraints posed by regional treaties. In the paper entitled 'Sustainable Management of Marine Protected Areas in the High Seas: From Regional Treaties to a Global New Agreement on Biodiversity in Areas beyond National Jurisdiction', it was argued that the BBNJ Agreement, without undermining existing instruments and frameworks, will result in the coexistence of different legal regimes in the management of high-seas MPAs. In the context of 'not undermining', the Agreement should be applied preferentially, ensuring the universal participation of stakeholders in decision-making and the role of soft law for non-contracting parties [5].

Likewise, deep seabed mining has the potential to harm the marine environment and biodiversity. To control and reduce the potential adverse impacts of deep seabed mining on the marine environment and biodiversity in the international seabed area, multi-subject participation in the International Seabed Authority (ISA)'s law-making on taking precautionary approaches to governing commercial deep seabed mining should be strengthened. This involves identifying the scope of environmental impact assessment, developing environmental standards and guidelines, promoting the implementation of environmental management and monitoring, and improving the application of regional environmental management plans (REMPs) [6]. To safeguard the marine environment, China has implemented proactive measures, including stringent legal liability regarding marine environmental matters. This approach fundamentally aims to address the issue of minimal legal consequences for violations and reduce instances of marine environmental offenses.

Maritime security is a comprehensive topic that encompasses various dimensions, including national security, maritime disputes, and the safety of shipping. As globalization continues to deepen and maritime activities increase, the importance of preserving maritime security has grown significantly. It is directly intertwined with the welfare and stability of the global community. Nevertheless, the concept of maritime security remains a subject of debate in academic discussions. In the paper entitled 'Building Up a Sustainable Path to Maritime Security: An Analytical Framework and its Policy Applications', it was argued that conducting an analytical comparison of the various concepts of maritime security could help clarify its fundamental elements. This, in turn, could facilitate the establishment of a sustainable development approach aimed at advancing maritime security as a comprehensive set of policy objectives [7]. China has introduced the concept of a 'maritime community with a shared future', allowing for a more flexible policy approach when considering the actions of relevant stakeholders. China's efforts have made advancements on both domestic and international fronts, although certain constraints persist. For instance, China's participation in Arctic governance has only just begun, and it has faced challenges in coordinating the positions of various parties and balancing the sustainable development of the Arctic region's environment. However, as the paper entitled 'China's Engagement

in Arctic Governance for Its Sustainable Development Based on an International Law Perspective' indicates, China does not advocate for disrupting the existing international legal order of Arctic governance for its sustainable development, particularly in the context of the situation in Ukraine. This conclusion can, to some extent, alleviate the doubts of certain Arctic states regarding China's engagement in Arctic affairs related to this theme [8].

The increase in maritime disputes is usually closely linked to a variety of factors, including geopolitics, competition for resources, legal disputes, environmental changes, and military rivalries. In the article "Why International Conciliation Can Resolve Maritime Disputes: A Study Based on the Jan Mayen Case", it was argued that international mediation will play a significant role in the resolution of maritime disputes in the future. The Jan Mayen case also shows that international mediation has the following four advantages: (1) guaranteeing the parties' ultimate decision-making power over the dispute settlement; (2) allowing for the flexible application of laws and procedures; (3) Providing recommendations without increasing the pressure on disputing parties; and (4) Incurring relatively low political and time costs [9].

Peace is an important prerequisite for achieving the goals of sustainable development. Peace contributes to the protection of the environment, the management of resources, and the enhancement of social equity, thus creating the conditions for long-term sustainable development. Peace is an important goal that we collectively pursue and is worthy of constant efforts to preserve and promote. With the growing global concern for sustainable development, we need not only to make better use of the ocean economy but also to promote the development of clean energy to achieve a balance between environmental protection and socio-economic development. By compiling relevant statistical data from 2009 to 2019 and considering four key factors: marine economy, marine resources, ecological environment, and technological innovation, we established an evaluation index system for the sustainable development of the marine economy. In the article "Measuring the Sustainable Development of Marine Economy Based on the Entropy Value Method: A Case Study in the Yangtze River Delta, China", it was suggested that promoting regional collaboration in the Yangtze River Delta, improving technological innovation, and enhancing environmental protection are crucial for supporting the sustainable development of the regional marine economy [10].

Many coastal countries, especially those classified by the World Bank as highly indebted poor countries (HIPC), face significant external debt burdens, which constitute a substantial portion of their gross domestic product (GDP) and impose a heavy burden on their economies. However, these countries typically make a minimal contribution to cumulative greenhouse gas emissions, resulting in a "climate debt". This implies that the cost of global climate change to them is much greater than their contribution. In the article "Multilateral Debt Relief for Clean Ocean Energy", it was argued that the policy of exchanging climate debt for clean energy provides a fair solution [11]. The core idea of this policy is that debtor countries can obtain clean energy by transferring a portion of their debt, thereby assisting them in achieving economic sustainability. This not only helps alleviate the debt burden but also promotes the development of clean energy, contributing to global efforts to mitigate climate change. For coastal nations, policy exit clauses are also crucial. Over time, the demands and the environment of policies may change, so policies must be flexible to adapt to new challenges and opportunities. In the article "Blue Than Blue: Exit from Policy Support for Clean Marine Energy", it is proposed that coastal states need to include a policy exit clause in their investment contracts to address changing circumstances. The analysis of policy optimization is applicable to policies supporting the transition to sustainable energy sources beyond marine energy [12]. Policy exit clauses can ensure policy adaptability, thus providing coastal states with better policy tools to promote their sustainable development.

4. Conclusions

The oceans are a global commons and cannot be divided separately. Before any decision is made, global common interests need to be taken into account, and national interests cannot be satisfied at the expense of the global common interests. Countries should take the common interests of all mankind as the starting point, adhere to the concept of the unity of rights and obligations, protect marine biodiversity, achieve the orderly exploitation of marine resources, and become advocates, builders, and contributors to international order based on international law. Ultimately, ocean governance is about striking a balance between human needs and environmental preservation. It seeks to ensure that we can continue to benefit from the wealth of resources the oceans offer while safeguarding their long-term sustainability for future generations. The international community must work together in solidarity, guided by a long-term vision of sustainable development, to establish a peaceful and sustainable order for the oceans. Only through such collective efforts can we ensure the health and prosperity of our oceans and the well-being of all those who depend on them.

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Article

Multilateral Debt Relief for Clean Ocean Energy

Anastasia Telesetsky

Department of Natural Resources and Environmental Sciences, California State Polytechnic University San Luis Obispo, San Luis Obispo, CA 93407, USA; atelese@calpoly.edu

Abstract: As states bring more and more offshore wind online and build renewable energy capacity, the promise of large-scale ocean renewables such as offshore wind is not shared equally across all coastal states. This paper examines the situation of coastal states identified by the World Bank as Heavily Indebted Poor Countries (HIPCs) in the context of the boom in offshore wind investment. Specifically, the paper looks at the limited access to renewable energy production exacerbated by ongoing public debt loads, and the almost complete lack of access to clean ocean energy development for the poorest coastal states. Using statistics from the International Renewable Energy Agency and datasets from the Our World in Data project, this paper highlights that the most indebted coastal states only have access to 0.69% of the available renewable energy even though these states represent 4.6% of the global population. In the context of state responsibility for failing to meet climate obligations under the UNFCCC, this paper argues that a sovereign debt relief package offers an equitable remedy to HIPC coastal states, many of whom owe a substantial portion of their GDP as external public debt. The debt service payments would be invested in the upfront capital costs of ocean-based clean energy. These types of debt relief arrangements address international state responsibility and offer the dual co-benefits of long-term economic development and low-carbon sustainability.

Keywords: ocean renewable energy; coastal states; debt relief; state responsibility; climate debt; sovereign debt; renewable energy transition; economic sustainability; environmental sustainability; heavily indebted poor countries

1. Introduction

We are in the midst of a global energy transition to large-scale renewables. Of particular excitement for many coastal states is the growth in offshore wind deployment. According to the International Renewable Energy Agency (IRENA), large-scale wind farms will increase from 34 gigawatts (GW) of installed capacity in 2019 to 382 GW by 2030 and 2002 GW by 2050 to keep global warming below 1.5 degrees Celsius [1].

Offshore wind offers a significant source of reliable energy with turbines generating more power than a comparable onshore farm. By 2035, the capacity for an offshore wind turbine is anticipated to be as large as 17 MW of production per turbine in contrast to the capacity for a single onshore wind turbine of 5.5 MW [2]. Offshore wind development offers other advantages over onshore wind development. Offshore wind is also usually strongest in the afternoon and evening when consumer demand is at a peak in contrast to land-based wind resources that are most available at night. With concentrated population centers along the coast of many states, offshore wind development may be able to shorten transmission lines to places where there is a high peak demand, thereby simplifying some aspects of power delivery infrastructure.

Governments and energy corporations are making substantial investments globally in offshore wind with offshore wind accounting for 12% of renewable energy investments in 2020 (USD 41 billion), 9% in 2021 (USD 39 billion), and 7% in 2022 (USD 34 billion) [3]. Yet, many coastal states are not able to participate in this “energy bonanza” because they do not have the financial resources to invest in large-scale energy infrastructure which has high upfront capital costs [4]. Many states, particularly some of the poorest states, are

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heavily indebted to international creditors. Because a number of these states also have high climate vulnerability, researchers have recently called for USD 520 billion in debt relief to help states meet climate adaptation goals and to “frontload” energy transition investments for indebted nations [5]. Researchers urge decision makers to address “climate debt” by developing new frameworks for managing debt including “programs for a sovereign debt restructuring mechanism and debt-for-climate swaps” [6] (p. 100).

States have tried to be creative with their financing. For example, Benin, which is categorized as a Heavily Indebted Poor Country (HIPC) by the World Bank, has issued sustainable development goal bonds to work towards development objectives including low-carbon electricity and zero-emission transportation [7]. These bonds do not, however, address sovereign debt loads.

Other non-conventional programs have been proposed to address sovereign indebtedness. Debt-for-conservation programs have been piloted [8–10] as well as debt-for-development (health/education) swaps [11]. Scholars and researchers have encouraged the development of new instruments particularly to allow an exchange of sovereign debt for climate projects [12–16]. Researchers have observed that debt relief for climate programs will need to be substantially large to make an economic difference for states or otherwise the relief will not provide the needed government budget to deliver effective conservation programs [15].

No large-scale “debt relief for energy” programs have been implemented though researchers and analysts have proposed using existing debt swap models to support other development outcomes. A U.S. Agency of International Development report on climate financing observed that “debt-for-nature swaps” can be “also used to finance renewable energy development; utility-scale battery storage, compensation for early shutdown of coal-fired power plants; energy efficiency improvements in the industry” and other sustainable development goals [16] (p. 110).

Focusing on the situation for low-income and lower-middle-income states, this article highlights the concept of “climate debt” as part of state responsibility for failing to mitigate climate emissions and argues that it is incumbent on international public creditors to create large-scale debt relief for clean energy programs to allow for both equitable development and future energy sustainability. This article will focus in particular on the potential of offshore wind sources of long-term clean energy for low-income coastal states with high wind energy capacity. This paper proceeds with a discussion of the datasets consulted, observations about the sustainable energy gap (e.g., 4.6% of the global population living in HIPCs has access to 0.69% of available renewable energy), discussion of sovereign debt creditor state responsibility for failure to mitigate climate emissions, and a proposal for debt relief in exchange for ocean-based renewable energy investments for states where offshore wind is a viable source of energy.

2. Methods

This study relied on publicly available datasets to explore the relationship between offshore wind capability, energy access, cumulative carbon emissions, and financial debt. The datasets included reports from the International Renewable Energy Agency (IRENA) and data collected by Our World in Data based on a variety of sources including United Nations agencies and the International Energy Agency. Each of the tables in the discussion below includes citations to the datasets. The IRENA data on offshore wind are from the 2023 Renewable Energy Statistics which used 2021 production data and 2022 capacity data. While it would be preferable to have data from one year, the data relied upon for this study still demonstrate general national trends in offshore production and capacity for most nations. The most recent data from the Our World in Data tables on per capita energy/electricity use, per capita emissions, and national renewable electricity production are from 2021. The data on national debt and GDP are from the United Nations Conference on Trade and Development from 2010 to 2022. Source information is available in the Data Availability Section.

3. Discussion

This section starts with a discussion of offshore wind and the inability of most low and lower-middle-income coastal countries to participate in the production of renewable energy transitions such as offshore wind. The next subsection looks at energy transition trends for coastal Heavily Indebted Poor Countries (HIPCs) and raises the question of whether states that have benefited from cumulative historical emissions need to engage in greater financial efforts to support energy access for poor states as a reparation owed to low-income coastal states, particularly the HIPCs, for failure to mitigate emissions in a timely fashion. The final section in this part offers a proposal for pursuing debt relief for clean ocean energy to address the gap in renewable energy infrastructure for many highly indebted states and to pay back some portion of their multi-decade climate debt.

3.1. Existing Offshore Wind Sector and Existing Renewable Energy Production for Low and Lower-Middle-Income Coastal Countries

In 2013, the International Renewable Energy Agency calculated offshore wind generation of 7171 megawatts (MW) capacity and 14,535 gigawatt-hours (GWh) of production [17]. By 2022, this number had grown substantially to 54,257 MW of production with approximately 137,614 GWh [17]. As of August 2023, 4C Offshore, a consultancy that collects offshore wind farm statistics, listed 63,081 MW of operational global offshore wind projects across Europe, Asia-Pacific, and the Americas [18]. Wind farms are becoming increasingly large as the cost of electricity associated with offshore wind has decreased. In 2023, the world's largest offshore wind farm was a 1.3 GW wind farm 55 miles (89 km) off the Yorkshire coast in the United Kingdom operated by Danish-based Ørsted with 165 wind turbines that can deliver power to 1.4 million UK homes [19]. In addition to fixed support wind farms, there are also floating wind farms that take advantage of energy production in deep ocean waters. The largest operational floating offshore wind farm in the world is off Norway which at full build-out by the end of 2023 will produce 88 MW of power [20]. The United States is likewise depending on floating wind technology to install off the coast of California as part of the nation's Floating Offshore Wind Shot [21].

The trends in the increasing number of wind farms and ever larger wind farms reflect steady growth in public and private offshore wind investment, albeit not at the ambitious rates suggested by IRENA in 2021 of 382 GW of production by 2030 [1]. Looking towards a global energy transition, the United Nations Conference on Trade and Development in its 2023 World Investment Report observed that renewable power generation is likely to require involvement from international investors because many countries do not have the financial resources for capital-intensive infrastructure [4]. The current investment in the offshore wind sector is not evenly distributed. Much of this investment is in the European region where several coastal states including the United Kingdom, France, and Germany have rapidly expanded their offshore wind capacity. In 2020, the European Union set a target of 60 GW of offshore wind generation by 2030 and 300 GW by 2050 [22]. Achieving Europe's target will mean "multiplying the capacity for offshore renewable energy by nearly 30 times by 2050" and investing "up to EUR 800 billion" [22]. Investments continue in the sector with offshore wind continuing to have the third-largest investment share among all renewables since 2014 [3].

Financial and industry trends point to the rapid expansion of offshore wind expansion, but as noted earlier, the investments are unevenly distributed. For purposes of understanding the difference in access to large-scale ocean renewables by states depending on the income level of a state, it is valuable to compare the top five global offshore wind producers as measured by energy production to all the coastal nations identified by the World Bank as low income (gross national income per capita USD 1135 or less) and lower-middle-income (gross national income per capita USD 1136–4465) (the low-income and lower-middle income coastal states compared in this paper are Algeria, Angola, Bangladesh, Benin*, Cabo Verde, Cameroon*, Comoros*, Cote d'Ivoire*, Democratic Republic of the Congo*, Djibouti, Egypt, Eritrea, The Gambia*, Ghana, Guinea*, Guinea-Bissau*, Guyana*, Haiti*, Honduras*,

India, Iran, Jordan, Kiribati, Lebanon, Liberia, Madagascar, Myanmar, Nicaragua*, Nigeria, Pakistan, the Philippines, Republic of the Congo*, Samoa, São Tomé and Príncipe*, Senegal*, Sierra Leone*, Solomon Islands, Somalia*, Sri Lanka, Sudan, Syria, Tanzania*, Timor-Leste, Togo*, Tunisia, Ukraine, Vanuatu, Venezuela, Vietnam, Ukraine, and Yemen. Countries with a "*" have qualified for debt relief as Heavily Indebted Poor Countries (HIPCs) and are eligible for the Multilateral Debt Relief Initiative managed by the World Bank, International Monetary Fund, and other institutional creditors). Existing offshore wind production and capacity data used in Table 1 and then for comparing renewable energy production with low-income and lower-middle income states were compiled from the International Renewable Energy Agency's 2023 report on global renewable energy.

Table 1. Offshore Wind Production and Total Renewable Energy in Top Offshore Wind-Producing States (2023).

Country	Offshore Wind Energy Production 2021 gWh [17]	Offshore Wind Capacity 2022 MW [17]	Offshore Wind Farms Operational as of August 2023 [18]	Planned Offshore Wind Projects as of August 2023 [18]	Total Renewable Energy 2021 Production (gWh) [17]	Population (Millions) [23]
China	52,711	30,460	136	304	2,405,538	1,425,887,337
United Kingdom	35,510	13,928	43	182	122,178	67,508,936
Germany	24,375	8129	29	163	230,800	83,369,843
Netherlands	7952	2571	10	121	40,471	17,618,299
Denmark	7593	2306	15	107	26,096	5,882,261

In contrast to the 5 major offshore wind production states, as of September 2023, only Vietnam among the 53 low-income or lower-middle-income coastal states produces offshore wind. Vietnam had 577 2021 gWh of offshore wind energy production in 2021 [17], 99 MW of offshore wind capacity in 2022 [17], and plans for 114 additional wind farms in addition to the existing 28 farms in 2023 [18]. India has 40 planned offshore projects [18]. No other low-income or lower-middle-income coastal state has public plans for offshore wind or other marine renewable technologies for domestic energy production.

Offshore wind energy is not equally distributed across coastlines but is instead, except for Vietnam, exclusively in countries that have middle to high incomes. Notably, most of the low-income or lower-middle-income coastal states have limited access to renewable energy. While the HIPCs that have a coastline have a total of 369,800,628 people, they presently only have access to 54,976 gWh of renewable energy production [17,23]. From the global total of 7,857,803 GWh of renewable energy in 2022 [17], the most indebted states have access to 0.69% of the available renewable energy even though these states are home to 4.6% of the global population [23].

This trend of differential energy access to both marine and non-marine renewable energy becomes even more apparent when you examine all of the low-income and lower-middle-income coastal states with a total population of 3,306,884,371 residents having access to only 736,208 GWh of renewable energy production [17,23]. When looking at the almost 7.9 million GWh of renewable energy production, this means that 41% of the global population only has access to 9.4% of global renewable energy [17,23]. This has real implications for sustainability as many of these countries attempt to advance basic development goals, which will include building new energy infrastructure. Almost all of these countries are not part of the "offshore wind" revolution or other renewable energy infrastructure efforts because of a lack of financial and technical capacity. In the next section, this paper examines the lack of per capita energy within HIPCs and what the current trends in energy adoption mean for low and lower-middle-income states to achieve a transition to low-carbon energy resources.

Even though there is sizable interest from the private sector, particularly in recent years, in offshore wind development, private investors are unlikely to seek renewable energy investments in many of the HIPCs not just because of general financial risks but also because of a lack of essential infrastructure to support a renewable energy transition including transmission lines [4]. At present, the majority of loans to the least-developed countries take a long time to financially close, are highly leveraged, and have higher interest premiums [4]. Private investors look for government equity in a project before investing in renewable energy infrastructure within many of these countries. Without private investment opportunities, states must rely heavily on multilateral development banks. As discussed below, many of these countries will continue to face challenges in making clean energy transitions and addressing energy access gaps due to ongoing and often unsustainable sovereign debts.

3.2. Energy Transitions for Heavily Indebted Poor Coastal Countries

There is a substantial need to accelerate energy transitions in low and lower-middle-income states by investing in renewable energy. To meet the global goals of achieving a renewable energy transition by 2030, renewable energy capacity has to increase at least three times by 2030. In the Middle East and Africa, installed renewable energy capacity needs to increase 10 times to meet growing needs [4].

Many, albeit not all, of the coastal countries identified by the multilateral financial institutions as low-income and lower-middle-income nations have extremely limited access to energy from any source which has limited economic growth potential. Table 2 lists the per capita energy use, per capita emissions for the Heavily Indebted Poor Coastal Countries, carbon intensity of electricity, and the renewable energy share of electricity production from 2013 and 2021.

Table 2. Low Per Capita Energy Use by Heavily Indebted Poor Coastal Countries with Carbon Intensity.

Coastal State	Per Capita Energy Use kWh (2021) [24]	Per Capita Electricity Use kWh (2021) [25]	Per Capita CO ₂ Equivalent Emissions (Metric Tons) [26]	Carbon Intensity of Electricity (2021) gCO ₂ e [27]	Renewable Energy Share of Electricity Production (2013)/(2021) (%GWh) [17]
Benin	2485	18	0.6	667	0/0.2
Cameroon	1594	296	0.4	278	80.9/79.3
Comoros	1634	170	0.4	714	8.2/0
Cote d' Ivoire	2371	400	0.4	411	21.3/18.7
Democratic Republic of the Congo	411	115	No information	25	99.9/99
The Gambia	931	114	0.2	700	2.1/1.6
Guinea	1282	205	0.3	209	74.1/88.1
Guinea-Bissau	677	39	0.2	750	0/7.1
Guyana	13,690	1529	1.92	642	8.4/7.1
Haiti	1031	86	0.3	606	13.5/18.2
Honduras	5087	1165	0.9	375	41.9/62.7
Liberia	1065	177	0.2	304	21.3/57.4
Madagascar	508	72	0.1	483	55.2/42.8

Table 2. Cont.

Coastal State	Per Capita Energy Use kWh (2021) [24]	Per Capita Electricity Use kWh (2021) [25]	Per Capita CO ₂ Equivalent Emissions (Metric Tons) [26]	Carbon Intensity of Electricity (2021) gCO ₂ e [27]	Renewable Energy Share of Electricity Production (2013)/(2021) (%GWh) [17]
Mauritania	3989	407	0.9	527	4.8/19.4
Mozambique	2241	620	0.2	127	99.8/94.5
Nicaragua	4265	676	0.7	354	52.4/69.3
Republic of Congo	2348	689	1.3	396	54.2/40.7
São Tomé and Príncipe	3310	448	0.6	600	91.7/6.1
Senegal	2505	333	0.6	523	1.9/12.5
Sierra Leone	493	25	0.1	48	62/75.3
Tanzania	907	129	0.2	517	39.4/42.8
Togo	1116	73	0.3	460	23.8/20.7

The sum per capita energy use of all of these 22 nations taken together is 53,940 kWh. A single user in the Netherlands, one of the top five offshore wind producers uses close to the same amount (56,001 kWh) [24]. Other global users are far more profligate in net energy use: United States (78,754 kWh), Canada (102,160 kWh), Singapore (147,085 kWh), and Australia (63,459 kWh) [24]. While there are some outstanding examples of states that produce more than half of their electricity from renewable sources (see, e.g., Cameroon, Democratic Republic of Congo, Guinea, Honduras, Liberia Mozambique, Nicaragua, and Sierra Leone), many HIPCs do not have a large share of renewable energy available for electricity production.

For some states without a substantial level of renewables, the energy available is relatively carbon intensive, as indicated by reading the data in the fourth column illustrating relatively high carbon intensity in conjunction with the first and second columns demonstrating both low energy usage and low electricity usage per capita. For example, in Togo, relatively little energy is used per capita but the carbon intensity for the electricity component of that energy is 460 gCO₂e, suggesting reliance on fossil fuel to deliver what minimal electricity is available per capita. North America and Europe, where there is far more access to renewables, had an average carbon intensity for electricity of 339 gCO₂e and 278 gCO₂e, respectively, in 2021 [27]. In contrast, African states across the continent had an average carbon intensity of 488 gCO₂e [27].

The last column in Table 2 indicates the trajectory for the uptake of renewables into electricity production. While most countries have made some progress over the course of a decade, there is a subset of countries that appear to have made little or no progress on developing new renewable sources of energy to tap into, at least, for electricity production. Notable countries where there has been a sizable decline in renewable energy usage of 10% or more are Madagascar, the Republic of Congo, and São Tomé and Príncipe over the past decade. What all these data taken together suggest is that HIPC coastal states have relatively limited access to energy given their population sizes and many of these states have not made a transition to cleaner energy either in terms of scaling up available clean energy or developing new clean energy sources. The need for more energy availability for most of the HIPCs is imperative to support development objectives, but many of these states appear to have challenges in achieving more energy access for their populations even through conventional sources. Pursuing additional energy access for populations that may not have existing energy access by developing more conventional sources will only exacerbate existing climate warming trends.

Given the financial debt cycle experiences of many of the HIPCs and the challenge of tapping into the renewable energy market, the next section examines the international responsibility of sovereign debt holders whose economies have benefited from unregulated emissions but have not achieved climate mitigation objectives under the United Nations Framework Convention on Climate Change. This section provides data on the percentage shares of carbon emissions for top quota holders of the International Monetary Funds, suggesting that these states have some international responsibility for failing to systematically mitigate emissions under the UNFCCC, and proposes that part of this “climate debt” responsibility can be discharged through sovereign debt relief in exchange for renewable energy investments including offshore wind.

3.3. International Sovereign Debt Holders Paying and International Responsibility for Failure to Mitigate

It is widely understood that the globe is 1.1 degrees warmer than historic baselines due to anthropogenic greenhouse gas emissions; we are not on track to reduce our warming by even 2 degrees Celsius and we have a global carbon limit beyond which additional carbon emissions are expected to trigger certain impacts [28]. Given the protection of national interest to develop, it has been a subject of contestation who should cut emissions and by how much. Even as warming continues with emerging impacts, there have been only limited discussions about climate accountability where states responsible for the largest historical proportion of global emissions accept some legal responsibility for having benefited from high emissions but not systematically mitigating recent emissions.

Philosopher Henry Shue argued in the context of hearings by the UN Framework Convention on Climate Change’s Subsidiary Body for Scientific and Technological Advice on historical responsibility that states that have benefited from a carbon-intensive development process have obligations to communities who “must be able to emit carbon” in order to achieve development needs. From the perspective of fairness and equity, he argued that states should think about carbon budgets in terms of hypothetical permits for different types of activities. If these permits were broadly distributed in a system where we have a carbon cap limit on new emissions, individuals who have basic development needs have priority in the release of the remaining global emissions that are still available in the global carbon budget [29]. Yet, politically powerful states continue to downplay their national economic enrichment that has been achieved due to the ability over multiple decades to have freely released greenhouse emissions. At present, these states, given the energy needs described above, have done relatively little to assist other states at the frontline of climate impacts which include HIPCs to develop sustainable energy systems.

Article 4(2)(a) of the United Nations Framework Convention on Climate Change obligates countries listed in Annex I, which includes most so-called developed states, to “adopt national policies and take corresponding measures on the mitigation of climate change, by limiting its anthropogenic emissions of greenhouse gases and protecting and enhancing its greenhouse gas sinks and reservoirs” [30]. While all of these Annex I states have adopted national policies under the Paris Agreement, these states have not necessarily limited anthropogenic emissions of greenhouse gas emissions. In the United States, for example, it was not until 2019 that the U.S. emitted less carbon dioxide per million metric tons than it had in 1990. Much better progress in the U.S. has been made on reducing methane and nitrous oxide emissions, but no progress has been made on hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride, or nitrogen trifluoride [31]. States such as the United States are internationally legally responsible for breaching UNFCCC obligations to limit anthropogenic emissions of greenhouse gases and take measures on the mitigation of climate change. Despite adequate knowledge of the harms of climate change to protect the interests of other states, the United States has been negligent in its responsibility to curb emissions in spite of the UNFCCC going into effect in 1994 and the U.S. being a member since 1992. This omission to take action comes with consequences including reparation for injuries through restitution, compensation, and/or satisfaction [32]. Where it may not be

possible to provide restitution for harm, it may still be possible to provide restitution in the form of compensation. One possibility that will be discussed in Section 3.4 is for this compensation for decades of inaction to come in the form of debt relief.

Existing efforts for mitigation based on concepts of historical responsibility have been ineffective. The Kyoto Protocol failed to tackle actual carbon consumption but focused only on carbon production as wealthier countries imported carbon in the form of carbon-intensive goods from non-participants in the Kyoto Protocol regime [33]. The current nod to historical responsibility is the UN Framework Convention on Climate Change’s Loss and Damage Fund designed to assist states with adaptation through a variety of proposed financial mechanisms to be funded by pledges from countries and philanthropies including social protection funds, catastrophe risk insurance, and catastrophe bonds [34]. Other proposals for future funding include international taxes, particularly on the fossil fuel industry, and debt for loss and damage swaps [34]. The idea of a variation on the “debt swap” proposed at the 27th UNFCCC Conference of Parties meeting that might address the inequities associated with climate debt will be explored in Section 3.5 of this paper.

Due to ongoing impoverishment triggered in part by large public debt loads, many states, including the HIPCs, are unable to make energy transitions including participating in ongoing global efforts to scale up offshore wind which holds the promise of helping certain coastal HIPCs with sufficient wind resources to become energy independent. It is important to remember that most of the countries with the largest shares of global cumulative carbon emissions are also some of the largest creditors in international financial institutions as illustrated in Table 3 below.

Table 3. Top 10 quota holders in the International Monetary Fund, Cumulative CO₂ Contributions, and Percentage Global Share in Cumulative Emissions.

	Quota in the IMF (Percent of Total) [35]	Cumulative CO ₂ Measured from 1750 (Billion Tons of CO ₂) [36]	Percentage Share of Global Cumulative CO ₂ Emissions as of 2021 [37]
United States	17.43	421.91	24.29%
Japan	6.47	66.71	3.84%
China	6.40	226.92	14.36%
Germany	5.59	93.29	5.37%
France	4.23	39.11	2.25%
United Kingdom	4.23	78.51	4.52%
India	2.75	57.11	3.29%
Russia	2.71	117.55	6.77%
Brazil	2.32	16.67	0.96%
Canada	2.31	34.12	1.96%

The top ten International Monetary Fund creditors holding quota are responsible for 67.6% of the global cumulative carbon emissions with most of the cumulative contributions from the United States, China, and Russia.

The lower-middle-income countries and the low-income countries, including both coastal and non-coastal states, together account for 10.5% of the cumulative emissions but are home to more than half of the current global population with 3.4 billion individuals in lower-middle-income states and 718.26 million in low-income states [37,38]. While regions such as Africa and the Middle East need to increase their renewable energy capacity by tenfold to meet growing local energy needs, at present, Europe only needs to double its capacity. Both states will need about the same amount of annual investment to achieve these different installation capacities (Africa and Middle East USD 170 billion, Europe USD 180 billion). Europe, however, had potential access to international investment in

2022 of around USD 248 billion while Africa only had potential access to USD 45 billion of investment [4].

A new approach is needed to square the ongoing state responsibility for unmitigated emissions and the need to accelerate energy transitions for the poorest nations that have not achieved domestic energy equity. The legacy of multilateral lending continues to keep some states in a cycle of impoverishment and prevents already disadvantaged states from gaining access to larger-scale low-carbon technologies. A total of 107 out of 147 developing countries have no strategy specifying sources of finance to assist with the energy transition [4]. Many of these countries remain indebted to public debtors which slows the amount of domestic public funding available for renewable energy infrastructure.

3.4. Need for Debt Relief for Clean Energy Transition

In the 1970s and 1980s, numerous low-income countries borrowed from governments or export credit agencies who would accept risks of non-repayment. At that time, export credit guarantees from lending countries were considered to be complementary to official development aid as a means of stimulating economies [39]. Much multilateral diplomatic attention in the last several decades has gone to addressing the debt crisis of low-income countries, many of these countries emerging from recent decolonization. Early attempts to relieve debt involved rescheduling repayments and refinancing loans. Rescheduling of debt service payments, however, did not eliminate the debt but increased scheduled debt service because of additional interest and principal payments associated with rescheduling [39]. Creditor agencies have been reluctant to reduce national debts although rescheduling agreements have forgiven some debt and rescheduled other debt at low interest rates. The International Monetary Fund and the World Bank initiated the Heavily Indebted Poor Country Initiative in 1996 to try and address unmanageable debt burdens for 39 developing countries that are only eligible for highly concessional aid and who have demonstrated some intention to reform policies including developing a Poverty Reduction Strategy. The initiative relieved many of the qualifying states of billions of dollars of debt [40]. Table 4 illustrates that sizable debt levels continue for many energy-poor states. Most of the HIPC's carry high levels of external public debt constituting for many of these countries around one-fifth of their GDP. Other countries in the world including China and the United States also carry high levels of debt but this debt is not in the form of external bilateral or multilateral public debt.

Table 4. List of Heavily Indebted Poor Coastal Countries with External Debt, Percentage of Debt from Multilateral/Bilateral Institutions, Percentage of Public Debt as a share of GDP, Per Capita external public debt, and availability of offshore oil and gas resources.

State	Amount of External Debt (Billions) [41]	Percentage of External Debt as Multilateral and Bilateral Financial Institution Debt [41]	Percentage of External Public Debt as a Share of GDP [41]	External Public Debt per Capita [41]	Availability of Offshore Oil or Gas [42–44]
Benin	6	57	32.9	467	Yes
Cameroon	12	83.5	27.4	456	Yes
Comoros	<1	100	21.2	296	No
Cote d' Ivoire	23	43.5	32.3	838	Yes
Democratic Republic of the Congo	7	70.9	11.5	70	Yes

Table 4. Cont.

State	Amount of External Debt (Billions) [41]	Percentage of External Debt as Multilateral and Bilateral Financial Institution Debt [41]	Percentage of External Public Debt as a Share of GDP [41]	External Public Debt per Capita [41]	Availability of Offshore Oil or Gas [42–44]
The Gambia	1	90	39.7	324	Yes
Guinea	4	92.1	22.2	251	No
Guinea-Bissau	1	66.1	55.1	512	Yes
Guyana	1	97.8	17.5	2000	Yes
Haiti	2	98.1	10	176	No
Honduras	9	72.5	30.5	853	No
Liberia	1	100	28.9	196	No
Madagascar	4	96.9	25.5	132	Yes
Mauritania	4	100	40.8	951	Yes
Mozambique	11	88	67	330	
Nicaragua	6	99.6	45.8	980	No
Republic of Congo	6	62.2	51.9	1000	Yes
São Tomé and Príncipe	<1	95.8	44.1	1000	No
Senegal	14	66	52.2	839	Yes
Sierra Leone	1	87.2	31.6	161	No
Tanzania	19	81.8	27	317	Yes
Togo	2	83.8	20.9	208	Yes

In June 2023, the World Bank agreed to suspend debt payments on new loans with Climate Resilient Debt Clauses in the case of extreme weather events, including events exacerbated by climate change [45]. These new loan clauses are, however, not intended to operate as debt forgiveness but instead to provide flexibility in debt repayment. These clauses may leave countries when repayments resume in potentially as vulnerable a financial position as before the disaster event triggering the clause. To pay off debts, some states may seek to pursue conventional offshore energy development. Table 4 also illustrates that most of the HIPCs have some access to offshore oil and gas reserves. Not all of these reserves are currently in production.

From a perspective of deep rather than shallow sustainability, there is a question of whether it might be possible to develop a different approach to dealing with existing public debt loads and energy transitions so that HIPCs can take a different development pathway from developing conventional energy supplies. Sustainable Development Goal funding has unfortunately only made a minimal difference for many of the HIPCs in increasing renewable energy consumption. In Table 5, the capacity of existing country-wide renewable energy for HIPCs is compared in 2016 when the Sustainable Development Goals were adopted with the most recent data from 2022. The proportion of renewable energy in final energy consumption between 2000 and 2020 is also compared to observe general trends in the uptake of renewable energy.

Table 5. Changes in HIPC Installed Renewable Capacity and Renewable Energy Share over time.

State	Installed Renewable Energy Capacity (Watts per Capita) 2016 [17]	Installed Renewable Energy Capacity (Watts per Capita) 2022 [17]	Percentage Renewable Energy Share in Total Final Energy Consumption (2000) [46]	Percentage Renewable Energy Share in Total Final Energy Consumption (2020) [46]
Benin	0.3	2	70.29	46.2
Cameroon	31	30	84.59	78.94
Comoros	1.8	2	69.87	48.29
Cote d'Ivoire	23	43.5	63.72	63.34
Democratic Republic of the Congo	32	30	97.94	96.16
The Gambia	1.6	1	62.86	49.74
Guinea	33	62	85.52	65.77
Guinea-Bissau	.2	1	91.24	87.22
Guyana	60	67	30.56	12.04
Haiti	5.4	7	80.56	76.31
Honduras	158	191	55.24	50.09
Liberia	5.7	18	91.34	92.96
Madagascar	7	7	82.17	84.75
Mauritania	17	26	44.41	23.78
Mozambique	80	72	93.64	80.91
Nicaragua	105	111	58.42	52.13
Republic of Congo	43	40	64.86	71.88
São Tomé and Príncipe	12	12	54.73	41.61
Senegal	4.5	26	47.52	38.64
Sierra Leone	12	13	93.32	75.07
Tanzania	13	11	93.73	83.95
Togo	9.2	15	77.11	76.62

Given an increase in Sustainable Development Goal Funding, policymakers would expect the trend to be a sizable increase in installed renewable energy capacity but the trends for the HIPCs either show little growth in capacity or even a small decrease in renewable capacity due to potentially non-operational energy infrastructure. This is in contrast to renewable energy capacity numbers for European and North American states that demonstrate a positive absolute change from 2016 to 2020 [17]. This inertia has implications for development, climate mitigation, and climate adaptation.

3.5. Proposal for a Debt Relief Program in Exchange for Investments in Renewable Ocean Energy

Current proposals to address the impact on states that are likely to experience climate impacts include a proposal to remove sovereign debt as a form of “loss and damage” payments when a climate-related disaster triggers specific loss and damage [34]. This approach is “too little too late” and ignores the structural fragility of already impoverished countries. While an influx of post-disaster funds can provide immediate and needed relief, this funding will be unlikely to address the larger infrastructure needs that will assist states in making transformative changes to a low-carbon economy.

Instead of debt relief for climate harms, debt relief exchanges can instead be used strategically and proactively to assist publicly indebted coastal states in making long-term investments in low-carbon energy futures. A debt relief program will avoid the problem of waiting on donor countries to exercise political will to provide sufficient funding to multilateral mechanisms. In the recent past, waiting for donor countries to step forward to help other states achieve low-carbon futures through financing has not been an effective strategy for those states who wanted to make a low-carbon transition but could not afford the economic opportunity costs of foregoing carbon-intensive resource development. A good example of this is the Yasuni-ITT project where the Ecuadorian government committed in 2007 to not drill in the Ishpingo-Tambococho-Tiputini oilfield in Yasuni National Park in exchange for international donations that would offset the expected revenue from the oil extraction activities. The donations never materialized and the Ecuadorian government proceeded in 2016 with authorizing drilling in about 0.01% of the park with a daily production of 55,000 barrels a day [47]. Seven years later, in a 2023 referendum, Ecuadorian citizens voted by a majority to ban oil drilling in the region [47]; Ecuador's oil industry had, however, already contributed an additional annual carbon load of about 8,553,957,500 kgCO₂ (8 million metric tons of carbon) that would have been avoided if international donors had given some assistance to Ecuador to cover opportunity costs of not drilling.

Debt swaps, particularly debt reduction for conservation work projects, have been more successful than Ecuador's efforts to solicit international donations. Chamon, Klok, Thakoor, and Zettelmeyer identified over 140 debt swaps including tripartite debt swaps involving an NGO or a new lender and bilateral debt swaps [12]. Most of these programs were relatively small in value with a total value in 2017 of USD 2.6 billion. In many cases, these programs simply replaced old debt with new debt [12].

3.5.1. Structure for Debt Relief for Energy Program

A debt relief program would be structured with a debtor state through either a bilateral or multilateral agreement. Figure 1 illustrates a basic design for a "debt relief for clean ocean energy program". The creditor country or multilateral bank could address its "climate debt" arising from state responsibility through the elimination of debt service payments. These payments would serve as reparation for the omission of adopting effective emission reduction policies and continuing to benefit from high-emission economies. Assuming that a particular state has a reasonable potential for ocean energy production, some pre-negotiated portion of the debt service payments would be invested in siting, building, and managing ocean clean energy infrastructure projects. Where a state has renewable energy development capacity but not expertise, the investment will probably result in joint projects between states, companies, and other private stakeholders (universities) with existing ocean renewable energy development skills. To protect clean energy investment funds from potential theft, the parties could agree that monies previously used for debt service payments would be transferred to an independent escrow account to be released for specific types of mutually agreed upon climate projects. If the funds are not used within a negotiated time period for a state to find a joint partner or undertake the project on its own, the funds would revert to the creditor.

This proposed ocean-focused energy infrastructure program would work well in parallel with recent proposals to forgive debt in exchange for countries investing in adaptation efforts so that climate-vulnerable states can make critical risk reduction investments now [48], to leave undeveloped and unassigned gas reserves in the ground for 10 years [49], and to reduce debt service payments for countries in the Amazon that effectively reduce national deforestation rates [50]. The proposal here for waiving debt payments would ensure a similar measurable outcome but would offer a different approach by triggering the construction and operation of a single infrastructure project. It would offer states an opportunity to reallocate money that might otherwise be used for debt payments into discrete renewable projects designed for a reasonable operational timeline for a large in-

infrastructure project (e.g., 10–12 years). The amount of debt forgiveness would depend on the costs associated with the project which would include training costs to ensure that the development and operation of the project does not become entirely outsourced from the region.

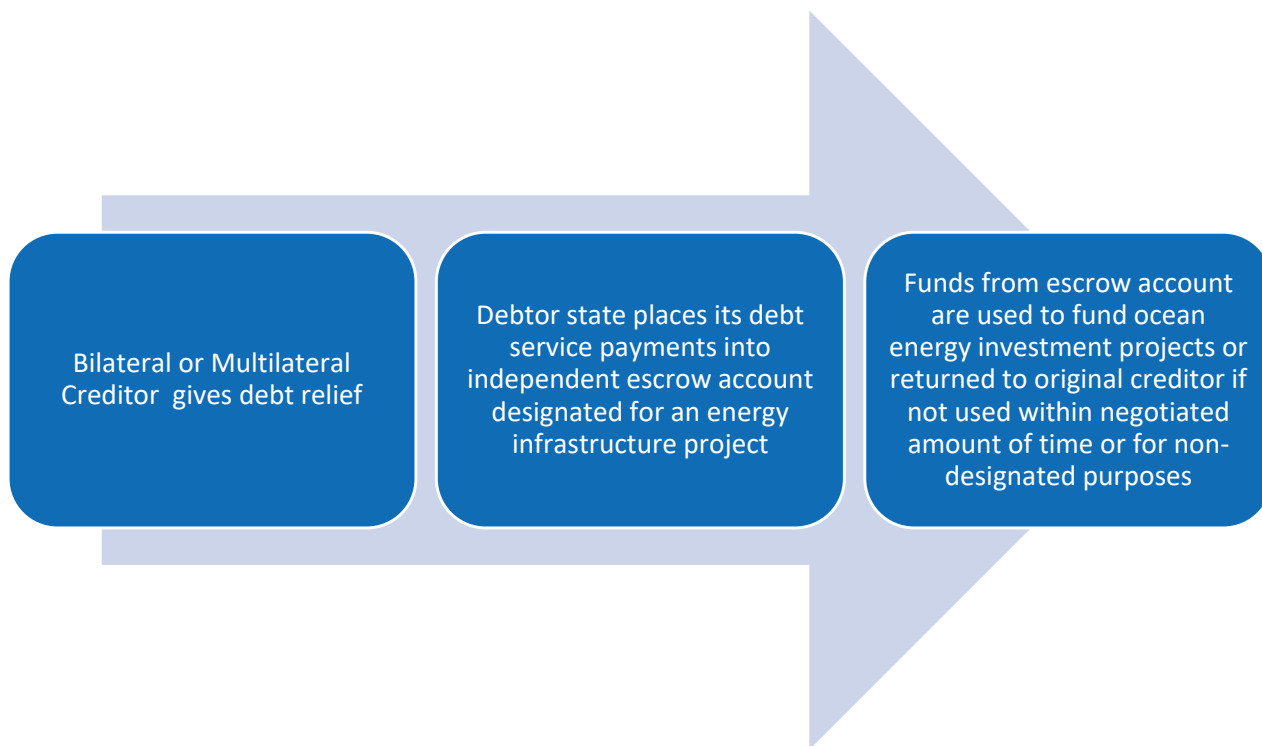


Figure 1. Process for a “Debt Relief for Clean Ocean Energy Program”.

3.5.2. Justification for Debt Relief for Ocean Clean Energy Program

There is a strong interest in seeking investment in offshore wind among several low and middle-income countries even though it is costly infrastructure. In 2019, the World Bank identified the potential for offshore wind construction in low and middle-income countries by evaluating access to sizable financing (USD 10–50 million in costs), plans to create an electricity grid, early investments (projects will take 5–10 years to bring to operation), and regional cooperation [51]. The 2019 report observed that Brazil, India, Morocco, the Philippines, South Africa, Sri Lanka, Turkey, and Vietnam together have the offshore wind potential to generate 3082 GW of energy [51]. This is nearly equivalent to all of the renewable energy capacity available in 2022 [17]. The only country that has actual operational offshore wind based on early investments and electricity grid planning as of 2023 is Vietnam. Renewable ocean energy for other states such as the HIPCs discussed in the sections above, which often carry unsustainable levels of debt, has not been discussed by international policymakers.

Yet, with sovereign debt relief, states such as the HIPCs may be able to make investments that would otherwise be unattainable. In addition to the low and middle-income countries identified by the World Bank as promising sites for wind development, some coastal states such as Mauritania, based on readings from the Global Wind Atlas (<https://globalwindatlas.info/en/area/Mauritania>, accessed on 22 August 2023), have potential high offshore wind rates comparable to the coasts of China and Denmark. Some investors have recognized this potential and are seeking to install a “green hydrogen” hub to develop hydrogen-based fuels for export [52]. While this may have an overall positive development on Mauritania’s economic development, it does not directly address Mauritania’s needs for its own energy transition.

For a country such as Mauritania with USD 4 billion in external debt mostly from multilateral and bilateral aid, Mauritania might work with its creditors to reduce its debts by building an 83.12-MW turbine floating windfarm to generate 1 GW. To construct such a wind farm, assuming development and project management, would be around USD 10.1 million per turbine plus operational costs of USD 1 million per turbine for 30 years lifespan of a wind farm and decommissioning of around a half million per turbine [53,54]. This would be around USD 2.9 billion over the course of the life of a wind farm. A USD 3 billion debt relief package in exchange for an operational wind farm may help Mauritania make an energy transition. As Table 5 indicates, today Mauritania has a smaller percentage of energy produced from renewables in 2020 than it did in 2000, suggesting that Mauritania may also be relying on additional fossil fuel investments to meet its energy demands. One gigawatt of production from a wind farm would meet all of Mauritania's residential electricity needs. Analogizing from the U.S. Department of Interior statistics that a U.S. household of 4 uses 10,655 kw/H and that 1 GW of wind power could supply at least 225,000 such homes [55], the average 4-person household in Mauritania would use 1628 kw/h so that 1 GW of energy would power 1.4 million households and there would still be surplus energy to bring energy to those without energy resources or to invest for other national priorities. Other ocean-based clean energy strategies such as wave turbines or green hydrogen production from seawater might also benefit from investment funds made available after debt relief.

Debt relief for climate action offers a reasonable mechanism for financing investments that are currently financially unattractive for private investors. With sovereign debt relief, creditor governments are repaying some of their climate debt that has accrued as part of state responsibility for failing to meet UNFCCC mitigation obligations. Debtor nations benefit from the potential for achieving energy independence for states. "Debt Forgiveness for Clean Ocean Energy" deals would contribute to energy sovereignty for coastal states by allowing these states to make capital investments to shift to supply energy into their own national and regional markets rather than into the global markets for oil and gas development. One of the promises of renewable energy from both a sovereignty and sustainability perspective will be the localization of clean energy production for national development objectives.

Five aspects of the "Debt Relief for Clean Ocean Energy" proposal are significant. First, this proposal is a legitimate approach to addressing the climate debt created by certain states that have benefited from contributing the most to the cumulative impacts of greenhouse gas emissions. It offers a just transition to a sustainable pathway for nations and regions that might otherwise not be able to capitalize on marine clean energy resources in any meaningful fashion. Second, this proposal scales up financing and restores political sustainability by eliminating what has become inescapable debt. Third, it opens up the opportunity for states to focus future national energy development in spaces where there are less likely to be conflicts with communities over the protection of land for food production or conflicts over terrestrial habitat protection. Acknowledging that developing and operating ocean renewable energy projects can generate conflicts among ocean space users, future projects need to be carefully designed in partnership with stakeholders to protect existing and potentially competing ocean uses including habitat uses, fishing, and shipping. Fourth, the project approach facilitates states receiving needed technology transfers with the political support of key members of the global financial community. Finally, designating debt relief money for specific ocean energy projects will make it easier to measure progress toward specific goals of enhancing energy access while improving ocean conservation. The goals of a clean energy production infrastructure project in contrast to a flexible climate adaptation program will be less open to interpretation.

Pursuing any debt relief package requires a detailed analysis of numerous factors including how much debt would be removed, how many fiscal resources would actually be allocated to ocean energy investment, how to involve stakeholders, and how a debt relief package might otherwise impact a country's balance of payments [56]. There is no

single model debt relief package, but the general idea is for those creditor states who have been enriched by climate emissions and who have failed to mitigate in keeping with their UNFCCC obligation to accept responsibility and compensate by giving debt relief that will enable otherwise heavily indebted states to invest in clean energy investments.

3.5.3. Limitations of Debt Relief for Clean Ocean Energy Program

Critics may argue that the need for the exercise of “generous” political will on the part of creditor nations would make these types of debt relief packages a financial non-starter. While it is true that creditors need to act first to make any debt relief package a reality because the power in the creditor–debtor relationship lies with the creditor, it is worth noting that the monies that would be involved in any debt relief program have already been disbursed from multilateral banks or under bilateral agreements as part of previous loans. Creditors are not being asked for new investments but instead to forego a financial repayment as a signal of recognizing state responsibility for a failure to systematically mitigate emissions. The financial creditor community has already demonstrated some appetite for debt relief through programs such as the 1996 Heavily Indebted Poor Countries Initiative and the 2005 Multilateral Debt Relief Initiative. There is also recent interest expressed by development agencies in creditor nations in deploying some form of “debt swap” for climate financing [16]. These programs, however, have not yet led to comprehensive debt relief, and more efforts are needed. What these programs and agency discussions indicate is some appetite for addressing chronic indebtedness using more innovative tools.

The proposed program “debt relief for clean ocean energy” will not lead to comprehensive debt relief either but would be another step in the right direction. A major challenge for a program will be to ensure that there is sufficient money available from expected debt service payments in order to populate an escrow fund. For some countries already struggling with repayment schedules, it may not be possible to amass sufficient money from redirecting debt payments, and in these cases, it may be better for a country to seek grants. Even for countries where there is debt service money available for energy investment, it will be critical that money in an account is used for renewable energy infrastructure projects and not for other general purposes, which can be tempting given that several heavily indebted states have multiple pressing development needs. Where there is adequate funding available, ensuring that projects are well managed will require adequate domestic technical capacity for financial and project management. For some states, this may prove to be a challenge particularly where there may already be existing governance challenges with combatting financial corruption. One protection that is contemplated in the proposed debt-relief scheme described above is the creation of an escrow account that would limit what disbursements are possible for project expenses.

Some creditor states may prefer to deliver conditional climate grants because they are perceived to be a safer investment in climate projects than debt relief packages [12]. Conditional grants may have fewer transactional costs than a sovereign debt restructuring effort and grants may provide sufficient upfront costs to allow for initial energy investments for a country that is regularly struggling with meeting basic debt service payments. Even with potentially more overall transactional costs, the debt relief proposal, for those countries with sufficient funding freed up from the debt service, has the distinction of giving some agency back to the debtor country over domestic energy planning independent of the preferences of donor countries. A former debtor country that is investing its own money in energy development may generate more national pride and ownership in ongoing energy and sustainability projects.

The problem with relying on conditional climate grants is similar to the overall challenge of a debt relief package. Grants depend on the willpower of creditor nations, which has been weak. If creditors refuse debt relief, many states will not be able to implement Nationally Determined Contributions under the Paris Agreement [12]. If debt relief is not available, indebted states will have to rely on grants which have not been forthcoming. Global climate finance gaps have been a chronic problem for developing countries with

donor countries chronically falling short of meeting the 2009 promise of USD 100 billion annually for mitigation and adaptation for low- and middle-income countries. According to recent reports by investigative journalists, some of this money has apparently been spent in unusual ways including expanding ice cream shops in Asia rather than furthering local basic development [57].

Any proposal such as the “debt relief for ocean energy” proposal in this paper will have financial implications on the economy. A detailed analysis of the financial implications of debt relief proposals on a specific economy is beyond the scope of this paper. It is worth noting, however, that general financial impacts from a policy involving a proposed debt relief package may have political consequences. How a specific government agrees to spend money that is made available under a debt relief package may generate domestic controversy when there are many demands within an already constrained economy. Citizens in a HIPC may have preferences for other priorities beyond large-scale clean energy production. These citizen preferences may be expressed in votes of no-confidence for administrations that negotiate a “debt-relief for clean energy” package when a majority of citizens would prefer to see government funding invested in other development efforts perceived to be more immediate. What this might mean for a debtor country entering into potential debt relief efforts is the need for broad community engagement to ensure that a debt relief effort is domestically viable.

This proposal is not naïve in recognizing that 1 GW wind farms installed in a handful of coastal countries will not offset the pre-existing emissions from more numerous financial creditor states. Much more effort needs to be made by “climate debtor” countries to make amends for continued harm driven by largely unregulated carbon and carbon-equivalent emissions. What is, however, important with the debt relief proposal is that it provides states that have been largely discounted as partners in low-carbon transition the ability to become lead players in national and regional energy transitions. It is both a step for “climate debtor” states to accept responsibility and also for creating conditions within sovereign debtor states for equitable large-scale energy development. If nations genuinely believe in “energy for all” as an equity principle, why should a heavily indebted poor country be the last to have access to large-scale and efficient clean energy?

4. Conclusions

As nations with financial capital built in part from financial enrichment generated by decades of carbon emissions pursue large-scale clean energy solutions, many of the poorest states are still not able to participate in the possibilities of producing large-scale and low-carbon energy. Poorer states that have contributed the least to the current climate peril have few options available to them as part of a clean energy transition due to their ongoing indebtedness to international creditors including public creditors. The most indebted coastal states have access to 0.69% of the available renewable energy even though these states represent 4.6% of the global population.

Solutions to global energy transitions need to recognize the inequity of imposing unsustainable financial debts on millions of people whose governments cannot invest in clean energy because they have to prioritize debt service payments. This paper argues that states that have failed to reduce emissions over the course of decades in compliance with UNFCCC obligations to “adopt national policies and take corresponding measures on the mitigation of climate change” have a state responsibility to remedy their impacts on making a systematic energy transition. One remedy includes providing debt relief that will not lead to more debt restructuring but rather investing debt service payments into clean energy investments. This paper has contributed a “debt relief for clean energy” proposal to waive public debt payments owed to multilateral and bilateral financial institutions in exchange for national commitments from low-income states to make strategic long-term clean energy investments including, where appropriate, ocean energy investments. This paper builds on previous calls from researchers to scale up debt-for-climate swaps [11–14]

and extends the concept to specific large-scale infrastructure efforts that will assist with the energy transition.

With so many countries in endless cycles of debt and with the need to accelerate a global energy transformation, achieving sustainability requires immediate investments not only to allow states to rebuild their social capital as debt-free states but also financial capital to fund capital-intensive startup costs associated with clean energy infrastructure. Achieving these outcomes will only be possible for many states through debt relief that provides states with the opportunity to make long-term investments in sustainable energy infrastructure that has been unattainable under current debt loads.

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per capita); and (11) Our World in Data, Sustainable Development Goal Indicator 7.2.1, available online at: <https://ourworldindata.org/sdgs/affordable-clean-energy> (accessed 30 September 2023) which uses data from <https://unstats.un.org/sdgs/metadata/files/Metadata-07-02-01.pdf> (accessed 30 September 2023).

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Article

Bluer Than Blue: Exit from Policy Support for Clean Marine Energy

Volker Roeben * and Rafael Emmanuel Macatangay

Durham Law School, Durham University, Durham DH1 3LE, UK; r.e.a.macatangay@durham.ac.uk

* Correspondence: volker.roeben@durham.ac.uk

Abstract: The amendment or removal of superfluous government support policies is typically difficult, yet in the ever more important debate on low-carbon (i.e., clean) marine energy policy under the international law of climate action, the law of the sea, and international investment protection, there are additional dimensions of legal or economic peril. Coastal states enact policies subsidising clean energy investments, such as offshore wind energy generation, in their exclusive economic zones or continental shelves. Investors are attracted to the prospect that policies granting subsidies for ostensibly new industries are sufficiently durable. Are such subsidy policies salient or stale? In principle, the purpose of regulatory policy is the promotion of social welfare, and hence, there is an optimal incidence, magnitude, and duration of the subsidy, in essence, an ideal strategy for starting, altering, or exiting such policy. We aim to introduce the concept of optimisation to the design and implementation of regulatory policy in this context. Our contribution is to offer three maxims of optimal clean marine energy law and policy: the efficiency and equity of alternative regulatory arrangements; the continuous optimisation of such arrangements; and the recognition of linguistic entanglements in the law. We test these maxims against the case of clean marine energy policy on offshore wind energy generation. One legal implication for international investment protection is that coastal states should establish a policy exit clause in their investment contracts. Our analysis of policy optimisation is generalisable across policies supporting the transition to sustainable energy forms.

Keywords: policy exit; international law of climate action; law of the sea; international investment protection; linguistic entanglements in the law; offshore wind energy

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1. Introduction

Superfluous policy tends to be difficult to amend or remove. Beneficiaries have an incentive to preserve it, or its victims could be voiceless or have been silenced. Its sunset clause could be missing, poorly designed, or badly implemented. Its mutations in political discourse might have rendered it hardly recognisable or practically invisible, or legislators or regulators may have forgotten its origins. How to deal with it, therefore, even under tranquil circumstances, requires considerable effort.

Yet, in the current debate on the use of marine resources for a low-carbon economy, there are additional dimensions of economic peril in a complex, legal regime of the international law of climate action, the law of the sea, and international investment protection. Within this legal regime, coastal states adopt policies subsidising decarbonisation investments, such as electricity generation from offshore wind plants or the sequestration of carbon in decommissioned oil reservoirs, in their exclusive economic zones (EEZ) or continental shelves (CS). Investors are ultimately attracted to the prospect that policies granting subsidies for ostensibly new industries are sufficiently durable. These policies are enshrined in law.

How to determine if such subsidy policies are salient or stale? In principle, the purpose of regulatory policy is the promotion of social welfare. For example, learning-by-doing spillovers in firms constitute a *bona fide* positive externality meriting a Pigouvian subsidy, and

there is an efficient level of policy support. In practice, firms receiving the subsidy ideally function as regulatory mechanisms delivering social benefits arising from the positive externality. They respond decisively to the commercial opportunities the subsidy has availed for them. Otherwise, they are mere rent seekers inflicting unnecessarily high prices on society, enjoying undue profits under the auspices of the state, and wasting precious resources better used elsewhere. In such a situation, it would be wise to optimise the policy support (i.e., adjust or abolish the subsidy).

Our objective in this paper is to develop a set of first principles (maxims) informing the substance and process of optimal marine energy policy and law in the multi-layered setting of the international law of climate action, the law of the sea, and international investment protection. Under our approach, policy is a contract, and the state and the investors are contracting parties. Deploying the tools of law and economics, we characterise the contractual behaviour of the state as an optimising agent in the face of potentially stale policy. The state offers a contract, the subsidy policy, to investors, and continues to perform on it, *as long as* they are willing and able to pursue the efficiency gains from genuine positive externalities. In the undesirable event of rent seeking, the prudent response of the state, invoking the concept of optimal breach, is to change or end the contract (i.e., alter or withdraw the policy support). There is, therefore, an optimal incidence, duration, and magnitude of the subsidy, and, by ricochet, an ideal exit strategy for unnecessary policy.

Our main contribution is to advance three maxims of optimal marine energy policy and law on low-carbon resources: the efficiency and equity implications of alternative regulatory arrangements as the drivers of state action; the continuous optimisation of the coastal state's policy portfolio; and the recognition of linguistic entanglements in the law. One legal implication for international investment protection is that coastal states may have to establish a policy exit clause in contracts for investments in their EEZs or continental shelves.

Section 2 explains the complex governance of marine resources governing a transition to a low-carbon economy under the international law of climate action, the law of the sea, international investment protection, and the domestic law of coastal states. Section 3 develops our three maxims of optimal marine energy law and policy making for coastal states within this regime. Section 4 provides a case study on offshore wind energy in order to test these doctrines. Section 5 develops the legal implications for international investment protection law. Section 6 offers conclusions and areas for further research.

2. The Governance of Marine Energy Resources in the Transition to a Low-Carbon Economy

Marine resources will be playing a crucial role in the transition to a low-carbon energy economy. Offshore wind electricity generation has long been recognised as a low-carbon option [1]. Technological advances of placing windfarms in ever deeper waters offshore, the falling costs of a maturing industry, and the laying of large interconnected offshore transmission grids have massively expanded capacity at scale. Marine resources are also essential to the decarbonisation of fossil fuels. The carbon that these fuels emit upon combustion can be captured at source, and then, safely sequestered. The cavernous space required for such sequestration is available offshore in decommissioned oil or gas reservoirs under the seabed. That space itself becomes a marine resource. A number of projects to deploy this technology at scale have now been launched [1]. Harvesting these marine resources for offshore electricity generation and carbon sequestration projects will require largescale investments, mostly private, and from both domestic and international investors. The question for the coastal state is which policy, to be enshrined in law, will incentivise the appropriate investment.

The starting point is that these marine resources are subject to complex governance that both enables and constraints the coastal state in this policy and law-making. This governance sets the parameters for the regulation, the exploitation of, and investment in these resources as well as the coastal states' support. The applicable international law

comprises three separate but interacting layers of law, the international law of climate protection, the law of the sea, and international investment law. Each will be described in turn.

The international climate regime establishes the responsibility for states. The use of marine energy, primarily offshore wind energy, as a climate change mitigation strategy has been a global consensus and politically required by the Johannesburg Plan of Implementation [2], the outcome document of the Rio + 20 conference on sustainable development [3], and Agenda 2030 [4]. This consensus is concretised by the international law of climate action, a regime formed of the UN Framework Convention on Climate Change (UNFCCC), the Kyoto Protocol, and the Paris Agreement. Under the 2015 Paris Agreement, States Parties have to pledge policies to progressively reduce carbon emissions, as so-called Nationally Determined Contributions. These will need to include policies on increasing renewables [5]. The climate regime thus provides the impetus for states to engage in offshore wind energy exploitation through ancillary infrastructure. To realise this objective, however, the climate regime looks to other international law, the law of the sea, and the law of investment protection.

The 1982 UN Convention on the Law of the Sea (UNCLOS) [6] is the international law framework for all marine energy resources [7]. It allocates competences to states to regulate and exploit these resources. The Convention does so through a zonal approach. Under that approach, the Convention defines certain zones—the Territorial Sea (TS), the Exclusive Economic Zone (EEZ), the Continental Shelf (CS), and the High Seas—and within these zones, competences are allocated either to a single state, the coastal state, or to all the states (the flag state principle) [6]. Most clean energy activities are taking place within 200 nautical miles off the coast, that is, within the TS, the EEZ [8], and the CS of coastal states. These zones define competences specific for each clean marine energy resource.

UNCLOS allocates exclusive competence to the coastal state over wind energy within the TS of 12 nautical miles, but also much further offshore where the most powerful offshore wind energy is now being harvested through floating platforms. The provisions on this use of the water column are found in Part V of UNCLOS on the EEZ. Article 59 provides that the coastal state has the exclusive (sovereign) right to exploit the non-living resources of the water column of the EEZ, including wind energy. This pertains both to regulation of wind energy production and reaping its economic value when fed into a grid by way of submarine cables. The coastal state is also the competent regulator for the above-water ‘installations or structures’ for wind energy plants in the EEZ, in accordance with Articles 60(1)(b) and 56(1)(a) UNCLOS. The coastal state’s comprehensive rights in relation to such installations are set out in detail in Article 60(2)–(8) UNCLOS, which, by virtue of Article 80, are also applicable to the continental shelf. Such plants generate electricity that needs to be transmitted to the onshore grid by cable using high voltage direct current technology. In line with the flag state principle, the Convention provides that all states have the right to lay such cables in the EEZs of all states, even though coastal states often do claim the authority to regulate [9].

These Convention rules seem static, envisaging each coastal state exploiting marine energy resources under their jurisdiction within the TS and EEZ. However, the Convention provides the legal clarity as to which state may do what, which enables cooperation to exploit these marine resources also in a transboundary manner. To achieve a socially optimal outcome for all, states should cooperate to ensure that resources of offshore power are developed as joint and hybrid projects connected to the onshore grid of several states across jurisdictional lines. This requires agreement between the littoral states, either informally or formally. Several models are emerging. An example of an informal agreement is the North Seas Energy Cooperation of Belgium, Denmark, France, Ireland, Luxembourg, the Netherlands, Norway, Sweden, Germany, and the European Commission. These states are cooperating, within an EU law framework, to tackle barriers to the deployment of multinational offshore wind energy projects, arriving at non-binding intergovernmental agreements that are then implemented in domestic law [10]. A governance mechanism to

arrive at a binding agreement is conciliation. Under UNCLOS, the successful conciliation between Timor-Leste and Australia brought forth a treaty on the joint exploitation of trans-boundary resources with limited third-party design or planning [11,12]. While this instance concerned a fossil fuel marine resource, the mechanism of conciliation can be employed voluntarily by states speedily to arrive at arrangements for shared clean marine resources as well. In this model, the conciliation commission, shaping for itself a “light-touch” role in an intrinsically collaborative process, hears the arguments of disputing states and makes proposals in order for them to freely reach and adhere to an amicable arrangement that puts jurisdictional disputes or questions to one side.

In addition to these enabling rules, the Convention enshrines constraints for protection of the marine environment. Part XII UNCLOS obligates coastal states (as well as all other states) to protect and preserve the marine environment in their EEZs and CSs [13,14]. In so doing, they must respect the rights of third states (Article 194(4) UNCLOS). This general but binding obligation [15,16] is concretised by specific standards [13]. These relate to controlling pollution of the marine environment, including the introduction of ‘energy’ (Article 1(1), (4) UNCLOS); controlling pollution from ‘the use of technologies under their jurisdiction or control’ (Article 196(1) UNCLOS); and minimising pollution ‘to the fullest possible extent’ from ‘installations and devices’ operating in the marine environment (Article 194(3)(d) UNCLOS). ‘Installations’ includes floating platforms. Protection and preservation of the marine environment encompasses measures for preventing accidents, dealing with emergencies, and ensuring the safety of operations by regulating the design, equipment, and operation of installations or devices. Measures must also be taken in the planning and operation of the offshore activities to protect and preserve rare or fragile ecosystems as well as the habitat of depleted, threatened, or endangered species and other forms of marine life (Article 194(5) UNCLOS). These obligations of due diligence depend on the level of risk and the activities involved and may vary over time [14,17,18]. They are concretised by principles, such as ‘use of best environmental techniques’ [17] and ‘the precautionary approach’ [17]. The Convention prescribes environmental impact assessments, if only in general terms [17]. Legislation to prevent, reduce, and control pollution of the marine environment from controlled activity must be no less effective than international rules, standards, and recommended practices and procedures [19]. Competent to develop such rules and standards are regional marine organisations, such as the OSPAR Commission for the North East Atlantic [20].

States are obligated to cooperate. In its provisional measures order in *MOX Plant*, the International Tribunal for the Law of the Sea emphasised that “the duty to cooperate is a fundamental principle in the prevention of pollution of the marine environment under Part XII of the Convention and general international law [21]”. Where an area meets the definition of an enclosed or semi-enclosed sea contained in Article 122 UNCLOS, then Article 123 UNCLOS provides that the states bordering such seas should cooperate in the exercise of their ‘rights’ under the Convention to ensure effective marine environmental protection. The North Sea and the South China Sea are examples.

A third layer of international law relates to investment protection. Deployment of offshore wind energy generation capacity at the desirable scale necessitates attracting private, foreign direct investment. International investment law then protects such investments against unjustified interferences by the host state. The withdrawal of a subsidy for renewable energy projects granted originally by the host state to the investor has become a widely litigated problem. Particularly, but not exclusively, under the 1994 Energy Charter Treaty, there has been a host of such cases. Broadly, these have drawn a line between the simple withdrawal of a subsidy and those instances where assurances were given. Only those then entail a duty to compensate the investor. It is fair to say, though, that the arbitral tribunals have not always been consistent in their assessment and that the law remains somewhat unclear [22].

It results from the above that coastal states have the competence, and pursuant to the Paris Agreement, the responsibility, to design policies and law to ensure that the

marine resources located in their EEZ and CS are effectively used for the purposes of a climate-friendly energy transition. The principal international constraints the coastal state would face in exercising this competence result from the environmental protection obligations under UNCLOS, international investment protection law, and regional EU law where applicable.

3. Optimising Marine Energy Policy and Law

After explaining the legal parameters of international climate change law, the law of the sea, and international investment protection, we now analyse three maxims of optimal marine energy policy within these parameters: the efficiency and equity implications of alternative regulatory arrangements as the drivers of state action; the continuous optimisation of the policy portfolio; and the recognition and reduction of linguistic complexity in the implementation of policy through law.

3.1. Alternative Regulatory Arrangements

Our first maxim concerns the choice of state action in a policy situation. In fact, there is a choice, which needs to be justified, as to whether the state should act to support at all, and in what form.

In principle, policy is justified if there is market failure (necessity) and if the costs of policy are less than the costs of leaving the market failure uncorrected (sufficiency) [23]. There is essentially a trade-off between the costs of enacting policies to correct market failure and the costs of ignoring it [23]. In practice, however, the key issue is how to assess the relative costs of market and state failures, especially because policy beyond the correction of market failure is generally difficult to justify [23].

Market or state failure is rooted in a trespass of the boundary between the firm and the market or that between the market and the state. The first boundary is a function of the competitive process and discovery. Competition amongst firms determines the extent of the market, and a similar process of entrepreneurial discovery not only defines the reach of the hierarchical firm, but also determines the scope of activities performed through markets (rather than through hierarchies) [24].

The second boundary is a function of freedom and self-determination. The benefit of freedom lies in the emergence of non-designed or freely grown institutions limiting the scope of the market and favouring state action for purposeful and valuable decisions on resource allocation. Most developed economies have nurtured the growth of institutions tightly controlling markets for the delivery of childhood education, health, or pensions [24]. Economies with strong trade unions, large welfare states, or significant regulation perform well on metrics concerning democracy, civil liberties, or innovation [24].

One of the major determinants of market or state failure, then, is the regulatory arrangement arising from state action. There are many illustrations of regulation without or with minimal state action. Regulation is conceptualised as part of the set of services provided by (instead of “done” to) the market, and the discovery of regulatory organisations naturally occurs during an entrepreneurial process [25]. It is certainly feasible to provide regulation within markets, such as finance, the accountancy profession, or sports. Obviously, state regulation is necessary in the case of natural monopoly, a form of market failure requiring the application of economic regulation to such bottleneck facilities as electric power transmission systems, natural gas pipelines, etc. Otherwise, state regulation is not necessarily needed to correct market failure [25], especially if the costs of state regulation exceed those of other regulatory organisations. Conciliation or informal agreement amongst (disputing) states is yet another example of spontaneous or emergent order constituting a regulatory arrangement in lieu of markets or state government [26]. Thus, in principle and practice, there are suitable regulatory arrangements available, such as a common or the provision of regulation within markets, each of which is demonstrably consistent with the quest for efficient and equitable outcomes. Indeed, if the state decides to not act, the risk of inefficiency or inequity does not inevitably escalate.

As a start, let us consider a common, involving the absence of (or a limited scope for) state action. A famous example, based on the work of Elinor Ostrom [27], shows the potential to escape from tragedy in a common. Trust, reciprocity, and reputation enable individuals owning property in common to approach the socially optimal levels of harvest or extraction [28]. A common, featuring group ownership, a narrowly defined group, and the exclusion of non-members, is “an efficient form of governance” (as opposed to open access, featuring no ownership, a broad definition of community, and no exclusion) [28]. In short, tragedy is avoidable in a common. A clear structure of leadership and the occurrence of repeated exchanges in a community, constituting a governance arrangement distinct to market creation (and the establishment of associated property rights), taxation, or regulation, support the pursuit of resource stewardship [29].

The pattern emerging from the discussion of market or state failure is that the menace of inefficiency or inequity largely depends on whether or not the resulting regulatory arrangements, in the effort to correct market failure, respect the boundaries between one social organisation and another. Demarcating that boundary is the province of the principle of subsidiarity. It can guide policy.

Under the principle of subsidiarity, generally, higher levels of aggregation empower lower levels of aggregation to determine themselves [30]. This applies to several political organisations that have concurrent or shared competences to act. In the context of the EU, for example, the EU should act only if Member States cannot sufficiently achieve a certain objective (necessity) and if it can be better achieved by the EU (added value). This is a legal obligation [31], which the EU has operationalised procedurally and which informs its bottom-up approach to energy policy [32,33]. In fact, subsidiarity is a shared principle of the EU and its decentralised member states for their national energy policies [34].

A broader implication of the principle of subsidiarity is that it protects the freedom and creativity animating individuals to take responsibility, in the spirit of ownership and initiative, for their future. Indeed, under the necessity and added value conditions of subsidiarity, the protection of freedom, creativity, ownership, and initiative enhances the momentum towards efficient and equitable outcomes across alternative governance arrangements, such as a common, regulation within markets, property rights and market creation, contracts, or a variety of regulatory regimes. For example, under a common, individuals often can communicate and cooperate in the establishment of institutions feasibly supporting the sustainable use of shared resources. In a market, buyers and sellers establish a spontaneous order through property, contract, and justice [35]. In the spontaneity of a market process, the “miracle” of the price system, in which an equilibrium price is eventually discovered between buyers and sellers having different valuations at the outset, reveals the scarcity of resources and directs them to their best use [35]. As a result, under a market-based policy, the parties closest to the buying or selling exercise their creativity in response to the market signals supporting the pursuit of social welfare maximisation. Even under tax or regulatory regimes, the potency of underlying incentives hinges on the degree to which local actions, such as the determination of the appropriate tax rate, the abatement decisions of relevant entities, or the oversight responsibility of local organisations, are initiated fittingly from the lowest levels of aggregation (rather than imposed imperiously from above). In other words, the principle of subsidiarity, in light of its extemporal affinity for the agency of freedom, creativity, ownership, and initiative in individuals nearest to the matter at hand, is the engine propelling alternative arrangements towards efficiency and equity.

If the state decides to intervene, the threat of inefficiency or inequity depends on the form of state action. Indeed, market or state failure happens, and it makes sense to reckon the net social benefit of different policies [29], such as the pricing of carbon (e.g., the creation of markets or the imposition of Pigouvian taxes), investment or production subsidies for low-carbon alternatives, or the establishment of command-and-control regulation (e.g., technology or performance standards). For example, under the 1970 Clean Air Act (and its amendments thereafter) in the USA, there are various types of policy

instruments, such as emissions trading, Pigouvian taxes, and technology or performance standards (i.e., command-and-control regulation) [36]. Under an emissions trading system (e.g., cap-and-trade), allowances collectively constraining the overall pollution level are initially distributed to polluters, and polluters managing to control their emissions below their allowable levels could sell their surplus allowances or bank them for later use. Polluters have incentives to abate until their marginal abatement costs equal the market price of tradable allowances, and the overall pollution constraint is then met in a cost-effective manner [36]. However, the use right under a cap-and-trade system represents a privilege of usage (rather than a genuine property right), is not tradeable independent of the productive activity, and in need of political or bureaucratic management [29]. The SO₂ trading programme in the US was cost-effective and is widely deemed a success [36], yet, the withdrawal of the banking facility for particular allowances, a worrying sign of regulatory volatility, damaged the credibility of the created asset and prompted a loss of value estimated at \$3 B [29]. The European Union's Emissions Trading System applies the cap-and-trade idea to carbon emissions by stationary facilities in the EU. The European Commission administers the system. It has successfully withdrawn excess allowances to ensure the workings of the price mechanism [37,38].

Under a Pigouvian tax regime, the tax per unit of pollution is ideally equal to marginal social damages at the efficient level of control [36]. In theory, even if damages could not be measured, imposing an identical tax on all sources reduces emissions to the point at which marginal abatement costs are equal to the tax, and the necessary condition for cost effectiveness is thus satisfied. Despite the theoretical advantages of a Pigouvian tax, however, the appropriate tax rate is difficult to determine, and abatement, in essence, the response of polluters to a particular tax rate, is inherently uncertain.

Under command-and-control regulation, the state has to know the abatement costs of all polluters in order to allocate the responsibility for emission control in a cost-effective manner. Yet, the state is highly unlikely to have such detailed knowledge, and command-and-control regulation, therefore, is hardly ever cost-effective. Indeed, regulation is efficient if the costs of regulatory alternatives are less than those of defining and enforcing property rights and establishing and operating the associated markets [29]. To an extent, organisational subsidiarity provides a remedy. One advantage of the devolution of environmental oversight is that local agencies may have better information on local conditions or preferences than national authorities, and monitoring and enforcement could then be properly customised [39]. Thus, most of the environmental permitting, inspection, or sanction activities in the US are devolved to state or local authorities [39].

In summary, our first maxim demonstrates that, in the event of state action, the form of state action, bringing about alternative market or regulatory arrangements, is a fundamental driver of the inefficiency or inequity of outcomes.

3.2. Continuous Policy Optimisation

Our second maxim pertains to the continuous optimisation of the policy portfolio, if the state decides to intervene under the first maxim. Policy optimisation introduces the element of time or duration of a support policy. Over that duration, the state has to introduce, modify, or withdraw policies, individually or in combination, in pursuit of social welfare maximisation. It has to manage its portfolio of policies. Thus, the introduction, modification, or withdrawal of policies optimised continuously as a portfolio over time is integral to government.

The introduction of a policy subsidising socially profitable investments in low-carbon technologies is based on the need to compensate the learning-by-doing spill-overs arising from cumulative production [40]. The learning rate, in particular, is a crucial determinant of whether or not a given pattern of such investments is justified. There is a variety of positive learning or production externalities, such as the increase in the productivity of workers as a result of training, or the complementarity between local technology and foreign capital [41]. There is uncertainty about past and future learning rates and their fundamental

drivers, and the gains from learning could be unfairly dispersed. In the presence of information externalities, for example, only the entrepreneur bears the investment cost if an innovation fails, but others imitate for free if it succeeds. As a result, if there is a propensity for “socialised benefits but privatised costs,” an entrepreneur may be unduly discouraged to invest in optimal levels of innovation and current or future learning rates would likely suffer.

It is imperative for firms granted a bona fide Pigouvian subsidy to efficiently generate the learning-by-doing spill-overs and monetise, akin to the function of a regulatory mechanism, the social benefits envisioned under the policy. Otherwise, failing as conduits of policy benefits, they would have succumbed to rent seeking, and it would be sensible to adjust or remove the subsidy to mitigate the risk of economic harm. Indeed, suppliers of goods or services required for compliance with a policy obviously have an incentive to perpetuate it [42], and there is evidence that the inadvertent continuation of credit subsidies initially established to correct a genuine market failure supports unproductive entrepreneurs and blocks the entry of productive ones [43].

The control of rent seeking, then, is one of the most important reasons for the continuous optimisation of a policy portfolio. In principle and in practice (in light of the experience of East Asian capitalist economies), the design of incentive systems, regardless of the specific instruments, should be targeted, have performance conditions, include monitoring against benchmarks (e.g., price and quality of imported substitutes), and have clear exit mechanisms (e.g., sunset clauses) [23]. Indeed, California subsidised solar installations at first, but eventually phased them down to avoid the subsidisation of a commercial technology [41].

Making do with less efficient or suboptimal policies dilutes or sacrifices economic gains, yet inefficient or suboptimal policy seems ubiquitous. Pricing carbon, for example, is a first-best policy, but tends to be politically difficult [38]. If a carbon tax, the ideal approach, is enacted, subsidies for the promotion of renewable energy (e.g., investment or production tax credits) could be eliminated, and the savings from their elimination in the US could reach approximately \$3 B a year [44]. The incremental cost of performance standards relative to a cap-and-trade system can be large [41]. An increase in a renewable portfolio standard shrinks the contribution of fossil fuels to the generation mix, but reduces the demand for emission allowances (and associated emission prices under a cap-and-trade system) [41]. In addition, opposition to the establishment of transmission lines traversing multiple state jurisdictions in the US could constrain the use of low carbon electricity, such as wind energy from the Midwest or hydroelectric power from Canada [41].

State action may also end up leaving “money on the table”. For example, in the presence of coordination externalities, there is a need for simultaneous upstream and downstream investments, especially if scale economies are significant [23]. In such a situation, there is a justification for the state to bear some risk, but the state, unlike a venture capitalist, often fails to earn a financial return on risk-bearing policy that ultimately enables the private sector to make a profit. As a result, if there is a propensity for “privatised benefits but socialised costs,” public R&D may be underfunded [23].

There is also a non-trivial risk of economic damage arising from state inaction. Consider a natural experiment inadvertently conducted in Ontario, Canada in 2010. Given the nature of a Feed-in Tariff programme, the challenge is to manage the risks to the timely and reliable estimation of the shadow value of the renewable energy contract. In Ontario, in order to develop a FIT price schedule, assumptions on project costs (i.e. capital, operating and maintenance, and connection costs) and efficiency are made on the basis of consultant studies and professional judgement [45]. In February 2010, the Ontario Power Authority (“OPA”) recommended a cut to the FIT price paid for power from micro FIT ground-mounted solar projects in view of its unexpected popularity at 80.2¢ per kWh (providing a 23% to 24% after-tax return on equity instead of 11% intended by OPA) [46]. The recommended price cut was not implemented until August 2010 [46]. Between the recommendation to cut prices in February 2010 and the announcement of the price cut in July

2010, OPA received more than 11,000 applications [46]. Because the government decided to grandfather the price in order to maintain investor confidence, all of the applications, if approved, would qualify for the original rather than the revised price [46]. If the revised price was implemented when it was first recommended by OPA, the cost of the program could have been reduced by about \$950 M [46].

A continuous process of policy portfolio optimisation, therefore, provides opportunities to control the hazard of rent seeking or state failure (due to action or inaction), add (or enhance the powers of) a sunset clause in policy, and minimise the dilution or sacrifice of social benefits. This goes beyond the matter of ideal social welfare maximisation. Political leaders, akin to financial asset managers making investment choices, consider the risk and return of competing policy priorities [47]. Responding to the day-to-day problems or opportunities of statecraft, they conduct a significant rebalancing of their policy portfolio across election cycles, not only to stabilise the returns to their policy capital, but also to preserve the stock they had upon an electoral victory [47,48]. Policy portfolios surely have very good reasons to evolve. In the context of climate change, a transition away from less efficient policies in the US is likely to bring huge social benefits, but political factors could hinder the immediate acceptance of a greenhouse gas pricing policy [41]. If policy choices had been more efficient than they were, the benefits of clean air legislation over the past 50 years in the US could have been achieved at a much-reduced cost [49].

3.3. Reducing Legal Complexity

Optimising policy entails legal change, in the shape of amending existing or adopting new regulation. In either case, change raises the risk of legal uncertainty, potentially undermining expected welfare gains. That risk, arising from a lack of rules or an excessively detailed structure of the law, is likely to impede the introduction, modification, or withdrawal of policies optimised continuously as a portfolio, and tends to have a large linguistic element. The third and final maxim thus pertains to the recognition and avoidance of linguistic entanglements in the law.

In principle, law is text and language, a collection of words constituting a network of references across multiple domains, such as statutes, precedents, treatises, opinions of non-legal experts, and facts [50]. The contextualisation of words in the process of introspective inquiry under the law leads to the construction of legal norms [50]. In practice, however, the law over time has evolved into a corpus of legal code [51]. There are various issues affecting the comprehensibility of legal code, such as the length or simplicity of sentences (conciseness); the scope of revisions bringing unexpected or unintended effects (change); the extent of dependencies across different titles, sections, sub-sections, clauses, or other subdivisions (coupling); and the preponderance of conditional statements, exceptions, or special cases (complexity) [51]. These issues arise in all legal settings. In a contract, for example, parties clearly have an incentive to use plain and intelligible language, especially in the event of regulatory scrutiny, adjudication, or enforcement [52]. Complex regulation requiring much effort to comprehend could heighten the level of uncertainty if full comprehension is not achieved [53]. Indeed, failures in regulatory design are largely a function of cognitive processing complexity [53].

Yet the search for the ordinary meaning of legal text appears to require extraordinary effort. Legal theorists and practitioners routinely assess the ordinary meaning of the text in the process of interpreting legal documents, including but not limited to contracts, statutes, regulations, treaties, or constitutions [54]. If, for example, dictionary definitions do not map to an ordinary meaning (and, instead, map to the dictionary's notion of "desirable meaning"), there could be huge consequences, especially because disputes over legal interpretations typically "turn on questions about subtle shades of meaning [54]". Disconcertingly, the evidence from experiments involving a wide variety of individuals indicates that dictionary definitions, legal corpus linguistics, or "scientific measures of meaning," in principle, may not be reliably used to find straightforward interpretations of the ordinary meaning of legal texts [54]. Thus, potentially bringing serious economic conse-

quences, an increasingly complex corpus of law has elevated the likelihood of linguistic entanglements, in fact, increasing the occurrence of inconsistencies or obfuscations within or across sections, articles, or provisions.

Regulatory complexity is an externality imposing incongruent cost burdens on the drafters of regulation and the entities struggling to comply with or enforce it. Of course, not all instances of regulatory complexity have brought economic disappointment. Air pollution regulation in the US, for example, has increased in complexity since the 1970 Clean Air Act [41], potentially putting a substantial regulatory burden on affected firms, yet the benefits seem to have far exceeded the costs [48]. Yet the social costs of regulatory complexity ought to be reckoned [51]. Various metrics, such as reading scores, are used to determine the difficulty for an average individual to understand contractual language [51]. One of the most important metrics concerns a vagueness–precision spectrum involving, at one end, ambiguous terminology (e.g., “reasonable” or “adequate” under prudential regulation) whose meaning is clarified in a specific context and, at the other end, numerical indicators, such as currency or percentage [51]. There is evidence, for instance, that linguistic complexity in banking regulation is clustered in a few provisions, possibly a result of an effort to incorporate additional commercial realities in the aftermath of the 2008 financial crisis [51].

There is, therefore, an optimal amount of detail, striking a balance between the marginal benefit of transparency and the marginal cost of regulatory complexity, and consequently facilitating the exercise of creativity and innovation in the context of social welfare maximisation and a continuous process of policy portfolio optimisation. The optimal amount of detail in the corpus of legal code is the point at which the marginal benefit of transparency is commensurate to the marginal cost of regulatory complexity. One approach, using the tools of linguistics, is to measure the dimensions of complexity. Vagueness, viewed in terms of processing complexity, is resolved partly through a reference to a particular context, such as a precedent or market practice [51]. Another approach, relying on the notion of comprehensibility, points to the principles of conciseness, change, coupling, or complexity [50], as mentioned above. The difference between, on one hand, humans interpreting and implementing the law and, on the other hand, computers interpreting and implementing software is a matter of degree rather than kind, but since humans are more flexible and intelligent than computers, the law does not have to be as explicit or precise as software [50].

4. The Case of Offshore Wind Energy Generation

We now review the case of offshore wind energy generation in light of our three maxims. Our main inference is that the maxims provide sensible and clear guidance on when to engage in, modify, or exit from support policies. We draw on UK, US, and EU policy examples.

There are policies of support for offshore wind plants through carbon pricing or subsidies for investment or production. Does the prevailing regulatory arrangement support the aspiration for efficiency and equity, assist in the continuous optimisation of a policy portfolio, or manage the menace of linguistic entanglements? Our starting point is the regulatory framework. The proper pricing of environmental externalities, one of the most important market failures in energy markets, is the most efficient policy [55]. The key question is how to put a price on carbon over time. A group of economists has affirmed that a carbon tax calibrated not only to increase yearly until emissions reductions goals are met, but also to be revenue neutral, would encourage innovation, quicken the spread of carbon-efficient goods or services, replace less efficient and cumbersome carbon regulations, and establish regulatory certainty for clean energy investments [56]. However, there is theory and evidence that the carbon price should be high today and fall over time, as both the cost of emissions reductions (due to technological change) and the “insurance” value of mitigation decline [57]. A falling carbon price path highlights both the importance of near-term action and the huge costs of delay [57]. In the US, an enhanced emphasis on

near-term implementation issues changes the cost rankings of climate policy alternatives, and the attractiveness of some previously disregarded climate policies, therefore, could improve [58]. Thus, operating as a portfolio, policies supporting innovation to cut the cost of low-carbon technologies may have to go hand-in-hand with a robust carbon price, if politically feasible.

In the US, due to political considerations, amongst other factors, the level of carbon pricing might be socially suboptimal at the start but can increase over time, and less-efficient policies in the portfolio could then be scaled down [41]. Of course, policy influences and responds to market conditions, and therefore, flexibility is crucial. For example, in the event of abundant natural gas from shale, local air pollution and greenhouse gas emissions are reduced, but the deployment of renewable energy is weakened, and the emissions reductions are less than those from a carbon price rising linearly to approximately \$46/tCO₂ in 2040 [59]. In other words, lower carbon fuels in the global energy market are another area for optimised policy support.

Given the political difficulties potentially hindering the implementation of a carbon price, the next best policy is to promote low-carbon technologies, such as wind or solar, for electricity generation [50]. Investment or production tax credits for renewable energy projects make sense only if carbon is not taxed [41]. Actually, in the struggle against global climate change, pricing carbon (or other greenhouse gases) is unlikely to be enough, especially if political challenges get in the way, and subsidising innovation to drive down the cost of low-carbon technologies is probably necessary [60]. There is theory and evidence, for instance, that reducing carbon emissions is feasible only through a successful transition to clean technology [61]. The optimal policy relies heavily on research subsidies, and using carbon taxes alone or delaying intervention has significant welfare costs [61]. In addition, most greenhouse gas emissions are from developing countries where a large carbon tax not only slows the climb out of poverty, but also seems less politically acceptable than in developed countries [41].

Fortuitously, the reductions in the costs of low-carbon technologies, such as wind or solar, and their subsequent deployment have been faster than expected [62], regardless of the debate on the attractiveness of subsidised investments or the extent of beneficial free-riding. In the US, federal subsidies for renewable energy, including biofuels for transportation and renewable electricity generation, fell by 56% between FY 2013 and FY 2016 [63]. In the UK, offshore wind prices resulting from an auction in 2017, at £57.50/MWh and £74.75/MWh, were lower than the cost of new nuclear power of £92.50/MWh or the levelised cost of gas-fired power plants [64], and offshore wind prices resulting from another auction in 2019, as low as £39.65/MWh, were approximately 30% lower than those resulting from the 2017 auction [65].

Yet policy support for low-carbon technologies is likely to continue for some time. The UK has the largest share, approximately 34%, of offshore wind capacity in the world, and is advocating a “modern Industrial Strategy” to establish up to 30 GW of offshore wind generation capacity by 2030, create thousands of high-quality jobs, foster a strong supply chain, and promote a five-fold increase in exports [66]. In the UK, the anticipated investments in offshore transmission assets, between £8 B and £20 B by 2030, are higher than those in onshore transmission assets [67]. Moreover, the adjustment (if not optimisation) of the policy portfolio has to account for the possible response of investors. In the UK, there is a recommendation to develop contingency plans bringing forward additional low-carbon generation in the event of a delay or cancellation of planned projects [64].

In the US, federal subsidies for renewable energy, including biofuels for transportation and renewable electricity generation, received 46% of total federal energy subsidies in FY 2016 [50]. Federal tax credits, such as the Investment Tax Credit (“ITC”) and the Production Tax Credit (“PTC”), are key drivers of investments in wind or solar projects in the US [68]. In modelling simulations going out to 2050, the extension of the ITC/PTC results in 40% more wind generation than in the reference case, but wind projects are built later (rather than earlier) in the study period [68]. By contrast, the immediate sunset of the ITC/PTC

results in lower wind generation than in the reference case, but wind projects, in order to claim the credit, are built earlier than market conditions would otherwise support [68].

In general, likely rooted in linguistic entanglements, the imbalance between the marginal benefit of transparency and the marginal cost of complexity in regulation has elevated the risk of misperceiving the social implications of energy regulations. For example, in the US, "... statutory and regulatory concessions to fossil energy inevitably distort how the costs of bringing new energy technologies to scale are perceived. Costs for both fossil and renewable resources are clearly mis-calibrated, with social costs of fossil energy still unaccounted for in terms of price, and environmental and health benefits of renewable energy going mostly unrecognised in economic terms [69]". Indeed "To date, energy regulators have at times operated within their silos without fully considering how their regulations interact with — and often conflict with—approaches adopted by other regulators [69]". In particular, the Inflation Reduction Act of 2022 ("IRA"), seeking to transform the US energy landscape through incentives promoting clean energy technologies in the electric power, transportation, and buildings sectors [70], does not seem to be immune to linguistic entanglements and the inefficiencies and inequities they tend to bring forth. The IRA provides an opportunity for additional financial incentives if clean energy projects are located in an "energy community" ostensibly suffering from the transformation of the energy landscape [71]. Under the IRA, one of the definitions of an "energy community" relies on the location's unemployment rate and share of fossil fuels in local tax revenue [71]. However, due to the lack of clarity in the relevant IRA provisions, the qualifying regions cover a massive 39% percent of total US land area, yet hardly correspond to areas considered to actually have such energy communities (e.g., most or all of North Dakota, Wyoming, and Oklahoma, in which fossil fuel production is a crucial aspect of local economies, are excluded) [71]. Moreover, it is not straightforward to ascertain the revenue obtained by local governments from fossil fuels [71]. For these and other reasons, therefore, there is non-trivial risk that IRA semantic structures inadvertently disregard the energy communities "likely to be hardest hit by a transition to a net-zero energy system [71]".

Nevertheless, a balance has to be found between, on the one hand, the scope for freedom and creativity in operation or investment decisions under alternative regulatory arrangements and, on the other hand, the natural inclination for coordination externalities in the electric power industry. Onshore or offshore wind projects, for instance, can claim the ITC instead of the PTC, but offshore wind projects are assumed to claim the ITC (rather than the PTC) because their capital costs are higher than those for onshore wind projects [72]. In other words, consistent with their economic characteristics, offshore wind projects are expected to creatively engage in self-selection in response to policies affecting investment decisions. Yet generation and transmission are complements and substitutes in operation and expansion, and there are many challenges associated with the design or implementation of incentives for attracting investments [73]. In particular, network connections and corresponding investments are specific to individual projects [65]. It would be ideal for cost-optimal transmission grid extensions to harvest renewable energy at sites where wind or solar availability is high [74], but the immense investment costs related to the establishment of offshore wind energy facilities could weaken the resolve to address the coordination externalities between generation and transmission investments.

In the US, the qualifying deadlines or phase-out schedules of ITC/PTC have been changed several times since their establishment in 1992 [64]. The stock of infrastructure, as a consequence, would likely have various vintages of investments, each of which reflects the innovation and learning, in essence, the vitality of animal spirits, in response to the adjustments in policy support over time. However, an element of durability in policy may be needed to moderate the adverse impact of regulatory volatility on investment decisions. There is evidence, for instance, that the enactment of a renewable portfolio standard in the US encouraged a smaller increase in renewable energy investments in states with a history of regulatory reversals [75]. Under conditions of asset specificity, a perception of regulatory instability not only restrains investments, but also undermines regulatory efficacy [75].

Investments required under a particular regulatory policy may be specific to the policy (in much the same way that investments required under a contract between firms may be specific to the contract), and if the policy (contract) changes, the value of the assets specific to the policy (contract) is markedly reduced [75].

Indeed, the inadvertent mutation of policy durability to rigidity risks the codification of linguistic entanglements under the law. Consider, again, the PTC. Prices for wholesale electricity, predominantly in bilateral spot markets in the US Pacific Northwest, are sometimes negative because certain generators, such as nuclear, hydroelectric, or wind, are unwilling or unable to cut output temporarily when demand is weak [76]. Various reasons have discernibly encouraged generators to operate continuously even if supply outstrips demand, such as technical or cost recovery factors in the case of nuclear plants; compliance with environmental regulations (e.g., the control of water flow maintaining fish populations) in the case of hydroelectric plants; the PTC attracting payments for sold electricity in the case of renewable energy generators (mostly wind); and maintenance or fuel-cost penalties on shut-down or start-up decisions in the case of large steam turbine plants (usually fossil fuel) [76]. In other words, part of the supply inflexibility resulting in negative prices is due to the provision of the PTC for renewable energy generation. There is evidence, in fact, that wind plants claiming the ITC are incentivised to generate at least 10% less electricity than those claiming the PTC [77]. However, there is also evidence in four of the largest US electricity markets that marginal emissions tend to be higher (not lower) when electricity prices are negative [77]. In other words, an output subsidy, such as the PTC, effectively encourages electricity production, but could be less efficient than a Pigouvian tax for the control of carbon [77].

The EU's policy on supporting marine renewables energy is another illustration of policy optimisation. The overall aim is for the EU to align itself with the Paris Agreement. The Climate Law, which forms the core of the EU's Green Deal and enshrines a target of reaching carbon neutrality by 2050, will demand a large scaling-up of offshore renewable energy [69]. This can be met under the recast, 2018 Renewables Directive [70]. This directive introduced a new, binding, and renewable energy target for the Union as a whole for 2030 of at least 32% of gross final energy consumption. The trajectory towards this target has its reference points in 2022, 2025, and 2027. Under the Energy Union governance regulation [71], the Commission may take early corrective action to close the gaps in meeting the reference points of the renewables trajectory, effectively to optimise the policy portfolio. A new EU-level renewable energy financing mechanism will be set up to reduce the cost of capital for renewable energy projects and enhance regional cooperation between Member States and between Member States and third countries, through joint projects, joint support schemes, and the opening of support schemes for renewable electricity to producers located in other Member States.

Pursuant to the principle of subsidiarity, in the main, the Union-wide target is to be met through Member States' action. The Commission, through its state aid policy, is encouraging Member States to optimise national renewable energy support schemes, for instance, to consider alternative instruments and phase-out the current system of direct support as maturing low-carbon technologies become cost-competitive. That could be supplemented by the accelerated implementation of cross-border offshore wind projects that are interconnected among North Seas riparian States to accelerate the cost-efficient deployment of offshore wind energy [78]. The sovereign rights of these states under UNCLOS are essentially re-structured in a self-enforcing contract in order to incorporate and unify their rights of use over the shared resource. This is the basis for developing transboundary market arrangements (i.e., electricity market rules and governance) to ensure an efficient utilisation of grid and market resources and address legal uncertainties. These will need to address novel questions of distributional effects of such projects on costs and revenues of market actors and repercussions on national renewable energy support schemes in order to incentivise efficient investment.

The 2022 EU hydrogen strategy prioritises “green” hydrogen from electricity that is renewably generated [79]. This will be supported across the value chain by the European Clean Hydrogen Alliance, a collaboration between public authorities, industry, and civil society, and which is effectively an optimised state aid policy. To ensure the availability of clean hydrogen for industrial sectors such as steelmaking, the Commission intends to promote so-called carbon contracts for difference (“CCfD”) that would remunerate investors by paying the difference between the CO₂ strike price and the actual CO₂ price on the EU carbon market. Importantly, the policy portfolio in the EU could eventually shift in emphasis to carbon pricing determined under the EU emissions trading system [80].

Thus, as these examples from the US, the UK, and the EU demonstrate, it is ideal to establish a policy portfolio for supporting marine energy resources, optimising it to evolve with conditions in global energy markets, developments under the law of the sea, and frameworks for international investment protection.

5. Policy Exit and International Investment Law

As noted above, we have articulated a set of maxims constituting a coherent framework for the rationale, adjustment, lucidity, and exodus of state action in the context of low-carbon marine energy policy under the international law of climate action, the law of the sea, and international investment law. This has enormous legal implications for a state contemplating a massive change in or complete withdrawal of policy on which major commercial decisions have been premised.

Under the governance of marine resources set out in Section 3, international investment protection law may stand in the way, or at least create legal predicaments for governments. In particular, the record of international case law, as pointed out above, is rather mixed as a source of clear guidance as to when the support policy can be ended lawfully. There is a need to go further and seek a firmer conceptual grounding. Exit from policy support for investments in clean marine energy becomes a case for the idea of an efficient breach of contract and the associated procedural and substantive aspects of policy optimisation. Our maxims assist both governments and investors not only to better understand when policy exit would be efficient, as well as equitable, but also to design and manage their legal relationships over time accordingly.

An efficient breach of contract is a figure of the law and economics literature that helps to conceptualise a paradox of legal certainty and efficiency. (Private law) contracts create legal certainty for the parties that promises will be kept and the initial efficient bargain will be realised. Yet circumstances may change, and under certain conditions, the overall efficiency of both parties may be greater if the contract is not carried out, that is, it is breach-able with impunity.

This helps address the core problematique of policy exit. This problematique is not abstract. It plays out in the concrete reality of government policy measures taken with a view to incentivising material investor action. This policy, as we demonstrate, will be enshrined in general laws and be applied to investors by public bodies through administrative law-instruments. However, the ensuing relation between the two parties is close and individualised enough that it can be seen as a quasi-contract for analytical purposes. The concept of an efficient breach can then be applied to understand that there are conditions where the initial bargain is outweighed later, with the consequence that the promised support ought to be stopped or altered. This, in turn, opens the door to identifying the conditions under which the policy support is indeed being optimised, striking the appropriate balance between legal certainty and economic efficiency (welfare maximisation). These conditions are procedural and substantive.

First, procedurally. In the law of investment protection, there is a dilemma between legal certainty for the foreign investor bringing much needed investments and flexibility for the host government to optimise policy in light of changing circumstances. The appropriate scope for regulatory change that does not entail the need to compensate the investor is under serious debate and scrutiny both legislatively and judicially. Legislatively, the modernised

treaties themselves now provide that: (a) the host state will have regulatory autonomy as a legitimate interest; (b) the withdrawal of a subsidy by itself does not entail compensation; and (c) the state has a wide margin of appreciation up to the limit of arbitrariness. This is part of the new investment protection-cum-trade agreements that the EU is currently negotiating with Vietnam, Japan, Singapore, and Mercosur.

Of course, there are many other bilateral treaties that do not enshrine such flexibility. In such cases, another way of securing flexibility is to insert a relevant clause into the contract that the government and the investor will conclude in order to govern their investment relationship. Indeed, the investment contracts that a host government will conclude with a foreign investor are an underused tool. They should contain a clause that spells out both the power of the host state to end any policy support and the conditions under which it would do so. The 2018 EU Directive on Renewables charts another procedural avenue for exit from policy support. Article 6 of that directive provides that the member state may adjust the level of support in accordance with objective criteria, provided that such criteria are established in the original design of the support scheme [81].

This begs the substantive question of why a state should exit such policy, and hence, why the investor should expect it to happen, rather than how. Our maxims address this very question of why. They provide a set of decision-making tools for governments and investors on when and under what circumstances policy support could and should be rationally withdrawn. Governments can rely on these tools in the exercise of their discretion. Investors can form reasonable expectations of alternative courses of government action, enhancing the security of their business planning.

Furthermore, our maxims strengthen the protection of foreign direct investments in a rational manner. They indicate the conditions under which policy exit is optimal. That maxim is for the investor to keep generating bona fide economic benefits but not to engage in rent-seeking. Another exit, either formally or informally, would not be optimising the policy. For example, Mexico's policy supporting offshore renewable energy projects grants credits that can be sold to large energy consumers required by law to buy a certain amount of renewable energy. Yet, in 2019, the Energy Secretariat also granted clean energy credits to state-run renewable energy projects. Six foreign and Mexican renewable energy companies have launched legal action in Mexican courts against the rule change, arguing that it would severely dilute the value of existing credits and harm clean energy investment [82]. It is doubtful that this exit from a policy of attracting private investment would meet the three maxims.

6. Conclusions

This article proposes an optimisation analysis from the perspective of efficiency and equity of regulatory policy. It articulates three maxims to strengthen the substance, process, and timeline of marine energy law and policy. A main finding is that our maxims will give coastal states guidance on whether a support policy is justified initially and when it is justified to exit such a policy, and on the instrumentalities. At the same time, they inform investors as to the conditions for such changes. States, investors, or civil society groups alike will appreciate that, in the aspiration for social welfare maximisation, the continuous optimisation of carbon pricing, subsidy provision, or other elements of the policy portfolio is rational.

This article provides the fundamental insight that states have a portfolio of policy options, and another is that their optimal use is a function of time. Policies may be started and ended as economic, political, or legal conditions change.

Such policy optimisation is taking place within an existing governance structure based on international law. Support policy ultimately must be enshrined in law to be effective. Law, then, has several functions. It is a driver of change, as is the case for the Paris Agreement demanding of states to increase the use of clean marine energy sources in the transition to a low-carbon economy. It is an enabler of change by providing competences and instruments for transboundary cooperation. Additionally, it is a mechanism for the

control of such change. One legal implication for international investment protection within the law of the sea is that coastal states may have to establish a policy exit clause in contracts for investments in their EEZs or continental shelves.

Our maxims assist in diffusing the tension typically arising across efficiency, policy flexibility, and regulatory autonomy, on the one hand, and legal certainty for business planning, on the other, in the context of marine energy law and policy. The lesson arising from the discussions above is that much of the damage due to suboptimal regulation is avoidable. Our maxims provide both the foundational concepts and practical steps. The menace of inefficiency or inequity largely depends on whether regulatory frameworks, seeking to correct market failure and operating under the principle of subsidiarity, respect the boundaries between one social organisation and another. A continuous and well understood process of policy portfolio optimisation maximises the scope for social benefits by controlling the hazard of rent seeking or state failure and introducing the idea of a sunset clause in policy. Finally, the optimal amount of linguistic detail in regulation not only strikes a balance between the marginal benefit of transparency and the marginal cost of regulatory complexity, but also facilitates the exercise of creativity and innovation in the pursuit of social welfare maximisation through continuous policy portfolio optimisation.

Marine clean energy resources illustrate these points well, both because states are now focusing on them in the transition to a low-carbon economy and because they are governed by a complex regulatory regime composite of international and domestic law. It would be interesting to explore situations in which the continuous optimisation of the policy portfolio would have helped to overcome inefficiencies or inequities and what the relevant regulatory arrangements and embedded linguistic entanglements in the law have been.

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Article

Revisiting Traditional Fishing Rights: Sustainable Fishing in the Historic and Legal Context

Weikang Wang and Guifang Xue *

Center for Polar and Deep Ocean Development, KoGuan School of Law, Shanghai Jiao Tong University (SJTU), Shanghai 200030, China; elijahwang@sjtu.edu.cn

* Correspondence: juliaxue@sjtu.edu.cn

Abstract: Poor fishing practices and overfishing are now imperiling livelihoods on small-scale fishing. Traditional fishing rights as one of the legal guarantees for small-scale artisanal fishers under SDG 14 may be abused in various maritime zones, which is precisely because such rights are not well-reflected in the United Nations Convention on the Law of the Sea (UNCLOS), leading to uncertainty between theories and practice. In order to better implement SDG 14 and its targets for sustainable fishing, this paper examines the practical meaning of traditional fishing rights through tracing back the origins, nature and legal elements of such fishing rights by jurisprudence and state practice, and it differentiates its distinctions between ‘historic rights’. Based on this, the paper analyzes the application of these fishing rights in different maritime zones and suggests sustainable ways of making a balance between the jurisprudence and practice for a healthy ocean.

Keywords: sustainable fishing; SDG 14; UNCLOS; traditional fishing rights; law of the sea

1. Introduction

Along with the development of the modern law of the sea, the allocation regime of fishery resources has undergone great changes, which are mainly reflected in the constant expansion of the fishery jurisdiction of coastal states, until the 200-nautical-mile exclusive economic zone (EEZ) regime was established by the United Nations Convention on the Law of the Sea (UNCLOS) [1]. UNCLOS has greatly expanded the exclusive jurisdiction of coastal states over the marine living resources and substantively restructured the pattern of global allocation and jurisdiction of fishery resources. With the exploration of the oceans and the development of the economy, the demand for seafood is rapidly increasing in more and more developing states as entrepreneurs comprehensively implement industrial fishing. Accordingly, small-scale fisheries with traditional methods and fishermen’s livelihoods are impacted [2] in different maritime zones, which therefore need legal support.

There is no provided official definition of the “traditional fishing rights” in UNCLOS. According to the existing literature, traditional fishing rights refer to the rights of fishermen of a state mainly living off fishing to habitually fish in certain international waters for a long-term practice [3,4]. However, such rights as fundamental rights of fishermen to fish on a small scale are not well reflected in UNCLOS. Further, the uncertainty about traditional fishing rights and their legal application may also leave the door open for the fishing nations which had enjoyed or sometimes abused the freedom of fishing in a region with which they had no geographical or economic connection. Thereby, it is necessary to clarify the meaning of traditional fishing rights in the context of ongoing practice and its prospects alongside the development of the law of the sea to keep sustainable fishery management.

This paper will trace back the key concepts and legal status of traditional fishing rights towards sustainable fishing, namely their origins, nature and legal elements. Attention will be given to whether and how these fishing rights under customary international law survived in light of fishing-related treaties. The paper also attempts to differentiate traditional fishing rights from ‘historic rights’. Based on this, the paper delves into the legal

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application of traditional fishing rights from a sustainable perspective in various maritime zones. Then, it finally suggests possible ways to bridge the gaps between jurisprudence and practice of these fishing rights towards sustainable fishery management.

2. The Origins and Nature of Traditional Fishing Rights under SDG 14

In 2015, the Sustainable Development Goals (SDGs) were adopted by the United Nations as a comprehensive call to action to protect the planet, end the poverty and ensure that all people enjoy peace and prosperity by 2030 [5]. Thereinto, the Sustainable Development Goal (SDG) 14 “Life Below Water” seeks to “conserve and sustainably use the oceans, seas, and marine resources [5]” and its targets 14.4, 14.7 and 14.B explicitly involve different respects of sustainable fishing [5]. This concerns not only fishermen fishing in their own exclusive economic zones but also their traditional fishing rights in waters beyond their jurisdiction. At the international law level, this paper does not address the issue of fishing rights in national waters, as these rights undoubtedly belong to local fishermen, but rather focuses on the traditional fishing rights in other waters to keep sustainable fisheries management between states. Under such circumstances, traditional fishing rights need to be regulated towards sustainable ocean exploitation and fishery management. Their legal elements have been constantly optimized and improved by cases and state practice. This section will outline and summarize the origins and nature of these fishing rights in the light of recent developments in the law of the sea.

2.1. Origins

There is no clear definition of traditional fishing rights [4]. These rights arise from long state practice. In the early history, human beings fished in the shallow waters adjacent to the land, and fishing was regarded as a vital means of survival for coastal inhabitants. On this basis, coastal states have long advocated for the subordination of shallow seas to their national jurisdiction. After the Industrial Revolution (1760s–1940s), many states, due to the development of science and technology, gradually realized that the lack of control over fishing activities would pose a threat eventually to the continuance of marine living resources [6] (p. 1) and cause the uncertainty of exercising fishing rights in different maritime zones.

Since UNCLOS entered into force, traditional fishing rights are rights granted to certain groups of fishermen who have been habitually fishing in certain areas for a long period of time. Some scholars divide this right into two categories: one is the traditional right to fish exercised by traditional local communities or indigenous peoples within their national maritime jurisdiction in a certain area where they have long fished [7]. In this type of case, the subjects of the fishing rights are individuals. The other is the right of nationals of a state to fish in the maritime areas under the jurisdiction of other states because of their long-standing fishing habits or historical factors [7]. This circumstance of such fishing rights is quite complicated in that they can either arise from the doctrine of vested or private rights or be claimed on the basis of the principle of historic titles or historic rights.

2.2. Nature

The main view of traditional fishing rights is that they are protected under customary international law [8] (para. 2). Many states tend to recognize traditional fishing rights existed before the conclusion of UNCLOS through bilateral or regional agreements. For example, the 1974 Boundary Agreement between India and Sri Lanka stated that “vessels of Sri Lanka and India will enjoy in inter se waters such rights as they have traditionally enjoyed therein [9] (Article 6)”, recognizing and protecting the traditional fishing rights of fishermen in both states. The 1978 boundary agreement between Australia and Papua New Guinea also protected the “traditional way of life and livelihood [10] (Article 10 (3), p. 215) [8] (para. 11)” including traditional fishing. Hence, these fishing-related agreements could, as mentioned in Article 51 of UNCLOS, be a condition for limiting the legal elements of traditional fishing rights. Or they may, instead, serve as evidence of

bilateral or multilateral recognition of the existence of traditional fishing rights in a given area. In any case, these agreements are able to offer general goals or detailed guidance for sustainable fishing.

However, it is debatable whether these fishing rights were replaced by treaty rights, or exist independently from treaties. The current literature in debating this issue has mainly been divided into two views. One argument states that these fishing rights cease to exist in treaties as these treaty-based “fishing rights” are not “traditional” or “historic” in themselves, much less understood as a “historic” right through a process of “historical” consolidation, for the fishing activities in treaty-based “traditional or historic fishing rights” are not naturally shaped in the history but regulated by treaties. This argument is based on Articles 30(3) and 59 of the 1969 Vienna Convention on the Law of Treaties relating to the incompatibility of UNCLOS as a subsequent treaty according to Article 311(2) of UNCLOS [11]. The London Fisheries Convention is a key case study of this question, reflected in Article 3 of the London Fisheries Convention, where this Convention only provides for fishing rights for a particular period of time, rather than fishing rights that are sustained over a long period of time in a particular area [12] (Article. 3). The “fishing rights” under the London Fisheries Convention are treaty-based rights. Unlike natural rights, treaty-based rights do not exist independently of the treaty. The right thus disappears when a state’s withdrawal from the treaty takes effect. In this regard, traditional or historic fishing rights shall be considered based on their legal elements. Alternatively, fishing rights by treaty rights largely depend on the way the text of the treaty is drafted. Fishing rights are sustained if, in the drafting of the treaty, the aim or content of the treaty tended to take into account their fishing rights as the rights consistent with the legal elements of traditional or historic fishing rights.

Another argument is that the traditional or historic fishing rights as customary international law may operate in parallel with the treaty-based fishing rights [13,14]. This view is fully reflected by the declaration in the 2022 *Nicaragua v. Colombia* case. However, a treaty provision may “embod [y]” a pre-existing rule of customary law [15] (p. 38, para. 24) or may “constitute the foundation of, or has generated a rule” [16] (p. 41, para. 71). Pre-existing rights under customary international law should continue to exist and apply under customary international law unless such rights are expressly denied by treaty law or a new customary rule [17] (p. 424, para. 73). This illustrates that customary international law continues to exist parallel with treaty law. Thus, the areas regulated by these two sources of law do not overlap [18] (p. 94, para. 176). In the modern law of the sea, historic fishing rights as a type of historic rights are not regulated by UNCLOS and continue to be governed by customary international law, which can, together with UNCLOS, explain matters that are separate but interrelated.

3. Legal Elements of Traditional Fishing Rights towards Sustainable Fishing

Traditional fishing rights have emerged from a long process of historical consolidation of socio-economic conditions and behavior. It recognizes that traditional livelihoods and cultural patterns, reflecting the long-established ways of subsistence, cultural traditions and habits of local fishermen are vulnerable to the development of inter-state relations [8] (para. 2). Thus, in order to achieve sustainable fishing, traditional fishing rights require ipso facto special protection [16] (para. 788). Considering the origin and nature of traditional fishing rights, the existence of traditional fishing rights shall be examined on a case-by-case basis [8] (para. 2). From relevant international judicial and arbitral cases and practices, the legal elements that form the traditional fishing rights are as follows:

3.1. Vested Rights

From the views of the *Eritrea/Yemen* case, traditional fishing rights are understood as the rights similar to a property right acquired by generations of fishermen who earn their living through long-term artisanal fishing. The 2022 *Nicaragua v. Colombia* case and *South China Sea* case confirmed the views of the *Eritrea/Yemen* case. They explicitly state

that the subjects of traditional fishing rights are individuals and communities who have been fishing in an area for a long time [19] (para. 798) [20] (Para. 220). It is thus clearly a private right rather than the right of state.

As far as private rights are concerned, the *South China Sea* case explains that developments in the concepts of international boundaries and sovereignty should, as far as possible, avoid modifying individual rights. As mentioned by the Permanent Court of International Justice in its advisory opinion in the case of *Settlers of German Origin in Poland* and by the tribunal in the *Abyei Arbitration*, “traditional rights, in the absence of an explicit agreement to the contrary, have usually been deemed to remain unaffected by any territorial delimitation”, implying that a change of sovereignty is not a necessary condition for the cessation of private rights [21,22]. The same principle was affirmed by the arbitral tribunal in the *Bering Sea Arbitration* with respect to rights at sea, namely that the arbitral tribunal dispensed with the division of jurisdiction for indigenous peoples in relation to the hunting of fur seals in the *Bering Sea* [23] (p. 271). Therefore, traditional fishing rights are held by individuals and communities.

3.2. Constant Exercise for a Lengthy Period of Time

Long-term and constant exercise of rights means that the exercise of rights should last a period of time, at least, in order to fully accumulate and consolidate the fisheries interests and relations to the extent that such claims of rights could be established preliminarily in law. In other words, the exercise of rights should have continued over a certain period of time. Thus, traditional fishing rights should meet the requirements of long-term and constant exercise of rights.

However, as for the duration of the exercise of rights, neither general international law nor the judgements and awards of international judicial and arbitral institutions have provided a unified and clear standard. On the contrary, both national and international judicial/arbitral practice consider the time factor of exercise of rights case-by-case, under the premise of taking into account the specific situation of each region. For instance, in the circumstance of the 2022 *Nicaragua v. Colombia* case, even 40 years could not be long enough to qualify such fishing as “a long-standing practice” [20] (para. 220). Additionally, there is a view that the evidence of duration of fishing is flexible. It cannot be measured in terms of a fixed number of years. The key point is that the duration must be long enough to reflect the existence of such traditions and cultures [8] (para. 16). Therefore, the duration of time is certainly an integral part of the basis of continuity, but international jurisprudence does not emphasize the specific requirement of time duration unless the continuity of the action [24] and the nature of its tradition are confirmed.

3.3. Artisanal Fishing

As the SDG 14 B states, “small-scale artisanal fishers [2]” need considering for achieving sustainable fishing. Correspondingly, to formulate sustainable fishing, traditional fishing rights should include artisanal fishing, which is essentially carried out in accordance with the long-standing customs of the community in which it is practiced. It means ‘those entitlements that all fishermen have exercised continuously through the ages [25] (p. 359, para. 104).’ But artisanal fishing does not include industrial fishing because industrial fishing is a serious departure from traditional practices. The Food and Agriculture Organization of the United Nations (“FAO”) in the *Eritrea/Yemen* case offers preliminary explanation of artisanal fishing. It notes that artisanal fishing does not extend to industrial fishing, nor to fishing by third-country nationals, whether on a small scale or on an industrial scale [25] (para. 105). The tribunal in the *South China Sea* case accepts this view and states that the “artisanal fishing” is used as opposed to “industrial fishing” [25]. However, although the tribunal recognized artisanal fishing is the means of traditional fishing, it fails to clearly define artisanal, only to identify that artisanal fishing ‘will be simple and carried out on a small-sale with fishing methods varying from region to region in keeping with local customs [19] (para. 797)’.

Hence, the traditional fishing rights could be judged and distinguished by whether the vessels are simple enough or whether the fishing is of the artisanal nature rather than industrialized. As for the “industrial fishing”, the tribunal in the *South China Sea* case did not specify the exact threshold of the methods of fishing that can be considered industrial fishing [19] (para. 806), nor did the tribunal find it necessary to consider how and when traditional fishing practices would change over time as technology developed [19] (para. 806) because traditional fishing is different from industrial one in means of fishing [8] (Para. 2). It seems to be judged on a case-by-case basis, leaving more space to discretion.

3.4. Differences from ‘Historic Fishing Rights’

Since UNCLOS does not specifically state the meaning of “traditional fishing rights”, the issue emerges as to whether such rights are equal to “historic rights [26]”. To clarify the more idiographic requirements of traditional fishing rights, this part will make a distinction between traditional fishing rights and history ones in the following two discussions of non-exclusive rights and the requirements of vessels.

3.4.1. Non-Exclusive Rights

Unlike “historic fishing rights”, which approached the level of sovereignty as a part of “historic rights”, the initial establishment of traditional fishing rights originates from fishermen’s private activities motivated by the needs of survival and reliance on resources. It is difficult for activities undertaken by individuals for their own interests without government authorization to be established evidence of national sovereignty, even if these practices have accumulated over a certain period of time and have not been interfered in by other states regardless of the number and the extent of private acts or vested rights [27] (p. 157) [28] (p. 47). Consequently, traditional fishing rights are non-exclusive, which are not given territorial sovereignty in nature.

In general, non-exclusive traditional fishing rights only involves conserving and continuing exercise of the existing rights, instead of the acquisition of new rights. These rights do not have to be based on anything beyond the private acts approved or authorized by states [28] (p. 51). Additionally, regarding traditional fishing rights as non-exclusive rights, the cases like the 2022 *Nicaragua v. Colombia* case and the *South China Sea* case emphasized the importance of considering the livelihoods of fishers in a comprehensive manner and analyzing evidence sensitively [19] (p. 805). These illustrate how the sufficient historic evidence and official documents could play a significant role in proving the existence of traditional fishing rights.

3.4.2. Requirements of Vessels

Meanwhile, traditional fishing rights strictly limit the requirements of vessels. The tribunal in the *Eritrea/Yemen* case provided minimum standards on fishing gear and vessel equipment in the context of traditional fishing rights. They were extensively discussed based on guidance on artisanal fishing in the Red Sea from a report by the FAO. Referring to the FAO study on artisanal fishing, the tribunal noted that the artisanal vessels ‘are usually canoes fitted with small outboard engines, slightly larger vessels (9–12 m) fitted with 40–75 hp engines, or fishing sambuks with inboard engines. Dugout canoes and small rafts (ramas) are also in use. Hand lines, gill nets and long lines are used [25] (p. 360, para. 105).’ This sets a standard for the artisanal vessels which might meet the requirements of traditional fishing rights; however, in the Report on Fishing in Eritrean waters, the FAO study states that this artisanal fishing gear, which varies according to the boat and the fish, is “simple and efficient” [25] (p. 360, para. 105), leaving less limitation on how simple the vessels should be. But still, as for the historic fishing rights, there is no limitation on vessels compared with traditional ones.

Another key problem is to balance the simpleness degree of the vessels or gears when allowing that these vessels can be improved in the techniques of navigation, communication or in the techniques of fishing. While historic fishing rights may place restrictions

on particular species to be fished, there are no restrictions on technological change under the context of historic rights, meaning that advances in technology can facilitate more efficient fishing. Therefore, technology change will influence fishing under historic rights as opposed to traditional fishing, showing that traditional rights are more fixed and narrower if fishing technology changed. However, in point of detail, this change does not exclude improvements in powering small-boats, navigation, communications or fishing technology [25] (p. 360, para. 106).

Therefore, traditional fishing rights are narrower or relatively conditioned in their scope of protection compared with historic rights. These limitations are mainly manifested on the extent of their exclusive extent, means of fishing and factors to prove the existence of this tradition and culture.

4. The Application of Traditional Fishing Rights for Sustainability

As is stated above, traditional fishing rights and historic fishing rights are different per se. Based on their development, the legal application of traditional fishing rights under these legal elements needs further exploring. For clarifying the application, this section will be discussed separately by different maritime zones.

4.1. In the Territorial Sea

It is not directly pointed out whether traditional fishing rights still exist in the territorial sea under UNCLOS. However, the judicial precedent is in favor of the legality of these fishing rights in the territorial sea. In the *Eritrea/Yemen* Arbitration, the tribunal stated that traditional fishing rights continue to exist in the territorial sea after the adoption of UNCLOS [25] (para. 109). This was then accepted by the *South China Sea* case, concluding that UNCLOS continues to apply the existing legal regime, and that protection of traditional fishing rights in the territorial sea remains essentially unchanged [19] (para. 804). This opinion was also reflected by Article 2(3) of UNCLOS [19] (para.804), stating that ‘the sovereignty over the territorial sea is exercised subject to this Convention and to other rules of international law [1] (Article. 2(3))’. It was confirmed by the awards in the *Chagos Marine Protected Area Arbitration* case [29] (para. 514). The Tribunal notes that Article 2(3) of UNCLOS covers the obligation of states to exercise their sovereignty subject to “other rules of international law”. It follows that, while exercising their sovereignty over their territorial waters, states must also observe other rules of international law. This illustrates that Article 2(3) provides a broader scope for coastal states’ obligations. Traditional fishing rights can be considered as other rules of international law even if they are not expressed in UNCLOS.

Traditional fishing rights in the territorial sea are not de facto up to the level of right of states. Rather, they belong to individuals. In the *South China Sea* case, traditional fishing rights were recognized as vested rights, and therefore, the tribunal ‘considers the rules of international law on the treatment of the vested rights of foreign nationals [30] (p. 42) to fall squarely within the “other rules of international law” applicable in the territorial sea [19] (para. 808)’. Accordingly, the tribunal agreed to include respect for a state’s traditional fishing rights among the “other rules of international law” in Article 2(3) of UNCLOS, which means that the vested rights of other states’ nationals in the territorial sea are protected. The ratio decidendi is evaluated as one of the court’s greatest contributions to the traditional fishing regime [7]. In practice, most of the traditional fishing was happening in waters close to the coastline [19] (para, 804(c)), suggesting that much of the traditional fishing took place in territorial seas. This view provides a favorable legal basis for such situations for foreign nationals.

However, in the absence of a unified international standard for the specific practice of traditional fishing, and given the different understandings of traditional fishing rights in different countries due to differences in fishing habits, such fishing activities in the territorial seas of other states on the basis of traditional fishing rights weaken the jurisdiction of coastal states over their own territorial seas. Moreover, legal uncertainty of traditional fishing

rights may be a justification for overfishing the resources of coastal states, which may pose challenges to the effective regulation of the resources of the territorial sea by coastal states.

4.2. In the Archipelagic Waters

An archipelago is made up of one or more islands, and thus, the archipelagic principle developed from the regime of islands in their territorial seas. In UNCLOS, the archipelagic state means ‘a State constituted wholly by one or more archipelagos [1] (Article. 46)’ and the sovereignty of it ‘extends to the waters enclosed by the archipelagic baselines, which is described as archipelagic waters [1] (Article. 49(1))’. But the archipelagic state should respect the existing rights and all other legitimate interests which its neighboring state has traditionally exercised in such waters and all rights stipulated by agreement between those states [1] (Article. 47(6)), if those existing rights lie inside the archipelagic waters of the archipelagic state. This shows that such ‘existing rights and all other legitimate interests’ of neighboring states in archipelagic waters existing prior to the adoption of UNCLOS may still be valid in the UNCLOS regime.

In order to make the definition of existing fishing rights and interests more specific, Article 51 of UNCLOS interprets them in more detail, including traditional fishing rights of neighboring states [1] (Article. 51(1)). However, there are conditions that need to be noted when considering traditional fishing rights in the archipelagic waters: first, before the exercise of such rights, states shall consider their ‘nature, extent and the areas to which they apply’ [1] (Article. 51(1)), and any special circumstance concerning the rights shall be regulated by bilateral agreements between the states [1] (Article. 51(1)); and second, these rights ‘shall not be transferred to or shared with other states or their nationals [1] (Article. 51(1))’.

Thus, traditional fishing rights in the archipelagic waters are explicitly protected by UNCLOS. However, due to the long-standing fishing practices in various maritime zones, regulating traditional fishing of the immediately adjacent neighboring states in the archipelagic waters by UNCLOS does not mean there is a legal basis to eliminate the existence of traditional fishing rights under other maritime zones.

4.3. In the Exclusive Economic Zone

The establishment of EEZ regime not only reflects the major concerns of coastal states about industrial and commercial fishing and the exploitation of living resources by foreign vessels in their coastal waters but ensures the demand for optimum utilization of the natural resources of the sea, which fundamentally changed the limits of fishing in the oceans and ends the freedom to fish internationally within the exclusive economic zone of the coastal state [8] (Para. 6).

There is a view in case law that traditional fishing rights are extinguished in the EEZ [19] (para. 804). Instead, the article 62(3) of UNCLOS states that ‘in giving access to other States to its exclusive economic zone under this article, the coastal State shall take into account all relevant factors including, inter alia, . . . the need to minimize economic dislocation in States whose nationals have habitually fished in the zone’ [1] (Article. 62). This means that coastal states would only consider allowing other fishing states in its EEZ if there was a surplus of the allowable catch, including states whose nationals traditionally fished in the area [31]. Apparently, this conclusion is extremely over-sweeping, as the factors this Article 62 highlights for consideration do not encompass all circumstances regarding to traditional fishing rights [8] (Para. 8). The determination of the allowable catch of living resources in the EEZ and the capacity of the coastal state to exploit them concerns political, economic, social and ecological factors. Thus, the existence of a residual allowable catch is entirely at the discretion of the coastal state, and other states have no right to participate in the determination of the allowable catch of living resources in the exclusive economic zone, giving much discretion for the coastal state in term of other states’ traditional fishing in its EEZ.

In fact, the establishment of the EEZ regime in UNCLOS does not by itself extinguish traditional fishing rights that, as Section 2 stated, exist under customary international law [8] (para. 9), which are also confirmed in international jurisprudence [8] (para. 12). The arbitral tribunal in the *Eritrea/Yemen* case observed that traditional fishing rights are ‘not qualified by the maritime zones specified under the United Nations Convention on the Law of the Sea . . . The traditional fishing regime operates throughout those waters beyond the territorial waters of each of the Parties, and also in their territorial waters and ports [25] (p. 361, paras. 109–110).’ It was also cited in the *Abyei* arbitration, stating that ‘traditional rights, in the absence of an explicit agreement to the contrary, have usually been deemed to remain unaffected by any territorial delimitation [32] (pp. 408–410 and 412, paras. 753–760 and 766)’. Importantly, the criteria for proving whether a state has traditional fishing rights in other EEZ need to be cautiously considered [20] (para. 218). The evidence should strictly satisfy all the legal elements of the traditional fishing right.

Additionally, it should be pointed out that UNCLOS does not preclude states from continuing to recognize traditional fishing rights located within the EEZ either in bilateral agreements [20] (para. 232) or through regional fisheries management organizations [19] (para. 804), promoting states to respect such rights outside of UNCLOS [19].

In summary, traditional fishing rights in different maritime zones are illustrated in Table 1 above. From a sustainable perspective, the application of traditional fishing rights has somewhat weakened the opacity of the coastal states’ fishing industry. Local fishermen are able to maintain sustainable fishing in the relevant maritime zones by regularly monitoring the information sharing on the catches of coastal states. Meanwhile, joint collaboration among states can be facilitated via bilateral and multilateral negotiations, using legislative means to agree on and mutually monitor states’ sustainable fishery management.

Table 1. Traditional fishing rights in different maritime zones.

Maritime Zones	UNCLOS	Referred by Judicial Precedents or Not
territorial sea	does not exist	yes
archipelagic waters	Article 51	/
EEZ	does not exist	yes

5. Sustainable Ways to Balance Traditional Fishing Rights between Jurisprudence and Practice

The above analytical discussions show that, theoretically, there are detailed arguments on the legal elements of traditional fishing rights. However, as for the application of traditional fishing rights in various maritime zones, the extent to which the coastal state restrains the foreign state in traditional fishing activities is ambiguous when the latter exercises its traditional fishing rights in the waters of coastal state. Practically, this ambiguous situation gives coastal states a certain degree of discretion in managing the exercise of traditional fishing rights by other states. Thus, with the goal towards better sustainable fishery management, it is desirable that coastal states may strike a balance between maintaining sovereign rights to fishing activities and allowing other states to exercise traditional fishing rights within coastal states’ jurisdiction. To achieve such a balance, the extent of the sustainable measures to be justified need to be clarified.

5.1. Bilateral Negotiation

To promote the conservation and management of fisheries resources, coastal states are obliged to regulate fishing activities in their waters. This is exemplified by the *North Atlantic Coast Fisheries Arbitration* case, in which the tribunal noted that coastal states, as sovereign states, have the duty of preserving and protecting the fisheries. Thus, they are not only entitled but obliged to provide for the protection and preservation of the fisheries in the form of their national laws or rules.

In practice, a workable solution to this matter would be for the parties to negotiate a bilateral treaty that would detail the extent to which the coastal state would regulate traditional fishing rights in its waters [19] (para. 232). In case the parties fail to take the ‘obligation to execute the cooperative treaties between coastal states and fishing states in good faith’ [33] (p. 104), or, as the *North Atlantic Coast Fisheries Arbitration* case held, bilateral agreement does not include the fisheries that parties recognize as requiring regulation to maintain, the coastal state is entitled to make reasonable provisions that are not inconsistent with its obligations under the agreement, for the protection of marine living resources in its own maritime zones [33]. A good example is provided by the *North Atlantic Coast Fisheries Arbitration*, which requires coastal states to make rules or regulations in respect to details of fishing effort, such as governing the fishermen’s hours, days or seasons for fishing [33]. A similar practice in the South China Sea may be found where China imposes fishing moratoria in certain areas of the South China Sea. During the moratoria, all types of fishing vessels, including supporting vessels, are prohibited from fishing. Meanwhile, China’s law-enforcement vessels conduct regular inspections and enforcement to combat illegal fishing activities [34]. The results have been positive, yet it needs to be noted that a coastal state must be cautious in exercising this right to restrict the traditional fishing rights of other states. This view is reflected in the *North Atlantic Coast Fisheries Arbitration*, where the laws enacted by the coastal state should be aimed at fishery conservation. As stated by the United States, though fishery regulations are to some extent restrictions, regulations for the purpose of preserving fisheries resources—the common fishery interest for both parties—should explicitly be distinguished from purposeless fishing restrictions [33].

5.2. Means of Fishing

Regulation of fishing practices by the coastal state is also the obligation of coastal states. In the *North Atlantic Coast Fisheries Arbitration* case, the tribunal held that ‘the method, means, and implements to be used in the taking of fish or in the carrying on of fishing operations on coasts [33]’ are supposed to be stipulated in written laws. These relevant laws can be used as legal elements to approve means of fishing, which is distinct from industrial fishing. Although UNCLOS does not provide precise standards for means of fishing, as discussed above, and the FAO and relevant judicial practices offering the minimum standard on fishing gear and vessel equipment may serve as a reference for coastal states in their regulation.

However, it is important that, regardless of the means of fishing, the coastal state ensures, in the course of regulation, that the fishing rights of the fishing state meet all the relevant legal elements of traditional fishing rights towards sustainable fishing, i.e., that the means of fishing is visibly distinct from industrial fishing.

5.3. Fishing Licenses

While it is controversial whether fishing licenses are issued to fishermen exercising their traditional fishing rights, fishing licenses can be important evidence of the fishing state’s fishing rights and coastal state’s regulatory obligations. For example, in the *Territorial and Maritime Dispute in the Caribbean Sea case* (Nicaragua v. Honduras, 2007), Honduras claimed that it owned the historic fishing rights in the maritime area near the Savanna reef and thus could grant fishing licenses to fishermen [35] (p. 711, para. 170, pp. 716–717, para. 190). The Court pointed out that the acts of granting fishing licenses and managing fishing vessels by the Honduras government could be regarded as evidence of regulative and de facto control, and such acts constituted a relevant display of effective exercise [35] (pp. 712–713, paras. 174–175). Similarly, in the *Fisheries case* (United Kingdom of Great Britain v. Norway, 1951), the Court viewed that Norway enjoyed the historic fishing rights over the waters of LoppHAVET. One of the ratio decidendi for the Court is that as long as 200 years ago, the Norwegian government has granted local fishermen fishing licenses for the exclusive privilege to fish and hunt whales [36] (p. 142).

To sum up, the North Atlantic Fisheries case provides good practice for the international community with regard to balancing the regulation of traditional fishing rights by coastal states, which serves as a valuable guideline for sustainable fishing. Integrating the nature and development of traditional fishing rights into sustainable fishing, coastal states and fishing states should mutually negotiate to bridge the theoretical and practical gaps in traditional fishing rights through sustainable means such as legislation, limiting means of fishing and granting fishing licenses.

6. Concluding Remarks

As fisheries operations have developed, the treatment of traditional fishing rights has adapted in response to the need for sustainable fishery management, progressively forming sustainable traditional fishing rights. Since the establishment of the EEZ regime, traditional fishing rights have been weakened to some extent, but these rights are continuously governed under customary international law. In this circumstance, controversial practices may exist between such fishing rights and fishing-related treaties. Whether such fishing rights exist in a treaty or operate in parallel to it, the survival of fishing rights in light of treaties depends on whether these rights are naturally shaped in the history or how the text of the fishing-related treaty is worded.

Furthermore, traditional fishing rights are based on long-standing practices. They also belong to individuals like local fishermen and native communities. However, these rights may be different from historic rights in these legal elements. Traditional fishing rights are conditional in some aspects, whose limitations are respectively reflected by requirements for sustainable fishing under the SDG 14. First, this limitation is manifested in the requirements for vessels. Traditional fishing rights require that the fishing vessels and means of fishing are simple while historic fishing rights seem not to clearly limit the technology of vessels, except for the requirements for fishing particular species; and second, the limitation manifests in the means of fishing. The fishing means of traditional fishing rights should be understood as artisanal fishing, which means that they cannot reach the level of industrial fishing, while the historic fishing rights rarely have conditions in fishing means.

Last but not least, although states or fishermen enjoyed freedom of traditional fishing, this freedom was not the same as compliance with the restrictions imposed by the coastal states. At the same time, the restrictions imposed by the coastal states, while not contrary to international tradition, do not recognize the right of the fishermen to require their consent to such restrictions. While the above sets out the possibilities of what a coastal state can do to balance the theory and practice of the traditional fishing rights in the sustainable exploitation of the ocean, it does not mean that the rights and obligations of coastal states and fishing states are invariably set on dealing with these fishing rights. Rather, as the law of the sea and marine environment evolve, this relationship of rights and obligations should be dynamic, and bilateral negotiations are the most appropriate way to deal with this dynamic change for mutual benefit and a sustainable ocean.

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Article

Sustainable Management of Marine Protected Areas in the High Seas: From Regional Treaties to a Global New Agreement on Biodiversity in Areas beyond National Jurisdiction

Rui Jiang ^{1,2} and Ping Guo ^{1,2,*}¹ School of Law, Sun Yat-sen University, Guangzhou 510006, China; jiangrui0218@163.com² Southern Marine Science and Engineering Guangdong Laboratory (Zhuhai), Zhuhai 519080, China

* Correspondence: guop26@mail.sysu.edu.cn; Tel.: +86-135-1424-3447

Abstract: The conservation and sustainable use of marine biodiversity have recently received attention, and Marine Protected Areas (MPAs) have become key management tools that are gradually being applied to the high seas. However, the sustainable management of MPAs in the high seas requires legal regimes to support them, though relevant regimes are still immature. This paper summarizes the existing regional treaties governing high seas MPAs, and the agreement on the conservation and sustainable use of marine biological diversity in areas beyond national jurisdiction (BBNJ Agreement). After reviewing and comparing their law-making histories, it is argued that regional treaties have issues of legitimacy, democracy, and science and are not conducive to sustainable management. It is concluded that the BBNJ Agreement is better suited to the comprehensive and sustainable management of high seas MPAs and can overcome the limitations of regional treaties. As the BBNJ Agreement does not undermine existing instruments and frameworks, the management of high seas MPAs will face the co-existence of different legal regimes. In the context of “not undermining”, the Agreement should be applied preferentially, ensuring the universal participation of stakeholders in decision-making and the role of soft law for non-contracting parties.

Keywords: high-seas MPAs; BBNJ Agreement; sustainable management; UNCLOS

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1. Introduction

The technological revolution has brought fundamental changes to human society, but it might also pose new challenges and dangers for the environment. The high seas, as an important source of goods and services, are facing serious ecological risks, and MPAs have become tools for achieving conservation targets and sustainable use of high-seas biodiversity. On 19 June 2023, the BBNJ Agreement was adopted, which is used to address biodiversity loss and degradation of ocean ecosystems in a coherent and cooperative manner. Among the Agreement, “marine protected area” is a management tool and is provided as “a geographically defined marine area that is designated and managed to achieve specific long-term biodiversity conservation objectives and may allow, where appropriate, sustainable use provided it is consistent with the conservation objectives” [1]. The concept of high-seas MPAs discussed in this paper is consistent with this, and other area-based management tools are beyond the scope of the paper.

At present, three major high-seas MPAs have been established by countries adjacent to these regions [2] and managed in a fragmented manner under different regional treaties. However, the agreement on the conservation and sustainable use of marine biodiversity of areas beyond national jurisdiction (BBNJ) brought questions from other countries, and some stated that the construction of high-seas MPAs was aimed at economic and strategic objectives [3] and pursued the interests of a particular state or a group of states under the guise of protecting community interests [4]. Thus, there are some issues in the construction of high-seas MPAs, such as legality, legitimacy, and practical effects, and existing

management frameworks do not provide sufficient and sustainable protection for marine biodiversity beyond national jurisdiction [5]. As early as 2003, the IUCN published a report entitled “Ten-year high seas marine protected area strategy” [6], which stressed that high-seas MPAs represent a structure for coordinated decision-making among a range of stakeholders and should not be seen as an opportunity to assert sovereignty or jurisdiction. Besides, the conclusion of the BBNJ Agreement led to overlaps and conflicts with regional treaties, and there was significant controversy as to whether the application of global or regional mechanisms is more conducive to achieving sustainable management of high-seas MPAs, including whether a new global body is needed [7]. Most of the existing literature examines different mechanisms from several perspectives, such as the limits and improvement of regional mechanisms [4,8,9], the construction of a global mechanism [5,10], and international cooperation and coordination between regional and global mechanisms [11,12]. However, it still fails to tackle the question of the legitimacy of those mechanisms and their instruments. This paper studies the legal instruments provided by different mechanisms and analyzes whether these instruments comply with the principles of rule of law in international law-making, which include elements of legitimacy, democracy, and science, in order to clarify which legal instruments are conducive to achieving sustainable management of the high-seas MPAs. At the same time, it is checked to see if the BBNJ Agreement, a new global instrument under the UN framework, will fill the existing gaps and achieve sustainable management of protected areas on the high seas, and how it should be implemented.

2. Materials and Methods

2.1. Materials and Data Gathering

The objectives of the present research are to review the legal instruments applied in the MPAs in the high seas. The research focused on documents generated during the law-making process, including purposes of law-making, consultative parties, member parties, applied MPAs, functions of the management committees, members, and decision-making methods resulting from the instruments, documents on management measures and action plans, resolutions for the establishment of high-seas MPAs, maps of existing high-seas MPAs, UN General Assembly resolutions, and reports by the intergovernmental Conference. These determine the attribution of interests and are important factors in determining whether the instrument is appropriate to achieve sustainable management of high-seas MPAs. Meanwhile, the above instruments are based on the United Nations Convention on the Law of the Sea (UNCLOS) and the Vienna Convention on the Law of Treaties; relevant parts of both treaties were summarized.

As it also tracks and analyzes the history of the legal instruments in this paper, the traditional methods of reviewing and analyzing the content of the documents are mainly used without relying on interviews with experts in this field.

2.2. Protection Rules of Living Resources on the High Seas in the UNCLOS

Historically, the freedom of the high seas was once held in high esteem by many nations, and today it remains an unassailable principle of the law of the sea. However, since the rapid increase in productivity and human needs has led to resource scarcity and a growing number of ecological problems in the oceans, the need to protect the marine environment is broadly accepted [13].

The UNCLOS was adopted in 1982 and remains an important source of law for marine living resource protection today, providing more comprehensive rules for the high-seas biodiversity. “Part VII: High Seas” refers to the conservation and management of living resources, mainly fish stocks, which suggests that all states have the duty to take measures or cooperate with other states for the conservation of living resources. The management measures are based on the best scientific evidence and are formulated with the participation of all states concerned, especially taking into consideration the special requirements and economic constraints of developing countries [14]. Article 145 of

“Part XI: The Area” provides protection for the marine environment, which requires the prevention, reduction, and control of interference with the ecological balance of the marine environment and the prevention of damage to marine flora and fauna from the activities in the Area [14]. Besides, because Article 1 of the UNCLOS shows that “pollution of the marine environment” includes harm to living resources and marine life as well as hindrance to fishing activities [14], it is necessary to summarize Part XII of the UNCLOS, “Protection and Preservation of the Marine Environment,” which also led to much controversy over the high-seas MPAs. Part XII states that “states have the obligation to protect and preserve the marine environment” and applies generally to the high-seas area, where pollution from activities in the Area, vessels, artificial islands, installations, and structures is the main concern. It is worth noting that Article 194(5) indicates that “the measures taken in accordance with this Part shall include those necessary to protect and preserve rare or fragile ecosystems as well as the habitat of depleted, threatened, or endangered species and other forms of marine life” [14]. These provisions of the UNCLOS reflect early ideas on the protection of marine biological resources.

2.3. Law-Making History of Legal Instruments for the Management of High-Seas MPAs

To date, three high-seas MPAs have been established through regional treaties. The South Orkney Islands South Shelf MPA and the Ross Sea region MPA were based on the Convention on the Conservation of Antarctic Marine Living Resources (the CAMLR Convention), and the OSPAR network of MPAs was based on the Convention for the Protection of the Marine Environment of the North-East Atlantic (the OSPAR Convention). The BBNJ Agreement has just been adopted this year and is not in force yet, which might be used to manage some MPAs in the high seas in the future.

2.3.1. The CAMLR Convention

The CAMLR Convention is the main basis for the management of the South Orkney Islands South Shelf MPA and the Ross Sea region MPA, and conservation measures are developed in accordance with the Convention [15]. The CAMLR Convention is an important part of the Antarctic Treaty system, and its formation is closely linked to the Antarctic Treaty consultative parties. In 1959, 12 countries signed the Antarctic Treaty and became the initial consultative parties with decision-making power over Antarctic affairs [16], but the subsequent contracting parties remain observers with no voting power unless the country can construct a scientific research station in Antarctica. In 1985, China was granted the status of a consultative party for the construction of an Antarctic scientific research station [17]. On this premise, the contracting parties of the Antarctic Treaty were then concerned about Antarctic marine living resources, and, from 1975 to 1980, they went through the formation of working groups, extended preparatory meetings, special preparatory meetings, and consultative meetings, respectively, to consider the conservation of Antarctic marine living resources, among which Australia, the United Kingdom, and the United States played the main leading and organizing roles. The CAMLR Convention was signed in Canberra, Australia, in 1980 and entered into force in 1982 [18].

As a result of the Convention, the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) was established as an international organization within the Antarctic treaty system and a decision-making body for the conservation of Antarctic marine living resources. It has decision-making power over the governance of the Southern Ocean and decides on conservation measures [19]. The CCAMLR is open to all states with an interest in marine scientific research and fishing activities in the Convention Area and currently has 27 member parties and 10 acceding states. The member parties have decision-making power, but acceding states cannot enjoy the same decision-making power due to a lack of financial contribution, but all are bound by the CAMLR Convention [20].

In 2009, following a proposal and active promotion by the UK, the CCAMLR adopted a proposal for the establishment of the South Orkney Islands South Shelf MPA [21]. In 2017, the 35th meeting of the Commission decided to establish another high-seas MPA in

the Antarctic Ross Sea region, following a joint proposal and promotion by the US and New Zealand [22]. Unlike the establishment of the South Orkney Islands MPA, the number of countries involved in this negotiation increased to 27, with China among them and an increase in African and Asian countries.

2.3.2. The OSPAR Convention

The 2010 OSPAR Ministerial Meeting decided to establish the North-East Atlantic Network of High-Seas MPAs according to the OSPAR Convention and designate six high-seas MPAs to form the first network of high-seas MPAs in the North-East Atlantic region [23]. The OSPAR Convention was derived from the merger of the Convention for the Prevention of Marine Pollution by Dumping from Ships and Aircraft (Oslo Convention) and the Convention for the Prevention of Marine Pollution from Land-Based Sources (Paris Convention) and was opened for signature in 1992 and entered into force in 1998 [24]. The OSPAR Convention has been signed by 14 states, the original contracting parties of the Oslo Convention and Paris Convention, and it now stands at 16 parties with Luxembourg and Switzerland [25], mainly in Western Europe.

The OSPAR Commission, also established accordingly, is composed of representatives of the contracting parties and is chaired by each contracting party in turn. The representatives of the contracting parties have the right to make management recommendations and monitor the implementation and development of legal instruments, and the observers have the right to participate in the meetings of the Commission [26]. The OSPAR Convention is the foundational treaty for the protection of the North-East Atlantic, regulating pollution from different sources, the assessment of the quality of the marine environment, and the conservation of marine biodiversity, but it explicitly does not take measures on fisheries management issues or shipping issues that may be managed by the International Maritime Organization (IMO) [24].

2.3.3. The BBNJ Agreement

The BBNJ Agreement stemmed from the massive loss of marine biodiversity, but the existing legal regimes, such as the UNCLOS and the Convention on Biological Diversity (CBD), could not provide adequate remedies, and the area-based management tools of international organizations lacked coordination [27]. In this background, European countries, together with some non-governmental organizations, promoted the development of a third legally binding agreement within the framework of the UNCLOS to ensure the conservation and sustainable use of marine biodiversity in areas beyond national jurisdiction [28]. Following the Ad Hoc Open-Ended Informal Working Group (2004–2015) and Preparatory Committee (2016–2017), the General Assembly adopted Resolution 72/249 and decided to convene intergovernmental conferences on 24 December 2017 to negotiate key topics of BBNJ instruments [29]. Since 2018, the BBNJ legislation has officially entered the intergovernmental negotiation stage, and five negotiation conferences have been held. On 19 June 2023, the Agreement was adopted at the fifth session of the intergovernmental conference [30].

The BBNJ Agreement mainly includes four key items: (1) the sharing of benefits from marine genetic resources; (2) area-based management measures and tools, including MPAs; (3) environmental impact assessment; and (4) capacity-building and transfer of marine technology. The Agreement provided main procedural matters and guidance for the establishment and management of MPAs, including proposals, publicity and preliminary review of proposals, consultations on and assessment of proposals, establishment, decision-making, implementation, monitoring, and review. The Conference of the Parties (COP) is a decision-making body, and consensus is the primary voting method.

The Conference is open to all member states of the United Nations, members of the specialized agencies, and parties to UNCLOS. Others can participate in the Conference as observers. Besides, the relevant organizations of the United Nations system, the interested global and regional intergovernmental organizations, some key non-governmental

organizations, and associate members of regional commissions were invited to participate in the conferences [31]. At present, the Agreement has been adopted and will be open to signature on 20 September 2023 [30].

The BBNJ Agreement is another milestone in the governance of high-seas biodiversity, providing a legal basis for the implementation of MPAs and laying down uniform standards for procedural issues. As can be seen from the process of law-making, the BBNJ Agreement aims to create a global legal instrument that reflects the views of all relevant subjects, achieves universal participation, and adapts to the legal attributes of the high seas. These are key points that differentiate BBNJ from other regional treaties (see Table 1).

Table 1. Comparison of law-making details of the CAMLR Convention, the OSPAR Convention, and the BBNJ Agreement.

Instruments	Purposes	Entered Into Force	Initial Parties	MPAs	Management Body
The CAMLR Convention	Conservation of Antarctic marine living resources	1982	Argentina, Australia, Belgium, Chile, the French Republic, the German Democratic Republic, the Federal Republic of Germany, Japan, New Zealand, Norway, Poland, the Republic of South Africa, the Soviet Union, UK, and USA	The South Orkney Islands South Shelf MPA; the Ross Sea region MPA	CCAMLR
The OSPAR Convention	Prevention and elimination of pollution of the marine environment, or with respect to the protection of the marine environment against the adverse effects of human activities	1998	Belgium, Denmark, Finland, France, Germany, Iceland, Ireland, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, UK, and EU	The OSPAR network of MPAs	OSPAR Commission
The BBNJ Agreement	Conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction	No in force	This agreement is now not open to signature, but many states and organizations participated in Conferences [32]	no	COP

3. Results and Discussion

3.1. Law-Making Review of Regional Treaties for the Management of High-Seas MPAs

Legal instruments are the basis of the establishment and management of high-seas MPAs, and if they are deficient in terms of legitimacy, democracy, and science, the sustainable management of high-seas MPAs based on them will be hard to achieve.

3.1.1. Questions on the Sources of Law-Making Authority

International law-making as an international activity should be carried out within the existing frameworks of international law, and the Charter of the United Nations, the Statute of the International Court of Justice, and the Vienna Convention on the Law of Treaties provide basic rules for international law-making [33]. In global ocean governance activities, the UNCLOS is currently the most authoritative and dominant ocean treaty, provides the overarching international legal framework, and should also be complied with. Regional states have engaged in treaty law-making to establish and manage MPAs, which has raised controversy about whether the UNCLOS provides regional states with such law-making competence.

The establishment of high-seas MPAs may regulate the rights of other states within MPAs. Once Russia and Ukraine questioned the legality of the establishment and management of Antarctic high-seas MPAs, Ukraine argued that the UNCLOS only provides a legal basis for the establishment of MPAs within national jurisdiction and does not see any legal possibility in the high seas [34]. But the OSPAR Commission stated in its argumentation document for legal competence that Parts VII, XI, and XII of the UNCLOS do provide the legal basis for the establishment and management of high-seas MPAs, especially Articles 192 and 197 of Part XII [35]. Some scholars share the view that Part VII and Part XII of the UNCLOS could be considered to provide the legal authority to establish management rules [36]. As can be seen, the objectives of Part VII and Part XII are far narrower than the long-term, comprehensive management objectives of high-seas MPAs. High-seas MPAs involve the restriction, prohibition, and management of navigation, fishing, marine scientific research, exploration and exploitation activities, and tourism activities, which go far beyond fishing and pollution (see Figure 1).

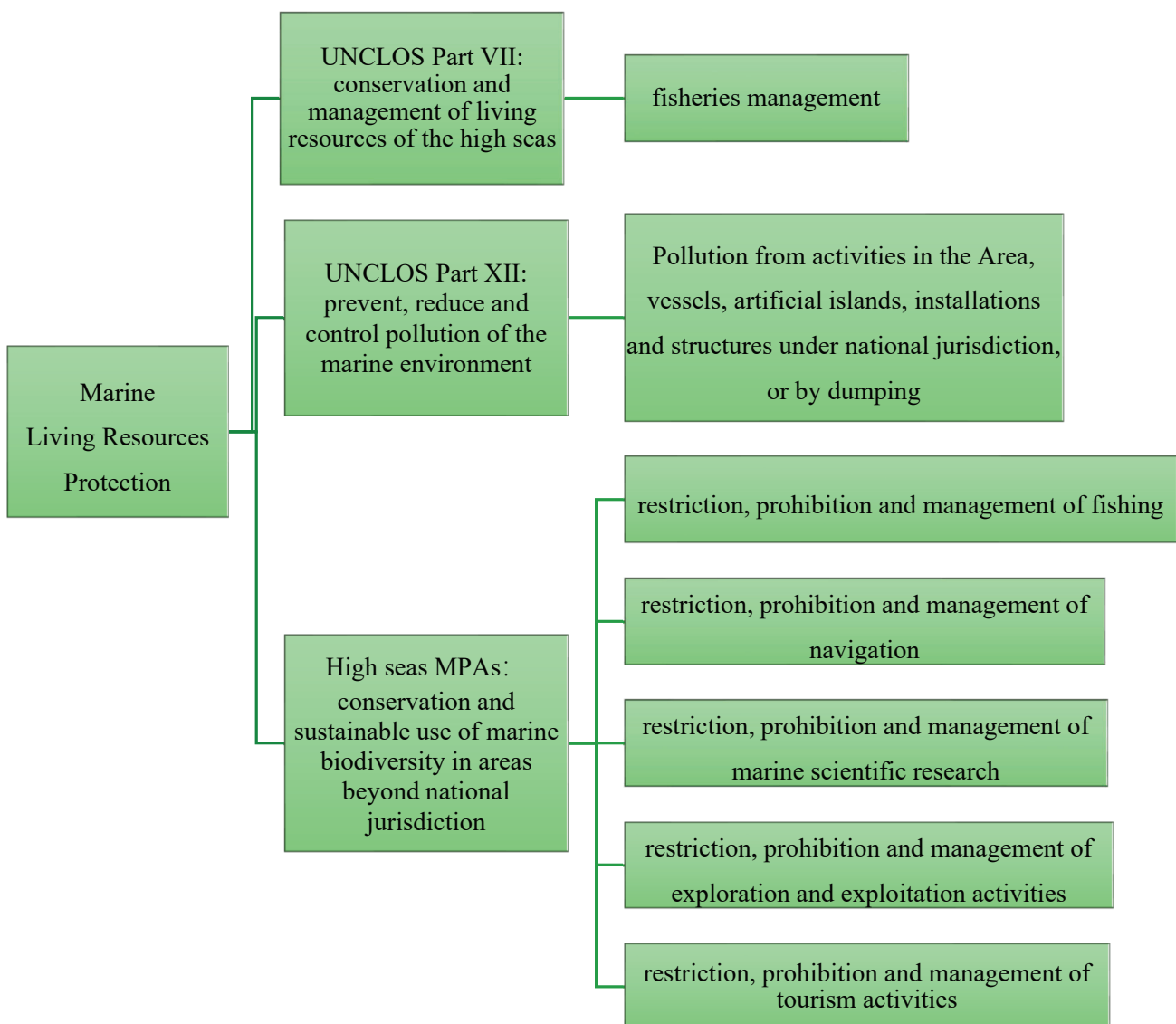


Figure 1. Differences in objectives between Part VII and Part XII of the UNCLOS and the high-seas MPAs.

The legal status of the high seas dictates that law-making in its area should be approached strictly and cautiously. The high seas do not belong to the territory of any state, and no one state can exercise any powers to claim them, implying sovereignty over the high seas [14]. The law of the sea precedents have demonstrated that “an unratified treaty may, at least in the short term, be regarded as the basis of a generally accepted rule” [37]. Once a treaty is concluded, the legal order it establishes takes on a life of its own [38]. Regional treaties ensure some “rights” over a universal resource by “selected” members, and it is difficult to consider that the treaties can achieve sustainable management if there are doubts about their legality.

3.1.2. The Failure of Law-Making Democratic Procedures

The preamble of the BBNJ Agreement, “aspiring to achieve universal participation” [39], demonstrates the importance of democracy in high seas law-making. The regional treaties for high seas MPAs were products of the last century and reflected the hegemony of power and procedures of that time.

The CAMLR Convention was adopted in the 1970s and 1980s. On the eve of the UN General Assembly questioning the legitimacy of the consultative parties’ governance of Antarctica and in the context of the NGOs’ concern for the global environment, 15 countries, mainly the Antarctic Treaty consultative parties, accelerated the negotiation process and defined the management mechanism of Antarctic biological resources before the UNCLOS was adopted. Clearly, in an era of monopoly power over Antarctic governance, the majority of developing countries were excluded from the process of developing the Convention, and even the major UN international organizations were not able to participate in the process. The OSPAR Convention was developed in the 1990s, when the UNCLOS was adopted, and international organizations began to pay attention to global environmental issues. Then, 15 countries and the European Union negotiated the Convention, while the members of the OSPAR Convention were mainly European and American countries, and almost all Asian and African countries were excluded from the consultative conferences. Third-world countries also failed to garner more power in high-seas governance through the UN platform [40].

On the other hand, the failure of democratic procedures is also reflected in the differential treatment of acceding states and the restriction of their rights. For example, in the Antarctic Treaty, there is a distinction between the rights of consultative parties and contracting parties. In order to become a consultative party with decision-making powers, a later acceding state needs to establish one scientific research station in Antarctica. However, the establishment of a scientific research station in the harsh Antarctic climate can be considered a barrier to involvement in the governance of the Antarctic for most developing countries because it concerns not only economic power but also scientific and technological capacity. The consultative parties largely control jurisdiction and decision-making in Antarctic affairs, and the CAMLR Convention, based on the Antarctic Treaty, has continued this unjustified governance mechanism without exception, and the CCAMLR also distinguishes between member states and acceding states based on financial supports [41]. Financial power determines decision-making power, and the strongest maritime states maintain a regime that gives them a favorable position, leaving the weaker maritime countries to accept such rules and participate in a seemingly fair competition [42], which is in fact procedural hegemony.

In addition to the limitations of some sovereign states, the views of important UN international organizations, such as the International Seabed Authority (ISA), the Food and Agriculture Organization of the United Nations (FAO), and the IMO, had not been adequately expressed in treaty law-making [22].

3.1.3. Political Implications in the Application of Regional Treaties

International law is the product of the harmonization of the wills of states. Article 34 of the Vienna Convention on the Law of Treaties provides that “no obligation or right shall

be created for a third State without its consent” [43]. The consent of states determines the extent of the application of regional treaties, which is independently provided by each state.

At present, more countries have acceded regional treaties on high-seas MPAs. Formally, of course, they are based on national consent, but it is hard to deny the influence of political factors. In the negotiation process of regional treaties, most of the states that led and participated in law-making are developed countries. In contrast, most of the states that did not get involved in the negotiations are developing countries, which are heavily dependent on developed countries in terms of capital, technology, and markets, and if they refuse to join the treaty or do not comply with its provisions, the preferential treatment or trade transactions would not be enjoyed. For example, the CCAMLR has developed a Catch Documentation Scheme (CDS) for non-contracting parties, which requires participating states to identify the origins of toothfish entering their markets and to determine whether toothfish caught in the CCAMLR area and landed or entering their territory were caught in a manner consistent with CCAMLR conservation measures [44]. The CCAMLR also expects to cooperate with non-contracting parties to monitor toothfish trade through electronic records, and has informed the countries on its official website, including developing countries such as the Philippines, Malaysia, Mexico, and Vietnam, that are unwilling to cooperate [45]. This constitutes a form of pressing non-contracting parties to comply with the CAMLR Convention. Besides, some countries have the political need to join a community where the rules are set by powerful countries, which is a way of realizing their values, because they need external support to gain international recognition [46].

3.2. Outcomes: The BBNJ Agreement Is Suitable for the Sustainable Management of High-Seas MPAs

The original intention of international law-making was to formulate normative concepts to institutionalize the distribution of benefits and create an international order. The management of high-seas MPAs also aims to ensure a fair distribution of costs and benefits. However, regional treaties have not only deficiencies in law-making but also other shortcomings such as the absence of international recognition, their subsequent unenforceability against third parties, and the difficulty of coordinating and cooperating with other competent organizations [3]. It is necessary to develop a new instrument for MPAs.

Compared with the regional treaties, the BBNJ Agreement bridges the shortcomings and presents several advantages, including the following: (1) the BBNJ Agreement is an instrument decided and organized by the UN General Assembly, which has greater legitimacy; (2) it is open to all countries and international organizations to achieve universal participation in order to reflect the interests of all stakeholders, thereby facilitating its implementation; (3) it promotes coordination and cooperation between international organizations under the UN framework, overcoming fragmentation of ocean governance; (4) it has taken nearly 20 years for the preparation and incorporates a lot of qualified knowledge and lessons, so it is better informed on scientific evidence and conducive to high-quality management plans. All in all, the BBNJ Agreement is an instrument at an international level that is convenient to achieve the sustainable management of high-seas MPAs [47]. It cannot be denied that there is much to be done to improve the governance mechanism under the BBNJ Agreement in the future. The implementation of the Agreement should avoid the shortcomings of existing regional treaties and deal with coexistence with regional mechanisms, paying special attention to the following matters mentioned thereafter.

3.2.1. The Preferential Application of the BBNJ Agreement in the Context of “Not Undermining”

As an area shared by all mankind, the high seas provide common interests in terms of security, ecology, and economic development, and their management should be the collective responsibility of all mankind. The BBNJ Agreement stipulates that the competence to establish and manage high-seas MPAs belongs to the COP mechanism, which is in line with this trend and wider national interests.

It should be noted, however, that the implementation of the BBNJ Agreement is premised on “not undermining relevant legal instruments, frameworks, and relevant global, regional, subregional and sectoral bodies” [1], which means that even though the regional treaties described above have been questioned, they will continue to exist. Although the BBNJ Agreement provides for “not undermining” existing instruments and mechanisms, it does not provide a clear definition or criteria. There might be two interpretations. The first approach requires that the new instrument “not undermine” the authority or mandate of existing bodies and not overlap with their area of jurisdiction. The second approach would require a new instrument that does not undermine the effectiveness or objectives of existing frameworks and bodies, which could improve the implementation and effectiveness of existing instruments [48]. The new instrument does not yet list the full range of international organizations involved in the governance of marine biodiversity beyond national jurisdiction, which amounted to 52 by 2018 [49]. If the first approach is adopted, the scope for the implementation of the BBNJ Agreement would be too narrow [49].

Therefore, in the case of anachronistic instruments and mechanisms and uncertainty as to which mechanism to apply, the BBNJ Agreement should be applied preferentially, and COP would be allowed to cooperate with regional bodies to improve the implementation and effectiveness of existing instruments. Otherwise, “not undermining” could easily become one excuse for countries with a wide range of interests in regional mechanisms to defend their own interests in the high seas, and any act detrimental to their interests could be considered “undermining” [50].

In addition, existing regional treaties have certain jurisdiction areas (see Figures 2 and 3), for example, the CCAMLR is limited to the areas south of 60° S and between this latitude and the Antarctic Convergence Zone, which forms part of the Antarctic marine ecosystem [51]. In practice, there are also a large number of areas not covered by existing mechanisms and adjacent to waters under the jurisdiction of CCAMLR, where management competence should be exercised by the COP mechanism, reflecting the will of the majority of states and avoiding possible “Enclosure” intentions.

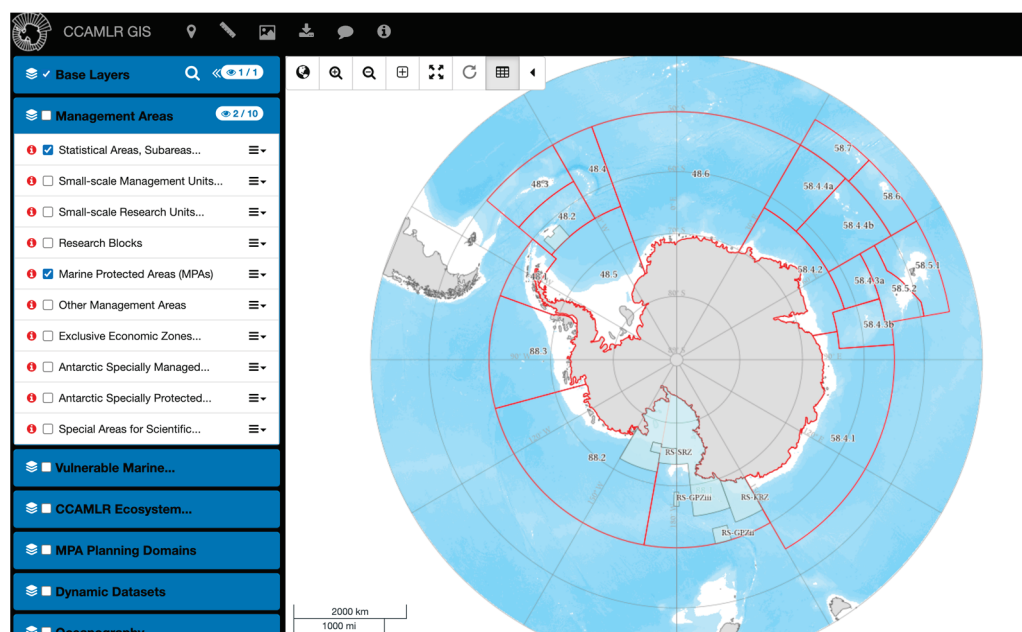


Figure 2. Management areas of CCAMLR, including the Ross Sea region MPA and the South Orkney Islands Southern Shelf MPA. Data from the CCAMLR website [52].

OSPAR Marine Protected Areas

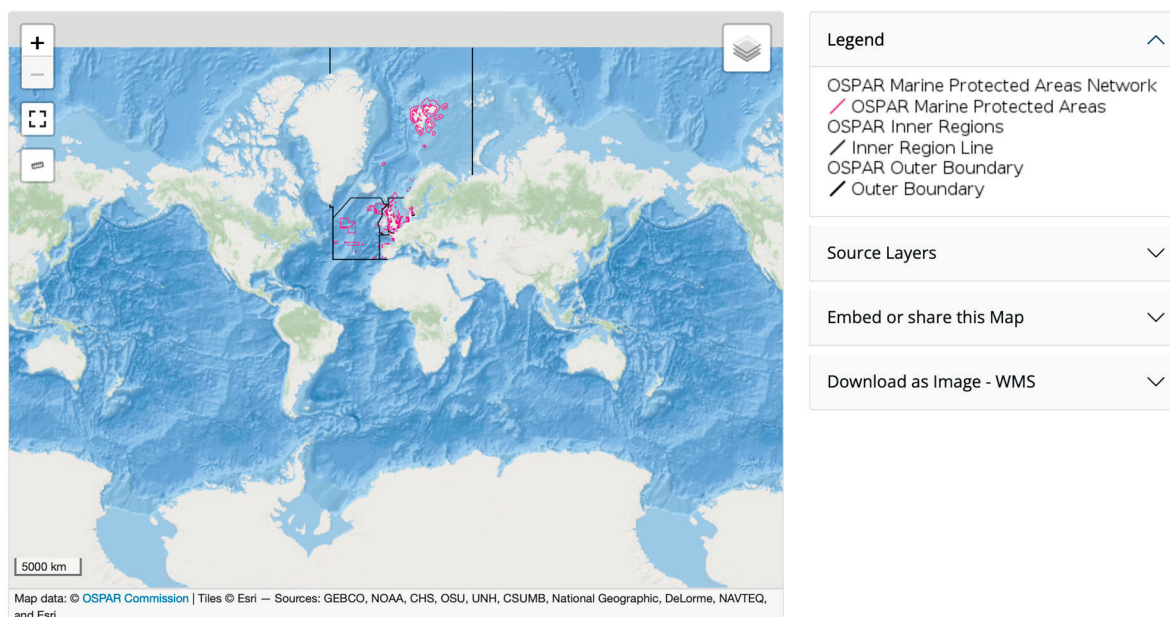


Figure 3. OSPAR region and its MPAs. Data from the OSPAR Commission website [53].

3.2.2. Adherence to Democratic Principles: Achieving Universal Participation of Stakeholders

Fairness and justice are intrinsic human pursuits, the criteria that define a virtuous society, and the primary virtues of a social system. Justice is used to determine the proper distribution of the benefits and burdens of social cooperation, and people prefer to accept a system or an order with equality [54]. The absence of stakeholders easily leads to the failure of policy implementation. Reversely, the universal participation of stakeholders can make decisions fair and effective, meet the needs of different subjects, and improve the quality of long-term management systems [55]. In this sense, the construction of a multi-level law-making power is required to deal with the specificity of the high seas and the changes in power balance. The vast majority of developing countries have been able to achieve on-going operations at sea and have a strong need to intervene in the governance of the high seas. A viable path to democratizing the governance of the global commons lies in encouraging the active participation of sovereign states [56]. In the future, decision-making related to high-seas MPAs within the BBNJ Agreement should be open to all sovereign states, with equal opportunities for participation and unimpeded procedures for expression. Legislative issues and procedures cannot continue to be determined by a few powerful nations, and institutional arrangements cannot unilaterally uphold the interests of those powerful nations [57].

In another respect, allowing international organizations to intervene in decision-making could collect more comprehensive views and knowledge for a high standard of governance. To some extent, they mediate the consultations and negotiations between countries, promote the process of law-making, and provide ideas for launching new issues [58], such as ISA, FAO, IMO, regional fisheries organizations, IUCN, etc. Among them, the involvement of ISA is particularly important in the decision-making process.

3.2.3. Dissipation of Political Influences: The Impact of Soft Law on the Non-Contracting Parties

Eliminating the influence of political factors on the application of treaties lies in avoiding the problem of over-regularization. Over-regularization implies the eradication of differences, enforced uniformity, and the defense of fixed interests, which easily develop into institutional hegemony [59]. Force should never be used in the implementation of the

BBNJ Agreement. Binding obligations are part of law, but law also includes permission, advice, incentives, guidance, etc., which can be uniformly referred to as soft law [60]. Soft law is the counterpart of hard law, a compromise to the mandatory nature of law that is not binding and gives states ample discretion. In the application of regional treaties on high-seas MPAs, some countries would refuse to become parties mainly because of concerns about being overburdened with technical, financial, and developmental burdens. Hence, putting political pressure on these countries is not a feasible way to implement the BBNJ Agreement. In order to minimize “free-riding” by uncompliant countries and achieve good governance of the high seas, soft law can be considered one possible approach to attract non-contracting states to adhere to the Agreement and gradually break through the limitations of the principle of relative effectiveness.

As far as current international practice is concerned, the main option is to develop initiatives and policies for encouraging non-contracting parties to take their own commitments, while all soft law should be premised on the realities and main demands of non-contracting parties. Based on past experiences, most of the non-contracting parties to regional treaties are developing countries with insufficient knowledge of MPAs, poor capacity for scientific research, few infrastructures and monitoring equipment, as well as a lack of strong financial support. Benefit sharing is also a key concern for non-contracting parties, and Southeast Asian developing countries, such as Indonesia and Malaysia, hope that the international mechanisms can achieve equitable benefit sharing, including technology transfer and information sharing [61]. Based on this, for non-contracting states that are willing to comply with the BBNJ Agreement or cooperate with contracting states, the COP shall take into consideration issues raised by those states and provide appropriate support and mechanisms of justice if needed. At the same time, by bearing the cost of MPA implementation, these non-contracting states can enjoy priority in the sharing of benefits from marine genetic resources. All in all, on the application of the Agreement, it is desirable to encourage non-contracting parties to make commitments in accordance with their conditions. It is also recommended to provide flexibility to allow all countries to participate in high-seas conservation actions without undue pressure or suspicion.

4. Conclusions

Treaty law-making, as an integral part of the development of international law, creates rights and obligations for international subjects and maintains international society in a certain stable order. Although the law is essentially political in nature [62] and it is inevitable that states will play games, international law carries the function of building social consensus, and there is still a need to bring the law back to the path of legitimacy and rationality. Regional treaties have played a role in the management of biological resources in parts of the high seas, but they are not recognized internationally. Action at the regional level cannot be seen as the way forward for high-seas MPAs. The BBNJ Agreement opens a new chapter in the governance of the high seas, setting common norms, achieving universal participation of states, overcoming the disadvantages of fragmented ocean governance, and being more conducive to achieving sustainable management. It cannot be denied that action at the international level has some drawbacks, such as inefficient decision-making, overlaps, and conflicts with existing mechanisms, which require the BBNJ Agreement to address the issues of coordination and cooperation with other mechanisms. Generally speaking, the high seas belong to all mankind, and their biodiversity would be most properly managed through a global legal instrument.

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Article

Further Development of the Law of the Sea Convention in the Anthropocene Era: The Case of Anthropogenic Underwater Noise

Maruf and Yen-Chiang Chang *

School of Law, Dalian Maritime University, Dalian 116026, China; mmaruf@dmlu.edu.cn

* Correspondence: ycchang@dmlu.edu.cn

Abstract: Anthropogenic underwater noise (AUN) is a growing concern for governments and international institutions around the world. This emerging issue signifies a rapid environmental change and raises questions about the applicability and effectiveness of current instruments. A key question to be addressed is whether the United Nations Convention on the Law of the Sea (UNCLOS) can address the challenges posed by AUN. While AUN is not explicitly mentioned in the UNCLOS, this article argues that some of its provisions are applicable to the problem. Part XII of the UNCLOS is proposed as a governing framework for protecting the marine environment from AUN. As a result, several options are presented to strengthen the regulation of AUN under the UNCLOS, including the adoption of a new implementing agreement, addressing AUN through the existing implementation agreement, and regulating through the rules of references.

Keywords: Anthropocene era; UNCLOS; marine environmental protection; anthropogenic underwater noise; ocean governance; marine pollution

1. Introduction

We currently live in the Anthropocene era, a complex period characterized by extensive anthropogenic activity, although its magnitude and starting point remain subject to serious debate [1]. The term “Anthropocene” refers to human-dominated activities (anthropogenic activities) that have significantly influenced global environmental changes, such as climate change, biodiversity loss, resource limitations, and waste production [2]. Anthropogenic activities are now global and the primary cause of contemporary environmental changes [3]. Consequently, they have rapidly and significantly impacted the Earth’s climate, land, oceans, and biosphere.

The oceans, with their abundant living and non-living resources, play a vital role in supporting human well-being. However, increasing attention has been drawn to the ability of the oceans to sustain human well-being and the decline in marine life due to anthropogenic pressures. Human activities have affected ocean ecosystems and resources on a global scale, including overexploitation of the oceans for food and energy production, tourism, and transportation, as well as land-based activities such as atmospheric emissions and waste discharge [4]. As a result, marine ecosystems worldwide face multiple threats, including declining biodiversity, collapsing fish stocks, increasing habitat destruction, pollution, and population growth. These significant anthropogenic pressures require urgent action to enhance the protection of the marine environment in the current Anthropocene era and highlight the need for progressive development of marine environmental law and policy.

This article explores how the United Nations Convention on the Law of the Sea (UNCLOS) [5], the most important source of modern law of the sea, can be developed to address current marine environmental problems. Specifically, this article provides a critical analysis of the UNCLOS’s capacity to facilitate the necessary systemic marine

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environmental changes caused by anthropogenic underwater noise (AUN). A crucial question to be addressed is: “Can the challenges posed by anthropogenic underwater noise be resolved by the UNCLOS?” This article also examines the institutional arrangements and their response to the issue of AUN.

2. The Nature of Anthropogenic Underwater Noise

As discussed above, the world’s oceans today are facing an environmental problem caused by several forms of anthropogenic pollution. Among these, AUN is classified as anthropogenic pollution in marine environments that can have detrimental effects on a variety of marine organisms, including whales, cetaceans, fish, and invertebrates [6]. Therefore, regulation and management of this problem are essential to protect the marine environment. Given the complexity of the problem, understanding the nature of AUN is fundamental to strengthening the regulatory framework for protecting the marine environment against this problem.

Sound plays many significant roles in the marine environment, including detecting predators and prey, communication, and navigation for various marine animals [7]. The term “acoustic” is sometimes used interchangeably with “sound” [8]. In addition, the term “soundscape” is used by scholars to describe the diverse array of sounds, including those of biological, geophysical, and anthropogenic origin, that arise from a particular landscape and vary over time and space, and offer information into critical ecosystem functions and human activities [9].

Underwater sound can occur naturally due to the physical environment, such as through wind, waves, rain, tidal actions, ice, and earthquakes (geophony) [10], and the activities of non-human organisms such as fish, marine mammals, and invertebrates (biophony) [10]. Sound can also be unintentionally or intentionally introduced by human activities such as shipping, seismic surveys, marine construction, and sonar technology (anthrophony) [10]. Seismic survey activities are categorized as anthrophony and are intentionally introduced into the marine environment. On the other hand, shipping, marine construction, and dredging are categorized as anthrophony and are unintentionally introduced into the marine environment.

Anthrophony can also be further classified into two categories: impulsive or temporary sounds, and non-impulsive or continuous sounds. Impulsive or temporary sounds have a short duration, high intensity, and a significant change in amplitude over a short period. They can be single events or repetitive, and examples include explosions, airgun discharges, sonar, and pile driving. On the other hand, non-impulsive or continuous sounds have a relatively constant sound level and are typically of lower intensity. For example, continuous sounds in the marine environment include those produced by ship propellers, industrial activities such as drilling and dredging, and renewable energy operations [6].

The term “noise” is defined as “undesired sound” [11] or “a type of unwanted sound for the receiver that interferes with the detection of other sounds of interest” [12]. Therefore, a particular sound can be considered noise to the receiver if it is unwanted. Wenz has classified four basic categories of underwater noise in the context of the sonar process, including radiated noise, self-noise, ambient noise, and reverberation noise [13]. Among these distinct categories, this article applies the term “anthropogenic underwater noise”, which refers to all sources of marine noise that have significant potential impacts on many types of marine animals, such as marine mammals, fish, invertebrates, and other animals.

Marine mammals have significant ecological and cultural value. Thus, research on the impacts of AUN on marine mammals generally has drawn more attention than that concerning other marine organisms. Marine mammals have a wide bandwidth of hearing, which makes them particularly vulnerable to increased AUN. As a result, AUN can lead to a decrease in communication space as well as trigger behavioral responses, such as avoidance of the ocean area, displacement (short- and long-term), change in communication behavior, stranding behavior, changes in surface patterns, and change in driving

behavior [6]. Therefore, AUN represents a particular challenge for the conservation and management of marine mammals [14].

Research on the impacts of AUN on marine fish has also received considerable attention from the scientific community, as about 20,000 species of marine fish can hear sounds [15]. Sound is essential for fish to detect their surroundings, communicate with each other, find mates, and avoid predators [16]. Studies have observed potential impacts of AUN on 66 species of fish, including individual behaviors, physiology, anatomy, and development [17]. The impact of noise on the individual behavior of marine fish includes impaired communication, orientation, feeding, and prey detection, as well as increased aggression, leading to reduced group cohesion, avoidance of crucial habitats, lower offspring production, and increased mortality rates [18]. Marine fish physiology can also be impacted by noise exposure, resulting in poor growth rates, weakened immunity, and reduced reproduction rates. In addition, exposure to noise can have negative anatomical impacts, such as hearing loss and injury to vital organs [19] and the development stages of marine fish, such as delayed growth and reduced growth rates [17].

Marine invertebrates play a vital role in supporting worldwide fisheries, making it crucial to investigate the impact of AUN on invertebrates [20,21]. Despite their importance, research on the effects of AUN on marine invertebrates remains limited compared to studies on marine mammals and fish [22]. Current reports suggest that about 36 species of invertebrates have been observed to respond to acoustic cues and detect sound or vibration [17,23]. The impacts of AUN on marine invertebrates include effects on anatomy, physiology (stress), behavior, and masking [17]. In addition to marine mammals, fish, and invertebrates, AUN can also impact other marine species, such as turtles and phytoplankton. Seismic surveys, for example, have been found to cause significant mortality in zooplankton populations, with a single discharge from a seismic airgun having the potential to kill even microscopic zooplankton [24]. Although the effects of marine seismic surveys on turtles remain poorly understood, there is evidence that they can have an impact on these animals [25]. Therefore, more research is needed to investigate the effects of AUN on marine turtles and other species [26].

Apart from the environmental impacts, AUN can have socio-economic consequences, either through a ripple effect on human activities that depend on marine species or by directly affecting humans. Although scientific research on such impacts is still limited, some studies have shown the potential economic losses caused by AUN under certain circumstances. For example, seismic surveys have been linked to decreasing catch rates for several species of fish [27].

The ocean is an incredibly effective medium for transmitting sound, with the speed of sound in seawater being five times faster than in air. As a result, the effects of AUN in the territory of one country may have detrimental effects on another country's territory or areas of the global commons. Therefore, AUN can be regarded as a form of transboundary pollution in the marine environment [28]. Moreover, the transboundary nature of AUN can be observed in ship-generated AUN, where the state of origin is often the flag state, and the state likely to be affected could be a coastal state, port state, or third state. International shipping involves sailing between ports of different countries, meaning the harmful effects of AUN from international shipping could affect two different areas. These areas may include regions beyond national jurisdiction, such as the high seas and the deep seabed, as well as areas within the national jurisdiction of other states, such as exclusive economic zones (EEZ), territorial seas (or archipelagic waters), or continental shelf.

3. The UNCLOS and Its Applicability to Address Anthropogenic Underwater Noise

The UNCLOS is, without a doubt, an essential source of the modern law of the sea, although there are several other sources of the international law of the sea. (Other international instruments relevant to the law of the sea may include the Convention on Biological Diversity (CBD Convention), instruments established by the IMO, the Convention on the Conservation of Migratory Species of Wild Animals (CMS Convention), as well as other

binding and non-binding instruments at different levels. The custom and practices of states, the judgments of international courts and tribunals and the opinion of international jurists also contribute significantly to the development and interpretation of the law of the sea). The UNCLOS, as an essential agreement related to the use of the oceans, does not explicitly mention AUN as a form of marine pollution. Article 1 (4) of the UNCLOS defines pollution of the marine environment as:

“[I]ntroduction 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”.

Some scholars argue that this definition encompasses all forms of marine pollution, either present or future, including AUN [29]. However, given that the word “noise” is not explicitly mentioned under this definition, the interpretation of this definition is critical to determine whether “noise” can qualify as a form of marine pollution. Does “energy” under this definition include “noise”? While the definition uses the term “energy”, scientific research indicates that noise is a natural form of energy, suggesting that it falls under this definition [30]. In a broader interpretation, the term “energy” might also include all forms of energy, including electricity, vibration, heat and radiation [31]. Additionally, the term “likely to result” in the definition implies that potentially harmful effects on the marine environment can be regulated [32]. Thus, given the scientific uncertainty around AUN, it is reasonable to consider it as potentially deleterious [6,12,33]. Finally, the definition states that pollution of the marine environment must be “introduced by man”, which limits the scope of AUN to noise that is introduced by human activities such as shipping, seismic surveys, marine construction, and the use of sonar technology [10]. Other sources of noise, such as geophony and biophony, will not be included as forms of marine pollution.

Taken together, these three elements support the argument that AUN falls within the definition of marine pollution in the UNCLOS. While the Convention was not drafted with AUN in mind, its provisions can be applied to regulate it. The following section explains how the existing provisions of the UNCLOS can be applied to deal with AUN. Additionally, Table 1 in this paper provides a summary of several relevant provisions of UNCLOS that can be reasonably employed to mitigate, adapt to, and reverse the impacts of AUN on the marine environment.

Table 1. Relevant provisions of the UNCLOS for mitigating, adapting to, and reversing the impact of AUN in the marine environment.

Main Argument	Article Number and Text
It is argued that this provision provides general obligation to address AUN	<ul style="list-style-type: none"> • Art. 192: "States have the obligation to protect and preserve the marine environment" • Art. 194 (1): "States shall take, individually or jointly as appropriate, all measures consistent with this Convention that are necessary to prevent, reduce and control pollution of the marine environment from any source . . . and they shall endeavour to harmonize their policies in this connection" • Art. 194 (2): "States shall take all measures necessary to ensure that activities under their jurisdiction or control are so conducted as not to cause damage by pollution to other States and their environment, and that pollution arising from incidents or activities under their jurisdiction or control does not spread beyond the areas where they exercise sovereign rights" • Art. 194 (3): "The measures taken pursuant to this Part shall deal with all sources of pollution of the marine environment"
It is argued that these provisions provide a general obligation to mitigate the impact of AUN in the marine environment.	<ul style="list-style-type: none"> • Art. 195: "States shall act so as not to transfer, directly or indirectly, damage or hazards from one area to another or transform one type of pollution into another" • Art. 196 (1): "States shall take all measures necessary to prevent, reduce and control pollution of the marine environment resulting from the use of technologies under their jurisdiction or control" • Art. 208: "Coastal States shall adopt laws and regulations to prevent, reduce and control pollution of the marine environment arising from or in connection with seabed activities subject to their jurisdiction and from artificial islands, installations and structures under their jurisdiction" • Art. 210: "States shall adopt laws and regulations to prevent, reduce and control pollution of the marine environment by dumping" and " . . . shall endeavour to establish global and regional rules, standards and recommended practices and procedures to prevent, reduce and control such pollution" • Art. 211: "States . . . shall establish international rules and standards to prevent, reduce and control pollution of the marine environment from vessels and promote the adoption, in the same manner, wherever appropriate, of routing systems designed to minimize the threat of accidents which might cause pollution of the marine environment"
It is argued that these provisions provide a general obligation to adapt to the impact of AUN in the marine environment.	<ul style="list-style-type: none"> • Art. 199: " . . . States in the area affected, in accordance with their capabilities, and the competent international organizations shall cooperate, to the extent possible, in eliminating the effects of pollution and preventing or minimizing the damage. To this end, States shall jointly develop and promote contingency plans for responding to pollution incidents in the marine environment" • Art. 61 (2): "The coastal State . . . shall ensure through proper conservation and management measures that the maintenance of the living resources in the exclusive economic zone is not endangered by over-exploitation" and " . . . shall cooperate to this end" • Art. 117: "All States have the duty 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"

Table 1. *Cont.*

Main Argument	Article Number and Text
<p>It is argued that these provisions provide a general obligation to reverse the impact of AUN in the marine environment.</p>	<ul style="list-style-type: none"> • Art. 61 (3): Conservation and management “measures shall also be designed to maintain or restore populations of harvested species at levels which can produce the maximum sustainable yield”
	<ul style="list-style-type: none"> • Art. 61 (4): “ . . . coastal State shall take into consideration the effects on species associated with or dependent upon harvested species with a view to maintaining or restoring populations of such associated or dependent species. . . . ”
	<ul style="list-style-type: none"> • Art. 63: “ . . . States shall seek, either directly or through appropriate subregional or regional organizations, to agree upon the measures necessary to coordinate and ensure the conservation and development of such stocks”
	<ul style="list-style-type: none"> • Art. 64: “The coastal State and other States whose nationals fish in the region for the highly migratory species listed in Annex I shall cooperate . . . with a view to ensuring conservation and promoting the objective of optimum utilization of such species”
	<ul style="list-style-type: none"> • Art. 119: “States shall: take measures which are designed . . . to restore populations of harvested species” and “take into consideration the effects on species associated with or dependent upon harvested species with a view to . . . restoring populations”

3.1. *The Protection and Preservation of the Marine Environment*

Article 192 of Part XII requires all States “to protect and preserve the marine environment”. The use of both “protect” and “preserve” indicates its comprehensive meaning, which goes beyond the prevention of substantive pollution [34]. The term “protect” refers to preventing future damage to the maritime environment, whereas “preserve” refers to maintaining or improving its current condition [34–36]. Professor James Harrison has suggested that the obligation under this provision can be considered as a “statement of principle” that serves to define the scope of Part XII. This means that the interpretation of Part XII should cover all forms of harm to the marine environment [35,37], including the alteration of the marine environment and its components, physical harm and destruction [37]. Given the impact of AUN, States have an obligation to protect the marine environment against AUN through efforts that will prevent future damage and maintain or improve the present condition of the marine environment. This obligation is also considered to be a binding norm of customary international law, which means that all States have a legal obligation, including those that have not ratified the UNCLOS [37,38].

The obligation under Article 192 is linked to Articles 194 (1) and (3). Article 194 (1) contains a general obligation for States to take all measures necessary for preventing, minimizing, and controlling pollution of the marine environment from any sources. As AUN can be considered a form of pollution of the marine environment, States arguably should also take necessary measures to prevent, reduce, and control AUN from any sources. Article 194 (3) requires States to take measures against all sources of marine pollution, including shipping, the use of sonar, exploitation and exploration of oil and gas, and other sources of AUN. In addition, States must “ensure that activities under their jurisdiction or control are conducted so as not to cause damage by pollution to other states and their environment” [39]. The phrase “to ensure” imposes a due diligence obligation on States [38], requiring them to take measures to prevent or minimize harmful pollution. Such measures include conducting environmental impact assessments, regulating activities, using the best available technology, applying the precautionary principle, and enforcing measures for activities causing AUN under their control and within their jurisdiction. This obligation also applies to activities that may have transboundary effects on the marine environment, including those in the ABNJ [31,35,40].

3.2. *The Conservation of Marine Living Resources*

The UNCLOS outlines two basic approaches to conserving marine living resources. The first approach is based on jurisdiction, wherein a coastal State is granted the sovereign right to explore, exploit, conserve and manage the natural resources, of the water supra-jacent above the seabed and its subsoil within its exclusive economic zones (EEZ) [41]. Within this jurisdiction, the coastal State has a responsibility for the conservation and management of the marine living resources in accordance with Article 61 of the UNCLOS. The term marine living resources may also include the concept of biodiversity under the CBD Convention, which allows for a more comprehensive interpretation of Article 61 for conserving, sustainably using and minimizing ecosystem impacts within the EEZ [42].

According to Article 61 of the UNCLOS, States are required to establish a total allowable catch (TAC) for the harvesting of living resources within the EEZ, based on the best scientific evidence available. Furthermore, each State is obligated to implement appropriate conservation and management measures to ensure sustainable use of these resources within the EEZ [43,44]. States must maintain or restore harvested species populations to levels that can produce maximum sustainable yield (MSY) considering environmental and economic factors. Given that AUN is an environmental factor that could potentially cause a decrease in MSY in certain populations, it is reasonable to argue that the UNCLOS has a mandate to consider AUN in the establishment of conservation measures and TAC [6,45]. The second approach to conserve marine living resources is based on the species-specific approach. The UNCLOS provides special regimes for specific species applicable to the conservation of shared fish stocks [46], straddling fish stocks [47], highly migratory species (HMS) [48],

marine mammals [49], anadromous stocks [50], catadromous species [51] and sedimentary species [52]. According to this approach, conservation measures are to be determined according to each category of certain marine species. Considering the impact of AUN, several conservation provisions under this subject can also be applied to AUN. (For instance, Article 63 (1) of the UNCLOS states: “States shall seek . . . to agree upon the measures necessary to co-ordinate and measure the conservation and development of such stocks” (shared and straddling fish stocks). Article 64 (1) provides that States “shall cooperate . . . with a view to ensuring conservation and promoting the objective of optimum utilization of such species throughout the region” (highly migratory species). Article 65 of the UNCLOS states: “States shall cooperate with a view to the conservation of marine mammals and in the case of cetaceans shall in particular work through the appropriate international organizations for their conservation, management and study” (marine mammals).

3.3. The Conservation of Marine Biodiversity

The UNCLOS provides two general provisions relating to the conservation of marine biological diversity, laid down in Articles 194 (5) and 196 (1). First, States are obligated under Article 194 (5) of the UNCLOS to protect and preserve rare or fragile marine ecosystems, threatened habitats, depleted or endangered species and other forms of marine life. [53]. Some commentators suggest that this provision aims to protect ecosystems and biodiversity as a whole [34]. Further, the scope is not only for preventing, reducing and controlling pollution but also includes all issues of protection of the marine environment, including AUN. Secondly, Article 196 (1) obligates States to take measures to prevent, reduce and control marine pollution caused by technologies that may cause a significant and harmful change to the marine environment [54]. This provision recognizes the use of technologies as a source of marine pollution and requires States to take measures against uncertain risks possibly from the use of technologies. The term “technologies” in this provision is broad and does not refer to a specific technology [34]. The term technology has a broader interpretation than the installations and devices under Article 194 (1)–(3), which is doubtful if the introduction and use of a (new) technology are encompassed by Article 194 [34]. Given that AUN can result from the use of many different technologies, States arguably have an obligation to take all measures to prevent, reduce and control AUN that may cause significant and harmful changes to a particular part of the marine environment.

4. Institutional Framework and Its Response to the Issue of Anthropogenic Underwater Noise

The UNCLOS is a unique instrument in terms of its institutional framework. Unlike other multilateral treaties, it does not provide a detailed arrangement for facilitating review and implementation. This is largely due to the fact that the UNCLOS addresses a broad range of issues related to the use of ocean space, rather than focusing on a specific area of concern. As a result, developing a comprehensive institutional framework to oversee the implementation and application of the UNCLOS is particularly challenging [55].

During the negotiation process for the UNCLOS, some delegations suggested the establishment of a specific body to periodically review and implement the Convention, but these proposals did not receive widespread support [56]. Consequently, the Convention does not have standing bodies or a conference of the parties, unlike many other multilateral treaties. Instead, the Convention has four annual review cycles, which include the UN Secretary-General’s report, the Meeting of the States Parties to the UNCLOS (SPLOS), the Open-Ended Informal Consultative Process on Oceans and Law of the Sea (ICP), and the UN General Assembly’s resolution. While these review cycles do not have the same function as the standing bodies of other treaties, some scholars and commentators have argued that they play a role in developing the issue of the law of the sea and the Convention [55]. This section summarizes the four annual review cycles of the Convention and their response to the issue of AUN.

Firstly, the UN Secretary-General's annual report, published at the beginning of each year, reviews developments related to the law of the sea, including the UNCLOS [57]. As the treaty depository function and "administrative hub" under Article 319 of the UNCLOS, the UN Secretary-General is responsible for convening necessary meetings and reporting on issues of a general nature [58]. This legal basis has led to the establishment of the SPLOS. In 2003, the UN Secretary-General first recognized the issue of AUN from shipping and continued to report on it from 2005 to 2020 due to its environmental impact on the marine environment and vulnerable ecosystems [59]. The increasing attention toward AUN has been noted in international forums, such as the International Whaling Commission, the European Parliament, and the International Union for Conservation of Nature (IUCN) [60]. In 2018, the UN Secretary-General provided a special report on the issue of AUN [61].

Secondly, the SPLOS normally convenes in June and aims to receive and consider matters relating to the UNCLOS, the International Tribunal for the Law of the Sea, and the Commission on the Limits of the Continental Shelf, including the election of their members. The SPLOS initially mentioned the issue of AUN in 2006, when some delegations stated that the report of the Secretary-General should "address the concept of maritime security in a broader sense including the effects of ocean noise on marine mammals" [62]. However, the discussion of AUN under the SPLOS was not continued until 2018 and 2019. Under this meeting, some delegations expressed their concern over the threats and pressures caused by many types of marine pollution, including AUN, and called for further action to address those problems. In particular, some delegations suggested the implementation of area-based management tools and environmental assessment as well as the need for capacity-building and transfer of marine technology [63,64].

Thirdly, the ICP usually meets shortly after the SPLOS. It was established on 24 November 1999 by the UNGA following the recommendation of the Commission on Sustainable Development, consistent with the legal framework of the UNCLOS and the goals of chapter 17 of Agenda 21 [65]. The ICP plays a role in facilitating the annual review by the General Assembly of the developments of the law of the sea and ocean affairs by considering the Secretary-General's annual report and suggesting particular issues relating to the oceans and the law of the sea [66]. In 2004, the fifth meeting of the ICP identified AUN and its impacts on marine life as one of the issues that could benefit from attention in future work of the UNGA on oceans and the law of the sea. This issue was further discussed in 2005 under "Agenda item 3: General exchange of views on areas of concern and actions needed, including on issues discussed at the previous meeting" [67]. During this meeting, some delegations stated that the problem of AUN had not been regulated and suggested applying the UNCLOS as a legal basis for action to address AUN, establishing a multinational task force to develop international agreements on noise regulations, and implementing the precautionary principle to reduce or mitigate activities that result in high levels of AUN until effective guidelines are established [67]. One delegation emphasized the international community's need to address the problem of AUN [67].

Finally, the annual review cycle ends with the adoption of the UNGA's resolution on "oceans and the law of the sea". It discusses agenda items on oceans and the law of the sea based on the report prepared by the UN Secretary-General. The resolution of the UNGA consists of reviewing the UNCLOS, calling on the Member States to take various kinds of action, and other normative instruments. Moreover, the UNGA has taken it upon itself to have the competence to undertake such a review and evaluation of the implementation of the UNCLOS as well as other developments relating to ocean affairs and the law of the sea. In this regard, the UNGA has taken upon itself a role that would be fulfilled by a conference of the parties under most other treaties [55]. The concern of AUN was first brought up in 2005 by the UNGA when it adopted Resolution A/Res/60/30 on "Oceans and the Law of the Sea." From 2006 onward, a reference to the issue of AUN regularly appeared in the UNGA resolution [68–71].

Despite the UNGA's concern on this issue, the resolution has not yet produced significant action toward noise regulation such as the development of a task force to develop

international agreements on noise regulation or effective guidelines to address AUN. The existing gaps in knowledge and the limited detailed studies and data on AUN are likely contributing factors hindering the development of specific regulations to tackle this issue. As a result, the current UNGA resolution has primarily focused on promoting further research and consideration of the effects of AUN on marine living resources, and has urged the DOALOS to gather and share peer-reviewed scientific studies received from Member States on its website [72]. Additionally, the resolution has recognized and encouraged the implementation of the IMO Guidelines for reducing AUN from commercial shipping. Furthermore, it has stressed the importance of cooperation and coordination among States and international organizations in conducting research on AUN. The resolution also calls on States to consider cost-effective measures and strategies for addressing the issue of AUN [68–73].

In addition, the ICP-19 focused its discussions on the theme of “Anthropogenic Underwater Noise”, as specified in Resolutions 71/257 and 72/73 [74,75]. This meeting, held from 18–22 June 2018, provided the most comprehensive discussion on the AUN issue under the annual cycle of the UNCLOS. The discussions at ICP-19 covered a wide range of topics related to AUN, ranging from its widespread and intricate nature and lack of information on its sources and effects to its socioeconomic impact on sectors such as fishing, tourism, and transportation. The meeting also explored possible management strategies, such as the use of area-based management tools and environmental impact assessments. Moreover, AUN was identified as a form of transboundary pollution requiring mitigation and action through a UNGA resolution [6,76]. Despite these significant discussions, the current UNGA resolution on the law of the sea has produced no substantial results in addressing AUN. However, the ICP-19 report acknowledges that other institutions, at the international, regional and national levels, have adopted and implemented various instruments, initiatives, and programs to tackle AUN, as indicated in Table 2 [6]. For instance, the IMO has adopted the IMO Guidelines specifically designed to address AUN arising from shipping activities. Therefore, it is recommended that Parties to the UNCLOS utilize these existing instruments and initiatives, including IMO Guidelines, as the best environmental practices and the best available technology to effectively address AUN and mitigate its impact on the marine environment.

Table 2. Regulatory framework and its responses to address AUN and its impact on the marine environment.

Category	Instruments/Institution/Mitigation Measures/Programs/Initiatives
International Instruments	<ul style="list-style-type: none"> United Nations Convention on the Law of the Sea <ul style="list-style-type: none"> The UNCLOS serves as a fundamental framework for regulating all marine activities, including the protection of the marine environment from AUN. The issue of AUN has been extensively discussed during the three annual meetings of the State Parties to the UNCLOS, as detailed in Section 3 of this paper. Convention on Migratory Marine Species <ul style="list-style-type: none"> Resolution 12.14 on Adverse Impacts of Anthropogenic Noise on Cetaceans and Other Migratory Species was adopted at COP-12 as the CMS, along with its annex on Guidelines on Environmental Impact Assessments for Marine Noise-generating Activities (UNEP/CMS/COP12/Inf.11/Rev.1) [77]. Best Available Technology (BAT) and Best Environmental Practice (BET) for Three Noise Sources: Shipping, Seismic Surveys, and Pile Driving, 2019 (UNEP/CMS/COP13/Int.9) [78]. International Maritime Organization <ul style="list-style-type: none"> Resolution MEPC.1-Circ.833 on the Guidelines for the Reduction of Underwater Noise from Commercial Shipping to Address Adverse Impacts on Marine Life (IMO Guidelines) [79].
	<ul style="list-style-type: none"> The CBD has not adopted a specific program or initiative to address AUN. However, it has comprehensively discussed the issue of AUN and encourages states and non-state actors to apply relevant mitigation measures to address AUN [80]. <ul style="list-style-type: none"> CBD Decision XII/23: Marine and coastal biodiversity: Impacts on marine and coastal biodiversity of anthropogenic underwater noise [81]. VIII/28. Impact assessment: Voluntary guidelines on biodiversity-inclusive impact assessment (UNEP/CBD/COP/DEC/VIII/28). It provides detailed guidance on whether, when and how to consider biodiversity in both project level and strategic level assessments (including AUN) [82].
	<ul style="list-style-type: none"> International Whaling Commission <ul style="list-style-type: none"> IWC, Resolution 2018-4 on Anthropogenic Underwater Noise. This resolution instructs the Conservation Committee to review progress in implementing IWC Recommendations on the mitigation and management of anthropogenic underwater noise and, based on this review, develop advice on priority actions to implement to address the impacts of anthropogenic underwater noise on cetaceans [83].
Regional Agreements and Initiatives	<ul style="list-style-type: none"> MSFD Descriptor 11 on Energy and Noise (D11): MSFD Descriptor 11 addresses the introduction of energy, including underwater noise, to ensure that it does not have adverse effects on the marine environment [84]. Commission Decision 2017/848 further specifies criteria elements for D11, focusing on anthropogenic impulsive sound and anthropogenic continuous low-frequency sound in water [85]. Recital 12 of Directive 2014/52/EU: Directive 2014/52/EU, which pertains to the assessment of the effects of certain public and private projects on the environment, recognizes the importance of the marine environment. It emphasizes the need for EIA and screening procedures for projects in marine environments, particularly those involving technologies such as seismic surveys that utilize active sonars. Annex III and Annex IV of the directive also highlight the consideration of the marine environment, including noise and vibration [86]. Habitats Directive and Birds Directive: The Habitats Directive (Council Directive 92/43/EEC) and the Birds Directive (Council and European Parliament Directive 2009/147/EC) play a crucial role in the protection of species and habitats in the European Union. These directives require measures to prevent significant disturbance to species within Natura 2000 sites (designated areas of high biodiversity importance). Article 6(2) of the directives specifies the obligation to assess human activities that may have a significant impact on the conservation objectives of these sites, including potential disturbances caused by AUN [87,88]. Monitoring Guidance for Underwater Noise in European Seas, Part I: Executive Summary, JRC Scientific and Policy Report EUR 265557 EN, 2014 [89]. Monitoring Guidance for Underwater Noise in European Seas, Part II: Monitoring Guidance Specifications, JRC Scientific and Policy Report EUR 26555 EN, 2014 [90]. Monitoring Guidance for Underwater Noise in European Seas, Part III: Background Information and Annexes, 2014 [91].
	<ul style="list-style-type: none"> The Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR Agreement 2011-03), 2021 [92]. Atlantic Environment Strategy (replacing Agreement 2010-03), 2021 [92]. Agreement 2015-05 on OSPAR Monitoring Strategy for Ambient Underwater Noise [93]. OSPAR Commission, CEMP Guidelines for Monitoring and Assessment of loud, low and mid-frequency impulsive sound sources in the OSPAR Maritime Region. OSPAR Agreement 2017-07, 2017 [94].
	<ul style="list-style-type: none"> OSPAR Commission, CEMP Guidelines for Monitoring and Assessment of loud, low and mid-frequency impulsive sound sources in the OSPAR Maritime Region. OSPAR Agreement 2017-07, 2017 [94].

Table 2. *Cont.*

Category	Instruments/Institution/Mitigation Measures/Programs/Initiatives
The Convention on the Protection of the Marine Environment of the Baltic Sea Areas (Helsinki Convention)	<ul style="list-style-type: none"> • HELCOM's Baltic Sea Action Plan 2021, specifically in Part IV on "Sea-based activities", includes a goal of environmentally sustainable sea-based activities. One of the ecological objectives within this part is to ensure "No or minimal harm to marine life from man-made noise". To achieve this objective, the Action Plan establishes a management objective to "Minimize noise to levels that do not adversely affect marine life". Furthermore, the Action Plan outlines nine specific action plans to address AUN [95]. • Regional Baltic Underwater Noise Roadmap 2015–2017 adopted in 2016 (HELCOM 37-2016) [96].
The Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean (Barcelona Convention)	<ul style="list-style-type: none"> • Strategic Action Programme for the Conservation of Biological Diversity in the Mediterranean Region, 2003 [97]. • Action Plan for the conservation of cetaceans in the Mediterranean Sea, 2016 [98]. • Integrated Monitoring and Assessment Programme and related Assessment Criteria (IMAP). Monitoring Ecological Objective 11: Energy including underwater noise [99].
The Convention on the Protection of the Black Sea Against Pollution (Bucharest Convention)	<ul style="list-style-type: none"> • Black Sea Integrated Monitoring and Assessment Program for years 2017–2022 (BSIMAP) [100]. The BSIMAP has the objective to answer the policy question on "What are the levels of noise pollution in the Black Sea and how to reduce the risk from noise pollution for fish and cetaceans in the Black Sea?"
The Agreement on the Conservation of Cetaceans of the Black Sea, the Mediterranean Sea and Contiguous Atlantic Area (ACCOBAMS)	<ul style="list-style-type: none"> • ACCOBAMS, Resolution 2.16 on Assessment and Impact Assessment of Man-Made Noise, (ACCOBAMS-MOP2/2004/Res.2.16), 2004 [101]. • ACCOBAMS Resolution 3.10 on the Guidelines to Address the Impact of Anthropogenic Underwater Noise on Marine Mammals in the ACCOBAMS Area (ACCOBAMS-MOP3/2007/Res.3.10), 2007 [102]. • ACCOBAMS, Annex Guidelines to address the impact of anthropogenic noise on cetaceans in the ACCOBAMS area, (ACCOBAMS-MP4/2010/Res.4.17), 2010 [103]. • ACCOBAMS, Resolution 5.15, Addressing the Impact of Anthropogenic Underwater Noise, (ACCOBAMS-MOP5/2013/Res.5.15), 2013 [104]. • ACCOBAMS, Resolution 6.17 on Anthropogenic Noise, (ACCOBAMS-MOP6/2016/Res.6.17), 2016 [105]. • ACCOBAMS, Resolution 7.13 Anthropogenic Noise, (ACCOBAMS-MOP7/2019/Doc38/Annex15/Res.7.13), 2019 [106].
Agreement on the Conservation of Small Cetaceans of the Baltic, North East Atlantic, Irish and North Seas (ASCOBANS)	<ul style="list-style-type: none"> • ASCOBANS, Resolution No. 4 on Disturbance, adopted at 3rd Session of the MOP, Bristol, UK, 26–28 July 2000 [107]. • ASCOBANS, Resolution No. 05 on Effects of Noise and of Vessels, adopted at 4th Meeting of the Parties to ASCOBANS, Esbjerg, Denmark, 19–22 August 2003 [108]. • ASCOBANS, Resolution No. 11 on "CMS Family Guidelines on Environmental Impact Assessments for Marine Noise-generating Activities", adopted at 8th Meeting of the Parties to ASCOBANS, Helsinki, Finland, 30 August–1 September 2016 [109]. • ASCOBANS, Resolution 8.11 on CMS Family Guidelines on Environmental Impact Assessment for Marine Noise-generating Activities, at the 9th Meeting of the MOP, Online, 7–11 September 2020 [110].
Canada National Legislation, Programs and Initiatives	<ul style="list-style-type: none"> • Canada has adopted several measures, such as: (1) Incentivizing quiet vessel design—The Vancouver Fraser Port Authority (VFPA) and the Port of Prince Rupert in Canada offer discounts on harbor fees for vessels that incorporate specific noise reduction technologies or hold a quiet certification from a recognized classification society, (2) Voluntary measures—The Working Group on Marine Traffic and Protection of Marine Mammals in the Gulf of St. Lawrence (G2T3M), comprising stakeholders from the marine industry, research, and conservation sectors, has proposed voluntary speed reduction measures for maritime transportation vessels in the St. Lawrence River. Led by Parks Canada and the Department of Fisheries and Oceans Canada, these measures aim to mitigate the risks of collisions with whales and minimize the impact of noise on belugas in the region. The Canadian Coast Guard published these measures in the Notice to Mariners—East monthly Edition from May to October 2013, emphasizing the importance of collective efforts to protect marine mammals and reduce noise disturbances in the St. Lawrence River [111].

Table 2. *Cont.*

Category	Instruments/Institution/Mitigation Measures/Programs/Initiatives
USA	<ul style="list-style-type: none"> • NOAA Ocean Noise Strategy Roadmap (NOAA Strategy), 2016 [112]. • Australia has adopted several measures to address AUN, such as: (1) The Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act) serves as a regulatory framework for activities that have the potential to significantly affect Matters of National Environmental Significance (MNES). Policy Statement 2.1, a component of the EPBC Act, establishes standards and a structured approach to mitigate risks associated with seismic surveys, providing essential guidance to operators conducting such surveys. (2) The North-East Shipping Management Plan encompasses a range of initiatives led by the Great Barrier Reef Marine Park Authority (GBRMPA) with the objective of advancing knowledge regarding the effects of shipping activities on the marine environment. As part of these efforts, GBRMPA and the Australian Maritime Safety Authority continually assess opportunities for research on noise monitoring tools and methodologies, as well as the implications for implementing ship noise mitigation strategies. (3) The Great Barrier Reef Marine Park Regulations of 1983 mandate that GBRMPA assess the environmental, social, cultural, and heritage implications of proposed activities within the marine park, including underwater noise. Recent updates to these regulations (4 October 2017) aim to enhance the consistency and transparency of the application process. These updates require the consideration of direct, indirect, and potential cumulative impacts of activities on the marine park's environment, biodiversity, and heritage values, which are now collectively referred to as "relevant impacts". (4) The Maritime Activities Environmental Management Plan incorporates measures to mitigate and address the environmental impacts associated with noise from military operations. Specific procedures are outlined to manage noise-related impacts, particularly in areas of higher marine mammal abundances and locations with specific sensitivities such as feeding and resting areas. These measures aim to avoid activities generating high noise levels in these sensitive areas. Additionally, since 2011, various sub-national states have implemented strategies, management plans, and initiatives focused on marine conservation areas. For instance, the "NSW 2021: a plan to make NSW number one" outlines goals related to biodiversity protection and conservation, including the establishment of additional conservation areas throughout New South Wales.
Australia	<ul style="list-style-type: none"> • Norway has adopted several measures, such as: (1) Regulations for offshore petroleum activities—Regulations governing seismic surveys have been established to prevent or minimize adverse effects. These regulations, specified in the Petroleum Act and Petroleum Regulations, mandate the implementation of impact assessments before the opening of new areas. These assessments encompass various aspects, including the potential impacts associated with underwater noise. (2) A common guideline titled "Implementation of seismic surveys on the Norwegian Continental Shelf" has been published by the Ministry of Fisheries and the Norwegian Ministry of Petroleum and Energy. Additionally, the Norwegian Oil and Gas Association has released comprehensive guidelines that provide further details on promoting coexistence with the fishing sector during seismic surveys on the Norwegian Continental Shelf. (3) Fisheries Liaison Officers on seismic vessels—Vessels carrying out seismic surveys must have a fisheries liaison officer (FLO) on board when it is necessary due to fishing operations in the area. (4) The use of sonar in naval operations has been subject to rigorous environmental assessment procedures since 2003. Generic EIAs have been conducted by the Navy to evaluate the potential impacts of sonar operations. Subsequently, comprehensive guidelines were introduced in 2006 and were later upgraded to regulations in 2009 and military instructions in 2015. These guidelines, regulations, and instructions encompass a range of measures aimed at minimizing the environmental impacts of sonar activities. (5) Underwater explosions—In accordance with the Norwegian pollution control act, provisions exist for granting permission that may include specific terms. These terms encompass mitigating measures, such as employing warning explosions of reduced power, with the primary objective of deterring fish, marine mammals and other animals species. (6) Piling—Piling activities in Norway are not considered to be extensive. However, ongoing efforts are being made to incorporate measures to mitigate AUN into the guidance for sediment management [111].
Norway	<ul style="list-style-type: none"> • Oman has implemented several measures aimed at minimizing the effects of AUN, including: imposing restrictions on seismic surveys near sensitive sites and prohibiting such activities during the breeding season of marine mammals and turtles, establishing environmental requirements for projects to minimize the impact of AUN on marine organisms, particularly that related to oil extraction platforms, conducting surveys of marine mammals and turtles to monitor and assess the impacts caused by anthropogenic underwater noise, and regulating marine tourism activities and associated businesses, and issuing diving licenses while considering the potential adverse effects of underwater noise on marine species [111].
Oman	

Table 2. *Cont.*

Category	Instruments/Institution/Mitigation Measures/Programs/Initiatives
Sweden	<ul style="list-style-type: none"> Sweden has implemented several measures to address AUN, including (1) EIA for permitting waterworks—Operators are required to prepare an EIA as part of the permit application process. The EIA should encompass an assessment of potential environmental impacts associated with underwater noise, along with proposed mitigation measures. (2) Designation of a marine Natura 2000 area in the Baltic Proper specifically for the conservation of harbor porpoises. This designated area represents the largest marine region proposed by Sweden as a Natura 2000 site. The project's objective is to minimize noise disturbances caused by various activities, including those involving pleasure boats and commercial vessels, as well as the use of underwater sounding devices such as sonars. (3) The AQUO (Achieve Quieter Oceans) initiative aims to reduce the shipping noise footprint. As part of this effort, guidelines have been developed in collaboration with another European Union project. These guidelines focus on measuring and mitigating noise generated by ships, with the goal of achieving quieter oceans [111].
Venezuela	<ul style="list-style-type: none"> Decree No. 1.257 and Official Gazette No. 35.946—Decree 1.257 establishes standards for conducting EIAs of activities that have the potential to degrade the environment. Official Gazette 35.946 mandates the submission of an EIA report for activities that may cause harm to various aspects of the natural and social environment. The EIA report should encompass empirical evidence supported by scientific studies to demonstrate the potential reversibility of underwater noise impacts [111].
Non-State Actors	<ul style="list-style-type: none"> Central Dredging Association serving Europe, Africa and the Middle East (CEDA) <ul style="list-style-type: none"> The Establishment of the Commission's Working Group on Underwater Sound (WCUS) CEDA Environment Commission Working Group, "CEDA Position Paper: Underwater Sound in Relation to Dredging", 2011 [113] World Organization of Dredging Associations (WODA) <ul style="list-style-type: none"> The establishment of Expert Group on Underwater Noise (WEGUS) Technical Guidance on: Underwater Sound in Relation to Dredging (Technical Guidance), 2013 [114]. WODA Workshop Underwater Sound in Relation to Dredging: Translating Science into First-Hand Practice, 26 March 2015, Paris, France.

5. The UNCLOS as Governing Framework for Anthropogenic Underwater Noise

Despite the applicability of the UNCLOS to address AUN, most of the UNCLOS provisions are too general to establish specific international standards to mitigate, adapt to and reverse the various impacts of AUN. To this end, Part XII of the UNCLOS should be understood as an umbrella convention (or framework agreement) that provides the overarching legal framework for a number of agreements on marine environmental protection and marine species conservation [115]. As a framework agreement, Part XII of the UNCLOS provides possible mechanisms to consider specific elements of the UNCLOS as fulfilling the role of sectoral framework conventions [35].

A framework convention is typically referred to as a treaty or convention that incorporates some principles and a general system of governance, provides general guidelines, or establishes international and national policies. At the same time, framework conventions allow states parties to develop and adopt future specific regulations, obligations, and targets to address the evolving international environment [116,117]. Therefore, the UNCLOS embodies both explicit and implicit characteristics of a framework convention, particularly those related to the protection and preservation of the marine environment. Since there is a lack of detailed regulations on the protection and preservation of the marine environment against AUN, the UNCLOS may adopt more detailed rules or standards pertaining to AUN through the implementing agreement or external rules and standards created by other bodies such as competent international organizations or general diplomatic conferences. Accordingly, this article examines three potential options to strengthen the regulation of AUN under the UNCLOS, including the development of new international legally binding instruments for AUN, addressing AUN through the BBNJ Agreement, and rules of references.

5.1. The Development of New International Legally Binding Instruments for AUN

In the absence of specific global binding instruments to address AUN, the adoption of a new implementation agreement under the UNCLOS could be a golden opportunity to address AUN. Such an agreement would improve the existing UNCLOS's obligations related to the protection and preservation of the marine environment against AUN. However, the idea of the adoption of a new implementation agreement to address several emerging marine environmental issues has been proposed by many scholars, although such an idea to develop a specific implementation agreement on AUN is considerably new. Examples of such agreements are those intended to address ocean acidification, land-based pollution, and marine plastic pollution [29]. Nevertheless, to date, no successful implementation agreement has been reached to address these issues. Furthermore, the idea concerning the development of a new implementation agreement for AUN is still fresh. Therefore, a proposal for such an agreement would face various challenges and obstacles.

In addition, while the scientific literature on the impact of AUN on marine living resources has expanded in recent years, extant reports underscore a critical need to enhance the scientific research and data on the sources and impact of AUN in the marine environment, particularly in developing countries. Thus, improving scientific research and data on the sources and impact of AUN constitutes a pivotal stride toward better regulation and management of AUN. The lack of comprehensive knowledge and data on AUN makes it difficult to identify effective management approaches and establish clear targets and standards for reducing AUN. As a result, numerous UNGA resolutions have repeatedly encouraged all stakeholders to improve their scientific understanding of the impact of AUN on marine living resources.

In response to the need for enhanced scientific research and data on AUN in the marine environment, several UNGA resolutions have called upon the DOALOS to compile and make available peer-reviewed scientific studies received from Member States on its website. However, a review of the DOALOS website reveals that no updated information on peer-reviewed scientific studies related to AUN has been made available since 2018. Therefore, it is recommended that DOALOS resume its mandate to collect and disseminate updated

scientific research on AUN. In addition to DOALOS, the ICP has also addressed the issue of AUN and the need to increase awareness and address knowledge gaps related to this issue. During the 2018 ICP meeting, it was recognized that effective management of AUN requires cooperation, coordination, and capacity-building to develop a comprehensive understanding of its impacts in an integrated and cross-sectoral manner [6].

Therefore, it is essential to prioritize cooperation, coordination and capacity-building in the scientific research and data on the sources and impact of AUN on marine living resources, particularly in developing countries, to establish clear guidelines and targets for reducing AUN and enhancing the regulation and management of marine living resources. The cooperation and coordination may occur on an inter-institutional or regional basis within and across different sectors representing noise-generated activities such as mining, oil and gas exploration, military, shipping, fisheries, and marine renewable energy or impacted sectors such as environment, fisheries and tourism [6]. Such cooperation and coordination will have several benefits such as increasing awareness, sharing of information on the sources and impacts of AUN on marine living resources, and the development and sharing of best practices for minimizing the impacts of AUN and addressing cumulative impacts from AUN [6].

Indeed, scientific research has been a driving force in the development of environmental law and policy. Unlike other areas of public international law, where the law-making process may be influenced by political, economic, or commercial considerations, environmental law relies heavily on scientific evidence. The law-making process involves both scientists and lawyers, but scientific evidence often shapes and guides the outputs [118]. As such, the development of environmental law requires the gathering of scientific evidence from a range of sources, including international bodies such as the Intergovernmental Panel on Climate Change (IPCC), the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), and the Joint Group of Experts on the Scientific Aspects of Marine Pollution (GESAMP), as well as from governmental and non-state entities [119].

According to scholars, global environmental assessments (GEAs) are considered as a crucial instrument for providing information to support decision-making in the field of international environmental governance [120]. GEAs produced by international organizations such as the IPCC, IPBES, and GESAMP are significant innovations in organizing policy-relevant knowledge and advice regarding multi-scale environmental concerns for governments, and for shaping and servicing multilateral environmental agreements (MEAs) [121,122]. For instance, the IPCC, established in 1988, has played a vital role in developing the United Nations Framework Convention on Climate Change (UNFCCC) [123] and several other international negotiations conducted under the UNFCCC. Similarly, GESAMP, established in 1969 as a scientific advisory body on marine pollution and marine environmental protection, has an essential role in providing GEAs related to marine pollution [124].

Given the circumstances, the formation of an institution or ad-hoc expert working group (WG) with a specific mandate to provide GEAs on AUN presents a significant opportunity to address current knowledge gaps. The WG will comprise technical experts from all member States of the UNCLOS, alongside representation from international and regional conventions and organizations and other relevant stakeholders. The WG's explicit mandate will entail identifying all obstacles to combating AUN, including those encountered by developing countries. Additionally, the WG will investigate extant responses at the national, regional, and international levels, including action plans, binding and non-binding instruments, and innovative approaches. The feasibility and effectiveness of different response options will also be examined by the WG. Moreover, the WG may proffer recommendations on prospective options for continuing work, to be considered by the UNGA.

Scholars have generally identified three critical components for the effectiveness of GEAs, which heavily rely on the perceptions of the intended audience [120]. These components are credibility, legitimacy, and salience of environmental assessments. Credibility

pertains to the extent to which a scientific or technical assessment is deemed trustworthy by the intended audience, typically within the scientific community [125,126]. In this context, the assessment's credibility is based on its ability to demonstrate a strong scientific foundation and technical validity. Meanwhile, legitimacy in the context of GEAs refers to how the intended audience perceives the fairness of the social aspects, rules, regulations, and processes involved in the assessment and its procedures. Lastly, salience refers to how relevant and applicable the information produced by the assessment is to the concerns of the intended audience. An assessment with high salience provides information that is perceived to be of practical value to the audience and that can be used to inform decisions or actions. Overall, these three components are crucial for the effectiveness of GEAs, as they ensure that the assessments are perceived as credible, legitimate, and salient by their intended audiences. By prioritizing these components, specific GEAs proposed for addressing the issue of AUN can produce reliable and valuable results. These results can be used to inform decisions or actions related to the regulation of AUN and its impact on marine living resources.

Although there are currently no specific international institutions that provide GEAs on AUN, the Ad Hoc Working Group of the Whole on the Regular Process for Global Reporting and Assessment of the State of the Marine Environment, including Socioeconomic Aspects (Regular Process), established by the UNGA, may play a crucial role in distributing relevant information and fostering the science-policy interface concerning AUN. The UNGA established the Regular Process to provide regular assessments at the global and supra-regional levels, and an integrated view of environmental, economic, and social aspects. To achieve this, the Regular Process should be conducted in close collaboration with existing global and regional institutions to ensure that the results can be utilized in decision-making. Thus, the Regular Process may provide a scientific basis for regular assessments of AUN at the global level. In this regard, collaboration with the existing global and regional institutions to address AUN is essential to ensure that the results of the Regular Process can be used in decision-making. Therefore, the Regular Process must be carefully managed in order to ensure the transparency and rigor of the reports of global ocean assessments, particularly in relation to the AUN [57].

5.2. Addressing AUN through the BBNJ Agreement

Despite the various challenges facing the adoption of the new implementation agreement for AUN, the recently agreed-upon instrument of the implementing agreement on biological diversity beyond national jurisdiction (BBNJ) presents a promising opportunity to strengthen the provisions of the UNCLOS to protect the marine environment against the deleterious effects of AUN. The BBNJ Agreement acknowledges the imperative of dealing with the loss of biodiversity and the deterioration of oceanic ecosystems in a coherent and cooperative fashion, in response to diverse environmental pressures. These pressures include, in particular, the impact of climate change on marine ecosystems, including warming, deoxygenation, and ocean acidification, as well as pollution, such as plastic pollution, and unsustainable use. Moreover, the BBNJ Agreement recognizes several provisions of the UNCLOS, such as the obligation to protect and preserve the marine environment and the requirement to evaluate, as far as practicable, the potential impacts on the marine environment of activities within a State's jurisdiction or control, where there are reasonable grounds to believe that such activities could result in significant pollution or harmful changes to the marine environment [127]. Therefore, although the issue of AUN is not explicitly mentioned in the BBNJ Agreement, the term "pollution" employed in the BBNJ Agreement arguably encompasses the issue of AUN and its diverse effects on marine living resources.

The BBNJ Agreement focuses on four key issues to conserve and sustainably use marine biodiversity in the ABNJ, including area-based management tools (ABMTs), including those for marine protected areas (MPAs); environmental impact assessments (EIAs); marine genetic resources; and capacity building and technology transfer [128]. Among

these four issue areas, this article argues that ABMTs (including MPAs), EIAs, and capacity building and technology transfers hold significant promise in addressing several activities that contribute to AUN in the ABNJ. ABMTs, including MPAs, are widely recognized as essential mechanisms for conserving and restoring biodiversity [129–131]. They can also be used as adaptive measures in response to AUN. These MPAs should be established in accordance with the UNCLOS provisions and other relevant international obligations and commitments that aim to protect and preserve the marine environment against marine pollution, including AUN. Therefore, identifying ABMTs, including MPAs, can incorporate AUN issues into indicative criteria for identifying areas that require protection. However, the BBNJ Agreement does not explicitly recognize AUN as an indicative criterion for the identification of ABMTs, including MPAs [127].

The existing criteria for the identification of ABMTs are limited to “vulnerability, including to climate change and ocean acidification” and other factors [127]. It is argued that introducing “anthropogenic underwater noise” as one of the specific criteria into the current draft of the BBNJ agreement could have implications for addressing AUN through ABMTs, including MPAs. Although AUN is not mentioned in the current indicative criteria for identifying ABMTs, it could be considered when establishing ABMTs due to its impact on marine living resources, including its cumulative and transboundary nature. Furthermore, Article 17 of the BBNJ Agreement allows for the indicative criteria in Annex I of the BBNJ Agreement to be further developed and revised by the Scientific and Technical Body for consideration and adoption by the Conference of the Parties. This means that although AUN is not explicitly mentioned in the current agreement, it could potentially be integrated into the existing Annex I of the BBNJ Agreement in the future.

EIAs have become widely accepted as an essential tool to manage and control the impacts of anthropogenic activities on the marine environment, including AUN [132]. The BBNJ Agreement stipulates that States Parties must conduct EIAs to assess the potential effects of planned activities under their jurisdiction or control in accordance with their obligations under Articles 204 to 206 of the UNCLOS [133]. Considering the potential impacts of AUN, integrating the issue of AUN into the EIA process under the BBNJ Agreement offers opportunities to manage and control the impacts of various anthropogenic activities on the marine environment of ABNJ, including any activities likely to generate AUN. There are several potential means through which AUN could be integrated into several phases of the EIA process, such as screening, scoping, public notification and consultation, reporting, and decision-making. For instance, during the screening process, States should recognize the significant nature of impacts associated with AUN from the proposed project or activity in ABNJ. After completing the screening process, the next phase of the EIA process is scoping, which aims to define those impacts that may have a significant effect on the environment. In addition, given the possibility of cumulative impacts associated with AUN, scoping should also recognize the potential for cumulative impacts by activities in widely separated areas [134].

In addition to ABMTs and EIAs, the transfer of technology and knowledge can also provide solutions to address AUN within the BBNJ Agreement. Article 42 of the BBNJ Agreement recognizes the importance of capacity-building and transfer of marine technology (CBTT) and outlines several objectives, including increasing and sharing knowledge about BBNJ, developing marine scientific and technological capacities of States Parties, and ensuring that developing countries have the necessary capacity to manage ABMTs including MPAs and to conduct and evaluate EIAs. CBTT can be particularly useful for developing countries in addressing AUN, as current regulations on AUN are mainly practiced in developed countries. Therefore, CBTT can be an effective tool to bridge the knowledge gap in developing countries and promote the conservation and sustainable use of biodiversity.

Unlike the UNCLOS, Article 48 of the BBNJ Agreement created the COP, which is responsible for monitoring and assessing the implementation of the Agreement. In fulfilling this mandate, the COP is empowered to adopt decisions and recommendations aimed at

facilitating the implementation of the agreement, and to review and exchange information amongst parties to the Agreement concerning its implementation. Furthermore, the COP is tasked with promoting cooperation and coordination with other legal instruments and frameworks as well as with relevant global, regional, subregional, and sectoral bodies, with a view to promoting coherence in the efforts toward the objective of the BBNJ Agreement. To support the effective implementation of the BBNJ Agreement, the COP may also establish subsidiary bodies as deemed necessary. Given the broad range of responsibilities conferred upon the COP, it is evident that this body has significant potential to contribute toward the development of regulations and policies that are specifically tailored to address the adverse impact of AUN on marine living resources.

5.3. Rules of References

Apart from incorporating AUN into the BBNJ agreement, the UNCLOS includes various other provisions that promote a dynamic and long-lasting relationship between the UNCLOS and other instruments concerning ocean-related matters [135]. The obligation for States to work through competent international organizations to develop the principles of UNCLOS and establish specific regulations regarding ocean-related matters can be found in several provisions throughout Part XII of the UNCLOS. Therefore, the regulation of AUN through rules of reference differs from law-making by obligating States Parties to establish more specialized institutions and other agreements related to ocean matters.

This type of interaction, *inter alia*, recognized under Article 197 of the UNCLOS, states that:

“States shall cooperate on a global basis and, as appropriate, on a regional basis, directly or through competent international organisations, in formulating and elaborating international rules, standards and recommended practices and procedures consistent with this Convention, for the protection and preservation of the marine environment, taking into account characteristic regional features”.

This Article can be understood to impose a fundamental duty on States to cooperate in formulating and elaborating “international rules, standards and recommended practices and procedures” for protecting and preserving the marine environment as reflected in several provisions of Part XII of the UNCLOS. This duty shall primarily be fulfilled through competent international organizations that can be considered to be an application of the general obligations established by the UNCLOS [35]. In such circumstances, competent international organizations can provide guidance or specific instruments on what is required under the general obligations of the UNCLOS. In addition, this type of interconnecting provision is further recognized in Section 5 of Part XII of the UNCLOS. Besides the duty of States to adopt laws and regulations to prevent, reduce and control pollution of the marine environment, Section 5 has also placed a fundamental duty upon states to adopt international rules, standards and recommended practices and procedures, “acting especially through a competent international organization (s)” from other regimes to prevent, reduce and control the pollution of the marine environment by different sources: land-based activities (Article 207 (4)), seabed activities (Article 208 (5)), dumping (Article 210 (4)), atmospheric pollution (Article 212 (3)) and vessels (Article 211 (1)) [135,136].

The term “competent international organizations” is prominently featured in five key areas of the UNCLOS, namely, navigation (Article 22), conservation of living resources (Article 61), protection and preservation of the marine environment (Article 211 (5)), marine scientific research (Article 238), and the transfer of technology (Article 266 (1)). The definition of the term can differ depending on the particular context in which it is employed. For example, to address concerns regarding AUN from shipping activities, the IMO is widely recognized as the sole international organization with the authority to establish rules and standards for ensuring safety, security, and environmental protection in international shipping. The IMO has adopted several instruments, including, *inter alia*, the MARPOL and its Annexes as principal sources of the rules and standards on pollution from vessels that are regarded as implementing the obligation under Article 211 (1) of the UNCLOS to establish

such “international rules and standards to prevent, reduce, and control pollution of the marine environment from vessels”. When formulating international rules and standards, the IMO must ensure that they adhere to the basic principles outlined by the UNCLOS [137]. Given that the UNCLOS has a general obligation to address AUN, the IMO as the sole international organization for international shipping should also adopt relevant rules and standards to address the AUN from shipping.

Thus, with regard to the AUN from ships, the IMO, through the Marine Environmental Protection Committee (MEPC), has adopted Resolution MEPC.1-Circ.833 on the Guidelines for the Reduction of Underwater Noise from Commercial Shipping to Address Adverse Impacts on Marine Life (2014 Guidelines) [79]. The 2014 Guidelines were adopted with the primary objective of offering comprehensive guidance to ship designers, builders, and operators on the mitigation measures for AUN from commercial ships. Despite the fact that compliance with the provisions of the guidelines is not mandatory, they are widely regarded as the most applicable instrument among the initiatives of the IMO aimed at protecting the marine environment. Due to several gaps in the current Guidelines, the issue of AUN from ships continued to be a topic of ongoing discussion in MEPC meetings, with a proposal to revise the 2014 Guidelines being presented. Consequently, the IMO reached an agreement in 2021 to conduct a comprehensive review of the existing Guidelines. In this regard, a draft of the revised Guidelines has been submitted for review and approval to the MEPC 80 meeting scheduled to be held from 3 July to 7 July 2023. While these Guidelines may be considered rules or standards adopted by the IMO, their non-binding nature raises the question of whether states parties to the UNCLOS can be obligated by sources that do not have a binding effect on them. The discussion on the legal status of rules of reference is a crucial issue, but it falls outside the scope of this section to provide a comprehensive analysis.

In addition to the AUN from ships, dredging activities, classified as a form of dumping, are acknowledged to be a particular source of AUN in the marine environment. In accordance with Article 210 of the UNCLOS regarding pollution caused by dumping, it is the responsibility of States, working in partnership with competent international organizations, to endeavor to establish and implement global and regional regulations, standards, recommended practices, and procedures aimed at preventing, reducing, and controlling such pollution. The use of the term “international organizations” in the plural signifies that the IMO can complement its global regulatory efforts through the activities of other organizations. The IMO has established collaborative partnerships with other organizations, particularly in connection with the development and adoption of regional agreements. An international framework has been established to manage marine pollution from dumping through a variety of treaties and agreements at both the global and regional levels [138]. These include the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972 (London Convention, 1972) and its Protocol to the Convention on the Prevention of Marine Pollution by the Dumping of Wastes and Other Matter, 1972 (1996 LC Protocol). Thus, the London Convention and Protocol, which seeks to prevent marine pollution caused by the dumping of waste and other materials, has been addressing the issue of AUN. In particular, the World Dredging Association (WODA) has presented guidance on managing the effects of underwater sound, especially from dredging, to the London Convention and Protocol Scientific Groups. The guidance presented by the WODA contains technical advice aimed at assisting decision-makers, stakeholders, and scientists in handling the impacts of underwater sound from dredging [139]. Although no specific instrument has been developed, the parties to the UNCLOS may consider applying any future specific instruments on AUN if they are adopted by the London Convention and Protocol in the future.

In conclusion, Article 197 and other complementary provisions in the UNCLOS aim to facilitate the adoption of internationally agreed standards, rules, recommended practices, and procedures to prevent pollution of the marine environment through cooperative arrangements involving competent international organizations. The UNCLOS obliges the

parties to abide by these standards by reference, reflecting its framework character. As the overarching legal framework for protecting and preserving the marine environment, the UNCLOS serves as a foundation for other international agreements that provide specific rules and standards for achieving its obligations. The rules of reference serve as an important flexibility mechanism, ensuring the continuous development of the UNCLOS through its openness to external regimes. Therefore, the UNCLOS "lives" within other external regimes, which are expected to "be carried out in manner consistent with the general principles and objectives" of the UNCLOS [140].

6. Conclusions

It is evident that AUN has been regarded as an emergent global marine environmental problem and poses several impacts on the marine environment and biodiversity. This fact has prompted the interpretation of the UNCLOS and examination of its institutional arrangement to respond to this issue. While several discussions have continuously been held in the annual cycle of review of the UNCLOS, there have been no significant policy outcomes to tackle this issue. Therefore, further discussion to strengthen the regulatory framework for the protection of the marine environment against this issue is a paramount necessity. This article argues that the UNCLOS offers a legal basis for protecting the marine environment against AUN. This legal basis can be found through various provisions related to the protection of the marine environment, conservation of marine living resources and conservation of marine biodiversity. However, it must be noted that the UNCLOS does not provide a specific standard to address AUN. Therefore, this article suggests that several provisions of Part XII of the UNCLOS relating to the protection of the marine environment should be interpreted as a framework agreement that contains a general obligation to address AUN. Accordingly, it is argued that the regulation and management of AUN under the UNCLOS can be further developed through three different approaches: the adoption of a new implementing agreement, addressing AUN through the existing implementing agreement (BBNJ Agreement), and regulation through rules of references. In addition, it is argued that the adoption of several instruments and programs by various other institutions (as shown in Table 2) could provide support and enhance the implementation of relevant provisions of the UNCLOS to effectively address the issue of AUN. In such circumstances, it is argued that the UNCLOS can be regarded as a living instrument that provides a flexible mechanism to respond to current and future problems for marine environmental protection. It is noteworthy that this article is relevant to the fundamental theoretical issue of how international law of the sea, based on the UNCLOS as its basic framework, can be further developed to meet new challenges.

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Article

China's Incentives and Efforts against IUU Fishing in the South China Sea

Chengyong Yu ¹ and Yen-Chiang Chang ^{2,*}¹ School of Law, Shandong University, Qingdao 266200, China² School of Law, Dalian Maritime University, Dalian 116026, China

* Correspondence: ycchang@dlnu.edu.cn

Abstract: Illegal, unreported, and unregulated (IUU) fishing is a massive problem that poses a significant threat to the sustainability of marine ecosystems and the livelihoods of millions of people who depend on fishing for their food and income. Many issues have emerged, such as declining fishery resources, regional fishery incidents, political impacts, and disputes over sovereignty, which all have mutual and complicated effects on IUU fishing, eventually hindering the sustainability of marine fisheries. In this situation, the People's Republic of China (hereinafter referred to as China) has tried to undertake some efforts to combat IUU fishing over the past few years using domestic regulation and international cooperation, especially in the South China Sea. This article discusses the seriousness of IUU fishing; examines the causes of IUU fishing in the South China Sea; analyzes why frequent fishing conflicts have increased in the South China Sea; identifies what IUU fishing is, based on its definition in the International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing (IPOA-IUU) and in other countries; and examines what actions have been undertaken to prevent IUU fishing in China from international and national perspectives. By analyzing the cause of IUU fishing, identifying its scope and nature, and demonstrating China's position on it, this study aims to prove that China has taken some positive measures to combat IUU fishing in the South China Sea. To promote the sustainable development of fisheries in the South China Sea, uniting China and other South China Sea states against IUU fishing could be an efficient way in the future.

Keywords: South China Sea; illegal; unreported and unregulated (IUU) fishing; maritime Silk Road; Agreement of Port State Measures (PSMA)

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1. Introduction

Aside from maritime disputes and growing state competition, states' interests in the sea can be generally summarized using the "three Ps": politics, petroleum, and protein (fish). Fisheries are the main source of protein and play a vital role in providing food and ensuring economic development. Utilizing fishery resources to their fullest potential has led to overfishing becoming a major problem globally, largely due to poor fishery management and IUU fishing. The results suggest that a country's risk of IUU fishing is positively related to the number of commercially significant species found within its territorial waters and its proximity to known ports of convenience [1]. The South China Sea is a marginal sea of the Western Pacific Ocean covering approximately 3.5 million km². Most coastal states in the South China Sea are developing or underdeveloped, with abundant fishery resources and important sites for the coastal aquaculture industry. The South China Sea is a vital region for the fishing industry, providing a major source of food and livelihood for the coastal communities in the area. However, in recent years, the issue of IUU fishing has become a significant problem in the South China Sea, leading to the depletion of fish stocks and damage to the marine ecosystem.

IUU fishing harms a country's economy, environment, and marine protected areas, causing a loss of economic income, environmental damage, and decline in fish stocks. IUU

fishing disrupts the sustainability of marine ecosystems and is a major threat to a country's sustainable fishery production. From an economic point of view, IUU fishing undermines the efforts of legitimate fishing industries and results in significant economic losses for coastal communities and countries [2]. From an environmental point of view, the use of illegal fishing equipment, such as mesh, fixed lines, and explosives, severely damages the marine ecosystem. Therefore, the study of combating IUU fishing in the South China Sea could have several positive impacts on regional sustainability, including the preservation of marine biodiversity, promotion of sustainable fishery-management practices, regional cooperation, and protection of food security.

2. Causes of IUU Fishing in the South China Sea

2.1. Sharp Decline of Fisheries Resources and Overfishing in the South China Sea

The South China Sea is a habitat for some of the world's richest reef systems, with more than 3000 fish species, accounting for approximately 12 percent of the total number of fish caught worldwide [3]. However, the fisheries in this region are in severe danger. Since the late 20th century, the fishery resources in the South China Sea have gradually shown a trend of rapid decline. States around the South China Sea generally have long coastlines, which strongly depend on the fishery industry. To pursue the maximum benefits of marine economics in the short term, coastal states are inclined to over-exploit fishery resources in this area. With the development of science and technology, more advanced and efficient fishing techniques have exacerbated overfishing in the South China Sea [4]. In addition, because the South China Sea is a typical semi-enclosed sea that relies mainly on the marine environment, the regeneration ability of its fishery resources is limited. As the Food and Agriculture Organization of the United Nations (FAO) published in "The State of World Fisheries and Aquaculture 2018 (SOFIA)," most fish populations in the mid-western Pacific, especially in the western part of the South China Sea, are over-fished [5].

2.2. Regional Fishery Conflicts and International Political Impacts

Regional fishery conflicts in the South China Sea are complex and multifaceted, with issues ranging from maritime disputes to overfishing and IUU fishing. In the South China Sea, fishery conflicts among fishers and fishing vessels from Vietnam, Indonesia, the Philippines, and China have occurred frequently in recent years [6]. The emergence of fishery incidents is one of the most crucial maritime threats, resulting in constant conflicts among states. For example, from the end of 2014 to April 2016, Indonesia seized 153 fishing boats from its maritime neighbors for "illegal fishing". Among them, 50 were from Vietnam, 43 were from the Philippines, and one was from China [7]. Another example is that, on 21 May 2017, Vietnam and Indonesia had a confrontation in the waters off the Natuna Islands, which Indonesia claims to be its exclusive economic zone. Indonesian patrol boats intercepted five Vietnamese fishing boats that had intruded into their exclusive economic zones and detained 11 Vietnamese fishers following their own laws [8]. In 2019, a Vietnamese fishing boat was sunk by a Chinese coast guard vessel near the disputed Paracel Islands, sparking protests from Vietnam [9]. These incidents highlight the ongoing tensions and conflicts in the South China Sea over fishing rights and territorial disputes. The lack of a comprehensive and effective framework for managing these conflicts has resulted in frequent incidents and escalated tensions among the countries involved [10].

The South China Sea is a region of great geopolitical importance due to its strategic location, rich natural resources, and overlapping maritime claims by several countries. IUU fishing is a significant problem in the region, and the involvement of external powers can complicate efforts to address it. One way in which external powers can complicate the issue of IUU fishing in the South China Sea is by supporting the maritime claims of one or more countries in the region. Doing so can exacerbate tensions and lead to an increase in IUU fishing activities, as countries may seek to assert their dominance over disputed waters. External powers can also contribute to IUU fishing in the region by providing financial or technical support to fishing activities. For example, subsidies provided by external

powers to their fishing companies may encourage overfishing and IUU fishing activities. Conflicting interests among external powers can also make it challenging to coordinate efforts to address IUU fishing in the South China Sea. For example, some countries may prioritize environmental concerns and sustainable fishing practices, while others may prioritize their security interests in the region. Therefore, addressing IUU fishing effectively in the South China Sea will require coordinated efforts and cooperation among countries and stakeholders.

2.3. Disputes over Sovereignty and IUU Fishing

The ongoing disputes over sovereignty in the South China Sea have significant impacts on IUU fishing in the region. These disputes create uncertainty and instability in the waters, making it difficult for countries to effectively manage their fisheries and prevent IUU fishing activities. Sovereignty disputes typically arise when neighboring countries lay claim to overlapping maritime areas, such as exclusive economic zones (EEZs) or continental shelves [11]. In the South China Sea, several countries have made overlapping maritime claims, including China, Vietnam, the Philippines, Malaysia, and Brunei. China has made a sweeping claim over most of the South China Sea, including areas that fall within the EEZs of other countries [12]. This conflict is due to differences in opinion on the South China Sea claims. China's claim has the nine-dash line, a map that outlines its historical claims to the region, as its historical background, and this line was first drawn by the Chinese government in the 1940s and has been a source of tension between China and its neighboring countries [13]. In contrast, other countries use a geographical location that refers to the International Law of the Sea Convention (UNCLOS), and they claim an exclusive economic zone (EEZ) extending 200 nautical miles (370 km) from their coasts and a continental shelf beyond that under the UNCLOS.

At the same time, the more deadlocked that the demarcation process is, the more likely that it is that the littoral states are to "increase their presence" in the South China Sea to strengthen their so-called sovereignty [14]. In this situation, fishing is endowed with distinct political colors; not only are fishing disputes in the South China Sea over fishery resources, but they also represent the political game between coastal states [15]. The fishing and sovereignty of the South China Sea have been firmly combined. From this perspective, the slow process of maritime delimitation in the South China Sea seriously hinders substantive solutions to the problem of IUU fishing.

In summary, due to the decrease in fishery resources and increase in demand, fishery disputes are escalating, further aggravating maritime conflicts over the sovereignty of the South China Sea, increasing the importance of the geopolitical situation in the South China Sea [10]. Currently, there is no effective regional cooperation in the conservation of fishery resources in the South China Sea, and IUU fishing behavior and fishery conflicts are constantly occurring. If coastal states do not undertake appropriate action in the South China Sea, marine biodiversity will be lost, and fishery resources may be depleted shortly thereafter [5]. In the states around the South China Sea, this depletion will be a fatal blow to fishery businesses and people's livelihoods and will cause serious damage to the marine environment of the South China Sea and the world.

3. How to Identify IUU Fishing

3.1. Definition Standards

3.1.1. Definition in IPOA-IUU

To define IUU fishing in the South China Sea, the current definition by international society should first be examined. It is predominantly defined in Article 3 of the International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported, and Unregulated Fishing (IPOA-IUU), which was developed by member states of the Food and Agriculture Organization of the United Nations (FAO) [16]. It mainly offers the definitions of the three fishing activities in question—"illegal," "unreported," and "unregulated"—as well as other terms used in the instrument. Although it is a soft law, the objective of the IPOA is to

“provide all states with comprehensive, effective transparent measures by which to act, including through appropriate regional fisheries management organizations established in accordance with international law.”

IUU fishing is an integrated activity, not a specific activity [17]. Article 3.1 of the IPOA-IUU defines the basic elements of illegal fishing: “contravention of a state’s laws and regulations,” “contravention of the conservation and management measures adopted by the organization which the flag states are joined, or international law,” and “contravention of the conservation of national law or international obligation.” Regarding unreported fishing activities, Clause 3.2.1 of the IPOA-IUU refers to those “which have not been reported, or have been misreported, to the relevant national authority, in contravention of national laws and regulations,” and Clause 3.2.2 refers to those “which have not been reported or have been misreported, in contravention of the reporting procedures of that organization.” As opposed to Clause 3.3.1, these clauses govern those countries that are members of Regional Fisheries Management Organizations (RFMOs), which are the international organizations regulating regional fishing activities on the high seas. Thus, unreported fishing is a special case of “illegal” fishing due to violations of national law. Unregulated fishing appears to be the inverse. Unregulated fishing activities can be legal or illegal if national laws are enacted or if relevant international obligations are applied.

Moreover, the IPOA-IUU does not list specific activities related to all three factors. However, this approach gives states a great deal of discretion in making decisions based on the IPOA-IUU. In other words, states can argue that the definition is in line with their different activities. The UNCLOS, the United Nations Fish Stocks Agreement [13], the Compliance Agreement [18], and the FAO Code of Conduct [19] all consider and abide by the definition in the IPOA-IUU when identifying specific activities. Article 3 of the IPOA-IUU is an international guide currently used for the identification of IUU fishing.

3.1.2. Definitions in Different States

Apart from the IPOA-IUU and other international documents, there are also different interpretations from different entities that further complicate the issue.

To prevent, deter, and eliminate IUU fishing, the Philippines officially passed Republic Act No. 10,654 (Amending Philippine Fisheries Code of 1998) in 2014, including several new provisions that became the basis for an important shift in national legislation to combat IUU fishing. In Section 3, illegal fishing refers to fishing activities conducted by Philippine fishing vessels operating in violation of Philippine laws, Regional Fisheries Management Organization resolutions, and laws of other coastal states [20]. China’s official documents provide multiple definitions and descriptions of IUU fishing. Article 2 of the Regulations on the Prevention and Control of Illegal, Unreported, and Unregulated Fishing in the People’s Republic of China (referred to as the “IUU Fishing Regulations”) defines “illegal, unreported, and unregulated fishing” as fishing activities conducted in violation of international, regional, or national laws, rules, and agreements. The China National Marine Fisheries Administration’s “Guiding Opinions on Combating IUU Fishing” states that IUU fishing includes, but is not limited to, fishing in prohibited areas or times, using illegal fishing tools or methods, fishing for fish that do not meet specified standards, and failing to report or misreporting fishing activities. Overall, China’s official definition is generally consistent with UNCLOS’s definition.

In fact, compared with the definition from coastal states in the South China Sea, the European Union (EU) and US have undertaken the most far-reaching legislative efforts to specifically define and address IUU fishing. The EU has enacted Council Regulation (EC) No. 1005/2008 (referred to as the EU Regulation), adopting the scope and nature of the IPOA-IUU and creating a list of activities that can be considered IUU fishing. The EU IUU Regulation also states that a vessel is presumed to be engaged in IUU fishing if it transships or participates in joint fishing operations or supports or resupplies other vessels that are determined to be engaged in IUU fishing [21]. Overall, the EU IUU regulation has stronger legal force, more specific measures, stricter enforcement, and a traceability system

that make it more effective in combating IUU fishing than the IPOA-IUU. In 2007, the US adopted amendments to the Magnuson–Stevens Fishery Conservation and Management Reauthorization Act (MSA) on IUU fishing. The new Section 609 has two main components: a definition of IUU fishing and measures for the identification and listing of foreign nations with vessels that have engaged in IUU fishing. This definition further considers the impact of fishing activities on habitats and ecosystems, an area not discussed in the IPOA-IUU [21]. While the IPOA-IUU is an important international agreement that encourages sustainable fishing practices, the MSA is a more robust and comprehensive framework that provides stronger legal and scientific guidelines for managing and conserving fish populations.

3.2. Constitutive Elements of IUU Fishing

Based on previous opinions, the IPOA-IUU specifies the scope of each component. When identifying IUU fishing in the South China Sea, based on the provisions of Article 3 of the IPOA-IUU, the following conditions should be met.

3.2.1. Fishing Activities

- (1) Fishing activities: IUU fishing can be identified throughout the fishing process, which means that every step of fishing could be considered IUU fishing. Although Article 3.4 is an exception, the basic criterion of IUU fishing for the judgment of fishing behavior is whether the behavior complies with the laws, regulations, or international obligations with which the behavior should comply.
- (2) Behavior subject: vessels. The IPOA-IUU does not provide a definition of this term, but it is defined in the FAO Compliance Agreement as “any vessel used or intended for use for the purposes of the commercial exploitation of living marine resources, including mother ships and any other vessels directly engaged in such fishing operations” [18].
- (3) Behavior patterns: obtaining fishery resources. The current definition of the word “fishing” is provided in WTO fishery subsidy negotiation documents [22].

3.2.2. The Law of the Place Where an Act Occurs Should Be Applicable to Identifying IUU Fishing

Regarding jurisdiction, Articles 3.1.1 and 3.2.1 of the IPOA-IUU refer to illegal and unreported fishing activities in the waters under the jurisdiction of a state, while Articles 3.1.2 and 3.2.2 refer to illegal and unreported fishing activities in the areas under the jurisdiction of the RFMOs. Within the purview of the RFMOs, Articles 3.1.2 and 3.1.3 of the IPOA-IUU apply to activities “conducted by vessels flying the flag of states that are parties to a relevant regional fisheries management organization” and “those undertaken by states cooperating with a regional fisheries management organization,” respectively, limiting the scope of application. However, regardless of stipulations, the identification of fishing behavior is based on the nature of the water where the conduct occurs; that is, the place where fishing activities occur determines the choice and application of the law.

Whether based on the definition or elements of IUU fishing, identifying IUU behaviors is a complex and controversial issue. Factors such as the nature of the fishing area, the nature of the fishing vessel, the specific conduct, and the regional and international organizations to which the flag state belongs all need to be considered. In this process, the determinant is the nature of the water in which fishing occurs. However, it is clear that this issue is extremely controversial in the South China Sea, and identification must be performed more prudently.

4. China’s Position and Measures on Combating IUU Fishing

4.1. China’s Stance on Combating IUU Fishing

4.1.1. International Concerns about China

IUU fishing is a global issue, and China is one of the countries that has been criticized for engaging in this practice. Several international organizations and countries have expressed concerns about China’s IUU fishing activities. The United Nations Food and

Agriculture Organization (FAO) has raised concerns about China's lack of effective measures to combat IUU fishing. In a 2016 report, the FAO noted that China was responsible for 20 percent of the world's fishing catch but that a significant portion of that catch was obtained through illegal, unreported, or unregulated means [23]. The European Union (EU) has also been critical of China's IUU fishing activities. In 2012, the EU issued a warning to China that it could face a ban on seafood imports if it did not undertake steps to address its IUU fishing practices [24]. In 2020, the EU renewed its warning and identified China as one of the top five countries engaged in IUU fishing [25].

4.1.2. China's Participation against IUU Fishing and the Sustainability of Global Fisheries

In addition, the international community has long argued that China has been unwilling to align its domestic policies with international rules on global fisheries governance [26]. China has been a major player in global fisheries governance and has been involved in various international agreements, such as the UNCLOS and the FAO Code of Conduct for Responsible Fisheries. However, there have been concerns among the international community that China has not fully aligned its domestic policies with these international rules, particularly in terms of sustainable fishing practices and IUU fishing. One issue that has been raised is China's large distant-water fishing fleet, which operates in waters around the world and has been accused of engaging in overfishing and IUU practices [27]. China has also been criticized for subsidizing its fishing industry, which could contribute to overfishing and distort global markets [28]. Additionally, there have been concerns about China's lack of transparency in reporting its fishing activities and the management of its fisheries [29]. There is still room for improvement, and the international community will continue to monitor China's progress in aligning its domestic policies with international rules in global fisheries governance.

However, as the world's largest fishing economy in terms of catch, production, and exports, China's actions to stop IUU fishing are important for the sustainable development of global fisheries. Moreover, China has undertaken steps to combat IUU fishing in recent years and has increased its participation in global efforts to address this issue. The Agreement on Port State Measures (PSMA) is the first binding international agreement to specifically target IUU fishing, aiming to prevent, deter, and eliminate IUU fishing by preventing vessels engaged in IUU fishing from using ports and landing their catches. China is a signatory to the PSMA and has taken steps to implement its provisions. In 2014, China enacted the "Regulations on the Administration of Port Inspection and Quarantine of Imported and Exported Aquatic Products," which are intended to help prevent IUU fishing by requiring that foreign vessels provide documentation demonstrating that their catch was obtained legally before being allowed to enter Chinese ports [30]. Overall, China's participation and cooperation against IUU fishing in the South China Sea have been increasing, and the country has shown a willingness to work with its neighbors and international organizations to promote sustainable fishing practices and preserve the marine environment.

4.2. China Firmly Regards UNCLOS as Its Legal Basis in Combating IUU Fishing

China's recent international norm-setting activities and domestic legislation regarding IUU fishing indicate a shift in Chinese policy from its previous reluctance to undertake action against IUU fishing. China hopes to improve its fisheries policy by updating its domestic fishing policies [31] and participating in international anti-IUU fishing negotiations.

IUU fishing directly endangers the sustainable development of fishery resources in the South China Sea; therefore, combating IUU fishing is an important task for all coastal states in the South China Sea. The United Nations Convention on the Law of the Sea (referred to as UNCLOS) specifically formulated the clause of "Conservation of living resources" for coastal states in Article 61, emphasizing that coastal states should adopt conservation and management measures to ensure that the living resources in exclusive economic zones (EEZs) are not endangered by over-exploitation. For instance, the coastal

state shall determine the allowable catch of the living resources in its EEZs, taking into account fishing patterns, the interdependence of stocks, any generally recommended international minimum standards, and available scientific information; and other data relevant to the conservation of fish stocks should be contributed and exchanged on a regular basis. Furthermore, according to Article 123 of the 1982 UNCLOS, the states of a semi-closed sea such as the SCS “should cooperate” with one another in the area of fisheries [32]. Therefore, China has undertaken active measures to control IUU fishing in the South China Sea, fulfilling its obligations under UNCLOS and international law.

4.3. China Is Implementing Measures to Keep Pace with the PSMA

The Agreement of Port State Measures (PSMA) was the first binding international agreement to specifically target IUU fishing [33]. The provisions of the PSMA can be applied to vessels trying to enter a designated port of a state that differs from their flag states. Its purpose is to restrain, deter, and reduce IUU fishing by preventing vessels from remaining in ports and unloading their catch. With this method, the PSMA limits the incentive for vessels engaged in IUU fishing to continue operation, keeping the fishery products of IUU fishing from entering domestic and international markets. The PSMA repeatedly emphasizes the value of the region, and unifying the various regions plays a basic role in the governance of global IUU fishing.

China signed the PSMA on 22 November 2016, indicating its intention to become a party to the treaty. However, China has not yet completed the ratification process by submitting the necessary instruments of ratification to the FAO. It is important to note that, even though China has not yet ratified the PSMA, it has undertaken steps to implement its provisions, including enacting domestic regulations to prevent IUU fishing and establishing a National Plan of Action to Combat IUU Fishing. Meanwhile, in the current measures against IUU fishing in the South China Sea, China has also made full reference to the ideas and measures in the PSMA. In addition to identifying IUU fishing vessels according to the IUU list provided by regional fishery organizations, some provisions of China’s Fisheries Law (revised draft) include port state supervision of foreign fishing vessels [34]. At the same time, to implement the PSMA in the future, China has actively engaged in the staffing of law enforcement personnel, construction of port infrastructure, and capacity building of multi-sectoral cooperation.

4.4. Controlling IUU Fishing Aligns with the Idea of the 21st Century Maritime Silk Road Advocated by China

The 21st Century Maritime Silk Road is part of the Belt and Road Initiative (BRI) proposed by China [35]. The South China Sea is one of the most important areas in the “21st Century Maritime Silk Road.” China proposes that states along the Belt and Road should jointly undertake the tasks of protecting the marine ecological environment and providing quality marine ecological services, with the goal of safeguarding global marine ecological security [36]. Based on the BRI, China adheres to three main principles in IUU fishing management: first, IUU fishing management should follow the premise of mutual respect; second, China will safeguard channels for dialogue and consultation, and maritime disputes will be resolved through dialogue, sincerity, and patience; third, states need to pursue win–win cooperation [37].

In this background, the pace of fishery cooperation at bilateral and multilateral levels between China and other neighboring states has been accelerated. For example, in 2013, China and Brunei signed the Joint Statement between the People’s Republic of China and Brunei Darussalam. In 2018, China and Malaysia signed the Joint Statement, stating that the two states should continue to strengthen cooperation in fisheries. At the multilateral level, for example, the Declaration on the Coastal and Marine Environmental Protection of the South China Sea in the Next Ten Years (2017–2027), signed in 2017, stated that China and ASEAN should strengthen cooperation in fisheries, environmental protection, and ecology. Although China has signed a number of bilateral or multilateral agreements,

most agreements focus on the cooperation and coordination of fishery resources, and their provisions lack specific content [38]. The BRI would provide an opportunity for coastal states in the South China Sea to develop and implement fisheries governance frameworks and policies.

4.5. National Efforts to Control IUU Fishing

Effective prevention and reduction of IUU fishing in domestic fishery activities, including domestic fishers and large fishery enterprises, is necessary. In addition to economic sanctions, judicial and administrative instruments are required. China has undertaken considerable efforts to combat and address IUU fishing from a national perspective to reduce, control, and eliminate IUU fishing activities (See Table 1).

Table 1. National Regulations to Combat IUU Fishing.

Regulation	Main Content	Nature	Time of Adoption
The Fisheries Law of the People's Republic of China (2013 Amendment)	Implementing a fishing quota system in accordance with the principle that the fishing amount shall be lower than the increasing amount of the fishery resources; a fishing license system; legal liability, such as fines, revoking of fishing licenses, confiscating of fishing vessels, and criminal liabilities.	Legally binding	28 December 2013
Revised Draft of the Fisheries Law for Comments (September 2019)	Enforcing regulations on IUU fishing; creating a 'blacklist' of IUU fishing in pelagic fisheries; reporting of fishing boats inbound and outbound; a fixed landing system for large- and medium-sized fishing boats; and a ban on foreign IUU fishing boats from entering Chinese ports.	Legally binding	Estimated take effect in 2023
Detailed Rules for the Implementation of the Fisheries Law of the People's Republic of China (2020 Second Revision)	Improving fishery supervision and administration; tightening circumstances of fishing licenses; detailing and aggravating punishments.	Legally binding	29 November 2020
Measures of the People's Republic of China on the Registration of Fishing Vessels (2019 Amendment)	To strengthen the supervision and administration of fishing vessels; determine the ownership, nationality, port of registry, and other relevant legal relations of fishing vessels; and safeguard the legitimate rights and interests of all parties involved in fishing vessel registration.	Legally binding	25 April 2019
Provisions for the Administration of Pelagic Fishery	Prohibiting pelagic fishing enterprises, vessels, and ships engaging in illegal fishing.	Legally binding	1 April 2020
Measures for Monitoring the Location of Ocean-going Fishing Vessels (Revised Version)	To support the requirements of RFOs, when regional fishery organizations of which China is a member have stricter regulations on ship position monitoring, Chinese vessels shall abide by and implement the stricter regulations.	Legally binding	2019

The existing domestic measures of IUU fishing are scattered among legal documents of various ranks in China, including the Fisheries Law of the People's Republic of China (2013 Amendment), Detailed Rules for the Implementation of the Fisheries Law of the

People's Republic of China (2020 Second Revision), and Measures of the People's Republic of China on the Registration of Fishing Vessels (2019 Amendment). Overall, a legal system for fishery governance with Chinese characteristics, based on the Fisheries Law and supplemented by various laws, regulations, rules, and international treaties, has taken shape.

The Fisheries Law was amended in 2013. Since 2019, substantial amendments to the Fisheries Law have been proposed and initiated. The Revised Draft for Comments was completed in September 2019, and it has made great progress in controlling IUU fishing in China. It is estimated that the revised Fisheries Law will take effect as soon as possible. The revised draft will tighten regulations on IUU fishing; meanwhile, the "blacklist" of IUU fishing in pelagic fisheries, the reporting of fishing boats inbound and outbound, a fixed landing system for large- and medium-sized fishing boats, and a ban on foreign IUU fishing boats from entering Chinese ports are all included in the revised draft. If the revised draft is formally implemented, Chinese fishing vessels that seriously violate the provisions could be "confiscated from their fishing vessels, suspended or canceled as deep-sea fishing enterprises, and the persons responsible put on a blacklist of deep-sea fishing employees" according to the law. Several provisions in the revised draft have been prepared for the implementation of the PSAM, for example, establishing procedures for the inspection of foreign vessels in non-fishing ports. The revised draft improves the legal effectiveness of the system to combat IUU fishing, reflecting the importance that China attaches to fishery resources; however, it could be more in line with relevant international treaties.

Simultaneously, support for the regulations of the Fisheries Law has developed. On 1 April 2020, provisions for the administration of pelagic fisheries came into force, and pelagic fishing enterprises, vessels, and ships were explicitly prohibited from engaging in IUU fishing activities [39]. Supporting increasingly stringent requirements for the management of fishing vessels from regional fishing organizations, at the end of August, China issued a revised version of the measures for monitoring the location of oceangoing fishing vessels, which came into force in 2019 [40]. According to these regulations, when regional fishery organizations in which China is a member have stricter regulations on ship position monitoring, Chinese ships shall abide by and implement stricter regulations, and fishing boats that dismantle or close their position monitoring systems without authorization will have their fishery subsidies deducted for that year [41].

5. Conclusions

IUU fishing poses a significant threat to fishery management, food security, state interests, and social stability. However, because the identification of IUU fishing is complex, and the causes of IUU fishing include many controversial issues, eliminating IUU fishing has a long way to go. In this situation, China's measures against IUU fishing have been criticized, but China's efforts to control IUU fishing, especially in the South China Sea, cannot be neglected [42]. Apart from adopting efficient measures from national and international perspectives to prevent IUU fishing, various forms of fisheries cooperation have been undertaken at the bilateral level. Simultaneously, China has undertaken efforts to conclude treaties in the region and actively refers to and intends to join the APSM. Certainly, some negative factors, such as maritime disputes, lack of trust, and weak enforcement, are challenging for China in establishing effective international cooperation in combating IUU fishing in the South China Sea. Addressing these challenges will require efforts to build trust among countries, address economic concerns, and strengthen enforcement measures. For example, joining SEAFDEC could be a positive step for China toward achieving this goal. In addition, the Center for Strategic and International Studies (CSIS) fisheries blueprint proposes several measures for China to improve the management of its fisheries resources, including strengthening its enforcement capabilities, improving data collection and sharing, promoting sustainable fishing practices, and enhancing international cooperation. Adopting these measures could help China to address the challenges that it faces in managing its vast and complex fisheries sector. Overall, China's participation and further efforts would play key roles against IUU fishing in the South China Sea and could

help to ensure that fishery resources are managed in a sustainable and equitable way for future generations.

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Article

Building Up a Sustainable Path to Maritime Security: An Analytical Framework and Its Policy Applications

Lingqun Li ^{1,2}¹ School of International Studies, Nanjing University, Nanjing 210023, China; lingqun@nju.edu.cn² China Center for Collaborative Studies of the South China Sea, Nanjing University, Nanjing 210023, China

Abstract: Maritime security is currently a buzzword in international relations. The popularity of the term reflects an emerging consensus across the international community recognizing increasing challenges to world oceans and helps to rally support for serious efforts to cope with these challenges. However, the term is highly contested with regard to its conceptual meaning and empirical implications. The discipline of security studies provides a critical perspective revealing the state-centered ontology embedded in many of the discussions of maritime security. The complicated and intertwining nature of maritime threats in today's world oceans demands a systematic analytical framework to comprehend and address them, a framework that moves beyond statist ontology, military means, and zero-sum mentality to a people-centered, diversified toolkit and positive-sum mentality and opens space for a common, cooperative, and comprehensive security agenda. The evolving discourse on human security and sustainable development sheds light on a possible path to approach such an agenda in an effective and sustainable manner. It has also enlightened the mandates of major international institutions and a lot of states practices in the pursuit of maritime security. Against this background, this article aims to explore the conception of maritime security and provide an analytical framework for analyzing and guiding maritime security practices and explores a feasible path towards realizing sustainable maritime security that can meet the diversified challenges emerging in global maritime space today. To this end, the article draws on the discipline of security studies over the past few decades so as to structure a rigorous analytical tool for engaging maritime security as a theoretical concept and a set of policy objectives. Applying this framework to state practices, this article discusses the case of China, examining, on the one hand, China's understanding of maritime security and related policy practices and, on the other hand, exploring the value of the proposed policy framework as serving the foundation for bridging disagreements, forging consensus, and coordinating policy actions in the pursuit of sustained security and development in the maritime domain.

Keywords: maritime security; human security; sustainable development; ocean community; positive-sum mentality

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1. Introduction

Maritime security is currently a buzzword in international relations [1]. It is listed as an important task on the work agendas of major international and intergovernmental organizations, and more and more countries throughout the world incorporate it into their national security mandates. Maritime security is also a term that attracts broad academic discussions, ranging from security studies, international trade, environment protection, climate change, to global governance, etc. The popularity of the term reflects an emerging consensus across the international society recognizing increasing challenges to world oceans and the urgent need for serious effort to cope with these challenges, and helps to mobilize political support for dealing with relevant issues.

However, as some observers have noted, the term “maritime security” has been applied to a quite extensive range of issues, and there seems to be a considerable degree

of ambiguity or disagreement as to its conception, scope, and related policy practices [1]. For example, the International Maritime Organization places an institutional emphasis on marine safety supported by the implementation of a series of IMO legislations [2]. In comparison, a core element in Britain's definition of maritime security is securing the waters of the UK and Overseas Territories and Crown Dependencies and the increasing security risks brought about by the ongoing Russian–Ukraine conflict [3]. China's definition of maritime security is rooted in its vision of "An Ocean Community of a Shared Future" that the maritime security is maintained through international cooperation of fighting against common threats and challenges. In the meantime, it attaches great importance to the challenge of maritime disputes in its surrounding waters [4].

Such ambiguity can be beneficial, as it allows different actors to participate in joint actions under the general abstract of the term while simultaneously disagreeing over local meanings [5,6]. However, it does not negate the imperative need for establishing a more well-defined conception of maritime security, which can serve as the foundation for coordinated policy practices and enlighten effective approaches to tackle various maritime security challenges. As Christian Bueger rightly pointed out, the 'laundry list' approach as we currently see to defining maritime security is "insufficient since it does neither prioritize issues, nor provides clues of how these issues are inter-linked, nor outlines of how these threats can be addressed" [1] (p. 159).

In the meantime, the ambiguity on what constitutes maritime security may potentially lead to two undesirable policy outcomes. First, in the absence of a consensus, it is tempting to "securitize" ocean-related issues in an indiscriminate manner. Once a problem is successfully "securitized", it will garner greater attention and rally more political support critical to the resolution of the problem [7]. In fact, a similar inclination for broad securitization has been identified in a number of policy realms, such as the environmental sector and the economic sector [8]. However, indiscriminate securitization may potentially result in a preference for short-term, extraordinary measures, which may be unsuitable or ineffective and could quickly drain up limited resources [9].

Second, the lack of rigorous differentiation of maritime-security-related issues could render the efforts to tackle them inappropriate or ineffective. For example, traditional security issues often concern state survival and territorial sovereignty. States, therefore, are the main actors who can provide powerful and effective means when confronted with challenges of this nature. However, state actors may not be the best candidates for addressing nontraditional security issues and many of the unconventional challenges that are emerging in the maritime world. Instead, various nonstate actors—shipping industry, private defense companies, and transnational organizations, such as those dedicated to marine safety, environmental protection, and humanitarian rescue—constitute an active, sometimes crucial, part in the potential solutions. By lumping together traditional and nontraditional maritime security issues, one would find it difficult to coordinate different policy actors and allocate appropriate resources for a particular problem and hence hinder the formation of a precise and effective policy response.

One possible way to bridge the gap of different understandings of maritime security and mitigate the policy limitations identified above is to connect the conception of maritime security with the idea of sustainability. As demonstrated in the following discussion, recent development of the security literature has laid a theoretical foundation to possibly examine the concept of security from the perspective of sustainability. On the policy level, serious efforts have been taken by relevant stakeholders to integrate the idea of sustainability into policy practices concerning maritime security. The fact that oceans are vulnerable and becoming incapable of sustaining human development is widely recognized by the international community in recent years. It is this sense of urgency that prompted the United Nations to incorporate oceans and seas into the UN 2030 Agenda, which lists as the 14th Sustainable Development Goal "Conserve and sustainably use the oceans, seas and marine resources for sustainable development". Approaching maritime security through the lens of sustainability, therefore, would promote convergence of the understanding of

maritime security and help direct dispersed policy efforts into a shared roadmap to achieve maritime security. This article aims to establish a conceptual framework for analyzing maritime security and, more importantly, explores a possible policy path that can hold up to sustainable values and meet the diversified challenges emerging in global maritime space today. To this end, the article intends to draw on the literature of security studies and the sustainable development discourse over the past few decades and examine concrete state practices in addressing maritime security issues to evaluate different policy considerations and approaches. The main body of the article comprises three sections. Section 2 aims to propose a conception of maritime security integrating the idea of sustainability and compares different frameworks that have been offered to grasp this conception. The third section goes on to establish an analytical framework for approaching maritime security, which is analytically rigorous and empirically useful for guiding and assessing policy practices. The fourth section takes China as an example to examine, and draw lessons from, concrete state practices in the pursuit of maritime security under the framework provided in Section 3. In the conclusion part, the main arguments are summarized, and some policy suggestions are proposed to cope with the unprecedented and complex challenges in the global maritime space.

2. Connecting Maritime Security with Sustainability: Exploring a Possibility

The contestedness or disagreement associated with different usages of maritime security comes from two major sources. One is the ambiguity concerning the term “maritime”, the other the ongoing debate in the security studies literature. First, does the maritime domain deserve to be treated as an independent subject of investigation? Put in another way, can maritime security be easily substituted for national security or human security? This question has raised concern in previous discussions, but remains largely underexplored.

The maritime domain has unique characteristics, which make it an illuminating subject of investigation. The world oceans comprise a vast and complex space in which all kinds of human activities are taking place. This space is known for three unique features: (1) a high level of openness and mobility, (2) a major portion of the space lying beyond state jurisdiction, and (3) critical as a whole for maintaining the health of the global ecosystem. These three features have significant policy bearings and cannot be simply reduced to national security or human security in the general sense. Consequently, many of the approaches commonly used in national security policy need to be carefully selected and modified in order to suit the demand of addressing distinctive security challenges in the maritime space.

Second, while it is a popular practice to label threats and challenges in the maritime domain as security issues, the combination of “maritime” and “security” requires further clarification before proceeding to conceptualize the term. As is demonstrated below, the conception of security carries its own analytical and practical strength buttressed by a rich literature of security studies. However, the security discipline has offered different perspectives on the concept with different, sometimes even contradicting, ontological and epistemological preferences, which has partly contributed to the existing disagreements surrounding discussions on maritime security. Therefore, in light of the three unique features of the maritime space, it is worth the effort to compare and carefully select from the pool of different security conceptions and policy approaches so as to formulate an effective and appropriate policy agenda suitable for the challenges identified in the world oceans.

2.1. Traditional Security Studies (TSS)

Security sits at the core of human needs. Broadly speaking, discussions about security issues can be traced back thousands of years in all major cultures. However, security studies as a vibrant research agenda in a modern sense are a relatively new phenomenon. During the Second World War, the international community was appalled by war atrocities committed by states. The invention and deployment of nuclear weapons further sent an alarming message to the world that security should be the top priority of mankind and

must be dealt with seriously. Security studies, therefore, were quickly developed in the aftermath of the Second World War as part of the response to this urgent demand and consensus for preserving security.

The 1950s–1970s constitute the first phase of security studies. In this period, state survival was the most pressing issue to be considered, as the world was overshadowed by the threat of proliferation of nuclear weapons, the risk of which was further exacerbated by the rising geopolitical confrontation between the U.S. and the U.S.S.R. Security, therefore, was treated as an equivalent of state survival and used interchangeably with national security. It is for this reason that the security literature in this period is often called traditional security studies (TSS) or strategic studies. Against this background, TSS developed a quite classical literature of deterrence theory [10–14]. Jargons such as MAD (mutually assured destruction), extended deterrence, and second strike capability featured both academic and policy achievements of the TSS in this period.

2.2. Critical Security Studies (CSS)

The late 1970s and early 1980s started to witness growing criticism against the TSS research paradigm. A number of important works appeared in this period, with the aim of shifting the course and direction of the TSS. The criticism targets the TSS's two theoretical assumptions, which are problematic. First, many scholars questioned traditional security studies for its state-centric ontology. They argued that in TSS works, it was taken for granted that state was the ultimate arbitrator of accessing threat to security, and, consequently, the sole provider/defender of security. However, in reality, states often constitute the biggest threat to the security of people. Second, it was argued that the TSS provided too narrow a definition of security. Security is defined and measured almost exclusively by the calculation of military capabilities, which made the TSS fall short of recognizing security threats from other dimensions, such as economic, environment, and public health risks.

Richard Ullman, for example, criticized that a heavy military emphasis on previous security studies contributed to pervasive militarization of international relations and lost sight of other and perhaps even more harmful dangers [15]. Barry Buzan pointed out that it was surprising that for such a politically powerful concept, security had so far remained underdeveloped. He argued that the lack of coherence must be overcome for security studies to progress [6]. As a result, exploratory efforts, especially those of the Copenhagen school and the Welsh school, were made in the 1980s and the 1990s with the aim of conceptualizing the term security in a more critical and theoretically robust manner. These security studies are often labeled as critical security studies (CSS) for their more dynamic, relativist, and relational perspectives in contrast with those employed by traditional security studies [16]. The Copenhagen school, for example, points out that the definition of security must be associated with a referent object, that is, the security for whom and of what. For the proponents of the Copenhagen school, the referent object of security is not necessarily the state. It can be individuals or other aggregated forms of actors. In the meantime, the Copenhagen school perceives security as a dynamic process of securitization, rather than a fixed status to be maintained. Securitization is a discursive process “in which the socially and politically successful ‘speech act’ of labelling an issue a ‘security issue’ removes it from the realm of normal day-to-day politics, casting it as an ‘existential threat’ calling for and justifying extreme measures” [17] (p. 435). By introducing the concept of securitization, the Copenhagen school unlocks the blackbox of security and enlarges the concept of security to address a broader range of issues beyond military threat. The five major security-related sectors are identified as follows: the economic, environmental, political, military, and societal sectors [16].

The Welsh school, also called by many as the Aberystwyth school, shares with the Copenhagen school in questioning the statist ontology embedded in the TSS. More importantly, it has demonstrated a clear stance on individuals and humanity as the ultimate subject for security inquiries and practices. The Welsh school establishes an integral tie between humanity and security. As Ken Booth argued, emancipation of humanity, not

power or order, produces true security, and “emancipation, theoretically, is security” [18] (p. 319). For the Welsh school, the concept of security should be centered on individuals. This shift of focus from the state to individual human beings enables the Welsh school to examine the “realities of (in)security”, such as human rights abuses, the powerlessness of the poor, the oppression of minorities, and violence against women, realities that have long been made invisible by the traditional power-security mindset of those who have dominated or disciplined the study of international relations [19]. The effort made by the academic community to reconceptualize security with people and beyond the military sense was simultaneously translated into relevant policies of major international institutions and those of many states. An exemplary case is found in UNDP’s Human Development Report in 1994. The report echoed the aforementioned criticism regarding the traditional definition of security that “for too long the concept of security has been shaped by the potential for conflict between states”, “for too long security has been equated with the threats to a country’s border”, and “for too long nations have thought arms to protect their security” [20] (p. 3). The report introduced instead a new concept named “human security”, which equated security with people rather than territories, with development rather than arms. Guided by the concept of human security, the report examined along four policy sectors—the political, economic, environmental, and social sectors—national and global concerns of human security and formulated, accordingly, policies and measures to be taken to better protect humanity from insecurities in daily life, such as poverty, famine, pollution, crimes, and ethnic violence [20].

To sum up, the TSS and the CSS have offered two different approaches to investigating the concept of security. The TSS generally presumes a statist ontology, a reductivist perspective, and a preference for military means, while the CSS assumes a more people-centered, constructivist, and relational approach, which in turn results in a relatively broadened security agenda.

2.3. *Connecting Maritime Security with Sustainability*

In the face of the aforementioned differences between the TSS and the CSS, one would have to ask: which line of conception outweighs the other in their application to the maritime domain? Bueger’s seminal work offers a quite solid foundation for exploring this question. In his review of existing discussions on maritime security, Bueger summarized three frameworks to grasp the term: (1) the “semiotics” framework, under which maritime security is examined through its relations to other terms; (2) the securitization framework, which scrutinizes what issues have been securitized as maritime security threats and how such process unfolded in political discourse; and (3) the security practice theory, which focuses on the concrete practices different agencies undertake in the name of maritime security [1]. Depending on different theoretical inclinations, one can choose one of the three frameworks to conduct further investigation on the concept.

These three frameworks, taken together, highlighted an accelerating trend in recent years in the maritime domain; that is, the maritime security agenda is quickly expanding to encompass a wide spectrum of issues far beyond the traditional scope of security as the one defined by the TSS. In other words, maritime security, in contemporary era, cannot be simply reduced to national security, and its policy agenda is closer to the one envisioned by the CSS.

Building upon the CSS literature and Burger’s work, it becomes possible to integrate sustainability with maritime security both as a concept and as a policy goal. At the conceptual level, the people-centered ontology assumed by the CSS is widely shared in the sustainable development discourse. With regard to policy practices, the policy agenda of maritime security envisioned by the CSS can be broadened to incorporate economic, environmental, and social dimensions, which, to a large extent, resonate with that of sustainable development. In fact, converging efforts have been observed in recent years to consider maritime challenges under the sustainable development framework, reflecting an increasing awareness that the maritime domain provides an indispensable foundation

for the sustainability of mankind. For example, the UN Millennium Development Goals launched in 2000 listed eight sustainable development goals, none of which was specifically related to oceans, and the maritime domain was vaguely mentioned in the text of the MDGs. The UN MDGs were concluded in 2015 and replaced by the UN 2030 Agenda for sustainable development. The UN 2030 Agenda listed 17 sustainable development goals, and the 14th SDG is directly related to oceans—“Conserve and sustainably use the oceans, seas and marine resources for sustainable development”. The concern is that the world oceans should no longer be seen as a depository of endless and inexhaustible resources. Rather, the detrimental impact of human activities is putting the oceans at the risk of becoming incapable of sustaining human development for generations to come. In this sense, approaching maritime security through the lens of sustainability would promote convergence of the understanding of maritime security and help direct dispersed policy efforts into a shared roadmap to achieve maritime security.

However, connecting sustainability with maritime security does not equate to a simple mathematical conversion of one plus one. For one thing, the term maritime security needs a reconceptualization in a way that can open room for integrating the principle of sustainability. Moreover, sustainability needs some clarification before such combination can be proceeded. The first clarification to be made is that although the terms of sustainability and sustainable development are frequently used as synonyms, in comparison, the term sustainability, defined as appropriate unity and balance among the economy, society, and environment considering the renewable capacity of the earth’s ecosystem, could be seen as the fundamental and abstract principle underpinning the discussion of sustainable development and hence entails a relatively broader scope in terms of policy application [21]. For the purpose of this research, the principle of sustainability, in its integration with maritime security, can be contextualized as consisting of two inter-related sets of elements: sustainable values/goals and sustainable means compatible with those values. Another clarification to be made is related to the controversial trade-off between different sustainable criteria and development goals. Sustainable development refers to maintaining a dynamic balance between economic and social development, on the one hand, and resource and environmental protection and conservation, on the other. Such balance frequently involves weighing carefully the trade-off between sometimes conflicting policy goals. In this sense, the combination of sustainability and maritime security calls for a carefully defined conception serving as the critical foundation based on which we can design a practical roadmap to bridge disagreements, coordinate policy efforts, and assess relevant policy practices in pursuit of sustainable maritime security.

3. Approaching Sustainable Maritime Security: An Analytical Framework for Policy Application

As the brief review above has shown, the term security developed in different security theories is featured by a highly contested nature [22,23]. The divergence between the TSS and CSS highlights the fact that the definition of security could vary greatly in the usage of scholars and policy practitioners, depending on different ontological and epistemological preferences. However, contestedness does not necessarily impede a theoretically robust conceptualization of security. Rather, it proves the power of the concept as an analytical tool [5]. Therefore, it becomes necessary and possible to establish a theoretical framework to conceptualize maritime security in a way that can be analytically rigorous, on the one hand, and, on the other, conducive to incorporating the principle of sustainability in comprehending and addressing the rising challenges to sustainable ocean security.

Recognizing the challenge in the conceptual analysis of the term security, David Baldwin suggested a possible way to improve conceptual clarity. He deciphered the security problematique by breaking down the ambiguity nested in the concept along seven dimensions, while retaining the basic notion in the conception of security. Wolfers’s classic characterization of security as “the absence of threats to acquired values” [24] (p. 483), according to Baldwin, “seems to capture the basic intuitive notion underlying most uses

of the term security” [22] (p. 13), and clarification of the seven dimensions allows for add-on specifications, when needed, to suit different research tasks. Concretely speaking, specifications can be determined along one or more of the seven dimensions proposed by Baldwin and the choice of which dimension, and the respective answer depends on the particular research question to be addressed:

1. Security for whom?
2. Security for which values?
3. How much security?
4. From what threats?
5. By what means?
6. At what cost?
7. In what time period?

Baldwin’s elaboration provides a useful formula for engaging the conceptual analysis of security, a formula that can be summarized as “core definition + selected specifications”. This formula has two benefits when it comes to the conceptualization of maritime security. First, it allows the term maritime security to share the core element regarding the conception of security. In the meantime, the formula makes it possible to specify security in a way that can nicely merge maritime and security. The second benefit concerns construing maritime security as a set of policy objectives. Depending on the preferred policy objectives, selected specifications can be tied to maritime security, which will facilitate the rationalization of policy-making and the attainment of policy goals.

Using the “core definition + selected specifications” formula, we can now move on to conceptualize maritime security, which is aimed to improve the theoretical robustness of previous conceptions, on the one hand, and, on the other, reflect the common interests of world oceans and create room for the possible integration of the sustainability principle. This task involves two steps. The first step is to determine the core elements anchoring the concept of maritime security. In this regard, the concept of maritime security certainly shares the basic notion of security defined by Arnold Wolfers, that is, “the absence of threats to acquired values”. This notion contains two core elements that are interconnected: “threats” and “values”, as threats are those things that can damage or hinder the realization of values. Therefore, maritime security can be defined as the status of the set of core values being sustained in the maritime domain in the absence of threats. This notion requires further specification in the context of maritime space—that is, what particular values are under what kind of threats and hence need to be guarded? This step helps to bring sustainable values into consideration.

Step 2 is to elaborate on these specifications. This step is critical for establishing a policy framework to guide ensuing policy practices. In an ideal sense, such framework can serve the purpose of bridging different understandings of the issue, coordinating various actors, and enlightening policy practices to tackle maritime security challenges in an effective and sustainable manner. Given that the maritime domain is a complex space featured by a highly open, mobile, and vastly shared nature, it would facilitate the following discussions by breaking down the maritime domain into more specific policy sectors/arenas. In this regard, the four sectors offered by the human security literature discussed earlier can be of a good reference. Applying the four sectors to the world oceans, one finds that the maritime space is a political space where maritime entitlements are delimited and interstate cooperation and conflicts are engaged; it is an economic space enabling blue economy activities, such as transportation, tourism, and exploration and exploitation of marine resources; it is an environmental space that upholds global biodiversity and sustains all life on earth; it is a social space where the basic rights of coastal communities, maritime professionals, and other relevant individuals and groups are under unprecedented threats, the major sources of which are uncommonly seen onshore. These characteristics of the maritime space, combined with Baldwin’s seven dimensions for specifications, will help guide further specifications on maritime values and identify real or potential challenges that undermine those values (the following will go through the first six dimensions, as

the last dimension—in what time period—is obvious: from the perspective of sustainable development, maritime security should be pursued as a long-term policy goal).

3.1. Security for Whom?

This question points to the object to which maritime security refers. For traditionalists, the answer is state and only state. In the case of maritime security, however, while states retain their position as a legitimate referent object, other actors also need to be considered in the security equation. In the political space, states generally constitute the main referent object of security. In the economic space, the business sector and those individuals engaged in the blue economy are often viewed as the main referent object of security. In the environmental space, the health of oceans as a whole deserves a central place in the consideration of security; in a similar vein, the social space contains individuals, coastal communities, marine professionals, etc., as the main referent object for whom security should be defended.

3.2. Security for Which Values?

This question points to the composition of values to be upheld for the purpose of achieving sustainable maritime security. To be sure, determining the core values to be safeguarded in the maritime domain concerns the defining element in the formulation of policy agenda regarding ocean security. The discourse on sustainable development is particularly relevant in this regard and offers useful insights as to the specific values to which coordinated efforts should be devoted in safeguarding maritime security.

Sustainable development as a discipline emerged in the last quarter of the 20th century, in the face of the detrimental impact of human activities on the earth environment, which raised concern about the depletion of natural resources and the collapse of the web of life. A number of definitions of sustainable development have been offered over the course of time, yet the most classical one can be found in the famous Brundtland Report published in 1987, in which sustainable development is defined by the Brundtland Commission as a goal “to make development sustainable to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs” [25]. In particular, the ocean is identified as one of the earthly environments that have suffered from unsustainable anthropogenic activities, mostly economic ones, resulting in pollution, overexploitation of marine species and nonliving resources, and climate change. Indeed, marine environmental degradation and climate change have been widely viewed as mounting a serious security threat to the ocean and the ecosystem as a whole. The three features of the world oceans further underscore the urgent need to go beyond traditional zero-sum mentality so that ocean security can be advanced in a holistic, comprehensive, and sustainable manner.

It needs be emphasized that the discussion of sustainable development so far has focused more on the economic, ecological, and social sectors of human security and less associated with the traditional political aspect of security. Given that the political sector is relatively more conflict prone, while it is difficult to consent on the extent to which sustainable values should be promoted, it would be easier to agree on the minimum, that is, the value of peace and stability. In other words, the principle of sustainability can be translated in the political sector as the value of peace and stability.

The brief discussion above helps to determine a set of core/abstract values, organized along the four policy sectors, to be safeguarded in pursuit of sustainable maritime security and respective types of actors involved as relevant referent objects (see Table 1).

Table 1. An analytical framework of sustainable maritime security.

Sectors	Core Values of Maritime Security	Threats to Maritime Security *	Policy Approaches **
Political sector	Peace and stability	Interstate disputes, WMD proliferation, terrorism	State-centered approach, cooperation, negotiation
Economic sector	Sustainable development of blue economy	Disruption of navigation/overflight, irresponsible exploitation, pollution, smuggling	Business/IO-led approach, blue/green technology innovation
Environmental sector	Healthy marine environment and biodiversity	Pollution, climate change, degradation of marine biodiversity	Community/IO-led approach, preservation, conservation
Social sector	Marine safety of vessels, installations and professionals, well-being of coastal communities	Piracy, human trafficking, labor abuses, maritime disasters, disruption of food chains	Individual/community/IO-led approach

* The list of threats provided here are not meant to be exhaustive, nor are they mutually exclusive, as many of the threats are closely linked. ** The approaches listed in different sectors are not mutually exclusive; rather, they are often used in combination in actual policy practices.

First of all, peace and stability compose the core value of security, however defined. Undoubtedly, the same applies to the maritime space. Maintaining peace and stability is also essential as it paves the way for safeguarding the sustainable use of world oceans in the other three sectors. In the economic sector, sustainable development has risen to prominence in the past three decades, guiding a new pattern of economic growth [25]. An emerging consensus in recent years on sustainable development in the international community is that security and development are two sides of one coin. Sustainable path is even more desirable for the development of the blue economy, given the latter's intricate relationship with the marine environment. The reciprocal relationship between security and development has been incorporated in a wide number of UN-led and regional development programs, many of which are targeted on the marine economy [26,27]. As regards the environmental sector, maritime space shares many commonalities with other environments, and the sustainable development of the whole humanity depends on a healthy and robust ecological system upheld by the world oceans. The UN Agenda 2030 specifically warns that the worsening of the global marine environment, i.e., pollution, sea level rise, and ocean acidification, is seriously affecting coastal areas and low-lying coastal countries and puts the survival of many societies, and that of the biological support systems of the planet, at risk [28]. Finally, the social sector highlights individuals' rights to safety, security, and development [29]. The human rights of individuals involved in maritime activities, including seafarers, port workers, and coastal communities, and the safety of vessels and facilities they use or board are at the core of human security in the maritime space.

3.3. From What Threats?

A plethora of activities can be identified as posing threats to human beings and the environment in the context of maritime space. Many of these threats are quite different from those experienced on the land space. First of all, threats to peace and stability in the maritime space mainly come from disputes over maritime entitlements, the proliferation of WMD (weapons of massive destruction), and terrorist attacks. Second, the blue economy is prospering in recent years and has become a major pillar of national economic development in many countries. Seaborne transportation forms the most crucial part of the blue economy. Nearly 70% of global commercial goods are transported by sea. Disruptions to smooth navigation and overflight represent a major challenge to maritime security and even jeopardize the stability of the global economy. Empowered by fast technology development, the exploration and exploitation of living and nonliving marine resources also contributes positively to the blue economy. In the meantime, however, the world's marine environment has suffered increasingly from the unsustainable use of exploration and exploitation

methods. Overexploitation of fisheries is one of the worrying trends in this regard, as reflected in the growing number of reported cases of illegal, unreported, and unregulated fishing (IUU fishing). Third, the marine environment has been under increasing pressures in the last several decades. Land-based pollution and seaborne pollution have long been viewed as threatening the marine environment in significant ways. Moreover, in recent years, climate change is ringing an alarm on a global scale as its impact on the global environment can be perilous. Resultantly, we are observing phenomena such as the rise of sea level, ocean acidification, and degradation of marine biodiversity worsening the marine environment worldwide. Finally, it is in the social sector that threats to human security are often neglected. Due to the borderless nature of most of the maritime space, it is much more difficult to enforce laws and regulations safeguarding human rights and shield facilities from sabotaging activities. Piracy, human trafficking, and labor abuses of seafarers, for example, are identified as prominent threats putting marine safety and human lives at risk. Moreover, environmental degradation, such as fishery depletion, habitat losses, pollution, and invasive species, has greatly undermined the resilience of coastal communities. The impact of climate change is making this situation even more difficult to alter.

It needs to be noted that the four sectors listed in the framework should be viewed as relational and interlinked. The complexity of maritime challenges lies in the fact that many of these threats are intertwined. Some of the threats are cross-sectoral and can undermine maritime security in different ways. For example, military confrontation is no doubt an unsustainable means to resolve maritime security issues. Its negative impact is threefold. It definitely threatens human lives, it impedes the free and open use of the oceans, and it also poses serious hazard to the marine environment. Climate change is another example. The impact of climate change not only puts the sustainable development of the blue economy at risk, but would push up incidents of natural disasters, thus further weakening the livelihood of coastal communities. Similarly, pollution and overfishing not only have detrimental effects on the marine environment but also threaten the food security of coastal communities and other people whose nutrition depends on marine-based proteins.

With the specifications of the first three dimensions discussed above, one can use them as a workable framework that not only provides basic guidance for policy formulation but also possibly generates a set of criteria against which disagreements can be organized and policy practices can be evaluated. On the one hand, by dividing the maritime space into four policy sectors, it becomes easier to pinpoint the referent object or agent whose security is being threatened. This, in turn, helps to choose appropriate policy approaches compatible with the particular referent object. For example, in the political sector, states are the main referent object, and most of the security threats in this sector are considered national security issues. Therefore, state-based approaches, such as negotiation and consultation, are commonly used policy approaches to addressing issues in this sector. In the environmental sector, as illustrated in Table 1, given that the sources of threats to the marine environment tend to be regional or global in nature and can affect multiple types of actors in varying degrees, regional or international coordination is most demanded in policy formulation, and community-led and IO-led approaches would be more effective. On the other hand, since this framework has adopted a minimum approach in the formation of core values, it can potentially be used to evaluate the effect and outcome of concrete policy practices. More specifically, one can determine in which sector the policy practice in question falls and compare the policy outcome with the values/threats specified in that sector. More importantly, the framework can serve as a basic roadmap upon which consensus may be built and policy actions can be converged.

3.4. How Much Security, by What Means, and at What Cost?

These three questions are not directly related to the conception of maritime security. Rather, they help clarify specifications so as to pursue sustainable maritime security as policy goals. Different specifications of these three questions often imply different modes of policy-making—different policy priorities and preferences of policy approaches. Moreover,

the pursuit of security always involves calculation of costs. How much security can be realized is heavily dependent on the kinds of resources at one's disposal and the types of actors involved.

These questions need to be considered in light of the ongoing debate in the sustainable development and sustainability discourse concerning the balance between different and sometimes even contradicting policy goals. Meanwhile, it is extensively agreed that sustainability can only be achieved as a result of the parallel development of all the four policy sectors in tandem. When translated into concrete policy objectives, they are not necessarily complementary, rather, controversy and contradiction are inevitable, and trade-off has to be made in order to maintain a delicate balance between conflicting policy goals in the face of limited resources and means available. Dasgupta and Mäler pointed out that there exists an inverted "U"-shaped relationship between environmental pollution and economic growth, indicating that with the development of the economy, especially the rapid development of the industry, there will be a certain degree of environmental pollution [30]. Others highlight the importance of economic growth to obtain the resources necessary to achieve sustainability. Another controversy concerns the issue of intergenerational and intragenerational equity. While most scholars subscribe to the view that the definition of sustainability must include intergenerational equity, it is uncertain what exactly are the needs of future generations to be considered and whether the current generation is legitimate to make a decision in their behalf [31]. In light of these discursive debates, the framework provided in Table 1 will provide a useful starting point as it helps to sort out relevant issues and identify policy priorities in each of the policy fields. It also provides a common ground on which different actors can weigh on the trade-off between different policy objectives and make a comparison of their respective priorities with each other. As mentioned earlier, the principle of sustainability can be contextualized as two sets of elements to be incorporated into the analytical framework of maritime security: sustainable values/goals and sustainable means. The realization of sustainable values requires an effective toolkit of sustainable means and an appropriate designation of policy goals compatible with sustainable values. Traditional security studies hold a state-centric view of security, which implies a strong preference for state-based approaches and a zero-sum mentality in consequent policy-making and implementation. In comparison, conceptualizing maritime security in terms of sustainable development implies that the safety of individuals and the health of oceans need to be prioritized in the pursuit of maritime security. Such conceptualization results in a fundamental shift of focus in the formation of policy goals and policy preferences. It also demands a quite different composition of policy toolkit filled with more people-centered and cooperative approaches and a positive-sum mentality in tackling challenges in the maritime space.

There is no doubt that states are the most crucial actors in the pursuit of maritime security. However, the open, mobile, and vastly shared nature of oceans renders purely state-based approaches inappropriate in addressing many of the unconventional challenges. Besides a state-based approach, an IO-based, business-based, community-based, and individual-based approach can also play effective roles in this regard. These nonstate actor-based approaches are good candidates of sustainable means, which facilitate the pooling in of diversified political, financial, and labor resources and make sure that all the legitimate concerns for sustainable developments are dealt with in the policy circle. It is the main rationale behind the codification of the 1982 United Nations Convention on the Law of the Sea. The convention encourages strongly that cooperative efforts involving multi-parties need to be fashioned to promote the orderly and sustainable use of the oceans. Under the convention, a variety of international regulatory/consultant bodies (i.e., International Seabed Authority, RFMOs, regional coordination centers, etc.) have been established at the regional and international levels, serving as multilateral platforms to facilitate the negotiation and resolution of disputes and foster cooperation between states and among state and nonstate actors.

The constraint of resources is another factor that matters a lot in the policy-making process. Many of the studies on maritime security have remained silent on the issue of policy costs. In fact, policy-making always involves a consideration of resource utilization and cost sharing. It is for this reason that indiscriminate securitization of maritime security issues is unsustainable in the long term as it can quickly drain up limited resources. Given that the attainment of maritime security is realized through the fulfillment of a variety of different policy objectives, some of which are competing for the same resources, critical decisions need to be made, such as which policy objectives should be prioritized, how to allocate resources, which approach is cost-effective, and how to evaluate policy outcomes. Different state and nonstate actors have different emphases and preferences when it comes to making a balance between different policy goals of sustainable development, which are then reflected in their respective policy practices and lead to different policy-delivery results.

4. The China Case: Policy Practices and Lessons Drawn

This section picks the case of China as an example to test the analytical value of the framework proposed in Section 3. Examining China's practices in terms of pursuing maritime security can be illuminating in three aspects. First, in the East and South China Seas, China is involved in complicated interstate disputes with neighboring countries, which are generally seen as typical traditional security issues. There have been diverging views as to the effect of China's policy practices in this regard. One way to approach this issue is to evaluate the policy effect of China's approach against the core value of peace and stability listed in the political sector of the framework, which could shed light on how and to what extent the value of peace and stability in the maritime space could be safeguarded. Second, China has traditionally preferred state-dominated approaches to maritime security. However, China's active participation in global marine governance has enlightened a much broader vision of maritime security involving a diversified set of nonactors. How and to what extent China balances and coordinates state and nonstate actors in efforts to formulate effective policies would draw interesting lessons not only in a practical sense but also in a theoretical sense. Third, China's aspiration to become an influential maritime nation and its growing capabilities have made it an increasingly important contributor to international marine governance. In this sense, using the proposed framework to investigate China's perception of sustainable maritime security and some of the debates surrounding its practices would promote further research on finding better ways to bridge disagreements and forge consensus-based actions for the sake of a shared future of mankind.

As mentioned earlier, while it is not difficult to consent, in principle, to sustainable maritime security as a desired long-term policy goal, the understanding of different actors may vary considerably when it comes to policy applications. Maritime security challenges, even the ones with a global scale, can generate a different impact, varying along different regions and human groups. Correspondingly, different actors may have different policy priorities and demonstrate preferences for certain approaches, which in turn result in diversified policy practices. In the case of China, maritime security is understood in relation to sustainable development and the vision of a common and shared community of mankind [32]. Generally speaking, this view of maritime security suits well with the analytical framework of maritime security provided in Table 1, which requires a sophisticated employment of different policy approaches and leads to the pursuit of policy goals in a comprehensive and relational manner. In the meantime, however, the China case is also featured by a strong preference for state-based approaches and a flexible employment of militarized means (but not necessarily military confrontation). All these make China an interesting case to be examined.

4.1. China's Perception of Maritime Security

China's view of maritime security and its practices of addressing maritime security challenges have been heavily influenced by the so-called new security concept and its more recent derivatives. China's new security concept was a concept originally brewed in the 1990s, first, in the academic circle of Chinese IR scholars closely following the debate between the TSS and the CSS [33]. Later, the concept was embraced as China's official position in its foreign policy and security strategy. In 1996, the new security concept was publicly put forward by Chinese Foreign Minister Qian Qichen at the Southeast Asian Nations Regional Forum (ARF). In subsequent years, Chinese leaders reiterated the concept in various bilateral and multilateral occasions. China's new security concept embraces cooperative, common, and comprehensive security, which to a large extent shares the conception of security proposed by the CSS [34]. It also echoes UN-led security and development agendas in the 1990s in which China took an active part, such as Agenda 21 and Millennium Development Goals. The thrust of the new security concept is enhancing trust through dialogue and promoting security through cooperation. It was articulated as a Chinese version of security in response to the post-Cold War realities. From the Chinese perspective, the traditionalist/realist view of security, characterized by absolute security, military alliances, containment, and deterrence, had long dogmatized the security policies of many countries. In the post-Cold War era, a Chinese leader elaborated, in the face of globalization and the common need for sustainable development, that countries must move beyond Cold War mentality and antagonism, rise above one-sided security, and seek common security through mutually beneficial cooperation [35].

The concept has been updated recently into a new version, the Global Security Initiative (GSI). The GSI was proposed by Chinese President Xi Jinping during the 2022 Boao Forum for Asia [36]. The idea advocates a vision of common, comprehensive, cooperative, and sustainable security; it underscores indivisible security as the important principle and building a security community as the long-term goal [37]. In comparison, while the GSI inherits the basic conception of security of the new security concept, it also places more emphasis on the importance of sustainability in the pursuit of security and highlights the sharing nature of security interests for the whole international community in the face of complex and intertwined security challenges rising on a global scale. The latest update on the new security concept reflects China's comprehension of the profoundly changing international landscape and its devotion to fashioning innovative approaches for improving global security governance.

The goal of common, comprehensive, cooperative, and sustainable security is specifically embedded in the vision of "An Ocean Community with a Shared Future" when it comes to the pursuit of maritime security. "An Ocean Community with a Shared Future" is proposed by Chinese leaders as providing the guiding values and principles for the construction of a global ocean governance system. As Xi Jinping elaborated, "the blue planet we live on is not divided into islands by the sea. Rather, it is linked by the sea into a community of shared destiny, and people of all countries share with the same interests of safety and security" [38]. He went on to explain that in terms of disputes, countries should consult with each other and should not resort to force or threat of force; in terms of economic development, China was devoted efforts to promoting the blue economy, maritime connectivity, and cooperation in various areas and performing international responsibilities and obligations to ensure the safety of international shipping lanes; in terms of marine environment, countries should cherish the ocean as we treat life; and in terms of social development, countries should encourage exchanges of different marine cultures and jointly promote marine welfare for mankind [39].

The new security concept and its recent updates, including the GSI and the vision of an ocean community, have generated significant policy bearings on China's approach to maritime security. First, the concept moves beyond traditional security to embrace nontraditional security concerns. From China's perspective, security in terms of policy goals is not limited to state survival but should include a comprehensive set of policy

objectives conducive to long-term social development, such as economic security, safety of energy, environmental protection, prevention of the spread of diseases, and migration control, many of which are essential to maritime security. Second, the concept reshapes the role of military means in tackling security issues in two ways. On the one hand, to China, military solutions have obvious limits in terms of fostering cooperation and pursuing comprehensive security objectives. On the other hand, the concept prompts China to envision a broader scope within which military forces can play an important role, which may contain issues such as terrorism, search and rescue, humanitarian aid, and drug trafficking [40]. Finally, in terms of concrete policy approaches, the conception of cooperative, common, and comprehensive security demands on China a more holistic approach to maritime security, emphasizing a more relational view of different issues and combining consultative and cooperative approaches in an innovative manner, as shown in the following discussion. In the meantime, however, we will also find in China's policy practices that China has its own understanding and preferences when it comes to the trade-off between different policy objectives concerning sustainable development.

4.2. The Political Sector: Prioritizing Peaceful Approaches to Maritime Dispute Management

In the political sector, the value to be upheld in safeguarding the sustainable use of maritime space is peace and stability. To this end, peaceful approaches to conflict management and dispute resolution are viewed as effective means compatible with the policy goal of maintaining peace and stability in the face of maritime disputes.

Maritime disputes between China and neighboring countries constitute the most prominent security concern on the part of China and threaten peace and stability. While a state-based approach is commonly used by countries to tackle traditional security threats, China is no exception in this regard. Despite sporadic frictions, the record has shown that China's employment of peaceful means to manage maritime disputes has been more or less effective in maintaining peace and stability in its surrounding seas. In the South China Sea, China is involved in territorial disputes and disputes of maritime delimitation with Vietnam, the Philippines, Malaysia, and Brunei. In the East China Sea, China and Japan have disputes over the Diaoyu Islands (Senkaku Islands in Japanese). China is also engaging with South Korea to resolve issues of maritime delimitation in the Yellow Sea. These disputes are often considered as traditional security issues, and states are tempted to employ military means to tackle them. However, the record of China's practices, at least since the 1990s, has demonstrated a strong preference for consultation, cooperation, and negotiation in managing and resolving maritime disputes.

In the South China Sea, for example, China reiterated in many regional and international occasions the position that the SCS dispute should be peacefully resolved through friendly consultations and negotiations between countries directly concerned. To this end, China has preferred bilateral negotiation and multilateral engagement with disputant countries and other bordering countries. With regard to the bilateral approach, China and Vietnam initiated bilateral engagement in 1992 on the dispute over the Gulf of Tonkin (Beibu Gulf in Chinese and Bac Bo Gulf in Vietnamese) [41]. The dispute was permanently settled after several years of negotiation, which resulted in China and Vietnam reaching a delimitation agreement on the Gulf of Tonkin in December 2000 [42]. In the meantime, China and the Vietnam also engaged in a parallel negotiation regarding the management of fishery resources in the gulf area, which resulted in an agreement of fishery cooperation in the gulf area. This agreement entered into force in June 2004. Under the agreement, the two countries set up the Fisheries Cooperation Committee in the Gulf of Tonkin, which coordinates and manages fishery production and resource conservation in the gulf. To ensure the smooth implementation of the delimitation agreement and the fishery agreement, China and Vietnam established another mechanism, the Coast Guard Joint Inspection in the Gulf of Tonkin. As of last year, coast guard personnel of the two countries had carried out joint inspection 24 times, ensuring the orderly production of fishery and strengthening the cooperation of the maritime law enforcement departments of the two countries [43].

The third cooperative mechanism is the navy's joint patrol in the gulf area. By November last year, the two navies had jointly conducted a total of 33 joint patrols for the purpose of maintaining order and tranquility in the gulf area and promoting military interaction between the two countries [44].

Multilateral approaches are also employed by China in its management of maritime disputes. The adoption of multilateral approaches reflects China's understanding of the complexity of and interconnectedness between different maritime issues and its effort to approach them in a pragmatic and holistic manner. A multilateral approach to manage maritime disputes in the SCS was originally employed in the Asian Regional Forum (ARF). In 1994, ASEAN and its dialogue partners, plus Vietnam and Laos (then not yet ASEAN members), China, Russia, and Papua New Guinea, initiated the ARF for consultation on regional political and security issues. The ARF was Asia's first formal multilateral security dialogue. Through this multilateral diplomatic mechanism, China engaged with regional countries on a multilateral level, covering a considerable range of maritime security issues, including maritime disputes, regional maritime security, maritime cooperation, etc. [45]. Based on the progress accumulated in the ARF, ASEAN and China signed a Declaration on the Conduct of Parties in the SCS (the DOC) in 2002, in which all parties to the DOC pledged to exercise self-restraint in the conduct of activities that would complicate or escalate disputes and affect peace and stability of the SCS. In the years following the DOC, China and other disputant parties in the SCS continued to engage and consult on relevant disputes and refrained from the employment of military means to resolve disputes. In the years following the DOC, China and ASEAN countries have held, on a regular basis, Senior Officials' Meeting 19 times and joint working group meeting 37 times on the implementation of the DOC. During the last joint working group meeting in October last year, China and ASEAN deputies exchanged views on practical marine cooperation and the second reading of the "Code of Conduct" text, and all parties reiterated that maintaining the peace and stability in the South China Sea is of great practical significance [46].

Another approach that China has taken for the main purpose of defending its maritime claims is law enforcement. Generally speaking, law enforcement activities are multipurpose. They not only are carried out for the purpose of safeguarding maritime rights and interests and ensuring the observation of national legislation, but also can be used to enforce environmental protection measures and provide protection and support for basic human rights. In the case of China, its law enforcement activities share such comprehensive nature by engaging in various activities, such as combatting illegal fishing, search and rescue missions, and operations against piracy, human trafficking, and transnational crimes. However, some controversies also arise as to the intention and effect of the increasingly expanding law enforcement operations.

China's professional law enforcement force emerged in the 1990s. In around 2000, there were around 50 law enforcement vessels with an average size of only 500 tonnage. The capability started to grow on a noticeable pace in the 2000s. In 2011, over 50 law enforcement ships were commissioned ranging from 1000 to 3000 tonnage, some of which were equipped with helicopters and small-size weaponry [47]. To date, the Chinese coast guard is equipped with over 200 vessels, half of which are above 1000 tonnage with the largest ones over 12,000 tonnage designed to conduct long-distance comprehensive patrols [48]. The scope of China's law enforcement operations includes enforcing national maritime legislations and ensuring observations of the Law on Territorial Sea and Contiguous Zone, the Law on Exclusive Economic Zone and the Continental Shelf, the Law of the People's Republic of China on the Administration of the Use of Sea Areas, the Law on the Protection of the Marine Environment, the Law of the People's Republic of China on the Protection of Sea Islands, the Regulations of the People's Republic of China on the Administration of Foreign-Related Marine Scientific Research, and other laws and regulations [47].

In January 2021, China adopted a new Coast Guard Law (CCG Law) to conduct "activities of maritime rights protection and law enforcement in the waters under the jurisdiction of the People's Republic of China". From China's perspective, the CCG Law is viewed

as an indispensable step to alter previous institutional fragmentation of law enforcement authorities. The term “Nine Dragons Stirring Up the Sea” was a vivid depiction of the previously highly fragmented and overlapping authorities concerning China’s law enforcement operations [49]. In this sense, the introduction of the CCG Law can streamline the institutional arrangement and provide a codified guidance for the CCG’s future activities by: (1) establishing a standardized and unified CCG legislation system including provisions on administration, crime inspection, codes for weapon use, etc.; (2) defining the scope, responsibilities, and principles of the CCG; (3) refining the provisions on domestic coordination and international cooperation; (4) highlighting the responsibility of safeguarding sovereignty, security, and maritime rights and interests.

This law received quite some criticism from a number of regional countries as well as extra-regional countries regarding, in particular, the nature of the coast guard force as a quasi-militarized force, its newly expanded role in unilaterally enforcing maritime claims with firearms, and the potential incompatibility with the Law of the Sea [50–53]. Part of the criticism has to do with the lack of clarification on some of the provisions. For example, it remains underdefined regarding the scope of the sea area under the CCG’s jurisdiction, which can be problematic in the process of implementation, say, in the disputed sea area. The provisions on compulsory law enforcement of foreign warships and government ships also demand further clarification to the regional and international audience, which has given rise to the concern of whether such provisions, e.g., Article 21, are incompatible with relevant provisions in the UNCLOS [54].

Evaluated against the framework proposed in Section 3, the 2021 CCG Law in its current form is not necessarily conducive to upholding the value of peace and stability. The controversial ambiguity, in the absence of further clarification, can become a source of friction in the implementation of the law in disputed sea waters. However, this does not negate the potentially positive role that China’s coast guard may play in contributing to advancing maritime security. There are at least two directions that China can take to realize the CCG’s potential to the fullest in safeguarding maritime security as envisioned by the proposed “ocean community”. On the one hand, China needs to seriously address and respond to the concerns that other countries have regarding the 2021 CCG Law by providing further elaborations on some of the ambiguous and controversial provisions and through its actual implementation of the law. On the other hand, given that the Chinese Coast Guard is positioned in the top rank internationally in terms of its law enforcement equipment, it would be in China’s interest and capability to consider innovative ways to contribute to the pursuit of values in the economic, environmental, and societal sectors, as illustrated in Table 1. For example, it would be welcome by the international community if the CCG participates in international cooperation on safeguarding navigational safety and combatting piracy, smuggling, and irresponsible exploitation, as listed in the economic sector of Table 1. The CCG can also provide assistance to local communities along the Maritime Silk Road in an effort to detect and combat IUU fishing and other practices that are environmentally unfriendly. Moreover, it can be of great use to be deployed to provide humanitarian relief to natural disasters and conduct search and rescue missions in cooperation with its counterparts in other countries.

To sum up, China’s approach to maritime disputes, enlightened by the new security concept, reflects its mindful efforts to move away from the zero-sum mentality and purely military solutions, which tend to dominate traditional approaches to dealing with territorial disputes and even China’s own practices in the 1970s and the 1980s. Such approach also demonstrates a certain level of sustainability in that multiple cooperative and consultative mechanisms have been established and function on a regular basis to date. Of course, it is debatable whether these efforts are sufficient to address the disputes in a way that can lead to the final resolution. The protraction of the South China Sea disputes, for example, has been viewed by many observers as brewing a hotbed for power competition and increasing the risk of military confrontation [55,56]. The controversies surrounding China’s land reclamation activities and its law enforcement activities have been criticized as disrupting

regional stability. However, if evaluated against the criterion of peace and stability, the core value in the political sector outlined in the framework, China's policy practices have not been completely ineffective, considering rising nationalist sentiments throughout the region surrounding such a protracted and complicated dispute. More importantly, to achieve sustainable maritime security in the political sector in the future, for China and other disputant parties, a solid political consensus on the value of peace and stability needs to be forged and strictly observed in their policy practices, independently and cooperatively, in a sustained manner.

4.3. *The Economic Sector: Promoting Development and Cooperation of the Blue Economy*

Sustainable development of the blue economy is another area highly valued by China as contributing an indispensable part in the process of attaining common, comprehensive, cooperative, and sustainable maritime security. It was based on economic motivations that the Chinese government endorsed the idea of joint development as a preferable approach to manage maritime disputes. China's proposal of the 21st-Century Maritime Silk Road Initiative is designed to boost the blue economy with countries along the route, which is viewed by the Chinese leadership as a critical pillar to achieve sustainable economic development domestically and at the international level. However, as we will see in the discussion below, China's policy practices revealed its unique understanding and position when it comes to the trade-off between economic growth and environmental protection and have yielded mixed policy results in terms of contributing to the sustainable development of the world oceans.

On the one hand, China's policy practices have prioritized the economic dimension in its implementation of sustainable development goals. This is partly due to China's own experience of achieving fast economic development at the expense of the environment. As many have observed in the implementation of the Maritime Silk Road Initiative, China seems to project its own experience in situations where difficult choices need to be made by developing countries to balance between different, sometimes conflicting, goals of human development in the face of limited capabilities and resources. Such experience entails prioritizing large infrastructure projects and a top-level design of economic plans, many of which are crucial and long desired in developing countries as the basis for robust and sustained economic development but not necessarily standing up to strict environmental protection criteria.

On the other hand, in terms of concrete policy practices, the priority of economic motivations yielded mixed results in terms of the balance between economic development and environmental protection. For example, although the joint development of hydrocarbon resources in the South China Sea, if put into practice, would potentially generate a negative impact on the ecological environment of the sea, the failure to solicit support from other littoral countries in the SCS for its joint development proposal has prompted China to take actions to prevent any unilateral exploration activities, resulting in a "freeze" of real oil and gas development in the disputed waters in the SCS. Moreover, despite many successful cases of blue economic cooperation between China and other countries along the maritime silk road, the state-based approach that China prefers has generated obvious constraints on its ability to involve all the relevant stakeholders and the local community in the policy design and implementation. This has given rise to the criticism and concern that China's blue economy cooperation initiatives may be unsustainable.

4.3.1. Joint Development

Joint development is often seen as an alternative approach to solving maritime disputes or an interim form of arrangement pending final resolution of overlapping claims. It is for this reason that China has embraced the idea as part of its approach to dealing with maritime disputes. In the meantime, joint development is certainly driven by economic motivations, especially in the disputed area estimated to be rich in hydrocarbon resources. The idea of joint development is encouraged by the 1982 UNCLOS. For example, Article 74 (3) of

UNCLOS stipulates that, pending final agreement on maritime delimitation, “the States concerned, in a spirit of understanding and cooperation, shall make every effort to enter into provisional arrangements of a practical nature and, during this transitional period, not to jeopardize or hamper the reaching of the final agreement” [57]. Joint development has been proved effective in multiple cases in mitigating confrontation and advancing the blue economy in disputed maritime areas. For example, the Malaysian and Thai governments agreed to a joint development area of 7250 km² in the Gulf of Thailand as an interim measure to solve their overlapping claims over continental shelf areas. Indonesia and Vietnam discussed similar arrangements for the Natuna Sea area. A more complicated joint development scheme, called a “zone of cooperation”, was established between Australia and Indonesia in the East Timor continental shelf area in 1989, and entered into force in 1991.

China took note of the value of joint development in promoting maritime welfare in the face of protracted disputes and started to advocate the idea to neighboring countries in the 1990s. In May 1994, Chinese Premier Li Peng met with Prime Minister Mahathir of Malaysia and discussed the idea of joint development in the SCS. During the second ARF in 1995, Chinese Foreign Minister Qian Qichen reiterated that the sovereignty question be shelved and efforts be made to begin the joint development of resources. In November 1996, China’s President Jiang Zemin talked with his Filipino counterpart, Fidel Ramos, and both agreed that China and the Philippines should shelve differences over the Spratly Islands and work together to build confidence and develop the disputed area jointly. Through China’s effort, the idea of joint development as a principle garnered support from neighboring countries, although no concrete projects were proposed at that time. This momentum bore fruit in 2005, following the spirit of the DOC, when China, Vietnam, and Philippines reached an agreement to cooperate on a tripartite seismic survey in the disputed waters of the SCS.

The main task of the project was to identify areas for oil and gas exploration. The agreement provided for a 3-year study to be undertaken by three state-owned oil companies, the Chinese National Offshore Oil Corporation (CNOOC), the Philippines National Oil Company (PNOC), and the Vietnam Oil and Gas Corporation (PetroVietnam). The project was a “pre-exploration” study that can be classified as “marine scientific research” and therefore was covered by paragraph 5 of the DOC [45]. The survey area covered over 143,000 km², which included part of the disputed waters [58]. The three national oil firms shared the costs involved in conducting the research equally, which eventually totaled approximately USD 7.14 million. The joint exploration project expired in 2008 as scheduled and was unable to be renewed due to increasing domestic pressure from the Philippines’ side [59].

Joint development was also deployed to manage the maritime dispute between China and Japan in the East China Sea. In 2004, China offered to Japan that the two countries start engagement on the possible arrangement for a joint development of oil and gas in the disputed area in the East China Sea [60]. After several rounds of negotiation, in 2007, China and Japan agreed on the basic principles for a joint development in the East China Sea. Pending final delimitation, the two sides would cooperate to develop natural resources in the East China Sea, without prejudice to their respective legal positions. As the first step of the joint development, the two sides decided to conduct joint exploration in a block of 2700 km² in size in the northern section of what the Japanese side called the “median line”. Although the area of this joint development zone is far smaller than the adjacent Japan–South Korea joint development zone, it is an important practice for China and Japan to effectively manage the East China Sea dispute through dialogue and cooperation in the hope of working towards a permanent resolution of the dispute [61].

Although joint development was originally motivated by the goodwill of promoting ocean economic development, the implementation of the idea has faced significant constraints which inevitably limit its potential as a sustainable approach to managing disputes. In the East China Sea, China and Japan have not engaged in any JD scheme for over a decade. In the South China Sea, China and the Philippines have been discussing new

scheme of joint exploration in the past few years. The two countries agreed on a memorandum in 2018, but no concrete proposal was introduced during the Duterte administration. In January 2023, during Philippines' president Ferdinand Romualdez Marcos Jr's state visit to China, it was agreed that the two countries would resume talks on joint development based on the 2018 memorandum [62]. A major constraint, on the part of China, is China's state-dominated approach to joint development, which allows very little room for private enterprises to participate constructively. While this is understandable given the sensitivity of the dispute, in practice it has certainly limited the potential that the approach of joint development can offer in advancing marine economic cooperation.

4.3.2. Blue Partnership

Sustainable development of the blue economy is another area highly valued by China as contributing an indispensable part in the process of attaining common, comprehensive, cooperative, and sustainable maritime security. Based on this consideration, China proposed the 21st-Century Maritime Silk Road Initiative in 2013 through Xi Jinping during his state visit to Indonesia. In China's view, strengthening maritime cooperation with countries along the Maritime Silk Road conforms with the prevailing trend of development, openness, and cooperation, and contributes to mutually beneficial cooperation and broadens space for development. Enhancing maritime cooperation also enables various countries to jointly tackle challenges and crises, thus promoting peace and stability of the world oceans [63].

Under the framework of the Maritime Silk Road Initiative, China proposed the Vision for Maritime Cooperation under the Belt and Road Initiative in 2017, the main task of which was establishing a constructive and pragmatic blue partnership to forge a "blue engine" for sustainable development [63]. The blue partnership, as China elaborates, aims to contribute to the realization of the United Nations 2030 Agenda for Sustainable Development, in particular Goal 14 and Goal 17, and to establish a new model of maritime cooperation that is inclusive and flexible to enhance mutual trust among coastal states. The Chinese delegation to the 2022 UN Ocean Conference proposed 16 principles of the blue partnership, which provide the concept, common collaborative areas, and vision of the blue partnership. These mainly include: protect marine environment, foster blue economy development, encourage innovation in technology and ocean governance, and promote human security in terms of individuals' rights in development and benefit sharing [64]. In particular, in these principles, China highlights the importance of the innovation and application of green technology in fueling the blue economy and tackling nontraditional security issues and the promising role that nonstate actors can play in ocean governance.

The official documents and elaborations cited above show that, at least in principle, China's major maritime economic initiatives have been infused with the values and policy goals germane to sustainable development. They also highlight that China is conscious of the need to actively involve nonstate actors in the formulation and implementation of sustainable development policies regarding the blue economy. Guided by these principles, China has established a blue partnership with a dozen countries along the Maritime Silk Road since 2017, and the list is gradually expanding. China has signed 23 maritime cooperation agreements with countries in Europe, the South Pacific, and Africa; constructed 8 intergovernmental cooperation platforms, and supported the establishment of branches of 13 maritime organizations in China [32] (p. 58). China and the EU signed Blue Partnership for the Oceans: Towards Better Ocean Governance in 2018 [65]. The agreement is meant to join efforts of the two sides to facilitate policy coordination, exchange experience and technology of ocean governance, and cooperate to improve international governance of the world's oceans, including through tackling IUU fishing and promoting a sustainable exploration of marine resources. China and the EU also agreed to cooperate on implementing the 2030 Agenda and the Paris Agreement on climate change.

In comparison, the blue partnership between China and Pacific Island countries contains different priorities from those between China and the EU. The partnership was established on the basis of bilateral cooperation cultivated for more than a decade. In 2006,

China and Pacific Island countries held the first ministerial meeting in Fiji, and the two sides pledged to deepen cooperation on multiple levels. Maritime cooperation was quickly developed in the years following the meeting. Priority areas of maritime cooperation between China and Pacific Island countries mainly include infrastructure construction, exploration and transportation of mineral resources, distant fishing and transfer of fishery technology, financial assistance, and educational and cultural exchanges. The momentum pushed the two sides to cooperate on the Maritime Silk Road Initiative in 2017, when Ministers of Oceans of China and Pacific Island countries held a roundtable meeting and adopted the Pingtan Declaration, pledging to jointly develop a blue partnership [66]. In 2018, during Xi Jinping's state visit to Papua New Guinea, a collective meeting between Xi and leaders of Pacific Island countries was held with both sides agreeing to develop the South Route of the Maritime Silk Road together. The blue partnership between China and Pacific Island countries prioritizes four areas of maritime cooperation. The first priority area is joint partnership in maritime environment protection and tackling climate change, given that Pacific Island countries rank high on the "Exposure to Natural Disasters Risk Index", reflecting their extreme vulnerability to climate change. The second priority area is fisheries. Pacific Island countries enjoy rich fishery resources in their expansive jurisdictional seawaters. The cooperation aims to promote exploitation, processing, and conservation of fishery resources. The third area is disaster relief, that is, cooperation to improve marine disaster prevention and mitigation capabilities. Natural disasters, intensified in recent years because of climate change, represent a major threat to Pacific Island countries. In January 2022, Tonga suffered from volcano eruption and tsunami. China was the first country in the world to provide assistance to Tonga using navy and air force to deliver humanitarian aids, showing the deepening of China–Tonga maritime cooperation in the pursuit of maritime security [67]. Last but not least, technology innovation and transfer is also prioritized in the maritime cooperation between the two sides. China has assisted in constructing marine scientific research and education centers in Samoa and other small island countries. The cooperation is reciprocal. It helps to train specialized personnel on the part of Pacific Island countries in marine science, maritime management, and other marine technologies and, in the meantime, facilitate Chinese scientists to conduct marine scientific research and technological innovation [66].

The brief review of China's policy practices in terms of implementing sustainable marine economic development is not exhaustive. Nevertheless, these practices are illuminating in at least two aspects. On the one hand, the differences between the China–EU blue partnership and China–Pacific Island countries blue partnership in terms of policy priorities and concrete cooperative projects demonstrate a certain degree of sophistication and flexibility on the part of China in its efforts to pursue sustainable development in ocean economy. With the EU, China prioritized cooperation on blue and green technology and coordinating actions on strengthening major global governance initiatives tackling unsustainable practices and environmental security challenges, in particular, climate change and decay of marine biodiversity. With Pacific Island countries, considering the developing status of Pacific Island countries and their vulnerability to rising natural disasters, China prioritized capacity building for local economic development and disaster relief.

On the other hand, as illustrated in the policy framework, while business-based and international-organizations-based approaches tend to be more effective in promoting values of sustainable development, China seems to be in favor of state-based approaches. Such preference has its advantages and disadvantages. For its advantages, states can provide powerful support in the form of labor, resources, finance, credibility, and political coordination, all of which are critical for guaranteeing the successful execution of economic development programs. However, the disadvantage associated with state-centrism is also obvious. State-driven initiatives often prescribe a limited scope in terms of integrating the participation of different actors. It also constrains the ability to promptly translate the input of local communities into project design and implementation processes. This disadvantage has raised serious concerns in a number of China-backed economic projects along the

Maritime Silk Road. The controversy revolving around the Hambantota international port concerning environmental, financial, and political sustainability is exemplary in this regard [68].

Another example is Chinese distant-water fishing fleet operating in the EEZ waters of Pacific Island countries. While China's policy consideration is to achieve a win-win outcome for the two sides, with China's large fishery industry benefitting from Pacific Island countries' fishery resources in the vast EEZ waters and Pacific Island countries receiving financial compensation, investment, and employment opportunities, the lack of an effective law enforcement or supervision measures, which are usually provided by IOs and local communities, has been viewed as a major cause of reported IUU fishing activities conducted by Chinese distant-water fishing fleet. Moreover, this situation has become increasingly problematic in the background of escalating competition between China and the United States. In December 2020, the U.S. Coast Guard boarded a small Chinese distant-water fishing group in the waters adjacent to Palau and confiscated all the fishing harvest. In the summer of 2022, China's fishing vessels and the U.S. Coast Guard forces engaged in a near collision in the South Pacific waters. The U.S. side accused China of engaging in IUU fishing and attempted to conduct on-board inspection [69]. China's fishing vessel refused the request of the U.S. Coast Guard and claimed that the U.S. accusation was baseless and politically motivated [70]. Such incidents, fueled by big power competition, are not only unsustainable in economic and environmental senses but can be dangerous and conflict prone. To avoid future incidents of this nature, it is urgent, as informed by the proposed framework, to shift from a state-based approach to an IO- and business-based approach and open up room for the constructive participation of different actors and stakeholders.

4.4. The Environmental Sector: Exploring Sustainable Marine Environment Management with Progress and Limitations

It is an emerging consensus that the maritime domain is facing unprecedented environmental challenges, which can only be effectively dealt with through coordinated actions and by taking into account all relevant stakeholders. The consensus is echoed in what China proposed as the vision of "An Ocean Community of Shared Future". In this area, China's policy practices have been underlined by more flexibility in terms of formulating and participating in collective actions involving a diversified set of actors. The efforts taken by China have resulted in certain progress, domestically and internationally. However, limitations remain for two reasons. As is demonstrated in the case of Arctic environment protection of the Arctic region, the lack of sufficient experience in coordinating multiparty positions in preserving a sustainable marine environment poses certain limitations on China's efforts to make a greater contribution to environment protection in the Arctic. It is also related to China's parallel endeavors to promote economic cooperation with Arctic countries in the development of the northwest sea route and the exploration of energy resources in the Arctic. Given that China's participation in Arctic governance only started recently, it is worth observing how China will coordinate different policy objectives in the Arctic to mitigate the tensions between economic sustainability and environmental sustainability and contribute positively to the sustainable development of the Arctic region in a balanced manner.

4.4.1. Domestic Institutional Reform

At the domestic level, the Chinese government has undertaken a series of institutional rearrangements in an effort to streamline interagency coordination on safeguarding a sustainable marine environment. Interagency coordination is a common challenge confronted by most countries. In the case of China, however, the highly fragmented organizational structure of China's domestic ocean governance system further exacerbated the situation [71]. The State Oceanic Bureau, which was supposed to shoulder the institutional responsibility of marine environment protection, had not been able to fulfill its obligations due to its weak institutional ranking and the highly decentralized authority in the marine

governance system. In the meantime, the issue of marine environment protection in recent years has been securitized through domestic discourse on environmental security [72]. Against this background, the central government launched a new round of institutional reform in 2018 to restructure the marine governance system. On the one hand, the Ministry of Natural Resources was established, absorbing the authority of the State Oceanic Bureau. Its main responsibilities are to supervise the development, utilization, and protection of natural resources; establish a spatial planning system; and supervise its implementation. In addition, the state oceanic information center was also established under the Ministry of Natural Resources to manage information concerning resource management and the marine environment. On the other hand, the environmental protection bureau was lifted up to become the Ministry of Environmental Protection, assigned with the authority of environmental protection. The reform resulted in one ministry supervising the utilization of marine resources and the other ministry overseeing the protection of the marine environment; by doing so, a check and balance was established at the institutional level for the purpose of achieving a sustainable marine environment surrounding China.

4.4.2. International Cooperation

With regard to international cooperation on marine environmental protection, China in recent years, has reportedly been demonstrating increasing interest and willingness to participate in and contribute to IO-led marine governance programs. From China's perspective, participation in IO-led marine environment protection not only promotes China's image as a responsible power and an influential contributor to the welfare of mankind, but also serves China's own interest in pursuing environmental security and sustainable development. China's policy regarding the Arctic governance is an illustrative example.

In the Arctic governance, China positions itself as a "near-Arctic state" and an important stakeholder in Arctic affairs [73]. The main goals of China's Arctic policy are: to understand, protect, develop, and participate in the governance of the Arctic, so as to safeguard the common interests of all countries and the international community in the Arctic, and promote sustainable development of the Arctic. Based on these goals, China's participation in the Arctic governance prioritizes supporting cooperative efforts in three inter-linked areas: (1) marine and polar scientific research; (2) environmental protection including combatting climate change; and (3) marine economic development, in particular, navigation, fisheries, and energy resources [74].

As elaborated in the White Paper on China's Arctic Policy, in the area of marine scientific research, China, on the one hand, respects the Arctic states' exclusive jurisdiction over research activities under their national jurisdiction, maintains that scientific research in areas under the jurisdiction of Arctic states should be carried out through cooperation in accordance with the law, and stresses that all states have the freedom of scientific research on the high seas of the Arctic Ocean. On the other hand, China has also actively sought to join cooperative mechanisms monitoring and assessing local climatic and environmental changes and carries out multilevel and multidomain continuous observation of atmosphere, sea, sea ice, glacier, soil, bioecological character, and environmental quality through the establishment of a multielement Arctic observation system, construction of cooperative research (observation) stations, and development of and participation in the Arctic observation network.

With regard to environmental protection in the Arctic, the Arctic policy paper claims that China has been actively engaged in improving the Arctic environment by enhancing the environmental background investigation of Arctic activities and the assessment of their environmental impact, supporting the Arctic coastal states in their efforts to reduce pollutants in the Arctic waters from land-based sources in accordance with the relevant treaties, and working with other states to enhance control of the sources of marine pollution, such as ship discharge, offshore dumping, and air pollution.

In the area of economic development, China advocates a lawful and rational use of the region and encourages its enterprises to engage in international cooperation in the

exploration and utilization of Arctic resources by making the best use of their advantages in the capital, technology, and domestic market. China urges that economic activities in the Arctic need to be proceeded in a sustainable way on the condition of properly protecting the ecoenvironment of the Arctic and respecting the interests and concerns of the indigenous peoples in the region.

Based on these elaborations, China has sought to enlarge its role in the Arctic governance through global and regional mechanisms. At the global level, China has utilized the UN Framework on Climate Change, International Maritime Organization, UN Environment Programme, Intergovernmental Oceanographic Commission, etc., to participate in their respective cooperative programs concerning the Arctic. China has also been involved in negotiations over high seas fisheries regulation in the Arctic, and calls for a legally binding international agreement for managing fishery resources in the high seas portion of the Arctic. At the regional level, China sought to acquire membership in various regional IO mechanisms, such as the Arctic Council, the Barents Euro-Arctic Council, the Arctic Coast Guard Forum, and the Arctic Offshore Regulators Forum. In 2013, China was accredited as an official observer to the Arctic Council. Since then, China dispatches experts to participate in the work of the council, including its working groups and task forces; observes the Agreement on Cooperation on Aeronautical and Maritime Search and Rescue in the Arctic, the Agreement on Cooperation on Marine Oil Pollution Preparedness and Response in the Arctic, and the Agreement on Enhancing International Arctic Scientific Cooperation; and supports international cooperation through such platforms as the Arctic Science Ministerial Meeting.

Nevertheless, the impact of China's participation in the environmental protection of the Arctic has been observed as quite limited. It has been argued that China's role in the Arctic is of a supportive and complementary nature [75]. There are multiple reasons for this situation. First, China's participation has been significantly constrained by its geographical location. After all, China is not bordering the Arctic and has no territory in the region. Second, limitations on financial and technological capabilities and a lack of experience in engaging local indigenous communities in the Arctic region sometimes make it difficult, on the side of China, to propose meaningful initiatives that can attract active involvement of different regional stakeholders. Third, China's proposal of the Ice Silk Road, featured by the development of the Arctic shipping routes in cooperation with Russia and resource exploitation, raised concerns and even suspicion over its strategic intentions and the potentially negative impact on the environment. In this sense, more work awaits to be undertaken by China to explain in what way and to what extent the intricate balance between economic development and marine environment in the Arctic can be maintained in a sustainable fashion.

4.5. The Social Sector: Providing Humanitarian Relief and Enhancing Resilience

In the social field, China's policy preferences have been designated to providing humanitarian relief and enhancing resilience of vulnerable communities. China has been contributing positively to the international cooperation on anti-piracy missions and during this course it accumulated innovative experience in fulfilling multi-purpose humanitarian missions. With regard to enhancing resilience of coastal communities, much of China's efforts have been directed to the implementation of the 14th SDG of the UN 2030 Agenda.

4.5.1. Anti-Piracy and Humanitarian Aid

As discussed earlier, nontraditional issues, such as piracy, terrorism, and humanitarian crises, constitute a major threat to maritime security. These threats impede smooth navigation, threaten human lives, and harm the marine environment. The pursuit of common, comprehensive, cooperative, and sustainable security requires that China places great emphasis on nontraditional security issues. For example, China has actively participated in international cooperation on combatting piracy in the Gulf of Aden. In December 2008, China started to send the first fleet of PLAN vessels, consisting of Wuha, Haikou, and

Weishanhu, from Sanya to carry out escort missions in the Somali waters and the Gulf of Aden. This mission also marked China's effort to use military means in a flexible way to tackle nontraditional security issues and provide maritime public goods. To date, China has sent out a total of 43 squadrons and conducted over 1500 missions [76]. These missions are conducted for multipurposes. On the one hand, China has been sending escort fleets on a regular basis to protect the navigational safety of its nationals and commercial vessels; on the other hand, China also participated in humanitarian missions and UN-organized missions to fulfill its international humanitarian obligations and protect the safety of international shipping routes. In 2009, a Chinese convoy helped rescue Greek merchant ships ambushed by Somali pirates. In 2011, a Chinese convoy undertook escorting mission for UN World Food Program ships to Bosaso Port. In 2013, China's convoy cooperated with convoys of Russia, Denmark, and Norway to escort ships carrying Syrian chemical weapons. In 2014, China's convoy participated in the search and rescue mission for Flight MH370 of Malaysian Airlines. The most well-known mission was carried out in the spring of 2015 when a civil war broke out in Yemen. China's 19th convoy suspended its scheduled convoy and proceeded to an emergency evacuation mission from the war-stricken Yemen. This mission successfully withdrew 613 Chinese compatriots and 279 foreign citizens from 15 countries [77].

China also assumes an active role in providing maritime humanitarian aids. For example, China's *Peace Ark* hospital ship has conducted 10 annual missions to provide advanced medical services to local people of over 43 countries, and held joint maritime rescue exercises with medical ships of other countries [78]. China's rescue service and humanitarian relief to an oil tanker accident in the Indian Ocean in 2020 depicts the complexity of maritime security challenges and the sophistication of China's policy practices to safeguard maritime security. An accident happened to *New Diamond*, an Indian-leased oil tanker carrying more than 2 million barrels of crude oil. On its way bound for the port of Palladib in eastern India, the tanker suddenly caught fire in an engine room boiler. Sri Lanka's Marine Environmental Protection Agency appealed for help from regional countries. China's response was two steps. First, experts from the Sino-Sri Lanka Joint Science and Education Center of the Chinese Academy of Sciences immediately sent data to Sri Lanka containing marine meteorology and environmental forecast information of the sea area adjacent to the tanker to help predict the surface water flow direction of the possible oil spill. Second, the Hambantota International Port Service Company, a joint venture between China and Sri Lanka, immediately prepared and sent firefighting materials, two tugboats, and emergency personnel to the accident area to participate in the rescue work, in cooperation with Indian and Russian counterparts [79,80].

4.5.2. Enhancing Resilience of Local Communities

Resilience of local communities is viewed by many as a core element in the discussion of sustainable development and human security [21]. The threats posed by pollution, climate change, and shift in local economic institutions compose serious challenges to the resilience of coastal communities. China's efforts to contribute to enhancing the resilience of coastal and vulnerable communities in recent years have been taken under the framework of the UN 2030 Agenda. In 2016, the Chinese government published China's National Plan on Implementation of the 2030 Agenda for Sustainable Development, in which it outlined the working plan to implement the 17 SDGs in the timeframe of the UN 2030 Agenda. The document provided a general principle in the promotion of social development—the principle of integration and coordination. It is elaborated that “it is essential to make development serve the people and put people first” and that China is committed to “giving priority to poverty eradication and people's livelihood, safeguard social equity and justice and firmly implement the concept of sustainable development, so as to achieve economic, social and environmental development in a balanced way, as well as harmony between individuals and the society and between man and nature” [81] (p. 10). Correspondingly, the nation plan sketches out a number of policy measures to be taken to gradually to realize

relevant goals prescribed in Goal 14, “Conserve and sustainably use the oceans, seas and marine resources for sustainable development”. For example, in its policy response to Goal 14.6 of the SDG, which focuses on fishermen’s protection and subsidies to avert overfishing, China’s national plan sets out policies to provide targeted support to reduce the number of fishing boats, fishermen quitting, artificial fish reef, maintenance, and reconstruction of fishing ports, on the one hand, and improve social protection for fishermen and eradicate poverty among fishermen, on the other hand. To achieve Goal 14.b, the nation plan suggests that concrete policies are designed to strengthen skills training for fishermen, expand the coverage of fishery mutual insurance and aquacultural insurance, and provide more and fairer market access for self-employed fishermen by developing new business models, such as e-commerce.

These policies have yielded positive results in enhancing the resilience of coastal and vulnerable communities. As documented in China’s Progress Reports on Implementation of the UN 2030 Agenda for Sustainable Development (2017, 2019, and 2021), at the domestic level, sustainable fishery policies have been taken to implement the newly revised “Fishing Permits” and quota management system of marine fishery resources. A total of more than 17000 ships have been reduced, and the fishing capacity has been reduced by over 1 million kilowatts. In the meantime, compensatory measures are also implemented to mitigate the negative impact on the local fishing industry. Efforts including promoting mudflat planning for aquaculture waters and expanding the application of large-scale innovative aquaculture fishery technologies to coastal areas proved effective in enhancing the resilience of affected traditional fishermen. At the international level, cooperative efforts have been concentrated on green aquaculture technology transfers and skills training and providing equipment and data for marine disaster prevention and reduction. Bilateral cooperative programs of this nature have been established with small-island developing states and least developed countries within the framework of South–South cooperation in the planning of marine economic zones, marine disaster prevention and reduction, fisheries, aquaculture, tourism, seawater desalination, and other fields. These cooperative efforts help to strengthen the resilience of affected groups in less development countries and support the welfare of vulnerable communities [82].

4.6. Lessons Drawn

The analysis of China’s policy practices provides a vivid depiction of the complexity of maritime security challenges and the flexible, pragmatic, and comprehensive approaches that state and nonstate actors have adopted to tackle these challenges and advance maritime welfare of the world as an indivisible community.

The main finding of the China case is that, while in principle or in theory China embraces a broadened maritime security agenda and is clearly aware of the need to diversify policy approaches and the value of engaging different actors and stakeholders, its practice does not neatly follow the policy approaches suggested to be effective in the proposed framework. The analysis shows that China has favored state-based approaches and militarized means (but not necessarily military confrontation) and is constrained by its capability and experience in attracting or coordinating constructive participation of diversified actors in collective policy actions.

This finding has important policy implications. First, it identifies the main obstacle to be overcome for China’s policy to achieve a more effective and desirable outcome. That is, the state-based approach, sometimes in combination of militarized means, has obvious limitations in pursuing sustainable values in the maritime domain, especially in economic and environment sectors. This is a lesson for not only China but also other states as well as IOs. A consensus should be forged throughout the international community that IOs, in particular, need to play a more central role in leading efforts to tackle transnational maritime threats.

Second, there is room for substantial improvement when it comes to China’s contribution to sustainable development in the marine economy. China’s policy practices regarding

sustainable development reveal its unique understanding and position regarding the trade-off between economic growth and environment protection. China's own experience of achieving fast economic growth at the expense of the environment has informed its calculation of the trade-off between economic development and environmental sustainability. This experience has partially accounted for China's preference, in its proposed maritime economic development initiatives, for large infrastructure projects and top-level design of economic plans, many of which are crucial and long desired as the basis for robust and sustained economic development but do not necessarily stand up to strict environmental protection criteria. In this regard, the policy framework provided in this paper suggested practical ways to improve China's policy practices. For example, engagement with local communities and greater support for the involvement of nonstate actors can be helpful in bridging the gap between China's vision of a sustainable blue economy and its actual implementation.

Finally, the findings also provide a solid test to the analytical value of the proposed policy framework. As shown in the empirical analysis, this framework can be useful for policy assessment. It also helps to map more precisely where the disagreements lie by breaking down the complex of maritime security into four sets of policy goals. In this sense, this framework can serve as the foundation upon which disagreements can be engaged and consensus can be built, to make sure that one does not talk past the other. For example, China has implemented the controversial policy of moratorium in the SCS, which evoked strong protests from neighboring countries. Applying the policy framework, it becomes clear that the moratorium *per se* is an effective approach to achieving sustainable fishing, and it is possible for relevant states to build consensus that the policy is best positioned in the environmental sector of the framework. Based on this consensus, it is clear that the disagreement or controversy is actually rooted in the implementation stage, which is carried out by a single state in disputed waters. Therefore, a feasible way can be devised to mediate the disagreement, that is, negotiating a coordinated action or mechanism in which all relevant states could participate in sustainable fishing in the SCS.

5. Conclusions: Building Up a Sustainable Path towards Maritime Security

Maritime security is a contested concept in both scholarly discussions and the policy-making circle. The conception provided in this paper helps to clarify the basic elements of maritime security and pave the way for building up a sustainable path to advancing maritime security as a comprehensive set of policy objectives.

The discourse on human security and sustainable development in the past three decades has highlighted clearly the complex nature of security challenges. The situation is even more acute in the global maritime space. It becomes clear that states are the most influential agents in tackling many of the issues, but this is far from sufficient in the face of contemporary challenges. Security cannot be sustainably attained through traditional approaches dominated by state-centrism, muscle-flexing, and zero-sum mentality. In the face of a profoundly changing landscape of the world politically, economically, technologically, and environmentally, the pursuit of maritime security demands an innovative policy toolkit filled with more people-centered, cooperative, and diversified approaches underlined by a positive-sum mentality. As illustrated in Table 1, threats to maritime security are multidimensional and, at the same time, deeply interconnected with each other. Depending on the nature of different threats, careful selection needs to be made in order to come up with the best policy approaches to address them. It also becomes clear that states are the most influential agents in tackling many of the security issues, but this is far from sufficient in the face of contemporary challenges.

The emerging consensus on sustainable development and cooperative and comprehensive security has influenced the theoretical understanding and policy practices of many actors, including China. China's adoption of the new security concept and, reflected in the issue of maritime security, the vision of "An Ocean Community of Shared Future" has made it embrace the broadened maritime security agenda. However, applying the policy frame-

work proposed in this paper, one can find that while, in general, China's policy practices have been conducive to maritime security, its preference for state-centered approach and active employment of militarized means has significantly limited its potential contribution, which can be improved by shifting towards a more flexible approach and greater support for the constructive involvement of distinct actors and relevant stakeholders. Future studies can be taken to apply the policy framework in other cases.

The ocean is the cradle for life, yet it is confronting unprecedented challenges today, which threatens not just coastal communities but the survival of the whole mankind. Maritime security, as analyzed in this paper, concerns human security in all dimensions, peace and stability, economic prosperity, environmental health, social equality, and safety, all together forming the basic human rights. In this sense, the pursuit of maritime security calls on the global community, states, communities, groups, and individuals to work together to contribute wisdom and solidarity in providing a sustainable path to maritime security, which applies a comprehensive and relational understanding and employs diversified approaches.

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Article

Measuring the Sustainable Development of Marine Economy Based on the Entropy Value Method: A Case Study in the Yangtze River Delta, China

Xiaowei Ni and Yongbo Quan *

School of Economics and Management, Zhejiang Ocean University, Zhoushan 316022, China

* Correspondence: quanyongbo@zjou.edu.cn

Abstract: The rapid growth of the marine economy has provided a strong impetus for the economic development of the Yangtze River Delta region, but it has also posed serious challenges to the ecological environment of the marine watersheds in which it is located. To investigate how to promote the sustainable development of the marine economy in the Yangtze River Delta region, this study used relevant statistical data from 2009 to 2019, combined with four factors—marine economy, marine resources, ecological environment, and scientific and technological innovation—to build an evaluation index system for the sustainable development of the marine economy and employed the entropy value method to conduct a deeper investigation. It was found that there are problems in the sustainable development of the Yangtze River Delta marine economy, such as imperfect marine industry structure, significant differences in resource allocation, insufficient support capacity of marine science and technology innovation, and insufficient ecological environmental protection. Therefore, the study suggests promoting regional collaboration in the Yangtze River Delta, improving technological innovation, and enhancing environmental protection to support the sustainable development of the regional marine economy.

Keywords: marine economy; sustainability; indicator system; Yangtze River Delta; entropy value method

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1. Introduction

With the dramatic increase in population and growth in economies, developing countries are facing problems of the depletion of terrestrial resources, space constraints, and environmental degradation, which seriously affect the process of sustainable development [1,2]. The growth of the marine economy has provided significant development opportunities for coastal countries and those with interests in marine industries [3]. However, with increasing industrialization, coastal areas are also confronted with various environmental challenges, including the discharge of industrial wastewater, domestic sewage, solid waste, and marine oil spills [4]. The Yangtze River Delta region is a crucial hub in China's drive to build a "strong ocean country," contributing a considerable portion of the nation's gross marine product. Yet, it faces severe environmental pollution issues, particularly in the Yellow Sea and East China Sea basin, accounting for 79.48% of China's jurisdictional waters. Thus, while promoting the development of the marine economy in the region, safeguarding marine ecology and resources is essential to ensure sustainable growth and advance the prospects of the regional marine economy.

The majority of studies on the sustainable development of the marine economy have concentrated on the current state of the marine economy as well as theoretical studies and influencing factors of sustainable development. The marine economy is a complex and dynamic system influenced by various factors such as pollution, overfishing, and coastal development [5]. Environmental pollution is a major factor because it can pollute marine resources, harm the health of marine ecosystems, and impair coastal communities' ability to adapt to change [6,7]. Overfishing is a major contributor, as it can lead to fish

stock depletion and the destruction of marine habitats [8]. Finally, coastal development has the potential to devastate the marine environment and displace coastal communities. Several strategies have been proposed to address these challenges for the sustainable development of the marine economy. These strategies include the creation of marine protected areas [9,10], the adoption of sustainable fishing practices [11], pollution reduction, and the promotion of environmentally friendly coastal development [12]. Some academics believe that implementing ocean governance at the governmental level is a critical step toward achieving sustainable ocean economy development [13]. Adapting and optimizing existing governance systems can improve marine environmental protection from various perspectives [14,15]; creating new sectors to implement integrated ocean management can also help improve overall marine economic development [16,17].

The marine economy is becoming increasingly important in the social development and improvement of living standards in coastal areas and regional economic and social development [18]. However, due to the rapid development of the marine economy, the marine ecosystem and environment that form the foundation of the marine economy's development are deteriorating and being lost, resulting in many issues such as the decline of the quality of the marine environment, the destruction of the marine ecosystem, and the continuous weakening of ecological capacity [19]. In light of the current development quandary, the transformation of marine economic growth is an important path for the long-term development of the marine economy [20]. At the same time, many studies have explored the impact of the ecological environment on the development of the marine economy from the regional marine ecological environment [21,22], arguing that the marine economy and marine environment can interact positively [23].

The input of marine resources and technological innovation constitutes an essential element of the marine economic system. Some scholars believe that the use and input of marine resources are critical to the development of regional marine economies, that its impact on the efficiency of marine economic development varies over time [24], and that improving energy development and utilization efficiency can help achieve sustainable development goals [25]. Several other scholars have investigated the relationship between the ocean economy and the environment from the standpoint of the ocean's carrying capacity [26], and they have made insightful policy recommendations to achieve sustainable ocean development [27]. On the other hand, excessive marine resource inputs will result in resource congestion, limiting the efficiency of economic output and sustainable development [28]. Marine technology innovation is a critical factor in the regional economy's healthy and sustainable development [29,30], and it is the primary mechanism for achieving sustainable development. Through innovative technology, marine science and technology can strengthen related enterprises and industries [31,32], which is the endogenous driving force for the rapid development of the marine economy, and better monitor the marine environment [33].

In addition, different scholars use different methods to measure the weight of indicators of sustainable development. Li et al. used the DPSIR model to combine economic and ecological impacts to construct a prediction system for the ecological sustainability of the Bohai Rim in China from five aspects: drivers, pressures, states, effects, and responses [34]. Lin used the coupled coordination degree model and information entropy method to establish an index system to measure the interrelationship between the marine economy and the ecological environment to achieve sustainable development [35]. Data envelopment analysis (DEA) was used by Wen et al. to assess the coordination and coupled development of marine economies and ecosystems [36]. As an objective weight assignment method, the entropy method is widely used in the measurement of sustainable development because it is not influenced by subjective factors and has high reliability. It is commonly used in the measurement of sustainable development. Most research related to sustainable development uses this method to create new indicator systems to measure more comprehensive abstract concepts. He et al. used the entropy method to gauge the state of clean energy development in various nations [37]. Gong et al. constructed a system of indicators to

compare the level of sustainable urban development in five dimensions: social, economic, environmental, resource, and technological [38]. Jin et al. presented a new country sustainable development indicator to improve on the widely used Human Development Index [39]. Sun et al. comprehensively analyzed and evaluated regional economic development using the entropy method in response to regional environmental problems and national policy goals of the green development of ecological and environmental construction [40]. These studies demonstrate the broad applicability of the method.

Previous studies have focused on specific sectors of the marine economy, or on individual factors, rather than taking a holistic approach that considers the impact of multiple factors on the sustainable development of the marine economy. Previous studies lacked comprehensive standardized data on the marine economy, which made it difficult to accurately assess its current state and sustainable development potential, and the assessment methods used were subject to issues of subjectivity and internal factors affecting the sustainable development system. Based on this, this study has several innovations and contributions. First, this study introduces several factors such as the current state of the marine economy, marine environment, ecological resources, and scientific and technological innovation, and establishes a more complete and comprehensive evaluation system that focuses more on the quality of development from the perspective of sustainable development. Secondly, the relationship between the current situation of the marine economy, marine environment, ecological resources, and the scientific and technological innovation and sustainable development of the marine economy is analyzed using the entropy value method, taking into account the objectivity and completeness of the evaluation indexes. Again, the Yangtze River Delta region is an important fulcrum of China's marine economic development, but few scholars have chosen it as a research area. This study explores the current situation of the sustainable development of the marine economy in the Yangtze River Delta region and the regional differences, and this study will provide referenceable insights for coastal areas on how to properly promote the sustainable development of the marine economy.

2. Construction of the Evaluation Index System for the Sustainability of the Marine Economy

The sustainable growth of the marine economy is an important foundation for supporting socio-economic development, as well as for the optimal allocation and development of marine resources [41]. Based on an understanding of the meaning of sustainable development in the context of the United Nations Sustainable Development Goals and China's ocean power strategy, three coastal provinces in the Yangtze River Delta are used as examples in this paper. Regarding the research of existing scholars [42], this study takes into account the scientific validity, comprehensiveness, and data availability of index selection. It constructs a sustainable development evaluation index system of marine economy containing 14 specific indicators from four dimensions: marine economy, marine resources, ecological environment, and scientific and technological innovation (Table 1).

Marine economy: Accelerating the growth of the marine economy is an inherent requirement for regional development and a powerful economic growth engine. The development of the marine economy in coastal areas affects the sustainable development potential of the region [43], and it needs to form a reasonable and diversified industrial structure [44] and maintain long-term vitality. As a result, in order to assess the level of development of the marine economy, not only the scale and speed of the marine economy but also the quality of marine economic development must be considered [45]. In this paper, the proportion of gross marine product to coastal area gross product is used to reflect the scale of marine economic development in Yangtze River Delta provinces [46]. The added value of major marine industries and marine-related industries is used to reflect the speed of marine economic development. Based on the theory of social reproduction, crude growth only brings short-term benefits and is not conducive to the sustainable development of the marine economy. The structure of the marine industry reflects a greater extent the growth

characteristics of the marine economy in terms of quality, so we used the proportion of tertiary industry to observe the rationality of the industrial structure [47].

Table 1. Evaluation system of the sustainable development level of the Yangtze River Delta marine economy.

Primary Indicator	Secondary Indicator	Unit	Nature
Marine economy	The proportion of marine GDP to regional GDP	%	Positive
	Value-added of major marine industries	Billion yuan	Positive
	Value-added of marine-related industries	Billion yuan	Positive
	The proportion of marine tertiary industry	%	Positive
Marine resources	Per capita water resources	Cubic meters per person	Positive
	Production of marine products	Ton	Positive
	Number of berths for production above 10,000 tons in ports	-	Positive
Ecological environment	Industrial wastewater emissions	Billion tons	Negative
	Industrial solid waste emissions	Million tons	Negative
	Investment in pollution control as a proportion of GDP	%	Positive
Technological innovation	Number of marine scientific research institutions	-	Positive
	Number of marine scientific researchers	-	Positive
	Number of scientific papers in marine research institutions	-	Positive
	Number of invention patents owned by marine research institutions	-	Positive

Marine resources: As an important input factor of the marine industry system [48], marine resources have biological resources value, habitat resources value, supply service value, and species diversity maintenance service value. Although Shanghai, Jiangsu, and Zhejiang Provinces are positioned in the same sea area, each province has its own resources involved in the development of the marine economy. To ensure the comparability of data indicators, three secondary indicators were selected to measure marine habitat resources, biological resources, and service levels: water resources per capita, seawater products production, and the number of berths for production in ports over 10,000 tons [49].

Ecological environment: Due to the frequent use of marine space, the cumulative impact on the marine ecosystem is increasing [50]. In the process of accelerating maritime economic development, we must focus on the synergy between economic growth and environmental protection, and we must be aware of the adverse effects of environmental degradation on economic growth. The efficacy of pollutants from terrestrial sources and their treatment is important for the sustainable development of oceans. We chose the indicators of industrial wastewater emissions and industrial solid waste emissions to represent the degree of ocean pollution [51,52]. The share of pollution control investment in regional GDP was used to measure the importance and effective response of each region to environmental protection [53].

Technological innovation: Marine technology innovation can promote the rapid development of related marine industries and is a booster to promote the rapid growth of the marine economy [54]. Therefore, this paper selected the number of marine scientific research institutions and scientific researchers as the input of technological innovation and used the number of scientific papers and invention patents of marine scientific research institutions to measure the effect of scientific innovation output [55].

3. Data and Research Method

3.1. Study Area

The Yangtze River Delta refers to the Yangtze River's downstream region, which is one of China's regions with the most marine economic development, the most coastal

development, and the greatest concentration and abundance of marine resources. The region includes three coastal provinces: Shanghai, Jiangsu, and Zhejiang, all of which contribute significantly to China's marine economy.

Shanghai achieved a marine GDP of 103.663 billion RMB in 2021, ranking fourth in China. It has the most rapidly developing coastal tourism and transportation industries. Jiangsu's coastal mudflat area accounts for about a quarter of the total mudflat area in China, with rich harbor and navigation, land, and biological resources. Zhejiang Province's coastline is the longest in the country, equivalent to 2.6 times that of the province's land area. At the same time, Zhejiang also has many islands and more than 700 km of deep-water coastline. The proportion of its marine GDP to the regional GDP is higher than the national average.

3.2. Data Sources

Since most of the official data from the last three years have not been published for most indicators in this paper, data for 2009–2019 were selected to be analyzed to conduct a more comprehensive study. The data on the marine economy, marine resources, and science and technology innovation were obtained mainly from China Marine Statistical Yearbooks (2010–2017) (<https://data.cnki.net/>, accessed on 27 March 2023) and China Marine Economic Statistical Yearbooks (2010–2020) (<https://data.cnki.net/>, accessed on 27 March 2023), and the data on the environmental pollution in this paper were obtained from China Environmental Statistical Yearbooks (2010–2020) (<https://data.cnki.net/>, accessed on 27 March 2023) and China Marine Environmental Status Bulletins (2010–2020) (<https://www.mee.gov.cn/hjzl/sthjzk/jagb/>, accessed on 27 March 2023). Missing data were completed by data from the statistical yearbooks of each region.

3.3. Method

In order to reflect the level of the sustainable development of the marine economy, a comprehensive evaluation requires multiple indicators. The determination of indicator weights, as an important part of the model evaluation, will directly affect the evaluation results. Hence, this paper proposes a method for measuring and analyzing the sustainability of the marine economy through the use of entropy values. The theoretical foundation of the entropy method rests on the concept of information entropy, which was originally introduced by Claude Shannon in 1948 [56]. The entropy method is a decision-making model that utilizes the principle of entropy to measure the uncertainty and information content of a set of data. Specifically, information is a measure of the degree of order in a system, while entropy is a measure of the degree of disorder in a system. Therefore, as the information entropy of indicators decreases, the information provided by the indicators increases. In the context of the comprehensive evaluation, the role and weight of indicators with lower information entropy become more significant [57,58]. Furthermore, compared to other comprehensive evaluation methods, the entropy method is an objective weighting method that calculates the information entropy of indicators and determines the weight of each indicator based on its relative changes, thereby effectively avoiding subjective influences [59]. As a result, the weight results of the entropy method possess a high reference value. The specific calculation steps are as follows:

This study includes T evaluation indicators to measure the level of sustainable development of the regional marine economy in a total of m provinces for n years. Due to the differences in positive and negative orientations among the indicators, and to avoid the influence of zero values on the calculation of information entropy, the data need to be standardized first, as follows:

If it is a positive indicator,

$$y'_{hij} = \frac{X_{hij} - \min X_j}{\max X_j - \min X_j} \times 99 + 1 \quad (1)$$

If it is a negative indicator,

$$y'_{hij} = \frac{\max X_j - X_{hij}}{\max X_j - \min X_j} \times 99 + 1 \quad (2)$$

where h is the year, i is the province, j is the index, and X_{hij} is denoted as the j index value of the i province in the h year; y'_{hij} represents the standardized value; and $\min X_j$ and $\max X_j$ denote the minimum and maximum values of X_j .

Thereafter, calculate the proportion of province i :

$$Y_{hij} = \frac{y'_{hij}}{\sum_{i=1}^{mn} y'_{hij}} \quad (3)$$

where Y_{hij} is the weight of the i indicator value in h year under the j indicator.

Furthermore, the information entropy value for the j indicator is:

$$e_j = -\frac{1}{\ln mn} \sum_{i=1}^{mn} Y_{hij} \ln Y_{hij} \quad (4)$$

In this step, we need to make ensure that $0 \leq e_j \leq 1$.

Then the information entropy difference degree d_j is calculated for the j th indicator, as follows:

$$d_j = 1 - e_j \quad (5)$$

where d_j stands for the coefficient of variation, indicating the degree of inconsistency in the contribution of each item to the j th indicator; in it, the higher the value, the more important it is.

Thereafter, the outcome of Equation (5) is then taken into Equation (6) to calculate the weights of each indicator:

$$W_j = \frac{d_j}{\sum_{j=1}^T d_j} \quad (6)$$

where W_j is the j th indicator weight, and $\sum_{j=1}^T W_j = 1$.

Then, calculate the comprehensive score of the sustainable development level of the marine economy F_i , as follows:

$$F_i = \sum_{j=1}^T W_j y'_{hij} \quad (7)$$

4. Analysis

4.1. Measurement Results of Index System

Based on the panel data of three provinces of the Yangtze River Delta from 2009 to 2019, the entropy method was used to calculate the weights of the indicators of marine economy, marine resources, ecological environment, and scientific and technological innovation, and the results are shown in Table 2.

Based on the panel data of 30 provinces and cities in three provinces of the Yangtze River Delta from 2009 to 2019, the entropy value method was used to calculate the weights of the marine economy, marine resources, ecological environment, and science and technology innovation indicators, and the results are shown in Table 1.

The four indicators affecting the sustainable development of the marine economy are marine resources, science and technology innovation, marine economy, and ecological environment, with weights of 0.3253, 0.3143, 0.2473, and 0.1132, respectively. The results show that marine resources and science and technology innovation are important driving factors for the sustainable development of the marine economy. From the secondary indicators, the number of invention patents owned by marine research institutions carries the highest weight of 0.1385, while other indicators with higher weight included water

resources per capita (0.1295), the production of seawater products (0.1287), and marine GDP as a percentage of regional GDP (0.1149). As can be seen, the output of marine scientific research, marine habitat resources, marine biological resources, and the scale of the marine economy in each region are the main driving factors for the sustainable development of the marine economy in the Yangtze River Delta region.

Table 2. The index weights of the sustainable development level of the Yangtze River Delta marine economy.

Primary Indicator	Weights	Secondary Indicator	Weights
Marine economy	0.2473	The proportion of marine GDP to regional GDP	0.1149
		Value-added of major marine industries	0.0318
		Value-added of marine-related industries	0.0300
		The proportion of marine tertiary industry	0.0706
Marine resources	0.3253	Per capita water resources	0.1295
		Production of marine products	0.1287
		Number of berths for production above 10,000 tons in ports	0.0670
Ecological environment	0.1132	Industrial wastewater emissions	0.0477
		Industrial solid waste emissions	0.0159
		Investment in pollution control as a proportion of GDP	0.0495
Technological innovation	0.3143	Number of marine scientific research institutions	0.0458
		Number of marine scientific researchers	0.0680
		Number of scientific papers in marine research institutions	0.0620
		Number of invention patents owned by marine research institutions	0.1385

4.2. Analysis of the Marine Economy

From the analysis of time evolution, the scores of marine economy indicators in each province of the Yangtze River Delta showed a slow upward trend, with a large difference in level but a similar overall trend (Figure 1). In 2014, Shanghai had a significant decrease in the proportion of marine GDP due to the adjustment of production structure, which made the marine economy score show a downward trend. With the construction of Shanghai's free trade zone, Shanghai's marine economy continued to develop, and major marine industries and related industries both developed rapidly with policy support. Jiangsu and Zhejiang, on the other hand, had been on a steady upward trend. The new round of the coronavirus pandemic that started in 2019 inevitably caused the regional marine economy to be negatively affected, leading to a decline in the added value of the national marine industry, while the related marine tertiary industry, which is extremely sensitive to emergencies, was most affected. From the analysis of regional differences in Shanghai, as the core area of the Yangtze River Delta region, the development of the marine economy in this region has greater advantages [60]. Influenced by the national policy strategy and international city positioning, Shanghai scored much higher than other provinces, among which Zhejiang and Jiangsu showed an almost parallel trend in the level of marine economic development. The gap between Zhejiang and Jiangsu gradually became smaller from 2009 to 2011 and tended to be parallel from 2013 to 2019. Due to the huge differences in the scale and industrial structure of the marine economy in each region, the gap between Shanghai's and Zhejiang and Jiangsu's marine economies tended to expand gradually after 2016.

4.3. Analysis of Marine Resources

The amount of marine resources varies greatly among the provinces and cities in the Yangtze River Delta, and the allocation and use of each resource have their own focus. In terms of time evolution, the scores of Zhejiang Province fluctuated significantly, while the scores of Shanghai and Jiangsu both changed in a more moderate trend (Figure 2). The score of Zhejiang Province fluctuated mainly due to the per capita water resources and seawater production indicators, reaching a very small value in 2011 and then fluctuating upwards. In

2015, with the port integration initiative, Zhejiang Province integrated the ports of Ningbo and Zhoushan and further improved the level of port construction. This led to a very large score of 30.91 for Zhejiang Province’s marine resources in 2015 and then showed a slight decline until 2019 when it gradually showed an upward trend. The fluctuation of Shanghai was not obvious, while Jiangsu Province reached a great value of 9.19 in 2016 due to the sudden increase in water resources per capita and showed a decreasing trend thereafter. From the analysis of regional differences, Zhejiang Province obtained the leading score in the development level of marine resources [61], while Jiangsu and Shanghai’s scores were more concentrated, and the gap between them gradually became smaller. Based on the important role of marine resources, provinces and cities should make full use of marine resources around the world, and at the same time can strengthen the circulation of resources through regional cooperation to reduce the differences.

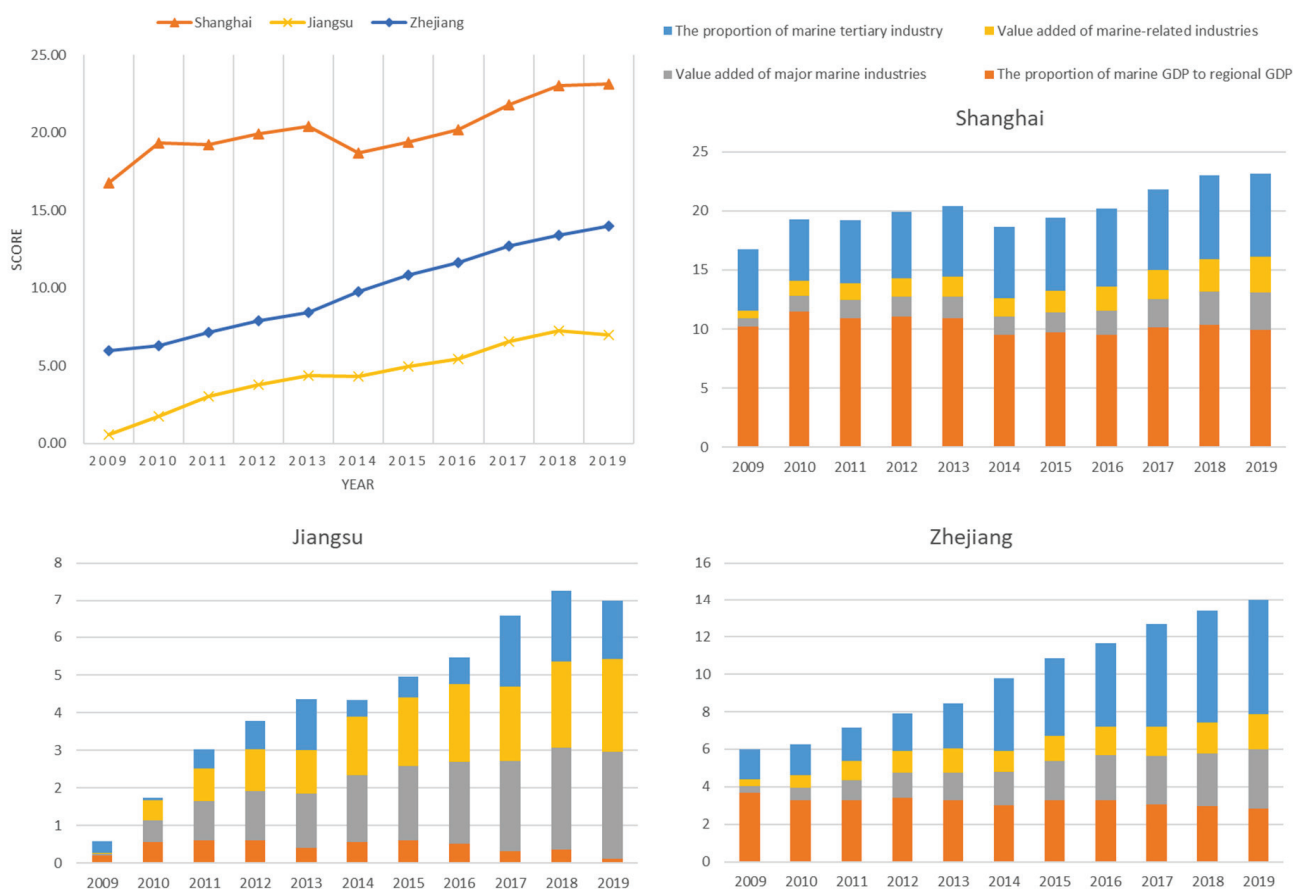


Figure 1. Yangtze River Delta marine economic indicator scores from 2009 to 2019.

4.4. Ecological Environment Analysis

Analyzed from the perspective of time evolution, Shanghai and Zhejiang showed large fluctuations in the ecological environment (Figure 3). Shanghai declined in an h-shape, with the rate of decline in the score slowing down between 2009 and 2012. In 2012, the State Council put forward the strategy of building a strong marine country, emphasizing the policy focus on coordinating marine ecological protection with the development of the marine economy, which led to a greater focus on marine ecological protection. The level of ecological development increased from 2012 to 2014 due to the significant decrease in two negative indicators of wastewater and solid waste emissions. However, due to the gradual reduction in the investment ratio of pollution control, Shanghai reached the lowest value of 7.16 in 2019 and developed a downward trend. Zhejiang Province showed a fluctuating rise until 2016, rising to a great value of 7.50 and then falling sharply due to the decrease in the investment ratio of pollution control, but showing an upward trend again

in 2019. Jiangsu Province showed a small change due to the decrease in pollution control investment, which brought it back down to the 2014 level in 2018. Although Jiangsu still ranks among the lowest coastal provinces, it was generally on an upward trend. Analyzing the regional differences, Shanghai scored consistently in the lead. As provinces and cities fluctuated, the change in the disparity between regions also fluctuated. Since 2016, there was a trend of narrowing the gap between provinces and cities. In summary, it can be seen that focusing on enhancing marine environmental protection should pay attention to reducing the discharge of wastewater, increasing investment in pollution control, taking the road of sustainable development, and achieving a harmonious coexistence between humans and nature.



Figure 2. Yangtze River Delta marine resources indicator score from 2009 to 2019.

4.5. Analysis of Technological Innovation

Technological innovation is an important source of motivation for economic development [62]. Analyzed from the time evolution, Shanghai’s score fluctuated significantly, while the other two provinces and cities fluctuated slightly upwards [63] (Figure 4). Shanghai’s score increased rapidly to a very high value of 24.94 from 2009 to 2015 due to the increase in the output of marine research institutions, but the number of patents decreased significantly after 2016, causing the score to plummet to a very low value of 9.16 and rebound slowly thereafter. In Jiangsu Province, the number of marine researchers decreased significantly after 2015, and after 2016, with the increase in input and output, the score of Jiangsu Province rebounded and increased to a great value of 11.21 in 2018, and the score of Zhejiang Province decreased in 2016 due to the decrease in the number of marine researchers and scientific research institution papers and showed a rising trend thereafter. Analyzing regional differences, Shanghai relies on stronger financial advantages and superior geographical advantages to attract a large number of talents, which made Shanghai’s score the greatest in the Yangtze River Delta region before 2015. However, in 2016, mainly

due to the decline in the number of marine researchers, thesis outputs, and the number of patent applications received, which led to a significant decrease in the overall scores of the three provinces, their gap also narrowed rapidly, and the level of science and technology innovation in the three regions maintained a basic parity level in 2018 and 2019. In 2017, Zhejiang Province overtook Jiangsu by a small margin due to the increase in its score in invention patents. Collectively, the provinces should continue to attract research talent continually and should place greater emphasis on research results, with a particular focus on increasing the number of patent applications.

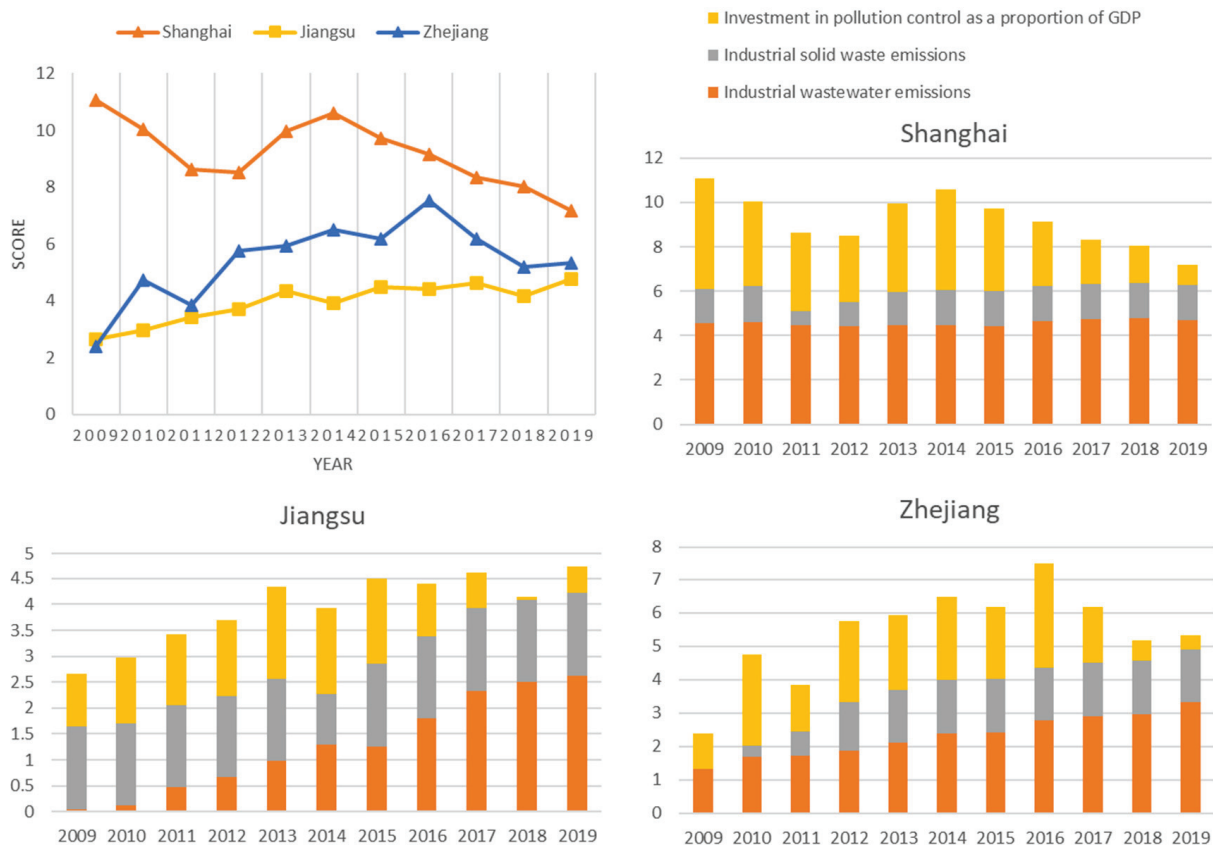


Figure 3. Yangtze River Delta ecological environment indicator score from 2009 to 2019.

4.6. Comprehensive Score Analysis

With the support of national development policies, the Yangtze River Delta region has been at the forefront of marine economic development in China [19]. In terms of time evolution, the level of marine sustainable development in the Yangtze River Delta provinces fluctuated and rose (Figure 5). Among them, Shanghai’s score fluctuated significantly, while the other two provinces and cities listed a relatively stable trend.

Relying on its larger industrial scale and talent advantage, Shanghai vigorously developed the marine tertiary industry, breaking through the limitation of resources through the adjustment of industrial structure and transforming into an intensive and efficient marine economic development mode. The level of sustainable development of the marine economy rose steadily from 2009 to 2015, much higher than the regional average, and the score grew rapidly to a great value of 59.58 but plummeted to a very small value of 44.07 in 2017 by the weakness of scientific and technological innovation drive, and has been in a slow rebound since then. Zhejiang relied on rich water resources and marine biological resources to fully promote the growth of the marine economy. The overall level of sustainable development of the marine economy in Zhejiang Province showed a fluctuating upward trend and surpassed Shanghai in 2016, and has been in first place in the overall score for four years since then. Jiangsu Province took its rich marine resources and high marine science and

technology innovation capacity as a good foundation for its marine economy development. However, the scale of Jiangsu’s marine economy compared to the region was small and the level of sustainable development of the marine economy was relatively backward, always below the regional average level and in the process of slow growth.

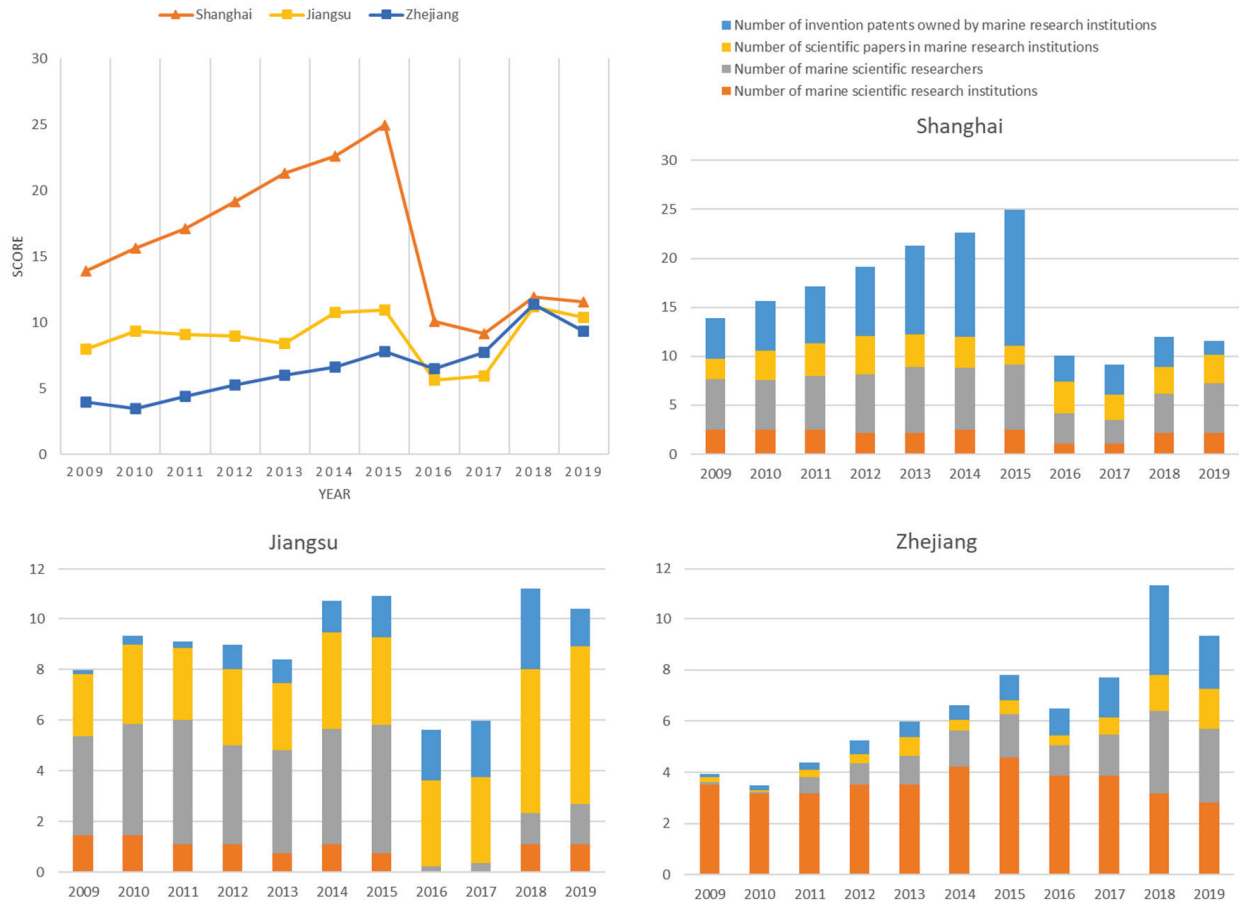


Figure 4. Yangtze River Delta science and technology innovation indicator score from 2009 to 2019.

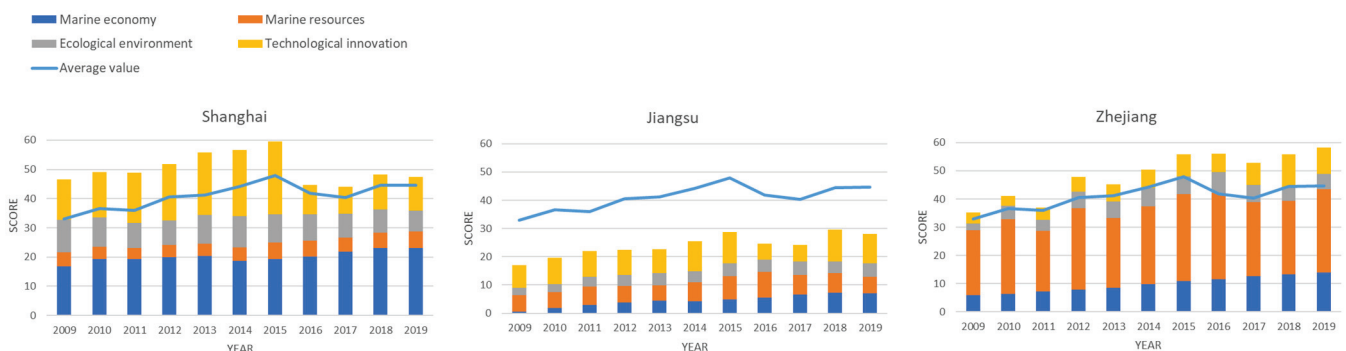


Figure 5. Yangtze River Delta comprehensive score from 2009 to 2019.

5. Discussion

Based on the theory of sustainable development, which is a fundamental strategy to guide social and economic transformation [64], this paper assessed the level of the sustainable development of the regional marine economy in four dimensions: the current situation of marine economy, environment, resources, and science and technology innovation, aiming to provide strategic suggestions to promote the sustainable development of regional marine economy and reduce regional differences. Sustainable development is a key task for coastal countries to gain a competitive advantage in the marine economy in the long

term, and existing studies have revealed the importance of sustainable development of the marine economy [65] and the driving role of various factors on sustainable development.

It has been shown that over-dependence on marine resources is not conducive to the sustainable development of the marine economy [66]. This study argues that the decisive role of marine resources in the development of the marine economy at this stage is related to the stage of the sustainable development of China's coastal areas [67]. This suggests that the establishment of marine economic development policies should take into account the current situation of each region's development and not directly borrow from the experience of other countries.

In this study, we believe that the current situation of the marine economy becomes an important support force for the sustainable and stable growth of the marine economy [68], and the quality, scale, and industrial structure of the marine economy will affect its sustainable level. In addition, the level of marine ecological environment also forms a constraint to sustainable development [69], and the government's attention to environmental pollution is one of the important foundations of sustainable development [70].

Existing empirical studies show that science and technology innovation has a driving effect on sustainable development [71]. This paper applies the viewpoint to the field of marine economic development and analyzes the relationship between marine science and technology innovation and the sustainable development of the marine economy. The results show that marine science and technology innovation is the intrinsic driving force of the sustainable development of the marine economy [72], but the conversion rate of regional scientific research results is not high at this stage, and the contribution rate of science and technology innovation to the marine economy needs to be improved.

At the same time, there are some limitations in this study. (1) This study did not use the most recent data and failed to measure and study the recent situation of the marine economy. (2) Due to the wide scope of the marine economy, some factors that are useful for measuring the sustainability of the marine economy were ignored. Therefore, future studies may update the data and establish a more complete evaluation system; in addition, with the growing recognition of the importance and necessity of the synergistic development of the marine economy and the environment, sustainable solutions for the marine economy can be further developed.

6. Conclusions and Recommendations

6.1. Conclusions

Grounded on the understanding of marine economic sustainable development, we constructed an evaluation index system for marine economic sustainable development from four dimensions—marine economy, marine resources, ecological environment, and technological innovation—and measured the level of marine economic sustainable development in the three provinces of the Yangtze River Delta from 2009 to 2019. The main conclusions are as follows: (1) There were significant differences in the industrial structure of the marine economy among regions in the Yangtze River Delta. (2) There was a large gap in the allocation and utilization of marine resources among provinces and cities in the Yangtze River Delta. In terms of the development, utilization, protection, and comprehensive management of marine resources, there was a lack of coordination and control capacity among regions, and there is a communication mechanism deficiency in cross-regional maritime resource circulation and maritime project construction. (3) The discharge of wastewater and waste in the Yangtze River Delta region was significantly controlled, but the investment in marine environmental governance was insufficient, seriously affecting the sustainable development of the marine economy in the region. (4) The support capability of marine technological innovation was insufficient. In terms of investment in technological innovation, the needs of marine researchers need to be further increased. In terms of technological innovation output, the conversion rate of scientific and technological achievements was relatively low, and there was a lack of core competitiveness in the production of marine technology patents.

6.2. Suggestions for Countermeasures

6.2.1. Strengthen Cooperation and Promote Regional Collaborative Development

The Yangtze River Delta is the intersection of “One Belt, One Road” and the Yangtze River Economic Belt and plays a leading role in China’s economic and social development. The Yangtze River Delta region has played a leading role in China’s economic and social development. The integrated development of the Yangtze River Delta provides opportunities for regional marine industry and economic as well as marine development; that is, collaborative innovation, attracting more international and domestic industrial and innovation resources to the Yangtze River Delta region. Based on the interconnection of infrastructure in the Yangtze River Delta region, provinces and cities strengthen regional cooperation to accelerate the flow of resources and shrink regional differences in marine resources.

6.2.2. Improve the Innovation Power of Marine Science and Technology and Improve the Efficiency of Transforming Marine Science and Technology Achievements

The rapid economic development of the Yangtze River Delta region has, to a certain extent, given it the advantage of attracting scientific research talents and applying for major marine research projects, but the lack of scientific research innovation output capacity has weakened the driving force of marine science and technology for economic development. Therefore, to address the problem of R&D investment in marine science and technology, the government should pay attention to the R&D of marine science and technology, increase the investment in science and technology innovation, orientate the training of relevant talents, and continuously increase the number of marine research personnel and institutions. For the problem of R&D output, through capital investment, promote the development of the traditional marine industry to a high-end direction and promote the transformation of scientific research results into actual productivity. Build marine enterprise brands, enhance the international visibility of enterprises, attract foreign investment, and improve the efficiency of the transformation of marine science and technology achievements. Through marine science and technology innovation, solve the technical problems faced by emerging industries such as the marine biomedical industry and high-end engineering equipment manufacturing, accelerate the improvement of the industrial structure of the marine economy, and promote the marine economy to achieve more efficient development.

6.2.3. Improve the Relevant System of Marine Environmental Protection and Increase the Protection of the Ecological Environment

The destruction of the marine ecological environment seriously restricts the development of major marine economic industries such as marine fishery, marine tourism, and marine biomedicine and hinders the growth trend of the marine economy. Therefore, the region should continue to strengthen the comprehensive management of marine pollution, increase investment in marine environmental management, continue to strictly control the discharge of pollutants such as solid waste and wastewater into the sea, and build ecosystem restoration projects to ecologically restore the heavily polluted marine areas. Detailed ecological and environmental protection policies have been developed to promote marine economic development at a pace that takes into account the preservation of the ecological environment. In order to better cope with the environmental dilemma, the world should work together to coordinate the planning of marine ecological protection in order to promote the safer development of the marine economy.

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Article

Taking Precautionary Approaches to the Governance of Commercial Deep Seabed Mining: Law-Making of International Seabed Authority and Multi-Subject Participation

Jinpeng Wang ^{1,*}, Wenqi Jiang ¹, Chuanjuan Wang ² and Dahai Liu ^{2,*}¹ School of Law, Ocean University of China, Qingdao 266100, China² Key Laboratory of Coastal Science and Integrated Management, First Institute of Oceanography, Ministry of Natural Resources of the People's Republic of China, Qingdao 266061, China

* Correspondence: liudahai@fio.org.cn (D.L.); wangjinpeng@ouc.edu.cn (J.W.)

Abstract: Although commercial deep seabed mining could provide the international community with new sources of metals and minerals, it can potentially cause adverse effects on the marine environment and biodiversity of the Area. To date, insufficient scientific knowledge has been obtained about the complex deep seabed ecosystems and the detailed impacts of deep seabed mining. The International Seabed Authority has begun to make provisions for exploiting mineral resources and related environmental protection requirements. The draft exploitation regulations take precautionary approaches such as stipulating rules, including environmental standards and guidelines, environment impact assessment, environmental management and monitoring plan, and regional environmental management plan. However, there are still apparent differences and controversies about these rules between States. This article elaborates on the evolution and content of drafted rules and explores the manifested specific divergences and interest conflicts in formulating these rules. Implementing precautionary approaches requires balancing potential serious environmental risks, available scientific evidence, and cost-effectiveness. This article also explores the essential requirements of taking precautionary approaches for governing commercial deep seabed mining. The ISA, sponsoring States, Contractors, scientists, experts, and public all play roles in the governance of imminent commercial deep seabed mining. Strengthening multi-subject participation in the ISA's law-making process for deep seabed environmental protection can be conducive to promoting consensus on taking precautionary approaches to govern commercial deep seabed mining.

Keywords: precautionary approaches; International Seabed Authority; deep seabed mining; exploitation regulations; multi-subject participation; environmental impact assessment; environmental management and monitoring plans; regional environmental management plan

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1. Introduction

The ocean plays a vital role in global sustainable development, such as adjusting temperature, absorbing carbon dioxide emissions, and providing other ecosystem services. The deep seabed is the habitat of many rare and unknown creatures, forming unique ecosystems which remain the least explored on Earth. Additionally, the Area, which means the seabed and ocean floor and subsoil beyond the limits of national jurisdiction, contains rich mineral resources [1]. With the development of marine science and technology, the exploitation of deep seabed mineral resources has gradually gained increasing attention. The possible main impacts of deep sea mining on the seafloor include the depletion or physical damage to the habitat and fauna by the mining equipment, changes in seafloor topography and geochemical characteristics, creation of sediment plumes, and potential toxicity from metal or process chemical release [2]. For example, sediment plumes generated during mineral extraction are considered a major risk to deep sea ecosystems resulting in the burial and clogging of animals' feeding apparatus [3]. Seabed disturbance experiments

such as the German project DISCOL (disturbance and recolonization experiment) and follow-up study, MIDAS (managing impacts of deep sea resource exploitation), presented the potential for the release of toxic elements during the mining process and the difficulty of predicting the impact of release using data from laboratory experiments involving only one element [4].

The United Nations Convention on the Law of the Sea (hereinafter referred to as “UNCLOS” or “the Convention”) and the Agreement relating to the Implementation of Part XI of the UNCLOS provide the basic legal framework for activities in the Area. The Article 140 of the Convention stipulates that activities in the Area shall be for the benefit of all mankind. Paragraph 1 of Article 157 of the Convention and Article 1 of Annex I of the Agreement relating to the Implementation of Part XI of the UNCLOS stipulate that the International Seabed Authority (hereinafter referred to as “ISA” or “the Authority”), as the competent international organization that manages the Area, is responsible for organizing and controlling mineral exploitation activities in the Area. The ISA shall take measures in accordance with this Convention with respect to relevant activities in the Area to ensure that the marine environment is not adversely affected by such activities [5]. The ISA can establish appropriate rules, regulations, and procedures. Since the establishment of the Authority, the exploration regulations for polymetallic nodules, polymetallic sulphides and cobalt-rich nodules, and a regional environmental management plan have been formulated. The ISA allows interested entities to apply for exclusive rights over a certain area. It is granted in the form of contracts extending over a period of 15 years and covering a defined geographical area. Moreover, the terms and conditions entailed with each contract are determined according to the exploration regulations, obliging every Contractor to conduct detailed oceanographic baseline studies to assess their environmental impact and demanding a “precautionary approach” to prevent pollution and other harmful effects on the ecosystem [6].

The Draft Regulations on Exploitation of Mineral Resources in the Area is an important legal instrument formulated by the ISA to regulate the exploitation of mineral resources in the Area. The Legal and Technical Commission prepared the first working draft of the regulations and standard contract terms on the exploitation for mineral resources in the Area in 2016 and released the Draft Regulations on the Exploitation of Mineral Resources in the Area in 2017. The draft was revised again in 2018 and 2019. The bulk of the ISA draft regulations establish procedures for granting contracts to exploit deep sea minerals. Part II sets out the application and approvals process, Part III the rights and obligations of Contractors, Part IV the protection and preservation of the marine environment, Part V review and modification for work plans, Part VI closure plans, and Part VII financial terms. These provisions primarily aim to establish the commercial relationship between the Contractor and the ISA, and represent efforts to manage risks associated with commercial deep seabed mining governance [7]. The environmental rules in the Draft Regulations on Exploitation of Mineral Resources in the Area mainly include environmental standards, environmental management, environmental impact assessment, pollution control, restriction on mining discharges, and environmental compensation fund. Compared with the environmental rules in the three exploration regulations previously formulated by the ISA, the environmental rules in the draft regulations on the exploitation of mineral resources in the Area have added several new systems.

However, the interests of the ISA member States are inconsistent, and their preferred environmental protection solutions for commercial deep seabed mining are widely divergent. Currently, the content of environmental rules in the draft regulations still needs to be further negotiated. For example, Germany suggests that fully developed and agreed Regional Environment Management Plans (REMPs) should be regarded as a prerequisite for granting exploitation licenses [8]. Key priorities from the UK’s perspective include ensuring the highest possible environmental standards [9]. Japan reaffirmed that it is essential to formulate reasonable Regulations, properly striking a balance between exploitation and environmental considerations, that are indispensable for the realization of deep sea

exploitation [10]. As another example, the Contractors shall carry out exploitation with reasonable regard for other activities in the marine environment. States have different views on whether the Contractors need to comply with “any applicable international rules and standards established by competent international organizations”. Opponents say it is unclear and too broad [11].

Until now, the international community’s scientific understanding of the deep sea ecosystem remains relatively limited. Moreover, commercial deep seabed mining may impact the marine environment of the Area. A rights of nature approach could be applied to the oceans [12] alongside the precautionary approach and sustainable development concepts [13]. The Nodules Exploration Regulations, Sulphides Exploration Regulations, and Crusts Exploration Regulations all specifically oblige the ISA and sponsoring States to “apply a precautionary approach, as reflected in the principle of the Rio Declaration on Environment and Development (hereinafter as the Rio Declaration), and best environmental practices”. Similar obligations apply to Contractors and prospectors. The concept of precaution shall be reflected in the governance of commercial deep seabed mining. Principle 15 of the Rio Declaration stated that 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 a reason for postponing cost-effective measures to prevent environmental degradation. The precautionary approach is incorporated in the Draft Regulations on Exploitation of Mineral Resources in the Area. Regulation 2: “Fundamental policies and principles” of the draft emphasizes that for the effective protection of the marine environment from the potentially harmful effects caused by exploitation, the precautionary approach, as reflected in principle 15 of the Rio Declaration shall be applied. Regulation 44: “general obligations relating to the marine environment” formulate that the ISA, sponsoring States and Contractors shall apply the precautionary approach to the assessment and management of the risk of harm to the marine environment from exploitation in the Area [14]. Therefore, the application of precautionary approaches is not only one of the basic principles of the draft exploitation regulations, but also one of the general obligations to protect and preserve the marine environment in deep sea mining activities. However, the draft currently lacks precise criteria and directions on how each actor should implement the precautionary approach. Until now, it is up to States and Contractors to identify the appropriate measures for applying the precautionary approach [15].

This article introduces and analyzes how the precautionary approach is applied in the environmental rule-making of the Regulations on Exploitation of Mineral Resources in the Area and provides recommendations to emphasize and pursue multi-subject participation in the environmental rule-making process of ISA. For the aim, this article will firstly analyze the precautionary approach and its development in the international law of the sea, explain the evolution and content of the rules that reflect the precautionary approach in the draft exploitation regulations, and explore the differences of views of parties on formulating relevant environmental rules. Implementing the precautionary approach needs to strike a balance between potentially serious environmental risks, available scientific evidence, and cost-effectiveness. This article also examines the basic requirements for the precautionary approach to managing commercial deep seabed mining and how to strengthen multi-subject participation in the law-making process of the deep seabed environmental protection of the ISA to promote the consensus on adopting the precautionary approach for governance on commercial deep seabed mining.

This article applies traditional desk research methods, analyzing primary sources (regulations and States’ comments) and secondary sources (academic discussion). Regulations include relevant rules of the UNCLOS and its implementation agreement, Convention on Biological Diversity, ISA’s existing regulations, guidelines and the draft regulation. The States’ comments on the Draft Regulations on the Exploitation of Mineral Resources in the Area and their difference or coherence are analyzed. In addition, the *Southern Bluefin Tuna* case and the Regional Environmental Management Plan for the Clarion-Clipperton Zone

are chosen as case studies to illustrate the connotation of precautionary approaches and the related practice of ISA, respectively.

2. The Precautionary Approach and Its Application in the International Law of the Sea

2.1. Defining the Precautionary Approach

With the rapid development of science and technology, the threat of human activities to the ecology and environment has become increasingly significant. International law requires States to abide by the principle of good neighborhood when dealing with transboundary environmental damage; that is, any State shall undertake prevention responsibilities for transboundary environmental hazards and foreseeable environmental risks caused by the activities under its jurisdiction or control [16]. This principle has gradually developed into international customary law and is stipulated in some international agreements. The Article 194 of the UNCLOS stipulates that States shall take all measures consistent with this Convention that are necessary to prevent, reduce, and control marine environment pollution from any source, individually or jointly as appropriate. Based on the principle of good neighborliness, States have the obligation not to cause damage to the environment beyond national jurisdiction and take responsibility for the damage caused by activities under their jurisdiction and control. However, due to the limitations of human cognition and the complexity of the ecological environment, there is always a lack of scientific certainty about environmental risks caused by human activities. Therefore, the traditional State responsibility model which is based on definitive scientific evidences, may lead to environmental degradation and irreversible losses. The concept of precaution aims to oblige States to take a precautionary approach to solve environmental problems promptly based on reasonable doubts, even there, is insufficient scientific evidence. Principle 15 of the Rio Declaration is regarded as an important symbol for establishing this concept in international law. The concept of precaution was gradually introduced to various fields dealing with environmental issues, such as marine biodiversity loss, dumping, ozone layer problems, and greenhouse effects.

It is generally believed that the concept of precaution includes three elements: the threat of environmental risks, scientific uncertainty, and taking measures. Firstly, there is a certain environmental risk, and the risk has reached a degree of suspicion. Secondly, there is scientific uncertainty, such as whether there is environmental harm and whether there is a causal link between that harm and the activity. Finally, scientific uncertainty cannot be a reason for postponing measures to prevent environmental degradation. The threat of environmental damage is the fundamental reason for formulating precautionary measures; scientific uncertainty is the premise of applying a precautionary approach [17]. Furthermore, applying the precautionary approach does not require unlimited precautions to avoid environmental damage. States can take cost-effective measures according to their respective capabilities by applying the precautionary approach. The precautionary approach is a soft approach, which has more flexibility and takes into account social and economic conditions in the implementation process [18]. The precautionary approach has been gradually reflected in many international legal instruments and has been applied and developed in the field of international law of the sea.

The status of precaution is disputed. In practice, some scholars believe that the precautionary principle is an international customary law rule, and precaution is a guiding principle in EU law [19]. However, other scholars believed that the precaution could not be used as a legal principle of international customary law to bind all members of the international community. The legal nature of the precautionary principle is vague, and its legal status is still controversial in international law. It has not yet developed into international customary law and cannot be used as a general legal principle to bind all members of the international community [20]. Compared with the precautionary principle, the precautionary approach is generally considered to be more flexible and tends not to be legally binding. For example, Judge Liang believed that the precautionary approach is more flexible in the 1999 *Southern Bluefin Tuna* case. Judge Shearer stated that applying

the precautionary approach, rather than the precautionary principle, is more flexible in dealing with the relevant issues [21]. The precautionary approach is more flexible and can incorporate socio-economic factors, while the precautionary principle is associated with complex conservation schemes and is considered incompatible with sustainable development. The precautionary approaches are flexibility measures to prevent human activities from possible risks when the causal relationship is uncertain.

In the formulation of the draft exploitation regulations, States showed noticeable differences on whether precaution is a general principle or an approach. Although Article 46 of the draft refers to the precautionary approach reflected in principle 15 of the Rio Declaration, the UK advocated that it should refer to the precautionary principle rather than the precautionary approach [22]. However, Australia pointed out that it agreed with Article 46 to apply the precautionary approach, emphasized the importance of being flexible to cope with scientific and technological progress, and believed that the principle of sustainable development should also be referred to [23]. The precautionary approach is more consistent with the concept of sustainable development. The concept of sustainable development is reflected in the balance between environmental interests and economic and social interests, ensuring environmental interests without excessively sacrificing social and economic interests. In practice, the precautionary principle usually stipulates prohibitive measures, such as the complete prohibition of large-scale pelagic driftnet fishing in order to protect fishery resources. The precautionary approach is more conducive when considering environmental, economic, and social interests in its implementation process, and could promote the realization of sustainable development.

2.2. Application of the Precautionary Approach in the International Law of the Sea

Article 5 and 6 of the United Nations Agreement for the Implementation of the Provisions of the UNCLOS relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (hereinafter referred to as the “1995 Fish Stock Agreement”) clearly states that coastal States and States shall apply the precautionary approach widely to conservation, management, and exploitation of straddling fish stocks and highly migratory fish stocks to protect the living marine resources and preserve the marine environment. Article 6 of the 1995 Fish Stock Agreement regulated the specific requirements of States for implementing the precautionary approach, which includes improving decision-making by obtaining and sharing the best scientific information available and implementing improved techniques for dealing with risk and uncertainty. The 1995 Fish Stock Agreement reinforces a dichotomy that making provision for the regulation of new and exploratory fisheries constitutes a core component of applying the precautionary approach to fisheries management, and such activities should in turn proceed in a graduated, monitored, and precautionary manner [24]. In addition, annex II of the Agreement sets out guidelines for applying precautionary reference points in the conservation and management of straddling fish stocks and highly migratory fish stocks. The 1992 Convention on Biological Diversity and the 2000 Cartagena Protocol on Biosafety to the Convention on Biological Diversity also contain references to the precautionary approach to marine biodiversity [25]. The 1996 Protocol to the 1972 Convention on the Prevention of Marine Pollution by Dumping of Waster and Other Matter (London Protocol) expressly introduced the precautionary approach to environmental protection from dumping.

The precautionary approach is also reflected in some regional sea agreements. For example, according to Article 2 of the Convention for the Protection of the Marine Environment of the North-East Atlantic (the ‘OSPAR Convention’), the parties to the Convention need to apply the precautionary principle, by which preventive measures are to be taken when there are reasonable grounds for concern that substances or energy introduced into the marine environment, directly or indirectly, 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. The Commission for the Conservation of Antarctic

Marine Living Resources (CCAMLR) is also considered a good example of applying the precautionary approach. The CCAMLR seeks to protect ecosystems by setting precautionary krill catch limits, considering the needs of associated species in a manner that protects their ecological sustainability. A spin-off of CCAMLR's pioneering work on the precautionary and ecosystem approach is now regarded as the model of regional fisheries management bodies worldwide.

3. The Environmental Rule-Making of Exploitation Regulations and Precaution

3.1. Requirements for Applying Precautionary Approaches to Managing Deep Seabed Mining

Currently, only limited knowledge of the deep sea ecology and environment is obtained, and deep seabed mining may potentially impact the marine environment. In order to protect marine biodiversity and ecological environment, the precautionary approach should be applied to the governance of deep seabed mining. Under the mandate of Part XI of the UNCLOS, the ISA manages the seabed, ocean floor, and subsoil beyond national jurisdiction on behalf of all mankind. The General Assembly of the Authority, composed of all its member States, is the nominally supreme authority to which all other principal institutions are accountable. The Council has the right to formulate environmental rules in the Area. The members of the Council's various groups play an important role in the decision-making process of environmental rules, which are divided into five groups: A, B, C, D, and E. The first three groups are composed of four member States; group D and E are composed of 6 and 18 member States, respectively. Among them, group A must include Member States whose future consumption of mineral resources imported from the Area exceeds 2% of the total consumption of mineral resources in the world. Group C is composed of terrestrial mineral resource exporting States that compete with the production of deep seabed mineral resources, among which there must be at least two member States whose main source of income is the export of mineral resources. The members of group D include major importers of various seabed minerals and potential producers of such minerals. Since 2011, the ISA has explored developing rules for commercial deep seabed mining. As mentioned above, the draft exploitation regulations emphasize the application of precautionary approaches.

The precautionary approach is the core of an ecosystem approach to management and is a legally binding obligation on ISA, States, and Contractors [26]. According to the draft exploitation regulations, the ISA, the sponsoring State, and the Contractor all have an obligation to adopt precautionary approaches. The adoption or implementation of a precautionary approach places demands on the competence of the ISA. The ISA needs to provide precautionary decision-making for the environmental risks that may arise from deep seabed mining and take corresponding methods or measures. The Legal and Technical Committee plays an important role in formulating regulations for the ISA. The Legal and Technical Committee is a subsidiary body of the Council of the ISA, which is mainly responsible for supervising and managing activities in the Area based on the actual situation and making specific suggestions to the Council on protecting the Area's environment. However, the application of the precautionary approach needs to be based on certain scientific evidence. One way to implement the precautionary approach in deep seabed mining is to adopt measures that specifically target existing knowledge gaps to reduce the surrounding uncertainties [27]. Developing a knowledge management system to understand better the potential impacts of deep seabed mining operations would enable the ISA to adopt the necessary measures as required by Article 145 of UNCLOS [28]. Establishing a scientific and technical advisory body can provide scientific advice for the decision-making or rule-making of the Assembly and Council of the ISA. The composition requirements of the Council members of the ISA reflect the coordination of interests between mineral resource exporting States and mineral resource importing States. Contractors, on the other hand, have an indirect influence on the decision-making of the Authority mainly by exerting influence on their sponsoring States. From the procedural level, some scholars believe that the process of precaution mainly includes environmental impact assessment

and environmental monitoring [29]. Peel believed applying a precautionary approach requires rigorous assessment of scientific uncertainties, ensuring transparency in balancing competing interests, and expanding participation in the decision-making process [30]. The draft exploitation regulations need to provide the necessary scientific deliberation, balancing of interests and participation mechanism of a precautionary approach, while promoting marine scientific research and environmental impact assessment to minimize scientific uncertainty.

Applying a precautionary approach may facilitate the fulfillment of a sponsoring State's obligation of due diligence. It is necessary to take all appropriate measures to fulfill the obligation of due diligence as long as their activities have potential environmental risks, even in the absence of full scientific evidence of their adverse effects [31]. The precautionary approach aims to ensure a high level of environmental protection through the use of smart, risk-averting decisions. For this, the ISA needs to implement full modern transparency procedures, hold meetings of the Legal and Technical Commission in public, initiate full public comment and review procedures in the exploitation regulations, with respect to all matters, and issue open invitations to workshops developing policy and procedures [32].

3.2. The Development of Environmental Rule-Making in the Exploitation Regulations

The draft exploitation regulations formulated by the ISA will be the legal instrument to regulate the exploitation of mineral resources in the Area. The content of environmental rules in the draft comprises the fundamental policies and principles of Part I and Part IV Protection and Preservation of the Marine Environment. The draft regulations clearly require the ISA, sponsoring States, and Contractors to jointly undertake the tasks of protecting the ecological environment in the Area and implementing relevant measures. The draft regulations stipulate that the ISA is responsible for formulating standards and requirements related to the environmental impact of exploitation activities. The environmental standards mainly include environmental quality objectives, monitoring procedures and mitigation measures. In the specific procedure for the Contractor to apply for exploitation, the ISA is responsible for announcing and reviewing the environmental impact assessment plan and evaluating whether the applicant has the technical capabilities for environmental protection that meet the standards and requirements.

The draft regulations also stipulate that when submitting an application, the Contractor must formulate the environmental impact statement and environmental management and monitoring plan in accordance with the regional environmental management plan according to the relevant provisions of Annex IV and VII, and take necessary measures to prevent, reduce, and control the pollution and other hazards to the Area's environment from mining activities (Table 1). In addition, before production, the Contractor shall lodge an environmental performance guarantee in favor of the ISA to provide guarantees for complying with relevant environmental obligations during the mining process. The draft also stipulates that a Contractor shall submit a final closure plan to ISA, at least 12 months prior to the planned end of commercial production, or as soon as is reasonably practicable in the case of any unexpected cessation. The Contractor shall continue to monitor the marine environment for such a period after the cessation of activities, as set out in the final closure plan. Regulation 54 of the draft also expressly stipulates the establishment of an environmental compensation fund to prevent, limit or remediate any damage to the Area arising from activities in the Area.

Table 1. Environmental Requirements for Contractors on Different Stages in the Draft Exploitation Regulations.

Environmental Requirements for Contractors	
Submission of Application	<ul style="list-style-type: none"> ① The application should include the environmental impact statement (Regulation 7(3)(d) and Annex IV of the draft) and the environmental management and monitoring plan (Regulation 7(3)(h) and Annex VII). ② Deposit an environmental performance guarantee in favor of the Authority (Regulation 26(1)).
Exploitation	<ul style="list-style-type: none"> ① The annual reports should include the actual results obtained from the environmental monitoring programs (Regulation 38(2)(g)) ② Taking necessary measures to prevent, reduce, and control pollution and other hazards in accordance with the environmental management and monitoring plan and applicable standards and guidelines (Regulation 49). ③ No dispose, dump or discharge into the Marine Environment or any mining discharge, except where such disposal, dumping or discharge is permitted (Regulation 50(1)). ④ Compliance with the environmental management and monitoring plan (Regulation 51). ⑤ Conducting performance assessments of the environmental management and monitoring plan (Regulation 52(1)).
Closure	<ul style="list-style-type: none"> ① The Environmental Performance Guarantee reflects the likely costs required for post-closure monitoring and management of residual environmental effects. (Regulation 26(2)(c)) ② The Contractor shall continue to monitor the marine environment within the period stipulated in the final closure plan (Regulation 61(2) and Annex VIII). ③ The closure plan shall be prepared and implemented according to the guidelines and the relevant regional environmental management plan; the closure plan shall include an updated environmental impact assessment for the activities that will be undertaken during closure, and the details of the identifiable residual environmental effects; the closure plan shall include details of management measures to mitigate residual environmental effects; the closure plan shall include details of the amount of the environmental performance guarantee (Appendix VIII).

There is a general recognition among stakeholders that further work is needed on the regulations related to protecting the marine environment. However, the content of environmental rules in the draft regulations still needs to be further discussed. Some States emphasized that the development of standards or guidelines related to the marine environment should be prioritized, including environmental impact assessment, preparation of environmental impact statements, environmental management and monitoring plans, and closure plans. Others suggested that all matters related to environmental protection should be listed in the standards. Some stakeholders also suggested that a manual should be developed on the monitoring and assessing activities before, during, and after the exploitation, including a detailed methodology for establishing an environmental baseline. At present, there are obvious differences between the opinions of States. States need to continue to discuss and try to reach a consensus around relevant environmental rules in subsequent negotiations.

3.3. Disputes over the Making of Environmental Rules in the Exploitation Regulations

There are different specific measures and procedures for implementing precautionary approaches. For example, a pause on mining activities may also be one of the measures to implement a precautionary approach. However, the pause of activities is not a necessary consequence of implementing a precautionary approach. Currently, the draft regulations lack standards and guidelines on how each participant implements precautionary approaches. Until the relevant standards and guidelines are developed by the Authority, it is primarily up to States and Contractors to determine how to implement appropriate precautionary approaches. There are several obvious disputes between States about the formulation of environmental rules of the draft regulations, especially in environmental impact assessment, environmental standards, environmental management and monitoring, and regional environmental management plans.

3.3.1. Scope of Environmental Impact Assessment

Deep seabed mining takes place in inaccessible areas of the deep seafloor, leading to considerable uncertainty about its effects on deep seabed ecosystems. Environmental impact assessment is an important precautionary approach. Environmental impact assessment is an assessment of the effects of a proposed mining action on the deep sea environment based on the available science and provides alternatives to the proposed action. A detailed environmental impact statement and an environmental management and monitoring plan are needed for the application and approval procedure of a plan of work. As part of the comprehensive review of an application, the Legal and Technical Commission shall examine the application in light of the comments made by stakeholders and the responses from the applicant, and consider whether the plans provide for the effective protection of the marine environment in accordance with article 145 of the UNCLOS and the precautionary approach [33]. The Contractor is responsible for providing evidence to the sponsoring State and the Authority that the nature or extent of adverse effects may be acceptable. In the formulation of the draft regulations, States have different opinions on the factors that should be considered in the environmental impact assessment. Article 47 of the draft regulations states that an environmental impact assessment should identify, predict, evaluate, and mitigate the biophysical, social, and other relevant effects of the proposed mining operation. However, France advocates that the environmental impact assessment should only be carried out according to strict environmental standards and should not consider the social consequences of the proposed mining activities, so as not to weaken the protection of the environment [34].

3.3.2. Necessary Environmental Standards and Guidelines

States also dispute over the formulation of the environmental standards of the Regulation. Germany believes that the environmental standards formulated by the ISA for deep seabed mining must be legally binding, and the approval of relevant environmental standards is the prerequisite for the ISA to allow exploitation activities [35]. Australia advocates that relevant coastal States should be consulted when formulating legally binding environmental standards [36]. Russia believes that what “the environmental acceptance criteria” mean and how these criteria will be established should be clarified [37]. The UK argues that ensuring the highest possible environmental standards should be a major priority [9]. Currently, the ISA is preparing to formulate the *Draft standard and guidelines on the form and calculation of an Environmental Performance Guarantee* [38]. However, due to the different procedures and legal effects of standards and guidelines, some States, including China, believe that this document is only suitable for specifying guidelines, not standards [39]. United States made comments on the *Draft standard and guidelines on the development and application of environmental management systems*, and advocated that specific and measurable environmental standards that Contractors need to meet should be clarified. The United States thought that setting an aspirational objective as the standard in the context of mining, e.g., preventing harm to the marine environment, is unrealistic and ignores the nature of this inherently destructive activity. Rather, this standard should address the question of what is an acceptable level of harm in calculable terms [40]. As the text of the draft exploitation regulations are being negotiated and eventually finalized, some or most of the drafts of the accompanying standards and guidelines that have been or are about to be issued by the LTC would need to be revisited and revised accordingly [41].

3.3.3. Implementation of Environmental Management and Monitoring

There are also differences among States regarding implementing environmental management and monitoring of the Regulation. In the opinion proposed by Germany in 2019, it is believed that the standards in the environmental management and monitoring plan must be legally binding, while the guidelines can be suggestive [35]. Japan, on the other hand, argues that environmental monitoring reports do not need to be formulated based on environmental objectives and standards [10]. Member States of the Latin American and

Caribbean Group collectively submitted a proposal at the 26th session of the Council in 2020, and expected that the Authority could be able to develop coherent environmental rules, including regional environmental management plans. The United States emphasizes that the implementation of environmental management measures should be based on the best available scientific evidence [42].

3.3.4. Application of Regional Environmental Management Plans

Regional environmental management plans (REMPs) are considered to be a scientifically sound and effective tool for implementing precaution requirements. Consideration of the scale and location of mining activity, potential cumulative impacts from more than one mining operation, and understanding of connectivity in the region are key to prevent biodiversity loss. For this reason, REMPs, which the ISA has commenced to develop, will be important strategic environmental management tools [43]. In addition to the 2012 Regional Environmental Management Plan for the Clarion-Clipperton Zone, the ISA developed a strategy to prioritize the development of REMPs in Areas where exploration activities are currently underway. The Council has preliminarily agreed and identified the Mid-Atlantic Ridge, the Indian Ocean triple junction ridge and nodule-bearing province, as well as the North-West Pacific and South Atlantic for seamounts as priority areas. In the future, REMPs for these areas will be negotiated. Germany and the Netherlands, with Costa Rica as co-sponsors, submitted a proposal for the establishment, approval, and review process of regional environmental management plans, hoping that relevant standards can be developed as soon as possible to facilitate accountability and transparency, reliability and acceptability, clarify environmental standards, and level the playing field for Contractors [44]. They emphasize that the applicant is obliged to prove that its management and monitoring conform to the REMPs, and advocate that Article 49 of the draft regulations requires the Contractor to comply with the environmental management and monitoring plan, the applicable REMPs and the applicable standards and guidelines, and take necessary measures to prevent, reduce, and control pollution and other hazards to the marine environment caused by its activities in the region. France advocates avoiding confusion between environmental management and monitoring plans and REMPs. In addition, REMPs may also involve other ocean activities, such as fishing or navigation. However, the current level of interest of other sectoral organizations in participating in the development of REMPs seems limited, highlighting the current limitations of the sectoral approach. Furthermore, the stakeholder engagement strategy of the REMPs and the response mechanism to stakeholder comments and suggestions are needed [45].

4. Applying Precautionary Approaches in Deep Seabed Mining and Multi-Subject Participation

4.1. The Necessity of Multi-Subject Participation

Governance of global common resources, especially when numerous uncertainties are involved, requires weighing societal risk and acceptability. The core issue is what level of environmental harm is acceptable to society [46]. The ISA provides for limited participation by external experts, primarily in the development of the Mining Code and regional management plans, through workshops and expert presentations at meetings of the Legal and Technical Commission [47]. As mentioned earlier, a precautionary approach should be applied where there is scientific uncertainty and the risk of environmental degradation. Meanwhile, the application of the precautionary approach needs to consider the capacity of each State and whether it is cost-effective, and take necessary preventive measures on this basis. Principle 15 of the Rio Declaration limits the application of the precautionary approach to “cost-effective measures to prevent environmental degradation” in response to “threats of serious or irreversible damage”. In the formulation of the draft regulations, there are still disputes among parties regarding the scope of environmental impact assessment, the formulation of environmental standards, the implementation of environmental management and monitoring plans, and the application of regional environmental management

plans. Strengthening the participation of multiple subjects in the law-making for the deep seabed environmental protection of the ISA will help to promote the consensus of States on adopting precautionary approaches for deep seabed commercial mining governance.

The ISA, sponsoring States, and Contractors have their responsibilities in adopting precautionary approaches to reducing the environmental effects of deep seabed mining. The ISA is the competent international organization for deep seabed mining activities and has the authority to approve mining applications subject to the relevant requirements. Subject to the application of precautionary approaches, the Legal and Technical Committee (LTC) of the Authority will determine whether the proposed work plan is effective in protecting the marine environment and biodiversity. The LTC should ensure that appropriate procedures and the best available scientific and technical information are in place to assess whether the proposed program of work meets the requirement. The application and approval process for developing a work plan requires the Authority to review the detailed environmental impact statement, environmental management and monitoring plan, and closure plan from the Contractor. As part of the overall review of the application, the LTC shall review the application based on the comments from stakeholders and the applicant's responses, and consider whether the plan is effective in protecting the marine environment as well as taking precautionary measures in accordance with Article 145 of the UNCLOS. If the application meets the requirements, LTC will recommend it to the Council for the work plan to be approved. However, the Council will not approve an exploitation application if there is evidence of a risk of serious harm to the marine environment. In addition to approving exploitation applications, the ISA is also trying to establish an environmental compensation fund through the Exploitation Regulations aimed at paying for preventive and restoration measures where the Contractor or sponsoring State is not liable.

The sponsoring States also have obligations to take precautionary approaches. All three exploration regulations stipulate that in order to ensure the effective protection of the marine environment from possible harmful effects of activities in the Area, the Authority and sponsoring States should adopt a precautionary approach as reflected in Principle 15 of the Rio Declaration. Regulation 33 of the Regulations on Prospecting and Exploration for Polymetallic Sulphides in the Area provides that Contractors, sponsoring States, and other interested States or entities shall cooperate with the Authority in the establishment and implementation of programs for monitoring and evaluating the impacts of deep seabed mining on the marine environment. In addition, the application of a precautionary approach is also an integral part of the sponsoring State's obligation of due diligence. As long as there are potential environmental risks in the activities guaranteed by the sponsoring State, even if there is no sufficient scientific evidence to prove it, necessary measures should be taken to fulfill the obligation of due diligence. The Article 194 of the UNCLOS embodies the requirement for States to fulfill their obligations diligently. The application of precautionary approaches is closely related to the duty of diligence. On the one hand, in the absence of sufficient scientific evidence but serious or irreversible risks, the application of a precautionary approach helps to clarify and enrich the content of the due diligence obligation in substance and procedure. On the other hand, the duty of due diligence helps States to resolve disputes over the application of the precautionary approach. Therefore, the sponsoring State involves the application of the precautionary approach when performing both direct obligations and obligation "to ensure".

The Contractor's application for exploration of deep seabed mineral resources can only be carried out after the application is approved, and the exploration contract will generate the exclusive right to explore mineral resources within a certain period in a specific area. Environmental obligations are broader in relation to exploitation than exploration. The Contractor must take the necessary steps to prevent and minimize pollution and other hazards to the marine environment and shall always take precautionary measures. The Contractor shall also cooperate with the Authority to develop and implement a management and monitoring plan for the potential impact of exploitation activities on the marine environment and must submit an annual report to the Authority. In addition, compared

with exploration, Contractors have stricter obligations to protect the environment from exploitation. Each application should include a scientific description of the proposed activities, the possible impacts of the exploitation activities on the marine environment and biodiversity, and a list of recommended measures to reduce and control pollution and other hazards to the marine environment.

The application of the precautionary approach means that necessary measures need to be taken when there are scientific uncertainties, which need to clarify the existing scientific knowledge or information and the limits. Given the current limited scientific understanding of deep sea ecosystems and the environmental impacts of deep seabed mining, the views of recognized experts and scientists are particularly important. The expertise advisory mechanism can be a way to provide the best scientific information and clarify uncertainties. According to Article 165(2)(e) of the Convention and Article 8 of Annex III, independent experts may provide advice on specific matters such as marine environmental protection and data assessment of reserved areas. A disconnect between scientists and other stakeholder groups may result in interactions related to science being abstract, jargon-filled (e.g., ecosystem approach), and unspecific, which can sometimes lead to miscommunication and planning errors. When science is not accessible to seabed mining policymakers, the operationalization of regulation frameworks can be hindered [48]. Additionally, interdisciplinary cooperation is likely to become even more relevant when cumulative impacts are to be considered because deep sea mining will add to existing threats to the marine environment, including temperature increase, acidification, deoxygenation, and fishing [49].

To summarize, the Authority, the sponsoring State, and the Contractor all play an important role in the application of the precautionary approach in deep seabed mining. In addition, relevant scientists and experts also have their unique roles. At present, public consultations are ongoing based on an initial set of ten drafts that pertain to phase one, which ranges from matters relating to environmental management systems, environmental performance guarantees, baseline environmental data, environmental impact assessments, hazard identification, and risk management.

4.2. Improving the Application of Precautionary Approaches in Deep Sea Mining by Multi-Subject Participation

The ISA, sponsoring States, Contractors, scientists, and experts all play a role in the upcoming governance of deep seabed commercial mining. The implementation of precautionary approaches requires a balance between potentially serious environmental risks, available scientific evidence, and cost-effectiveness. Multi-subject participation is an important factor in applying precautionary approaches, allowing competent international organizations to understand the variety of views and concerns regarding environmental risks and their acceptable levels. ISA can establish greater public participation in the ISA's meetings through providing space in the agendas of Assembly and Council meetings for public input; allowing observers to attend pre-determined portions of Finance Committee and LTC meetings, and encouraging all ISA organs, the LTC in particular, to better engage with external experts and organizations, through requests for advice [50]. ISA can also work to make as much information as public as possible, and use the regulatory control to secure a much larger public take [51]. Strengthening the multi-subject participation in the law-making of the deep seabed environmental protection of the ISA will help to promote the consensus on adopting precautionary approaches for deep seabed commercial mining governance.

4.2.1. Identifying the Scope of Environmental Impact Assessment

For the ISA, which represents the interests of all mankind, multi-subject participation is very important. As mentioned above, there are differences among States on whether social factors should be considered in the process of environment impact assessment. Environment impact assessment is one of the specific manifestations of precaution. Precautionary decision-making includes consideration of scientific knowledge and the identification and

examination of uncertainties. The precautionary approach is valuable in many stages of both the preparation and evaluation of environment impact assessment. The application of the precautionary approach is by stressing the need to avoid the occurrence of irreversible damage. Seeking alternatives to the proposed action as well as ongoing monitoring and research are also essential components of the precautionary approach. Moreover, where there is a possibility of an adverse effect, the provision of evidence that the nature or extent of this will be acceptable will rest with the operator [52]. Regulation 44 of the draft now establishes that not only the ISA and the sponsoring States but also Contractors must plan, implement, and modify the measures within their competences, for the effective protection of the marine environment from harmful effects, applying the precautionary principle to assess and manage the risk to the marine environment.

The precautionary approach requires considering the capabilities of States and cost-effectiveness requirements, which also means that social factors should be considered together rather than just focusing on environmental impacts. As for assessing the biophysical, social, and other relevant effects of the proposed mining operation, the ISA, Contractors, sponsoring States, and the relevant stakeholders will be involved. The ISA, mining Contractors, and sponsoring States are required to apply a precautionary approach to ensure effective protection of the marine environment from the harmful effects of mining. This requirement entails the implementation of protective measures at an early stage in response to a risk of harm, even if scientific evidence as to the specific harm remains uncertain. These measures must be proportionate to the risk [53]. The ISA is currently discussing the establishment of Impact Reference Zones (IRZ), which are “representative of the environmental characteristics of a particular region to be used for assessing the effect of activities in the region on the marine environment”, as well as Preservation Reference Zones (PRZ), which according to the ISA glossary describe “areas representative of the mine site in which no mining shall occur to ensure representative and stable biota of the seabed in order to assess any changes in the flora and fauna of the marine environment caused by mining activities” [54]. In addition, current regulations of environment impact assessment in the draft are flawed without taking alternatives into account. The environment impact assessment typically includes consideration of viable alternatives, including different project locations, sizes, processes, operating conditions, etc. Applying the precaution for the environmental risks that may arise from specific deep seabed mining activities also needs to take into account alternatives to the activity. The establishment of alternatives will undoubtedly require the participation of Contractors, sponsoring States, the ISA, and relevant stakeholders.

4.2.2. Developing Environmental Standards and Guidelines

Regulation 94 of the draft stipulates that the LTC shall, taking into account the views of recognized experts and relevant stakeholders, make recommendations to the Council on the adoption and revision of standards relating to the conservation of the resources and protection of the marine environment. This means that the draft regulations recognize that in the formulation of environmental standards, in addition to the participation of States in the ISA Council, experts and stakeholders can also participate in the formulation of environmental standards. As for the Contractors who are directly restricted by environmental standards, they often influence the formulation of environmental standards by submitting opinions to their sponsoring States. The views of recognized experts and relevant stakeholders should also be taken into account in the follow-up consultations on environmental standard regulations and the formulation of relevant standards and guidelines. The ISA will need a process to review progress toward its targets by evaluating quantifiable performance indicators. At the global and regional scales, this process should not be left to Contractors, as it may not guarantee that the ISA’s environmental objectives are met, although a compilation of standardized measures from Contractors can inform the progress. Developing overarching goals and objectives may require crossing jurisdictions or sectors and, considering cumulative impacts, could require the ISA to work with other

entities that manage or influence the deep ocean. Additionally, ISA needs to cooperate with the scientific community and other stakeholders, which must develop and implement strategic environmental goals and objectives across mineral resource types and environmental settings. This process will require targets that are measurable through a series of realistic indicators and associated ecological thresholds [55].

4.2.3. Promoting the Implementation of Environmental Management and Monitoring

The precautionary approach is incorporated into the Authority's exploration contracts. The ISA is conducting preliminary work on environmental baselines that will facilitate an ecosystem-based approach. Establishing an environmental baseline makes it easy to understand what biota exists at a particular mining site, what impacts mining will have, and how to minimize and manage those impacts [56]. The standard contractual clauses provided by the ISA state that the Contractor shall take the necessary measures to adopt a precautionary approach to the extent reasonably possible. In the draft regulations, the environmental management and monitoring plan is a necessary condition for the Contractor to apply for exploitation. The Contractor shall also implement and maintain an environmental management system. During the application stage, Contractors need to prepare environmental management and monitoring plans in line with the respective regional environmental management plans. Contractors shall submit an environmental management and monitoring plan, together with an environmental impact statement and closure plan, as part of their work plan to the Authority. Currently, there are differences among various parties on how to specify and implement environmental management and monitoring. The implementation of precaution needs to consider States' capacity. The requirements for a precautionary approach may differ for developed and developing countries. In the future consultations on the draft regulations and related standards and guidelines, it is meaningful to achieve a greater degree of multi-participation and provide space for States or Contractors to decide.

4.2.4. Improving the Application of the Regional Environmental Management Plans

Although it may be difficult in the absence of adequate scientific information on deep sea ecosystems, the main priority remains the definition of conservation objectives. The regional environmental management plan (REMP) is a useful tool aimed at operationalizing the precautionary approach. The Regional Environmental Management Plan for the Clarion-Clipperton Zone reflects the REMP as an application of precaution. The Regional Environmental Management Plan for the Clarion-Clipperton Zone not only covered the exclusive exploration areas of relevant States and reserved areas, but also selected nine areas of particular environmental interest. The Plan stipulates the location, size, characteristics, operational objectives, and monitoring mechanisms of areas of particular environmental interest. The environmental management plan for the Clarion-Clipperton Zone, as adopted by the ISA in 2012, protects approximately 25% of the management area [57]. The goal of the regional environmental management plan is to avoid serious or irreversible damage to important seabed ecosystems caused by deep seabed mining through area-based management tools. The formulation or implementation of regional environmental management plans requires the multi-participation of the ISA, sponsoring States, Contractors, stakeholders, scientists, and experts. Currently, States have different opinions on how to specify the regional environmental management plan in the draft regulations. As a means of area-based management, regional environmental management plans will affect the exploitation activities within its scope, the activities on high seas, and the marine activities of adjacent coastal States. In future consultations on relevant regulations, it is important to strengthen the consideration of opinions from all relevant parties and improve the transparency of regional environmental management plan formulation on the basis of the best available science.

5. Conclusions

Taking precautionary approaches is the core of the ecosystem-based management of deep seabed mining and is a legally binding obligation on ISA, States, and Contractors. For controlling and reducing potential adverse effects on the marine environment and biodiversity of the international seabed area caused by deep seabed mining, the draft exploitation regulations take precautionary approaches such as stipulating rules, including environmental standards and guidelines, environment impact assessment, environmental management and monitoring plan, and REMPs. However, there are still obvious differences and controversies about making these rules between States due to limited scientific knowledge and diverse States' interests. Multi-subject participation in the law-making helps to make scientific and legitimate decisions that take into account the interests of all relevant parties, and is conducive to promoting consensus among them. We found that the Authority, the sponsoring State, and the Contractor all play an important role in the application of precautionary approaches in deep seabed mining. In addition, relevant scientists and experts also have their unique roles. The stakeholder engagement and the response mechanism to stakeholder comments and suggestions are needed in the process of environmental rule-making in the exploitation regulations. We suggest that multi-subject participation in the ISA's law-making on taking precautionary approaches to govern commercial deep seabed mining shall be strengthened to identify the scope of environmental impact assessment, develop environmental standards and guidelines, promote the implementation of environmental management and monitoring, and improve the application of REMPs.

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Article

The Impact of Globalisation on the Development of International Fisheries Law

Kuan-Hsiung Wang¹ and Hung-Jeng Tsai^{2,*}

¹ Graduate Institute of Political Science, National Taiwan Normal University, Taipei 106, Taiwan; khwang@ntnu.edu.tw

² Graduate Institute of Marine Affairs, National Sun Yat-sen University, Kaohsiung 804, Taiwan

* Correspondence: hjtsai@mail.nsysu.edu.tw

Abstract: As the starting point, this paper introduces the development of globalisation and the evolution of the international legal order and then discusses the interaction between the two. The article then explores the impact of the “concept” and “practice” of globalisation on the evolution of the international fisheries’ legal system by taking “sustainable development” and “international trade” as the probes to gain a practical understanding of the protection and conservation of high seas fisheries’ resources. The authors argued that the international law of the sea is an ever-renewing legal system, especially in the regulation of conserving and managing high seas fisheries resources, which has undergone tremendous and drastic changes in recent decades due to the development of global trade, the strengthening of environmental issues, and the flourishing of international organisations. Obviously, globalisation is an important and fundamental driving force behind it. The authors presented findings by observing the changes in international fisheries law during the two decades between the signing of the UNCLOS and the completion of the IPOA-IUU.

Keywords: globalization; international fisheries law; international fisheries organisations; fish products; high seas fisheries

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1. Introduction

If globalisation could be defined as the transnational flows of commodities, capital, labour and information, then the globalisation that began in the 1980s is the result of two major trends. The first is economic liberalization and the second is the advancement of information and communication technologies (ICT).

The world system we live in today is composed of two interconnected parts: the international political system dominated by individual nation-states and capitalism aimed at endless capital accumulation. The preservation of the sovereignty of nation-states (especially the ability to mobilize for war) requires the mobilization of domestic resources. Therefore, the efficient production capacity organized by capitalists constitutes one of the key supporting forces. On the other hand, the efficient operation of the market economy requires effective legal management and management of bureaucracy in every aspect, from the mobilization of production factors, production, sales, consumption, and financial management to the final accumulation of capital.

At the time of the gold standard, it was believed that there was a self-regulating market mechanism, free from political interference, that applied to both microscopic everyday transactions and the macroscopic global economy. However, the gold standard was actually operated on the basis of British hegemony. The First World War not only destroyed the gold standard, but also proved that states could effectively intervene in economic activities, such as production, distribution, and consumption, in order to mobilize for war. After the Second World War, the proposition that economic development requires effective government regulation and control, as elaborated by John M. Keynes, became the cornerstone of the Bretton Woods system.

However, after the stagnant inflation in the 1970s, Keynesianism was replaced by the supply side economics advocated by the UK and the US, which was based on the liberalization of trade, finance, and labour markets in order to increase productivity and eliminate inflation. This unveiled the introduction of neo-classic economics in the 1980s, which emphasizes the removal of government regulation and free flows of productive factors across state boundaries. Deregulation and transnational governance formed the premise of the World Trade Organisation (WTO) in 1995.

Institutional deregulation was reinforced by technological innovation. A crucial factor contributing to globalisation in the 1980s is the digitization of information and global network mobility created by ICT, a general technology that serves as the basis for other technological applications. At the same time, the accelerated flow of knowledge due to the advancement of information technology had in turn accelerated the development of innovative information technologies. The mutual reinforcement between the use of knowledge and the creation of knowledge, the so-called “feedback loop” of knowledge, rapidly developed into a transnational information network, which promoted not only global supply chains but also global governance constituted by formal intergovernmental negotiation and collaboration of non-government organisations [1].

The feedback loop effect between the use and creation of IT has changed the traditional vertically integrated industrial division of labour. Rapid technological innovation allows each production segment in the information industry to develop further technological differentiation, thus facilitating the transformation of the industry organisation from vertical integration to vertical differentiation. In the more differentiated technological levels, each country seeks its own production niche, and together they form a networked global production system that is more flexible in the organisation and more interdependent in function, also known as global supply chains. Global production is not limited by geographical boundaries, and can truly utilize the cheapest factors of production with comparative benefits in economics to carry out the most efficient production, and at the same time, accelerate the development of inter- and intra-industrial trade, of which computers, electronic products and automobiles are the most typical examples.

As a more elaborated global division of labour promotes increased productivity, it creates the crisis of resource exhaustion and environmental deterioration. In 1983 the United Nations established the World Commission on Environment and Development, which publicized “Our Common Future: Report of the World Commission on Environment and Development” in 1987 UN, *Report of the World Commission on Environment and Development: Our Common Future* (1987). [2]. The report pointed out that past economic growth patterns and governance, based on the sovereignty of individual nation-states, had caused the global ecological crisis to extend into interlocking crises ([2], para. 15).

These related changes have locked the global economy and global ecology together in new ways. In the past, we were concerned about the impacts of economic growth on the environment. We are now forced to concern ourselves with the impacts of ecological stress-degradation of soils, water regimes, atmosphere, and forests upon our economic prospects. More recently, we were forced to face up to a sharp increase in economic interdependence among nations. Ecology and economy are becoming ever more interwoven locally, regionally, nationally, and globally into a seamless net of causes and effects.

To deal with these interlocking crises, *Our Common Future* proposes that global development in the future must be sustainable development, whose definition is “to meet the needs of the present without compromising the ability of future generations to meet their own needs” ([2], para. 27). Sustainable development set the main tone of the Earth Summit at Rio de Janeiro in 1992, which formulated a series of institutional and legal reforms and funding sources required to establish an integrated management mechanism to solve global ecological degradation. Although these declarations and conference reports are not legally binding, they still provide the legal framework for normative perspectives to deal with global environmental problems. It is also under this transformation that the number of global NGOs rapidly grew and formed a bottom-up network of global governance.

The aforementioned observations are also reflected in the development of the international legal system. Since the adoption of the United Nations Convention on the Law of the Sea (UNCLOS) in 1982, the international fishery legal system has gone through a surging development and evolution. This reveals the impact of certain globalisation issues, such as “sustainable development and utilization of resources”, “international trade and the environment”, and “strengthening conservation and management measures of international fishery organisations” on the development of international fisheries law.

In the past four decades, since the signing of the UNCLOS, the evolution and development of international fisheries law have gained considerable impetus. This is particularly evident in the high seas fisheries, where some conditions have emerged for what was originally a matter of freedom of fishing on the high seas. For example, there is the competence of coastal states to manage fisheries resources, and there are limits to which attention should be paid in catching highly migratory fish stocks and straddling fish stocks. As a result, many factors and achievements can be seen that have been involved in the development of international fisheries law. In this paper, the authors present the findings by assessing changes in international fisheries law roughly during the two decades between the signing of UNCLOS and the completion of IPOA-IUU [3]. Other important developments, such as the EU IUU Regulation (Council Regulation No. 1005/2008 of 29 September 2008) and Agreement on Port State Measures to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing, PSMA (2009) will be dealt with in another study.

2. The Impact of Globalisation on Sovereignty

The claiming and exercising of sovereignty is fundamental in international relations and international law because states, being the basic constituent units of the international community, have long advocated for the international law principle of “*par in parem non habet imperium*”, and this principle is also manifested in the United Nations Declaration on Principles of International Law concerning Friendly Relations and Cooperation Among States in accordance with the Charter of the United Nations in 1970, in which it is said that all nations are entitled to sovereign equality, regardless of differences in their economic, social, political or other conditions. Sovereign equality includes, *inter alia*, the following elements:

- (a) States are judicially equal;
- (b) Each state enjoys the rights inherent in full sovereignty;
- (c) Each state has the duty to respect the personality of other states;
- (d) The territorial integrity and political independence of the state are inviolable;
- (e) Each state has the right to freely to choose and develop its political, social, economic and cultural systems;
- (f) Each state has the duty to comply fully and in good faith with its international obligations and to live in peace with other states [4].

Under the traditional consideration of international politics, the processing of international affairs is based on a state’s practices in accordance with their respective tangible geographical boundaries as the scope of rights, supplemented by cooperation with international organisations or agreements with other states, in order to maintain or develop international relations. However, with the diversified development of globalisation issues, states are facing international affairs covering the aspects of politics, economy, law, technology, culture, media communication, environmental ecology, and social development. It is interesting to observe that the relationship between these aspects are overlapped and highly interactive, and it is difficult to differentiate them. Moreover, among those aspects, the economic factor is probably one of the most common and far-reaching elements for further consideration. It is not the only factor, but the development of economic globalisation has become the most important phenomenon among the various aspects of globalisation.

David Held analysed the development of globalisation and concluded that it includes four different issues: firstly, globalisation transcends political boundaries, as it is an extension of political and economic activities; secondly, the target of globalisation is the flow of trade, investment, finance, and culture; thirdly, globalisation will promote states’ interac-

tions and accelerate global exchanges; and fourthly, globalisation will generate influence on those issues even if they have happened far away [5]

Therefore, the operation of national sovereignty in international law has undergone changes in state practices under the rapid development of globalisation. In the case of the above-mentioned discussion on the sovereign equality of states, agreement or consensus among the States is needed. However, the reality is that states perform slowly when they are dealing with transnational issues. Under such circumstances, international organisations have gradually played more important roles in resolving those issues. In the study of globalisation, this often refers to inter-governmental organisations (IGOs), non-governmental international organisations (NGOs), and multinational corporations (MNCs). Although all three are playing active roles in the development of international relations, this paper will take IGOs as the object of discussion, since the formation of the international legal order is based on the states as the main bodies.

It is understandable that there are similar aspects in the functions of international organisations and national sovereignty through long-term practices. International organisations have independent legal personalities [6]. Furthermore, international organisations are established by sovereign states through treaties. The existence of an international organisation requires the consent of or authorization from a sovereign state. Moreover, an international organisation is capable of enforcing its resolutions on member states, and even on non-member states.

Taking high seas fisheries as an example, fisheries refer not only to the fishing activities themselves but also the shipbuilding industry, personnel, etc., but also to recruitment, welfare, fishing gear, port equipment, management, transportation, fishery product production, trade and even marketing [7]. However, it is impossible for one country to maintain its fishing industry through domestic control, either from its own legislation or from its practices in fisheries. In contrast, the globalisation of fish, the fish products trade, the regulations for such practices, and even the governance of international fisheries are all manifested in concrete ways in fishing activities.

However, the emphasis on globalisation (such as international trade practices and the flourishing development of international organisations) conflicts with the traditional concept of respect for national sovereignty in international law. This is a result of the fact that the resolution of current global international issues can no longer be achieved only by a single state, or even when the State is willing to transfer part of its sovereignty to share interests with others. This undermines the basis on which national sovereignty is built. Therefore, the concept of traditional national sovereignty has been challenged in the globalised world, and some scholars have argued that sovereignty is gradually being weakened and replaced by another form of exercise [8]

3. The Impact of Globalisation on Fishing Activities

The United Nations Food and Agriculture Organisation (FAO) has repeatedly issued warnings about the state of marine living resources, pointing out that more than 60% of major fisheries are fully exploited or overexploited, while 35% are severely exploited. Facing the predicament of the possible overexploitation of fishery resources, the Consensus on World Fisheries was adopted at the ministerial meeting held by FAO in March 1995. The document clearly states that the international community needs to take a number of actions, such as eliminating overfishing, rebuilding and strengthening fish stocks, reducing wasteful fishing practices, and developing new and alternative fish stocks based on scientific sustainability and responsible management [9]. It also warns that if the aforementioned actions are not implemented, about 70% of the fish stocks on the planet will continue to decline, and these are fish stocks currently considered to be fully exploited, overexploited, depleted, or in the process of recovery ([9], para. 7).

In addition, according to the FAO *the State of World Fisheries and Aquaculture 2022*, [10], from 1976 to 2020, the value of trade in aquatic products increased at an average annual rate of 6.9% in nominal terms and 3.9% in real terms (adjusted for inflation). The faster

rate of growth in value relative to quantity reflects the increasing proportion of trade in high-value species and products undergoing processing or other forms of value addition. In terms of exports, China remains the world's largest exporter of aquatic animal products, followed by Norway and Vietnam, with the European Union as the largest single importing market. The largest importing countries are the United States of America, followed by China and Japan. In terms of volume (live weight), China is the top importing country of large quantities of species not only for domestic consumption but also as raw material to be processed in China and then re-exported.

It is understandable that fishery activities that were originally dominated by the state, no longer exist within the jurisdiction of the state. Instead, through the globalised trade in fishery products, transnational fishing activities, and the capture of transnational fish species, these transnational, trans-regional and even global activities have given a deeper meaning to fishery operations or activities, i.e., the international legal regime governing fishing operations at sea has been influenced by the environment protection consideration, the globalisation of trade, and the measures taken by international organisations.

3.1. Conservation and Management of Fishery Resources

As a result of the rapid pace of industrial modernisation and the globalisation of the sale of industrial products, the entire Earth has suffered from the after-effects of the development of civilisation. The deterioration of the ecological environment has led the international community to reconsider the protection of the global environment and the use of biological resources. States are aware of the fact that the global environment is indivisible, and if one ecosystem or one region is damaged, the effects will spread to other ecosystems or regions, and even to the whole world. For example, the destruction of the Antarctic ozone layer, global climate change, acid rain, desertification, reduction in tropical rainforests, transboundary transportation of hazardous waste, damage to the marine environment, and carbon dioxide emissions from various countries are all directly or indirectly harmful to the global ecological environment. Among these considerations, fishery activities are an extremely obvious area. The commercial transaction of fish and fish products and the active mobilization of fishing activities are worthy of observation because they may not only cause the depletion of living marine resources, but also the destruction of marine ecosystems.

If we only look at the phenomenon of marine environmental pollution and the over-exploitation of biological resources, overfishing and the deterioration of marine habitats are destroying the main source of human food. Rapid population growth, excessive land use, agriculture production, deforestation, fishery resources over-exploitation, urban development, and industrial emissions all affect the marine environment. According to the Sustainable Development Goals Report 2022, between 2009 and 2018, the world lost about 14% of its coral reefs, often called the "rainforests of the sea" because of the extraordinary biodiversity they support. The oceans are also under increasing stress from multiple sources of pollution, which is harmful to marine life and eventually makes its way into the food chain. Among those sources of pollution, 80% comes from land-based activities. In 2021, a study estimated that more than 17 million metric tons of plastic entered the world's oceans, making up about 85% of marine litter. The volume of plastic pollution entering the ocean each year is expected to double or triple by 2040, threatening all marine life. Moreover, in terms of fishery resources, global fish stocks are under increasing threat from overfishing and from IUU fishing. More than a third (35.4%) of global stocks were overfished in 2019, an increase compared to 34.2% in 2017 and 10% in 1974. In addition, the rapidly growing consumption of fish (an increase of 122% between 1990 and 2018), along with inadequate public policies for managing the sector, have led to depleting fish stocks [11,12].

The international community is aware that the pollution of the marine environment and the overexploitation of living marine resources are seriously undermining the productivity of the oceans and endangering the livelihoods of those who depend on them for their livelihoods. Through the signing and entry into force of the UNCLOS, the international

community sought to provide a comprehensive legal framework for the management of the oceans and seas. Part XII of the UNCLOS stipulates the sources of pollution from land, sea, and atmosphere, as well as the consequences of pollution resulting from economic development activities that exploit marine resources. Obviously, overfishing is one of those activities. However, this convention is just the beginning and there have been numerous meetings and documents on the regulation of high seas fishing activities.

3.1.1. The Emergence of the Concept of Responsible Fishing

The Mexican government convened the International Conference on Responsible Fishing in Cancun, Mexico, from 6 to 8 May 1992. The Cancun Declaration defines 'responsible fishing' as "meaning that the sustainable use of fisheries resources should be compatible with the environment; that fishing and farming activities should not harm ecosystems, resources or their quality; and that the valorisation of fish products or manufacturing processes should meet the requirements of health standards and provide products of good quality to consumers in the course of commerce" and that "subject to the relevant provisions of the UNCLOS freedom of fishing on the high seas should be balanced with the obligation to cooperate between states to ensure the conservation and rational management of biological resources" [13]. The conference further explained the concept of "responsible fishing" and discussed the current state of global fisheries, resources and environment, management and development, capture and trade of fishery products, and issued a Declaration of Cancun on the conservation and management of global fisheries resources. The Declaration requested FAO to consult with relevant international organisations to draft a Code of Conduct for Responsible Fishing, which takes into account the Declaration. However, it is a document expressing political willingness and it is not legally binding in its nature.

3.1.2. Chapter 17 of Agenda 21

The United Nations Conference on Environment and Development (UNCED) was held in Rio de Janeiro, Brazil from 3 to 14 June 1992. The conference discussed the issue of marine fisheries and concluded that all oceans should be protected, used wisely and exploited for their biological resources. The Rio Declaration on Environment and Development (Rio Declaration), [14], and Agenda 21 [15,16], were adopted, and Chapter 17 of Agenda 21 includes a section on the protection of the marine environment. Paragraph 17.46 of Chapter 17C "Sustainable use and conservation of marine living resources of the high seas" emphasizes [16] that states commit themselves to the conservation and sustainable use of marine living resources on the high seas. To this end, it is necessary to:

- a. Develop and increase the potential of marine living resources to meet human nutritional needs, as well as social, economic, and development goals;
- b. Maintain or restore populations of marine species at levels that can produce the maximum sustainable yield as qualified by relevant environmental and economic factors, taking into consideration relationships among species;
- c. Promote the development and use of selective fishing gear and practices that minimize waste in the catch of target species and minimize by-catch of non-target species;
- d. Ensure effective monitoring and enforcement with respect to fishing activities;
- e. Protect and restore endangered marine species;
- f. Preserve habitats and other ecologically sensitive areas;
- g. Promote scientific research with respect to the marine living resources in the high seas.

Therefore, all states (whether coastal or distant-water fishing nations) have the responsibility to protect and manage the living resources in the high seas. As a result, the conservation and management of marine living resources have been widely debated by the international community and a consensus has been reached on the further conservation and management of high seas fisheries resources. Since the launch of Agenda 21, the international community has been actively discussing, formulating, and adopting a series

of documents for the conservation and management of marine resources with the goal of “sustainable development”, although Agenda 21 itself does not have binding forces.

3.1.3. Regulation of Fishing Vessels Operating on the High Seas

At its 27th session in November 1993, FAO adopted the Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas (the Compliance Agreement) [17]. Its preamble begins by reaffirming the freedom of fishing on the high seas and the restrictions it faces when exercising such freedom. One of the main restrictions is that “all states have the duty 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” ([17], paras. 1,2). The Compliance Agreement establishes and strengthens the means for the flag state to exercise jurisdiction and control over fishing vessels that have the right to fly its flag in accordance with the UNCLOS, and at the same time, promotes transparency in high seas fishing operations.

3.1.4. Regulation of Fishing Operations Targeting Straddling and Highly Migratory Fish Stocks

On 4 August 1995, the United Nations adopted 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 (the UNFSA) [18]. The goal of the UNFSA is very clear; that is, to ensure the long-term conservation and sustainable use of straddling fish stocks and highly migratory fish stocks through the effective implementation of the relevant provisions of the UNCLOS ([18], Article 2). The UNFSA takes into account the integrity of marine ecology, so it is stipulated that the parties should also assess the impact of fishing, other human activities and environmental factors on the target population (target stocks) and species belonging to the same ecosystem or species related to or dependent on the target population. If necessary, conservation and management measures should be harmonized for species belonging to the same ecosystem or related species to maintain or restore the number of such species, so as to prevent the reproduction of species from being seriously threatened ([18], Article 5). At the same time, the UNFSA also clearly stipulates that coastal states and states fishing on the high seas shall have the duty to “cooperate” to adopt measures to ensure the long-term sustainability of straddling fish stocks and highly migratory fish stocks and promote the objective of their optimum utilization [18].

3.1.5. Establishment of the Code of Conduct for Responsible Fisheries

In October 1995, the resolution of the 28th session of the FAO adopted the Code of Conduct for Responsible Fisheries, [19]. It is a continuation of the 1992 Cancun Declaration. The purpose of the Code of Conduct is mainly to provide an international standard of conduct to promote the effective development, conservation, and management of fishery resources. That is to say, the principles of the Code of Conduct can promote the consistency between the development and utilization of fishery resources and the principle of “sustainable development”. Moreover, it recognizes the important role of fisheries in world food security, economic and social development, and the need to ensure the sustainability of aquatic biological resources and their environment for present and future generations. Two points are worth noting. The first is that compared to the term of “fishing responsibility” used in the 1992 Cancun Declaration, the Code of Conduct uses “responsible fisheries”. This change indicates an expansion of the definition of fisheries to include the whole range of fisheries’ activities, rather than being limited to fishing alone; the second is that the Code of Conduct in its first article expresses that the document is voluntary in nature ([19], Article 1.1). It continues to say that certain parts of it are based on relevant rules of international law, including those reflected in the United Nations Convention on the Law of the Sea of 10 December 1982. The Code also contains provisions that may be or have

already been given binding effect by means of other obligatory legal instruments amongst the Parties, such as the Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas, 1993, which, according to FAO Conference resolution 15/93, paragraph 3, forms an integral part of the Code and it does not have a mandatory legal regulatory force. However, it appears from states practices that the Code of Conduct has become a fundamental instrument in the development of international fisheries law.

3.1.6. Other Instruments concerning Fishing Activities

The Kyoto Declaration and Plan of Action on the Sustainable Contribution of Fisheries to Food Security was adopted by delegates from 95 countries at a conference in Kyoto, Japan, from 4 to 9 December 1995. In the Kyoto Declaration [20], participants noted the trend of the increasing global population, the need to ensure a secure supply of food for present and future generations, the significant contribution of fisheries to income, wealth and food security, and the importance of fisheries to a number of low-income and undersupplied countries, and therefore, the importance of the concept of sustainable use of resources in order to promote the goal of maximizing the utilization of fish products.

The Rome Declaration on the Implementation of the Code of Conduct for Responsible Fisheries was adopted at the FAO Ministerial Conference held on 10–11 March 1999 [21]. In particular, Paragraph 4 of the Rome Declaration expresses that the participating states welcomed the adoption by the FAO Committee on Fisheries at its 23rd Session in February 1999 of International Plans of Action for the Management of Fishing Capacity (IPOA-Capacity), for the Conservation and Management of Sharks (IPOA-Sharks), and for Reducing Incidental Catch of Seabirds in Long-line Fisheries (IPOA-Seabirds) [22]. These International Plans of Action are all within the framework of the Code of Conduct for Responsible Fisheries. It is hoped that the content of these documents and the role of countries in policy formulation will lead to the development of national action plans to achieve the goal of sustainable use of high seas living resources.

In addition, in view of the increasing number of fishing activities on the high seas by fishing vessels of the flag of convenience and the need for the development of an international fisheries management system, the FAO Committee on Fisheries (COFI) adopted the International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing (IPOA-IUU) at its 24th session on 2 March 2001 [3]. It is expected that fishing vessels that are deemed as not regulated by international fisheries organisations do not comply with relevant conservation management measures and do not submit or submit false catch reports will be combated and eliminated. It is because such practices are contrary to the objectives of international fisheries management organisations to conserve fisheries' resources and have a significant negative impact on the sustainable use of fishery resources.

3.1.7. Johannesburg Global Sustainable Development Summit and Implementation Plan

Ten years after the aforementioned Rio Declaration in 1992, the World Summit on Sustainable Development (WSSD) in Johannesburg in 2002 adopted a Plan of Implementation [23], which set out a timetable for the sustainable development of fisheries resources:

By the end of 2004 → Preventing, deterring and eliminating illegal, unreported and unregulated fishing.

By the end of 2005 → Countries and regional fisheries organisations agree on effective, equitable and transparent management of fishing capacity on a global basis.

2006 → Substantial progress can be made to protect the marine environment from land-based activities.

By the end of 2012 → Establishment of representative networks and time/area restrictions on the protection of fish farms and periods.

By the end of 2015 → Maintain or restore populations to a level where they can produce maximum sustainable production.

While this approach demonstrates the international community's concern over the depletion of fisheries resources and the urgency of restoring them, the schedule for completion also demonstrates the binding effect that the WSSD Plan of Implementation seeks to achieve. However, as the situation stands today, the arranged schedule and outcome expectations appear overly optimistic.

Following the two Earth Summits and the progress of the concept of sustainable development of high seas fisheries resources, it is clear that the international community is increasingly concerned about the depletion of fisheries resources and the urgency of restoring them. Even in terms of drawing up a schedule, members of the international community have expressed great anxiety about the connection between the sustainable development of resources and the conservation of marine living resources.

3.2. Fish Products Trade

The scope of trade in fishery products is a standard global phenomenon, and through trade practices, the quality and quantity of capture of fishery resources is enlarging, and even the velocity of depletion of these resources is accelerating. As a result, there is a tendency for governments or international organisations to discuss environmental protection issues in conjunction with trade activities and to link them more closely. The following is an analysis of the relationship between trade and the environment in relation to the adoption of trade measures and the application of eco-labelling between countries.

Trade measures are used to influencing the formulation or modification of specific policies of other countries by adjusting trade activities. One of the famous examples is the one between the United States and Mexico over the conservation of dolphins, which can be traced back to the enactment of the US Marine Mammal Protection Act (MMPA) in 1972 to protect marine mammals from the harmful effects of human fishing activities. According to the Act, embargoes could be imposed on countries that did not meet US conservation and management standards.

In addition to this, the promotion of 'dolphin safe' eco-labelling has been established through private commercial activity in the USA. The concept of eco-labelling is to regulate fishing activities through commercial behaviour between the consumer and the producer. Through the use of the eco-labelling system, consumers are encouraged and educated to consume fish species that have been caught from sources that have been replenished. This approach is supported by companies, governments, and volunteer groups worldwide.

This dual approach of domestic legislation and domestic commercial pressure by the US government has put great pressure on many fishing nations around the world, one of which is Mexico. In 1990, the United States imposed an embargo on tuna produced in Mexico under the Marine Mammal Protection Act, but this was countered by Mexico under the terms of the General Agreement on Tariffs and Trade (GATT). The reason for this controversy is that dolphins and tuna often migrate together in the waters of the Eastern Pacific Ocean, which has led fishermen to use dolphins migrating at the surface as a reference target when fishing for tuna in deeper waters, but this led to by-catch. This practice has drawn the attention of several marine environmental and ecological conservation groups in the United States and has led to a boycott of Mexican fishing products by the US government.

The controversy over ecology and resource conservation has not diminished with the passage of time, or even with improved fishing laws in Mexico. In 1992, the Dolphin Conservation Program was established within the IATTC, the regional fisheries organisation for the Eastern Pacific Ocean region, to protect dolphins and reduce their mortality due to fishing operations. Under the programme, representatives from IATTC member governments, the fishing industry, and environmental conservation groups form the International Review Panel, which reviews reports from onboard observers, determined whether there had been a breach of operational regulations and recommends sanctions.

Statistics show the mortality rate of dolphins during fishing operations has decreased from 130,000 in 1986 to 3000 in 1994, which is a remarkable result [24]. Although the

US government lifted the embargo in 1997, a combination of boycotts by canners and distributors in the US led to restrictions on the sale of tuna products from countries such as Mexico, which have not yet been lifted and have led to trade conflicts between the US and Latin American countries, particularly Mexico. In addition to the case concerning the embargo on tuna products, there is also the case concerning the Import Prohibition of Certain Shrimp and Shrimp Products between Malaysia and the United States under the dispute settlement system of the World Trade Organisation [25]. In that case, the United States invoked its domestic law (Section 609 of the US Public Law 101-162) to prohibit the importation of shrimp products where the use of trawls to catch shrimp had caused the death of sea turtles. While this is certainly relevant to ecological conservation, it has prompted Malaysia to appeal to the World Trade Organisation to resolve the dispute. Meanwhile, Australia, the European Union, Hong Kong, China, India, Japan, Mexico, and Thailand have also submitted position papers for third-party countries.

Professor Richard Parker suggested that such trade sanctions can be abused in three ways by those who emphasize free trade: firstly, by protectionism in disguise; secondly, by imposing trade pressure specifically for environmental reasons; and thirdly, by imposing bilateral economic pressure on the sanctioning state to alter multilateral cooperation, or to impose excessive and unfair conditions on that cooperation [24].

Regardless of which assumption is consistent with future developments, the use of trade measures as a means of achieving environmental protection is already well established and should continue to be discussed in the context of future environmental issues. It is also worth noting that manipulating domestic legislation as a tool to influence the policies of other countries has become a common practice in non-traditional interactions between countries.

Another issue is an analysis of the application of eco-labelling. The so-called eco-labelling is a process of approving labels for fish products that have a lower environmental impact during the production process, with the aim of increasing the sustainable management of fisheries and educating consumers about environmental protection [26]. The concept of eco-labelling has already been discussed in the previous discussion of trade measures, with the aim of regulating fishing activities through commercial behaviour between consumers and producers. The European Union's view on eco-labelling is to provide guidance to consumers on products that aim to reduce environmental impacts during the biological life cycle and to provide information on the environmental characteristics of labelled products [27]. In general, in state practices, the use of eco-labelling encourages and educates consumers to consume fish or fish products that have been processed from sources that are sustainable.

Whether the use and requirements for eco-labelling will constitute a non-tariff (or technical) barrier to the trade of fish and fish products remains to be explored, but the impulsion of international non-governmental organisations is a demonstration of the impact of trade globalisation.

3.3. Efforts from Regional Fisheries Management Organisations (RFMOS)

In any case, by way of the integration capability, international organisations should have the effect of achieving governance on the conservation of fishery resources that are transnational in nature. This is evidence that resolutions adopted by international organisations have become, in substance, one of the sources of international law. [28] Therefore, Article 118 of the UNCLOS specifies how to conserve and manage high seas resources among countries. Furthermore, according to the provisions of the Convention on the Law of the Sea, with regard to the issue of straddling and highly migratory fish stocks, the second paragraph of Article 63 imposes this obligation on coastal states and fisheries that fish these stocks on the high seas states, they should agree or cooperate on ways to conserve the stock. Such cooperation can be achieved through bilateral or other agreements, as well as through appropriate sub-regional and regional organisations. In fact, Article 63, Paragraph 2 of UNCLOS has foreseen the importance of establishing a

cooperative mechanism for the conservation of fishery resources in high seas areas, which encourages cooperation through appropriate subregional or regional organizations [29]. In addition, Article 64 adds an additional obligation to coastal states and other high seas fishing states, expressly stating that such cooperation is to ensure the conservation of straddling and highly migratory fish stocks, with a view to improving the fishery resources inside and outside the exclusive economic zone, achieving optimal utilization. If no suitable international organisation exists to ensure such cooperation, Article 64 of UNCLOS stipulates that coastal states and other high seas fishing states fishing for these stocks “shall cooperate in the establishment of such organisations and participate in their work” [29]. The emphasis on the importance of this cooperative functioning mechanism is also clearly regulated in Agenda 21:

17.10. → International cooperation and coordination, on a bilateral basis and, where feasible, at a subregional, interregional, regional or global level, with the role of supporting and complementing the national efforts of coastal States to promote integrated management and sustainable development.

17.11. → States should cooperate, as appropriate, in the development of national guidelines for integrated coastal zone management and development, taking into account existing experience.

Following this design in UNCLOS, Part III of the 1995 Compliance Agreement emphasises international cooperation mechanisms, i.e., the establishment and functions of regional or sub-regional international fisheries organisations. More notably, in order to avoid impediments to the functioning of such an international fisheries organisation by non-parties, Article 17(1) of the 1995 UNFSA goes further by providing that:

A state that is not a member of a subregional or regional fisheries management organisation or is not a participant in a subregional or regional fisheries management arrangement, and which does not otherwise agree to apply the conservation and management measures established by such organisation 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.

In international practice, there are various RFMOs that are organized on a geographic basis and have a long history of managing straddling and highly migratory fish stocks [30]. For example, the Western and Central Pacific Ocean Fisheries Commission (WCPFC) [31], the Inter-American Tropical Tuna Convention (IATTC) [32], the International Commission for the Conservation of Atlantic Tunas (ICCAT) [33], the Indian Ocean Tuna Commission (IOTC) [34]; and the Commission for the Conservation of Southern Bluefin Tuna (CCSBT) [35].

The resolutions and management measures adopted by these RFMOs have added regulative power on non-members or non-parties fishing in the waters under the RFMOs jurisdiction. For example, when the Antigua Convention enters into force, the Convention Area of IATTC was set to be the waters between the eastern boundary of the American continent’s west coast, the northern and southern boundaries of 50° S and 50° N, and the western boundary of 150° W. The Convention Area of IATTC will also include the high seas. Then, there will be many discussions or even debates on such development concerning the connotation of public international law [36]. It is a well-known principle of “*pacta tertiis nec nocent nec prosunt*”, which means “a treaty binds the parties and only the parties; it does not create obligations for a third state”. In this regard, this would be a reflection of the pressure on national sovereignty to compromise on facing the dilemma between the need for globalisation and the pursuit of national interests.

4. Conclusions

The development of globalisation has become an important phenomenon and has resulted in the development of the modern international society. It presents multiple aspects, including political, economic, cultural, and other aspects, within which, “economic globalisation” is a crucial part of globalisation, which means that various economic elements

are flowing around the world at an unprecedented speed and scale. Globalisation does not mean the inevitable elimination of national borders, but economic globalisation reflects the fact that the degree of interdependence in the international community has been strengthened and deepened. On this basis, the connotation and representation of national sovereignty are constantly being challenged.

Throughout the history of mankind, the sea has not only played the role of a nourisher providing food, but has also served as an interface for communication. Through this interface, people in different places have been able to fulfil their wishes for adventure, communication, interaction, trade, and even war. By way of using this interface, humans have gradually built up a legal system to regulate the use of the sea.

As discussed above, the international community's attitude towards marine living resources has evolved from "possession and use" to "conservation and management", and there are currently two main directions of thinking about the regulation of "conservation and management":

1. To protect marine living resources from extinction and to compile a reasonable and safe maximum catch of fish that can adequately supply human protein without wasteful overfishing through competitive fish catch records;
2. By means of these norms, coastal states or fishing nations can cooperate fully in complying with the normative agreement in a regional or sub-regional context, thereby reducing conflicts between them and promoting regional or sub-regional harmony.

This is achieved through the regulation of international trade rules, regional or sub-regional cooperation, and the management of related fishing practices. The emergence of this concept of "ocean governance" is a clear sign of the changing attitude of the international community toward oceans as a whole. "Rather than being a term for the management of the marine environment and resources, 'ocean governance' is a term for the reflection of mankind after a long period of use of the oceans, with the aim of ensuring that both ocean space and resources are used effectively and in a way that achieves sustainable resources.

From the above analysis of the development of the regulation of the international fisheries legal system, the development and influence of 'globalisation' plays an important role, whether from the perspective of environmental protection and resource conservation, from the impact of international trade practices, or from the regulation of international organisations.

Under the influence of the globalisation of concepts and through the development of international trade in fishery products, a broad platform for the promotion of sustainability has been established, which has led to a deepening concept of conservation and management of marine living resources and has, in turn, influenced changes in national legislation and policies.

At the same time, the collective forces of the international community are also pushing for the consolidation of such concepts. The RFMOs, for example, are attempting to construct legal norms that break away from the traditional international law framework of national sovereignty. Traditional international law principles such as "*pacta tertis nec nocent nec prosunt*", "freedom of fishing on the high seas" and "flag state control" are being challenged under the premise of conservation and management, and further developments are expected.

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Article

China's Engagement in Arctic Governance for Its Sustainable Development Based on International Law Perspective

Jiayu Bai ^{1,*} and Kailei Zhu ²¹ School of Law, Nankai University, Tianjin 300350, China² School of International Affairs and Public Administration, Ocean University of China, Qingdao 266100, China

* Correspondence: gracefulgl@hotmail.com

Abstract: With climate change, melting sea ice and snow in the Arctic increase the probability that states engage in activities there. The prosperity of Arctic activities serves as a reminder to the international community that the issue of Arctic governance must be prioritised to avoid Arctic unsustainable development. As a major stakeholder besides the Arctic states, it is necessary to study China's role in Arctic governance for its sustainable development to provide a reference for the diplomatic decision-making of other states. The paper selects international law as a perspective. It discusses China's engagement in the development of international law related to the theme from the global, regional, and bilateral/multilateral levels. At the global level, China's national role is characterized by engaging in global governance under the international rule of law for guarding the international order based on international law. At the regional level, China maintains the role of supporting and engaging in the Arctic Council, both before and after its establishment. At the bilateral and multilateral levels, China, as an Arctic stakeholder pursuing cooperation, has achieved many cooperation results. The paper holds that under China's national roles, China's engagement has affected the development of international law referred to the theme to some extent.

Keywords: Arctic governance; Arctic sustainable development; international law; China's role; Arctic cooperation

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1. Introduction

Sea ice in the Arctic melts rapidly. On the basis of the U.S. Environmental Protection Agency, the sea ice area in the Arctic has highlighted a negative trend in recent decades [1]. Rapid Arctic environmental change affects the entire Earth's system as thawing permafrost ecosystems release greenhouse gases into the atmosphere, further accelerating global warming [2]. On the other side of the coin, along with climate warming, the melting of ice and snow in the Arctic has provided more opportunities for activities in navigation, mining, and tourism. With an increase in human activities in the Arctic, attention has been raised about competing for richness and economic advantages [3] (p. 1), which serves as a reminder to the international community that more attention must be focused on the issues of Arctic governance in order to avoid the accelerated Arctic CO₂ release caused by the Arctic unsustainable development, which will worsen the global climate and pose a threat to human survival.

The research on the Arctic sustainable development starts from the interpretation of the concept of sustainable development. As early as the 18th and 19th centuries, issues such as intrageneration and intergenerational equity, natural resource protection, and concern for the future have been discussed by European philosophers [4] (p. 367). In the early 20th century, scholars such as Vladimir Ivanovich Vernadsky [5] (pp. 167–176) and Kenneth E. Boulding [6] (pp. 3–14) began to research sustainable development. These theories reflect the common ground of attaching importance to the future of humankind and abandoning selfishness. Based on the accumulation of these theories, the World

Commission on Environment and Development published the report called *our common future* in 1987, which is considered the starting point for proposing the concept of sustainable development. It holds that sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs [7]. Based on *our common future*, the international community has further explored the concept of sustainable development, including the World Bank [8] (p. 8) and economist Herman Daly [9] (pp. 39–53). In 1991, the book *Caring for the Earth—A Strategy for Sustainable Living* edited by the International Union for Conservation of Nature further proposed a concept of sustainable development: improving the quality of human life while living within the carrying capacity of supporting ecosystems [10] (p. 10). A sustainable society lives by several principles which contain a general principle and four standards. The general principle of “inspect and care for the community of life” is a basic principle that provides a moral basis for other principles. It requires governors to manage development so that it does not threaten the survival of other species or eliminate their habitats. The standard of improving the quality of human life emphasizes that economic growth is an important component of development, but it cannot be a goal in itself, nor can it go on indefinitely. The standard of conserving the Earth’s vitality and diversity focuses on the conservation of life-support systems of ecological processes such as climate shaping, the biodiversity conservation, and the assurance of sustainable renewable resources uses. The standard of minimizing the depletion of non-renewable resources focuses on the conservation of non-renewable resources such as minerals, oil, gas, and coal. The standard of keeping within the earth’s carrying capacity requires that policies that bring human numbers and lifestyles into balance with nature’s capacity must be developed alongside technologies that enhance that capacity by careful management. The achievement of these standards depends on the establishment of a global alliance at the international level.

As an indispensable part of sustainable development, the sustainable development of the Arctic is closely involved in the implementation of sustainable development theory. From the global perspective, the sustainable development of the Arctic involves Arctic states and other stakeholders. There are many universal interests in the Arctic region, which links the interests of Arctic states and other stakeholders. Some Arctic sustainable development issues involve the common concern of humankind, such as climate change [11] (pp. 525–530) and the conservation of biological diversity [12] (pp. 171–180). In addition, international navigation [13] (pp. 770–783) and marine environmental protection [14] (p. 1) in the Arctic do not only matter for the Arctic states themselves. In order to put the theory of sustainable development into practice, the United Nations further divides the issue of sustainable development into specific goals which are called the United Nations Sustainable Development Goals (SDGs), such as the “SDGs 13—Take urgent action to combat climate change and its impacts” and the “SDGs 14—Conserve and sustainably use the oceans, seas and marine resources for sustainable development” [15]. From the regional perspective, the Arctic Council (AC), which takes the sustainable development and environmental protection in the Arctic as its own mission [16], has set the three themes of environmental protection (Arctic Climate, Healthy and Resilient Arctic Ecosystems, and Healthy Arctic Marine Environment), sustainable social and economic development (Sustainable Social Development and Sustainable Economic Development), and strengthening the AC (Knowledge and Communications and Stronger AC) as its goals in the 10-year plan 2021–2030 [17]. At the same time, any SDGs associated with the AC’s mission and the projects and activities based on these SDGs are valued and implemented by the AC [18].

Governance is the general name of various ways in which all kinds of individuals manage their common affairs, and it is a continuous process of coordinating different interests to promote cooperation [19]. The governance process is dynamic. As the Arctic natural and political environments are constantly changing, Arctic governance for its sustainable development presents dynamic features. To facilitate an evaluation, it is necessary to select a representative, highly related indicator from the dynamic theme in order to solve a challenge that is difficult to assess owing to the dynamics of governance. Governance

and law are closely related [20] (p. 208). In global governance, the close relationship between international law and global governance proves it. Specific to the Arctic region, “the comprehensive governance model based on international law has benefited all Arctic states and the region as a whole” [21] (p. 1149). In view of the significant role of international law in Arctic governance for its sustainable development, it is reasonable to take up research from the perspective of international law.

On the evidence of the international law-making theory, international law is predominantly made by states and is often said to be a consent-based (or consensual) system [22]. Hence, when some proposals submitted by a state are adopted and embodied in the international treaty final version, it is generally considered that the state promotes the development of international law. Adoption is generally regarded as the substantive engagement of a state in international law-making. While, at the bilateral level, the substantive engagement is generally analysed from the results of the conclusion because the archives of concluding bilateral agreement are rarely open for the public. In addition, the contribution of codifying and progressively developing international law by diverse, non-binding, normatively worded instruments used in contemporary international relations by states and international organizations, called “soft law,” cannot be ignored [23]. Furthermore, both bilateral treaties and multilateral treaties are structures in a complex architecture of legal instruments that make up international law. Neglecting the significance of both of them in this complex architecture impairs our descriptive acumen in that it leaves us with only a partial account of international law-making [24].

It is an undeniable fact that China is one of the major Arctic stakeholders besides the Arctic states [25] (p. 209). As for the geographical position, Chinese experts show maps of an expansive fifteenth-century empire that nearly touches the Arctic as proof of China’s historical origin as that stakeholder [26] (p. 3). From the perspective of history, China joined the 1920 *Spitsbergen Treaty* as early as 1925. From the angle of climate change, as China is a Near-Arctic State [27], for the state’s relatively northern latitudes [28] (p. 646), it is more affected by climate change from the Arctic compared with other non-Arctic states. A study shows that there is an association between spring Arctic sea ice concentration and Chinese summer rainfall [29] (p. 1). In terms of community communication, at the border, China has “Near-Arctic nationalities” [30]. The common well-being between Chinese Near-Arctic nationalities and the peoples in the Arctic region has established by community communication. Considering geographical location, history, climate change response, and community communication, China is one of the major Arctic stakeholders.

The authors pay attention to the ideas of ecological civilization and a community of life for man and nature proposed by China in recent years. These governance initiatives are highly consistent with the “respect and care for the community of life” of the sustainable development theory. Guided by these ideas, some research articles shed light on the increased credibility of the Chinese government’s commitment to environmental protection since 2013 [31]. Adopting a four-wheel-driven approach that involves the government, enterprises, farmers, and academia, remarkable progress has been made in alleviating desertification and raising people’s incomes in Kubuqi, the seventh largest desert in China [32]. Based on satellite data, China accounted for one-fourth of the globe’s net increase in leaf area between 2000 and 2017 [33]. Accordingly, there are reasons to believe that China owns the ability and experience to conduct governance under the goal of sustainable development. In light of the close relationship between China and the two elements of the Arctic and sustainable development, it is rational to study China’s engagement in Arctic governance for its sustainable development from the perspective of international law.

The authors intend to start with a detailed description of the development of international law for the related theme at the global, regional, multilateral, and bilateral levels. Then, on the basis of the international law-making theory, the authors apply the empirical study through the analysis of the proposal contents and their adoption to explore evidence regarding China’s substantive engagement in the above-mentioned international law development at the global, regional, multilateral, and bilateral levels. These document

sources include the proposals of the Chinese representative, the adopted international law documents, the reports, and the resolutions of the conference of the parties and consensus documents. Then, according to the theory of National Role, National role is the general foreign policy behaviour of governments. National role is concluded from the policymakers' own definitions of the general kinds of decisions, commitments, rules, and actions suitable to their state, and of the functions, if any, their state should perform on a continuing basis in the international system or in subordinate regional systems.) [34] (p. 245). The authors apply the inductive study through the analysis of the official document contents to summarize the role of China at the above levels, because China's role guides a wide range of national practices, covering China's engagement in the international law development of Arctic governance for its sustainable development. In other words, the authors utilize China's role to figure out why China is willing to engage in the international law development of Arctic governance for its sustainable development and submit the proposals.

2. The Development of International Law and China's Engagement at the Global Level

At the global level, as one of the global regions, the Arctic region also faces challenges from many global issues, such as the maintenance of marine rights and interests, matters of common concern of humankind, including joint response to climate change and biodiversity conservation in whole aspects, and the navigation system in the open waters of the Arctic at relatively specific aspects. Since the solution of these global issues depends on the joint efforts of states in all regions, including the Arctic region, this requires that states, as the makers of international law, have the responsibility to formulate norms and systems to reflect their specific values and interests, any collective values or interests they may hold, or "the greater interests of humanity and planetary welfare" [35] (p. 2). Correspondingly, it is affirmed that the formation of a series of international laws and rules mentioned below has potential implications for Arctic governance. This is also the premise for the following discussion on China's dynamic engagement.

2.1. The International Law Development of Arctic Governance for Its Sustainable Development at the Global Level

2.1.1. The Field of Ocean Studies

The *Spitsbergen treaty* came into being earlier than the United Nations Convention on the Law of the Sea (UNCLOS). The *Spitsbergen treaty* is representative of this concept. The *Spitsbergen Archipelago* is a group of islands located in the Arctic Ocean. The legal status and the regime of the archipelago are governed by the unique *Spitsbergen Treaty* of 1920. Its emergence is of great significance for balancing the interests of Norway and other stakeholders in the archipelago. Before the conclusion of the *Spitsbergen treaty*, the interests of European states represented by Britain, Russia, and Norway on the archipelago of Spitsbergen were so complex that the sovereignty of the archipelago could not be clarified for a long time. After the end of World War I, the reset of the international order brought an opportunity to solve the issue of sovereignty over the archipelago. In this context, the fair system established by the *Spitsbergen treaty* helps solve the above issues in order to avoid contention between the contracting states for the rights and interests of the archipelago [36] (p. 2). The treaty also aimed to secure the economic interests of nationals from other states. This was achieved by including provisions on equal rights and non-discrimination in the most relevant economic activities [37] (p. 79). Under the treaty, the contracting parties enjoy the liberty of access and entrance within the Arctic as well as the right to carry out activities. Such rights include those of fishing and hunting in the territories specified in the *Spitsbergen Treaty* and in their territorial waters by ships and nationals of the contracting parties, the equal liberty of access and entry to the waters, fjords and ports of these territories, and the rights to carry out all maritime, industrial, mining, and commercial operations on a footing of absolute equality [38] (p. 266). Although there are details to be clarified, such as the conclusion of a convention on scientific investigation in accordance with Article 5, the treaty has smoothly existed for more than a century. At that time, the parties to the treaty

intended to solve the issue of territorial ownership, but objectively, the treaty provided favourable conditions for the parties to make rational and orderly use of the resources in the related area. It avoids the potential pre-emptive occupation and unsustainable development of related regional resources due to the dilemma of territorial ownership in a particular historical period. Specifically, the core intention of the contracting parties is to reach an agreement on how to maintain and exercise their rights over the contracting area so that the activities of the contracting parties to develop resources, including fishery resources, within the scope of application of the treaty are in an orderly state so as to ensure the peaceful use of the archipelago [39] (p. 159). The above provisions are advantageous to achieve the theoretical standard of sustainable development for maintaining the carrying capacity of the earth in specific regions of the Arctic.

The entry into force of UNCLOS has been widely recognized by States parties, including Arctic states and other Arctic stakeholders. There are customary international laws and general principles, including those related to the Arctic, such as the principle of sustainable development, which are applicable to the treatment of global international legal issues. Article 234 of UNCLOS is the only article directly related to the Arctic, which calls for marine environmental protection. The *Ilulissat Declaration* affirmed the role of UNCLOS in the governance of the marine environment, navigation, scientific research, and ice-covered areas, among other topics [40] (p. 817). UNCLOS protects the interests of humankind in the ocean by establishing legal order and provides the cornerstone for ocean studies [41] (p. 229). It proves that the parties of the convention are aware that all life on the earth is part of a huge interdependent system. Anthropogenic activities interference with the Arctic biosphere can affect the whole. Accordingly, it provides a basic legal framework for the follow-up Arctic navigation, joint response to climate change [42] (pp. 406–409), biodiversity conservation [43] (pp. 188–191), and other issues. This approach has benefited the present and future generations of Arctic residents who are part of the community of life.

2.1.2. The Field of Arctic Navigation

Economic growth is an important component of development. Although people set different goals for development, some goals are actually universal and represent universal interests, such as the Arctic navigation mentioned above. The *International code of safety for ships operating in polar waters* (PC) is a separate set of legally binding rules [44] (p. 677), which is used to guide the benign development of Arctic navigation. It balances economic development and environment protection when navigating in Arctic ice-covered waters, makes our life better in the economic and environmental fields, and makes for ensuring improvement of the quality of human life. However, the PC has not solved all international legal issues surrounding polar shipping. It is not applicable to state owned or operated vessels, smaller vessels, leisure boats, and fishing boats [45] (p. 368) and also fails to address issues of invasive species [46] (p. 176). Some sea ice areas which pose a structural risk to ships have been excluded in the PC. For instance, these areas are the North Atlantic Ocean to part of the Norwegian Sea along the shore of Norway and the adjacent part of the Barents Sea to the Kola Peninsula in Russia [47] (p. 219). It is worth affirming that the PC adapts to the latest polar navigation demand and natural environment by constantly improving itself. For example, the International Maritime Organization's (IMO) Marine Environment Protection Committee (MEPC) has adopted a resolution prohibiting the use of heavy fuel oil (HFO) in the Arctic, although certain exemptions mean that a complete ban in the Arctic is still years away [48] (P. 274). Especially in the context of the COVID-19 global pandemic, the IMO provided practical suggestions and guidance [49].

2.1.3. The Field of Joint Response to Climate Change

The increase in Arctic navigation is due to the melting of ice and snow in the context of Arctic climate change. However, the melting of ice and snow may also exacerbate the loss of biodiversity in the Arctic, which relies on ice and snow for survival, thus increasing the risk

of unsustainable development faced by humankind. In response to this concern, the U.N. General Assembly established the Intergovernmental Negotiating Committee in December 1990 [50] and adopted the *U.N. Framework Convention on Climate Change* (UNFCCC) on 9 May 1992. It is a considerable achievement to reach an agreement recognized by more than 140 states with different interests in such a limited time [51] (p. 454). It is necessary to point out that the Convention contains only a vague set of commitments regarding stabilization and no commitment to all on reductions. The *Kyoto protocol* adopted in 1997 is an attempt to implement specific measures after the Convention. It has set up a mandatory emission reduction system, but the effect is limited [52]. Some developed states listed in Annex I argue that it would affect domestic employment and cause economic losses [53] (p. 46). The key to curbing the serious threat of global warming is the investment in research, new technology, and tax incentives to promote voluntary reductions, as opposed to the imposition of mandatory regulatory target levels of emissions [53] (p. 46). For the sake of optimizing the problems existing in the *Kyoto Protocol*, based on the framework, more specific agreements are gradually produced to implement climate change response measures. Accordingly, the Warsaw climate change conference held at the end of 2013 first proposed the concept of Intended Nationally Determined Contributions (INDCs) [54] and further clarified its content and form at the Lima climate change conference in 2014 [55]. The *Paris Agreement* was a milestone, and global economies agreed to make every attempt [56] (p. 11881) to ensure that the planet's temperature does not rise above 2 °C. The achievement of this ambitious goal relies on nationally determined contributions (NDCs) [57] (p. e93). After the ratification and entry into force of the *Paris Agreement*, the INDCs have been transformed into the official NDCs. From UNFCCC to the *Paris Agreement*, these efforts help protect the ecological processes that shape the climate to protect the life support system that maintains the vitality of the earth and reach the theoretical sustainable development standard of conserving the earth's vitality and diversity.

The climate change response in the Arctic is facing challenges related to the design of earth system models and the implementation of the *Paris Agreement*. From the perspective of carbon release, most earth system models do not consider the process by which permafrost may lead to carbon release. Therefore, the *Paris Agreement* needs to assess the specific circumstances of the Arctic. In addition, climate governance depends on governance mechanisms, knowledge, and funds, which entail strict requirements for all states [58] (p. 2). To meet these challenges, the *Paris Agreement* is making corresponding adjustments. Two international carbon markets named the framework of various approaches, and the new market mechanisms were introduced recently in the light of Art. 6 of the *Paris Agreement* that affect the post-2020 climate regime [59] (p. 21).

2.1.4. The Field of Biological Diversity Conservation

Climate change has caused habitat change, which has broken the balance of ecosystems and threatened the diversity of genes, species, and ecosystems. Hence, Arctic biodiversity also deserves global attention. The *Convention on Biological Diversity* (CBD) provides solutions to biodiversity challenges within national jurisdictions [60] (p. 3295). However, the scope of the application of the CBD does not include areas beyond national jurisdiction, so it needs to be supplemented by other agreements. The *international legally binding instrument under UNCLOS on the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction* (the BBNJ Agreement) fills the gap. By stressing universal participation, the BBNJ Agreement contributes to sustainable development [61], reflecting the consideration of the common wellbeing of humankind [62]. Biodiversity conservation in the Arctic is closely related to the diversity of the earth in the standard of sustainable development. The ecology of the Arctic is fragile, and the formulation of international laws regulating the utilization of biological resources in the Arctic is conducive to preventing the uncontrolled development of its biological resources. After four preparatory committee conferences and five intergovernmental negotiations, the agreement has been reached.

During the negotiation, the most common consensus is related to the theme of capacity-building and technology transfer, which will be described in detail below.

2.2. China's Arctic Substantive Engagement in the International Law Development of Arctic Governance for Its Sustainable Development at the Global Level

2.2.1. The Field of Ocean Studies

In the light of the international law-making theory, it is necessary for the authors to find China's dynamic engagement results of the international law development related to the paper's theme by examining the adoption of China's proposals in the international law-making in the above treaties. As one of the parties to the *Spitsbergen treaty*, China (the Beiyang government) was first invited by France and joined the treaty on 1 July 1925. Due to the shortage of data about the negotiating or signing the *Spitsbergen treaty*, the authors do not find substantive engagement of China in the period of negotiating or signing the *Spitsbergen treaty*. China built a permanent research station named the Arctic Yellow River Station on Svalbard Island in 2004, which was permitted by the treaty [63] (p. 11). These scientific research practices proved that the more China conducts scientific research activities in accordance with the *Spitsbergen treaty*, the clearer the intention to establish long-term legal relations in accordance with the *Spitsbergen treaty* would be reflected [39] (p. 159). The AC's sustainable development goal of healthy and resilient Arctic ecosystems and the realization of the SDGs 14 all depend on the best scientific evidence. China has contributed to the collection of scientific evidence within the treaty area. Such scientific evidence could provide preparations for a new convention conclusion on scientific investigation in accordance with Article 5 of the *Spitsbergen treaty*.

Compared with the shortage of data about negotiating or signing the *Spitsbergen treaty*, the negotiation archives of UNCLOS are relatively complete. Since the restoration of the lawful seat of the People's Republic of China in the United Nations, Chinese representatives have actively engaged in the formulation of UNCLOS. China's relevant proposals can be roughly divided into four categories. China stresses marine environmental protection, sharing in scientific research, freedom of navigation, and sustainable development in resource exploitation [64] (pp. 79–99). As a newcomer on the international stage, the negotiation conference did not adopt many proposals at the beginning of the negotiation. With the accumulation of diplomatic experience along with China's reform and opening up, the substantive achievements of China's participation in the conference have gradually increased [65] (p. 33). Some of China's statements have been considered into the final version of UNCLOS, such as the transfer of scientific achievements from developed states to developing states, the purpose of peaceful exploitation of seabed resources, equal access to seabed resources regardless of the size of states, etc. (All China's proposals are quoted from a series of books called Documents of the Chinese delegation to relevant United Nations meetings (in Chinese, published by the People's Publishing House). Except for 1973, this series is published every six months from 1974 to 1982.). In addition, China stated that the international seabed area and its resources are the common heritage of mankind and that the activities of exploration and mining in deep seabed areas need to be managed by international law [66] (p. 276). In line with the international law-making theory, these substantive engagements shows China's contribution to the development of the international law related to the paper's theme, although China did not put forward very specific ideas on the Arctic at that time [67] (p. 2). The above proposals on marine environmental protection have encouraged safety at sea, prevention of marine pollution, and cooperation to improve knowledge of the Arctic marine environment. It advanced the realization of the AC's sustainable development goal of a healthy Arctic marine environment. At the same time, since the above proposal also provides effective legislative advice on issues such as deep-sea mining including the area in the Arctic, it ultimately supports the implementation of the SDGs 14.

2.2.2. The Field of Navigation

Due to the remoteness and complexity of the Arctic region, it is necessary to formulate a separate set of legally binding rules to guide navigation. Until 2014, China began to put forward relevant suggestions on PC legislation. China's rising engagement in the law-making of navigation regulations in polar waters can be observed through the number of proposals by China. According to the international law-making theory, the authors mainly focus on the following four results of China's substantive engagement).

China actively engaged in the IMO law-making activities related to Arctic navigation and had a direct effect on the PC text. It resolves the contradiction that ships with lower oil pollution risk have more stringent structural requirements, while ships facing higher oil pollution risk enjoy less stringent requirements. China and the Republic of Korea jointly submitted a proposal on the content of environmental protection in the draft PC at the 68th MEPC meeting in 2015 [68]. The General Assembly agreed in principle with the proposed modifications to regulations 1.2.2 [69].

China's proposals are also concerned with the transition period and promotion of the crew training for Arctic navigation by engaging in PC-related law-making activities indirectly. China submitted a proposal in 2014 [70] on the content of training requirements for personnel on ships operating in polar waters before the draft PC was developed or finalized at the first Sub-Committee on Human Element, Training and Watchkeeping (HTW) meeting in 2013. The decision of the General Assembly to consider it at an appropriate time [71] affirmed the above views of the Chinese representative to a certain extent. As the provision was used as an interim provision before PC took effect, the revision promoted the smooth transition of the rules and supplied a good reference for the formation of PC in formulating the above terms for crew training.

In addition, by sharing information and actively completing the performance of the Sub-Committee on Pollution Prevention and Response (PPR) working group [72] (p. 9), China has made preliminary preparations for the formulation of rules around controlling black carbon emissions in Arctic navigation. In accordance with the relevant requirements of the instructions of MEPC 74 in 2019 and the communication group of the PPR 7 in 2020, China carried out research related to black carbon emission control and shared information on its ongoing black carbon project in 2021 [73–75].

It is worth noting that in addition to hard laws such as PC and others regulating black carbon emissions from ships in polar waters, soft law engagement activities attended by China via the IMO are also more frequent. China has published the *Guidance on the Prevention and Control of COVID-19 on Board* via the IMO to the world since 2020 [76]. Guided by the circular, the infection incident on the container vessel Gjertrud Maersk was successfully handled, and the ship was able to resume navigation in time [77].

By the international law-making theory, the above substantive engagements reflect in the types of adopted proposals and have positive effects on the international law development involving the paper's theme. They are advantageous to promote innovative, sustainable, and low-emission technologies and maintain the balance between economic development and environmental protection in the Arctic so as to achieve the AC's sustainable development goal of sustainable economic development. Meanwhile, the implementation of these measures proposed by China is valid for fulfilling the SDGs 14.

2.2.3. The Field of Joint Response to Climate Change

It is such an urgent fact that the Arctic is more impacted by global warming than any other place in the world [78]. Hence, it is pressing to speed up the formulation of relevant international laws to deal with the sustainable development issues caused by the increasingly serious climate warming in the Arctic. China has actively engaged in law-making activities in this field. In regard to the international law-making theory, the following is China's substantive engagement combed by the authors through the negotiation documents, namely the adoption of the proposals.

During the Intergovernmental negotiations of the UNFCCC, China put forth the idea of formulating a “Framework Convention”, which is supported by the group of 77 members, and the conference ultimately adopted this idea [79] (p. 208). China has also put forward a complete proposal on the draft convention during the negotiation process. This is the first time that China has provided a complete text of the draft convention in multilateral treaty negotiations [79] (p. 207). The draft consists of 26 articles. The expression in the draft that “the international community has common but shared responsibilities in dealing with climate change” is the prototype of the “common but differentiated responsibilities” established by the follow-up conference of the parties [79] (p. 211). China stressed that the joint activities of developed and developing parties are different from joint implementation [80]. These joint activities should cooperate with and support national priority areas and strategies for sustainable development and should promote technical cooperation, including technology transfer and capacity building. This declaration is reflected in Article 4.5 of the adopted text [81].

In the negotiation stage of the *Paris Agreement*, the scope of provisions related to NDCs is diverse, involving mitigation, adaptation, finance, technology development and transfer, capacity-building, and transparency, among others. China has put forward some views on NDCs systems similar to those of Arctic states. Both China and Iceland agreed in the submission documents about views regarding the process and outcome of the 2015 agreement negotiation that any agreement that needs to be finalized in 2015 should include the transparency of mitigation, adaptation, means of implementation, action, and support and should be legally binding at the international level [82,83]. Canada also stressed in the submission that the agreement should contain key themes similar to those above [84]. In fact, the official text of the *Paris Agreement* is legally binding and does contain the above themes [85]. In addition, based on the *Paris Agreement*, China has created several INDCs according to their actual situation. China constantly puts forward new emission reduction targets and makes efforts to fulfil its commitments in the implementation of the *Paris Agreement* (See Table 1). China made its first commitment to reduce carbon emissions in 2009 and fulfilled it two years ahead of schedule [86]. In the Paris climate conference of 2015, China pledged to peak CO₂ emissions by around 2030 and strive to achieve it as soon as possible. In 2020, China refreshed the above commitments, that is, to have a CO₂ emissions peak before 2030 and achieve carbon neutrality by 2060 [87].

Table 1. Main targets for 2030 in China’s First NDC (2016) and its revised version (2021) as well as the progress to date as of the end of 2020 [88]).

Indicators	Targets for 2030		Progress in 2020
	First NDC (2016)	Revised NDC (2021)	
peaking CO ₂ emissions	“around 2030” (and “making best efforts to peak early”)	“before 2030” (and “achieve carbon neutrality before 2060”)	around 80% of China’s emissions “having peaked” or “expected to peak before 2025”
CO ₂ intensity reduction (compared to 2005)	60–65%	>65%	48.4%
non-fossil share in primary energy mix	around 20%	around 25%	15.9%
forest stock volume increase (compared to 2005)	around 4.5 billion cubic metres	6 billion cubic metres	5.1 billion cubic metres
installed capacity of wind and solar power	–	>1200 GW	534 GW

By the international law-making theory, this substantive participation of China denotes China’s promotion to the development of international law concerning the paper’s theme. These adopted proposals require Arctic states and other stakeholders to monitor, assess,

and highlight the impacts of climate change in the Arctic for the purpose of the SDGs 13 and the AC's sustainable development goals on climate. Meanwhile, these opinions support the adoption of stronger global measures to reduce greenhouse gases and short-lived climate pollutants and enhances the Arctic's adaptability and resilience to climate change.

2.2.4. The Field of Biological Diversity Conservation

The emergence and development of the CBD and the BBNJ Agreement indicate that global governance in the biological diversity field has attracted much attention. China has been actively participating in this developing field of biodiversity conservation since the formation of the CBD draft. In the fifth negotiating session of the Intergovernmental Negotiating Committee in 1991, the Committee quoted a Chinese proposal at the third session of the Preparatory Committee for the United Nations Conference on Environment and Development in 1991 as a reference for the legislative wording of Article 16 (acquisition and transfer of technology) of the CBD draft [89]. The access to and transfer of the technology system described in this article is retained in the effective version. This substantive engagement (that is, the adopted proposals by the theory of international law-making) is the impetus to the development of international law concerning the paper's theme. In detail, both the establishment and management of protected areas and the implementation of environmental impact assessments (EIAs) are inseparable from professional technology. However, the fact is that there is a gap in the capacity and technology of developing states compared with developed states. The shortage of technology in developing states is not conducive to the global conservation of biodiversity. Accordingly, it is necessary to pay special attention to these shortages to achieve worldwide cooperation. The clause of acquisition and transfer of technology contributed by China is conducive to enhancing developing states' understanding and mastery of biodiversity conservation technologies in the Arctic and enhancing their ability to engage in Arctic affairs.

In recent years, China has actively hosted the Conference of the Parties. During the 15th meeting of the Conference of the Parties to the CBD hosted by China, the *Kunming Declaration* was adopted. The significance of the *Kunming declaration* to the Arctic is that it provides guidance for Arctic states to continue to protect biodiversity under national jurisdiction after 2020 [90]. The endeavours of China are influential in providing a platform for the discussion of biodiversity solutions and reflect China's contributions to issues in the conservation of biodiversity in the Arctic. The above suggestions and efforts prove that China owns the ability to promote the "SDGs 15- Department of Economic and Social Affairs" and the AC's sustainable development goal of healthy and resilient Arctic ecosystems.

China has actively engaged in the negotiation of the BBNJ Agreement. In currently published materials (as of the fifth resumed intergovernmental negotiating conferences) related to the agreement negotiation, consensus was reached on the four core issues involved in the agreement mentioned above. Although the BBNJ Agreement has been reached, the complete documents of the resumed fifth intergovernmental conference are unavailable as of March 19, 2023. Accordingly, the authors attempt to compare these consensuses recorded in the report of the conference with China's related proposals which are from before the resumed fifth intergovernmental conference. In regard to the international law-making theory, the authors seek to anatomize how China's substantive engagement in the negotiation of this agreement that takes these coincidence points as the carrier promotes the development of international law related to the theme.

First, as mentioned earlier, capacity-building and the transfer of marine technology are of great significance to the BBNJ Agreement. The effective implementation of the agreement depends on the premise that parties are equipped with effective capacity-building and technology transfer. The views on the types [91,92], modalities [91–93] (p. 45), cooperation [92–96] (pp. 32, 46, 79), funding [94,97], and supervision [92,94,97–99] have been mutually confirmed with the consensuses in the report of the president of the General Assembly. These facts are of great significance to the sustainable use of biological resources

in the Arctic. Specifically, a flexible list of categories or types helps to better identify the actual needs of parties for biodiversity conservation technologies in relevant Arctic regions. The establishment of the information exchange mechanism and cooperation on the modalities and implementation can facilitate the promotion of the mastery and efficiency of technologies related to human well-being for the conservation of biodiversity in the Arctic areas beyond national jurisdiction. The agreed funding acquisition and supervision stipulation help provide sufficient funds for Arctic technology transfer and strengthen the legitimacy of the process.

Second, EIAs and area-based management tools (ABMTs) are two primary means of implementation. The agreed guiding principles and approaches of EIAs [91–93] (pp. 72, 95) require relevant subjects to adopt a flexible list of categories [91–93,95] (p. 75) and ensure that the details of the contents of the EIAs report are appropriate [91–93] (p. 140). The assessment of the establishment of marine protected areas as one of the ABMTs [92,93,100] (pp. 15, 29, 65, 94) should be based on broad participation with stakeholders [92,95,101] (p. 70). The views are consistent with the consensus and are meaningful to Arctic biodiversity conservation. For the EIAs, its application in the Arctic under the BBNJ Agreement is worth making any possible adjustments to promote the proposed activities. Meanwhile, it is in favour of preventing or mitigating possible marine environmental pollution or harmful changes. Ultimately, it would help facilitate the implementation of the proposed activities. For the ABMTs, the Arctic ecosystem's natural biochemical processes are slowed by cold, extreme seasonal variations in light and extensive ice cover. Accordingly, it is necessary to establish marine protected areas in relevant places in the future. The consensus to ensure the broad engagement of Arctic stakeholders is favourable to the implementation of the agreement.

Finally, the purpose of the convention, as described in the title of the BBNJ Agreement, can be achieved by meeting the above premises and using the above means. After unanimously approving the inclusion of the definition of marine genetic resources in the text [92,93,97–99] (p. 64), the adoption of the sharing of nonmonetary benefits [92,93,97,98] (p. 63) was widely recognized by the conference and Chinese representatives. As the majority of marine genetic resources (MGRs), including those in the polar regions, are located in waters that are beyond all national jurisdictions [102] (p. 273), how to sustainably use MGRs to benefit humankind is an issue that needs rational thinking in the future. MGRs are the biological building blocks for biodiversity in all of these areas [103] (p. 1). The necessity of including MGRs in the scope of application of the BBNJ Agreement has been recognized by consensus. In addition, considering the conditions for large-scale commercialization are not yet mature, giving priority to nonmonetary benefit-sharing rather than monetary benefit-sharing, such as convenient access to samples, information exchange, technology transfer, and capacity-building, is positive for encouraging the enthusiasm of researchers.

By comparing the views of China's proposals with the consensus reached at the Conference, it can be observed that almost all of the consensus reached there can be found in China's proposals. Chinese views are consistent with the consensus of the General Assembly. They are conducive to the entry into force and improvement of the BBNJ Agreement and in turn promote the development of international law for the Arctic biodiversity beyond national jurisdiction. This is favourable to the conservation of Arctic biodiversity, ecosystems, and species' habitats in order to achieve the SDGs 14 and the AC's sustainable development goal of healthy and resilient Arctic ecosystems.

2.3. Implications of China's Arctic Engagement in the International Law Development of Arctic Governance for Its Sustainable Development at the Global Level

As mentioned above, international law at the global level has potential implications for Arctic governance. Moreover, the national role in diplomacy guides the process of state engagement in the formation of international law. Accordingly, the paper intends to summarize China's evolving diplomatic role since 1971 to explore the relationship between

that role and engagement in the formulation of the international legal framework at the global level.

2.3.1. Discussion on China's Role Assessed by Its Official Documents at the Global Level

The national role in diplomacy has guiding significance for the state to engage in the development of international law. Meanwhile, since international law is also applicable to the Arctic region, and these international laws are related to the Arctic governance for its sustainable development, the role of the state is also related to the Arctic governance for sustainable development. Based on the above analyses, the paper summarizes China's implications by observing the national role and explaining China's engagement as well as analysing the impact on the development of international law for Arctic governance. The text used to analyse the role of this is based on the documents of the Chinese representatives presented in the United Nations General Assembly, which spans from the early 1970s to the late 1980s. At this stage, the policy process represented by the Third United Nations Conference on the Law of the Sea has been taking shape ever since [104] (p. 9). The authors observed that China has repeatedly emphasized the political and economic aspects of the "development of developing states" in the United Nations general debate. Specifically, China emphasized its status as a developing state with a backward economy [105] (pp. 5–6), reminded the world of the importance of providing assistance to the developing states in the greatest need [106], and advocated for uniting with third world states [107]. China also pointed out that the establishment of a new international economic order is what developing states require [108], proposed the help of developed states to developing states [109], and promised to give full play to China's own contribution [110]. China's foreign policies also pointed out the reality of poverty in the emerging stages of developing states [111] and advocated strengthening cooperation with the third world states [112]. In addition, China commenced to stress that the settlement of international disputes depends on the international law since 1980. Obviously, China emphasized its role as a developing state in need of the mutual assistance of the third world and the care of developed states at that stage on the premise of respecting international law.

From the 1990s to 2010, China paid more attention to its own development with changes in the international circumstances of peace and development [113]. The development of the national role has affected China's engagement in the development of international law at the global level, which also applies to the Arctic region. In this context, states all over the world have gradually been absorbed in developing their own economies and have begun to commit to dealing with some of the environmental and climate issues caused by national development. China consistently expressed respect to international law in the United Nations general debate. Through the observation of China's foreign policies, the authors find that the orientation of foreign policy remained basically stable for more than 20 years. Specifically, the foreign policies of this period emphasized adhering to the five principles of peaceful coexistence [114] (p. 1437), paying attention to its own development [115] (p. 1346), and striving to assume responsibilities and obligations in international affairs that are commensurate with its own capabilities [116] (p. 237) at the right time. Judging from China's diplomatic speeches at international occasions, at the United Nations General Assembly during this period, China conveyed that China is still a developing state and pledged to participate in international conferences related to the environment and climate [117,118]. Since the United Nations General Assembly incorporated for the first time the item entitled "The rule of Law at the national and international levels" into the agenda of the Sixth Committee in 2006, China started to express its views about international rule of law via this occasion. During that period, China repeatedly reaffirmed the strengthening of the international rule of law by upholding the authority of the United Nations Charter and the fundamental principles of international law, improving international legislation, adhering to the uniform application of international law, and promoting democratization in international relations [119]. Accordingly, this evidence shows that China emphasized its role in diplomacy in view of its ability at that stage. It

emphasizes avoidance of conflict with the great powers subject to international law at the national and international levels and strives to strengthen its economy and technological base.

Over the past decade, with enhanced comprehensive national strength in the previous period, China began to pay more attention to the building of the global governance system [120] followed by the new trend of the multilevel global governance system [121] (p. 94). It stressed upholding the international system with the United Nations at its core [122], advocated cooperation [123], and called for maintaining the common well-being of humankind [124] and boosting a community with a shared future for humankind [125–127]. These years, China gradually initiated the international order based on international law and expressed this initiative on various occasions under the United Nations, such as the United Nations Security Council Open Debate on Peacebuilding and Sustaining Peace. These diplomatic initiatives coincide with the general principle of respecting and caring for the community of life in the theory of sustainable development. Their realization is inseparable from the joint efforts of all states worldwide. Accordingly, China's role during the period from 2011 to present is characterized by engaging in global governance under the international rule of law for guarding the international order based on international law (See Table 2).

Table 2. China's Arctic dynamic engagement in the international law development of Arctic governance for its sustainable development at the global level under the national role.

Period	International Law Context	China's National Role	Proposals Key Words	Adoption Outcome
1970s to the 1980s	third United Nations Conference on the Law of the Sea	a developing state in need of the mutual assistance of the third world and the care of developed states at that stage on the premise of respecting the international law	marine environment; marine scientific research; right of navigation; marine resource development	many adopted proposals assessed under the condition of relatively complete archives
1990s to 2010	Convention on Biological Diversity and United Nations Framework Convention on Climate Change negotiation	a developing state carrying out diplomacy in view of its ability	acquisition and transfer of technology; common but differentiated responsibilities; joint activities	a few adopted proposals assessed under the condition of limited archive
2011 to present	Polar Code and the Marine Biodiversity of Areas Beyond National Jurisdiction Agreement negotiation	a developing state engaging in global governance under the international rule of law for guarding the international order based on international law	training requirements for personnel on board ships operating in polar waters; ships structural requirements under oil pollution risk; black carbon emissions; marine genetic resources; area-based management tools; environmental impact assessments; capacity-building and the transfer of marine technology	a few adopted proposals assessed under the condition of relatively complete archives

2.3.2. Discussion on China's Arctic Engagement under Its Role at the Global Level

From the early 1970s to the late 1980s, since the restoration of the People's Republic of China's lawful seat in the United Nations, China has shown a high level of enthusiasm and has been very active in sessions and debates with developed states for its friends in the third world [128] (p. 215). Accordingly, the national role during this period provides a reasonable explanation for China's engagement in the formation of UNCLOS. Moreover, the

contents of these proposals objectively follow China's national role during this period. The peaceful use of the ocean, the contents of technology transfer, fair systems, and licensing systems emphasized by the Chinese representative in the proposals can, on the one hand, promote the balance of the benefits of the exploration and mining in the deep-sea areas between developed and developing states. On the other hand, as UNCLOS contains approximately 25 references to the need for assistance in developing states and accounting for their concerns, these China's proposals help enhance the capacity of developing states.

The shifting international development trends at the stage from the 1990s to 2010 generate new diplomatic needs, which is the main reason for the conclusion of the new international laws such as the CBD and the UNFCCC. The emergence of these international laws has further promoted the legal framework centred on UNCLOS related to the theme. China fulfils its commitment, which forms the characteristics of China's role in this period, to participate in international conferences related to the environment and climate. Affected by the national role, some climate and biodiversity conservation proposals are in line with China's own strength and no longer show aggressive ambition. Regardless of the principle of common but differentiated responsibilities or the technology transfer of biodiversity conservation from developed states to those developing states, China's purpose is to seek a competent position in international law and expect to assume international responsibilities and obligations commensurate with their own capabilities.

The currently complex international situation poses challenges to the status of the international legal framework at the global level. The new development of international law in this field, particularly the emergence of PC, provides more accurate guidance for the Arctic navigation. China witnessed its role with the characteristics of active rather than passive participation in global governance in this period.. Such characteristics persuasively interpret why China seeks to introduce the domestic idea of ecological civilization to the CBD and to make new INDCs for the *Paris Agreement*. Such characteristics also explain why many of the views in China's proposals are consistent with the consensus of the BBNJ Agreement negotiating conference. Based on the characteristic of respect for the international rule of law reflected by China's role, it is China's commencement to participate in the formulation of the PC by taking advantage of its membership in the IMO that makes China's participation in the Arctic region based on the global international rule of law.

3. The Development of International Law and China's Engagement at the Regional Level

The Arctic, as a region for strategic competition, has seized the world's attention, but it is also necessary to ensure the rule of law so that it remains a region free of conflict where states act responsibly [129]. At the regional level, the international law for Arctic governance focuses on common Arctic issues, particularly on issues of sustainable development and environmental protection in the Arctic. These issues are closely related to the mission of the AC. In the AC, Arctic states and other Arctic stakeholders have different rights and obligations, similar to the status of "member states" and "observer states," respectively. Accordingly, international law for Arctic governance at the regional level refers to the provision of public goods to the Arctic region by Arctic states and other Arctic stakeholders through forums with the AC as the core, on the premise of being endowed with different rights and obligations.

3.1. The International Law Development of Arctic Governance for Its Sustainable Development at the Regional Level

Global regulations can provide a basic framework but to some extent may be weak in meeting the special needs of Arctic governance. Therefore, in recent years, regional treaties specifically applicable to the Arctic have been successively adopted. Among them, the most important are the *Agreement on Cooperation on Aeronautical and Maritime Search and Rescue in the Arctic* (SARA), the *Agreement on Cooperation on Marine Oil Pollution Preparedness and Response in the Arctic* (MOSPA), and the *Agreement on Enhancing International Arctic Scientific Cooperation* (EIASC). On 20 May 2021, foreign ministers of the eight Arctic states as

permanent members of the AC adopted a first 10-year strategic plan for the region [130]. It is the AC's first-ever Strategic Plan that reflects the shared values, goals, and joint aspirations of the Arctic states and Indigenous Permanent Participants, which will guide the Council's work for the next decade. The strategic plan covers almost all concerned fields in today's Arctic region. Therefore, it can be inferred that it will play an important guiding role in today's Arctic governance. Through this declaration and plan, the council can act as a promoter to make the Arctic a region of peace, stability, and constructive cooperation, which will allow for stakeholders, including China, to engage in Arctic affairs. This plan allows stakeholders, including China, to further engage in Arctic affairs to make the Arctic a peaceful, stable, and constructive region of cooperation.

The formation of the abovementioned regional treaties reflects an important difference between regional and global international law for Arctic governance. The most influential platforms generated by these treaties at the regional level are relatively centralized and dominated by Arctic states. These important regional treaties were reached through the platform of the AC. Although the AC is a semigovernmental forum, it has become the core institution for regional governance and cooperation in the Arctic [131] (p. 780). Just as human societies are interdependent, and future generations are affected by our present actions, the world of nature is increasingly dominated by our behaviour. The 10-year plan and a series of agreements adopted by the AC require the members of the AC to manage the Arctic climate, environment, economy, scientific activities, local knowledge, and other fields [129] so that human activities in the above fields in the Arctic region do not threaten the survival of other species or eliminate their habitats. It is a practice of care for other people and other forms of life and avails ourselves of meeting the general requirements of respecting and caring for the community of life in the theory of sustainable development.

What deserves deep attention is that some recent changes in the AC affect the normal operation of the AC mechanism. Seven of the eight states that make up the AC temporarily paused most of their cooperation due to the situation in Ukraine [132] in March 2022 [133]. It seems to expose the myth of "Arctic exceptionalism"—the idea that the Arctic is impervious to, or at least isolated from, the conflicts plaguing the rest of the world [134]. With the temporary pause of most work of the AC, the impact is complex. Scientists worry that "a range of research priorities, including the monitoring of wildfires, thawing permafrost, and methane emissions could be disrupted by an extended interruption in data collection and sharing" [135]. Considering the enduring value of the AC for the above work and the commitment of the AC members when they joined, since June of the same year, seven states except Russia intend to implement a limited resumption of their work in the AC in projects that do not involve the participation of Russia [136]. Nevertheless, given that Russia accounts for 50% of the Arctic landmass, it seems difficult to promote the operation of these projects without Russia. Since the issues caused by climate change are not those that can be suspended by human beings [137], although the impact of the temporary pause on the AC cannot be predicted in a short amount of time, it is obviously not conducive for the AC to achieve its purpose if it is paused for a long time. As no similar situation was expected during the formulation of the AC, no alternate plan can be adopted [138]. It is necessary to observe the impact of the conflict on the AC for a long time.

3.2. China's Arctic Substantive Engagement in the International Law Development of Arctic Governance for Its Sustainable Development at the Regional Level

China is not a party to SARA, MOSPA, and EIASC, but it would still like to respect these treaties and help with implementing them in practice. The evidence reflecting in *China's Arctic policy* said that China respects the agreements adopted by the AC [27]. Such recognition is the premise for China to engage in Arctic governance for its sustainable development at the regional level via the AC from the perspective of international law. By the international law-making theory, the substantive practices below explain China's efforts to promote the regional international law development concerning the paper's theme via the AC.

Before the formal establishment of the AC on 19 September 1996 [139], China had tried to participate in activities at the Arctic regional level as a stakeholder. As early as 8 November 1991, 11 regions from 9 northern states [140] established the Northern Forum (NF) in the United States. It became an observer for the AC in 1998 [141]. As one of the founding members, the then governor of the Heilongjiang Province of China served as the vice chairman of the NF [142,143]. On 23 April 1996 [144], China joined the International Arctic Science Committee [145] (p. 26), which also became an AC observer in 1998 [146]. Although the authors have not collected more archives from that period about China's engagement in the Arctic governance for its sustainable development at the regional level in this period, a series of activities related to China's engagement as a member of the Arctic regional organizations have laid a foundation for China to engage in the AC and carry out activities.

After the establishment of the AC and before China became its official observer in 2013, China sent the then vice governor of the Heilongjiang Province to attend the senior Arctic officials meeting held in Washington, D. C. in 1999 [147]. This reflects China's early interest in the AC. To apply to become an ad hoc observer, China actively hosted an Arctic Science summit week under the International Arctic Science Committee framework in Kunming in 2005 [148] and joined the Ny-Ålesund Science Managers Committee the same year [149] to express its support for the Arctic and to look for and work on common goals and interests [150]. Since being admitted as an ad hoc observer in 2006, China began to engage in the AC Meeting of Senior Arctic Officials [151] and became a member of the planning group members for the International Polar Year in 2007 [152]. This engagement has accumulated experience for China to become an official observer.

After China officially became an AC observer in 2013, it submitted three reports in 2016, 2018, and 2020. On these official recordings, China has put forward proposals in relevant meetings of the working groups, some of which have been adopted by the working groups of the AC. These proposals are either reflected in the plan of the working groups or shown in their reports. In recent years, especially, the number of pertinent proposals adopted by China has increased, which shows the maturity of China's relevant engagement. These proposals involved the formulation of action plans under the Conservation of Arctic Flora and Fauna (CAFF) working group, as well as some evaluation work under the Arctic Monitoring and Assessment Programme (AMAP) working group. These proposals are linked to international law for Arctic governance.

Firstly, climate change can have an effect on the movement of contaminants to the Arctic and their accumulation in the Arctic [153] (p. 1). In some parts of the Arctic, the levels of particular persistent organic pollutants (POPs) are no longer declining to the expected extent, and climate change might be part of the reason [154]. The assessment of Arctic POP-climate interactions is necessary for the joint response to climate change. A researcher from the Chinese Academy of Sciences and two experts participated in the Workshop on POPs and Climate Change which is operated by the Arctic Monitoring & Assessment Program (AMAP) Working Group of the AC in 2019. In the discussion of the assessment report on POPs and climate change, Chinese experts made the proposal to include the reference of POP emissions in the Qinghai-Tibet Plateau and Antarctica, which was accepted in the Workshop [155]. It "fills data gaps and strengthens and supports conclusions" [156] for Arctic POP-climate interaction assessments. The AWAP believes its assessments participated by Chinese experts of POPs in the Arctic "contribute to the arrangements for adding new substances to *United Nations Environment Programme Stockholm Convention on Persistent Organic Pollutants* (the Stockholm Convention) and the *POPs Protocol to the Convention on Long-range Transboundary Pollution (LRTAP)*" and help "evaluate the effectiveness and sufficiency of the Stockholm Convention and LRTAP agreements" [157].

Secondly, although economic activity represents important opportunities for Arctic communities, it also entails environmental challenges that must be handled in the most effective ways possible [158], such as through control of black carbon and methane emissions. A Chinese researcher of the Chinese Research Academy of Environmental Sciences engaged

in the work of ACAP, mainly on the work of black carbon- and methane-related projects and research reports [159]. The report, *The Expert Group on Black Carbon and Methane—third Summary of Progress and Recommendations*, was written as a result of China's active participation. The report calls on all Arctic states to carry out international cooperation in the IMO for a global regulatory framework to reduce black carbon emissions [159]. In response to this report, many sponsors (Canada, Finland, France, Germany, Iceland, Netherlands, Norway, Solomon Islands, Sweden, United Kingdom, and the United States), including Arctic states, submitted a response proposal via the IMO [160]. The proposal finally received the attention of the Committee, and it agreed to further develop the draft MEPC resolution [161].

Finally, because climate change affects the Arctic marine environment, from ecosystem and habitat impacts to driving changes in human activities, marine protected areas are crucial to the resilience of the Arctic as a tool [162]. CAFF's Migratory Bird Work Plan, participated in by Chinese representatives, calls to establish marine protected areas under the Protection of the Arctic Marine Environment (PAME) [163]. Furthermore, the proposal made by China in CAFF's Migratory Bird Work Plan helped establish PAME marine protected areas at the AC level and then led to the output of a new work plan.

The above engagement reveals China's efforts to promote the development of international law involving the paper's theme at the regional level. Before China became an official observer of the AC, China mainly focused on the recognition of the identity of Arctic stakeholders with their own interests and the core position of the AC at the regional level as well as support for the concept and purpose of the AC. Since China did not become an official observer of the AC at that time, the focus of such a national role was mainly to seek the recognition of the AC. Coupled with limited information, it seems difficult to determine that China had a significant implication on the development of international law at the regional level of Arctic governance before China became an official observer of the AC. After China became an official observer of the AC, the main method of China's engagement in the AC was to send experts to the meetings, respect the three agreements adopted by the AC, and support international cooperation through platforms such as the Arctic science and technology ministers' meetings. It is conducive to achieve the AC's sustainable development goals and the SDGs 13–15 related to the Arctic region, because the sustainable development goals at all levels depend on the best scientific evidence, and the relevant scientific data provided by China is advantageous to provide intellectual support for the sustainable development of the Arctic.

As mentioned in Section 3.1 above, the full operation of the core institutions of Arctic governance at the regional level is currently paused. This has delayed the formation of relevant scientific reports, which are the basis for the formulation of international laws and regulations at the Arctic regional level. Accordingly, the temporary pause of the AC prevents China from engaging in the formulation of relevant international laws at the regional level from the perspective of the Arctic governance for its sustainable development.

3.3. Implications of China's Arctic Engagement in the International Law Development of Arctic Governance for Its Sustainable Development at the Regional Level

3.3.1. Discussion on China's Role Assessed by Its Official Documents at the Regional Level

At the regional level, China's national role has remained stable. By summarizing the speeches of Chinese leaders at international occasions, the authors find that China maintains the role of supporting and engaging in the AC. Since China first attended the AC Meeting of Senior Arctic Officials in 2007, Chinese representatives have expressed their support of the purposes and objectives of the AC and conveyed their willingness to actively engage in the work of the Council [164]. In 2009, China's then Assistant Foreign Minister expressed his recognition that the AC is the most influential regional intergovernmental organization on Arctic issues and stressed China's desire to engage in the AC work in view of China's own identity and ability [165] (p. 55). In 2010, China issued that "the issue for the AC members now is how to involve non-Arctic states in relevant research endeavours

and discussions at an early stage and in depth” [166]. It represents that China expressed its intention to participate in relevant activities related to the formation of international law at the regional level. Since China became an official observer of the AC in 2015, the then Vice Foreign Minister recognized that Chinese experts actively engaged in scientific research projects of several working groups of the AC [167]. China’s 2018 *Arctic policy* reiterates that China fully supports the work of the Council, and dispatches experts to participate in the work of the Council including its Working Groups and Task Forces [27]. In these two official reports, the authors find that the wording adopted by China no longer expresses the desire for active participation but emphasizes that active engagement is a genuine existing circumstances and possible future endeavour.

It is noteworthy that China’s diplomatic documents during the pausing of the AC stressed the significance of peace and security to the international community [168] and called for upholding the open regionalism of unity and cooperation [169]. Accordingly, China’s role in supporting and engaging in the AC has not changed, regardless of the current operational dilemma of the AC. Although the crisis has objectively hindered China’s engagement, it still seeks to support and engage in the AC activities (See Table 3).

Table 3. China’s Arctic dynamic engagement in the international law development of Arctic governance for its sustainable development at the regional level under the national role.

Period	International Law Context	China’s National Role	Proposals Key Words	Adoption Outcome
before the formal establishment of the Arctic Council in 1996	the formation of regional rules mainly driven by Arctic states and other stakeholders’ engagement in the International Arctic Science Committee and the Northern Forum, etc.	an Arctic stakeholder supporting and engaging in the Arctic Council	limited archive as the document acquisition	-
after the establishment of the Arctic Council and before the acceptance of China’s application for official observer seat in 2013	the formation of regional rules mainly driven by Arctic states and other stakeholders’ engagement in the Arctic Council		limited archive as the limited authorization by the Arctic Council rules of procedure	-
after China officially became the Arctic Council observer in 2013	mechanisms of the senior Arctic officials meeting and the working groups, etc.		Arctic migratory bird protection; persistent organic pollutants and climate change	a few adopted proposals assessed under the condition of relatively complete archives

3.3.2. Discussion on China’s Arctic Engagement under Its Role at the Regional Level

Before China became an official observer of the AC, China has been given less opportunities to support and engage in the AC. Under limited conditions, China was still willing to engage in the AC by any available opportunity. This phenomenon is illustrated in the consistency of state practice and national role. After China became an official observer of the AC, China has been given more opportunities to support and participate in the AC. Such engagement has mainly given expression to scientists’ suggestion to the AC working group’s scientific projects.

There is limited room for China to play in the AC compared with the Arctic states at the regional level, although China has made relevant efforts. China cannot carry out more activities in the AC due to its observer status and the AC rules. On account of the rules adopted in 2013, observers can attend meetings of the AC, consult Council documents, and speak at the meeting after statements by states and permanent participants [170], but they

do not have the right to vote. Observers may contribute to the Council's projects and pay for part of the work of the Council, but their financial contributions shall not exceed the funds provided by Arctic states. This means that observers cannot have any substantive impact on the AC system itself. Therefore, within the existing legal framework, China can only act by appointing experts to engage in scientific activities and publishing some literal "observations" [171]. These observer rules objectively limit China's engagement at the regional level. It highlights the necessity for the complementary role of other Arctic bodies outside the AC core of the Arctic governance system at the regional level. It does not contradict the characteristics of China's role at this level, because other Arctic bodies just serve as supplementary fields for China's engagement. Such supplementary fields are in need under the current situation of the AC's comprehensive cooperation pause.

4. The Development of International Law and China's Engagement at the Multilateral and Bilateral Levels

4.1. The International Law Development of Arctic Governance for Its Sustainable Development at the Multilateral and Bilateral Levels

Activities in bilateral Arctic governance mostly occur within the jurisdiction of Arctic states. Considering that Arctic states and other stakeholders cannot overcome common challenges and threats, respectively, such interdependent relations among Arctic states and other stakeholders require cooperation at comprehensive levels [172,173]. Respect for sovereignty, sovereign rights, and the jurisdiction of Arctic states are prerequisites to launching activities. It is the rational meaning of providing a national framework for integrating development and conservation in the theory of sustainable development that bring together representatives of government, environmental groups, business and industry, indigenous people, and other interests on an equal footing for the establishment of a bilateral and multilateral comprehensive cooperation network. Since cooperation depends on state relations, which are usually more complex, the type of international law on Arctic governance at this level is flexible. It could take the form of hard laws, soft laws, and implied consensus, even with no document, which are the common points of the domestic policies of both sides. This section will examine China's multilateral and bilateral Arctic cooperation based on hard laws, soft laws, and implied consensus.

4.2. China's Arctic Multilateral and Bilateral Engagement in Arctic Governance for Its Sustainable Development Based on Hard Law

4.2.1. China's Multilateral Arctic Engagement Based on Hard Law

China's multilateral cooperation based on hard law involves a wide range of examples, and the *Agreement to Prevent Unregulated High Seas Fisheries in the Central Arctic Ocean* (the CAO fisheries agreement) is one of the updated instances of Arctic multilateral cooperation based on hard law. In 2015, the Arctic Five (Russia, United States, Canada, Denmark, and Norway) reached and issued the *Declaration Concerning the Prevention of Unregulated High Seas Fishing in the Central Arctic Ocean*, the predecessor of the CAO fisheries agreement. The declaration states that until there is sufficient scientific evidence to prove the sustainable development of the fisheries in the related area, the Arctic Five will not authorize their vessels to conduct commercial fishing in the stated area. In December of that year, Iceland, China, Japan, the Republic of Korea, and the European Union joined the negotiations on an agreement to restrict fisheries in the abovementioned areas based on the declaration. By the international law-making theory, the authors try to find China's substantive engagement, that is, adopted proposals in negotiation documents related to this agreement, so as to confirm if there is any evidence of China's contribution to the hard law's development for Arctic cooperation at the multilateral level.

At the third meeting of scientific experts on fish stocks in the central Arctic Ocean in May 2015, Chinese representatives delivered a report named *Perspective China Arctic Research Activities—with focusing on the biological information* [174]. Based on the consensus reached by the conference representatives, including China, agreed upon the need to develop a joint programme of research and monitoring, the fourth meeting of scientific

experts on fish stocks in the central Arctic Ocean was successfully held in September 2016 [174]. At the fifth meeting on the same subject in October 2017, Chinese representatives engaged in a monitoring task [175]. In May 2019, the signatory states of the CAO fisheries Agreement established the Provisional Scientific Coordinating Group (PSCG) to further prepare for the implementation of the agreement [176]. China missed the first PSCG meeting hosted in 2020 due to COVID-19-related flight restrictions. However, the meeting document of PSCG pointed out that “a note from the Chinese delegation concerning certain provisions of the proposed Terms of Reference was taken into account during the discussions” [177]. At the first Conference of the Parties to the CAO fisheries agreement held in the Republic of Korea from November 23 to 25, 2022, China, together with other parties, decided to establish a formal scientific coordinating group to carry out research on marine living resources and ecosystems and to strive for the establishment of a joint program of scientific research and monitoring for the central Arctic high seas marine living resources and ecosystems. On account of the international law-making theory, these adopted proposals consolidate the practice of international law based on the best scientific evidence and the precautionary approach and provide a basic legal framework for the sustainable development of fishery resources in the Arctic region. This legal framework is a good beginning for the implementation of SDGs 14 and the AC’s sustainable development goal of healthy and resilient Arctic ecosystems.

With China’s approval in May 2021 [178], the CAO fisheries agreement has come into effect in June 2021 [179]. In fact, China is the signatory that finally completed the domestic approval. It is necessary to analyse why there was a delay in China’s completion of the domestic approval process as well as the reasons for the final completion of the domestic approval. There are several potential reasons. First, stemming from *Law of the People’s Republic of China on the Procedure of the Conclusion of Treaties*, the CAO fisheries agreement does not need to be ratified by the Standing Committee of the National People’s Congress but only by the State Council [180]. In other words, this is not an agreement in urgent need of approval. Second, in terms of diplomacy, China needs time to fully understand the relevant scientific expertise and develop the necessary diplomacy [181]. Third, there is a great demand for China’s pelagic fisheries [182] (p. 99). A ban on fishing activities in pertinent waters of the Arctic Ocean for a vague period of time in the future will increase the pressure on China’s domestic fisheries. Despite the above-noted challenges, China has completed the domestic approval procedure, which shows China’s determination to promote the achievement of the negotiations.

4.2.2. China’s Bilateral Arctic Engagement Based on Hard Law

From the perspective of bilateral Arctic cooperation, at present, only Iceland has signed a bilateral intergovernmental agreement on Arctic issues with China, called the *Framework agreement between the government of the People’s Republic of China and the government of Iceland on Arctic cooperation* [183]. By the theory of international law-making, the signing result of the agreement denotes that China and Iceland jointly promote the making of bilateral international law. Stemming from this agreement, the two sides are willing to promote the exchange of scientific researchers, explore the establishment of the northern light monitoring station in Iceland, and establish the joint research centre for oceans and polar regions [184]. Policies and programmes for sustainability must be based on scientific knowledge of the factors that they will affect and be affected by. Without a sound basis of scientific knowledge and public understanding of its implications, policies for sustainability are unlikely to be as well formulated or widely supported as they should be. States have to act on the best information they have. The cooperation between China and Iceland in scientific research based on hard law improves the understanding of the Arctic environment and reduces environmental uncertainty that hinders sustainable development. In order to practice the framework agreement, China actively promoted the implementation of it through various cooperation activities, such as the promotion of the exchange of scientific researchers [185] and the construction of the aurora observatory [186]. The abovementioned

activities manifest China's efforts from the perspective of scientific research for the SDGs 14 and the AC's sustainable development goals of healthy and resilient Arctic ecosystems and a healthy Arctic marine environment.

4.3. China's Arctic Bilateral Engagement in Arctic Governance for Its Sustainable Development Based on Soft Law

There is a soft law between Finland and China called the *Joint Action Plan 2019–2023* based on a memorandum to carry out joint investigation and research [187]. By the plan document, the two sides agreed to deepen bilateral economic dialogue, promote practical cooperation among enterprises, conduct studies on Arctic-related laws and social science studies and increase knowledge of the Arctic region through science [188]. Based on the soft law, the representatives of China have made many efforts to promote the cooperation plan, such as the joint construction of an icebreaker [189], railway [190], and the research centre [191]. In addition, Russia is another state that reached a soft law on economic cooperation with China on Arctic cooperation based on the "Ice Silk Road" since 2016 [192].

It is worth mentioning that not only China and the Arctic states but also China and other Arctic stakeholders reach soft laws. The Arctic policy released by Japan in 2015, the Arctic policy issued by China in 2018, and the Republic of Korea's *Polar Activities Promotion Act* passed in 2021 all focus on Arctic economic and scientific research activities in the future. Based on this tacit understanding, before the COVID-19 pandemic, China, Japan, and the Republic of Korea held four trilateral high-level dialogues on the Arctic based on the *Joint Declaration for Peace and Cooperation in Northeast Asia* issued in November 2015 and adopted two joint statements. The three Heads of Delegations promoted scientific research as the priority for cooperation among the three countries. They supported the enhancement of the exchange of information on Arctic expeditions and encouraged the sharing of scientific data and further development of collaborative surveys.

By the theory of international law-making, the signing result of the bilateral agreement marks the joint contribution in the making of bilateral international law by Arctic states and other stakeholders. The fields involved in the abovementioned soft law reached between China and Arctic states and other stakeholders is divided into two areas: economic cooperation and scientific research cooperation. The relationship between Arctic scientific research cooperation and Arctic sustainable development has already been analysed in Section 4.2.1. For the Arctic economic cooperation, as mentioned above, every state has a universal goal of economic and social development. The agreements mentioned above on economic cooperation polymerize the universal goals of Arctic states and other stakeholders on sustainable economic development, which is instrumental in meeting the standards for improving the quality of human life in the theory of sustainable development.

There is also another type of cooperation, which is based on implicit consensus reflected by the forms including but not limited to domestic laws and policies. For example, China and Norway decided to increase cooperation on Arctic climate monitoring and prediction in April 2018 [193]. The cooperation has been completed in 2021 based on the platform of the Nansen-Zhu International Research Center [194]. Before the two sides promoted cooperation in 2018, Norway released its Arctic policy in 2006, 2009, 2012, and 2017. These policy contents convey Norway's willingness to launch dialogue with other Arctic stakeholders on some Arctic issues, such as Arctic scientific research and climate change response. China also conveys its aspiration to cooperate with Arctic states on the above Arctic issues in its Arctic policy, which was published in January 2018. The cooperation improves exploration and understanding of the Arctic climate and environmental change and provide scientific support for the realization of the *Paris Agreement* central aims. The realization of the *Paris Agreement* central aims is a manifestation of humanity's pursuit of sustainability. The Arctic region, as an indispensable region in the world, also benefits from the accelerated realization of the *Paris Agreement* central aims resulting from the achievement of the climate change joint response cooperation promoted by China and Norway.

4.4. Implications of in the International Law Development of Arctic Governance for Its Sustainable Development at the Multilateral and Bilateral Levels

4.4.1. Discussion on China’s Role Assessed by Its Official Documents at the Multilateral and Bilateral Levels

Based on the interdependent relations among Arctic states and other stakeholders mentioned above, China’s national role at multilateral and bilateral levels has basically remained stable. It emphasizes cooperation as a keyword of its national role at this level for engaging in the development of international law for Arctic governance (See Table 4). Before the publication of *China’s Arctic policy*, China repeatedly stressed respect for the inherent rights of Arctic states and indigenous peoples [195], developing multilevel Arctic cooperation [167,196] and paying attention to the win–win results of Arctic bilateral and multilateral cooperation, especially the commercial use of sea routes [197]. After the publication of *China’s Arctic policy*, China continued to adhere to Arctic cooperation. In detail, China states that:

“Cooperation” is an effective means for China’s participation in Arctic affairs. It means establishing a relationship of multi-level, omni-dimensional, and wide-ranging cooperation in this area. Through global, regional, multilateral, and bilateral channels, all stakeholders—including States from both inside and outside the Arctic, intergovernmental organizations, and nonstate entities—are encouraged to take part in cooperation on climate change, scientific research, environmental protection, shipping route development, resource utilization, and cultural activities [27].

Table 4. China’s Arctic dynamic cooperation of Arctic governance for its sustainable development at the multilateral and bilateral levels under the national role.

Period	International Law Context	China’s National Role	The Focus of Cooperation	Characteristics of Cooperation
before the publication of China’s Arctic policy in 2018	the enhancement of national win-win results together beneficial to people’s welfare of their countries in bilateral and multilateral agreement negotiations between Arctic states and other stakeholders	a partner seeking for Arctic cooperation with Arctic states and other stakeholders	high seas fisheries in the central Arctic Ocean; the promotion of the exchange of scientific researchers; joint marine and polar research; joint construction of icebreaker, railway, and the research centre	mainstream of cooperation based on soft laws, supplemented by cooperation based on hard law; more achievements gained under soft laws compared with hard laws concluded between Arctic states and other stakeholders
after the publication of China’s Arctic policy in 2018				

4.4.2. Discussion on China’s Arctic Engagement under Its Role at the Multilateral and Bilateral Levels

In consideration of the requirement of providing a national framework for integrating development and conservation in sustainable development theory, governments should set the creation of a sustainable society as an overall policy goal. To achieve it, they need cooperation in comprehensive fields. China’s cooperation on Arctic scientific research, environmental protection, the climate change joint response, and resource development, based on China’s role at the multilateral and bilateral levels, is instrumental in the achievement of all sustainable development goals related to the Arctic region.

Among China’s cooperation types under the guidance of such a national role, cooperation based on implied consensus is the loosest. It has no independent cooperation document with the set form and frequency. Cooperation based on hard law has the strongest legal effect. Their conclusion is often based on detailed considerations. A strong legal framework is conducive to solving complex issues, including the regional management of fisheries, which calls for solid collective cooperation. It is also instrumental in ensuring the maxi-

imum implementation of cooperation, which is in favour of covering the urgent demand of states. However, the procedures for the formulation of a hard law are cumbersome. The soft laws facilitate this issue. The soft laws are flexible compared with the hard laws and enable participants to carry out activities under recorded conditions selected by both parties compared with the implied consensus.

For the future, China and Arctic states have broader prospects for cooperation. As most Arctic states and other stakeholders have made carbon reduction commitments in response to climate change at the United Nations Climate Change Conference [198], it is valuable to expect bilateral and multilateral emission reduction cooperation for the Arctic. After all, climate change will not be paused due to changes in the regional situation, which is a long-term and consensus task for all states.

5. Conclusions

The paper summarizes China's national role and engagement in the development of international law related to the Arctic governance for its sustainable development and its implications. The authors find that under China's national roles mentioned above, China's engagement has affected the development of international law around the mentioned theme to some extent. The summary and conclusions are as follows.

As far as the development of international law related to this theme is concerned, the international law at the global level involves marine studies, Arctic navigation, joint response to climate change, and biodiversity conservation. The international law at the regional level refers to a series of international agreements and public goods adopted under the auspices of the AC. The international legal norms at the multilateral and bilateral levels are the hard laws, soft laws and implied consensus for cooperation. They are closely related to the theory of sustainable development.

In terms of China's national role and engagement, at the global level, China's national role has experienced development from a developing state that needs the mutual assistance of the third world and the care of developed states to then play a role in diplomacy in view of its ability and finally to actively participate in the building of the global governance system. At the regional level, China maintains the role of supporting and engaging in the AC. At the bilateral and multilateral levels, China emphasizes cooperation as a keyword of national role. Based on the abovementioned national roles, China has continuously engaged in the development of international law at all levels and made substantial contributions. These contributions promoted the realization of sustainable development goals at the United Nations and the AC levels.

In order to comprehensively achieve the commitments of *China's Arctic policy* in the future, at the global level, there is a need for China to further optimize the agenda setting to reach more consensus and to "fulfil all its international obligations in accordance with the law" [27]. At the regional level, it is necessary for China to continuously expand the size of the expert group, make good use of limited conditions, and increase the quantity of effective proposals in each working group to achieve "full support" and "high value" [27]. At the bilateral and multilateral levels, the vitality of bilateral and multilateral cooperation based on hard law and soft laws needs to be stimulated so as to achieve the goal of "promoting practical cooperation in all fields" [27]. Inasmuch as the above prediction of China's practice based on *China's Arctic policy*, the authors believe that China does not advocate for breaking the existing international legal order of Arctic governance for its sustainable development, especially in the context of the situation in Ukraine. The conclusion could, to some extent, alleviate doubts of some Arctic states about China's engagement in Arctic affairs related to the theme.

Currently, the international law development of Arctic governance for its sustainable development is facing some challenges, especially the hindrance of the situation in Ukraine for the operation of the AC. Considering the rapidly changing situation in Ukraine, the cooperation based on soft laws and implied consensus reflected by the forms including but not limited to hard laws between Arctic states and non-Arctic states seems to be more

efficient and effective. Such cooperation could be based on the Arctic forums, including but not limited to the AC, or could be organized by the cooperating states themselves. Given that most Arctic states take the issue of climate change response into consideration, the cooperation between Arctic states and non-Arctic states based on clean energy is expected.

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Article

Why International Conciliation Can Resolve Maritime Disputes: A Study Based on the Jan Mayen Case

Limin Dong

School of International Affairs and Public Administration, Ocean University of China, Qingdao 266005, China; donglimin@ouc.edu.cn

Abstract: The settlement of maritime disputes is an important issue faced by many countries. Choosing an appropriate settlement method is the primary task of policy makers. International conciliation, which results from careful and systematic evaluation, could become the primary choice of dispute settlement. During conciliation, parties have dominant and final decision-making power over the settlement of disputes, and there is flexibility in the application of law and procedural rules. The Conciliation Commission provides independent third-party advice, and the political and time costs of dispute settlements are relatively low. These are core advantages of conciliation that attract the attention of decision makers. The willingness and diplomatic relations of disputing parties, existence of external pressure, economization of delimitation, and capacity of the Commission are key factors that affect the success of conciliation. The roles these factors play depend on their controllability and the strength of the disputing parties. The effects of dispute settlement with the assistance of the Conciliation Commission are systemic. The successful settlement of maritime disputes between Norway and Iceland in the context of the Cold War not only demonstrated that conciliation is of great value in resolving maritime disputes and promoting inter-state relations but also had considerable uniqueness. Many questions regarding international conciliation cannot be clearly answered by the Jan Mayen Case. Increased state practice and further in-depth research are needed.

Keywords: maritime dispute; international conciliation; continental shelf; system effects

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1. Introduction

Along with the development of human marine activities, the number and complexity of maritime disputes have increased rapidly. Dispute settlement has become an important issue that many countries must face. In order to promote the peaceful settlement of disputes, the international community has explored methods such as negotiation, investigation, conciliation, arbitration, and litigation. Among them, international conciliation, which was conceived in the late 19th and early 20th centuries, represents an important achievement. The Charter of the United Nations specifically stipulates conciliation as one of the main methods of dispute settlement. The United Nations Convention on the Law of the Sea has also incorporated it into its dispute settlement mechanism. After long-term exploration, international conciliation has developed into voluntary conciliation and compulsory conciliation. However, both methods were not given sufficient attention in practice for a long time until Timor-Leste and Australia successfully resolved their maritime dispute through compulsory conciliation in 2018 when the method received attention again. As many countries are suffering from rigid, inflexible, and time-consuming arbitration and litigation procedures, the value of conciliation needs to be reawakened. Although dispute settlements depend on professional investigation and the conclusion of facts and legal issues, it should be noted that choosing an appropriate method still represents an important political decision for the involved parties. In terms of its procedural value, how can international conciliation become a key option for policy makers? As a non-confrontational, cooperative approach, does the success of conciliation depend on other factors? Can the

parties ensure they play a positive role? What are the implications of resolving disputes with the assistance of the Conciliation Commission? The systematic assessment of these issues is the prerequisite for decision makers in choosing this method. As early as the 1980s, Norway and Iceland resolved a maritime dispute through conciliation. The success of the Jan Mayen Conciliation, which occurred during the Cold War, not only demonstrated the value of conciliation in resolving maritime disputes and promoting inter-state relations; it was also inseparable from the international political background of the time, the friendly relations between the two parties, and other factors, which were quite unique. However, it is also one of the few international conciliation cases to have been made public and one of the few successfully resolved maritime disputes in recent decades, providing important empirical materials for academic research. According to Jean-Pierre Cot, the classical model of conciliation is defined as a non-compulsory procedure. Compulsory conciliation is quite contrary to the initial philosophy of it. Compared with the Timor-Leste/Australia compulsory conciliation case, the Jan Mayen Case is more capable of reflecting the core characteristics of the procedure [1]. Scholars have carried out rich discussion on the latter case, mainly from the perspective of international law [2,3]. From the perspective of political decision making, studying this case can also provide assessment approaches for decision makers who intend to initiate international conciliation voluntarily. This article attempts to answer the above-mentioned questions based on an analysis of the Jan Mayen Conciliation, providing new ideas and possibilities for countries that are struggling to find a suitable dispute settlement method.

2. Jan Mayen Conciliation

2.1. Background of the Dispute and the Establishment of the Conciliation Commission

Jan Mayen is a small island in the Arctic that belongs to Norway. The shortest distance between the island and Iceland is approximately 292 nautical miles. In the 1960s and 1970s, with the development of the international law of the sea, Norway and Iceland began to claim exclusive economic zones and continental shelves [4,5]. Since the distance between Jan Mayen and Iceland is less than 400 nautical miles, the maritime claims of the two countries overlapped, which led to a demarcation dispute. The two sides negotiated and reached the Agreement Between Norway and Iceland on Fishery and Continental Shelf Questions on 28 May 1980.

The agreement resolved the delimitation of the exclusive economic zone between Iceland and Jan Mayen. However, the two countries still disputed the delimitation of the continental shelf. They agreed to submit the dispute to a Conciliation Commission and made specific provisions in Article 9 of the Agreement. According to these provisions, the Commission consisted of three conciliators. Each side appointed one conciliator of their own nationality. The chairman of the Commission was jointly appointed by two countries. Iceland appointed Ambassador Hans G. Andersen as conciliator, who was also head of the Icelandic delegation to the third UN Conference on the Law of the Sea. Norway appointed Ambassador Jens Evensen, head of the country's delegation to the Conference, as its conciliator. By unanimous agreement between the two countries, Elliot Richardson, head of the U.S. delegation to the Conference, was selected as chairman. The Conciliation Commission was officially announced on 16 August 1980. Afterward, the Commission held meetings with both parties in Washington, New York, Geneva, and London to actively promote the dispute's resolution.

2.2. Dispute Investigation and Resolution

2.2.1. Conciliation Commission Conducts Independent Investigation

The independent investigation of disputes is an important responsibility of the Conciliation Commission [6]. In the Jan Mayen Case, the legal status of Jan Mayen Island and whether the disputed continental shelf was a natural extension of Jan Mayen Island or Iceland had a key impact on the settlement of the delimitation. These also represented the

main disputes between the two parties. The Commission conducted an investigation into this.

First, the Commission investigated and concluded the legal status of Jan Mayen Island. With the development of the international law of the sea, the legal status of islands can have a key impact on the delimitation of continental shelves [7]. In the Jan Mayen Case, Iceland and Norway had a difference of opinion on the legal status of the island and its ability to have an exclusive economic zone and continental shelf. Iceland maintained that Jan Mayen Island was a rock that could not have an EEZ or continental shelf. Even if the island could claim them, it could not be given the same status as Iceland. Norway, on the other hand, maintained an exclusive economic zone and continental shelf could be claimed for Jan Mayen. Accordingly, the legal status of Jan Mayen Island became the first issue to be investigated and determined by the Commission. The Commission investigated the location, size, physical geography, and human activities of Jan Mayen Island. It concluded that Jan Mayen was an island that could have an exclusive economic zone and continental shelf in accordance with Article 121 of the United Nations Convention on the Law of the Sea [8].

Second, the Commission investigated and concluded that the disputed continental shelf was not a natural extension of Iceland or Jan Mayen. In the case, the failure of the parties to reach an agreement on the application of the principle of natural extension and the delimitation of the continental shelf was the main reason they submitted the dispute to the Commission. Based on the principle of natural extension, Iceland maintained that the seabed between the country and Jan Mayen was a natural extension of Iceland's land territory and formed part of the Icelandic continental shelf. The outer limit of it exceeded 200 nautical miles [9]. Norway, on the basis of the same principle, maintained that this part of the seabed was a natural extension of Jan Mayen Island. Determining the geological relationship between the Jan Mayen Ridge, Iceland, and Jan Mayen Island was the key to deciding on the application of the natural extension principle. The Commission established a working group of scientists. The working group was responsible for investigating and submitting a report to the Commission, which included two parts. First, they investigated and determined whether the ridge was a natural extension of Iceland or Jan Mayen. Second, they used the existing geological and geophysical data to analyze the distribution of resources on the disputed continental shelf. After investigation, the working group concluded that the Jan Mayen Ridge was neither Iceland's nor Jan Mayen Island's natural extension. Based on this, the Commission believed that the principle of natural extension could not be used as the basis for the delimitation of the continental shelf in the case.

2.2.2. Commission Recommendations and Dispute Resolution

The Agreement required the Commission to try to make recommendations within five months of its establishment. On the basis of the investigation into the dispute, the Commission finally submitted a report to Iceland and Norway in May 1981. It made two recommendations and pointed out that they constituted a method of resolving the dispute.

First, the Commission proposed that the two countries could jointly develop resources in the disputed area. Based on the resources assessment of the Jan Mayen Ridge by the working group, it designated a special area of 45,474 square kilometers in total as a joint development zone. Moreover, the Commission also provided recommendations on cooperation models, including the jurisdiction of resource exploration and development activities in the development zone; the development cooperation of transboundary resources within the zone; resource cooperative development methods across the zone; and benefit sharing.

Second, the Commission suggested that the delimitation of the continental shelf in this area should be consistent with the exclusive economic zone previously reached in the Agreement. Accordingly, the central and northern sides of the joint development zone were under the jurisdiction of Norway and included 32,750 square kilometers (accounting for 72% of the total area of the joint development zone), and the area under the jurisdiction of Iceland on the southern side was 12,725 square kilometers (28% of the total area of the joint

development zone). These recommendations were eventually accepted by both parties. On the basis of this proposal, the two countries formally signed a delimitation agreement on 22 October 1981.

3. Why Conciliation Could Be the Option for Disputing Parties

When Norway and Iceland could not resolve their dispute through negotiation, what were the reasons they finally chose conciliation? The success of the Jan Mayen Case allows us to investigate this. The dominant power over the dispute settlement process; the flexibility in the application of law and procedural rules; the independent third-party advice provided by the Commission; and the relatively low cost of conciliation create key attractions. These elements have general implications for other countries that opt for conciliation to resolve maritime disputes.

3.1. *The Parties Have Dominant and Final Decision-Making Power over the Settlement of Disputes*

According to the logic of classical realist international relations theory, the pursuit of power is at the core of national interests [10]. When making a decision on choosing a dispute settlement method, countries must take dominance and final decision-making power as the primary consideration. In the Jan Mayen Case, the Conciliation Commission involved in the settlement of the dispute was a third party; however, considering the initiation of the procedure, the non-judgmental nature of the Commission's functions, and the fact that the results were only recommendations, Norway and Iceland were always able to make the final decision. Apparently, both countries were happy with the outcome.

The initiation of the procedure and the establishment of the Commission by Norway and Iceland were entirely voluntary. Voluntariness is a core principle of international conciliation. Accordingly, the initiation of the procedure must be based on the willingness of the parties. This principle has been guaranteed by many important international institutions. According to the Regulations on the Procedure of International Conciliation promulgated by the Institute of International Law, the Conciliation Commission has the power to hear disputes only with the consent of the parties [11]. The United Nations Model Rules for the Conciliation of Disputes between States adopted by the UN General Assembly requires that conciliation can only be initiated with the written consent of the disputing parties [12]. The Optional Conciliation Rules formulated by the Permanent Court of Arbitration stipulate that the initiation of conciliation proceedings requires the consent of the parties to dispute [13]. Iceland and Norway reached the Agreement through consultation, confirming that they would submit the maritime disputes to conciliation. Moreover, a Conciliation Commission is also established by the joint appointment of both parties; it is clear that, from the beginning of the conciliation, the two countries had absolute dominance during the process.

The core responsibility of a Conciliation Commission is to promote the peaceful settlement of disputes. This not only differentiates the procedure from the highly adversarial nature of arbitration and litigation, but also further ensured Norwegian and Icelandic dominance. The emergence of international conciliation largely stems from the fact that the international community considers some disputes to be legally non-judgmental, and thus regards conciliation as an alternative method to resolve them [14,15]. Lauterpacht points out that the fundamental feature of conciliation is not the implementation of the law; its existence means that some international disputes are recognized as non-judgmental [16]. Max Huber also believes that since political disputes are legally non-judgmental, they cannot be resolved by resorting to international adjudication. Conciliation provides new possibilities for the peaceful settlement of international disputes [17]. Considering the complexity of maritime delimitation and in the interest of maintaining friendly relations, Iceland and Norway did not intend to refer the dispute to an arbitral tribunal or court. Instead, they appointed a Conciliation Commission to provide recommendations. The Commission investigated legal and factual issues, such as the status of Jan Mayen and

whether the disputed continental shelf was a natural extension of Iceland or Jan Mayen. However, it was emphasized that the Commission's role was to propose a solution that was fair and acceptable to both countries rather than adjudicate the maritime dispute strictly in accordance with the law. Compared with arbitration and litigation, the Conciliation Commission, Iceland, and Norway established and maintained close cooperation throughout the dispute resolution process. They held conciliation meetings in many places. The Commission also sought the views of the two parties on the report and recommendations. To the greatest extent, Norway and Iceland's dominating power over the dispute settlement was guaranteed.

According to the rules of international conciliation, as a third party, the Commission has the right to intervene in the settlement of disputes and make recommendations. However, its recommendations are not legally binding on the parties. This is the core feature that distinguishes conciliation from arbitration and litigation. It ensures that parties have the final decision on the dispute settlement. In the Jan Mayen Case, Iceland and Norway clearly stipulated in the Agreement that the recommendations and reports of the Commission would not be legally binding. This meant that the final settlement of the dispute still depended on the willingness of both parties, and that even if they accepted the recommendations, this would not change the legal nature of the recommendations themselves. In the Maritime Delimitation Case between Greenland and Jan Mayen, the International Court of Justice pointed out that the success of the Jan Mayen Conciliation was the result of political compromise between the two parties. Hence, it rejected the request to set the case as a precedent in the sense of international law [18]. This judgement reaffirmed the final decision-making power of the parties in resolving disputes through conciliation. Norway and Iceland regarded conciliation as part of a negotiated settlement of disputes between them. Based on the Commission's recommendations, they continued to negotiate and finally signed a demarcation agreement. It is worth noting that disputing parties hold dominating power, which is not only an advantage of conciliation, but is also an important cause of the shortcomings of the method. The initiation and outcomes of conciliation depend largely on the will and cooperation of the parties. This means that without them, the procedure is easily at risk of failure. The uncertainty arising from the Conciliation Commission recommendations' lack of a legally binding nature is also prone to inviting concerns that parties may still be unable to resolve disputes after time and effort have been devoted to conciliation. With these considerations in mind, it is not difficult to understand why some countries prefer to settle maritime disputes through arbitration and litigation.

3.2. The Commission Can Apply Law and Procedural Rules in A More Flexible Way

The development of international conciliation has largely been influenced by arbitration procedures. The Agreement reached by Iceland and Norway provided the procedures to be followed in a dispute settlement. They include the composition of the Conciliation Commission, rights and responsibilities of the Commission, decision-making rules, submission dates, legal effects of the recommendations, etc. Nevertheless, the Commission and parties are less tightly bound by legal and procedural rules than in arbitration and litigation. The flexibility of the political dispute resolution method is maintained. This was of great significance in guaranteeing the dominance of Norway and Iceland throughout the dispute settlement process.

The basic idea of conciliation is that international disputes are the result of various factors combined, such as law, politics, economy, history, etc. International law is only one of the problems faced in resolving disputes. When parties are choosing a settlement method, international law cannot always be the primary consideration [19]. In order to achieve the amicable settlement of disputes and meet the real interests of parties, the recommendations made by the Commission may not be strictly limited by the law and rules of evidence. It was this factor that led Norway and Iceland to choose conciliation. In making proposals for maritime delimitation, the disputing parties requested the Commission would fully

consider the following factors: Iceland's significant economic interests, the geographical and geological conditions of the disputed area, and other special circumstances. Accordingly, the Commission focused on the following factors in making its recommendations: Iceland's energy sources are completely imported; scientific research estimates that the resource reserves on the Icelandic continental shelf are extremely low; the Jan Mayen Ridge is the only place where resources are likely to be stored; and the development of the Jan Mayen Ridge's resources is technically important. Moreover, the Commission also concerned itself with the uncertainty regarding the resources of the continental shelf in the disputed area leading to a need for continued research and exploration; and the promotion of friendly relations between Iceland and Norway. The Commission did not make recommendations dogmatically based on legal provisions, but made some practical arrangements after the comprehensive consideration of variable factors, including political, economic, diplomatic, and legal factors. These arrangements did not necessarily strictly conform to the principle of law. However, they could be accepted by the parties and were better equipped to ensure the equity of the demarcation [20].

Although Iceland and Norway reached procedural rules through the Agreement, the case showed that the Commission could still adjust flexibly according to the needs of the dispute settlement. For example, the Commission had flexibility in following the procedural rules. Since the two conciliators appointed by the parties had participated in previous negotiations and had a full understanding of the case, the Commission determined that there was no need to provide further written or oral opinions. The members of the Commission were experts in the international law of the sea. They did not have professional knowledge on topography or the geological relationship of the disputed continental shelf, nor on the resource reserves in the area. Therefore, the Commission set up a scientist working group that was required to investigate and report on the scientific issues.

According to the Agreement, the Commission had to submit recommendations within five months of its establishment. However, it did not submit recommendations until May 1981, which apparently exceeded the time limit. Neither Iceland nor Norway disputed this. Moreover, the content of the Commission's recommendations went beyond the scope of the parties' request. According to Article 9 of the Agreement, the parties merely requested the Commission's assistance in resolving the dispute over the delimitation of the continental shelf. The recommendations went beyond this since they also proposed that the two countries jointly develop resources in the area, emphasizing that these two proposals together constituted a solution. The joint development proposal clearly exceeded the scope of the request. Iceland and Norway did not dispute this and accepted both proposals in their 1982 demarcation agreement.

3.3. The Commission Provides Independent Third-Party Recommendations

For the settlement of maritime disputes, direct negotiation by the parties is the first choice of many countries. They are often cautious about the method of third-party intervention. Since Norway and Iceland were unable to resolve their dispute through negotiation, they decided to submit it to the Conciliation Commission. In turn, the recommendations made by the Commission provided a new possibility. The Agreement also stressed that the Commission's recommendations would be given due consideration in future negotiations. Of course, this also demands the high competency of the Commission. As the Commission stated, a solid factual and legal basis are key for the parties to accept the recommendations. Therefore, conclusions on issues of fact and law should be able to withstand challenges from both sides. The Commission's investigation and determination of the legal status of Jan Mayen Island was based on Article 121 of the United Nations Convention on the Law of the Sea. Their conclusion on the topographical and geological relationship of the disputed continental shelf with Iceland and Jan Mayen Island was based on the scientific working group's report. These conclusions were sufficiently authoritative to be respected by both Norway and Iceland.

Although the recommendations were not legally binding, this did not prevent them from having a critical impact in achieving the dispute settlement. Iceland and Norway continued to negotiate on the basis of the recommendations and eventually reached a demarcation agreement [21]. The provisions on the delimitation of the continental shelf and the joint development zone in this agreement were consistent with the recommendations. It can be said that, when Iceland and Norway could not resolve the dispute through bilateral negotiation, the intervention of the Commission became key to its final solution. Moreover, whether disputes were resolved through negotiation or conciliation, it was inevitable that the parties would exchange interests or compromise. This led them to potentially facing enormous domestic pressure. Based on strategic considerations, Norway needed to take Iceland's special economic interests into account. Thus, the government faced doubt from various domestic interest groups and the public. Since the recommendations were proposed by the Commission, this overtly shifted the focus to a third party and helped ease the pressure on the Norwegian government.

3.4. The Political and Time Costs of Dispute Settlement Are Relatively Low

The settlement of international disputes is a process of a game focused on national interests, which is bound to consume a lot of resources from all parties involved. Countries need to conduct a cost and benefit analysis when choosing a dispute settlement method. Compared with arbitration and litigation, conciliation has obvious advantages with respect to controlling political and time costs, which is an important reason why Iceland and Norway resorted to it.

Arbitration and litigation have traditionally been viewed as highly adversarial methods. When parties submit disputes to these adjudicating bodies, their diplomatic relations could be negatively affected. During the South China Sea arbitration, relations between China and the Philippines were directly affected. Timor-Leste and Australia's relations have also been influenced since they initiated an arbitration under the Timor Sea Treaty in 2013 [22]. If Norway and Iceland had chosen arbitration or litigation, the two countries would have inevitably been in a state of confrontation with each other. This might have negatively affected their diplomatic relations. The political costs were broader and difficult to calculate precisely. Conciliation is a cooperative method. With the assistance of the Commission, the two countries resolved their differences through consultation and cooperation, effectively reducing or even avoiding the political costs.

Conciliation can also control the time costs of parties, which is an important reason why the method is largely welcomed. In order to facilitate the settlement of disputes within a short period of time and to avoid procedural abuses and delays in dispute settlement, the working time of the Commission is usually limited [23]. In the Jan Mayen Case, it took only one year and two months from the establishment of the Commission to the final signing of the delimitation agreement. Even the Timor-Leste/Australia compulsory conciliation took less than two years. Since the entry into force of the United Nations Convention on the Law of the Sea, a total of 11 disputes involving the law of the sea have been submitted to the International Court of Justice. Among them, nine cases involved maritime delimitation disputes. Six cases in which the Court rendered judgments, including the Territorial and Maritime Dispute between Nicaragua and Honduras in the Caribbean Sea (Nicaragua v. Honduras); Territorial and Maritime Dispute (Nicaragua v. Colombia); Maritime Delimitation in the Black Sea (Romania v. Ukraine); Maritime Dispute (Peru v. Chile); Maritime Delimitation in the Caribbean Sea and the Pacific Ocean (Costa Rica v. Nicaragua); and Maritime Delimitation in the Indian Ocean (Somalia v. Kenya). These trials took at least four years. The longest one lasted for 11 years. It has been nearly 10 years since the dispute on the delimitation of the continental shelf between Nicaragua and Colombia was submitted to the Court [24]. The International Tribunal for the Law of the Sea took three and four years to hear the maritime delimitation disputes between Bangladesh and Myanmar in the Bay of Bengal and between Ghana and Côte d'Ivoire in the Atlantic Ocean, respectively [25]. The ongoing maritime dispute between Mauritius and Maldives in the

Indian Ocean was submitted to the ITLOS three years ago. According to the records of the Permanent Court of Arbitration, it takes three to five years for UNCLOS Annex VII arbitral tribunals to hear cases [26]. By comparison with maritime delimitation disputes submitted to the International Court of Justice, the International Tribunal for the Law of the Sea, and arbitral tribunals, international conciliation's advantage with respect to time costs is even more apparent.

4. Key Factors Affecting the Success of Conciliation

The above content combined with the Jan Mayen Case shows that conciliation, with its four advantages, could become an option for countries. Logically, the next question rests on how to ensure the success of conciliation. In other words, in addition to the procedure itself, does the resolution of maritime disputes through conciliation depend on other factors? Could the parties control them? There were four key drivers of dispute settlement in the Jan Mayen Case (Figure 1). Among them, the willingness and diplomatic relations of the parties; economization of the dispute; and composition of the Commission were more controllable by the disputing parties. External pressure was less controllable. It should be pointed out that the Jan Mayen Case was quite unique, and the factors that promoted its success may not have universal relevance.

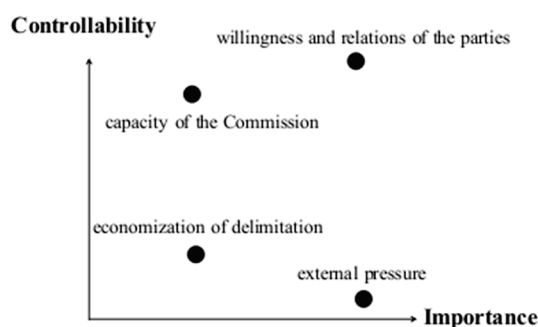


Figure 1. Key Factors Affecting the Success of Conciliation.

4.1. The Willingness and Diplomatic Relations of Disputing Parties

Since the parties held the dominating power, the will of Norway and Iceland and their relationship became the fundamental factors affecting the settlement of the dispute. Undoubtedly, both the factors were precisely controlled by the parties. Since the two countries negotiated and submitted the dispute to conciliation voluntarily, there is no doubt that they had a strong will to resolve it.

Iceland and Norway are Nordic countries. They have close ties on various levels, including politics, economy, culture, diplomacy, and military. Both sides wanted to maintain traditional relations, regional peace, and stability. This is an important basis for their cooperation in resolving disputes. Norway is a major Nordic power. Strengthening interdependence with other countries in the region was a key priority of its foreign policy in the 1970s and 1980s. The country had already made some compromises with its neighbors when resolving disputes over maritime delimitation and dealing with issues such as energy development. As early as the 1960s and 1970s, Norway had already taken Iceland's interests into consideration when it claimed the exclusive economic zone and continental shelf of Jan Mayen. The 1958 Convention on the Continental Shelf allowed contracting parties to designate the outer limits of a continental shelf using the "200 m isobaths criterion" or "resource exploitation capacity criterion" [27]. Accordingly, Norway promulgated a decree in 1963 declaring that the country had sovereignty over all the natural resources of the seabed and subsoil adjacent to its coast. Its outer limits were determined by the "resource exploitation capacity criterion". The decree also stipulated that the outer limits of Norway's continental shelf should not exceed the median line with other countries. This left room for the cooperation required to resolve the continental shelf delimitation dispute with Iceland.

On 17 December 1976, Norway promulgated the Economic Zone Decree, declaring it had the right to establish a 200 nautical mile exclusive economic zone. It then established an exclusive economic zone and a fishery protection zone in the Norwegian mainland and the waters off the Spitzbergen Islands. However, Norway had not yet claimed an exclusive economic zone in the waters near Jan Mayen Island. In 1978, important fishery resources were discovered in the waters southwest of Jan Mayen. Under pressure from fishermen, the country announced that it had the right to claim an exclusive economic zone in the waters near Jan Mayen [28]. At this time, Norway still took the interests of Iceland into account. It stated that it would only issue the decree to claim an exclusive economic zone in this area if Iceland did not object. When deciding to submit the dispute to conciliation, Norway also explicitly requested that the Commission take Iceland's special interests into account.

Being a Nordic country, seeking to maintain good relations with neighboring Nordic countries is a key goal of Iceland's foreign policy [29]. This apparently has implications for its cooperative approach to resolving maritime disputes with Norway. Conciliator Jens Evensen noted that Norway and Iceland had a close partnership based on history and ethnicity, which provided the basis for the negotiation and the success of the conciliation [30]. It is not difficult to imagine that, should parties lack the necessary will or their diplomatic relations not provide sufficient support for the settlement of disputes, even if conciliation were initiated it would be unlikely to succeed.

4.2. External Pressure

The Jan Mayen Case occurred during the Cold War. The settlement of the maritime dispute between Norway and Iceland was not only related to the relationship between the two countries. It may have also been impacted by the military deployment of NATO and even the overall strategic competition between the United States and the Soviet Union. At the time, Norway and Iceland were highly dependent on the United States for security, diplomacy, and economy [31]. This increased the latter country's ability to influence the two Nordic countries. External pressures, such as the United States, NATO, and even the Soviet Union, therefore played key roles in the case.

Norway and Iceland are members of NATO. They were at the forefront of strategic confrontation during the Cold War. Specifically, the ocean area from Greenland to Iceland and the United Kingdom was the only passage for the Soviet Navy and Air Force to enter the Atlantic Ocean, namely the G-I-UK Gap. Iceland, along with Greenland and the United Kingdom, was regarded as a natural barrier for the early warning and interception of the ships and aircraft of the Soviet Union. The country is also at the center of the gap. Its strategic location was therefore extremely important [32]. In order to detect and monitor information on Soviet military activities, the United States deployed a radar station in Keflavik, Iceland. Under the circumstance of increasing confrontation between the East and West, the strategic value of Iceland was self-evident. As a result, maintaining a military presence in Iceland became a priority of U.S. foreign policy in the 1970s and 1980s [33]. The support of the U.S. and NATO boosted Iceland's leverage in negotiations with Norway. To safeguard its interests, Iceland will likely use its position to seek compromises from other countries. For example, before the Jan Mayen Case, Iceland had already demanded pressure from NATO and the United States on the grounds of withdrawing from the organization and terminating its radar stations, which eventually forced Britain to make concessions in a fisheries dispute with Iceland [34,35]. If Iceland had failed to achieve its goals in the dispute settlement with Norway, it would have used this tactic again. Moreover, if the maritime dispute had become out of control and escalated into a fierce fight, it would have directly affected the overall situation of cooperation among NATO allies and the strategic competition with the Soviet Union. Thus, the United States and NATO needed to contain this dispute at an early stage and pushed for a quick settlement. Norwegian Foreign Minister Knut Frydenlund acknowledged that there were strategic considerations in the Jan Mayen Conciliation. The country tried to avoid or minimize any negative impact on Iceland's relations with NATO and the United States [36].

In addition, concerns about the Soviet Union taking the opportunity to strengthen relations with Iceland were an important source of external pressure for Norway [37]. In the 1970s and 1980s, Iceland viewed the Soviet Union not as a major security threat but as its trading partner. Strengthening ties with Iceland was an important strategy for the latter country during the Cold War. The Soviet Union supported Iceland during its fishing dispute with Britain. For strategic purposes, the Soviet Union deliberately exaggerated the differences between the two countries and supported Iceland. Facing this pressure, Norway had to compromise in its dispute settlement with Iceland to prevent Soviet goals from being achieved.

Norway and Iceland are small and medium-sized countries with limited strength. They were caught in the middle of a strategic competition between great powers. Their foreign policy was inevitably influenced by these powers. Although Iceland and Norway were completely disproportionate in power, the latter was under pressure from the United States, NATO, and even the Soviet Union. This was the key to its compromise in the dispute settlement. In this dispute, the role external pressure played in facilitating a final settlement cannot be underestimated. This pressure was clearly well beyond the control of Norway and Iceland. The two countries were undoubtedly fortunate; after all, the external pressure played a positive role in the dispute resolution. For states trying to resolve maritime disputes through conciliation, close attention must be paid to external factors and players. If the resolution of disputes is not in their interests, they may also cause unmanageable disruptive effects.

4.3. Economization of Maritime Delimitation

There are many types of maritime disputes, among which boundary disputes are the most difficult. Boundary disputes always involve factors such as history, international law, national feelings, resource ownership, and international politics. A Conciliation Commission can consider these factors more flexibly and resolve disputes fundamentally.

At the heart of the maritime delimitation dispute between Norway and Iceland was the competition for the continental shelf. The continental shelf is an important source of oil and gas production. The concept of a continental shelf in the sense of the international law of the sea was first proposed by the Truman government in 1945 and had a strong resource attribute [38]. Since then, the exclusive jurisdiction of coastal states over natural resources on their continental shelf has been recognized by the United Nations Convention on the Law of the Sea [39]. The fundamental reason for the dispute over the delimitation of the continental shelf between Norway and Iceland was competition for resources. As a result, the Conciliation Commission proposed a joint development zone in the disputed area and a benefit-sharing mechanism so as to transform the complex demarcation issue into an economic issue. This not only reduced the sensitivity of dispute but also fundamentally eliminated the possibility of disputes between the two sides over the ownership of resources. The recommendations made the delimitation itself irrelevant and thus reduced the difficulty of the dispute. There is no doubt that the economization of maritime delimitation has played an important role in facilitating the settlement of disputes; this approach has been increasingly practiced in resolving other maritime disputes [40,41]. It should be noted that the success of such a solution depends not only on the will of the parties but also on the nature of the dispute itself, the coordination capacity of the Conciliation Commission, and other accidental factors. Thus, although the disputing parties have some control over these factors, the extent of their control is relatively low.

4.4. Composition and Coordination Capacity of the Commission

The procedural advantages of conciliation only create the formal conditions for dispute settlement. Whether they can be fully utilized depends not only on the willingness of the parties but also on the capabilities of the Commission. The appointment of conciliators and the composition of the Commission are important prerequisites for the achievement of dispute settlement, which are entirely in the hands of the parties and are highly controllable.

The success of the Jan Mayen Case is inseparable from the careful arrangements of the Commission. The dispute was closely related to the international law of the sea. Thus, the conciliators appointed by the two countries had a legal background and also played a key role in the negotiations of the third United Nations Conference on the Law of the Sea. More importantly, they also had the diplomatic experience required for negotiation, which laid the foundation of coordinating the interests of the two parties. The investment of Norway and Iceland in establishing the Commission ultimately paid off. First, the Commission conducted a serious investigation into the dispute. It noted that its recommendations could be accepted by both parties only if they had a conclusive legal and factual basis [42]. Second, the Commission made full use of the flexibility of the procedure, including setting up a working group of scientists, extending the deadline for submitting recommendations, and making proposals beyond the scope of the request. It also contributed to the complete settlement of the dispute by economizing complex delimitation issues, actively safeguarding relations between Norway and Iceland, and giving special care to the interests of the latter as required.

5. Systemic Effect of Resolving Maritime Disputes through Conciliation

For political decision makers, achieving dispute settlement is the central objective. However, in order to make the best choice, they must undertake a systematic assessment of the impact of the dispute settlement in advance. The influence of resolving disputes through cooperative conciliation is necessarily different from that of highly confrontational arbitration and litigation. It has a direct impact on policy makers' choice of procedure. Using the system effect analysis framework by Robert Jervis [43], this section of the article intends to reveal the possible impact of resolving maritime disputes through conciliation (Table 1). It is important to note that the following analysis is based on the case study of the maritime delimitation dispute between Norway and Iceland; the particularity of this case still cannot be ignored.

Table 1. The systemic effects of the Jan Mayen Conciliation.

	Direct Effects	Indirect Effects
Intentional Effects	Disputes are resolved; the interests of both parties and friendly relations are maintained	Lays the foundation for cooperation in resource development and governance in the disputed sea area
Unintentional Effects	The stability of the regional power structure is promoted	Promotes the practice and development of international conciliation

5.1. Direct and Intentional Effects: Resolved Disputes, Maintained Interests, and Good Relations

Resolving disputes, safeguarding the interests of the parties, and maintaining friendly relations are the most direct and primary objectives of countries facing maritime disputes. With the assistance of the Conciliation Commission, Norway and Iceland worked closely together to finally demarcate the maritime boundary and enact a plan to establish a joint development zone. This brought the decades-long dispute between the two countries to a complete settlement.

At the request of the parties, the joint development zone proposed by the Commission took special consideration of Iceland's economic interests. The country's maritime and economic interests were largely maintained. In the JDZ, the continental shelf under the jurisdiction of Norway is 32,750 square kilometers. This is much more than the 12,725 square kilometers under the jurisdiction of Iceland. The two countries also made favorable arrangements for Iceland in terms of resource exploration and cost and benefit sharing. It was agreed that the cost of geological exploration would be borne by Norway, but the results would be shared by the two countries. Iceland was given more freedom of choice in the commercial development of resources, meaning it faced less risk than Norway. The

economic compromise made by Norway was highly welcomed in Iceland. However, the Norwegian government faced much doubt domestically [44]. At the same time, Iceland's strategic importance was again confirmed by the United States and NATO.

Although economic compromises were made, Norway's substantive interests were not seriously affected. In fact, under the active coordination of the Commission, Iceland also adjusted some of its own positions. This included accepting that Jan Mayen was an island with the right to claim an exclusive economic zone and continental shelf, abandoning the proposal that all the waters surrounding Jan Mayen Island were under the joint jurisdiction of the two countries, and no longer claiming the continental shelf beyond 200 nautical miles. It also no longer insisted that the mineral resources of the waters around Jan Mayen Island were completely shared by both parties. This satisfied Norway's maritime and economic interests. More importantly, Norway had broader strategic and military objectives. As a major Nordic power, it was committed to maintaining regional peace and stability. By resolving maritime disputes with Iceland, traditional friendly relations were strengthened between the two countries. According to Frydenlund, the former Norwegian Foreign Minister, Iceland is an important member of the Nordic society. This is the main reason for Norway to avoid conflicts with Iceland and maintain relations between the two sides [45]. Former Norwegian Prime Minister Odvar Nordli also admitted that the maritime dispute with Iceland would affect the relationship between the two countries in other areas, which was an issue that the Norwegian government needed to face. Because of the concessions made by Norway, Icelandic nationals' favorability towards Norway improved [46]. This continued to consolidate the friendly relations between them, thereby promoting regional peace and stability. Furthermore, if the maritime dispute between the two countries had not been well resolved, Iceland may have requested the withdrawal of United States military bases and radar stations. Norway had to offer an alternative solution. It is worth noting that in order to not provoke the Soviet Union, Norway did not allow other countries, including allies, to deploy troops in its country at that time [47,48]. The settlement of the maritime dispute also lifted the threat of changing its military policy.

5.2. Direct but Unintentional Effects: Promoting the Stability of the Regional Power Structure

The intervention of the United States and NATO was an important driving force for Norway and Iceland to achieve the settlement of maritime disputes through conciliation. Its direct result was that the NATO alliance was further maintained, which ensured the stability of the regional power structure in the context of the Cold War. Norway and Iceland are Nordic countries and they are both NATO members. The maritime dispute settlement deepened the interdependence between the two countries [49]. Since the further escalation of the dispute may have threatened the relationships of NATO alliances, resolving the dispute limited contradictions to a controllable range and removed such a threat.

The relationship between the United States, Norway, and Iceland was consolidated. Norway's foreign and security policy was closely influenced by the United States, focusing on the maintenance of Western cohesion. The country complied with the will of the United States and made a compromise to Iceland in the Jan Mayen Case. It was once regarded as the soundest partner in NATO [50]. As Norway resolved its maritime dispute with Iceland, the United States signed a memorandum with Norway providing military equipment to help the country counter the rising Soviet threat [51]. In order to strengthen the security of Norway, some scholars in the United States even proposed to deploy radar stations on Jan Mayen Island to provide early warning of Soviet missiles and aircraft [52]. Due to the United States' pressure on the dispute settlement, Iceland's relations with US and NATO were also consolidated. This led to the country playing a more critical role in the implementation of the Reagan administration's ocean strategy in the early 1980s [53].

Although Norway and Iceland are important NATO members, the strategic landscape of East–West confrontation is far beyond their control. When they submitted their dispute to the Conciliation Commission, promoting the stability of regional power structures was not their original intention. However, the two sides chose to resolve the dispute through

conciliation, avoiding a negative impact on the strategic layout of their allies. Other countries should likewise act more cautiously when great powers' strategic competition and traditional security are highly valued. Compared with adversarial arbitration and litigation, resolving disputes through conciliation can effectively alleviate confrontation between parties. It can also reduce the risk of reshuffling the regional power structure due to the intervention of external forces.

5.3. Indirect but Intentional Effects: Laying the Foundation for Resource Development and Governance in Disputed Sea Area

The essence of the dispute between Iceland and Norway in Jan Mayen was competition over the ownership of resources. Although the two parties only requested the Conciliation Commission to assist in resolving the delimitation dispute, they still put forward a proposal to establish a joint development zone. Along with this, the Commission also proposed rules for exploration and benefit sharing. These recommendations were ultimately accepted by the two countries. The dispute settlement therefore laid the foundation for further cooperation in resource development and governance in this area.

Specifically, Iceland and Norway agreed that after the signing of the delimitation agreement, a preliminary geological survey would be carried out in the joint development zone. The cost was borne by Norway. However, the results and data were shared by both parties. As for the continental shelves under the separate jurisdictions of Norway and Iceland in the development zone, once development activities were permitted, the other country had the right to participate and share 25% of the profit [54]. In 1985, the National Energy Agency of Iceland and the Norwegian Ministry of Energy jointly conducted a preliminary survey of the joint development zone [55]. In 2007, the Icelandic government decided to offer exploration and production licenses of hydrocarbons in the Dreki area of the joint development zone. The area's oil reserves may exceed 10 billion barrels at most, which has attracted the attention of many companies [56,57]. The country then officially offered exploration licenses in the Dreki area in 2013 to companies from Denmark, Iceland, and China. According to the previous agreement, Norway decided to participate and obtained a 25% stake in the profits [58]. However, due to factors such as high development costs and high risks, exploration has been stopped [59]. In a broader sense, types of maritime disputes are not limited to delimitation. However, involvement from the Conciliation Commission often helps push the parties to de-escalate tensions. Where the Commission can further propose a cooperation model that is in line with the interests of all parties involved, it can lay the foundations for marine resource development and even governance cooperation.

5.4. Indirect and Unintentional Effects: Promoting Development of International Conciliation

States are rational actors. When policy makers seek the settlement of disputes, they consider their own interests more than the development of international law. Norway and Iceland chose to refer their disputes to the Conciliation Commission with no intention of promoting the development of international conciliation. However, it is precisely the increase in state practice that is the main driver behind the continued progress of various dispute resolution methods, including conciliation, arbitration, and litigation.

The Jan Mayen Case, which occurred between 1980 and 1981, coincided with the convening of the third United Nations Conference on the Law of the Sea. The members of the Commission were all representatives of the Conference. This led to its significant impact on the negotiation of the UNCLOS conciliation procedures. Moreover, the settlement of the dispute also had significance for the further practice and development of conciliation after the Convention came into force. The practices of the Jan Mayen Case, including the voluntary initiation of the procedure, the composition of the Commission, the flexible application of procedures and laws, etc., are all regarded as important references for the formulation of the annex V conciliation rules of the UNCLOS [60]. The Commission's approach to legal issues was also used to model the first compulsory conciliation case after the UNCLOS

came into force—the East Timor and Australia compulsory conciliation. In this case, the parties reminded the Commission to pay attention to the difference between conciliation and arbitration. During the investigation of the dispute, the Commission realized that East Timor and Australia had serious differences of opinions on issues of international law. It was not conducive to the settlement of the dispute if the Commission expressed a clear opinion. Accordingly, the Commission ultimately chose to avoid commenting on the issue. In order to achieve a complete settlement of the dispute, the joint development zone proposed by the Commission beyond the scope of the request was also affected by the compulsory conciliation of East Timor and Australia. In this case, in addition to making recommendations on the delimitation of the Timor Sea at the request of parties, the Commission also proposed a special arrangement for the cooperative management of marine resources in the area [61]. This recommendation was eventually accepted by the parties. When Norway and Iceland submitted their maritime dispute for conciliation, it may have been difficult to imagine that as the procedure has attracted more and more attention, the practices of the Jan Mayen Case are still of great value after more than 40 years.

6. Conclusions

In comparison to the settlement of maritime disputes themselves, choosing a suitable method is an important political decision. Such a choice directly affects the result of the dispute and even the maintenance of national interests. Thus, it must be made with great caution. Due to their constant rigidity and complexity in practice and development, arbitration and litigation have been questioned all over the world. It is urgent that countries search for and develop alternative dispute settlement methods. As such, can international conciliation attract the attention of policy makers and become a key option? Of course, the further consideration of conciliation requires careful assessment. The Jan Mayen Case shows that international conciliation has at least four advantages, including guaranteeing the parties' ultimate decision-making power over the dispute settlement; the flexible application of laws and procedures; providing recommendations without increasing the pressure on disputing parties; and relatively low political and time costs. The settlement of disputes does not need to necessitate adjusting to third-party tribunals. The willingness and friendly relations of the parties; the existence of external pressure; the economization of delimitation; and the capacity of the Conciliation Commission can also play important roles in dispute settlement. It is worth noting that the parties have varying degrees of control over these factors. Resolving disputes in a cooperative manner with the assistance of a Conciliation Commission is of great benefit to maintaining the interests of and friendly relations between parties; the stability of the regional power structure; the cooperative governance of disputed waters; and the practice and development of international conciliation itself. Given the many advantages of the procedure, how can international conciliation become more attractive to states? International organizations, states, and scholars have in fact made great efforts on this front. In order to reduce uncertainty about the outcome of conciliation, the United Nations General Assembly adopted a convention (Singapore Convention on Mediation) on 20 December 2018. It established a framework for the enforcement and invocation of international settlement agreements resulting from conciliation. Although the Convention applies only to commercial disputes, it may provide new ideas and directions for the development of the method. The Organization for Security and Co-operation in Europe (OSCE) had already established the Court of Conciliation and Arbitration in 1995. Recently, China also decided to initiate an international court of conciliation. With the growing demand for international conciliation, more and more platforms dedicated to conciliation should be established. There is no doubt that the settlement of the maritime dispute between Norway and Iceland in the context of the Cold War was quite unique. Constrained by the fact that there are very few cases voluntarily initiated, it is difficult to escape the drawbacks of solitary evidence in the analysis of international conciliation. Many other questions have not yet been clearly answered. Why are opinions on the role of the

method polarized in academia? Is the success of conciliation relevant to the nature of the dispute itself? If external forces are not willing to see the settlement of disputes, how great a negative impact can they exert? For scholars, further in-depth research is needed. With the active promotion of international organizations, countries, and scholars, international conciliation could play a more important role in future maritime dispute settlements.

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Article

Daily Penalty System under Revision of the Marine Environment Protection Law in China: Review and Prospect

Kang Zhang¹ and Yen-Chiang Chang^{2,*}¹ School of Law, Shandong University, Qingdao 266237, China² School of Law, Dalian Maritime University, Dalian 116026, China

* Correspondence: ycchang@dlnu.edu.cn; Tel.: +86-152-7519-7632

Abstract: The strictness of legal liability for the marine environment protects the marine space of China. Designed to impose the most severe punishment for polluting marine environmental violations, the use of a daily penalty system in maritime legislation has been developed from scratch and from the national to the local levels. Based on Article 73 of *The Marine Environment Protection Law*, the introduced factors, application, and innovative regulations of the daily penalty system are also hereby discussed. Although substantial progress has been made, the daily penalty system still faces two major obstacles, i.e., shortcomings in *The Marine Environment Protection Law* and the imperfection in the marine supporting laws, regulations, and local legislation. To this end, to provide an effective guarantee for marine administrative law enforcement and fundamentally solve the problem of the low law-breaking cost, the liability design of the daily penalty system should be improved by expanding the application scope, increasing the daily fine quota, and formulating specific applicable standards adaptable to the marine environment. In this case, a reference can also be provided for the revision of *The Marine Environment Protection Law* in China. Additionally, it is also suggested to enhance the relevant provisions of marine supporting laws, regulations, and local legislation.

Keywords: China; *Marine Environment Protection Law (MEPL)*; daily penalty system (DPS); realistic obstacles; future proposals

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1. Introduction

Covering 70% of the earth's surface, the ocean is the largest biosphere on the planet, also home to as much as 80% of all life [1]. As one of the ecosystems most affected by human activities [2], the marine system is exposed to increasingly severe threats (i.e., climate change [3], marine pollution [4], ocean acidification [5], deep-sea mining [6], etc.) that damage its health and balance. The effectiveness of marine environmental protection depends largely on the perfection of laws [7].

In 2011, the shocking ConocoPhillips oil spill occurred in China. The accident polluted a total area of over 5500 km², taking up 7% of the entire Bohai Sea area, which caused economic losses of RMB (abbreviation of Chinese currency name) 1.3 billion, and made it the worst oil spill in China in 40 years [8]. ConocoPhillips finally paid more than RMB 2 billion, including a total amount of administrative fines, administrative coordination compensation, and civil coordination. Among the overall fines, however, the administrative penalty was only RMB 200,000. A similar oil spill in the Gulf of Mexico in 2010 resulted in a fine of USD 20.8 billion (RMB 140 billion, according to the exchange rate of RMB to USD in 2010, USD 1 was about RMB 6.7704) [9]. The disparity in fines was mainly attributed to different legal punishments for oil pollution accidents between China and U.S. *The 1990 Oil Pollution Act* in the U.S. had long stipulated a civil penalty of no more than USD 25,000 (RMB 160,000 in 2010) per day. If the responsible enterprise was found to have gross negligence, intent, or fraud, the civil compensation limit of USD 75 million (RMB 500 million in 2010) stipulated by the Act would be abolished. However, the Chinese legal and regulatory system failed to

effectively protect the marine environment, especially the legal liability stipulated in the MEPL at that time. As the highest level of law in the marine management area, Article 91 of MEPL (1999 revision) regulated that the amount of administrative fines shall not exceed RMB 300,000 for violations that cause pollution accidents to the marine environment. That meant the costs of fines imposed on accidents causing marine environmental pollution were no more than RMB 300,000. In comparison, the illegal cost in China was too low for marine environmental pollution, failing to effectively crack down on marine violations. All sectors of society called for the amendment of MEPL to strengthen the punishment of polluting marine environment violations. Notably, the low illegal costs mentioned in this research referred to the low costs of fines, which indicated the low statutory cost of administrative fines for unlawfully polluting the marine environment. Direct costs and opportunity costs were not taken into account here. The former included raw materials and machines purchased for illegally discharging pollutants, fees paid for identifying pollution discharge points, etc. At the same time, the latter was an opportunity actually incurred by businesses for engaging in illegal pollution discharge.

Different from China, the international community has early found a solution to the issue of the low costs of fines for illegal behaviors related to continuous environmental violations. The famous view is the “rational polluter model” based on the deterrence theory, which allows enterprises to choose their environmental behaviors in accordance with the cost-effect analysis of law-abiding/law-breaking [10]. Previously, Charles Garlow & Jay Ryan pointed out that the ability to prevent pollution relied on a precondition that “illegal costs should be higher than compliance costs.” This indicates that it is much more economical to comply with environmental regulations than to pay fines for illegal behaviors [11]. DPS’s logic is to increase the illegal costs for continuous environmental violations by imposing consecutive economic fines to achieve effective deterrence and restrain illegal behaviors. Patricia Lindauer predicted that legal provisions, such as a “daily penalty” would be added in future legislation [12].

In order to address the issue of the low costs of fines for illegal behaviors related to marine environment polluting, the 24th session of the 12th Standing Committee of the National People’s Congress (NPCSC) deliberated and approved the draft amendment to the MEPL on 7 November 2016. This amendment introduced the DPS and canceled the ceiling of a fine at RMB 300,000. DPS takes a “day” as a punishment unit and continuously accumulates fines according to the number of days of refusing to correct the illegal pollution discharge behavior. In this case, fines are tied to the duration of the violation. The longer the illegal time is, the higher the penalty amount will be. Unlike the environmental licensing system established to prevent environmental damage before it occurs, DPS should be the ex-post resort in an environmental protection system, considered punitive measures. The design of DPS increases the cost of illegally polluting emissions by consecutive daily fines. Besides, DPS results in an effective psychological deterrence and threat of high cost for noncompliance by imposing strict economic penalties, which encourages enterprises to rectify their violations and avoid “high fines.”

After introducing the DPS, China effectively solves marine environmental pollution. China Coast Guard, jointly with the Ministry of Natural Resources, Ecology and Environment, Transport, carried out the “Blue Sea 2021” special law enforcement action for marine ecological environment protection in coastal provinces, autonomous regions, and municipalities directly under the central government. This action strictly cracked down on all kinds of violations of marine pollution and ecological destruction. Coast guard law enforcement agencies at all levels seized 438 cases involving sea sand violations, investigated and punished 57 cases of dumping wastes, dealt with 573 cases of constructing marine engineering without an environmental impact assessment and illegally excavating sea sand and destroying the island, and imposed a total sum of administrative fines of RMB 23.8 million [13]. However, China still faces the challenges of a difficult marine ecological environment situation, such as constant serious marine environmental pollution, improvement effectiveness of water quality in unstable offshore areas, pollution rebound in some

bays and estuaries, marine garbage pollution affecting the happiness of residents dwelling closing to the sea, and frequent occurrence of oil spill accidents at sea [14]. From the original intention of “strict enforcement,” DPS is far from enough for a thorough response to protect the marine environment, which indicates the necessity of improving the corresponding provisions. For example, the DPS in the MEPL only applies to the four situations of polluting marine violations, without covering all violations of polluting marine or being extended to other marine ecological protection targeting issues such as IUU fishing, overfishing, over-exploitation of marine resources and marine conservation, etc.

However, current research mainly focuses on two categories related to marine environmental protection in China, i.e., the macro-analysis of MEPL that introduces its historical development, shortcomings, and opinions and suggestions for future revision [15,16], as well as analysis of some marine pollution prevention problems that provides suggestions for the improvement under the revision background of MEPL [17,18]. DPS has been rarely mentioned in the study of maritime administrative penalties, and the content is relatively concise and ambiguous [19]. As of yet, there is no research specifically investigating the DPS in the MEPL. Then, problems arise concerning the reason for and the approach of the MEPL establishing the DPS, innovations of the DPS in the MEPL, etc. The key issue is whether the DPS established by the MEPL works well for the effective remediation of the marine environment. If not, the focus will be placed on obstacles in implementation to be found and solved. To this end, this article addresses the problems of the upcoming MEPL revision and formulates a reasonable design of DPS suitable for the marine law enforcement system. After all, “a sound legal system of marine environmental protection is an important prerequisite for orderly promotion of marine comprehensive utilization and sustainable development” [20]. Notably, the MEPL has started to prepare the related work of a new revision in 2022.

Herein, a normative and comparative analysis is mainly applied. Under the normative analysis approach, this research centers on Article 73 of the MEPL, the top-level marine legislation of China, and macroscopically reviews the DPS provisions. Then, it microscopically carries out an in-depth analysis of specific norms of the DPS in local marine protection legislation. Furthermore, a comparative analysis is also used. In addition to a comparison with the foreign legislative experiences, an internal comparative analysis is carried out, and the DPS is explored and compared with other environmental legislation at the same level and between local marine legislation. These discussions will have great reference values for the improvement of DPS in the future.

The revision of the MEPL is hereby taken as the research background. First, the legislative process of China’s MEPL is summarized, the reasons for the revisions are analyzed, and the origin of DPS is investigated. Second, focusing on Article 73 of MEPL, it analyzes the introduced factors, applications, and innovations of DPS. Third, the progress and obstacles to the implementation of DPS in maritime law enforcement are further discussed. Finally, it is proposed that the design of DPS should be improved, and corresponding suggestions should be provided.

2. The Revision Background of the MEPL

After years of planning, China’s marine governance system has experienced a development process of being continuously strengthened. Since the promulgation of the MEPL in 1982, a series of marine governance policy documents, including laws, administrative regulations, department rules, local governance rules, normative documents, national planning outlines, and notices, have been issued. Meanwhile, the State Council (SC), as the Central People’s Government of China, has formulated a five-year plan for marine economic development. The development goals and directions of the marine environmental governance policies are similar during the same planning period [21]. Against such a background, this paper integrates these policies and takes the five-year plan for marine economic development as the node, which can be roughly divided into six stages (see Table 1). Obviously, the marine governance system in China is a huge and complex project with

some progress, such as the diversity of participants and policy tools and the direction from ex-post control to ex-ante control, especially the proposal of the green priority principle.

Table 1. Evolution history of China’s marine environmental governance policy.

Stage	Progress	Characteristics
1982–2000	Germination	Ex-post control (pollution control); Single policy tool (administrative means)
2001–2005 (The 10th Five-Year Plan)	Establishment	Shifted to ex-ante control (dynamic monitoring); Increased policy tools (economy means)
2006–2010 (The 11th Five-Year Plan)	Steady advancement	Expanded governance scope; Increased policy tools (legal means)
2011–2015 (The 12th Five-Year Plan)	Deepening adjustment	Ex-ante control (risk prevention and control); Diversity of policy tools
2016–2020 (The 13th Five-Year Plan)	Strategic development	Coordinated land and marine; Diversity of participants
2021–2025 (The 14th Five-Year Plan)	Strategic upgrading	Regional coordinated development; Green low carbon development

Note: the characteristics from the first stage to the fifth stage refer to the article *Evolution of Marine Environmental Governance Policy in China* published in the journal of Sustainability [21].

China’s marine rule of law started relatively late. After a long period of development and accumulation, China has formed a marine ecological environmental legal system. As a whole, the developing history of this legal system can be divided into four stages:

- (1) Founding stage (before 1982): China had no formal marine law. The legislative level of marine environmental management was limited to administrative regulations and rules issued by the SC and its Departments.
- (2) Rapidly-developing stage (1982–1999): MEPL, as the first marine law formulated by the NPCSC, appeared, opening an era of China’s marine rule of law. Limited by the times and insufficient legislative experience, the content of the law was restricted to pollution prevention.
- (3) Revision-improving stage (1999–2017): MEPL was revised many times. A series of supporting regulations were issued by the SC and its Departments. Some local legislations were established by the Local People’s Congress and its Standing Committee. The above finally constructed the basic framework of China’s marine ecological environment protection legal system. Marine ecological protection began to be taken into consideration.
- (4) Deeply-promoting stage (2017 to present): The marine legislation aims to further deepen marine pollution prevention and control as well as marine ecological protection. The MEPL is about to be exposed to a new round of revision.

2.1. Legislative History of the MEPL

As a comprehensive law regulating the marine environment, the MEPL offers a sufficient legal basis for marine environmental protection and provides general guidance for marine-concentrated legislation. Promulgated in 1982, the MEPL has been revised once and amended three times, having been implemented for 40 years. The focus of MEPL has shifted from preventing and controlling marine pollution to protecting the marine ecological environment [22]. It has occupied a stable core position in the legal system of the marine ecological environment. The MEPL of 1982 was completely a law on marine pollution prevention and control and established the keynote of China’s MEPL, mainly with pollution prevention and control. Two new chapters have been added to the MEPL of 1999, and almost all provisions of the whole law have been modified, with marine ecological protection starting to be taken into account. The 2013 MEPL only revised Articles 43, 54,

and 80. The 2016 MEPL amended 19 articles, among which, Article 73 is about the daily penalty. The 2017 MEPL just modified the two Articles 30 and 77 (see Table 2).

Table 2. Legislative history of the MEPL in China.

Version	Total Number of Chapters and Articles	Chapters and Articles on Pollution Prevention and Control	Chapters and Articles on Ecological Protection	Chapters and Articles on Legal Liability	Number of Revised Terms/Proportion in the Total	Highlights
In 1982, (Formulation)	8 Chapters 48 Articles	5 Chapters 35 Articles	0	1 Chapter 4 Articles		The first professional marine environmental protection law, “pollution prevention and control law.”
In 1999, (Revision)	10 Chapters 98 Articles	5 Chapters 44 Articles	1 Chapter 9 Articles	1 Chapter 22 Articles	Two new chapters/ above 95%	The revision rate exceeds 95%, with two special chapters of “Supervision and Control over the Marine Environment” and “Marine Ecological Protection” added
In 2013, (Amendment)	10 Chapters 98 Articles	5 Chapters 44 Articles	1 Chapter 9 Articles	1 Chapter 22 Articles	3/3%	“Minor Repair”: implement the reform results of administrative examination and approval in the same year
In 2016, (Amendment)	10 Chapters 97 Articles	5 Chapters 44 Articles	1 Chapter 9 Articles	1 Chapter 21 Articles	19/19.6%	“Medium Repair”: establish two basic systems of ecological protection red lines and marine ecological compensation; cancel the upper limit of RMB 300,000 fines and increase the daily penalty; advance the reform of the administrative examination and approval system
In 2017, (Amendment)	10 Chapters 97 Articles	5 Chapters 44 Articles	1 Chapter 9 Articles	1 Chapter 21 Articles	2/2.1%	“Minor Repair”: modify the relevant provisions on the setting of sewage outlet into the sea

Source: Created in this research.

2.2. Reasons and Processes for Starting a New Revision of MEPL

The initiative to start a new revision of MEPL was driven by the 2018 supervision and inspection of the enforcement inspection team of the NPCSC on the implementation of MEPL. The inspection results were not optimistic. There continued to be widespread calls for the urgent revision of MEPL, which attracted the attention of the central government of China. Another important reason was the institutional reform of the SC in 2018. The SC, the Central People’s Government, is the highest organ of state administration in China. On March 13th, 2018, the fourth plenary session of the first session of the 13th National People’s Congress (NPC) resolved that according to *The SC’s Proposal for Reviewing the Reform Scheme of the SC’s Institutions*, the State Oceanic Administration (SOA) was no longer retained [23]. The SOA was originally the state oceanic administrative department responsible for the supervision and control over the marine environment, survey organization, surveillance, supervision, assessment, and scientific research of the marine environment. After the 2018 reforms, its responsibilities have been merged into the newly-established Ministry of Natural Resources and the Ministry of Ecology and Environment. The former is responsible for marine economy and planning, island development and utilization, marine rights and interests protection. It sets the Marine Strategic Planning and Economics Department, Sea Area and Island Management Department, and Marine Early Warning and Monitoring Department, affording marine integrated management tasks. Whereas the latter is recognized as the competent department for marine environment management and protection, which sets the Marine Ecological Environment Department, and is responsible for national

marine ecological environment protection and supervision. The reform has changed the marine environmental protection and management mechanism in China from “integrated management” to “decentralized management” [24]. The central government centralizes the functional departments of marine affairs, and marine management and law enforcement are scattered across multiple departments. This institutional reform has re-divided the responsibilities of marine administrative departments and should be translated into legal safeguards in a timely manner, thus indicating the necessity of amending the MEPL [25].

For the aforementioned reasons, the report of the NPCSC’s inspection on the implementation of the MEPL on 24 December 2018 clearly proposed to protect the marine ecological environment with the strictest legal system and immediately initiate the revision process of the MEPL. On 28 October 2020, the 27th plenary meeting of the Environmental and Resources Protection Committee (ERPC) of the NPC considered that the bill on the MEPL was indeed necessary for legislation and suggested incorporating it into the annual legislative work plan of the NPCSC. The ERPC held a symposium on the revision of the MEPL in March 2021 and performed a “start work” on the revision of the MEPL in December 2021. The ERPC followed the opinions and suggestions of relevant departments of the SC and made arrangements for the revision [26]. On 11 April 2022, the NPCSC listed the revision of MEPL as a preparatory deliberation item in *The 2022 Legislative Work Plan* [27].

3. The Origin of DPS

Given that the development of DPS in foreign countries occurred quite early, it has now reached a mature state. At present, there are three types of DPS abroad, i.e., “order penalty,” “enforcement penalty,” and “criminal penalty,” respectively. The first imposes daily cumulative penalties from the occurrence of the violation to the date of correction, represented by the U.S. As early as the 1970s, the fine per day is expressly stipulated by several environmental acts such as *The Clean Air Act of 1970*, *The Toxic Substances Control Act of 1976*, etc. The second imposes a penalty and order correction at the beginning and then initiates the daily continuous penalties if the review finds that the violation is still not corrected, which was regulated by *The Air Pollution Prevention and Control Act (1981)* in India. The third is “day fines” in the criminal justice system, where the court adjusts the size of the fine to both the severity of the offense and the wealth of the offender. The concept of day fines was first introduced in Finland in 1921, followed by other countries in Europe. Half of all Europe countries apply day fines into practice [28]. The most successful is Germany, where more than 80% of criminal sanctions are day fines, and besides environmental offenses, day fines are widely applicable for theft, fraud, forgery, and drug offense.

DPS in China first appeared in the local legislation. *Chongqing Municipal Environmental Protection Ordinance (2007 Revision)* was the first to put the DPS into effect. *Shenzhen Special Economic Zone Environmental Protection Regulation (2009 Revision)* was the second to adopt the DPS. One year following the implementation of DPS in Shenzhen City, the rectification rate of enterprises facing environmental violations had increased by 30%. In Chongqing City, the voluntary rectification rate of enterprises raised from 4.8% in 2007 to 95.5% in 2014, following seven years of implementation [29]. Further, the concept of DPS has been successively adopted for the environmental regulations in Hebei, Ningxia, and other regions. However, considering the lack of the superior law’s authorization, the DPS provisions differed in different regions and became “zombie regulations” [30].

Fortunately, encouraged by the successful experiences of local legislation, the central authorities began to emphasize and discuss the introduction of DPS. After going through several processes of the initial proposal, intermediate deletion, multiple deliberations, and finally into the law, the DPS was clearly defined in *The Environmental Protection Law (EPL)* of the People’s Republic of China in 2014. The DPS formally become a national legal responsibility. Article 59 of EPL stipulates the DPS clause as follows: where any enterprise, public institution, or other business is fined and ordered to make corrections for illegally discharging pollutants but refuses to do so, the administrative agency legally making the punishment decision may impose continuous fines on it in the amount of the original fine

for each day from the next day after it is ordered to make corrections [31]. Obviously, in China, one correction opportunity is allowed before starting the DPS. The forms of ordered correction include ceasing the violations, stopping construction, production, or use as ordered, dismantling and undertaking treatment within a prescribed time limit, and any other specific form of administrative order as prescribed in any law, regulation, or rule. If the lawbreakers do correct this, they shall not be imposed consecutive fines per day. In the same year, the Ministry of Environmental Protection (dissolved) deliberated and adopted *The Measures for the Implementation by Competent Environmental Protection Departments of Consecutive Daily Penalties* (hereinafter referred to as *Daily Penalties Implementation Measures*), standardizing the application scope, implementation procedures, methods of calculating penalties, and other specific contents. Article 5 of *Daily Penalties Implementation Measures* regulated five types of illegally polluting discharge violations applicable to the DPS, including (1) discharging pollutants beyond the national or local pollutant discharge standards or the total discharge volume control indicators of key pollutants; (2) illegally discharging pollutants by means to avoid supervision; (3) discharging pollutants as prohibited by laws and regulations; (4) illegally dumping hazardous wastes; and (5) other acts as illegally discharging pollutants [32]. The 2014 EPL and *Daily Penalties Implementation Measures* provide the legal basis and specific guidelines for other environmental laws and local regulations and empower the local regulations to increase the types of illegal acts subject to continuous daily fines based on the actual needs of environmental protection. For example, the DPS was introduced in the 2016 MEPL, *2015 Atmospheric Pollution Prevention and Control Law* (APPCL), and *2017 Water Pollution Prevention and Control Law* (WPPCL), respectively.

4. The DPS Provisions of MEPL

4.1. Factors of Introducing DPS Provisions

The incorporation of DPS into the MEPL is triggered by multiple complex factors inseparable from three aspects: the political requirement, scientific productivity, and legal support. First, the political factor refers to the positive response to legislative requirements of marine ecological civilization [33]. Marine ecological civilization is an essential part of China's ecological civilization construction, also a significant content of developing socialism with Chinese characteristics in accordance with the actual situation of China featuring distinctive Chinese characteristics. The core lies in pursuing harmony between human beings and marine space on the premise of respecting the sea. The specific requirements are to jointly build a maritime community with a shared future, strengthen the prevention and control of marine environmental pollution, protect marine biodiversity, realize orderly development and utilization of marine resources, and leave a blue sea and sky for future generations. President Xi Jinping of the Chinese Communist Party pays close attention to the construction of marine ecological civilization, especially the legal construction of marine ecology, and even proposes protecting the marine ecological environment through the strictest legal system [34]. DPS further clarifies the legal liability of marine environmental protection. The consecutive fines with no capping have drawn a red line of strict accountability for the restoration of the damaged marine ecological environment.

Second, the scientific factor is to improve the compliance rate and total factor productivity of enterprises and promote sustainable marine development. The international community is making waves for the "blue economy" [35], which develops an ocean-based economy for current and future generations and requires managing and using the oceans and their resources in a sustainable manner. The DPS ties the fine amount to the violation duration and increases the costs of illegal pollution discharge by accumulating the daily illegal cost. This kind of design benefits to guide the pollution behavior of enterprises toward legal conformity and improve the compliance rate. Furthermore, a study suggests that the DPS stimulates the innovation compensation effect of enterprises through the high dynamic penalty mode and eliminates highly polluting and inefficient enterprises in the industry to improve the productivity of enterprises [36]. In the long run, DPS functions as a tool for environmental regulation that advances sustainable development. It turns

anti-pollution treatment from an “external compulsion” of environmental regulation into enterprises’ “internal demand” for constant survival and development [37]. Therefore, the introduction of DPS is an effective practice of following international waves for the blue economy and is conducive to achieving a win-win situation of marine economic growth and green development.

Third, the legal factor is to link up with the DPS added in the EPL. The EPL is a basic and comprehensive law in the environmental field, while the MEPL is a comprehensive law in marine environmental protection. They are both reviewed and adopted by the NPCSC and are endowed with equal effectiveness from the legal level. However, these two laws actually have an inclusive relationship in three aspects of the applicable scope, the protected object, and the stipulated content. First, Article 3 of the EPL regulates that this law applies to the territory of China and other sea areas under the jurisdiction of China. It naturally includes the applicable scope provided by Article 2 of the MEPL, i.e., the internal waters, territorial seas, contiguous zones, exclusive economic zones, and continental shelves of China and all other sea areas under the jurisdiction of China. Second, Article 2 of the EPL stipulates the protected object is the “environment,” i.e., the entirety of all the natural elements and artificially transformed natural elements that affect the survival and development of human beings. That includes the “marine environment,” namely, the protected object of a specific environment targeted by MEPL. Third, the EPL has proposed principles and general provisions regarding marine environmental protection and provides a guideline for specific provisions of the MEPL [38]. Hence, the EPL is considered the general law, while the MEPL serves as the special law. Under the principle that the special law is superior to the general law, the MEPL shall prevail in the case of any discrepancy between the MEPL and the EPL. The 2014 EPL is known as the strictest environmental protection law in Chinese history. DPS, with no upper limit, makes an outstanding addition by undoing the issue of “the low cost of violations” [39]. The introduction of DPS in the MEPL is a supplement to the EPL in marine environmental protection management, ensuring the consistency of China’s legal system for environmental protection. Further, it meets the needs of marine environmental protection work to deter offenders.

4.2. Applications of the DPS Provisions

The notable innovations of the MEPL (2016 Amendment) were the DPS provision in Article 73 and the cancellation of the fines ceiling of RMB 300,000 in Article 90. These two clauses were still retained in the MEPL (2017 Amendment) without any change. Article 73 stipulates: In the case of any of the following acts in violation of the provisions of this Law, the department empowered by this Law to conduct marine environment supervision and control shall order the violator to stop the illegal act and take corrective actions within a prescribed time limit or to take such measures as restricting production or suspending production for rectification, and impose a fine thereon. If the violator refuses to take corrective actions, the department that makes the punishment decision in accordance with the law may impose continuous fines thereon in the amount of the original fine for each day from the next day after the violator is ordered to take corrective actions. Under serious circumstances, the violator shall be ordered to stop operations or be closed down with the approval of the competent people’s government, including:

- (1) Discharging any pollutants or any other substances prohibited by this Law into any sea area.
- (2) Failing to discharge pollutants into the sea in accordance with the provisions of this Law or discharging pollutants in excess of standards or total discharge volume control indicators.
- (3) Dumping wastes into the sea without obtaining a permit for dumping wastes into the sea.
- (4) Failing to take immediate measures to handle any marine environmental pollution accident resulting from any accident or any other emergencies.

For any violation mentioned in (1) and (3) of the preceding paragraph, a fine of not less than RMB 30,000 but not more than RMB 200,000 shall be imposed, while for any violation mentioned in (2) and (4) of the preceding paragraph, a fine not less than RMB 20,000 but not more than RMB 100,000 shall be imposed [40] (see Table 3). Notably, the fine amount for each day of continuous punishment shall be the amount of the fine determined in the original punishment decision. In other words, the original fine in the second paragraph acts as the base for cumulatively calculating the total fines of consecutive penalties. The fine amount set following the rule of the daily continuous penalty shall be the amount of the fine determined in the original penalty decision multiplied by the number of penalty days.

Table 3. Daily penalty provisions of the MEPL.

	Penalty Objects	Implementation Scopes	Applicable Situations	Authority Departments
Daily Penalty	Indefinite	Polluting marine violations	Four situations	Departments conducting marine environment supervision and control

Source: Created in this research.

Taking an administrative penalty in Beihai City as an example, a firm discharged water pollutants in excess of standards. That violated item (2) of paragraph 1, Article 73 of the MEPL. The Ecological Environmental Bureau imposed a fine of RMB 60,000 and ordered the violator to halt discharging water pollutants out of standards. The firm refused to correct and continued the violating actions, thus leading the administrative organs to initiate continuous fines per day. The final fines were equal to RMB 60,000 multiplied by 13 days, a total of RMB 780,000. This penalty directly increased the illegal cost by 12 times, severely striking the malicious pollution behavior of the firm [41]. In addition, a firm in Zhongshan City carried out marine dumping operations without obtaining a permit for dumping wastes into the sea. The law enforcers imposed a fine of RMB 80,000 in accordance with item (3) of paragraph 1, Article 73 of the MEPL. The firm stopped violations and rectify immediately. Then the law enforcers did not start a daily continuous fine on it, which was mainly attributed to the preventive deterrence of DPS [42].

Notably, the MEPL, as the top-level marine law, was issued by the national legislature NPCSC. The DPS provisions apply to any polluting marine violations facing any one of the four situations nationwide. Furthermore, before the 2018 institutional reforms of the SC, the authorities of marine environment supervision were the SOA and the departments empowered to conduct marine environment supervision and control under the local people's governments at or above the county level. The responsibility of the enforcing law was specifically undertaken by the Chinese maritime supervision section affiliated thereto. After the reforms, the marine environment supervision was in charge of the Ecology and Environment Ministry at the central level, also the local ecological administrative organ (Ecological Environment Bureau). In 2021, the *Coast Guard Law* was formulated by the NPCSC, and the coast guard agencies were required to uniformly perform the duties of maritime rights protection and law enforcement.

4.3. Innovative Regulations for DPS

Notably, DPS in the MEPL has innovative regulations based on the EPL and *Daily Penalties Implementation Measures*, which can be detailed as follows: First, new applicable situations are established. Item (3) in paragraph 1 of Article 73 adds procedural violations involving the discharge of unlicensed pollutants, including dumping wastes into the sea without applying for a marine dumping permit and dumping waste when the application for a marine dumping permit is submitted but not approved. Item (4) in paragraph 1 of Article 73 refers to obligatory provisions stipulated for violators failing to take immediate measures to handle any marine environmental pollution accident resulting from any accident or any other emergencies. In case of any accident or emergency, the violators must immediately adopt effective measures, promptly inform all potentially endangered

parties, report to the department empowered by the MEPL to conduct marine environment supervision and control, and accept investigation and treatment. Otherwise, continuous daily fines will be imposed. Second, the DPS has two types of fines base. For the violation of the first and third items in paragraph 1 of Article 73, the base of the fine ranges from RMB 30,000 to RMB 200,000. For offenses of the second and fourth items, the fine base ranges from RMB 20,000 to RMB 100,000. Third, the forms for ordered corrections are explicit. The EPL uses the uniform title of “order to correct.” However, Article 73 of the MEPL prescribes “order to correct” as orders to stop illegal acts and take corrective action within a prescribed time limit or to take measures such as restricting production and suspending the production for rectification. Finally, a fine cannot be used singularly as the penalty base.

Article 59 of EPL restricts four conditions for implementing the DPS, including “polluter illegally discharging pollutants, being fined, being ordered to make corrections, and refusing to make corrections.” A logical relationship exists among the four terms. Only polluters illegally discharging pollutants can be fined. Besides, there will be situations related to refusing to make corrections only when the violator is ordered to make corrections. However, no order is set between “being fined” and “being ordered to correct.” The violator can be fined before being ordered to correct or be simultaneously fined and ordered to correct. However, when the MEPL applies the DPS, a fine must be imposed concurrently with the correction order. This indicates that while ordering the violator to correct the violation, the violator shall be given a certain financial punishment to compensate for losses and enhance deterrence.

5. Progress and Obstacles in the Implementation

When a law is enacted, its effectiveness lies in practical experience, not in logic alone [43]. Thus far, the DPS has been implemented for six years in marine law enforcement, which presents both achievements and shortcomings.

5.1. Achievements of DPS

First, the implementation of DPS has improved the citing frequency of the MEPL. This research chooses the Peking University law database, an authoritative and comprehensive database in China, and investigates the invoking of MEPL by searching the marine administrative penalties cases. Taking *The Marine Environment Protection Law* as the key term, the database shows relevant cases from 2008 to 2021 involving the administrative organs at all levels (the national, provincial, municipal, county, and district levels). The types of penalty organs include the ministry/department/bureau of environment protection, ministry/department/bureau of ecology and environment, ocean bureau, maritime bureau, etc. [44]. Figure 1 depicts that the number of cases on marine administrative punishment as a whole is on the rise, indicating that the usage frequency of citing the MEPL in administrative penalties practice is increasing in mass. With the MEPL (2016 Amendment) as the turning point, the number of cases per year was ≤ 100 before 2016, suggesting a low citing frequency of the MEPL before 2016. The number of cases from 2016 to 2021 increased significantly, exceeding 600 for five consecutive years, and exceeding 1000 in 2018 and 2021, respectively. The data show that the administrative organs have maintained a high citing frequency of the MEPL (2016 Amendment). However, the reason behind the high citing frequency is that the first two items of Article 73 and the second item of Article 87 of the MEPL are mainly applied by law enforcement agencies: cases applying Article 73 account for 17.80% in Liaoning Province, 16.90% in Shandong Province, 18.70% in Fujian Province, 21.91% in Zhejiang Province, and 36.70% in Guangdong Province [19]. Article 73 is the DPS clause added to the MEPL. In this case, it can be inferred that the DPS does improve the citing frequency of the MEPL.

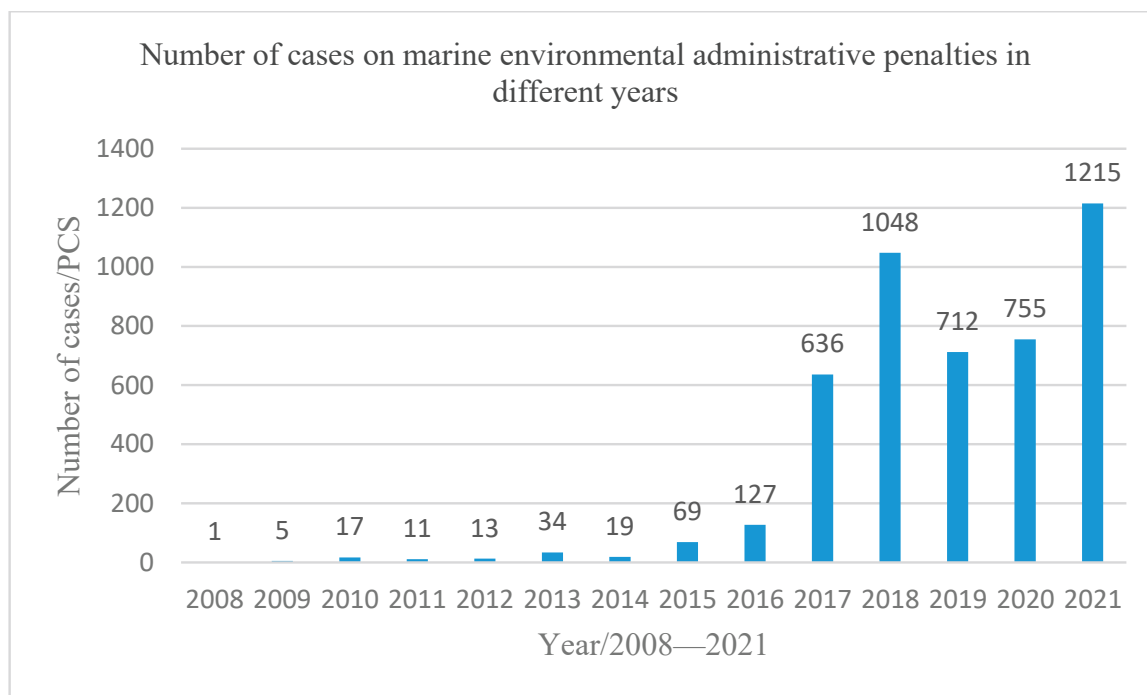


Figure 1. Number of cases of marine environmental administrative penalties from 2008 to 2021. Source: Created in this research.

Second, Article 73 of the MEPL provides a legal basis for DPS in local marine legislation. The addition of the DPS clauses in the 2016 revision of MEPL inspired local marine environmental protection legislation to attach importance to this legal-liability design. Significantly, despite the DPS of the MEPL being a national system, not all coastal provinces and cities have explicitly incorporated the DPS provisions. Currently, there are three forms of DPS provisions: first, DPS is clearly stipulated, listing the applicable situation and covering the miscellaneous clauses. For example, *The Qingdao Marine Environmental Protection Provision* lists four applicable cases of DPS and a miscellaneous clause as “violation of this Provision, in accordance with the MEPL . . . punish according to the law” [45]. Second, it directly quotes the related provisions of the MEPL. In *The Shandong Province Marine Environmental Protection Regulation*, “violation of this Regulation, the MEPL and other laws and administrative regulations have provided the penalty, and the department responsible for marine environment supervision and administration shall impose punishment in accordance with the provisions of laws and administrative regulations” [46]. Third, only a miscellaneous clause is stipulated. *The Tianjin Marine Environmental Protection Regulation* stipulates that “violation against this Regulation, punishment provisions in laws, administrative regulations and other local regulations of this Municipality shall be followed” [47].

Finally, the DPS raised the costs of violations and achieved positive results in protecting the marine ecological environment. Before adding the DPS clause, the maximum cost of dumping waste into the sea without obtaining a permit was RMB 200,000. After the DPS was incorporated, the cost of illegal behavior was increased without an upper limit. Huge fines deter violators from polluting marine and can also be used as a fund for restoring and conserving the marine ecological environment. For example, since 2022, the Guangxi Coast Guard has investigated and dealt with 16 cases of illegally dumping wastes into the sea, involving 24 ships and 7 marine projects, with a total fine of RMB 1.28 million, and effectively protected the marine ecological environment of the North Gulf [48].

5.2. First Obstacle: Shortcomings of DPS Provisions in MEPL

Despite substantial progress in the maritime field, DPS provisions in the MEPL are still subject to some shortcomings, heavily hindering the deterrence in solving maritime problems in China.

5.2.1. Narrow Application Scope

There are four illegal acts of marine pollution applicable to the DPS stipulated in the MEPL. Although the four violations have both substantive and procedural aspects, they are still not comprehensive enough. Marine environmental violations in China are extremely severe at present, including constructing marine engineering projects before their approval, dumping without following the provisions of the dumping permit, and distorting and falsifying marine environmental monitoring data. The above problems affect the entire compliance of marine environmental protection. In this case, limiting the application of DPS to marine pollution will seriously weaken the deterrent function and is, therefore, insufficient.

5.2.2. Low Daily Fine Quota

During the inspection of the MEPL enforcement by the NPCSC, local law enforcement generally reflects the necessity of strengthening the punishment [49].

Paragraph 2 of Article 73 of the MEPL stipulates a daily fine quota of up to RMB 200,000. However, the costs of marine pollution control are often tens of millions, and the fine of RMB 200,000 per day is obviously too low. After all, the final fines for ten consecutive days of illegal pollution discharge are RMB 2 million, failing to effectively punish and curb marine environmental violations. It is also an important reason explaining the preference of lawbreakers to “leave the land and discharge into the sea” in practice. Additionally, the APPCL and the WPPCL also provide the DPS, applying to the same violations involving unlicensed pollution discharge and beyond-standard pollution discharge. The maximum daily fine quota in the APPCL and the WPPCL is RMB one million, far more than five times or even ten times as stipulated in the MEPL (see Table 4).

Table 4. Comparison of the daily fine quota imposed on daily penalty under different laws (in RMB).

	MEPL	WPPCL	APPCL
Unlicensed pollution discharge behavior	30,000–200,000	100,000–1 million	100,000–1 million
Beyond standard pollution discharge behavior	20,000–100,000	100,000–1 million	100,000–1 million

Source: Created in this research.

5.2.3. Vague Provisions

First, there is no clear definition and standard for “pollutants” and “pollution sources” in the DPS clause. It can only be inferred from the other chapters of the MEPL. “Pollutants” include any possible substances that are directly or indirectly discharged to the seas and may cause pollution to the seas. “Pollution sources” may contain land-based pollution sources, coastal construction projects, marine construction projects, and vessels. Such uncertainty will be prone to law enforcement errors. For example, the Fishery Bureau and Natural Planning Bureau of a certain district imposed daily continuous fines on a company that illegally discharged a large amount of aquaculture wastewater directly into the sea. The company’s refusal to abide by the law triggered an administrative lawsuit. In the case of determining whether the cultivation wastewater was a pollutant as specified in the MEPL, the court held that the two defendants had not conducted a water-quality inspection on the wastewater without determining whether it exceeded the current national discharge standards, who then subjectively identified the cultivation wastewater as a pollutant. The court, in the absence of evidentiary support and an insufficient factual basis, finally revoked the administrative decision of daily continuous fines [50].

Second, there are no clearly punished objects of the DPS clause. The punished objects for the four violations stipulated in Article 73 of MEPL are not uniform, either the unit or the individual. In detail, items (1) and (2) correspond to most articles of the MEPL, such as Article 29, “the discharge of land-based pollutants into the sea shall strictly comply with the State or local standards and relevant stipulations”, failing to clarify the objects. Item (3) corresponds to Article 55, and the punished objects are units. Item (4) corresponds to Article 17, and the punished objects are units and individuals. In judicial practice, as claimed by some courts, the general provisions of the MEPL specify that the restricted objects are any unit or individual. Thus imposing daily continuous fines on individuals for illegally dumping without obtaining dumping permissions conforms to the legislative purpose [51]. However, some courts think that the term “unit” in Article 55 of the MEPL should not be expanded to “unit and individual”, either from the perspective of literal interpretation or overall interpretation imposing or the inappropriateness to decide against the administrative counterpart on ambiguous legal provisions. The courts persist that imposing the daily continuous fines for individual dumping is a mistake in the use of the law and should be revoked in accordance with the law [52].

Finally, the reviewing period and method are unreasonable. Marine environmental pollution is complex, difficult to control, and technically demanding [53]. To completely correct marine pollution violations, the 30-day review period is rather unreasonable, which not only increases the correction burden of the counterparts but also constrains law enforcers. Meanwhile, many maritime illegal acts are strongly concealed. Maritime law enforcement is limited by the conditions for handling cases, which makes it difficult to check, obtain, and verify evidence on the spot. The secret inspection of the review method in DPS is not conducive to the development of marine law enforcement.

5.3. Second Obstacle: Imperfect DPS in Other Marine Legislations

China has gradually developed a marine environmental governance system supported by various policies, laws, and regulations, with the MEPL at its core [21]. However, the following obstacles exist in the implementation of local legislation as well as their supporting laws and regulations.

First, there is a lack of DPS provisions in most of the supporting laws and regulations. To coordinate the implementation of the MEPL, a series of legislative acts on marine environmental protection and management have been successively promulgated in China. Laws and regulations, including *The Administrative Regulation on the Prevention and Treatment of the Pollution and Damage to the Marine Environment by Marine Engineering*, *Regulation on the Prevention and Control of Vessel-induced Pollution to the Marine Environment*, and *Fisheries Law and Regulations of Concerning Environmental Protection in Offshore Oil Exploration and Exploitation*, etc., jointly constitute a legal normative system for marine environmental protection. However, the DPS has not been established in the above laws and regulations, making it difficult to meet the actual needs of modern marine integrated management. *The U.S. 1987 Act Aimed to Prevent Pollution from Ships* stipulated a penalty of as much as USD 25,000 (RMB 93,000, according to the exchange rate of RMB to USD in 1987, USD 1 was about RMB 3.7221) per day [54]. *The Fishing Port Law of Taiwan, China*, stipulates continuous punishment on a daily basis for discharging toxic and harmful substances and oil waste in the fishing-port area and discharging wastewater or arbitrarily discarding waste in general [55].

Second, the majority of local marine legislations simply take the MEPL as the legal basis and copy the DPS provisions of the Law. Among 11 coastal provinces in China, except Hainan Province, marine environmental protection regulations or management regulations in other regions (Liaoning, Shandong, Hebei, Jiangsu, Zhejiang, Fujian, Shanghai, Guangdong, Tianjin, and Guangxi Zhuang Autonomous Region) have not explicitly introduced the DPS, thereby failing to solve the local marine pollution problem according to local conditions.

Third, the DPS clauses in some local laws and regulations are inconsistent with the higher-level laws. For example, *China's Maritime Traffic Safety Law* does not stipulate the DPS. However, *The Marine and Maritime Administrative Penalty Regulations* (MMAPR) of China in 2021 introduces the DPS, which directly copies three applicable situations in the MEPL, but deletes the situation of “dumping waste without a license” [56]. Meanwhile, *The Regulation of Yantai Municipality Marine Ecological Environment Protection* (Draft) copies three applicable situations of DPS in the MEPL but disregards the behavior of dumping wastes into the ocean without a license. Additionally, the Regulation extends the application of the DPS to “marine pollution from ships” [57].

6. Suggestions for Future Revisions

Against the revision background of the MEPL, the DPS design should be timely improved to provide a guarantee for marine administrative law enforcement when the essential role of effective law enforcement in the stability and security of any coastal state's maritime rights and interests is taken into consideration [58].

6.1. Revising the DPS Provisions of MEPL

6.1.1. Expanding the Application Scope

Marine environmental protection includes pollution prevention and control and ecological protection. In this case, it is necessary to expand the application scope of DPS and improve the overall system deterrence in an orderly manner, thereby further improving the marine ecological environment.

First, the types of violations can be more inclusive and wide-ranging. Construction of marine engineering projects without approval and environmental impact assessment according to law and the marine pollution by ships should be included in the applications of DPS. Article 54 of *The Dalian Marine Environmental Protection Regulations* has regulated that violations of “vessels pollution” are also applicable to the DPS. That means if the vessel garbage, sewage, oily wastewater, wastewater containing toxic and hazardous substances, waste gas and other pollutants, and ballast water discharged by vessels to the ocean within the sea areas of Dalian City don't meet the laws, regulations, other relevant provisions and the requirement of discharge standards could impose continuous penalties per day when refusing correction after being ordered to correct [59]. Second, some serious violations that damage marine ecological protection shall also be consecutively punished on a daily basis. For example, excessive illegal land reclamation has reduced the coastal wetlands in a large area and the natural coastline, causing serious ecological degradation and idle waste of resources. The total annual ecological damage in Jiaozhou Bay caused by land reclamation amounts to RMB 12.46 billion [60]. Finally, a supplementary provision shall be added, whereby local marine protection regulations can, according to the actual needs, increase the types of violations for which continuous daily penalty is imposed.

6.1.2. Increasing the Daily Fine Quota

Zheng Jianmin, the Vice Governor of Fujian Province in China, claimed that the fine quota for marine violations was too low and proposed to increase the quota when revising the MEPL again [61].

Herein, it is first recommended to learn from the DPS provision of the APPCL and the WPPCL, setting the maximum daily fine at RMB one million to strengthen marine legal deterrence. Second, the U.S. experience of adjusting the daily fine with inflation should be absorbed. On 13 January 2020, the U.S. Environmental Protection Agency adjusted the statutory maximum of daily fine in multiple environmental Acts. *The Act to Prevent Pollution from Ships* raised the daily fine to USD 75,867 per day, and *The Marine Protection, Research, and Sanctuaries Act* raised the daily fine to USD 1284 per day [62]. According to the exchange rate of RMB to USD on January 2020, USD 1 was about RMB 6.9172. Thus, the maximum daily fine under the two laws in the U.S. was about RMB 520,000 and RMB 8881, respectively. Third, paragraph 2 of Article 59 in the EPL rules that the daily fine quota shall

be determined on the basis of factors such as the operation costs of pollution prevention and control installations, the direct losses caused by the illegal act, and the illegal income as provided for by the relevant laws and regulations. However, factors such as “enterprise size, illegal economic interests, violators’ compliance record honest efforts and payment ability” should also be considered as the punishment criteria [63].

6.1.3. Formulating Specific Application Standards for DPS

It is suggested to formulate specific application standards of the DPS to solve the problems of inadequate legal responsibility, lax law enforcement, and administrative inaction in the implementation by marine law enforcers.

First, “pollutants” of the DPS clause could be defined in three specific ways: (1) MEPL may imitate the definition of water pollutants in the WPPCL, defining pollutants as substances directly or indirectly discharged to the sea and might cause pollution to the sea; (2) MEPL may learn the second paragraph of Article 2 of the APPCL, listing out specific substances included in the pollutants; and (3) Article 94 of MEPL stipulates the meaning of “pollution damage to the marine environment.” From that, MEPL may define the pollutants as “substances that are directly or indirectly discharged into marine environment and are harmful to marine living resources, human health, fishing, seawater utilization quality and environmental quality.” This research holds that the most reasonable way is to list the types of pollutants for identification based on the unified definition in the MEPL.

Second, the punished object should be regulated clearly. Article 4 of China’s *Administrative Penalty Law* stipulates, “an administrative penalty that needs to be imposed upon a citizen, legal person or another organization for violation of the administrative order”. Article 4 of MEPL goes, “All units and individuals shall have the obligation to protect the marine environment”. Especially, Article 59 of EPL specifies the objects of DPS as “any enterprise, public institution, or other producers and operators.” Furthermore, Article 38 of MMAPR (2021) further defines the punished objects of DPS as a vessel’s owner, an operator, or a manager. Therefore, the punished object of DPS can be reasonably inferred to be “any unit or individual,” which not only conforms to the legislative spirit [64] but is also in line with other legal norms.

Third, the Ministry of Ecological Environment has decided to cancel the 30-day review period for DPS to strengthen law enforcement [65]. The decision can be referred to when revising the MEPL. Additionally, a reasonable review method should be set with the marine particularity to avoid the one-size-fits-all method of hidden inspection.

Furthermore, to prevent marine law enforcers from abusing their power or neglecting their duties, refining the applicable standards for the DPS is suggested. *The Discretion Standard on Marine Administrative Punishment of Shenzhen* has made positive explorations in that aspect, detailing the DPS clause of the MEPL and classifying the punishment according to different illegal circumstances. The illegal degree of item (1) of Article 73 divided the punishment into light, ordinary, and serious conditions, and the daily fine quota is RMB 30,000, RMB 100,000, and RMB 200,000, respectively. The illegal degree of items (2) and (4) is divided into general and heavier, with a daily fine quota of RMB 50,000 and RMB 100,000, respectively [66].

6.2. Improving DPS in Other Marine Legislations

First, supporting legislation should be incorporated the DPS clause in a timely manner. To regulate marine and maritime administrative penalties, the Transport Ministry of China included the DPS in the MMAPR (2021). Similarly, such practice should be followed to strictly regulate fishery management, oil and gas exploration and production, ship pollution, ocean engineering construction projects, and ocean dumping. Correspondingly, it is necessary to modify the legal responsibilities of relevant marine supporting legislation. Such as *Administrative Regulation on the Prevention and Treatment of the Pollution and Damage to the Marine Environment by Marine Engineering*, *Regulation on the Prevention and Control of Vessel-induced Pollution to the Marine Environment*, *Fisheries Law and Regulations of Concerning*

Environmental Protection in Offshore Oil Exploration and Exploitation shall introduce the DPS, thereby strengthening the punishment and promoting the comprehensive development of marine undertakings.

Second, the local people's congress and its standing committee should perform their legislative power and design DPS provisions according to local conditions. Adaptive coordination from the bottom to the top is the most prominent feature of changing from management to governance [67]. New models of marine environmental governance tailored to local conditions should be explored by local governments [68]. Local laws and regulations related to marine environmental protection should explicitly include the DPS, gradually improve its system construction, and promote its implementation at a larger scope and a higher level. For example, *The 2017 Marine Environmental Protection Regulations of Hainan* (Amendment (II)) has detailed the liability content of DPS and clearly listed three applicable situations as (1) discharging mariculture wastewater beyond the standard, (2) discharging solid wastes and wastewater into the sea area by units or individuals that lawfully use the sea area or the coast for production and business activities; and (3) failing to transport the solid wastes and wastewater generated to the land for centralized treatment and discharge into the sea from entities and vessels engaged in marine catering services and other production, transportation, and business activities in the coastal sea area [69].

7. Conclusions

The upcoming revision of the MEPL represents the efforts made by China to promote marine ecological civilization and build its maritime power. One of the crucial points of the revision is about improving the punishment methods and the intensity of marine administrative punishment. To achieve a major breakthrough in this regard, it is an inevitable course of action to revise the DPS clause of the MEPL. However, not enough attention has been paid to constructing the DPS in the marine field. There is a lack of comprehensive and systematic research on DPS based on the particularity of marine law enforcement. Some scholars have already proposed to establish the principle of DPS in revising the MEPL as the highest conduct code in marine environmental law enforcement and management, to better protect China's marine environmental rights and interests [70]. In this case, the improvement of DPS is a rather important new subject in revising the MEPL.

Besides revising the DPS provisions of the MEPL, the improvement and refinement of the DPS shall be carefully considered in the marine supporting regulations and local legislation. In particular, the DPS shall be introduced into important areas such as fishery, vessel operation, and offshore oil exploration and exploitation, thereby making DPS a wide, regular, and effective marine punishment system in China.

To summarize, the DPS matters considerably in protecting the marine environment and promoting the sound development of marine undertakings. However, it is still subject to some obstacles, as proposed in this paper. China is expected to give full play to the institutional advantages of DPS in the revision of the MEPL, realize the strictness of marine administrative penalties, and fundamentally solve the problem of "low costs of fines for illegal behaviors".

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