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Original Paper

Applicability of the Multi-level Governance Framework and Optimization Paths in Marine Environmental Governance in North-East Asia

Fengqin Deng[1*]

1 School of Northeast Asian Studies, Shandong University, Weihai, China

* Corresponding author

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Abstract

The marine areas of Northeast Asia face severe environmental pollution and ecological degradation, while existing regional governance mechanisms remain fragmented and poorly coordinated, limiting the region's ability to effectively address transboundary environmental challenges. A multi-level governance (MLG) framework, involving actors and institutions from local to global levels, offers a promising approach to managing such complex issues. In Northeast Asia, current cooperative mechanisms have made modest progress in information-sharing and joint monitoring, yet they remain largely consultative in nature and lack legally binding targets, robust enforcement mechanisms, and long-term institutional coherence. Diverging national priorities, overlapping mandates, and institutional fragility further constrain effective regional coordination. To improve governance outcomes, a strengthened MLG approach is necessary, incorporating binding regional conventions, enhanced coordination among governance levels, broader engagement of non-state actors, and lessons learned from other successful regional governance models. By advancing institutional integration and stakeholder participation, these strategies aim to foster a more effective and sustainable framework for marine environmental governance in Northeast Asia, while simultaneously promoting regional trust and cooperative resilience.

Keywords

Multi-level governance, marine environmental governance, North-East Asia, regional cooperation, policy optimization

1. Introduction

The Northeast Asian Seas (including the Yellow Sea, the Bohai Sea, the East China Sea and the Sea of Japan) are globally important areas for fisheries and economic activities, but the marine ecological environment in the region has deteriorated dramatically in recent decades. The main manifestations are: the frequent occurrence of harmful algal blooms caused by eutrophication, resulting in the massive death of aquatic resources; the occurrence of oil spills and toxic substance leakage caused by marine accidents; the invasion of exotic species and overfishing, which threaten the biodiversity; and the increasingly serious problem of marine garbage pollution. For example, statistics show that 338 oil and hazardous substance spills were recorded in the waters of Northeast Asia between 1990 and 2011, mainly due to ship collisions, reflecting the environmental risks associated with the high density of shipping activities in the region. For example, it has been reported that an average of 536 pieces of garbage per 100 square meters of beach are washed up every month along the coast of South Korea (Lee et al., 2014), while 1.32 to 3.53 million tons of plastic garbage entered the ocean off the coast of China in 2010 (Jambeck et al., 2015), which is the highest in the world. These cross-border marine environmental problems not only jeopardize the ecology and health of coastal residents, but also may cause diplomatic tensions between countries. Therefore, strengthening cooperation and governance of the marine environment in the Northeast Asian region has become an urgent issue for all countries. However, compared with the well-established environmental governance systems in Europe and other regions (e.g., the Convention on Long-Range Transboundary Air Pollution (LRTAP), which has been effective in reducing pollution), the regional cooperation mechanism for marine environmental protection in Northeast Asia is still weak. Currently, it mainly relies on national-level policies and a number of non-binding multilateral cooperation programs, without a unified long-term vision and legally binding framework (Maruf et al., 2024). Differences among Northeast Asian countries in terms of their stage of economic development, environmental aspirations and political mutual trust make it difficult to advance environmental cooperation at the regional level. This underscores the need to explore a governance approach that integrates actors at all levels and balances the interests of all parties to address the shortcomings of existing mechanisms. Multi-level Governance (MLG) is a public governance framework that has emerged in the field of European integration studies in recent years, emphasizing the decentralization and interaction of decision-making power at the supranational, national and sub-national levels. This theory provides a new perspective for analyzing the governance of the marine environment in Northeast Asia: how to enhance governance performance through cross-level cooperative networks in the absence of international mechanisms. This article intends to apply the multilevel governance theory to the research in the field of marine environmental protection in Northeast Asia, and to explore the applicability of the framework in the region as well as the potential optimization paths. The article is structured as follows: first, the theoretical framework section introduces the conceptual origins and connotations of multilevel governance and explains them in the light of the characteristics of the field of environmental governance; second, the background and case

study section reviews the current state of the marine environment in Northeast Asia and the existing governance mechanisms, and analyzes the problems that exist in the current practice of multilevel governance; and then the discussion section compares the different modes of governance and analyzes the opportunities faced by the multilevel governance in the implementation of the multilevel governance in Northeast Asia. Then, in the discussion section, different governance models are compared to analyze the opportunities and obstacles in the implementation of multi-level governance in Northeast Asia; finally, in the policy recommendations section, a number of targeted measures are proposed to optimize the multi-level structure of Northeast Asia's marine environmental governance, and the main points of the text are summarized in the conclusion.

2. Theoretical Framework

2.1 Overview of Multilevel Governance Theory

Multilevel governance is an important theoretical perspective in the field of political science and public administration, proposed by Hooghe and Marks in the early 1990s based on the study of European integration. The theory argues that in the context of globalization and regional integration, public decision-making authority has been decentralized from a single nation-state level to multiple levels, intertwining between domestic and international to form a complex power structure (Piattoni 2009). In other words, in a multilevel governance system, from local governments, regional governments, national governments to transnational and global institutions, all are jointly participating in the governance process, and the decision-making subjects at different levels are interacting and interdependent. Multi-level governance emphasizes both vertical power sharing and horizontal cooperation and interaction: vertically, it includes local-national-international synergies, and horizontally, it involves a multiplicity of actors, including governmental and nongovernmental, public and private sectors. This model of governance breaks away from the traditional top-down hierarchical structure and promotes the inclusion of all levels and stakeholders in decision-making to improve the efficiency of responses to complex public problems (e.g., climate change, transboundary pollution, etc.). In the field of environmental governance, the concept of multilevel governance has special significance. Environmental problems are often multidimensional and multi-scalar in nature across administrative and national boundaries, requiring simultaneous action at global, regional, national and local levels . For example, issues such as climate change and marine pollution involve international treaties and rules, but also require national policy implementation and collaborative responses from local communities. Multi-level governance provides a framework for analyzing such issues: it advocates the development of overarching goals and guiding principles at the global level, the strengthening of interstate coordination mechanisms at the regional level, the improvement of regulations and policies and the implementation of international obligations at the national level, and the encouragement of the active participation of local governments and civil society in the formation of a coherent network of governance . This "all levels" approach has been recognized as helping to overcome the limitations of

single-level governance and to improve the coherence and implementation of environmental policies. For example, documents such as the United Nations Agenda 21 advocate global-local synergy ("think global, act local"), reflecting the application of the idea of multilevel governance (Grip, 2017).

2.2 Comparative Analysis of Multilevel Governance Models

Multilevel governance is not a single model in practice but can be categorized into different types based on differences in the distribution of authority and institutional design. Marks distinguish between Type I and Type II multilevel governance models: the former refers to a stable division of authority at a few levels, such as a clear central and state/provincial division of power under federalism; the latter refers to a large number of flexible and variable cooperative networks that form cross-level coalitions based on specific policy areas. In environmental governance, Type II is more common, i.e., networks of transnational and cross-sectoral cooperation mechanisms around specific environmental issues, such as watershed management committees, regional seas conventions, etc., which often involve multinational government departments, international organizations, expert networks, and even corporations and non-governmental organizations (NGOs) (Marks, 2003). Such networked, polycentric governance structures are seen as a way to increase the resilience and adaptability of environmental governance, as actors can act autonomously and in coordination with each other at different levels. In contrast, traditional models of intergovernmental cooperation (similar to Type I) are often limited to consultation between national environmental authorities and are relatively inflexible and participatory. It is important to note that multilevel governance is not a rejection of traditional national sovereignty, but rather emphasizes the creation of partnerships between different levels of action. In practice, the success of multilevel governance requires a clear division of labor at each level, adequate information sharing, and effective coordination mechanisms to prevent overlapping responsibilities or mutual constraints. For example, in the environmental policy system of the European Union (EU), legislation at the EU level sets uniform goals and standards for member states, member governments are responsible for domestic implementation, and local governments and relevant interest groups are involved in policy formulation and implementation through a consultative mechanism, thus forming an upward and downward linked governance chain (Trondal & Bauer, 2017). This experience shows that clear institutional frameworks and hierarchical synergies are essential for the effectiveness of multilevel governance.

In summary, the multilevel governance framework provides a new perspective for analyzing transnational environmental governance, which emphasizes the decentralization of authority and synergy, and advocates the integration of international organizations, regional mechanisms, national governments, and local actors into a unified network. This framework provides a theoretical basis for examining improvements in marine environmental governance in North-East Asia: effective responses to shared marine environmental crises in North-East Asia require the development and refinement of cross-level governance systems that synergize efforts at the global, regional, national and local levels.

3. Empirical Background

The Northeast Asian seas, covering the nearshore seas of China, Japan, South Korea, North Korea and the Russian Far East, are an area of highly intensive resource and economic activities, but environmental problems have become increasingly serious in recent years. First, harmful algal blooms caused by eutrophication occur frequently. According to the monitoring, about 50 large-scale "red tides" or "green tides" occur annually in the Northeast Asian seas, mostly along the coast of the Sea of Japan and part of the western coast. Algal blooms cause a sudden drop in the oxygen content of seawater and produce toxins, leading to the death of a wide range of aquatic animals, threatening the marine ecology and aquaculture industry, and also endangering human health through the enrichment of toxins in the food chain. Secondly, the frequent occurrence of oil and toxic and hazardous substances spills has seriously damaged the marine ecology. According to statistics, 338 such spills occurred in Northeast Asia from 1990 to 2011, most of which originated from ship collisions and other maritime accidents, and high-density shipping activities have made the Yellow Sea and other local waters accident-prone areas. Large-scale oil spills not only directly kill marine organisms and pollute the coast, but also have a long-term residual impact on the marine environment. For example, an oil tanker collision off the coast of South Korea in July 1990 released 1.5 million liters of fuel oil into the sea, polluting dozens of kilometers of coastline. Third, the trend of biodiversity decline is obvious. Offshore species in Northeast Asian waters are seriously threatened by habitat destruction, excessive fishing and invasive alien species. It is estimated that 60 of the 194 species assessed in the region are at risk of extinction. In particular, the decline of high economic value fish resources is significant, the annual catch of the Yellow Sea in the past 50 years from 200,000 tons to 2.2 million tons, while aquaculture production in the same period is a 12-fold surge, which indicates that anthropogenic high-intensity use of the ecological carrying capacity has been exceeded. Finally, marine litter pollution has become an emerging and thorny problem. Plastic garbage is difficult to degrade in the ocean, endangering marine life and entering the food chain. The coastal waters of all Northeast Asian countries are plagued by floating garbage, with China's coastal plastic debris emissions being the highest: in 2010 alone, about 1.32-3.53 million tons of plastic debris flowed into the ocean from China. Monitoring of Korean waters also shows that an average of 536 pieces of marine litter accumulate on every 100 square meters of beach every month. Floating debris not only directly pollutes water bodies and beaches, endangering marine life, but also reduces the primary productivity of the oceans by blocking out sunlight.

All of the above data indicate that the marine environment of North-East Asia is under tremendous transboundary ecological pressure and that there is an urgent need for concerted action by the countries of the region to manage it. Existing mechanisms for the governance of the marine environment in North-East Asia. In response to regional environmental challenges, Northeast Asian countries have gradually established a number of cooperative mechanisms and programs since the 1990s in an attempt to jointly address pollution and ecological issues. The main multilateral environmental cooperation mechanisms include:

1) Northeast Asian Subregional Programme for Environmental Cooperation (NEASPEC): Established in 1993 on the initiative of the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP), NEASPEC consists of six countries, namely China, Japan, the Republic of Korea, the Democratic People's Republic of Korea (DPRK), Mongolia and the Russian Federation (DPRK). . NEASPEC, as a comprehensive framework for environmental cooperation, has a wide range of issues covering transboundary atmospheric pollution, prevention of sandstorms and dust storms, conservation of biodiversity, and protection of the oceans. NEASPEC is a comprehensive framework for environmental cooperation covering a wide range of issues, including transboundary air pollution, sand and dust storm prevention, biodiversity conservation, marine conservation, etc. Its secretariat is located in Incheon, Korea, and the Senior Officials Meeting (SOM) of member countries serves as the main decision-making platform. Since its establishment, NEASPEC has carried out cooperative projects in a number of areas, for example, the countries jointly implemented a demonstration project on emission reduction from coal-fired power plants in 1996-2012 and helped China and Mongolia to improve their desulphurization technologies. However, NEASPEC also has obvious structural problems. On the one hand, member states have different authorities for the mechanism: China, North Korea, and South Korea are led by their respective foreign ministries, while Japan, Mongolia, and Russia are in charge of their environmental ministries. This unequal setup of domestic coordinating bodies leads to poor communication and slow decision-making. On the other hand, NEASPEC's broad mandate inevitably overlaps with the functions of other specialized mechanisms, leading to fragmentation of resources and inconsistent strategies. Overall, NEASPEC has so far played more of a role as a platform for dialog and project coordination, and its resolutions are not binding and have limited implementation effects.

2) Northwest Pacific Action Plan (NOWPAP): This is part of the Regional Seas Programme of the United Nations Environment Programme (UNEP), which was initiated in 1994 by China, Japan, South Korea and Russia. NOWPAP focuses on marine environmental protection in the Northwest Pacific and adjacent seas, covering the Yellow Sea, the Sea of Japan, etc., but unfortunately does not include the most polluted Bohai Sea. NOWPAP focuses on marine environmental protection in the Northwest Pacific Ocean and adjacent seas, covering the Yellow Sea, the Sea of Japan, etc., but unfortunately does not include the Bohai Sea, which is the most polluted sea. NOWPAP operates on the basis of funding from member countries, with four Regional Activity Centers (RACs) set up to carry out the project, and a Regional Coordination Unit (RCU) in each of Japan and South Korea to act as the secretariat, with decision-making by an intergovernmental meeting of the member countries. Functionally, NOWPAP mainly serves as a platform for marine environmental information and cooperation: it has established a marine pollution and legal policy information system, coordinated joint monitoring, and promoted regional cooperation on oil pollution accident response. For example, in 2004, the four NOWPAP countries signed a Memorandum of Understanding (MOU) on Cooperation in Maritime Oil Spill Preparedness and Response to strengthen joint prevention and control of oil pollution incidents. However, NOWPAP has also revealed some shortcomings in its operation for more than 20 years: its

work focuses on information exchange and research, and it has never formulated specific environmental quality objectives or assessment indicators, and it lacks a mechanism to quantitatively assess the marine ecological status of the region. In terms of outputs, NOWPAP has only published two overall marine environmental assessment reports since its establishment, in 2007 and 2014, which is obviously insufficient in frequency and influence. In addition, the lack of funding constrains NOWPAP's actions: for example, the total budget for the two years of 2016-2017 is less than 1 million US dollars, which is very tight to maintain the operation of four centers and two secretariats. More representatively, NOWPAP had to set up dual secretariats in Japan and South Korea due to the competition for dominance among member states, a compromise arrangement that resulted in inefficient management. Although NOWPAP provides a framework for regional marine cooperation, its substantive effect on the improvement of the marine environment in Northeast Asia is rather limited due to the lack of coercive power and limited resources.

3) Trilateral Environment Ministers Meeting (TEMM): Initiated in 1999 by China, Japan and the Republic of Korea, the TEMM meets annually at the ministerial level with the aim of strengthening trilateral environmental policy dialogues and cooperation. The TEMM covers a wide range of issues, including atmosphere, water, waste and biodiversity, and also addresses marine pollution. Its working groups have promoted a number of projects, such as the joint study on "Long-range Transboundary Air Pollution (LTP)" and the monitoring of marine floating garbage. However, the TEMM itself is not a treaty and has no permanent secretariat, but exists mainly as a platform for high-level policy coordination. The TEMM has played a role in promoting consensus through sharing of environmental data, staff exchanges and capacity building among the three countries . However, due to the lack of legal binding force, the TEMM resolution relies more on the voluntary implementation of member states, and there is no mandatory requirement for substantive emission reduction or governance targets. This makes the TEMM not strong enough to deal with complex environmental problems, and the results remain at the level of initiatives and information sharing .

4) Other mechanisms and bilateral cooperation: There are also a number of cooperative networks on specialized topics in the North-East Asian region. For example, the East Asian Network for Acid Deposition Monitoring (EANET), which covers several countries in North-East and South-East Asia, is dedicated to regional acid rain monitoring. . The Northeast Asian Marine Biodiversity Conservation Network (NAMBCN) and the Japan-Korea High-Level Dialogue on Ocean Affairs (JKHDOA) are other examples of cooperation in specific areas or on a bilateral basis. In addition, it is also common for countries to address pressing transboundary issues through bilateral agreements. For example, China and South Korea maintain close consultations on environmental protection and fisheries resources management in the Yellow Sea, and have made some progress on pollution control in the Yellow Sea through bilateral channels, which are considered sometimes more effective than multilateral frameworks on sensitive topics . For example, there are agreements on cooperation in oil pollution incident response between China and Japan and between Korea and Japan, as well as cooperation

between Russia and Japan in combating radioactive pollution at sea. These bilateral arrangements often have the advantage of being well-targeted and flexible in decision-making, but they may also lack a holistic regional perspective because they are limited to two countries.

Overall, the North-East Asian region now has a multi-level, networked pattern of environmental cooperation: there are multilateral frameworks (NEASPEC, NOWPAP, etc.) covering the entire region, issue-specific networks (EANET, etc.), and frequent bilateral cooperation. This objectively constitutes a certain degree of "multilevel governance", with the coexistence of different levels and forms of mechanisms. These mechanisms have achieved some results in terms of information sharing, joint monitoring, etc., and have provided a scientific basis for understanding environmental issues. However, as mentioned earlier, most of them lack legally binding and unified action programs, and the effectiveness of cooperation is limited. In particular, when responding to regional environmental crises, there is no strong regional system to coordinate the responses of countries in an integrated manner. This has resulted in Northeast Asia's environmental cooperation remaining mainly at the policy dialog and technical levels, with joint actions and substantive emission reductions being ineffective. In the following section, we will discuss in depth the crux and optimization direction of multi-level governance of the environment in Northeast Asia against the above background.

4. Discussion

The fragmentation dilemma of environmental governance in Northeast Asia. From the above case study, it can be seen that Northeast Asian marine environmental governance is currently in a fragmented state. This fragmentation is manifested in two aspects: first, the vertical hierarchy is fragmented, and second, the horizontal mechanism is overlapped. Vertically, due to the lack of an authoritative regional hierarchy, governance relies mainly on domestic policies and bilateral coordination, and lacks regional constraints and guidance for national actions. While countries are parties to global environmental agreements such as the United Nations Convention on the Law of the Sea, these global frameworks are often broad and limited in their implementation, requiring regional and national implementation. Northeast Asia has so far failed to introduce regional environmental regulations or targets similar to those of the European Union, and the high degree of policy autonomy and lack of uniformity in national policies have resulted in uneven standards and intensity of environmental governance. Horizontally, there are several existing cooperation mechanisms that are cross-functional and lack of integration. For example, NEASPEC, NOWPAP, and TEMM are all involved in the field of marine pollution, but there is a lack of coordination among them, and their work is sometimes duplicated with gaps in focus. Korea prefers to promote a self-contained cooperative mechanism in Northeast Asia, while Japan favors a pan-East Asian network (e.g., EANET) covering more countries. This divergence of interests has led to the parallel development of several mechanisms without creating synergies. At the domestic level, participation in the same cooperative mechanism is also differently positioned

between different sectors (e.g., foreign affairs and environment), further exacerbating miscommunication. As a result, environmental cooperation in Northeast Asia is currently characterized by "different voices singing different tunes": the presence of multilevel actors, but a lack of effective linkages, makes it difficult to address regional systemic challenges. Analysis of the applicability of multilevel governance in Northeast Asia. The concept of multilevel governance, which emphasizes the need for multidimensional collaboration on transnational issues, is of great relevance to the governance of the marine environment in Northeast Asia. In terms of applicability, the situation in Northeast Asia is consistent with the original intent of multilevel governance: environmental problems in the region transcend national boundaries and are so complex and diverse that they cannot be adequately dealt with at a single level (either by individual countries or by relying exclusively on international mechanisms), and they must be combined with upward and downward, and internal and external coordination is necessary. Existing cooperation practices in Northeast Asia confirm this: countries are engaged in governance through multilateral and bilateral channels, forming a sort of de facto multilevel network. For example, the conservation of the Yellow Sea LME involves GEF/UNDP support at the global level ("Yellow Sea Large Marine Ecosystem Project"), bilateral cooperation between China and South Korea at the regional level, and the participation of local governments and communities in the coastal areas of the two countries to jointly develop and implement action plans. This shows that even in the absence of a written regional convention, multilevel cooperation has been taking place to some extent and has been instrumental in solving localized problems. However, North-East Asia still faces a number of challenges in applying the multilevel governance framework on a broader scale and at a higher level:

1) Insufficient national will and political trust. Multi-level governance requires the willingness of Governments to cede some of their autonomous decision-making power to coordinate and harmonize actions at the regional level. However, in Northeast Asia, countries have a stronger sense of sovereignty and development aspirations and are less receptive to the regional system. In particular, as the region's largest economy and a polluter, China has been cautious about joining the strict regional environmental constraints for fear of affecting its own economic development space. Russia also pays limited attention to environmental issues in the Far East. The lack of a common sense of environmental mission and urgency makes it difficult to deepen multi-level cooperation. In addition, geopolitical relations in Northeast Asia are complex, with historical and territorial disputes leading to a lack of mutual trust among countries, and environmental cooperation often takes a backseat to higher-priority strategic considerations. This political climate is not conducive to the establishment of strong regional governance mechanisms. In contrast, an important reason for the effectiveness of environmental cooperation in Europe is that the EU framework provides supranational authority and a high level of mutual trust among its members, and there is a solid political basis for multi-level governance. The gap in this regard in Northeast Asia makes it difficult for the theoretical multilevel framework to be translated into a binding system on the ground.

2) Inadequate institutional provision and coordination. The effective functioning of multilevel

governance requires clear institutional design to coordinate actions at all levels. However, the existing mechanisms in Northeast Asia are more of a coordinating and ad hoc nature and lack a legally binding long-term system. There is no regional environmental convention, and each mechanism acts in its own way, leading to resource fragmentation and inefficiency. For example, in regional air pollution control, Korea and Japan are leading different multilateral programs (Korea focuses on LTP under the TEMM framework, while Japan prefers the EANET framework), but there is no synergy. A similar situation exists in the field of marine environment: NOWPAP could be the main axis of regional ocean governance, but its role is limited due to insufficient functions and incomplete membership; NEASPEC is involved in ocean issues, but its efforts are scattered. The lack of a pivotal institution to coordinate these mechanisms leaves no physical vehicle for multilevel governance. Ideally, North-East Asia would need a body similar to the European Commission or the Regional Environment Commission to integrate and coordinate these mechanisms, but such a hub has not yet been formed, either politically or organizationally.

3) Lack of binding objectives and monitoring. Multi-level governance emphasizes common goal-setting and progress monitoring to ensure that efforts at all levels are directed in the same direction. However, Northeast Asian environmental cooperation has so far lacked clear quantitative targets and a mechanism for regular assessment. Regional countries have not been able to reach agreement on hard targets such as emission reduction quotas and marine water quality standards, and multilateral mechanisms have not established a system to monitor countries' implementation. This means that even if there are multiple levels of participation, the lack of hard constraints means that cooperation is easily reduced to a mere formality and fails to ensure improved environmental performance. In contrast, other regions, such as the Baltic States, have established strict caps on pollutant discharges and ecological targets through the Helsinki Convention, and regularly report on their progress, which has had a significant effect on improving the marine environment. The current state of "soft cooperation" in Northeast Asia has weakened the power of collective action that should be generated by multilevel governance.

Despite these difficulties, a multilevel governance framework is not irrelevant in North-East Asia, but is the way forward. On the one hand, the transboundary nature of environmental problems in North-East Asia dictates that no single level or country can solve them alone, and that global-regional-national-local vertical linkages are needed. For example, marine plastic pollution requires a global convention on plastics, regional cooperation to reduce emissions at the source, national improvement of waste management, and local enhancement of public awareness of environmental protection, each of which is indispensable. Multi-level governance provides ideas for coordinating these links. On the other hand, multilevel governance focuses on diversified participation and flexible response, which can make up for the limitation of insufficient momentum of intergovernmental cooperation in Northeast Asia. By bringing in local governments, civil society, businesses and scientific research networks as complementary forces, environmental cooperation may

be able to progress beyond diplomatic barriers. For example, fishermen and coastal communities in China, Japan, and South Korea already have informal cooperation and exchange programs to share information on red tide warnings and jointly clean up beach trash, and these grassroots-level interactions play a positive role when official channels are blocked (which reflects horizontal polycentric governance thinking). In short, multilevel governance possesses necessity and potential benefits in Northeast Asia, but it needs to be brought into play through appropriate institutional innovations and policy guidance to dissolve the real obstacles and bring out its advantages.

In order to have a clearer understanding of the direction of optimization of multilevel governance in Northeast Asia, it is necessary to compare the experience of other regional models of environmental governance. The European Union (EU) is seen as a model of multilevel environmental governance: internally, it coordinates the actions of member states through binding regulations and targets, and environmental agencies at the regional level form a vertical and horizontal implementation network with national environment ministries and local governments. This model dramatically reduces the potential for member States to act in isolation from each other, leading to sustained improvements in environmental quality across the region. For example, the EU Water Framework Directive and the Marine Strategy Framework Directive harmonize the objectives for the water and marine environments respectively, and member states formulate their own national implementation plans accordingly and evaluate them regularly, while the EU level provides financial and technical support. This reflects the combination of top-level rule design and bottom-level pluralistic participation. In contrast, the Northeast Asian model is closer to traditional intergovernmentalism: the absence of mandatory rules at the regional level, and a reliance on national will to drive cooperation. The difference between the two models suggests that Northeast Asia needs to evolve towards a more multi-layered and binding approach if it wishes to improve regional environmental governance performance. In addition to the EU, there are a number of environmental cooperation mechanisms in North America and Oceania that are worthy of reference. For example, the Air Quality Agreement in North America and the Indian Ocean Marine Agreement in South Asia, although not as well integrated as the EU, reflect the efforts of neighboring countries to clarify their responsibilities and set common goals through legal agreements. These experiences show that an effective regional environmental governance system usually has a clear legal framework (agreement/convention), specific emission reduction or protection targets, regular joint assessments, and a multi-tiered implementation network. It is the first two items that are currently lacking in Northeast Asia, and to improve the multilevel governance framework, the shortcomings at the legal and target levels should be addressed first. The following policy recommendations suggest ways to optimize the framework accordingly.

5. Policy Recommendations

Based on the above analysis, this paper proposes a number of policy recommendations for optimizing the multilevel governance of the marine environment in North-East Asia:

1) Establishment of binding regional conventions on the marine environment. Northeast Asian countries should jointly promote the formulation of a specialized regional agreement on marine environmental protection that legally defines the responsibilities, obligations and quantitative targets of each country in pollution prevention and ecological protection. Reference can be made to successful international experiences, such as the Helsinki Convention adopted by the Baltic States, which sets limits on the discharge of various pollutants, and the Plastic Pollution Convention that is under preparation globally. In terms of the form of the agreement, we can consider adopting the model of "framework convention + subsidiary agreement": first, we can reach a framework convention on the overall goal and cooperation mechanism, and then formulate bylaws or protocols on specific issues, such as land-based pollution control, marine plastic waste treatment, emergency mutual aid, etc.), so as to gradually refine the implementation. The convention should specify the environmental targets (e.g., near-shore water quality, beach litter reduction rate, etc.) and timetables that should be met by each country, and establish a regular review and reporting system to ensure that the performance of member countries is transparently verifiable. Such a regional convention would provide common "rules of the game" for multi-level governance and fill the longstanding institutional gap in North-East Asia, which has long been characterized by a lack of hard constraints.

2) Strengthening the integration and coordination of regional governance mechanisms. In parallel with the establishment of the convention, the existing multilateral cooperation mechanisms need to be reformed and integrated to form an efficient and coordinated structure. On the one hand, the Trilateral Environment Ministers' Meeting (TEMM) should be given a clearer coordinating role. Consideration could be given to reorganizing TEMM into an environmental cooperation council covering the major countries in Northeast Asia as a central coordinating body for regional environmental issues . Under the TEMM council, several specialized working groups could be set up to coordinate the work plans of related mechanisms such as NEASPEC and NOWPAP, so as to avoid duplication of resource investment . On the other hand, the synergy between NEASPEC and NOWPAP should be promoted. For example, the existing projects and resources of NOWPAP can be incorporated into the NEASPEC framework for unified planning, or vice versa, the marine protection part of NEASPEC can be merged with NOWPAP, so that one mechanism focuses on the terrestrial environment and the other focuses on the oceans, thus focusing on each other and reducing the overlapping of functions. . Meanwhile, for some cross-cutting issues, a joint working mechanism should be set up between the mechanisms to exchange information and coordinate actions on a regular basis. Through the above measures, a "one platform, multi-party participation "pattern will gradually be formed, so that the currently fragmented multi-level cooperation channels can be organically integrated, and the overall governance efficiency can be improved.

3) Setting of common environmental objectives and monitoring and evaluation mechanisms. The countries of North-East Asia should set quantitative common goals for the improvement of the regional marine environment, such as reducing a certain percentage of pollutants entering the sea by a certain

year, improving the rate of compliance with seawater quality standards, and restoring a specific percentage of marine habitats. These targets could be incorporated into the above-mentioned regional conventions or cooperation agreements and determined through consultations based on scientific assessments and the capacity of each country. To ensure the implementation of the goals, an independent monitoring and assessment mechanism needs to be established: scientific research institutions in the region or international agencies could be commissioned to conduct regular assessments of the progress of each country and to publish regional state of the marine environment reports (it is recommended that they be published every 2-3 years, rather than seven years apart, as NOWPAP has done in the past) . The assessment reports should cover key data such as water quality indicators, pollutant concentrations, biodiversity indices, litter removal, etc., and give an assessment of how well countries are fulfilling their regional commitments and recommendations for improvement. Such a transparent assessment will enhance countries' sense of accountability and motivation to comply. At the same time, countries should also strengthen their domestic environmental monitoring systems and interface with regional monitoring networks to ensure data sharing and mutual recognition. The establishment of common goals and assessment mechanisms will help to transform multilevel governance from a "loose dialogue" to a "result-oriented" approach, whereby the effectiveness of cooperation will be tested by actual environmental improvements.

4) Expanding the range of participants and promoting cooperation among multiple actors. The advantage of multilevel governance is that it encompasses forces other than government in the governance of the environment. Northeast Asia should encourage and institutionalize the participation of more non-State actors, including local governments, businesses, non-governmental organizations, academic institutions and the public. Specifically, a "Northeast Asian Partnership Network for the Marine Environment" could be established under a regional convention or cooperative framework** to which relevant stakeholders would be invited to join, and regular exchanges and forums would be organized to allow them to contribute to policy formulation and project implementation. . For example, coastal cities could enter into "sister bay" partnerships to share experiences in coastal management and pollution control; fisheries associations and community organizations could conduct transnational joint breeding and stocking and closed area management pilots; and environmental NGOs could take the lead in organizing regional marine garbage cleanups or public awareness and education campaigns. Businesses can commit to reducing plastic use and industrial emissions through platforms such as the Green Supply Chain Alliance. The government level should provide support for these private and market-driven collaborations, such as streamlining cross-border cooperation approvals, providing small grants funds, and facilitating access to information. By stimulating the enthusiasm of multiple actors and forming a governance ecology in which the government and the people work together and interact up and down, the lack of motivation for official cooperation can be compensated for to a large extent. Especially in the current context of uncertain political relations, environmental cooperation at the civil level can serve as a buffer and supplement to maintain the overall momentum of

cooperation.

5) Strengthening financial technology support and capacity building. Environmental governance requires adequate financial and scientific and technological inputs. Northeast Asian countries should consider establishing a regional environmental cooperation fund, financed by major economies such as China, Japan and the Republic of Korea, to finance regional scientific research, capacity training and demonstration projects. This fund could be used to support less developed countries (e.g., DPRK, Mongolia) in upgrading their environmental management capacity, as well as for joint response preparedness for environmental emergencies. At the same time, deepen intra-regional cooperation in environmental science and technology to share monitoring technologies, governance techniques and best practices. For example, a Northeast Asian Marine Environmental Science Center or a network of experts could be established, and scientific and technical reports could be released regularly to provide a basis for policymaking. In terms of capacity building, exchange training programs for officials and technicians can be carried out to strengthen the training of environmental managers from various countries in the concept of multilateral governance and to enhance their sense of collaboration and professionalism. Through the investment of funds and technology, the hard and soft power of the whole region in environmental governance can be enhanced, providing material guarantee and intellectual support for multi-level cooperation. It is worth mentioning that this cooperation will not only benefit the environment itself, but also promote the development of environmental protection industry and green technology in the region, realizing a win-win situation for both the economy and the environment.

The above recommendations complement each other and aim to gradually improve the multilevel structure of marine environmental governance in North-East Asia. In the long run, these measures are expected to move regional cooperation out of its current ineffective rut and towards institutionalization, targeting and participation by all . It needs to be emphasized that the key lies in the political determination of regional countries: only if they recognize the urgency and mutual benefits of common environmental actions and are willing to invest resources and political capital, the multi-level governance framework can really work. The next section concludes the full paper and looks at the future prospects for multilevel governance of the marine environment in North-East Asia.

6. Conclusion

The governance of the marine environment in North-East Asia is at a critical crossroads. On the one hand, the increasing trend of pollution and ecological degradation poses a direct threat to the sustainable development of the region and the well-being of its people, and no country can afford to stay away from it; on the other hand, it is difficult for the traditional single-country or loosely negotiated approach to generate effective collective action, and regional cooperation urgently needs to make a breakthrough in terms of both depth and breadth. Through theoretical discussion and empirical analysis, this paper points out the practical applicability of the multilevel governance framework in

Northeast Asia as well as the current obstacles. Multi-level governance, which emphasizes synergistic participation across local and national to regional and global levels, provides the necessary thinking for solving the complex marine environmental problems in Northeast Asia. However, for this framework to take root, Northeast Asian countries must move beyond the fragmented governance model and make substantial improvements in institutional construction and policy implementation . The optimization pathway proposed in this paper covers five dimensions: from formulating regional conventions to fill legal gaps to integrating existing mechanisms to enhance coordination; from setting common environmental goals and assessment mechanisms to guide actions to mobilizing a wide range of non-state actors to participate in governance; and from providing financial and technological support to strengthen the foundation of cooperation. These measures complement each other and aim to gradually weave a multi-level governance network for the marine environment in North-East Asia. The core concept is to introduce higher-level constraints and wider participation while maintaining the leading role of the state, so that environmental governance becomes the common responsibility and collective practice of the entire region. Of course, promoting a multilevel governance framework is not an overnight success, and there are still many practical challenges to overcome. For example, how to balance the development and environmental protection goals of each country, how to persuade key countries to join binding agreements, and how to mitigate the interference of geopolitical tensions in environmental cooperation. These need to be addressed through sustained diplomatic communication and trust building. However, there are signs of hope: China, the region's largest emitter, has increased its environmental priority in recent years, with policies such as the 14th Five-Year Plan explicitly emphasizing the building of an ecological civilization ; Japan and South Korea are also looking for more ways to cooperate with their neighbors in addressing climate and environmental threats. There is also a growing call for cleaner oceans from the private sector, and the application of new technologies has made pollution prevention and control more feasible. These factors provide favorable conditions for deepening multi-level governance. In short, the governance of the marine environment in Northeast Asia needs to shift from the past model of fragmented and ad hoc responses to a new phase of cooperative and proactive governance. The introduction and optimization of a multi-level governance framework points the way to this transition. Through the establishment of a common vision and mechanism at the regional level, the implementation of commitments and coordination and integration at the national level, and the stimulation of vitality and innovation at the local and civic levels, North-East Asia is expected to progressively establish an effective system of governance for the marine environment. This will not only help to restore the health and productivity of the regional marine ecosystems for the benefit of hundreds of millions of people along the coasts but will also become a new highlight of regional cooperation in North-East Asia, contributing to the enhancement of peace and trust in the region. Looking ahead, as long as all parties concerned work together and have the courage to shoulder their responsibilities, it is entirely possible for North-East Asia to walk out of a path of multilevel environmental governance that is in line with its own characteristics and contributes

valuable experience to global ocean governance.

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References

Al Jazeera. (2007, December 10). *South Korea oil spill spreads*. Retrieved from https://www.aljazeera.com/news/2007/12/10/south-korea-oil-spill-spreads

Aoyama, M., Inomata, Y., Tsumune, D., & Tateda, Y. (2019). Fukushima radionuclides in the marine environment from coastal region of Japan to the Pacific Ocean through the end of 2016. *Progress in nuclear science and technology*, *6*, 1-7. https://doi.org/10.15669/pnst.6.1

Fortnam, M., Evans, L., Ayu, A. A. M., Bastian, L., Chaigneau, T., Creencia, L., ... & Syazana, W. W. N. (2022). Polycentricity in practice: Marine governance transitions in Southeast Asia. *Environmental Science & Policy*, *137*, 87-98. https://doi.org/10.1016/j.envsci.2022.08.010

Grip, K. International marine environmental governance: A review. *Ambio*, *46*, 413-427. https://doi.org/10.1007/s13280-016-0847-9

Hong, S., Lee, J., Kang, D., Choi, H.-W., & Ko, S.-H. (2014). Quantities, composition, and sources of beach debris in Korea from the results of nationwide monitoring. *Marine Pollution Bulletin*, 84(1-2), 27-34. https://doi.org/10.1016/j.marpolbul.2014.05.051

Jambeck, J. R., Geyer, R., Wilcox, C., Siegler, T. R., Perryman, M., Andrady, A., ... & Law, K. L. (2015). Plastic waste inputs from land into the ocean. *Science*, *347*(6223), 768-771. https://doi.org/10.1126/science.1260352

Marks, G., & Hooghe, L. (2004). Contrasting visions of multi-level governance. *Multi-level governance*, 15-30. https://doi.org/10.1093/0199259259.003.0002

Maruf, M., Chang, Y. C., & Yang, L. (2024). Managing institutional interlinkages for the protection of marine environment in the East Asian seas region and beyond: The case of marine plastic pollution. *Ocean & Coastal Management*, *255*, 107232. https://doi.org/10.1016/j.ocecoaman.2024.107232

Miyake, Y., & Onitsuka, G. (2025). Long-term statistics of the Karenia mikimotoi blooms in western Japan imply multidecadal intensification and phenological changes on the semi-national, regional, and local scales. *Fisheries Science*, 1-17. https://doi.org/10.1007/s12562-025-01867-5

Mälly, M. (2018). International cooperation organizations of regional governments (ICORGs) in the multi-level governance (MLG) system of the Baltic Sea macro-region AQ methodological study (Doctoral dissertation). *Acta Universitatis Tamperensis*, 2398.

Park, J. B. (2018). *Regional environmental politics in Northeast Asia: Conflict and cooperation*. Routledge. https://doi.org/10.4324/9780203731796

Piattoni, S. (2009). Multi-level governance: A historical and conceptual analysis. *European integration*,

31(2), 163-180. https://doi.org/10.1080/07036330802642755

Ren, W., Ni, J., & Chen, Y. (2022). Exploring the marine ecological environment management in China: evolution, challenges and prospects. *Sustainability*, *14*(2), 912. https://doi.org/10.3390/su14020912

Taek-Whan Han, "*Northeast Asia Environmental Cooperation: Progress and Prospects", EASSNet*, September 24, 1994, https://nautilus.org/eassnet/northeast-asia-environmental-cooperation-progress-and-prospects/

Thomas, N. (2009). Understanding regional governance in Asia. In *Governance and Regionalism in Asia* (pp. 1-31). Routledge. https://doi.org/10.4324/9780203883853-10

Trondal, J., & Bauer, M. W. (2017). Conceptualizing the European multilevel administrative order: Capturing variation in the European administrative system. *European political science review*, *9*(1), 73-94. https://doi.org/10.1017/S1755773915000223

van Tatenhove, J. P. (2016). Marine governance: institutional capacity-building in a multi-level governance setting. In *Governing Europe's Marine Environment* (pp. 35-52). Routledge.

차 재 권 . (2011). The Role of Epistemic Community in Some Experiences of Multi-Level Governance-Two Contrasting Cases of Regional Seas Programs, NOWPAP and MAP. *아태연구*, *18*(3), 161-188. https://doi.org/10.18107/japs.2011.18.3.009