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EDITED BY

Yen-Chiang Chang,
Dalian Maritime University, China

REVIEWED BY

Jan Marcin Weslawski,
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Giuseppe Suaria,
National Research Council, Italy
Mezni Ali,
University of Jendouba, Tunisia

*CORRESPONDENCE

Xinqi Yan
✉ yanxq614@nenu.edu.cn

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Multi-level governance of Arctic marine plastic pollution: effectiveness and enhancement approaches

Jiajia Zhang¹ and Xinqi Yan^{2*}

¹School of International Affairs and Public Administration, Ocean University of China, Qingdao, China,

²School of Marxism, Qingdao University of Science and Technology, Qingdao, China

Marine plastic pollution (MPP) poses a significant threat to the sustainable development of the Arctic. In response, a multi-level governance framework has emerged across global, regional, and national dimensions. At the global level, international agreements such as the United Nations Convention on the Law of the Sea (UNCLOS), the International Convention for the Prevention of Pollution from Ships (MARPOL), and the Code of Conduct for Responsible Fisheries (CCRF) provide foundational regulatory frameworks for marine plastic pollution governance. Regionally, the Arctic Council plays a pivotal role by leveraging initiatives such as the Protection of the Arctic Marine Environment (PAME) and the Arctic Monitoring and Assessment Programme (AMAP). These mechanisms serve to integrate Arctic issues into the global agenda while facilitating knowledge sharing and implementing tailored action plans. Nationally, the eight Arctic states interact with both global and regional governance regimes, participating in collaborative efforts to mitigate marine plastic pollution. However, the effectiveness of multi-level governance of Arctic marine plastic pollution is constrained by regime robustness and state capacity. To more effectively tackle marine plastic pollution in the Arctic, it is imperative to integrate Arctic concerns into global governance agendas, actively build a multidimensional governance framework at the regional level, and enhance the Arctic states' willingness and capacity—with attention to the contributions and demands of Indigenous communities regarding this issue.

KEYWORDS

marine plastic pollution, Arctic governance, multi-level governance, institutional effectiveness, Arctic council

1 Introduction

Plastic pollution is a global environmental crisis that threatens marine ecosystems and human health (Yu et al., 2023). In 2021, the United Nations Environment Programme (UNEP) released *From Pollution to Solution: A Global Assessment of Marine Litter and Plastic Pollution*, a report warning that emissions of plastic waste into aquatic ecosystems

are projected to nearly triple by 2040 without meaningful action (UNEP, 2021). Plastic litter is found in even the most remote locations in the world, and the Arctic is no exception (AC, 2025a). Notably, the Arctic region has a sparse population and lacks both large-scale plastic industry and major consumer markets. Therefore, Arctic marine plastic pollution is a transnational issue, both in terms of its origins and its consequences (PAME, 2025a). Surface circulation models and field data show that the poleward branch of the Thermohaline Circulation transports floating debris from the North Atlantic to the Greenland and Barents Seas, which would be a dead end for this “plastic conveyor belt”. With 95% of the plastic load estimated in the Arctic confined to the Greenland and Barents Seas, the northeastern Atlantic sector of the Arctic Ocean can be characterized as the single, dominant high-accumulation zone for floating plastic debris (Cózar et al., 2017). The above evidence indicates that a negligible proportion of plastic trash originates from the Arctic.

Specifically, Arctic plastic litter comes from four ways: fisheries and parts thereof lost, the Arctic industry, outside the Arctic, and local activities (AC, 2025b). Compounding this issue, recent studies indicate that the Arctic has been warming at four times as fast as the globe (Zhou et al., 2024). The Arctic Ocean could be ice-free in summer by the 2030s (Kim et al., 2023). As Arctic sea ice melts and maritime activities in the region increase, the problem of Arctic marine plastic pollution will become increasingly prominent. This crisis not only damages the Arctic’s ecosystem but also poses global risks, directly threatening global environmental sustainable development. Given these compounding threats, mitigating Arctic marine plastic pollution demands urgent international action.

International regimes are defined as principles, norms, rules, and decision-making procedures around which actor expectations converge in a given issue-area. (Krasner, 1982) Historically, a multi-level governance of Arctic marine plastic pollution has been formed. Global agreements include pollution-oriented instruments, biodiversity-species-oriented instruments, chemicals and waste-oriented instruments, and global initiatives related to marine plastic pollution governance. The United Nations Environment Assembly (UNEA), in *resolution 5/14* in March 2022, requested the UNEP Executive Director to convene an intergovernmental negotiating committee to develop an *international legally binding instrument on plastic pollution*, including the marine environment (UNEP, 2022). This initiative marks a pivotal advancement in global plastic pollution governance. The Arctic marine plastic pollution is also constrained by global-level regimes, particularly regulations on shipping and fisheries-related plastic pollution under the *MARPOL* and *Polar Code*, which apply to Arctic waters. At the regional governance level, the Arctic Council is the leading intergovernmental forum (AC, 2024c), playing a core role in Arctic governance. Through its working groups AMAP and PAME, the Arctic Council has released scientific monitoring plans and regional action plans for marine plastic pollution governance in the Arctic. By setting policy issues, supplying scientific knowledge, and implementing practical measures, the Council not only integrates global marine plastic governance

goals into the regional governance framework but also elevates the prominence of Arctic issues in global environmental discussions. In addition to the Arctic Council, the Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR) has also exerted a positive impact on the governance of marine plastic pollution in the Arctic. Nationally, several of the eight Arctic States have enacted domestic plastic governance legislation while participating in regional and global governance regimes. In 2019, the ministers of environment and climate of the Nordic countries approved the *Nordic Co-operation 2019 Declaration*, which calls for a global agreement to more effectively and comprehensively address marine plastic litter and microplastics (Linnebjerg et al., 2021). Collectively, the multi-level governance regimes provide a standardized and legalized path for addressing the Arctic marine plastic pollution problem.

The academic community has undertaken in-depth research on evaluating institutional effectiveness. The most widely adopted criteria are the three dimensions proposed by Oran Young: output (whether institutions operate as designed), outcome (whether institutions alter actors’ behavior), and impact (whether institutions solve the targeted problems) (Young, 1999). In Young’s opinion, factors shaping institutional effectiveness encompass both endogenous variables—such as the transparency and robustness of the institution—and exogenous variables, including the capacity of governments, the distribution of power, interdependence, and intellectual order (Rosenau and Czempiel, 2009a). Although the study on institutional effectiveness is comparatively well-developed, marine plastic pollution—being a relatively new issue area—has yet to be subjected to systematic effectiveness assessments of its international regimes. Once the meaning of institutional effectiveness and the empirical focus have been clarified, a comprehensive analytical framework should be constructed to evaluate the effectiveness of governance institutions targeting marine plastic pollution in the Arctic. Accordingly, this article adopts a qualitative case-study design focused on identifying the determinants that shape the effectiveness of institutions governing Arctic marine plastic pollution. Building on extant theories of institutional effectiveness, it selects output, outcome, and impact as evaluative criteria and takes the multi-level governance complex for Arctic plastic pollution—comprising the principal global and regional instruments—as its empirical case. Analytical variables are distilled from regime robustness (mechanism density, stability, and issue salience) and state capacity (both willingness and capability to cooperate), thereby mapping the predicaments that confront the effectiveness of multi-layered governance mechanisms for Arctic marine plastic debris (see Table 1).

The effectiveness of multi-level governance in addressing Arctic marine plastic pollution remains significantly constrained by systemic limitations. Globally, regime robustness is hindered by the absence of compliance-enforcement mechanisms, and comparatively low issue salience for the Arctic, while simultaneously constrained by the state-capacity factor of a lack of global normative consensus. Regionally, insufficient regime robustness is manifested in stability weakened by geopolitical contestation and in structural dilemmas and coordination

TABLE 1 Determinants of institutional effectiveness.

State capacity Institutional robustness Institutional effectiveness	Higher	Lower
	Higher	High effectiveness Partially effective
Lower	Partially effective	Low effectiveness

problems generated by rising mechanism density; moreover, state capacity is further constrained by uneven willingness and divergent governance capabilities among the Arctic states. Therefore, to enhance the effectiveness of the Arctic marine plastic pollution governance, a multi-pronged approach is essential. First, elevating the issue of Arctic plastic pollution within global environmental agendas is critical to garnering international attention and resources. Subsequently, regional governance regimes must strengthen their institutional linkages with global regimes. Specifically, the Arctic Council, leveraging its rotating chairmanship, working groups, and expert groups, should enhance coordination with the broader global marine plastic pollution governance framework. This integration would facilitate the development of a multidimensional networked governance structure, ultimately establishing the Arctic as a regional model for effective marine plastic pollution governance. Finally, Indigenous Peoples are direct stakeholders in the Arctic. To refine the Arctic marine plastic pollution governance mechanism, it is necessary to strengthen the systematic integration and learning from Indigenous traditional knowledge, and prioritize attention to the effective role of Indigenous organizations within the mechanism.

The governance of Arctic plastic pollution fundamentally depends on close cooperation among the eight Arctic States. As the primary actors in Arctic governance, these states play a decisive role in shaping the trajectory of marine plastic pollution mitigation. Their economic activities—particularly resource extraction and maritime shipping—directly influence pollution levels, thereby positioning them as key stakeholders in addressing this environmental challenge. Moreover, as influential members of both global and regional governance institutions, the Arctic states significantly impact policy formulation, agenda-setting, and the overall efficacy of governance mechanisms. However, the cautious stance of major Arctic powers—notably the United States and Russia—toward marine plastic pollution regulation has slowed progress in this domain. To overcome these barriers, Arctic states must take greater responsibility by fostering consensus, strengthening institutional capacities, and ensuring the effective implementation of governance frameworks. Only through coordinated and committed action can the region establish a robust system for combating marine plastic pollution.

The effectiveness of Arctic marine plastic pollution governance regimes depends not only on regional actors but also on the meaningful participation of non-Arctic states. China, as a

signatory to key international agreements such as the UNCLOS and the *Convention on Biological Diversity* (CBD)—and as an accredited observer to the Arctic Council—plays an increasingly significant role in this domain. As stated in *China’s Arctic Policy*, sustainability is the fundamental goal of China’s participation in Arctic affairs ([China’s Arctic Policy, 2018](#)). In recent years, China has started monitoring marine plastic pollutants in Arctic expeditions. China’s eighth Arctic Expedition in 2017 carried out investigations on floating litter and marine microplastics ([PAME, 2019](#)). In 2023, China’s 13th Arctic Ocean Expedition Team and Thailand cooperated for the first time to provide a reference for the research and control of global microplastic pollution ([CGTN, 2023](#)). Moving forward, China is willing and capable of carrying out more international cooperation on marine plastic-related scientific research in the Arctic, sharing knowledge and available data with the Arctic Council, as well as taking active actions on the issue of governing Arctic marine plastic pollution.

This study focuses on the governance of Arctic marine plastic pollution within the broader context of advancing negotiations on an international legally binding instrument for plastic pollution, to analyze the multi-level governance for Arctic marine plastic pollution—particularly the multi-dimensional network governance model that coordinates regional and global governance regimes—and puts forward response suggestions to promote sustainable development in the Arctic. This paper is organized as follows: Section 2 examines the multi-level governance regimes for Arctic marine plastic pollution, with a special focus on how the Arctic Council links the global marine plastic pollution governance agenda with the regional marine plastic pollution governance issue. Section 3 discusses the challenges facing the effectiveness of Arctic marine plastic pollution governance. Section 4 proposes optimization suggestions for Arctic marine plastic pollution governance regimes and China’s contribution pathways. Section 5 concludes the study. By analyzing the multi-level governance for Arctic marine plastic pollution, this research aims to promote sustainable development in the Arctic, provide a regional case for global plastic convention negotiations, and offer feasible suggestions for China’s participation in global marine plastic pollution governance.

2 Multi-level governance of Arctic marine plastic pollution

Plastic pollution is having an impact in remote areas of the Arctic, and it is already affecting people’s livelihoods and inflicting social costs ([Governance of Iceland, 2024a](#)). Therefore, to truly maintain a healthy environment in the Arctic, a comprehensive “turn off the tap” approach is required to stem the flow of plastic waste through coordinated local, regional, national, and global interventions ([Governance of Iceland, 2024b](#)). The international community has begun establishing a multi-level governance framework to address this challenge (see [Table 2](#)). The Arctic Council, as the most critical cooperative platform for Arctic

TABLE 2 Multi-level governance of Arctic marine plastic pollution.

Governance levels	Actors	Governance regimes
Global level	United Nations	Pollution oriented instruments, Biodiversity-species oriented instruments, Chemicals and waste oriented instruments
		Global strategies and soft law instruments
Regional level	Arctic Council	Working groups, regional action plans, initiatives
National level	The eight Arctic States	Domestic legislation, participation in global and regional governance regimes
	Other stakeholders in Arctic affairs	Participation in relevant mechanisms, scientific cooperation, knowledge supply

governance, has taken landmark initiatives like the *Regional Action Plan on Marine Litter in the Arctic (ML-RAP)*, which has strategically integrated Arctic issues within global environmental agendas.

2.1 Global governance frameworks for regulating marine plastic pollution in the Arctic

In 2018, the United Nations Environment Programme (UNEP) released the report titled *Combating Marine Plastic Litter and Microplastics: A Summary for Policymakers*. This report provides a detailed review of international and regional instruments related to global marine plastic governance, and also conducts an assessment of the effectiveness of relevant international, regional and subregional governance strategies and approaches. The global marine plastic governance mechanisms addressed and discussed in this paper are based on and aligned with the standards set forth in this report.

2.1.1 The international law provides the legal basis for the governance of Arctic marine plastic pollution

International and regional instruments that play a core role in addressing marine plastic pollution can be categorized into three types: pollution-oriented instruments, biodiversity-species-oriented instruments, chemicals and waste-oriented instruments (UNEP, 2018a). Representative international conventions include the *Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter 1972* (London Convention) and its 1996 *Protocol* (London Protocol), the *Convention on Biological Diversity*, and the *Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal* (Basel Convention). These international conventions provide the legal basis for the Arctic region on preventive regulation of plastic production and disposal, protection of vulnerable marine species

and habitats, and management of transboundary plastic waste streams.

Marine plastic pollution in the Arctic originates significantly from two anthropogenic sources: fishing activities and maritime shipping operations. International conventions addressing fishing and shipping operations primarily include the *CCRF* and the *MARPOL*. The *CCRF* (including the *Voluntary Guidelines on the Marking of Fishing Gear*) provides the legal basis for addressing plastic pollution from abandoned, lost, or discarded fishing gear (ALDFG). Annex V of *MARPOL* is designed to prevent marine environmental pollution caused by ships. It prohibits the discharge of any plastic waste into marine environments and requires ships of 100 gross tonnage (GT) or more to maintain a Garbage Management Plan (GMP) in compliance with Annex V's standards. To address Arctic-specific shipping-related plastic pollution, *MARPOL*'s 'Special Area' designation, now applied to regions like the Baltic Sea, could be extended to Arctic waters. This extension would mandate stricter port reception facilities to handle plastic waste, directly linking *MARPOL* Annex V's regulatory framework to the mitigation of Arctic marine plastic pollution from shipping activities.

The *Polar Code* stipulates more detailed measures based on *MARPOL*, forming Pollution Prevention Measures (Part II-A). For example, Chapter 5 of the *Polar Code* stipulates that "In Arctic waters, discharge of garbage into the sea permitted in accordance with regulation 4 of *MARPOL* Annex V, shall meet the following additional requirements (IMO, 2014)." The global marine plastic governance architecture thus provides both the normative framework and operational guidelines for addressing Arctic marine plastic pollution.

2.1.2 Global initiatives as governance guidance for Arctic marine plastic pollution

Marine plastic pollution represents a growing environmental governance challenge that currently lacks comprehensive lifecycle laws and regulations to address plastic pollution throughout the value chain. Despite this regulatory gap, significant international initiatives have established important policy foundations and normative frameworks for addressing Arctic marine plastic pollution. As the premier decision-making body on the environment, UNEA has been focusing on global marine plastic pollution. In June 2014, the 1st UNEA meeting expressed concern over marine litter's impact on marine life. The first four UNEA resolutions have requested UNEP to conduct further studies, called for enhanced actions, and recognized the need for locally adapted measures (UNEP, 2016). (UNEA Resolution 2/11, 2016). This global policy development directly informed regional governance actions. In 2017, the Arctic Council initiated its first dedicated efforts to address marine plastic pollution.

Additionally, initiatives such as the *2030 Agenda for Sustainable Development* (2015), the *Global Programme of Action for the Protection of the Marine Environment from Land-based Activities* (1995), and *Honolulu Strategy: A Global Framework for Prevention and Management of Marine Debris* (2011) also call for formulating rules for marine plastic pollution governance. In 2019, the G20

Summit proposed the “Osaka Blue Ocean Vision” and reached a consensus on “zero emission of plastic waste into the ocean by 2050”, providing guidance for Arctic marine plastic pollution.

2.2 Regional governance mechanisms for Arctic marine plastic pollution

As the core Arctic governance mechanism, the Arctic Council shows core strengths in three areas: membership composition, issue coverage, and governance effectiveness. Its membership includes diverse stakeholders, such as the eight Arctic States, Arctic Indigenous organizations, and other stakeholders. Its agenda covers the issues of sustainable development and environmental protection in the Arctic. The Arctic Council has achieved notable outcomes in shaping Arctic governance rules and guiding perceptions of Arctic affairs.

2.2.1 Decision-making and implementation regime of the Arctic Council

The Arctic Council achieves governance effectiveness through an institutionalized division of labor framework. As the Arctic Council’s supreme authority, the biennially convened Ministerial Meeting (AMM) holds exclusive decision-making power over major initiatives like the Marine Litter Strategy (Steinveg, 2023). To effectively leverage its decision-shaping role, the Arctic Council has established six working groups, eleven task forces, and three expert groups to carry out specific tasks (Chen and Cheng, 2025). Currently, several working groups of the Arctic Council are involved in the governance of plastic pollution. For example, the Arctic Migratory Birds Initiative (AMBI), an initiative of the Conservation of Arctic Flora and Fauna (CAFF), has been monitoring trends in plastic ingestion by seabirds across the North Atlantic (PAME, 2021a).

The Protection of the Arctic Marine Environment (PAME) and the Arctic Monitoring and Assessment Program (AMAP) serve as the direct implementing bodies for Arctic marine plastic pollution governance, playing a critical role in advancing its implementation. Working groups publish scientific reports, implement regional cleanup initiatives, and conduct monitoring programs, providing the knowledge base and capacity for governance.

2.2.2 The Arctic Council integrates regional governance issues into global governance agendas

The Arctic Council has achieved success in early warning of emerging issues, issue framing, environmental monitoring, and innovative policy initiatives (Young, 2022). The Arctic Council employs informal mechanisms to interact with global governance regimes, which constitutes a distinct advantage in addressing marine plastic pollution in the Arctic region.

On the one hand, the Arctic Council facilitates the integration of regional environmental issues into global governance agendas by promoting awareness of Arctic marine plastic pollution through various initiatives, including expert workshops and international

symposiums. For example, Iceland organized the Second International Symposium on Plastics in the Arctic and Sub-Arctic Region during its chairmanship of the Arctic Council (2019–2021). The Symposium attracted the participation of international organizations such as the International Council for the Exploration of the Sea (ICES), the International Arctic Science Committee (IASC), and the Intergovernmental Oceanographic Commission (IOC). The Symposium focused on Arctic plastic pollution implementation and provided useful information for the international plastic negotiations (Governance of Iceland, 2024c).

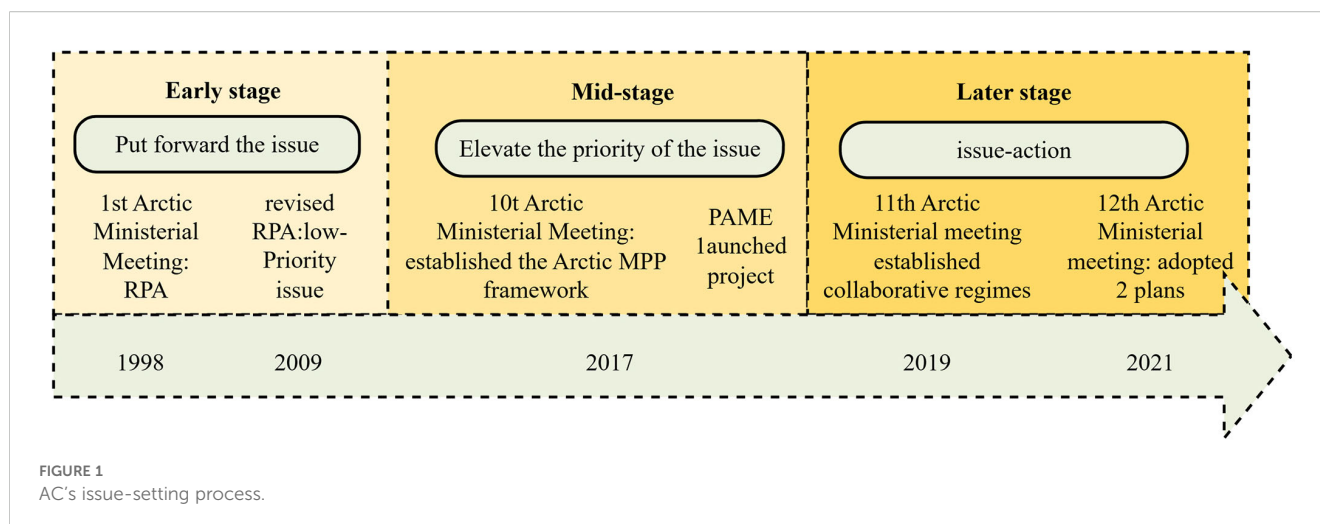
On the other hand, the Arctic Council fosters policy coherence between regional issues and global agendas by systematically addressing marine plastic pollution. Through high-level ministerial meetings, the Council has elevated plastic pollution as a key agenda item within Arctic governance. Notably, the Council’s working groups—particularly the PAME and the AMAP—have developed targeted action plans, including the *ML-RAP* and the *Monitoring Plan for Arctic Marine Plastic Pollution*. The Monitoring Plan builds on existing regional and global monitoring programs. It also supports contributions to global regulation and effectiveness evaluation efforts, such as the *Joint Group of Experts on Scientific Aspects of Marine Environmental Protection (GESAMP)* and the *UN Sustainable Development Goal indicator 14.1.1b on plastic debris density* (AMAP, 2021). The Arctic Council has integrated global plastic governance goals into regional plans, thereby aligning with global processes and policies at the regional and global levels.

Furthermore, the Arctic Council achieves linkages with global governance mechanisms through systematic knowledge-sharing initiatives. The AMAP’s monitoring programme emphasizes the establishment of a polar-specific database and multi-platform data sharing. The Arctic Plastic Monitoring Guidelines exemplify this approach by mandating standardized reporting protocols: atmospheric deposition data must be submitted to the EBAS Database (managed by the Norwegian Institute for Air Research/NILU), while abiotic compartment data (seawater, seabed, beaches, sediments) and biotic data (invertebrates, fish, birds, mammals) are routed to the ICES Environmental Database (DOME) (AMAP, 2021a). Through such structured collaborations with international organizations, the Council has established a “Data Alliance”. This initiative not only facilitates cross-border data harmonization but also creates institutional bridges between regional monitoring efforts and global governance systems, enhancing the scalability of Arctic-specific data for transnational policy processes.

2.2.3 Pathways for the Arctic Council’s governance of marine plastic pollution

2.2.3.1 Issue setting for the Arctic marine plastic pollution governance

As an emerging environmental challenge, marine plastic pollution has been on the Arctic Council’s agenda since its establishment. Recognizing its growing significance, the Council has systematically elevated this issue through successive Ministerial Meetings, effectively institutionalizing Arctic marine plastic pollution as a priority concern within the governance framework.



As shown in Figure 1, this issue-framing process illustrates how the Arctic Council has gradually elevated the importance of governing Arctic marine plastic pollution. Through this strategic issue-setting, the Arctic Council has further enabled the alignment of regional governance actions with global environmental agendas.

In the early stage of issue setting in the Arctic Governance, the Arctic Council demonstrated early recognition of marine plastic pollution as a significant environmental threat through its foundational governance mechanisms. In 1998, the first Arctic Ministerial Meeting adopted the *Regional Programme of Action for the Protection of the Arctic Marine Environment from Land-based Activities* (Arctic RPA), establishing the first regional framework for Arctic marine pollution control. The objectives of the RPA are to take action individually and jointly, which will lead to the prevention, reduction, control, and elimination of pollution in the Arctic marine environment and the protection of its marine habitat (AC, 2009). Although the 2009 revision of the RPA initially categorized marine litter as a lower-priority concern, this policy instrument nevertheless played a crucial issue-setting role in the Arctic's emerging plastic pollution governance framework.

In the Mid-stage of issue setting in the Arctic Governance, the Arctic Council elevated marine plastic pollution to a position of strategic priority within its governance agenda. This shift reflected growing recognition of the issue's transboundary impacts as global plastic pollution intensified. A pivotal development occurred at the 10th Arctic Council Ministerial Meeting (2017) with the adoption of the Fairbanks Declaration, which formally acknowledged marine litter as a pressing circumpolar challenge and emphasized Arctic environmental cooperation. The Declaration articulated continued efforts to address growing concerns about the increasing levels of microplastics in the Arctic and potential effects on ecosystems and human health (AC, 2017). The Fairbanks Meeting established the Arctic marine plastic governance framework with scientific assessment, prevention mechanisms, and regional collaboration. Under this framework, the PAME launched the project -*Desktop Study on Marine Litter including Microplastics in the Arctic* in the same year.

In the later stage of issue setting in the Arctic Governance, the Arctic Council establishes a regional action plan on marine plastic. The year 2019 marked a pivotal juncture in the framing of Arctic marine plastic pollution governance issues, when the *Rovaniemi Ministerial Meeting Chair's Statement* explicitly recognized marine litter as a serious global environmental problem with significant Arctic impacts. This declaration accomplished three critical institutional advances. Firstly, it endorsed the *Desktop Study on Marine Litter* and supported an Arctic regional action plan to reduce marine litter (PAME, 2021b). Secondly, it mandated the development of an Arctic-specific action plan. Thirdly, it established marine plastics as a permanent priority within the Council's environmental agenda. Meanwhile, the AMAP led the creation of the Litter and Microplastics Expert Group (LMEG), advancing monitoring standards and policy tools. In 2021, the 12th Ministerial adopted the *Arctic Marine Litter Regional Action Plan and Litter and Microplastics Monitoring Plan*. Marine plastic pollution was formally recognized as a key governance issue.

2.2.3.2 Realizing the knowledge supply for the Arctic marine plastic pollution governance

The Arctic Council advances Arctic marine plastic governance principally through the systematic generation and dissemination of scientific knowledge, providing policymakers, stakeholders, and the public with evidence-based research reports and technical guidelines to inform pollution mitigation strategies.

Firstly, the Arctic Council offers policymakers constructive marine plastic governance guidelines through regional plans and monitoring. In 2025, the AMAP released *Effects of Plastic Pollution on Arctic Animals: Summary for Policy-makers*, recommending actions for Arctic states and observer states. The report recommends that the Arctic Council members and observers should support global, regional, and local efforts to reduce plastic litter (AMAP, 2025).

Secondly, the Arctic Council serves as a critical knowledge broker in marine plastic governance by generating and

disseminating comprehensive scientific assessments to inform policy-making. As the first international body to systematically document Arctic-specific plastic pollution dynamics, the Council has produced seminal reports that establish the empirical foundation for effective governance. In recent years, the Arctic Council has addressed Arctic marine plastic pollution through key reports, including the *Desktop Study on Marine Litter Including Microplastics in the Arctic* (2019), *Regional Action Plan on Marine Litter in the Arctic* (2021), *AMAP Litter and Microplastics Monitoring Plan* (2021), *AMAP Litter and Microplastics Monitoring Version 1.0* (2021), and *Implementation Plan for the Regional Action Plan on Marine Litter in the Arctic* (2024). These discussions cover Arctic marine plastic pollution status, pathways, harm mechanisms, monitoring plans, and action plans, providing essential science info for diverse actors-indigenous organizations, scientists, and firms.

Finally, the Arctic Council provides marine plastic pollution knowledge to the public. Recognizing that effective governance requires robust public participation, the AMAP explicitly states that it produces sound science-based, policy-relevant assessments and public outreach products to inform policy and decision-making processes (AMAP, 2021b). During the period from 2018 to 2021, the Arctic Council's Arctic Contaminants Action Program (ACAP) implemented waste cleanup-recycling programs in the Kola Peninsula's Sami communities. Concurrently, the Arctic Council advanced the Solid Waste Management in Remote Arctic Communities Project. Through its projects, the Arctic Council disseminates knowledge about Arctic marine plastic pollution governance, enhances the public's understanding of governance policies, and widely mobilizes public participation in the governance system.

2.2.3.3 Implementing actions for marine plastic pollution governance

The Arctic Council operationalizes its marine plastic governance plan through hierarchical refinement and review mechanisms. The PAME released the ML-RAP in 2021, establishing a full-cycle governance system covering source prevention, process supervision, and ecological restoration. And the Arctic Council provides strong institutional support for the stewardship of the Arctic marine environment.

On the one hand, the Arctic Council operationalizes its marine plastic pollution agenda through its working groups, which serve as the primary implementation vehicles for regional action plans. This institutional architecture assigns distinct but complementary roles to two key bodies. The PAME working group leads policy implementation, currently executing 59 strategic actions under Phase I of the Marine Litter Regional Action Plan. The AMAP focuses on science-policy integration, having completed the *Litter and Microplastics Guidance and Monitoring Plan (2019-2021)* with its current focus on chemical contaminants in plastic pollution.

On the other hand, the Arctic Council has developed accountability mechanisms to ensure the Marine Litter Regional Action Plan (ML-RAP) achieves its objectives through structured review processes. ML-RAP implementation reports are submitted biennially to SAOs. In 2024, the PAME released the *Implementation Plan for the Regional Action Plan on Marine Litter in the Arctic* (2024), which shows that ML-RAP has made substantial progress in priority areas such as marine plastic tracing and coastal cleanup. For instance, through the "plastic in a bottle" initiative, ML-RAP simulated long-distance marine litter movement in/out of Arctic waters, creating a real-time map of Arctic plastic bottles. As shown in Figure 2, through issue-setting, knowledge supply, and

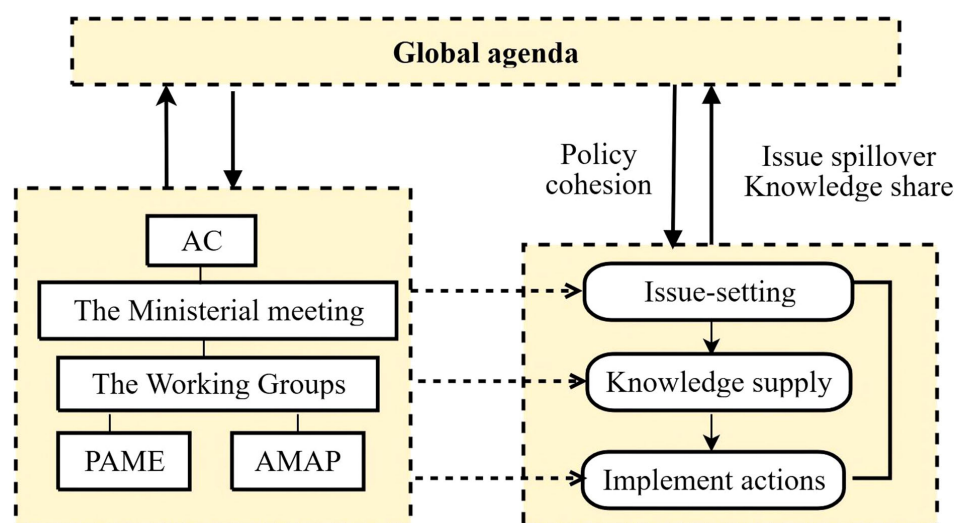


FIGURE 2
Pathways for the AC's MPP governance.

implementing actions, the Arctic Council plays a core role in addressing Arctic marine plastic pollution.

2.3 Arctic States' regimes on marine plastic pollution governance

State actors with abundant resources and strong execution capabilities are the core of global governance. The eight Arctic States are irreplaceable in Arctic marine plastic governance. Arctic States' marine plastic governance mechanisms focus on enacting domestic laws as well as participating in regional and global governance frameworks.

On the one hand, Arctic States have enacted domestic plastic governance laws. The United States has a variety of national policies that address marine debris, such as the *Marine Debris Research, Prevention and Reduction Act* (2006), the *Maritime Pollution Prevention Act* (2008), and the *Save Our Seas Act* (2018). To address marine debris in the Arctic area, Canada has enacted the *Federal Arctic Waters Pollution Prevention Act* (Government of Canada 2019b), which prohibits the deposition of waste in Arctic waters (or land where waste may enter Arctic waters). Norway's *Marine Resources Act* (2008) states that fishermen are required to search for lost fishing gear and report losses to the Norwegian Coast Guard if gear is not retrieved. Finland and Iceland have adopted the EU's policies and legislation on the prevention of marine litter and waste management (Linnebjerg et al., 2021).

On the other hand, the Arctic States participate in regional and global plastic governance mechanisms, driven by diverse interests. The Nordic countries (Denmark, Finland, Iceland, Norway, and Sweden), significantly influenced by European Union environmental policy frameworks, have not only ratified the OSPAR Convention but have also implemented its monitoring protocols while developing complementary national programs. Specifically, Denmark, Norway, and Iceland have institutionalized the OSPAR seabird monitoring program while establishing parallel long-term national surveillance systems for macro- and microplastics. Greenland has implemented national policies and regulations to combat marine pollution and waste management issues (Linnebjerg et al., 2021).

Beyond regional cooperation, Arctic states exercise global leadership in plastic governance. Canada played a pivotal role in formulating and adopting the *Ocean Plastics Charter* during the G7 Summit in 2018. The United States, through NOAA's Marine Debris Program in partnership with UNEP, contributed to the development of the *Honolulu Strategy*, which is a global framework for the prevention and management of marine debris.

3 Challenges of Arctic plastic pollution regimes' effectiveness

Regime effectiveness constitutes a core pillar of international regime theory. Assessed against the trinity of output, outcome, and impact, the present multi-level governance architecture reveals: (1)

output—regime platforms exist and operate, yet generate rules that are weakly binding; (2) outcome—Arctic states act disparately with minimal coordination; and (3) impact—marine plastic pollution in the Arctic remains unresolved and continues to worsen. Consequently, regime effectiveness is still mired in substantial. This article, therefore concentrates on explaining this ineffectiveness, disaggregating endogenous (regime robustness) and exogenous (state capacity) factors across global and regional regimes, with the Arctic Council—the region's premier governance body—serving as the focal case for the regional analysis.

3.1 Dilemma of effectiveness in the global governance of Arctic marine plastic pollution

3.1.1 International regimes lack robustness

3.1.1.1 The absence of compliance-enforcement mechanisms

The effectiveness of international institutions is a function of the robustness of the social-choice mechanisms they employ (Rosenau and Czempiel, 2009b). The insufficient robustness of global marine plastic pollution regimes is primarily manifested in the fragmentation of mechanisms and the imperfection of compliance mechanisms, both of which have hindered efforts to address Arctic plastic pollution. The compliance mechanisms of the global marine plastic pollution governance system are inadequate, with weak enforcement effectiveness and an accountability system. For instance, Part XII of the United Nations Convention on the Law of the Sea stipulates the general obligations of contracting parties to protect the oceans, which can be applied to the prevention and control of Arctic marine plastic pollution, but the content of the Convention is relatively principled. The Honolulu Strategy puts forward goals and strategies for preventing and reducing marine litter, which plays an important guiding role in the prevention and control of Arctic marine plastic pollution. However, as it lacks mandatory legal force, its implementation still depends on the voluntary compliance of participating countries (He, 2023).

In general, the superposition of the above factors has further weakened the applicability of global governance mechanisms in the Arctic region, and the existing governance mechanisms are difficult to meet the needs of addressing the complex problem of Arctic marine plastic pollution governance.

3.1.1.2 International regimes lack Arctic-specific considerations

The systemic neglect of Arctic issues in the global governance framework has profoundly constrained the effectiveness of Arctic plastic pollution governance. Firstly, the global governance framework ignores the particularities of Arctic marine plastic pollution governance, resulting in institutional gaps. For example, MARPOL defines certain sea areas as "special areas", in which the adoption of special mandatory methods for the prevention of sea pollution is required for technical reasons relating to their oceanographical and ecological condition and to their sea traffic. Under

the Convention, these special areas are provided with a higher level of protection than other areas of the sea (IMO, 2025). But the Arctic is not included.

Secondly, the global governance framework overlooks the governance knowledge and technical support required by the unique natural environment of the Arctic. The AMAP has pointed out in several reports that the extreme environmental conditions of the Arctic might affect plastic transport and degradation processes is not yet known (AMAP, 2021c). Knowledge gained from lower latitudes may not apply to the Arctic environment, necessitating studies specific to Arctic conditions.

Thirdly, the global governance framework neglects the protection of the rights and interests of indigenous peoples. Arctic indigenous peoples are direct victims of Arctic marine plastic pollution, facing risks to their diet, health, and other aspects caused by marine plastic waste. However, the current global governance framework does not pay attention to the special situation of Arctic indigenous peoples in the issue of marine plastic pollution, nor has it introduced a compensation mechanism, which has seriously harmed the rights and interests of indigenous peoples.

In general, the systemic neglect of the Arctic region in the global governance framework makes global principles unable to meet the actual regional governance needs, seriously affecting the effectiveness of the Arctic plastic pollution governance.

3.1.2 Low capacity of governments

The global governance of marine plastic pollution presents a fragmented pattern (Cui, 2023), making it difficult to form a global governance system with clearly defined rights and obligations. As the UNEP concluded that current governance strategies and approaches provide a fragmented approach that does not adequately address marine plastic litter and microplastics, after the assessments reviewed 18 international instruments as well as 36 regional instruments (UNEP, 2018b). At present, the international community has introduced overlapping and fragmented initiatives and rules for global marine plastic governance. Reports issued by different governance mechanisms use various methods to assess basic data, such as the base amount and increment of marine plastics, but the results vary greatly. For example, the estimates of the current total amount of marine plastics alone include multiple figures such as 155 million tons and 196 million tons (Wang, 2020). Although the phenomenon of marine plastic debris is now widely recognized as a problem for the international community, significant gaps in understanding still inhibit the creation and implementation of effective policy responses (Mendenhall, 2018).

The lack of an international agreement for global marine plastic pollution governance and the fragmented governance pattern cannot provide effective guidelines for the orderly advancement of Arctic marine plastic governance. This further weakens the governance determination and willingness of multiple Arctic subjects and provides a reasonable space for state actors to evade responsibilities.

3.2 Effectiveness dilemma of Arctic governance regimes

3.2.1 The Arctic Council lack robustness

The Arctic Council serves as the primary governance body for addressing marine plastic issues in the Arctic region. While it has achieved significant successes, it also encounters structural limitations.

3.2.1.1 The Arctic Council is unstable

The Arctic Council lacks both a fixed funding mechanism and law enforcement authority, and its operations rely primarily on collaboration and consensus among the eight Arctic States. The complex geopolitical dynamics in the Arctic post the 2022 Russia-Ukraine conflict have further underscored the AC's effectiveness dilemma from insufficient stability. The eight Arctic states face challenges in reaching a consensus on governance issues in the region. Following Russia's invasion of Ukraine, the seven Western Arctic Council member states released a joint statement suspending their participation in Arctic Council activities (U.S. Department of State, 2022). Previously, Russia had suspended its annual payments to the Arctic Council (Zhang and Guo, 2024). The competition among great powers in the Arctic has affected the efficiency of working groups. Existing research highlights that a barrier to effectiveness in decision making may be the need for improved coordination between differing national agencies on their positions across several subsidiary bodies (Barry et al., 2020a). During the Arctic Council's operational hiatus, cross-border data sharing and joint monitoring projects led by its working groups and expert panels were negatively impacted. Although the Arctic Council's activities have seen a limited resumption, the ongoing Russia-Ukraine conflict and the potential threats to Arctic science following Trump's re-election cast a shadow over the Council's future operations and those of its working groups. Svein Vigeland Rottem, a researcher at the Nansen Institute, remarked that the Working Groups are asking themselves why they are undertaking this work and why they should continue (High North News, 2025). In this context, the Arctic Council's governance process regarding marine plastic pollution in the Arctic will also be affected.

Compared with the Arctic Council, OSPAR has demonstrated better continuity and stability in addressing the marine plastic governance issue. During the 2021–2025 period, OSPAR released *Report on Plastic Production and Consumption (2021)* (OSPAR Commission, 2021), and *Marine Litter Thematic Assessment (2023)* (OSPAR Commission, 2023); It has also continuously discussed the marine plastic governance issue at meetings including the Annual Commission Meeting held in Copenhagen in 2022 (European Commission, 2022) and the Ministerial Meeting held in Vigo in 2025 (OSPAR Commission, 2025).

OSPAR's issue stability reflects its strong regime robustness, which is primarily demonstrated through well-developed implementation mechanisms and binding legal frameworks. First, OSPAR as a piece of hard law, clearly defines the rights and obligations of contracting parties and exerts enforceable binding

force on them. Second, the OSPAR Commission has the authority to issue “decisions” that are legally binding on contracting parties. Third, OSPAR has established a comprehensive annual reporting system: contracting parties are required to submit national annual reports to the OSPAR Commission on a regular basis for review and assessment. Enhancing regime robustness to improve issue stability is an urgent issue that the Arctic Council needs to address regarding the marine plastic issue.

3.2.1.2 The Arctic Council’s effectiveness dilemma stemming from functional overlap

While the Arctic Council has achieved results, it also faces numerous structural constraints. The issue of functional overlap resulting from the excessive density of regional governance mechanisms is a key factor affecting the Arctic Council’s advancement of the marine plastic governance agenda. The growing number of regional governance regimes presents coordination challenges. On one hand, the proliferation of institutions breeds competition for scarce resources and creates persistent inefficiencies. The Arctic Council and the OSPAR Commission share jurisdictional areas in Arctic waters and have overlapping member states, namely Norway, Denmark, and Iceland. This institutional overlap can lead to a dilution of expertise and diplomatic capital across the two platforms, potentially resulting in duplicated efforts and inefficient use of resources. On the other hand, newly created regimes with poorly defined functions can lead to overlapping roles, duplication of processes, and wasted resources alongside existing regimes, thereby decreasing efficiency.

For instance, during the Icelandic Chairmanship (2019–2021), a *Special Coordinator on Plastics and Marine Litter* was appointed. However, in the absence of specifics as to what such an advisor should do other than “coordinate”, it remains unclear how this role will add value to already existing mechanisms. There is an overlap between the role of the Special Coordinator on Plastics and Marine Litter and PAME’s responsibility to develop and implement the Regional Action Plan on Marine Litter (Barry et al., 2020b). In summary, as Arctic governance regimes become more numerous, a lack of clear responsibility allocation among them for addressing marine plastic pollution will lead to significantly higher coordination costs and serious setbacks in governance effectiveness.

3.3 Cooperative willingness and governance capacities vary among Arctic States

Cooperative willingness and governance capacities among Arctic States are crucial factors for addressing marine plastic pollution. The AMAP notes that policies on plastic pollution vary widely across Arctic states. Given that plastic pollution is subject to long-range transport, this inconsistency across the region is likely to reduce the efficacy of actions for reducing plastic pollution and for monitoring changes over time. Therefore, for policies to be more effective, pan-Arctic coordination is required so that similar

programs can be implemented in a harmonized and consistent manner. This cooperation needs to be facilitated at both the regional and international levels to ensure that litter and microplastic data from the Arctic are used in the context of global efforts to reduce litter and plastic pollution and minimize harm to the environment (AMAP, 2021d).

While Arctic States have adopted some relevant policies and participated in global plastic regimes, their willingness and governance capacities differ significantly among the eight nations. The five Nordic countries and Canada tend to be more proactive regarding marine plastic issues, whereas the United States and Russia have displayed a more negative attitude. For instance, all six developed nations, except for the United States, signed the Ocean Plastics Charter at the G7 Summit in 2018. Conversely, Russia’s federal policies and legislation do not include specific laws addressing marine plastic pollution. As influential Arctic powers, the United States and Russia significantly affect the progress on Arctic marine plastic issues due to their conservative approaches. Furthermore, the uncertain foreign policies of the Trump administration and the volatile international landscape have impacted the willingness of Arctic states to collaborate and participate. *Initiatives* on the part of Russia and the Western states are heightening the tendency to look at Arctic issues through the lens of high politics, putting considerations of national security ahead of issues relating to sustainable development and environmental protection (Young, 2022).

4 Pathways for improving Arctic marine plastic pollution governance effectiveness and China’s strategic actions

Given the increasingly prominent issue of Arctic marine plastic pollution and the multilevel governance regimes formed by the international community on this topic are facing a series of dilemmas. There is an urgent need for multilevel policy interventions to enhance the effectiveness of these regimes. First, it is important to promote the governance of Arctic plastic pollution within global governance frameworks. This can be achieved by supplementing and revising the *MARPOL Convention (1978)* and the *Polar Code (2015)* to designate the Arctic as a special area under *MARPOL Annex V*, which regulates the prevention of pollution by ship-generated waste. Additionally, improving compensation mechanisms for pollution in Arctic waters is necessary. Second, regional governance regimes should enhance their operational efficiency and strengthen their connections with global governance frameworks. This could involve creating a vertical governance structure centered around the Arctic Council and developing an informal network of governance that includes working groups and expert panels. Such a structure would provide a regional model for addressing marine plastic pollution. Third, Arctic states must take responsibility to build a governance consensus, enhance their governance capabilities, and promote the

effective functioning of these regimes. Finally, as a significant stakeholder, China should take proactive steps to contribute governance knowledge and support the development of relevant rules and regulations.

4.1 Integrate Arctic issues into global governance agendas

Issue management is the foundation of global governance. The process by which an issue evolves from being ignored to becoming a consensus among all parties does not happen automatically; it requires agenda-setting, frame politics, and more (Zhao, 2022). The power to shape people's cognitive patterns for understanding world politics is achieved through frame-setting (Reese et al., 2001). The primary international organizations addressing global marine plastic pollution, such as the UNEP and the IMO, are responsible for establishing the governance agenda for plastic pollution in the Arctic.

On the one hand, the participation of the Arctic Council, Arctic States, and Arctic regional non-governmental organizations (NGOs) must be fully ensured in the formulation and revision of initiatives and rules at the UNEA. For instance, within the *Ad Hoc* Open-ended Expert Group on Marine Litter and Microplastics established by the UNEP at UNEA, seats should be allocated for representatives from the Arctic Council and its working groups (UNEP, 2018c). Additionally, recommendations from the Arctic Council and its working groups regarding Arctic plastic issues should be integrated into the global agenda for marine plastic pollution governance. Another example includes the IMO granting the Arctic Council observer or consultative status. Finally, during the negotiations for an international legally binding instrument on plastic pollution, the *Intergovernmental Negotiating Committee (INC)* should actively invite representatives of the Arctic Council to participate in the meetings.

On the other hand, global governance regimes must take into account the unique characteristics of the Arctic region. When revising the MARPOL Convention, the International Maritime

Organization should consider designating the Arctic as a special area and implementing mandatory measures to prevent marine pollution. This is essential because Arctic waters require a higher level of protection than other marine environments. Furthermore, global governance regimes should fully address environmental justice issues related to plastic pollution in the Arctic marine environment. They should uphold the principle of compensation, prioritize the assessment of risks that Arctic marine plastic pollution poses to indigenous communities, establish special funds for managing Arctic marine plastic pollution, and tackle the imbalance between responsibilities and rights.

4.2 Establish a multi-dimensional network governance framework based on the Arctic Council at the regional level

The Arctic Council plays a critical role in addressing marine plastic pollution in the Arctic. To enhance the effectiveness of governance related to this issue, it is essential to strengthen both the integration of the Arctic Council's governance mechanisms and its interactions with global governance systems through formal and informal channels. By establishing a multi-dimensional network governance framework (see Figure 3), we can not only increase the visibility of Arctic issues but also support regional efforts in developing an *international legally binding instrument on plastic pollution*.

4.2.1 Enhance the AC's robustness

The Arctic Council can enhance its regime robustness through measures including developing predictable legal frameworks for specific issues, establishing hierarchical decision-making procedures, building systematic compliance review mechanisms, and integrating working groups.

First, as a high-level intergovernmental forum, the Arctic Council may draw on the OSPAR Convention model to formulate predictable legal frameworks for specific issues—for instance, promoting the adoption of the Arctic Marine Plastic

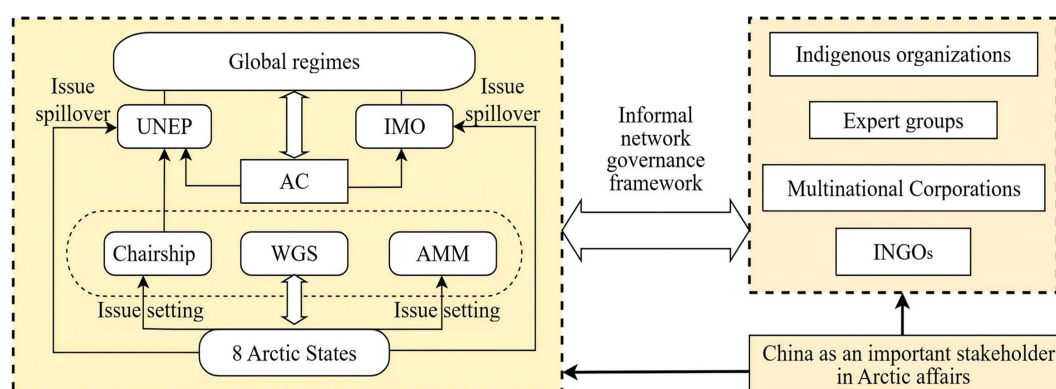


FIGURE 3
Multi-dimensional governance framework.

Pollution Prevention and Control Agreement, a legally binding instrument.

Second, the Arctic Council could establish a hierarchical decision-making mechanism, introducing “decisions” with preliminary legal binding force.

Third, the Arctic Council’s overall effectiveness relies heavily on the compliance of its member states. The compliance mechanism for addressing plastic pollution could take inspiration from OSPAR’s annual reporting system and the “Nationally Determined Contributions” model outlined in the Paris Agreement. This approach would require member states to regularly submit progress reports on their efforts to manage plastic waste. Such transparency would encourage member states to fulfill their obligations more diligently.

Finally, the Arctic Council should work on integrating the activities of its working groups. Currently, several working groups within the Arctic Council are addressing Arctic plastic pollution through separate projects. To improve internal development, it is essential to strengthen cooperation among these groups to avoid overlapping functions. For instance, integrating the scientific research data from the AMAP with the PAME working group could create a “science-policy” linkage mechanism, thereby increasing decision-making efficiency.

4.2.2 Establish a vertical governance structure for Arctic marine plastic pollution

The Arctic Council should engage with global governance mechanisms through formal channels, establish a vertical governance structure to address Arctic marine plastic pollution, and enhance the visibility of Arctic issues. As an important regional mechanism, the effectiveness of the Arctic Council is particularly evident in what is termed “discursive regionality,” where the region is thought and spoken of as a distinctive unit (Stokke and Hønneland, 2006). By creating vertical institutional channels for managing Arctic plastic pollution and engaging deeply with global plastic pollution governance frameworks, the global influence of Arctic issues can be strengthened.

On one hand, the eight Arctic states, as the primary participants in the Arctic Council, should align their positions at the UNEA. They need to incorporate the unique aspects of Arctic plastic pollution—such as slow degradation in low temperatures and ecological vulnerability—into the negotiation framework of the *international legally binding instrument on plastic pollution*, seeking regional exemptions or additional financial support. On the other hand, these states should actively collaborate with the IMO to develop plastic waste emission standards for Arctic shipping, thereby addressing gaps in international law.

Moreover, during Denmark’s term as the chairship, issues related to plastic pollution were added to the agenda of the International Maritime Organization. In January 2025, with the support of the IMO, Norway hosted a polar seminar focusing on Arctic plastic pollution (AC, 2024). The Arctic Council can institutionalize a model of “international conference - Arctic-themed side event - Arctic-themed seminar,” leveraging the

opportunities presented by global-level conferences organized by the international community to promote Arctic issues.

4.2.3 Establish an informal network governance framework for Arctic marine plastic pollution

The Arctic Council should create an informal network governance framework to address marine plastic pollution by bringing together indigenous organizations, expert groups, working groups, multinational corporations, and environmental non-governmental organizations. Effective informal networks often collaborate through resilient and efficient problem-solving strategies. Establishing “Transnational Advocacy Networks” (Keck and Sikkink, 2002) can facilitate more flexible responses to this pressing issue.

First, leverage Indigenous Peoples’ traditional knowledge systems and the geospatial nodal advantages of their communities in Arctic marine plastic governance. The Arctic Ocean plastic issue is one of the core concerns for Indigenous Peoples. The United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) provides legal legitimacy for their participation in governance.

At INC 5.2 (Geneva, 9 Aug 2025) on the global plastic treaty, the ICC put forward three key positions: a rights-based framework, embedding Indigenous rights, linking to Arctic microplastic harms, and stressing Indigenous decision-making; it aims to institutionalize these rights via forums like the International Indigenous Peoples’ Forum on Plastics.

The extensive distribution of Indigenous communities makes them indispensable governance nodes for Arctic marine plastic governance, and their traditional knowledge holds significant value in this field. Platforms such as the Arctic Science Ministerial Meeting and the Arctic Circle Assembly should be used to promote knowledge sharing among governments, research institutions, and Indigenous communities, thereby fostering a more inclusive governance consensus.

Second, an “Arctic-Global Plastic Governance Dialogue Mechanism” should be established to invite international environmental organizations, such as WWF and The Ocean Cleanup, along with multinational enterprises, like fishing and shipping companies, to participate in innovative projects aimed at Arctic plastic governance, thereby forming a public-private partnership model.

Additionally, experts from the Arctic Council’s working groups and expert panels should be encouraged to engage in global seminars on marine plastic pollution governance. These multi-level interactions can not only amplify the Arctic Council’s voice in global environmental governance but also contribute valuable polar-related expertise to address global plastic pollution.

4.3 Enhancing governance willingness and capacity among the 8 Arctic States

To address the challenges of plastic pollution in the Arctic, the eight Arctic states need to strengthen their governance efforts.

Firstly, they should enhance their domestic legislation regarding Arctic marine plastic pollution. For example, they can draw inspiration from Canada's Federal Arctic Waters Pollution Prevention Act to create specialized regulations aimed specifically at plastic pollution in Arctic waters. These regulations should include clear monitoring standards, define cleanup responsibilities, and establish a producer extended responsibility (PER) system. Additionally, it's important to note that as the Arctic Council's chairmanship rotates every two years, there is no guarantee that plastic pollution will remain a priority on the Council's agenda moving forward. If the issue of plastic pollution is removed from the priority agenda, it will negatively impact governance efforts. Therefore, during their term as rotating chairs, the eight Arctic states should prioritize addressing marine plastic pollution. They need to build governance consensus among governments, communities, and other stakeholders to encourage collaboration and cooperation.

Arctic states must enhance their capacity to govern marine plastic pollution in the region. They should overcome governance challenges through technological innovation. This could involve the joint deployment of intelligent monitoring networks to improve surveillance of Arctic plastic pollution and the establishment of real-time databases. They should also actively provide financial support for initiatives aimed at addressing plastic pollution. Establishing sustainable funding mechanisms is essential to ensure that the operations of Arctic Council working groups are not affected by geopolitical factors.

4.4 China's contribution pathways

China, guided by the concepts of "Maritime Community with a Shared Future" and "Arctic Community with a Shared Future," has actively participated in global marine governance and Arctic governance. The country has signed various international multilateral agreements and initiatives, including the Basel Convention (1989), the MARPOL Convention (1978), and the Honolulu Strategy (2011). Additionally, China has promoted the adoption of the Polar Code and has been actively involved in the Arctic Council's working groups. Furthermore, China has dispatched experts to contribute to the development of multiple proposals, reports, and programs, such as the Arctic Marine Litter Regional Action Plan.

To address the growing issue of marine plastic pollution, China should take an active role in global governance efforts and help shape the agenda for the Arctic region. There is a consensus among stakeholders that maintaining existing marine plastic governance frameworks and developing a new global plastic agreement under the UN is crucial. In discussions about the global plastic convention, China should proactively present constructive proposals aimed at improving the governance of plastic pollution in the Arctic. China should actively engage in the work of the Arctic Council working groups focused on governance related to Arctic plastic pollution. By sending more experienced experts to these groups, China can help advance the governance process. Additionally, in the context of the

Arctic Marine Litter Regional Plan and the Arctic Marine Microplastics and Litter Monitoring Programme, China should continue to offer intellectual support and promote the implementation of these initiatives through tangible actions.

China must adhere to Arctic environmental protection regulations while engaging in Arctic affairs. It is important to consider the rights and interests of indigenous peoples and to respect the value of their traditional knowledge. Additionally, China should actively promote the sharing of data and knowledge. Chinese enterprises and scientists must strictly adhere to regulations that prohibit plastic pollution, the discharge of solid plastic waste, and other related rules during activities such as Arctic development, shipping, and scientific expeditions. Additionally, China should establish Arctic plastic monitoring programs as part of its scientific research projects. It is also important for China to share the collected scientific data with organizations like the Arctic Council, the UNEP, and the IMO to collaboratively enhance our understanding of plastic pollution in Arctic marine environments.

5 Conclusion and prospects

Plastic pollution is one of the major problems facing the marine environment today. The damage caused by marine plastic pollution to the broader ecosystem underscores its significance as a governance issue. The international community is reaching a consensus on governance strategies. In this context, the multi-level governance of Arctic marine plastic pollution not only complements and enhances the development of global marine plastic governance regimes but also provides a regional governance model for addressing global marine plastic pollution. The Arctic Council, as the main body in Arctic governance, has taken effective actions in three key areas: issue setting, knowledge supply, and action implementation regarding Arctic marine plastic pollution governance. In this process, the Arctic Council's working groups, PAME (Protection of the Arctic Marine Environment) and AMAP (Arctic Monitoring and Assessment Programme), have played a critical role. However, while these governance mechanisms have achieved significant results, they also face dilemmas that arise from global, regional, and national levels. The lack of robust global governance mechanisms and the neglect of Arctic issues, alongside prominent structural contradictions at the regional level and varying levels of governance willingness and capacity at the national level, have all severely limited the effectiveness of multi-level governance in addressing this issue.

To address the current challenges, the Arctic Council must prioritize Arctic issues on the global agenda and actively establish a multi-dimensional network governance framework at the regional level. This framework should include a vertical governance structure along with an informal network that involves Indigenous organizations, expert groups, transnational corporations, environmental non-governmental organizations, and various other stakeholders. By enhancing and refining this multi-level governance approach, we can promote collaborative cooperation among states both within and outside the Arctic Circle.

and create new momentum for tackling plastic pollution in the Arctic.

In June 2025, the Third UN Ocean Conference was convened, where participating parties expressed a united determination to finalize a global treaty to regulate plastics across their entire life cycle. The development of the “Global Plastic Treaty” has significant implications for governing marine plastic pollution in the Arctic. Therefore, the Arctic Council urgently needs to articulate its demands in the treaty negotiations. However, since the escalation of the Ukraine crisis, the Arctic Council and its working groups have been severely impacted by a pause in their activities. After Donald Trump was re-elected as President, he sparked disputes by announcing plans to purchase Greenland and launching a “war against Arctic science”. These actions have intensified distrust between the United States and its Arctic allies, introducing a series of uncertainties regarding the governance of Arctic marine plastic pollution. It remains to be seen whether concerns about Arctic issues will be adequately addressed in the negotiations for the international legally binding instrument on plastic pollution.

There is no need to be overly pessimistic. In May 2025, the Kingdom of Denmark assumed the Chairship of the Arctic Council and is committed to a comprehensive follow-up on the Implementation Plan for the Regional Action Plan addressing Marine Litter, including microplastics in the Arctic. The Protection of the Arctic Marine Environment (PAME) Working Group continues to prioritize marine plastic pollution in its *Work Plan (2025-2027)*, with seven related activities planned during this period. The group intends to provide a structured approach to tracking ongoing and planned follow-up activities in close coordination with other Arctic Council members and working groups. They will report on marine litter-related initiatives across all Arctic Council working groups and Arctic States, including the integration of marine litter activities into the plans of multiple working groups (PAME, 2025b). Although the Arctic Council faces numerous challenges, existing evidence indicates that it will adhere to established frameworks, maintain focus on the governance of Arctic marine plastic pollution, strengthen governance consensus, and implement current action plans.

The case we proposed suggests a promising new direction for studying the effectiveness of international institutions. To raise awareness about Arctic marine plastic pollution, the Arctic Council seeks to align itself with the global agenda for marine plastic governance. This connection aims to enhance the effectiveness of governance in addressing this issue. While this study offers valuable insights through qualitative and case study analysis, it is limited by the absence of empirical verification. Future work should aim to integrate quantitative data from interviews,

questionnaires, or long-term monitoring to provide robust support for and further refine the theoretical framework.

Author contributions

JZ: Conceptualization, Funding acquisition, Writing – original draft, Writing – review & editing. XY: Writing – original draft, Writing – review & editing.

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Conflict of interest

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