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Climate Change
Indigenous Communities
Global Governance

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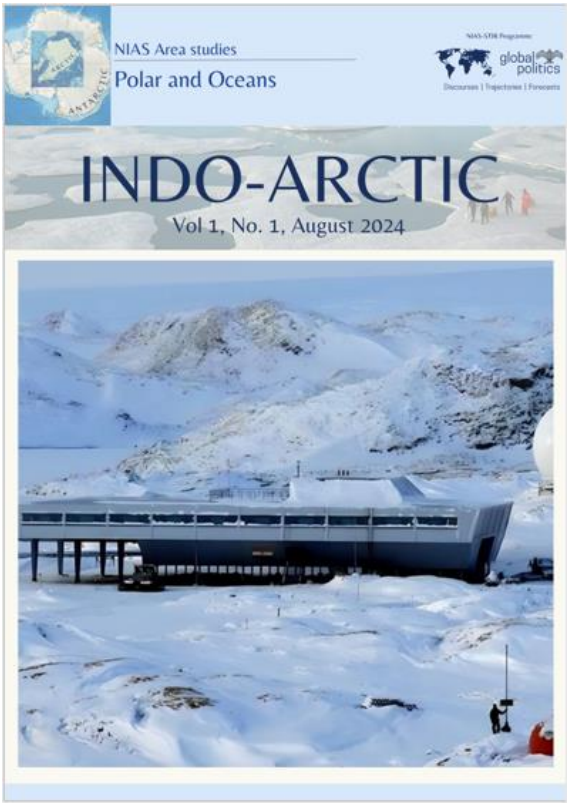

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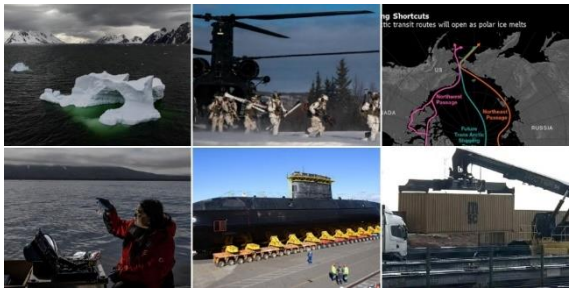

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IA Daily Brief provides a brief overview of the latest developments in the Arctic and Antarctic from climate change, economy, politics, science and technology, security and governance aspects.

COMMENT

The Hidden Impact of Climate Change: Microplastic Contamination in Kongsfjorden, Svalbard

Dr Sruthy
International Centre for Polar Studies, Mahatma Gandhi University, Kottayam

Introduction

The Arctic, traditionally viewed as a remote and relatively pristine environment, is increasingly revealing its vulnerability to global environmental challenges, notably microplastic (MP) pollution. Microplastics, defined as plastic particles less than five mm in diameter, result from the fragmentation of larger plastic debris through mechanical degradation, ultraviolet (UV) radiation, and biological processes. Despite its geographical isolation, the Arctic Ocean has become a recipient of global plastic pollution. Climate change has intensified this issue by affecting the transport and accumulation of MPs in regions previously less impacted, such as Arctic fjords. The Arctic region is undergoing significant transformations due to global climate change. Increasing temperatures, reduction in sea ice, and glacier melting are altering the region's physical and ecological systems.

These climatic changes influence not only local ecosystems but also the dynamics of pollutants, including microplastics. The reduction in ice cover and rising temperatures facilitate the movement of MPs into previously less affected areas, leading to increased accumulation in Arctic environments. The melting of glaciers and sea ice releases previously trapped pollutants into the marine environment. Furthermore, alterations in ocean circulation and atmospheric patterns enhance the transport and distribution of MPs. Consequently, even remote Arctic fjords, such as Kongsfjorden, are experiencing elevated levels of plastic pollution.

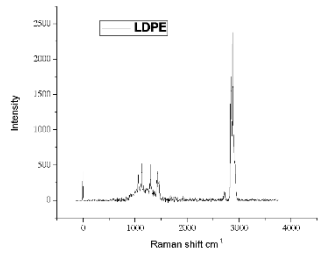
Microplastics in Kongsfjorden's Sediments

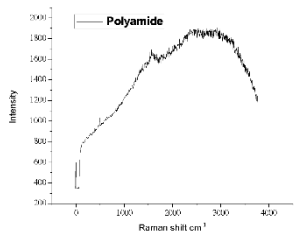
Kongsfjorden, located in the northwestern part of the Svalbard archipelago (79°N, 11°E), is a 20-km long fjord with varying depths from less than 100 m in the inner fjord to over 300 m in the outer fjord. The fjord's water quality is influenced by seasonal exchanges with Atlantic and Arctic waters and by anthropogenic activities such as fishing and tourism. Climate change has exacerbated seasonal water quality variations and accelerated glacier and sea ice melting, potentially affecting MP transport dynamics into the fjord. Sediment analysis from eight distinct locations within Kongsfjorden detected MPs in sediments from three sites. Concentrations ranged from 4 to 24 particles per kilogram of dry sediment. The average concentration was 2.87 MPs/kg, with particle sizes ranging from 55 µm to 381 µm. The dominant morphotypes were fragments and fibers, indicating diverse pollution sources (Figure 1). Micro-Raman spectroscopy was used to determine the polymer types of MPs in the sediments.

The analysis identified high-density polyethylene (HDPE), low-density polyethylene (LDPE), and polyamide (PA) as the predominant polymers (Figure 2). HDPE, prevalent in plastic bottles and containers, was the most frequently identified polymer, reflecting the widespread nature of plastic pollution. LDPE, found in plastic bags and packaging materials, and PA, used in textiles and

fishing gear, further illustrate the varied origins of plastic debris. The presence of these polymers underscores the extensive impact of plastic pollution on Arctic environments.

Figure 1: MPs representing pellets, fragment and fibre shapes extracted from sediment samples of Kongsfjorden.





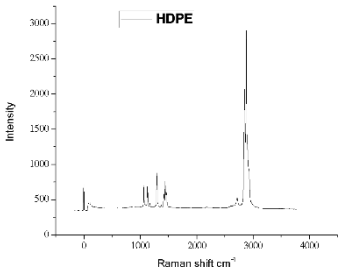


Figure 2: Polymer spectrums of MPs extracted from the sediments of Kongsfjorden: (A) HDPE; (B) LDPE; (C)PA

Comparative studies show that MP concentrations in Kongsfjorden are lower than in other Arctic regions. This discrepancy may be attributed to the density of the extraction solution, which may exclude high-density polymers. Nonetheless, the identified polymers align with those observed in other Arctic sediment studies. The presence of MPs in Kongsfjorden's sediments is closely related to the broader impacts of climate change. Rising temperatures and reduced ice cover facilitate more active MP transport pathways, allowing these pollutants to reach previously less affected areas. Glacier melting and changes in ice dynamics contribute to the mobilisation and release of plastic debris from terrestrial sources into marine environments. Additionally, warming temperatures and altered ocean currents enhance MP distribution across the Arctic. Proximity to Ny-Ålesund, an international research town, may also impact MP levels in the fjord.

Environmental Implications and Future Research

The findings from Kongsfjorden highlight the intersection of climate change and plastic pollution in the Arctic. The presence of MPs in sediment poses significant ecological risks, including potential adverse effects on sediment-dwelling organisms and the role of sediments as reservoirs of plastic pollution. These results underscore the need for comprehensive research to fully understand the impact of climate change on microplastic pollution in the Arctic. Investigating interactions between MPs and Arctic biota, including effects on sediment-dwelling organisms and the broader marine

food web, is also essential. Addressing MP pollution in the Arctic requires targeted mitigation strategies and policy interventions, including reducing plastic production and consumption, improving waste management practices, and enhancing recycling efforts. International collaboration and policies addressing the global nature of plastic pollution are crucial for protecting the Arctic and other vulnerable environments from further degradation.

Conclusion

The study of microplastics in Kongsfjorden underscores the critical impact of climate change on plastic pollution in the Arctic. As the region undergoes warming and ice melting, the presence and effects of MPs are becoming more pronounced. The findings highlight the urgent need for continued research and targeted mitigation strategies to address this pressing issue and safeguard the Arctic's fragile ecosystems. Understanding the influence of climate change on microplastic pollution is vital for developing effective strategies to protect the Arctic environment and enhance its resilience against global environmental challenges.

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COMMENT

Impact of climate change on emerging contaminants: Perfluorinated compounds in the environmental matrices of Svalbard

Saritha V K & Mahesh Mohan
School of Environmental Sciences, Mahatma Gandhi University, International Centre for Polar Studies, Mahatma Gandhi University, Kottayam Kerala, India

The causes and consequences of climate change vary depending on the time period of Earth's history, they are a part of the geological time scale. In the period of the Anthropocene, climate change directly or indirectly influenced the pattern of environmental pollution, particularly the distribution of emerging contaminants. It is one of the most significant challenges in the 21st century. Due to climate change, the Arctic Archipelago of Svalbard, which is sandwiched between mainland Norway and the North Pole, is seeing significant environmental changes.
Not only is the Svalbard region experiencing notable variations in temperature and ice cover, but it's also becoming a hub for research on how these changes affect pollutants in the ecosystem, particularly emerging contaminants. Emerging contaminants are substances that are not commonly found in the environment but have the potential to enter the environment and lead to adverse effects. Poly and perfluoroalkyl substances (PFASs) are a group of compounds that are among the emerging contaminants with a wide range of commercial and industrial applications.

They are synthetic chemicals utilised in many consumer and commercial items because of their grease- and water-resistant qualities, are among the rising pollutants of concern. Perfluorinated compounds have one of the strongest carbon-fluorine interactions found in organic chemistry, they are extremely persistent in the environment. Perfluorooctanoic acid (PFOA) and perfluorooctane sulfonic acid (PFOS) are common PFCs. Cleaning products, non-stick cookware, water-resistant fabrics, firefighting foams and Packing materials are the major applications of these compounds. They are potential persistent organic pollutants with highly toxic effects. They are bioaccumulative and biomagnifying in nature. The nature of the PFCs has raised concerns about their potential impact on different flora and fauna, including human beings. They are included in the list of Persistent organic pollutants at the Stockholm Convention. Perfluoro octane sulfonate and perfluorooctane sulfonyl fluoride (PFOSF), were included in the Annex B to the Stockholm Convention, which can be used for acceptable purposes and several specific exemptions (UNEP, 2009). However, Perfluorooctanoic acid, its salts, and related compounds were listed as POPs under Annex A of the Convention for Elimination in 2019, with several specific exemptions (UNEP, 2019). In 2022, the Conference of the Parties listed PFHxS, its salts and PFHxS-related compounds in Annex A to the Stockholm Convention.The POPs Review Committee is currently reviewing Long-chain perfluorocarboxylic acids (LC-PFCAs), their salts and related compounds, proposed for listing in Annexes A, B and/or C to the Stockholm Convention. It is under review.

Long-range air transport and marine aerosol-mediated transport are significant sources of PFCs in the Arctic region. Also, landfill leachate and firefighting testing stations are identified as local sources in the Svalbard region (Climatic variation influences the distribution pattern of PFCs in the Svalbard region. PFCs trapped in the ice and snow are released by ice thawing; these contaminants are carried into rivers and lakes and ultimately reach the marine environment. This phenomenon is known as "ice melt contamination. According to recent research, PFCs widely distributed to previously uncontaminated areas are the

leakage of contaminants from ice and snow. Warmer temperatures influence the distribution and fate of PFCs in different environmental matrices. Temperature and precipitation variations in the Arctic impact the deposition, transportation, and fate of PFCs.

A critical issue related to these contaminants is the bioaccumulation of PFCs in Arctic flora and fauna. The buildup of these pollutants in the tissues of many Arctic creatures, such as fish, birds, and mammals, puts them at risk. Because lipid-rich creatures like seals and polar bears are crucial to the Arctic food web, PFCs have been shown to accumulate in fatty tissues and can concentrate at higher trophic levels. The effects of PFCs on wildlife may worsen due to changes in prey availability and species dispersion brought on by climate change. For example, species that depend on sea ice, like polar bears, may be more exposed to PFCs through their diet when the amount of ice cover declines.

Furthermore, variations in prey availability may impact these animals' nutritional state, possibly rendering them. Improved monitoring procedures are required to address the effects of climate change on PFCs in Svalbard. Conducting routine air, water, soil, and biota sampling is crucial to monitor PFC levels and comprehend their long-term trends. Fundamental environmental matrices should be the focus of monitoring programs, which should also include a thorough analysis of the temporal and spatial distribution of PFCs. Compared to water, sediment matrices have a relatively stable record of variation of these compounds in the ecosystem; they have direct and indirect impacts on productivity and the food chain and web of the marine ecosystem. There are few studies conducted in the sedimentary environment of the polar region. The present study assessed the concentration and distribution of different PFCs- Perfluoro-butanoic acid, Perfluoro-heptanoic acid, Perfluoro-nonanoic acid, Perfluoro-decanoic acid, Perfluoro-pentanoic acid, Perfluoro-dodecanoic acid, Perfluoro-hexanoic acid, Perfluoro undecanoic acid, Perfluoro tetra-decanoic acid, perfluorooctanoic acid and perfluoro octane sulfonate in the Kongs fjords of the Svalbard archipelago in Norway. The traces of different PFCs detected in the various environmental matrices -snow, water samples, sediment and Tundra soil of the Arctic. The concentration reported in the present study is also comparable with the other part of the Arctic regions. More investigation is required to fully comprehend the intricate relationships between climate change and PFC behaviour in the Arctic environment. Different modelling studies mimic the movement and destiny of PFCs under various climatic conditions, can assist guide management plans and offer insightful information about potential future trends. Effective regulations and policies for PFCs are essential for their management at national and international levels.

The distribution and behaviour of perfluorinated chemicals in Svalbard's environmental matrix is being profoundly impacted by climate change. These persistent pollutants are being mobilised, accumulating, and spreading due to melting ice and snow, variations in temperature and precipitation, and changes in biological dynamics. PFCs in the Arctic provide several issues that must be addressed with a multifaceted strategy that includes improved monitoring, focused research, and sensible legislative actions. Understanding and controlling the effects of newly developing pollutants will be essential to safeguarding the ecosystem and public health as Svalbard continues to undergo fast environmental changes.

COMMENT

Climate Change in the Arctic: A call to shift from Traditional to Ecosystem-based Marine Governance

Bishwarupa Kar
Post-graduate student at the Department of Politics and International Studies, Pondicherry University

Introduction

Climate change is affecting oceans worldwide. In the Arctic Ocean, the melting of the polar ice cap has significant implications for the Arctic ecosystem as the increased accessibility to Northern waters welcomes new opportunities for anthropogenic activities that threaten the survival of biodiversity in the region. While ocean governance systems exist to regulate the laws of the seas, the question is, are traditional ocean resource management systems sufficient to keep up with the changes in the Arctic? As the Arctic ecosystem transcends the national boundaries of the eight coastal states and includes areas beyond national jurisdiction (ABNJ), existing marine governance systems are limited by their organisational and legal structures to protect the biodiversity in the central part of the Arctic and to ensure the rights as well as compliance of non-Arctic parties. Thus, there is a need to frame a more environment-oriented ocean governance system and to study the possibilities of implementing an Integrated Ecosystem-Based Marine Management (IEBMM) in the Arctic.

How Climate Change is affecting the Arctic

As temperatures rise and sea ice declines, the Arctic Ocean expands, exposing its previously covered central part to anthropogenic activities such as navigation, trade, fishing, and resource extraction. The unregulated rise of human involvement in the region threatens its biodiversity through the exploitation of marine resources, and pollution from oil spills. Therefore, as the Arctic environment changes, to protect its ecosystem, there needs to be a mechanism of ocean governance that controls and coordinates the movements of the parties involved.

The uniqueness of Arctic Ocean governance

However, there are increasingly more players in the Arctic Ocean, making the governance in the region unique. There are two primary categories of jurisdiction. First, the waters that fall under the jurisdiction of the eight Arctic countries, i.e. the area under two hundred nautical miles from their continental shelf. However, the Arctic consists of a vast coverage of areas beyond national jurisdiction (ABNJ) that don't come under the sovereignty of any particular state. The governance in these areas is significant as it determines the legal dynamics between coastal states and third parties such as non-coastal states, international organisations, and other autonomous entities. Therefore, with the growing possibility of conflict over marine resources in the Arctic's ABNJs, it is up to the law of the sea to decide how far the legal provisions are binding, to whom they apply, and what kind of freedoms or rights third parties enjoy.

Existing marine governance provisions and their limitations

The existing law of the sea for the governance of the Arctic is guided by various legal systems at international and regional levels, such as the UN Convention on the Law of the Sea (UNCLOS), the UN Convention on Biological Diversity (UNCBD), the Arctic Council, and the Polar Code.

At the global level, UNCLOS is the primary

binding legal provision that regulates marine activities in all waters. It provides laws to balance the sovereignty of coastal states and the freedoms and rights of third states. However, Article 311 states that regional mechanisms can modify the rules of UNCLOS but only with the consent of the concerned states. This leaves ambiguity on the rights of third states in waters of ABNJs that will increase in the central part of the Arctic. Further, although UNCLOS mentions broad provisions for the protection of the marine environment, it does not include the concept of the arctic ecosystem, marking its two limitations to deal with the present scenario.

At the regional level, the Arctic Council is the primary regional cooperation that brings together the eight Arctic states, the indigenous Arctic communities, and other organisations for the protection and development of the region. Regarding the environment, the Arctic Council has three binding agreements on maritime rescue, marine pollution and scientific cooperation. However, its provisions are insufficient for the changing times as the agreements have a sectoral approach to dealing with the region's human activities. Moreover, there is a minimal role of non-Arctic players in the Council, thus reducing the possibility of coordinating the movements of all entities in the Arctic.

Another relevant Polar mandate is that of the Polar Code, an international code to regulate shipping in polar waters. It is a legally binding document applicable to the 176 members of the International Marine Organization (IMO) to prevent pollution.

The necessity and meaning of an ecosystem approach (EA)

From a closer look at all the existing marine provisions, two conclusions can be drawn:
1) All existing mechanisms have a sectoral approach, i.e. each type of human activity is managed separately. However, the Arctic ecosystem is cross-boundary, therefore there needs to be one umbrella system to integrate the regulation of all activities, and
2) The existing international laws are fragmented about different environmental issues? Thus, there is a need to look for a system that can bring together all the provisions.

Hence, the best solution to protect the Arctic ecosystem is to have an ecosystem-based management approach where the focus is not on individual human activities but rather on the ecosystem as a whole, including the coordination of all the structures, legal provisions, activities, and knowledge systems that might affect an ecosystem. Thus, an Integrated Ecosystem-Based Marine Management (IEBMM) is an alternative to the traditional sectoral approach and is most suitable to handle the changing dynamics of the Arctic environment.

Challenges in implementing IEBMM in the Arctic?

IEBMMs are not a new concept. They have been experimented with in regions of the world having the most fragile and politically complex ecosystems. In ocean management, IEBMMs increasingly occupy centre stage. They have evolved from a vague principle to a central paradigm underlying living marine resource policy.

To date, wherever marine IEBMMs were tested out, happened to be areas of national jurisdiction of countries. Therefore, only the commitment from one state, i.e. the coastal state, was mainly required to implement environmental protection measures. Thus, cooperation with the stakeholders involved was easier to achieve. However, in the case of the Arctic, as there are large ABNJs over which no country has sovereignty, new challenges arise to the implementation of IEBMM.

The primary questions that therefore need to be addressed are:

1. How to make the measures binding?
2. How to ensure compliance by non-Arctic stakeholders?
3. How to coordinate with international maritime organisation guidelines?

4. How to coordinate ecosystem-based policies with sectoral organisations since even the global management organisations, such as the International Maritime Organization (IMO), and International Seabed Authority (ISA) have fragmented mandates, making their synchronicity difficult.

To gauge the possibility of tackling these challenges while implementing an ecosystem approach in the Arctic, the examples of previously applied successful IEBMMs may be looked at.

Case study: Learnings from the OSPAR model of IEBMM

Learnings from the previously applied IEBMMs around the world can be selectively applied to the Arctic. The example that comes closest to the Arctic setting is the OSPAR model, i.e. the Convention for the Protection of Marine Environment of the North-East Atlantic. To tackle the challenges of implementing an IEBMM, the OSPAR model actively cooperated with regional and global organisations such as the International Marine Organization (IMO), and the International Seabed Authority (ISA) that govern various maritime activities by signing MoUs with them.

Firstly, as these organisations are renowned for regulating marine life in ABNJs, cooperating with them increased the legitimacy of OSPAR's measures in ABNJs of the Atlantic. Secondly, collaboration with sectoral organisations made it possible for OSPAR to have a cross-sectoral effect. Thirdly, the framework of those organisations filled the gaps in OSPAR's regulations. For example, while OSPAR cannot regulate fishing, the North East Atlantic Fisheries Commission (NEAFC) covered it. Fourthly, it opened the door to engage with third States as the membership of international organisations (IOs) are generally broader than that of regional ones. Thus, through the MoUs, all the member states of the IOs were brought under OSPAR's regulation.

However, a challenge that can arise through cross-organizational cooperation is the clash in guidelines if the mandates of international organisations differ on a particular matter.

Possible solutions for applying IEBMM in the Arctic

To successfully implement IEBMM in the Arctic, lessons from other IEBMM models such as OSPAR and lacunae in the existing marine governance in the region need to be addressed. This includes, reforming the Arctic Council, coordinating with sectoral organisations increasing the involvement of non-arctic states, and coordinating the existing research efforts in the region.

1. **Coordination with sectoral organisations:**

As seen in the OSPAR model, the best way to synergize cross-sectoral regulative measures is through cooperation with various international organisations having different marine use regulations. However, it can be challenging for the Arctic Council to get all States on board unlike in OSPAR in which members had more shared interest and thus better cooperation. Nevertheless, the Arctic Council can begin by collaborating with the NEAFC to tackle the issue of fishing in the central part of the Arctic.

2. Greater involvement of Non-Arctic States:

For IEBMM to work in the entire arctic region and ABNJ, even non-regional states need to enjoy certain freedoms/rights. The AC can achieve this by increasing the role of its observer states. At present, observer states are not part of the decision-making process of the AC and can't participate in negotiations of legally binding agreements of AC. These are significant for IEBMM and thus need to be reformed.

3. Coordination of Arctic research efforts:

A major prerequisite for the IEBMM mechanism is the support of scientific groups. Ecosystem management is only as good as the understanding of its dynamics. At present, even though major scientific organisations such as the International

Council for Exploration of Seas (ICES), the North Pacific Marine Science Organization (PICES), and the International Arctic Science Committee (IASC) exist in the Arctic, none are dedicated to studying an integrated marine science activity in the Arctic Ocean. Therefore, gaps still exist in the scientific understanding of the central part of the future marine Arctic. Hence, either a new independent scientific organisation needs to be created with dedicated jurisdiction over the Arctic, or a comprehensive scientific program within the Arctic Council can be created where both member-states, as well as international scientific organisations, can participate in studying the marine ecosystem in the region.

Conclusion

As traditional sectoral ocean governance becomes insufficient in the Arctic Ocean, implementing an ecosystem approach is the need of the hour. However, applying an IEBMM in the Arctic has legal and organizational challenges in ensuring that the ecosystem-based measures comply with international law and that the non-regional states have rights and freedoms within the ABNJs. To tackle these challenges, the Arctic Council needs to be reformed and given more international legal powers. For example, its Secretariat could be made similar to OSPAR's Commission to give it more authority. However, as the AC has limitations in making binding measures for Third states in ABNJs, additional measures need to be put in place. Learning from previously applied IEBMMs, the Arctic Council can coordinate with global and regional sectoral to increase the compliance of third states by engaging the observers of the Council in its core discussions and projects. Further, the scientific effort to study and suggest relevant marine management techniques also needs a boost. If these steps are taken, there can be a chance to better protect the Arctic ecosystem given the changing dynamics of the Arctic Ocean caused by climate change.

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COMMENT

Frozen Nightmare: A Pandemic Hibernating in the Arctic Ice

Shreya Jagadeesan, *Postgraduate Scholar at the Department of International Relations, Peace Studies and Public Policy, St. Joseph's University*

The Significance and Threats of the Melting Arctic:

The Arctic, known for its frozen landscapes and severe conditions, is gaining global attention as climate change causes unprecedented melting of ice. The Arctic region, centred on the North Pole, is immensely important from geological, historical, and geopolitical perspectives. Along with opening up new potential for economic expansion, the melting of the ice has triggered a race among nations to assert influence and control over the strategically crucial area. The melting glaciers may pave the way for opportunities in the global system, but it could also trigger a new fatal pandemic.

The melting ice in the Arctic is mostly due to global climate change caused by human activity. It is warming at least twice as fast as the rest of the planet, and whatever occurs there has a footprint on everything. The environmental repercussions are far-reaching, affecting not only the Arctic ecology but also adding to global sea-level rise. As the ice melts, numerous major powers have strengthened their presence in the region, worsening the situation. All of the bacteria and viruses that were frozen beneath might be revived. The return of these pathogens might mean the end of humanity. Recently, researchers revealed remarkable genetic compatibility between viruses isolated from lake sediments in the high Arctic and potential living hosts.

Notable viruses including SARS-CoV-2, Ebola, and HIV may have been transmitted to humans through interaction with other animal hosts.

As a result, a formerly ice-bound virus may reach the human population via zoonotic transmission. The viruses may have exploited the frozen ice as a time traveller. Diseases from the past may return to the current world, and there is no guarantee that modern species will be immune.

All of it is frozen in permafrost, which is defined as any earth substance that has been at or below 0 degrees Celsius for two or more years. It does not melt, but thaws. When the icy layer melts and the land remains, the thawing will result in the release of massive amounts of greenhouse gases. There is an unfrozen layer above the permafrost, known as the active layer, that serves as a new home when unfrozen water levels rise enough to activate certain biological activities. However, among these viruses, RNA is unlikely to recover. The best-known DNA virus, and is smallpox. Smallpox, the worst disease in recent history, can be revived, but because immunizations have eradicated it, it may not pose a threat. Anthrax is the germ that could cause an outbreak, as it killed thousands of reindeer in Siberia in 2016 and infected about a dozen people.

Although many of these risks are being discounted due to the availability of antibiotics, the emerging threat may be the antibiotic resistance crisis. There

was an outbreak in Madagascar only a few years ago. And that's antibiotic-resistant Pasteurella pestis or plague. The antibiotic-resistant pandemic will kill more people each year than the coronavirus pandemic. The Arctic, long regarded as an industrial frontier, is changing into a ticking time bomb, unleashing diseases that have been trapped in time for centuries.

Geopolitical Rivalries and Economic Interests:

The rivals fighting for this region, and the majority of the international system that views it as an asset are oblivious that it has been frozen for a very long time, and that melting it will bring about a significant

change. As a result, expecting it to be an opportunity while ignoring the reality of what was frozen in it could be a curse. Major powers are becoming more and more interested in the region, although melting glaciers are perceived as a threat to the entire world. Building outposts and stepping up patrols, Russia is increasing its military presence in the Arctic, the US and Canada are also taking initiatives. These activities endanger the delicate Arctic ecosystem and exacerbate environmental degradation in conjunction with related infrastructure. Despite the framework provided by the UN Convention on the Law of the Sea, territorial disputes still exist. Rivalry is heightened by Russia's strong claims, demonstrated in 2007 by the placement of a flag at the North Pole. The Arctic's economic potential for shipping, tourism, and resource extraction comes with advantages, but it also comes with environmental hazards that exacerbate climate change and ice melt. Sustainable development is essential for the long-term health of the area and the stability of the global climate because it strikes a balance between economic interests and

ecosystem protection.

In addition to being a threat to global warming, the warm Arctic serves as a military staging area for the US and Russia; similar to the Cold War, this might be the start of a new conflict. Due to its enormous gas and oil reserves, it is also very important to them.

Russia has a third more arctic sites than the US and NATO put together, and it is utilizing the area to test its hypersonic weapons. Russia possesses 24000 kilometres of coastline and roughly half of the polar region. Over the past ten years, Russia has been able to rapidly expand its military in the region due to its territorial domination.

Russia also views the Norwegian border as being extremely important because they have nuclear submarines stationed in Kola, which is quite close to the border, and they require a clear path free of obstructions in case of confrontation to launch those submarines. Vladimir Putin was spotted in 2023 during a military parade when he reiterated Russia's maritime philosophy, which calls for the country to become a major maritime force and use all available measures to safeguard its interests, the most important of which is the Arctic. Retaining strategic importance and abundant resources in the Arctic. Divers undertook the significant task of placing a ceremonial Russian flag beneath the North Pole in 2007, but the UN Commission only confirmed the majority of Russia's claims in February 2023. The claim would give Russia an extra 1.7 million square kilometres of the seabed, and although this decision is not the last word on rights to the Arctic, Russia estimates that this claimed territory contains more than 17.3 billion tonnes of oil and 85.1 trillion cubic meters of gas.

On par with this, the US released an Arctic strategy in 2022, it reflects the priority that they place on the Arctic, it is embedded with their national security strategy, in that the Arctic is singled out as one of the seven issue areas of priority alongside Indo-pacific and middle east. The strategy reaffirms that the US seeks an Arctic region that is peaceful, stable, prosperous and cooperative. It includes four mutually reinforcing pillars, climate change and environmental protection, sustainable economic development, international cooperation, governance and security.

There are other players in this game besides the US and Russia. Russia stated that they see this as a chance to link China's maritime Silk Road with the Northern Sea route. In 2018, China declared itself to be a near-arctic state even though its northernmost region is more than 1450 km from the Arctic Circle. In essence, China seeks to exploit natural resources and establish maritime lanes.

It is feasible to manually resurrect these lethal viruses, which might potentially create a new avenue for bioweapons. For instance, a 48,500-year-old "zombie virus" that was submerged beneath a frozen lake in Russia has been brought back to life by French scientists. Conspiracy theories exist

regarding the coronavirus's creation as a man-made bioweapon. If this is true, then spreading these viruses once they have resurfaced is not very difficult.

The Arctic's Dual Narrative

The Arctic's melting ice signals a dual narrative, melting ice that takes us to two opposite ends of the spectrum, it presents prospects for growth economically, but on the other, it raises the possibility of a catastrophic epidemic. Ancient viruses and bacteria that have been frozen for generations pose a threat that is often neglected as great powers struggle for resources and strategic advantages. Permafrost that has thawed serves as a time capsule, allowing ancient viruses to potentially resurrect and unleashing threats like Anthrax. When economic opportunity and impending peril combine, priorities must be reevaluated. It is critical to address environmental issues, devise plans for sustainable growth, and prepare for the possibility of a new, catastrophic pandemic in the rapidly changing Arctic. These are all related to the necessity to strike a fine balance between human aspirations and the capacity to withstand natural forces.

COMMENT

Challenges of State Interventions in Traditional Societies: The cases of Canadian and Greenlandic Inuits

Ayan Datta
Post-graduate student, Department of Political Science, University of Hyderabad

The Inuits, one of the Arctic's indigenous peoples, inhabit 40 per cent of Canada's territory and constitute 90 per cent of Greenland's population. Despite their vast spread and numbers, the community suffers historical and ongoing marginalisation because of intervention by colonial nation-states. State intervention in these Inuit societies has produced multiple challenges for the latter, including healthcare disparities, environmental degradation and loss of traditional culture.

Healthcare disparities between Inuits and mainstream

Legacies of state intervention have substantially harmed Inuit health outcomes. The community suffer lower life expectancies, living on average for 10-17 fewer years than their mainstream Canadian and Greenlandic counterparts, with the numbers further exacerbated because of high rates of suicide among Inuits. While modern medicine has raised Inuit life expectancy, which ranged between 30 and 40 years before contact with Europeans, they have also introduced new issues, including the wide gap in health outcomes.

Over 30 per cent of Canadian Inuits suffer from chronic diseases, including Tuberculosis, which is 20 times more common in Inuits than the general population. Infant mortality, diabetes, obesity, and HIV-AIDS rates are also higher in the community, reflecting a vast healthcare disparity with the mainstream.

How did the challenge originate?

Traditionally, Inuit medicine was "folk medicine," with all adult community members familiar with the traditional healing practices, which relied on a shared knowledge of the social environment and older medical knowledge passed down through the generations. However, state interventions in Inuit healthcare practices were rooted in assimilationist and colonial practices, aiming to destroy Inuit healthcare practices and rapidly integrate them into the "mainstream" (read: White Christian) society.

A review of specific government practices within Canada and Greenland reflects country-specific attempts to dilute the community's traditional healthcare practices. Canada's Indian Act (1876) sought to regulate and damage Inuit health practices in multiple ways. The Act made the federal government liable for health and neglected the local community's role as the source of healthcare and repository of traditional knowledge about Inuit wellness practices. Healthcare interventions in Greenland reflected a similar pattern, with Denmark's government introducing policies that advanced Western medicine at the expense of the traditional Inuit practices. According to research from Colorado State University, the lack of culturally rooted medicine intensified health issues, including mental disorders and substance abuse among Inuits.

What was the actors' response?

Although both governments initially sought to destroy the Inuits' traditional healing practices, they adopted a reconciliatory approach during the 2000s. In Canada, the government partnered with Inuit groups to enhance Inuit communities' control over their health service delivery mechanisms, reflecting its commitment to giving Inuits a stake in issues that impact them. In 2024, Ottawa allocated around USD 105 million for Indigenous community healthcare and

USD 167 million to combat racism against Indigenous people, highlighting the leadership's commitment to providing Inuits safe access to health services. The government's Indigenous Services Department partnered with Saskatchewan's Woodland Wellness Centre, combining traditional and modern healing practices. According to Canada's Indigenous Service Plan, the government will reduce Inuit's TB rates and improve access to HIV treatment by 2025, reflecting a targeted approach towards Inuit issues.

The government has followed a similar model in Greenland, focusing on culturally appropriate care and partnership with local Inuit organisations. The Inuit-majority government of Greenland took control of its healthcare from Denmark in 1992. Since the takeover, the country has focused on Western medical facilities while struggling to address high infant mortality rates and suicides.

What is the future trajectory?

Although both governments changed their policies, the future of Inuit healthcare will be characterised by slow progress. Although both governments are collaborating with Indigenous communities and allocating greater funds in the national budgets towards improving Inuits' access to healthcare, they have maintained Western medical facilities as their thrust area and made inadequate investments in traditional practices.

Environmental degradation

State interventions into the Inuits' natural environment have led to a climate crisis for the community, affecting their traditional knowledge and way of life. The Inuit share a deep-rooted economic and spiritual bond with the land and consider it an extension of their bodies.

The land and ocean provide the community with essential resources, including seals, fish and caribou for food. However, rapid industrialisation and climate change reduce the availability of Arctic fauna and threaten the Inuits' food security and Qaujimajatuqangit. (traditional knowledge) which centres around the interconnections between the community and local ecosystems.

How did the challenge originate?

State intervention into Canada and Greenland's Inuit spaces began during the 20th century, with governments aiming to control the region's resources to advance their modern industrial economies and assert their territorial claims over the Arctic against their Cold War adversaries. During the 1950s, the Canadian government built the Distant Early Warning (DEW) Line in the Arctic and forcibly relocated over 5,000 Inuits, intensifying the community's reliance on modern society and transportation. Furthermore, Ottawa's resource extraction practices, especially in northern Canada's Beaufort Sea (part of the Inuit homeland), harmed Inuits by causing oil spills. In Greenland, the colonial Danish government prioritised industrial progress over a sustainable environment, establishing multiple mining corporations for minerals, including lead and zinc, disrupting the island's ecological balance and polluting its land and water. During World War II, the US built the Thule Air Base in Greenland, releasing pollutants into the local atmosphere and artificially altering its natural landscape.

What has been the actors' response?

Since the 1970s, Inuit non-governmental organisations, including Inuit Taprit Kanatami (ITK) and Inuit Circumpolar Council (ICC), demanded greater involvement of indigenous voices in climate change policy-making, advocating the use of that Inuit Qaujimajatuqangit (traditional knowledge) to frame ecological policies. The ITK organised workshops and community sessions to voice their concerns about climate change in Canada's Inuit region, called Nunavut and contested the dominant development narratives pushed by the country's "southern" mainstream. Canada's government adopted a conciliatory response towards the Inuits' issue. In 1999, it formed the northern territory of Nunavut, uniting all Canadian Inuits under one province. It signed the Nunavut Land Claims Agreement, allowing the community to co-manage the territory's wildlife, land, and

natural resources. The agreement also gave Inuit shares in the federal government's royalties earned from natural resource mining and exploration in Nunavut, giving the community a stake in their sustainable development. Furthermore, Nunavut's Nunatsiavut region unveiled plans for an Inuit Protected Area, where the community's local institutions would collaborate with the federal government to protect Inuit hunting and fishing traditions. The Guardian reported that the arrangement would enable the community to "jointly create and co-manage the protected area, based on Inuit priorities, as an equal authority," marking a shift from the state's industrialist and paternalist approach.

In Greenland, the environmentalist effort was led by international organisations, including the Inuit Circumpolar Council (ICC), which campaigned about the harmful effects of climate change on Greenland's environment. The ICC advocates combining the community's traditional knowledge with modern science, research and technology to create sustainable development policies as a solution. The Greenland government has begun incorporating traditional knowledge into its policymaking and cooperates with Inuit groups. However, recent steps by Greenland's government to attract foreign direct investment have exacerbated the community's climate crisis. The Inuit-led government allowed foreign firms to explore critical minerals on the island, including the Jeff Bezos-owned Bluejay Mining, leading to further possibilities of environmental degradation.

What is the future trajectory?

State interventions in Inuits' natural environment have invited intense protests and counter-demands from the community. However, National Geographic reported that most community members do not want a return to the pre-colonial hunter-gatherer lifestyle, instead favouring a balance between environmentalism and technological progress in the future. While the ICC will continue to advocate the inclusion of Inuits' policy inputs, the Canadian and Greenlandic groups will push for greater control over their homeland's resources. These groups will seek a balance between industrial technology and environmental sustainability by adopting green technologies, in which mining and exploration of critical minerals will play a significant role.

Cultural erosion

The Inuit community faces substantial loss of cultural forms, including the Inuit language, knowledge of hunting-gathering practices, and its traditional kinship-based social structure. The Inuit language is threatened in Canada by the dominance of French and English. Despite being Greenland being majority Inuit, most of the residents are Christians, reflecting the dilution of traditional Inuit religion. State-led modernisation has replaced the kinship-based Inuit society with an increasingly capitalist society, leading to the alienation of young Inuits and rising suicide rates.

How did the challenge originate?

Canada and Denmark's 19th and 20th-century colonial policies marked the beginning of the Inuit cultural erosion. In Canada, the Department of Indian Affairs began the system of residential schools, which suppressed the Inuit language and traditions and was responsible for the dilution of Inuit youths' cultural identity. The government would forcibly send Inuit children to these institutions, separating them from their families and communities. Once inside, the children would be forced to adopt Western and Christian beliefs and practices and physically punished if they disobeyed, reflecting the government's assimilationist mentality of 'civilising the savage Indian.' In Greenland, government-backed Catholic priests launched proselytising missions, socialising the native Inuits into Western and Christian culture.

What has been the actors' response?

Since the 1970s, Ottawa and Copenhagen began to support the preservation of indigenous cultures. Canada's Truth and Reconciliation Commission (formed in 2015) investigated atrocities against Indigenous peoples, including Inuits, and

recommended greater funding for promoting indigenous culture. The ITK and ICC also held cultural camps, language classes, and community programmes to revive the Inuit traditions. In Greenland, agitations by native Inuits led to efforts to restore the Inuit language. The Home Rule Act (1979) made Greenlandic (an Inuit dialect) the language for school instruction. The Self-government Act (2009) consolidated the trend towards cultural reclamation by making Greenlandic the country's sole official language.

What is the future trajectory?

According to the ICC, Inuit youth are eager to reclaim their lost culture, indicating that the community will acquire cultural autonomy in the future. According to the Regional Environmental Change journal, Inuit scientists are attempting to combine traditional and modern research methods, which, in the future, will likely enhance the community's cultural preservation. While the community has not found a solution to its westernisation and high suicide rates, its leaders will continue to advocate for policy changes that provide solutions tailored to the community's specific needs.

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COMMENT

The Inuit & Arctic Governance: Five Core Challenges

Vaneeta
Post-graduate student, UMISARC & Centre for South Asian Studies, Pondicherry University

Inuit means “people.” Inuit is a term for Indigenous inhabitants of Canada, Greenland, and Alaska. Inuit communities also live in Russia, but they were moved to the mainland and do not speak their Indigenous language, Inuktitut. The Inuit have lived in the Arctic for thousands of years, long before any modern nation-states claimed Arctic territories or international organisations engaged in Arctic governance. Their traditional knowledge of the environment, grounded in sustainable practices, has enabled them to thrive in what many consider an uninhabitable region.

In the context of the Arctic and Indigenous communities, governance is defined differently than the usual use of the name. The term “governance" refers to exercising legitimate authority within a group to make decisions about resource allocation and managing communal and individual activities. While the term is often used interchangeably with "government," scholars focusing on Arctic Indigenous communities use governance to evaluate the powers given to authorities and the incorporation of traditional knowledge (TK) into policy implementation. Governance arrangements in the Arctic region vary widely. Inuit live in different countries and have various types of governance arrangements with their respective countries. Greenland stands out the most for its significant progress toward self-government; the opposite of that is Russia, where no agreements have been reached. Whereas in Canada, in places like Nunavik and Nunatsiavut, governance agreements often involve multiple government levels, including federal and provincial authorities. In the Arctic, for governance, the Inuit have agreements that can be broadly categorised into two types: land claims agreements, which create local and regional structures for managing settlements as seen in Alaska, the Inuvialuit Settlement Region, and Nunavik, and self-government agreements, such as those in Greenland, Nunavut, and Labrador. These governance systems may be ethnically based, as in Nunavik and Nunatsiavut, or public, as seen in Nunavut, Greenland, and Alaska. However, governance in the Arctic extends beyond these agreements, with regional and international organisations playing a crucial role in enhancing and supporting these structures. Organisations such as the Inuit Circumpolar Council (ICC), which was established with the intention of providing a new Arctic vision that valued “Inuit autonomy, Arctic economic development, and environmental protection.” Similarly, regional organisations such as Inuit Tapiriit Kanatami (ITK) represent the national voice protecting and advancing the rights and interests of all Inuit living in Inuit Nunangat, the homeland of Inuit in Canada.

These organisations are instrumental in advocating for Inuit rights, facilitating cooperation across borders, and ensuring that Indigenous voices are central to decision-making processes on both regional and global scales. These organisations help to bridge the gaps between local governance and broader environmental and political challenges, ensuring a more cohesive and representative governance framework for the Arctic. Despite the presence of multiple governance agreements and the active involvement of organisations like the Inuit Circumpolar Council (ICC) and Inuit Tapiriit Kanatami (ITK), significant challenges continue to impede effective Inuit governance in the Arctic. Below are five challenges faced by the Inuit in Arctic governance.

First is Climate Change and Environmental Degradation in the Arctic. Global warming is transforming the Arctic environment and heightening economic opportunities for resource extraction and shipping. Concerns about environmental degradation are growing, which poses an enormous challenge for the Inuit. Climate change is a common concern for all now, but it has more significant implications for the Inuit way of life. Inuit, who traditionally hunt and fish for their livelihood, are affected by things like melting ice, changing wildlife patterns, and unpredictable weather. According to the Intergovernmental Panel on Climate Change (IPCC) reports, 'surface warming in the Arctic will continue to be more pronounced than the global average warming over the 21st century'. The decline in seasonal sea ice and rising sea levels makes it hard for Indigenous people to access their ancestral lands. Fish stocks and marine species have been affected by ocean warming and acidification, limiting the opportunities for Inuit to access marine resources and threatening their income, food security and cultural heritage. Moreover, melting ice has opened new shipping routes, providing access to unreachable natural resources such as oil and gas. While sectors such as mining can contribute to the development of an area, they also bring up issues related to social effects, environmental damage, and the equitable distribution of benefits. Inuit people frequently feel caught between the ecological risks and the possible economic rewards. Indigenous people have lived with ancestorial knowledge, which helps them cope with climate change better than others. Still, environmental degradation is a challenge to their cultural practices and sustainable resource management, leading to a greater need for Inuit involvement in environmental governance.

The second is political marginalisation. Inuit are one of the key stakeholders of the Arctic region. However, they are frequently overlooked in the decision-making process. ICC (The Inuit Circumpolar Council) is a permanent participant in the Arctic Council,

along with five other Indigenous organisations. Still, they do not have formal decision-making power or voting rights. This limits their influence over policies that impact their lands and livelihoods, as the eight Arctic nation-states make the Arctic Council's key decisions.
The lack of adequate funding for Permanent Participants is a prominent example of political marginalisation experienced by Inuit and other Indigenous groups within the Arctic Council. These groups struggle to get funding to conduct research, review documents, and actively participate in decision-making processes. Lack of financial support ensures political marginalisation compared to the member states, which have far greater resources at their disposal. The continuous fundraising and lobbying for funds highlight the systemic barriers that prevent Indigenous groups from having an equal say in the governance of their homeland.

The third is increased International Relations and Geopolitical interest in the Arctic. In recent years, the Arctic has become a focal point of geopolitical and international interest for several countries, including non-Arctic countries like China and India. The abundance of natural resources in the area, including petroleum and gas, has intertwined geopolitics and geoeconomics and attracted a wide range of stakeholders. This intensified global competition between these parties often leads to increased industrial activities that harm the Arctic environment and disrupt traditional Inuit practices. The geopolitical environment is becoming increasingly complex due to the growing role of multinational corporations in government.
Fourth is the Legal and Land Rights Issue. Land claim agreements are designed to recognise Inuit land rights and provide for self-governance. However, implementing land claims agreements in the Arctic, particularly in Canada, faces significant challenges because of their complexity. For example, the Nunavut Land Claims Agreement and the Inuvialuit Final Agreement involve numerous land use, resource management, and governance stipulations. Interpreting and applying

become hindrances in the effectiveness of these agreements.

Fifth is Cultural Preservation and Social Issues. The Inuit face substantial challenges in preserving their culture and addressing social issues amid the pressures of modernisation. Attempts to assimilate Indigenous peoples into Western society have resulted in the erosion of traditional culture in many Arctic communities, including the Inuit. This cultural degradation has an enormous impact on all aspects of Inuit identity. Even though In North America, Inuit communities are among the most culturally resilient, with around 60% of Inuit reporting an ability to converse in Inuktitut. Daily use of Inuktitut and its dialects in households declined in the community. Therefore, there have been efforts to have more autonomy and preserve the culture and language. The former Minister of Education in Nunavut (Canada), Paul Quassat, said, "That is the whole reason why the land claims took place because we were losing our language…I think that's part of the whole land claims process. Once you have the language, the culture is strong" which explains the importance of self-governance and language preservation.

Furthermore, Inuit communities experience disproportionately high rates of suicide, substance abuse, and mental health problems, which are deeply rooted in historical trauma, cultural dislocation, and socio-economic disadvantages. For example, in Canada, Inuit were moved to permanent settlement in the 1950s and 1960s, but since then, they have lacked adequate housing and have suffered health-related problems. Inuit communities have high infant mortality, food insecurity, poor nutrition, and overcrowded housing, which again puts them on a disadvantage side and becomes a challenge for the governance process. Additionally, the influence of external cultures and the migration to urban areas threaten the survival of Inuit languages, traditions, and knowledge systems. Governance structures often fail to fully integrate traditional knowledge (TK) into policymaking, further endangering cultural preservation. These intertwined challenges threaten the cultural fabric of Inuit society and hinder their effective participation in governance.

In conclusion, Indigenous communities are essential for Arctic governance. As Eben Hopson, the founder of the ICC, stated in 1977, "Our language contains the memory of four thousand years of human survival through the conservation and good managing of our Arctic wealth…Our language contains the intricate knowledge of the ice that we have seen no others demonstrate. Without our central involvement, there can be no safe and responsible Arctic resource development." This statement is still relevant, and Indigenous traditional knowledge could be used effectively to govern the Arctic. Inuit have played a role in governance since the formation of ICC. Still, they face multiple challenges, such as climate change, environmental degradation, political marginalisation, increased interest in international relations and geopolitical interests, land agreement issues, and cultural preservation.

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COMMENT

The Arctic Council: Managing resources and Environmental challenges

Nupur Priya
Post-graduate student at the Department of Politics and International Studies, Pondicherry University

The Arctic, a region of unparalleled ecological significance and strategic importance, is experiencing unprecedented changes due to climate change and increasing human activity. The growing interest in Arctic resources is driven by the dual forces of climate change and increasing global demand. As the Arctic ice cap recedes due to rising temperatures, previously inaccessible resources such as oil, natural gas, and minerals are becoming more accessible. This has spurred significant interest from Arctic and non-Arctic nations seeking to capitalize on these untapped reserves. Concurrently, global demand for energy and raw materials continues to rise, exacerbating the push for exploration and extraction in the Arctic region. This convergence of climatic shifts and economic incentives has intensified the urgency of managing Arctic resources responsibly, as the environmental sensitivity of the region complicates efforts to balance development with conservation.

The first step towards creating the Arctic Council began in 1991 when the eight Arctic nations signed the Arctic Environmental Protection Strategy (AEPS). The Arctic Council was formally established by the 1996 Ottawa Declaration with its headquarters in Tromso, Norway (2012). Since then, the Council has addressed topics including climate change, oil and gas, and Arctic shipping. It is the leading intergovernmental forum promoting cooperation, coordination, and interaction among the Arctic States, Arctic Indigenous Peoples, and other Arctic inhabitants on common Arctic issues, particularly in matters of sustainable development and environmental protection in the Arctic. The council consists of 8 member states, 13 observer states, SIX working groups, and 6 Arctic indigenous communities that have Permanent Participant status. All Arctic Council decisions and statements require consensus of the eight Arctic States (Canada, Denmark, Finland, Iceland, Norway, Russia, Sweden, and the United States). The Council's activities are conducted in the six Working Groups, which are the Arctic Contaminants Action Program (ACAP) (since 2006), Conservation of Arctic Flora & Fauna (CAFF), Emergency Prevention, Preparedness & Response (EPPR), Protection of the Arctic Marine Environment (PAME), Sustainable Development Working Group (SDWG), and Arctic Monitoring and Assessment Programme (AMAP). It is the responsibility of the Working Groups to execute the programs and projects mandated by the Arctic Council Ministers. These mandates are stated in the Ministerial Declarations, the official documents that result from Ministerial Meetings.

While not explicitly a resource management body, the Council's mandate directly influences how Arctic resources are managed. By prioritising environmental protection, the Council sets a framework for responsible resource extraction. Its emphasis on sustainable development ensures that the utilisation of Arctic resources considers the long-term well-being of the region and its inhabitants. The Senior Arctic Officials, who are the core of the Council's operational structure, are responsible for day-to-day management; Working Groups that focus on specific issues related to the Arctic environment, such as marine pollution, emergency prevention, preparedness, and response, and sustainable development, and provide expert advice and develop recommendations; Expert Groups which

support the work of the Working Groups by providing scientific and technical expertise; and, the consensus decision-making mechanism ensures a balanced approach to resource management. While the Arctic Council does not have direct regulatory power over resource extraction, its influence lies in setting standards, promoting cooperation, and providing a platform for addressing environmental concerns related to resource management. Melting Arctic ice and thawing permafrost have made resource extraction more feasible. Currently, oil, gas, and coal are being mined in the region. Ironically, as Arctic nations aim to reduce greenhouse gas emissions under the Paris Agreement and transition to renewable energy, they're also recognizing the Arctic as a potential treasure trove of critical minerals essential for these new technologies.

The Arctic Council coordinates resource management among Arctic nations and international bodies through intergovernmental cooperation, the inclusion of Indigenous perspectives, partnerships with global organisations like the UNEP and IMO, and the sharing of knowledge. Apart from this, there are many policies and frameworks developed by the Council to promote sustainable resource management like the Arctic Marine Shipping Assessment (AMSA) which aims to prevent, minimise, and mitigate marine pollution from ships operating in Arctic waters, protecting the fragile marine ecosystem; Arctic Contaminants Action Program (ACAP) which focuses on reducing the long-range transport of persistent organic pollutants to the Arctic and minimising their impact on human health and the environment; Sustainable Development Working Group which works on a range of issues related to sustainable development, including resource management, climate change adaptation, and community resilience; and, Conservation of Arctic Flora and Fauna (CAFF) which promotes the conservation and sustainable use of Arctic biodiversity, including marine and terrestrial ecosystems. These policies and guidelines establish a framework for managing Arctic resources sustainably while safeguarding the environment. Nevertheless, obstacles such as accelerating climate change, growing geopolitical rivalry, and inadequate enforcement hinder the full realisation of these goals.

The Arctic's environment is particularly vulnerable to the impacts of resource extraction. The region's harsh conditions increase the risk of catastrophic oil spills, harming marine life and coastal communities. Extracting fossil fuels intensifies climate change, melting Arctic ice, and disrupting ecosystems. Building infrastructure destroys habitats, while chemical, noise, and air pollution from equipment harm wildlife and contaminate water. Arctic resource extraction is a major driver of climate change. Burning fossil fuels for energy releases greenhouse gases like carbon dioxide and methane. Melting permafrost, caused partly by warming temperatures, releases even more methane. Additionally, removing snow and ice cover exposes darker surfaces, reducing Earth's reflectivity and thus, absorbing more sunlight and increasing warming called the Albedo effect.

The Council plays a pivotal role in addressing this complex interplay between resource management and environmental protection in the rapidly changing Arctic Region. So, it can strategically leverage its strengths, overcome its weaknesses, seize opportunities, and manage threats to enhance its effectiveness.
One of the most prominent strengths is the Council being a Global, collaborating platform that provides a unique forum bringing together Arctic nations, Indigenous groups, and other interested parties. The Council prioritises environmental protection and sustainable development which is another significant strength. Further, it also ensures Indigenous perspectives are integrated into decision-making. The Council also uses scientific expertise and makes data-driven decisions to guide its work. Lastly, consensus-based decision-making promotes cooperation and avoids unilateral actions. The major

weakness of the council is that it lacks authority to enforce decisions, relying on the cooperation of the member states. The consensus-based approach, which is a strength, can also be a weakness by leading to delays in addressing urgent issues. The dependency on member states is another major weakness as the effectiveness of the council is contingent on member state commitment. The geography of the Arctic region acts as another weakness as the vast and remote region poses logistical challenges for monitoring and enforcement.

The Council has numerous opportunities to capitalise upon. Emerging technologies can be an important opportunity to improve monitoring and management. Increased global interest in the Arctic presents another range of opportunities for expanded cooperation. The rapidly changing Arctic environment poses a significant threat to resource management and ecosystem protection, increasing competition among Arctic states for resources can undermine cooperation, unregulated or unsustainable resource extraction can damage the Arctic ecosystem, potential conflicts between resource development and Indigenous rights can arise and negative public perception of resource extraction can impact the Council's legitimacy.

The Arctic Council operates in a complex and dynamic environment characterised by all these significant opportunities and pressing challenges. While the Council has established itself as a vital platform for cooperation and environmental stewardship, its effectiveness is contingent upon its ability to navigate these complexities. Ultimately, the Council's success hinges on the continued commitment of its member states, Indigenous peoples, and the international community to prioritise sustainable development and environmental protection in the Arctic.

The Council's stewardship of Arctic resources is multifaceted. It involves balancing the economic interests of Arctic states with the imperative of environmental preservation. The Council's role is to facilitate sustainable exploitation of these resources while minimising their environmental footprint. By fostering cooperation among Arctic nations, it seeks to prevent conflicts over resource claims and ensure equitable sharing of benefits. The Council's commitment to Indigenous peoples is fundamental to its mission. These communities have lived in the Arctic for millennia and possess invaluable knowledge of the region's ecosystems. The Council provides a platform for Indigenous voices to be heard and their rights respected. By incorporating traditional knowledge into decision-making, the Council enhances its ability to address the complex challenges facing the Arctic.

While the Arctic Council has made significant strides in environmental protection and resource management, challenges persist. The growing geopolitical competition in the region, coupled with the accelerating pace of climate change, demands increased cooperation and innovation. The Council must continue to strengthen its scientific capacity, enhance its collaboration with non-Arctic stakeholders, and develop effective mechanisms for implementing its decisions.

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COMMENT

Ocean Management and Marine Environment Governance under the Arctic Council

Prajwal TV
Post-graduate student, St. Joseph University

The Arctic Council, established in 1996 is an inter-governmental forum that promotes cooperation, coordination and interaction among the Arctic States, Indigenous people and those associated with the Arctic region on all common Arctic issues. It initially focused on the protection and conservation of the Arctic environment mainly on pollution prevention and scientific research aspects under the Arctic Environmental Protection Strategy which has since expanded to include a wide range of issues including sustainable development and economic cooperation. This essay attempts to create a compiled portfolio of the Arctic Council's ocean management and governance of its marine environment since its inception and the several challenges in achieving its goals and objectives, impacts of its policies and key takeaways.

Arctic Council's Approach to Marine Environmental Governance

Initially, the Council's focus was primarily focused on addressing immediate environmental concerns such as pollution prevention and emergency response which saw a reactive approach to environmental challenges. As scientific understanding of the Arctic environment grew in-depth and the impacts of climate change became more apparent, the Council's focus also expanded to include a more proactive approach to structural governance of the region's marine environment. The Arctic Environmental Protection Strategy (AEPS), adopted in 1991, laid the groundwork for the Arctic Council's formation in 1996, becoming the first cooperative effort among Arctic nations to address environmental concerns. It stressed the need for coordinated efforts to reduce pollution, particularly from persistent organic pollutants, resistant to degradation, such as Polychlorinated biphenyls (PCBs), Organochlorine pesticides and Polybrominated diphenyl ethers (PBDEs) and heavy metals from industrial emissions and mining activities such as Mercury, Lead and Arsenic, which posed a significant threat to the Arctic environment. It also emphasised the necessity to enhance cooperation on emergency responses to environmental disasters, setting the stage for future collaborative frameworks. Alongside working towards protecting the environment, the Arctic Council also focused on scientific research and making decisions on scientific knowledge. Therefore, early efforts were made to gather extensive data on the Arctic environment to understand the idiosyncratic challenges particular to the region. This data collection informed the Council's early policies and initiatives, ensuring that actions taken were based on scientific understanding.

Later on, the Council also adopted Ecosystem-Based Management (EBM), which considers the cumulative impacts of human activities on the Arctic environment to consider for a larger impact on the Arctic's ecosystem as a whole. This was followed by the adaptation towards the impact of Climate Change, melting of sea ice, changing weather patterns, and shifting ecosystems presented new difficulties for Arctic governance, needing a more adaptable strategy. This also led to engagement with international organisations such as the United Nations Framework Convention on Climate Change (UNFCCC) and the Intergovernmental Panel on Climate Change (IPCC), aligning its policies with international climate goals.

Current Frameworks, Policies & Challenges for Ocean Management

In recent years, the Arctic Council has also placed a greater emphasis on the difficulty of balancing environmental conservation

with sustainable economic development. The region's vast natural resources, which include oil, gas, and fisheries, have gained widespread attention, mainly from the big powers. However, the Council has highlighted the necessity of ensuring that resource extraction and commercial activities are carried out in a way that reduces environmental effects and preserves the Arctic's distinctive ecosystems.

The Indigenous peoples' role in Arctic governance has become ever so crucial. Indigenous tribes have lived in the Arctic for millennia and have extensive knowledge of the ecosystem and sustainable ways. The Council has seen increased Indigenous participation in decision-making processes, ensuring that their perspectives and traditional knowledge are considered in policies and programs. This inclusive approach has increased the Council's legitimacy and effectiveness. As new challenges arise, the Arctic Council has broadened its mandate to include issues such as marine spatial planning, ocean acidification, and marine waste which have major ramifications for the health of Arctic ecosystems and the livelihoods of local inhabitants. These changes disrupt marine ecosystems and the livelihoods of coastal communities. Biodiversity loss is also accelerating, driven by these environmental stressors and human activities, resulting in the decline of key species and the degradation of their habitats. Moreover, increasing maritime activity raises the risk of oil spills, which could have devastating consequences for the fragile Arctic environment. The Arctic Council has adopted the following key policies to ensure that the Arctic region is free from contamination and that the economic and conservation efforts are balanced:

1. **The Arctic Marine Shipping Assessment (AMSA)** addresses the dangers associated with expanding marine traffic in the Arctic. AMSA conducted an extensive examination of shipping patterns, environmental implications, and the need for regulatory frameworks to ensure safe and sustainable shipping practices.
2. **The Arctic Contaminants Action Program (ACAP)** tackles the problem of persistent organic pollutants (POPs) and other harmful compounds in the Arctic. ACAP's programs have focused on reducing pollutant emissions, cleaning up contaminated sites, and promoting best environmental practices.
3. **The Conservation of Arctic Flora and Fauna (CAFF)** Working Group works to safeguard Arctic biodiversity. CAFF has led efforts to monitor species and ecosystems, establish conservation plans, and form international partnerships to protect the Arctic's distinctive flora and fauna.

Geopolitically, the Arctic's vast natural resources, including oil, gas, minerals, and fisheries, have attracted significant global interest, fueling competition among states. Territorial disputes over overlapping claims to Arctic territory and maritime zones add to the tension, making cooperation more difficult. The opening of new shipping routes further complicates matters, as states must balance economic opportunities with safety and environmental protection. The growing military presence of some states in the Arctic is also an increasing concern about regional stability and the potential for conflict.

Over the years, the Arctic Council has also played a key role in fostering collaboration and promoting sustainable fisheries management. One of its major achievements was the creation of the Arctic Fisheries Working Group (AFWG) in 1998, which has been actively aiding in collecting and analysing scientific data on fish stocks and sharing best practices for fisheries management. This collaboration has improved stock assessments and management practices across the region. One of the key elements of the Council’s success has been its emphasis on data sharing, which enables member states to make informed decisions and conservation

efforts. It has also worked closely with other international organisations, such as the North Atlantic Fisheries Organization (NAFO), to address transboundary fish stock issues while also including Indigenous communities in fisheries management through their traditional knowledge, which has also been a major practice in the Council's functions.

The Council faces significant challenges towards this end as well, data gaps concerning certain fish stocks and regions, create uncertainties that make management and conservation efforts difficult. Climate change adds to the disruption in fish distribution and behaviour, making future trends harder to predict. Illegal, unreported, and unregulated (IUU) fishing also continues to threaten Arctic fisheries, and the Council's limited enforcement authority undermines its ability to ensure compliance with sustainable practices.

Successful Initiatives and Indigenous Participation

The Arctic Council has relied heavily on indigenous groups to shape maritime management and marine environmental protection in the region. Their strong connection to the land and sea, along with millennia of traditional knowledge, gives major insights into the Arctic ecosystem, providing a thorough awareness of marine species, migration patterns, and complex ecological relationships aiding in detecting fragile species and environments., and providing insights that modern science may overlook. For example, Inuit communities have long noticed changes in sea ice thickness and distribution, offering early warnings of climate-related hazards. Furthermore, Indigenous tribes' millennia-long sustainable fishing and hunting methods provide valuable lessons for modern fisheries management and conservation efforts.
Indigenous community-based monitoring has also become important in Arctic ocean management. These communities are actively involved in monitoring maritime environments and gathering data on water quality, fish numbers, and the health of marine mammals, aiding in providing early warning signs of environmental changes such as toxic algal blooms or pollution. This promotes a sense of ownership and guarantees that Indigenous views are heard in maritime governance. Indigenous peoples have also made significant contributions to co-management, in which they share resource management responsibilities with government officials. This approach recognises Indigenous rights to land and sea and contributes to the preservation of Indigenous cultural traditions and livelihoods, ensuring that they coexist with the natural environment.

Indigenous communities across the Arctic have significantly helped in environmental monitoring and governance. Inuit communities in Canada actively monitor marine mammals, such as polar bears and seals, while the Saami people in Northern Europe contribute knowledge of reindeer herding practices that affect Arctic ecosystems. In Alaska, Native communities collaborate with researchers to document changes in marine ecosystems and develop adaptation strategies to address climate change. Integrating Indigenous knowledge into ocean management increases the Arctic Council's effectiveness in safeguarding the marine environment while also benefiting Indigenous communities' well-being.

Recent technological advances have transformed the monitoring and management of the Arctic's marine ecology. Autonomous Underwater Vehicles (AUVs) and gliders have greatly enhanced data collecting by sensing water temperature, salinity, and oxygen levels at previously unattainable depths. Satellite remote sensing provides extensive data on sea ice extent, ocean temperature, and other vital factors, offering a complete picture of the Arctic's environmental health. Ice-tethered profilers acquire data from beneath the ice, which is critical for studying the interplay of water and ice in extreme situations. Acoustic monitoring tools, such as hydrophones, monitor marine mammal populations and detect underwater noise pollution. Drones outfitted with high-resolution cameras monitor ice conditions and marine animal populations and Arctic

Wildfires, which are a natural part of the Arctic's boreal forest, have become more frequent and widespread in recent years, owing mostly to global warming. These devices also help to respond to environmental calamities like oil spills. Genetic analysis improves our understanding of marine animals by tracking diversity and detecting invading species. Oceanographic buoys, outfitted with sensors, continuously monitor ocean processes, giving critical information for marine management.

Impact and Key Takeaways

In terms of encouraging sustainable management of marine resources, cutting pollution, and preserving the Arctic's biodiversity, the Arctic Council has accomplished great strides. The creation of marine protected areas, the use of ecosystem-based management, and the inclusion of Indigenous knowledge in the decision-making process are notable accomplishments. However, closing the gap between scientific understanding and policy implementation is a significant problem. Although the understanding of the Arctic ecosystem has advanced, it is still challenging to translate research into practical policy. Closing this gap and guaranteeing that scientific findings inform governance require improved collaboration between scientists, policymakers, and stakeholders. It is also crucial to enhance cooperation with states that are both Arctic and non-Arctic. The Arctic Ocean necessitates international cooperation since it is a global commons. Even though there has been progress, especially with non-Arctic states, issues like resource competitiveness and climate change still require more effort to be resolved.

The experience of the Arctic Council provides important insights for international ocean governance. Its emphasis on Indigenous rights, ecosystem-based management, and international cooperation may serve as a model for other areas dealing with related problems. Adequate enforcement and flexible management techniques are essential for guaranteeing adherence to environmental laws in the Arctic. Because of the effects of climate change and human activities, the region is undergoing rapid changes. To preserve its ecology, adaptable management strategies are needed. To ensure that policy decisions keep up with the changing Arctic environment, continuous monitoring makes it possible to identify areas of success as well as areas that require improvement. The Arctic Council can maintain its vital role in protecting the area and advancing sustainable development by tackling these issues.

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IA DAILY BRIEF [1]

By Sayeka Ghosh, Padmashree Anandhan and Vetriselvi Baskaran

CLIMATE CHANGE

Submarine canyons as silent contributors to Antarctic ice sheet melting says an opinion

On 24 July, an opinion piece in *Earth.com* stated that a groundbreaking study led by the National Institute of Oceanography and Applied Geophysics has unveiled the crucial role of submarine canyons in the melting of the Antarctic Ice Sheet. These underwater formations act as conduits for relatively warm Circumpolar Deep Water, channelling it from the depths to the continental shelf and ultimately to the ice sheet's base. The research focused on the Totten and Ninnis glaciers, guardians of East Antarctica's largest subglacial basins. The study's lead author Federica Donda, emphasised: "Constraining the extent and long-term persistence of this phenomenon is crucial in deciphering potential responses of the ice sheet to global warming." Sedimentary bodies within these canyons provide evidence of persistent bottom currents, suggesting this process has been ongoing for at least a million years. University of Southampton's Dr Alessandro Silvano noted: "We have crucial new insights that there are preferred pathways for warm waters to constantly reach two of the largest glaciers on Earth." The author stated that this revelation has significant implications for global sea level rise, as the affected subglacial basins contain the equivalent of over eight metres of potential sea level increase. The findings underscore the urgent need for continued research to better predict and mitigate future environmental changes.

(Sanjana Gajbhiye, "Stability of Antarctica is threatened by submarine canyons," *Earth.com*, 24 July 2024)

Climate change-led polar ice melting causes a rotational slowdown of the Earth

On 16 July, a study published in the National Academy of Sciences revealed that polar ice melting has a significant impact on Earth's rotation, which would further impact "fundamental astronomical measurements and space exploration." The study said that the water influx from Greenland and Antarctica redistributes mass around the planet's equator which led the Earth to spin slowly. This will increase the length of days. The study used advanced observational techniques like Very Long Baseline Interferometry and the Global Positioning System to measure Earth's orientation and length of days. The study further highlighted that the ongoing climate change might exceed the lunar gravitational pull which was the primary reason for the rotational slowdown. Climate change has already increased the length of the day by approximately 0.8 milliseconds since 1990. This is likely to increase to 2.2 milliseconds by 2100. The impact increase in the length of days could would affect space travel and navigation. A slight increase from 86,400 seconds in length of the day could impact the space mission as minor deviations in the orientation of Earth would lead to disc

IA Daily Brief provides a brief overview of the latest developments in the Arctic and Antarctic from climate change, economy, politics, science and technology, security and governance aspects.

differences over distance. ("New Study Links Polar Ice Melt To Longer Earth Days," *Outlook*, 16 July 2024)

Climate change-induced ocean warming causes unprecedented harmful algal blooms in the polar waters

On 16 July, an exploration carried out by Evie Fachon and colleagues in July 2022 captured the largest toxic bloom of *Alexandrium catenella* in the Bering Strait. This exploration was originally focused on searching for tiny and dangerous creatures on the Alaskan coast. The toxic bloom of *A. catenalla* was extended to at least 600 kilometres. Scientists noted that these polar blooms will occur if the oceans hit higher temperatures due to climate change. Fachon, the lead author of a paper describing the 2022 bloom, mentioned that "The warmer it is, the faster the cell can potentially grow and multiply." The team stressed that these toxic blooms can implicitly unsafe marine harvests. *A. catenella* blooms have plagued fisheries in southeastern Alaska and currently, these are becoming a threat to Arctic communities, according to evidence. Earlier, Fachon's Ph.D. adviser, WHOI's Donald Anderson documented massive Acatenella cysts blooms of 1000 kilometres from the Bering Strait to the Beaufort Sea. He observed that when the conditions are met, these cysts can seed in the surface water. Thus, Fachon and colleagues suspect that the 2022 bloom might germinated somewhere in the Bering Sea, through strong winds. The article further mentioned that the Bering Sea communities lack the infrastructure to detect these unprecedented blooms. There has been a knowledge gap as well which makes the upgrade difficult. The tribes in the community are still dependent on seabirds, seals, walrusesand whales, says the team. ("Warming oceans are pushing harmful algal blooms into polar waters," *Science*, 16 July 2024)

DEFENCE & SECURITY

Russia: Fighter jets intercept two US military aircraft bomber

On 21 July, *CBS news* reported on the Russian fighter jet interception of two US military MiG-29 and MiG-31 long-range bomber aircraft that approached the Barents Sea (Russian border) in the Arctic. Moscow's Defense Ministry stated that the "crews of the Russian fighters identified the aerial target as a pair of U.S. Air Force B-52H strategic bombers." Recently, Russia has been increasing its military operations in the Arctic Circle such as advanced hypersonic missile tests. Similarly, the US regularly flies in international waters. Both developments have resulted in the recent aggressive response by Russia. For instance, in June, Russia accused the US of using its reconnaissance drone flights over neutral waters in the Black Sea.
The DefenceMinister also directed the officials to prepare a "response" to those US drone flights. Any such confrontation would further fuel tensions over the war in Ukraine. ("Russia says its fighter jets intercepted 2 U.S. strategic bombers in the Arctic," *CBS News*, 21 July 2024)

Canada Defence Ministry to acquire new submarines to boost security in the Arctic

On 18 July, the Canadian Defence Ministry proposed a plan to acquire new submarines capable of travelling under sea ice. This is to strengthen the defence capability of its Arctic coastal region. According to Canada's Defence Minister Bill Blair, the submarines are capable to "…detect, track, deter and defeat adversaries." He said: "This new fleet will enable Canada to protect its sovereignty in a changing world and make valuable, high-end contributions to the

security of our partners and NATO Allies." It aims to tackle and contain the growing Chinese and Russian presence in the Arctic region. The Canadian Department of National Defence predicted the Northern Sea Route to become the most efficient shipping route between Europe and Asia by 2050. Canada's military also expressed concern over a growing number of Chinese dual-purpose research vessels that are allegedly collecting data regarding the Canadian North. The defence ministry found the threat to be emerging from Chinese increasing presence and Russian intelligence activities through its submarines in Arctic waters. Thus, Canada intends to increase military presence in the Arctic region. Similarly, Canada, the US and Finland will meet to hold a trilateral partnership to build Best Arctic icebreakers to improve polar capabilities. ("Canada wants 12 new submarines to bolster Arctic defense as NATO watches Russia and China move in," *CBS News*, 18 July 2024)

FISHERIES

Report published on challenges in sustainable fisheries

On 12 July, *Phys.Org* reported that Climate change is making it increasingly difficult to sustainably manage fisheries, as "the future of global fish stocks becomes highly uncertain." This leads to inaction and a slow process of adapting fisheries and their management to the impacts of climate change. It claimed that this situation could lead to a trend of "overfished global fish stocks." This uncertainty threatens the Arctic Ocean ecosystem where polar bears, beluga whales, narwhals and a range of fish species, such as Arctic char and Greenland halibut can be identified. The article underlined a "16-year moratorium on commercial fishing in the central Arctic Ocean" by 10 countries signed in 2021 which aims to provide an opportunity to improve scientific understanding of the Arctic ecosystem. The agreement states that "any future fishing activity or international management agreements are to be based on scientific information and Indigenous knowledge." However, concerns arose and parties of the agreement saw this as "temporary."

To address this, a collaboration of scientists, environmental organizations and the European Polar Board has proposed for a future fisheries governance. The collaboration used the marine ecosystem model ensemble to quantify the future uncertainty of Arctic fisheries. The assessment model resulted in highlighting "substantive uncertainty about the Arctic's future" without remarking on the direction (increase or decrease). To cope this, the collaboration proposed to evaluate risk and mitigated it through joint processes like structured scenario planning. ("Accepting uncertainty in sustainable fisheries is essential in a rapidly changing Arctic, says researcher," *Phys.Org*, 12 July 2024)

GEOPOLITICS

US concerns mount over Russia-China Arctic cooperation amid climate change, reports *The Hindu*

On 24 July, *The Hindu* reported that the US has expressed growing unease about increasing military and economic collaboration between Russia and China in the Arctic. As climate change rapidly transforms the region, opening new opportunities for resource exploitation and shipping routes, geopolitical tensions are rising. US Deputy Secretary of Defence Kathleen Hicks highlighted China's significant funding of Russian energy projects and joint military exercises near Alaska. She emphasised that climate change is "enabling all of this activity" by melting polar ice and thinning coverage. Russia has been modernising abandoned Soviet-era bases in the Arctic, while China invests heavily in polar research. Moscow is also promoting its Northern Sea Route as an alternative cargo path between Europe and Asia. Both Russia and China defended their Arctic policies, with Beijing claiming to act on principles of "respect, cooperation, mutual wins and sustainability." The Kremlin asserted that their collaboration "contributes to an atmosphere of stability and predictability" in the region. The US Arctic strategy underscores the area's strategic importance, warning of potential "accidents, miscalculation and environmental degradation" as human activity increases. It projects the first "practically ice-free summer by 2030," emphasising the need for US forces to be prepared for Arctic contingencies. ("Russia, China push back after U.S. Arctic strategy flags military cooperation," *The Hindu*, 24 July 2024)

INFRASTRUCTURE

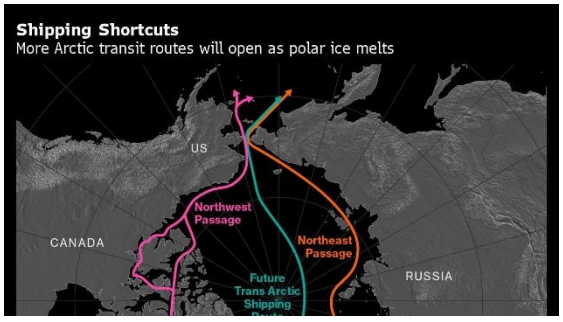
China launches new Arctic service route with Russia

On 05 July, China and Russia launched the Arctic Express Number One rail-sea cargo service. The Chinese firm announced that the new service was launched by China's NewNew Shipping Line and Russia's Rosatom State Nuclear Energy. The new service aims to tranship cargo by rail from Moscow to Arkhangelsk port in Russia and then it will be transferred across the Arctic and North Pacific oceans. The distance it covers is about 13,200 kilometres. (20 to 25 days). China's NewNew Shipping Line will be managing the container ship navigation and transportation and Russia's Rosatom will handle piloting and escorting the route. The new route benefits China as it is less dependent on traditional shipping lanes like the Suez Canal and minimal congestion. The route saves 5000 to 8000 kilometres and at least 20 days from the traditional Suez Canal route. In addition, earlier in June China and Russia signed an agreement to build a fleet of ships that will strengthen the newly launched service route. Following this, both are all set to make five ARC7-class polar container vessels. This move is expected to help both achieve normal shipping via the Arctic throughout 2024. ("China, Russia Open New Arctic Express Trade Route," *Yicai*, 18 July 2024)

SCIENCE AND TECHNOLOGY

New study reveals Southern Ocean's CO2 absorption higher than previously estimated

On 25 July, *Technology Networks* reported that recent research led by the University of East Anglia and Plymouth Marine Laboratory uncovered that the Southern Ocean absorbs 25 per cent more carbon dioxide than prior estimates suggested. Using a novel eddy covariance technique, scientists directly measured air-sea CO2 fluxes during seven research cruises, challenging weaker estimates based on float data and model simulations. The study's lead author Dr Yuanxu Dong, emphasised that this discovery "provides direct observational evidence that this ocean may take up more CO2 than previously recognized." The research, published in Science Advances, highlights the importance of high-resolution data in accurately assessing the Southern Ocean's role in climate regulation. While the study primarily focused on summer measurements, researchers acknowledge the need for year-round data collection. ("The Antarctic Ocean Is Absorbing More Carbon Than Previously Thought," *Technology Networks*, 25 July 2024)



Underwater acoustic study unveils marine mammal insights near Heard Island

On 24 July, Australian Antarctic Program scientists conducted a groundbreaking study using passive acoustic monitoring off Heard Island. The study revealed valuable information about marine mammals in the Southern Ocean. The research team, led by Drs Cara Masere and Brian Miller, deployed a seafloor-moored recorder that captured over 4,700 hours of underwater sounds over seven months. The recordings documented various species, including the first detections of fin and Antarctic minkewhales in the area. Notably, the study focused on sperm whale vocalizations, analysing 719 hours of clicks to estimate their size and behaviour. Dr Miller explained that the inter-pulse-interval of these clicks correlates with the whale's head size and overall length. ("Sound science delivers whale symphony," *Australian Antarctic Program*, 24 July 2024)

Turkey conducts fourth Arctic Scientific Research Expedition

On 18 July, Turkey conducted its fourth Arctic Scientific Research Expedition encompassing 16 diverse projects in the Arctic Ocean. This 11-member team expedition proposes to study the planet's future and will return next week after gathering insights and data from their expedition. This project was conducted under the Turkish Presidency and Ministry of Industry and Technology and coordinated by Tubitak Mam Polar Research Institute.

Further, there were also collaborations from Bulgaria and Chile institutions. Further, the leader of the expedition, Professor Ersan Basar focuses on: "Examination of Plankton and Pigment Composition in the Barents Sea during the 2024 Arctic Summer," in which he aims to study the health and dynamic changes of the Barents Sea ecosystem. Deputy leader Dogac Baybars Isiler was assigned to oversee logistical operations for navigation and safety enhancement in the polar region.

About the Authors

Padmashree Anandhan
Ms Anandhan is a Project Associate at the National Institute of Advanced Studies. Her research focuses on ocean health, governance and contemporary Europe.

Sayeka Ghosh
Ms Ghosh is a Research Assistant Intern at NIAS, Bangalore. Her area of interest includes the polar governance of Japan and East Asia.

Vetriselvi Baskaran
Ms Baskaran is a Research Assistant Intern at NIAS, Bangalore. Her area of interest includes fisheries and ocean governance.