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Changing Dynamic of Maritime Security: A Critical Study of Melting the Arctic Ocean

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Abstract:

This qualitative study aims to comprehend the issue of changing dynamics of maritime security in the Arctic due to the climate change. Melting of ice has now become one of the most preeminent issues in the Arctic which; now; requires international attention. The region is strategically transforming due to the environmental damage, increase resources competition and the interests of several non-Arctic states; this phenomenon in evolving the maritime security dynamic by opening of new routes and economic potential. Multipolarity in Arctic has made governance much more difficult due to difference in interests and policies of states. The threat to maritime security has been affecting the human security in many aspects and can lead towards a devastating situation in near future. Melting Arctic requires cooperation of state and non-state actors; measures like confidence-building, crisis management and regulations through International and reginal organizations can help. This paper contributes to United Nations SDGs which promote responsible consumption, climate action, protection of life, and international partnership; crucial for the region. The study recommends the ruling out of underlying reasons behind melting Arctic to protect the region from any conflictual situation in future.

Keywords: *Arctic region, Climate change, Environmental degradation, Human security, International Law, Maritime security, Multilateral organizations*

Introduction:

The Arctic region, previously defined by its remoteness and harsh weather, is experiencing a dramatic shift through the rapidly increasing effects of climate change. With receding sea ice and opening-up of hitherto inaccessible sea routes, the Arctic has quickly become a new geopolitics frontier. The "melting Arctic" is not merely an emblem of global environmental disruption but also a driver for changing dynamics in maritime security. The Arctic, previously shielded from the intricacies of global politics, now finds itself at the center of strategic competition, environmental exposure, and economic aspiration.

The emerging limits of maritime security in the Arctic from a multi-perspective angle grounded in theoretical understandings of neo-realism and securitization theory. Neo-realism is interested in states' strategic rationality and power-oriented behavior, while securitization theory is interested in discursive and political practices through which Arctic affairs are framed as security issues. Together, these understandings provide a solid ground to understand the security dynamics unfolding in the region.

The strategic development of the Arctic in the context of climate change, rising competition for vast untapped natural resources, and rising interest from non-Arctic powers such as China, India, and the EU are discussed. This new reality has led to military posturing, policy restructurings by the Arctic states, and increasingly contentious debates about the roles of international organizations and law in regulating the affairs of the region. Controlling this multipolar Arctic, however, is decentralized and bedeviled by great power competition, and the structures that exist are not yet in a position to contain the danger of miscalculation and war. Additionally, the new focus of maritime security in the Arctic is not limited to classic state-based threats. It also includes wider human and environmental security issues; ranging from indigenous peoples' rights and environmental degradation to maritime safety and search-and-rescue issues. These multifaceted security requirements reflect the imperative need for cooperative measures, such as confidence-building measures (CBMs), effective crisis management, and inclusive involvement of non-Arctic actors.

The paper also highlighted the need for Arctic policies to be integrated with the United Nations Sustainable Development Goals (SDGs), which promote responsible consumption, climate action, institutional capacity strengthening, and international partnership. In examining the changing dynamics of Arctic maritime security, the research hopes to contribute to deepening the rich understanding of the new strategic paradigm of the region and the necessity of cooperative management within a melting and militarizing Arctic.

Literature Review:

A recent study by Gartler et al. (2025) on “A transdisciplinary, comparative analysis reveals key risks from Arctic permafrost thaw” in journal Communication earth & environment give detailed insights on how thawing is posing serious risks in Arctic. Risk assessment has been carried out on four main regions which involves areas of Norway, Greenland, Russia and Canada. Physical processes such as; unpredictable weather conditions, climate change, erosion, changes in flora & fauna and biochemical cycles; that have been increased by the industrialization causing hazards in region. These hazardous conditions involve poor water quality, infections & contaminants, food insecurity, destruction of infrastructure and difficulty in mobility. These destructive changes are causing catastrophic consequences to ecosystem in the region. It mainly emphasizes on climate change leaving out the changing political structure in the Arctic.

Mary B. West on Arctic Warming: Environmental, Human, and Security Implications (2021) published in Vanderbilt journal of transnational law, several critical issues of climate change have been discussed that shows the change in marine ecosystem and its impacts on human lives especially by its implications on national security. Melting of ice and opening of new maritime routes; predicting that by 2050 there will be 125 days per year with 75% less sea ice cover making conditions favorable for mobility. It also predicted that 13% world’s undiscovered oil and 30% undiscovered natural gas is present in the region which can alter the geostrategic and geopolitical situation of the region where states like United States and Russia will fiercely challenge each other, creating towards security dilemma. It deeply explores the environmental, human and security but geopolitical changes impacting ion international relations are required to be explored.

A detailed examination of state policies in Arctic region with a comparative study of the arctic strategies was done by Lassi Heininen in an article “Arctic strategies and policies: inventory and comparative study” (2012) published by the Northern Research Forum & the University of Lapland. By the visible changes in the environment, states are now evolving their policies to meet national interests. The self-governing status of Greenland, economic potential of the region and security risks. Each states having its own interests, particularly prioritizing the protection of national security and sovereignty beside environment protection and collaboration at international level to minimize the risks. Economic

development by using natural resources and emerging maritime routes through more sustainable ways but the risk of exploitation of environment in on high stake at the competition is high in the region. It primarily focuses on the policies of states present in Arctic region leaving behind the deep effect of climate change on the ecosystem which can later the dynamic of environment all over the world.

Addressing the implications of how socio-economic patterns have been changing in Arctic region because of the climate change by Tingstad et al. (2024) in a research article "Divergent trajectories of Arctic change: Implications for future socio-economic patterns" published by Springer Nature shows that Arctic region is warming up four times more than as it was in 1979 by the devastation of environment. The change is emerging in several aspects that includes political, social, economic, technological and security. The invasion of Ukraine by Russia has divided the region into more bipolar structurer causing disruption of cooperation but the mutual emerging challenges are changing the dynamic of the region in order to overcome the social and environmental tensions which can minimize the geopolitical crisis. While analyzing on the socio-economic changes the indigenous people have been neglected.

The multifaceted threats posed on the human security in a region like Arctic that has been highly affected by climate change that will probably face much bigger challenges in future have been taken udder account in a research paper by Mohammed Abdullah Shiblee and MD Mufassir Rashid on "Environmental security of the Arctic: A human security perspective" publishes in journal Research in Social Change (RSC). Beside national interests and states security; human security lies as a binger issue because of increase in pollution and risk of health and natural hazards. The paper provides insight on how human security is a very diverse concept dealing with other kinds such as economic, political. climate, health, food, personal and community security. Drastic climate change in the region will cause consequences on the long term for the indigenous people of Arctic. Disturbing increase in the suicide rates of these people is often seen as a result dark and cold lifestyle. Now the globalization has caused a drastic increase in health vulnerabilities and illness because of natural hazards but worst has yet to come which needs to be controlled. While dealing with human security to a great extent, the impact on international political structure have not been analyzed which is now have become a major requirement.

In a policy brief by Thomas Hughes on "Arctic Defense in 2023: A review" in NAADSN clearly mentions the defense and security approach of Arctic states from NATO to non-NATO members. Russia opposition of the militarization of Arctic but a clear stance on countering the rival states shows the complexity in the region. Finland's military exercises in the region as being a part of NATO and U.S. increase in military operations in order to deal with Russia in the region in 2023 has shown the increase of militarization threats and security dilemma in the region that can potentially cause conflicts over the maritime routes, natural resources and national security. The policy brief has emphasized on the security dynamics in terms of hard power of states leaving behind the devastating effect of human security that is now at risk.

A report "The future of Arctic security: The geopolitical pressure cooker and the consequences for the Netherlands" by Dick Zandee, Kimberley Kruijver and Adája Stoetman (2020) published by Netherlands Institute of International Relation Clingendael states the role of multilateral organizations; EU & NATO as a main actor in the region. Beside the individual states; the option of organizations is also available in the region in order of security. Arctic security is a concern for whole of the Europe which makes European Union an important entity there. Beside EU; NATO is another crucial actor that can shape the strategies in the region but it faces negative response from other actors on its involvement and can cause conflictual scenario in dealing with Moscow. Organization for Security and Cooperation in Europe (OSCE) is also another potential actor in the region that can deal with security issues in the region but the division in the organization and the conflicting national interests are hindrance in the case of OSCE.

Valery A. Tsvetkov, Mikhail N. Dudin and Anna A. Yuryeva in their article on "Strategic development of the Arctic region in the context of great challenges and threats" by Market Economy Institute of RAS provides opportunities and threats for Russian Arctic as the region is full of hydrocarbons, oil, natural gas and minerals. The economic opportunities, increase in tourism and research productions in the region will likely to increase in the future but there are some potential threats mentioned which includes the need of huge investment, oil-monarchies in the middle-east as great rivals, lack of communication infrastructure in the region and high risk of environmental exploitation to a region that is already at the stake of serious climate change consequence and lastly how this will impact the competition at global level in underexplored.

Alexander Sergunin & Gunhild Hoogensen Gjørv in an article "The Politics of Russian Arctic shipping: evolving security and geopolitical factors" (2020) by The Polar Journal discusses the importance of Norther Sea Route (NSR) for Russia; not only for "soft security" like economy and environment but the "hard security" too for which Russia is continually militarizing through bases along the NSR for more efficient navigation and maritime security. Arctic zone holds immense importance in Russian politics and national interests for economic and security purposes.

Based on the data from Arctic zones; Malgorzata Smieszek, Oran R. Young, Alf Hakon Hoel and Krittika Singh pm article "The state and challenges of Arctic governance in an era of transformation" (2021) by One Earth focuses on the need of governance in the region like Arctic that has been highly affecting by climate change. The rise of temperature and melting of ice is becoming destructive that requires cooperation in which Arctic Council (AC); an intergovernmental organization; playing a crucial role. It has provided the data ice has decreased by 44% and there will be ice free summer in Arctic Ocean by 2050 that is a major setback for the whole region. AC has 8 member states, 6 working groups and 6 organizations that represents indigenous people. Arctic region does not lack governance; it lacks coordination and progressive development for governance mechanism which has now become a requirement for the region in order to protect it from natural hazards that are on their way.

Research Methodology:

This research employs a qualitative study design, in order to examine the evolving dynamics of maritime security within the Arctic region as a result of climate-induced melting. The approach to methodology is exploratory and analytical with the goal of examining the evolving maritime security issues and trends of change in strategic patterns in the Arctic region.

The study is based solely on secondary sources of data. An extensive review of scholarly literature was done through Law of Seas by United Nations and Google Scholar, where applicable peer-reviewed journal publications, research studies, policy briefs, and analytical reports were screened for relevance to maritime security in the Arctic and climate change. These constitute the empirical and theoretical basis of the research.

Qualitative analysis involves content analysis. By a close reading of the chosen texts, resurgent themes like maritime management, security weaknesses, environmental transformation, and strategic interests are recognized and grouped. Thematic analysis is useful in revealing latent stories and arguments within the literature at hand, facilitating an organized understanding of how the disappearing Arctic is imagined in maritime security.

The exploratory nature of the research enables the researcher to investigate a broad range of topics while the analytical approach to the study offers interpretation and critical analysis from the observed patterns and trends. Overall, this approach guarantees a comprehensive, literature-based analysis of the way environmental change in the Arctic is affecting maritime security and setting the stage for even deeper and more specialized research in future work.

Statement of Problem:

Global warming-induced rapid melting of Arctic Sea ice is reorienting the maritime landscape of the region by creating new passable routes, which is redefining the nature of maritime security. This new access poses serious challenges, such as heightened maritime traffic, disputes over jurisdiction, and the risk of increased military presence. Yet, lacking is a thorough analysis directly connecting these environmental changes to developing maritime security challenges and changes in regional security structures. This research bridges that gap by exploring how the melting Arctic influences the availability of maritime routes, the character of security challenges, and the evolution of security arrangements within the region, offering insights required for comprehending and managing the future of Arctic maritime security.

Research Questions:

1. What are the new maritime security challenges arising from expanded navigability in the Arctic?

2. How does environmental change in the Arctic add to changes in regional security arrangements or naval presence?

3. In what ways is Arctic Sea ice melting affecting the availability of maritime routes and the wider regional security environment?

Theoretical Analysis:

Neo-Realist Theory:

Neo-realism, or structural realism, perceives the international system as anarchic, with no central power to impose rules and guarantee stability. States, hence, seek survival, national interests, and relative power. In the Arctic, the melting sea ice is not an environmental phenomenon; it is an opening to strategy. As seas such as the Northern Sea Route and the Northwest Passage become more accessible, both Arctic and non-Arctic states are reassessing their security and economic policies.

Through a neo-realist perspective, this new geography is causing a rebalancing of regional power. States are deploying icebreakers, increasing naval presence, and bolstering territorial claims. The Arctic is emerging as a theater of great power rivalry; most notably as Russia, the U.S., and China build long-term strategies to establish dominance over trade routes, resources, and strategic chokepoints. This behavior is not motivated by cooperation or climate, but by the zero-sum calculus of power: if one state becomes established in the Arctic, others will be left behind. Neo-realism attributes this conduct as a rational reaction to uncertainty and the need to preserve relative advantage in an unstable security environment.

Securitization Theory

Securitization theory, developed by the Copenhagen School, examines how issues become security concerns by language and political framing. In accordance with this theory, an issue is deemed a "security issue" once influential actors, such as governments or military commanders, pronounce it as such and convince their audience that extraordinary action is warranted.

When it comes to the melting Arctic, securitization theory explains how climate change, which is fundamentally a scientific and environmental problem, is reframed as a national and maritime security threat. Political leaders frame the opening of Arctic waters as not merely a navigational or economic transition but as a possible security vacuum. Consequently, operations such as enhanced military deployment, constructing ice-worthy ships, or crafting Arctic defense plans are couched as needed actions to "protect sovereignty" or "guard strategic interests."

What's important to note here is that securitization converts a global common issue into a competitive, and frequently militarized, one. Rather than providing legitimacy for collective environmental action, it legitimizes a competition for control, based on the dialectic of defense and

deterrence. This theory can be used to make sense of the increasing application of militarized language and behavior in the Arctic, even without an immediate military threat.

The Strategic Transformation of the Arctic:

- **Environmental transformation:**

The Arctic has been transforming to great level by the extreme environmental changes all around the globe. From ice melting to emergence of new routes and changing dynamics of security in different aspects; Arctic is facing threats maritime security more than ever.

Melting ice and the influx of freshwater into the polar oceans are directly contributing to rising sea levels. Over the last three decades, the average annual sea-ice extent has decreased by approximately 8%; a reduction of nearly one million square kilometers, which is larger than the combined area of Norway, Sweden, and Denmark (or Texas and Arizona). Summer sea-ice cover has decreased even more drastically, with a 15–20% decrease in late-summer ice cover. This trend of melting is not only continuing but is accelerating. Scientists estimate an additional 10–50% loss in the average annual sea-ice cover by the close of the 21st century. Summer sea ice is projected to reduce by over 50%, and certain climate models even suggest the disappearance of summer sea ice altogether before the century is out. (West, 2021)

By the reduction of ice, new maritime routes have been emerging causing increase in competition among international actors in and around the region. As the Arctic melts and sea ice melts as well, waters that were once inaccessible are being opened up, and more traffic is moving through the area by vessels. While projections are uncertain, some estimate that by 2050 the Northern Sea Route, which is along Russia's northern border, could have as many as 125 days a year with fewer than 75% of the route covered in ice. This would make it more suitable for navigation by ships built to handle icy water. In the same way, the Northwest Passage over Canada is also seeing diminished ice coverage. (West, 2021)

- **Resource Competition & Economic Stakes:**

The Arctic is well endowed with mineral wealth in the form of hydrocarbons. Northwestern Siberia and the North Slope of Alaska are two large producing regions of oil and natural gas. Northwestern Siberia, discovered during the 1950s, is a significant source of Russia's oil and gas, whereas Alaska's North Slope is a source of roughly 20% of US oil production. Smaller deposits are found in Canada's Northwest Territories, Russia's Pechora basin, and Sakha. Offshore drilling continues, particularly along Russia's extensive continental shelf, while exploration off Svalbard and Greenland remains to be fruitful. Transportation by pipeline is vital to development. Russia dominates hard-rock mining, with principal centers at Murmansk and Norilsk. Sakha is a principal source of diamonds, and the Arctic also produces gold, tin, nickel, copper, platinum, cobalt, iron ore, coal, and apatite. Arctic Canada and Alaska have small lead-zinc mining. (Armstrong & Dunbar, 2025)

On the other hand, fishing is one of the most significant renewable resources of the Arctic. The Barents, Greenland, and Bering seas provide around 10% of the world's marine catch, although overfishing is increasingly becoming a cause for concern. The primary base of Russia's fishing industry is Murmansk, which is free from ice, and it has large operations in the Barents and Norwegian seas. These seas are within Russia's exclusive economic zones and restrict other countries' access to them. Freshwater fishing, particularly in Siberia, focuses on value-priced species such as salmonids, while Arctic char is a highly prized delicacy in Canada. (Armstrong & Dunbar, 2025)

The Arctic is also increasingly a focal point of strategic rivalry because it contains unexploited riches and new maritime trade routes; Russia being the preeminent Arctic power with the longest coast and extensive military facilities within the region, United States considers the Arctic crucial to its national security and economic interests and the growing issue of Greenland. The outcome is a growing

geopolitical competition characterized by overlapping claims to territory, military expansion, and economic interest, all fueled by climate change and Arctic thaw.

- **Interests of non-Arctic States in the Arctic:**

Non-Arctic States have exhibited sustained interest in the Arctic through policy declarations, diplomatic initiative, increased investment in science, logistics, infrastructure, and economic activity; shipping most prominently. They take an active role in other forums like the Arctic Circle Assembly, Arctic Frontiers, and Arctic Spirit conferences with access to Arctic Council decision-making being limited. Their interests vary based on historical connections, national capabilities, and strategic interests. Some, such as the UK, France, and the Netherlands, focus on their history of Arctic exploration expeditions. Others focus on near-future economic interests like shipping routes, tourism, energy, and fishing. Most have an interest in joining climate research, Arctic governance, and environmental policy to address global impacts of Arctic change. (Bloom, 2022)

Security and geopolitical interests also drive action. Countries highlight various drivers: the UK links Arctic interests to post-Brexit global influence; the EU focuses on multilateral Arctic cooperation and climate action; Singapore highlights change in global shipping; Japan and South Korea highlight leadership in technology; Germany highlights freedom of navigation and international law. (Bloom, 2022)

Whereas reaffirming respect for the sovereignty of Arctic States, Non-Arctic States would prefer to influence Arctic governance and engage with Indigenous peoples. China, for example, is a "near-Arctic State" making significant investments in shipping and science and exercising military interest by naval presence in the Arctic. The 2018 Agreement on the Prevention of Unregulated High Seas Fisheries was a step towards non-Arctic engagement in the governance of the Arctic. Its acknowledgment of the large fishing states like China, Japan, South Korea, and the EU institutionalized them in regional cooperation. (Bloom, 2022)

Evolving Maritime Security in the Arctic:

- **Military Buildups:**

States in Arctic are spending billion of dollar in military buildups to counter the rivals and deter at the most efficient manner. Russia, Canada, United States, Denmark (and Greenland) and Norway have shown concerns over the probability of conflicts in future due to the strategic transformation of the region by the climate change.

Canada's Arctic maritime security capabilities are modest but developing, The Royal Canadian Navy possesses 13 significant surface warships and 4 diesel-electric submarines suitable for Arctic operations. The Canadian Coast Guard, has 6 large (2 heavy, 4 medium) and 7 small unarmed icebreakers, most active during only summer. Only 5 of the 6–8 Arctic Offshore Patrol Vessels (OPVs) and The Nanisivik base on Baffin Island is crucial ones. Generally, in spite of strategic priority, Canada's development of Arctic maritime capabilities has been impeded by budget and changing priorities. (Wezeman, 2016)

Denmark's Arctic naval capabilities include; three big frigates and two support vessels can sail in Arctic seas, four Thetis-class OPV/frigates (1990s) break ice up to 1 meter thick and are used for North Atlantic and Greenland patrol missions. Rasmussen-class ice-strengthened OPVs, guard off Greenland. Tulugaq large ice-strengthened patrol vessel, MH-60R helicopters and a naval base at southern Greenland by Denmark. On the other hand, Norway's Arctic naval capacities comprise of Nansen-class frigates, large combat support ship, Ula-class submarines, research vessel with electronic intelligence capacity with several OPVs. (Wezeman, 2016)

The two most important states in the region are Russia and United States; two major rivals and competitors that are expanding their capabilities in order to have a strong deterrence. Russia's Arctic maritime capabilities involve; Russia's Northern Fleet, Russia's nuclear-powered ballistic missile

submarines (SSBNs), the core of its nuclear deterrent, shielded by surface vessels, submarines and aircraft. Russia's sole aircraft carrier. The second-largest, Pacific Fleet, is present on the eastern Arctic coast. Project-97 small icebreakers, Project-97P armed icebreaking OPVs, civilian icebreakers, including former navy ships, potentially could aid naval operations. Project-21180 patrol/support ship, Project-03182 Arctic Sea Tankers, Project-23550 patrol vessels and several SSBNs. (Wezeman, 2016)

United States Arctic maritime capabilities are US Navy; despite not being ice-dedicated, large vessels (e.g., aircraft carriers, amphibious ships) can be used in Arctic conditions. Nuclear attack submarines (not SSBNs) are Arctic-capable, having the ability to pass under and break through ice. The Arctic Submarine Laboratory develops Arctic capabilities. US Coast Guard (USCG) have Principal Arctic patroller, homeported at Dutch Harbor, Alaska. Legend-class (NSC) OPVs and unarmed icebreakers. (Wezeman, 2016)

- **Strategic Changing in Policies of Arctic Nations:**

By the change in environment, the policies of Arctic nations have also been changing due to increase in competition and high risk of conflicts over new maritime routes, resources and security threats.

The 2009 Arctic Region Policy broke with the generally abstemious U.S. policy toward the Arctic following the Cold War, acknowledging the increasing strategic value of the region but keeping the emphasis primarily on energy and security. By contrast, the 2022 National Strategy for the Arctic Region embraced a wider and more all-encompassing framework, prioritizing four pillars: security, climate change and environmental protection, sustainable development, and international governance. Changes in the physical, economic, and geopolitical balances of the region have shaped U.S. grand strategy in the Arctic, marking the end of thirty years of post–Cold War stability and an echo of heightened tensions with Russia and other Arctic interests. (Pechko, 2025)

The 2009 United States Arctic Region Policy sought to diminish oil dependence through access to Alaskan reserves. It encountered environmental resistance, curtailing implementation. The Trump administration, in 2021, granted leases on more than 400,000 acres in the Arctic National Wildlife Refuge. The 2022 National Strategy recognized economic dependence on hydrocarbons but prioritized diversification and green energy. In 2024, the Department of the Interior prohibited drilling in half of the National Petroleum Reserve-Alaska and rejected copper mining in Gates of the Arctic National Park. U.S. Arctic security policy shifted from unilateralism to cooperation, fueled by Russian militarization. The Northern Sea Route's (NSR) window of operation will widen to 3 to 6 months, and the Northwest Passage (NWP) to 2 to 4 months by 2100. NSR shipping may be 25% more lucrative than the Suez Canal route. Houthi attack and Panama Canal drought in 2023 interrupted shipping, increasing container prices by 283%. (Pechko, 2025)

Russia's 2011–2015 Arctic strategy gave high priority to infrastructure. The 2035 plan invests $19 billion in developing the NSR. China, as a "near-Arctic state," endorses the NSR through the Polar Silk Road for 25% greater profit margin. Chinese NSR transits increased from 27 in 2018 to 62 in 2020. China invested $12B in Russia's Yamal LNG (2012), $5.6B in Russian gas (2019), and entered an Alaskan LNG deal (2018). It also sought mines in Nunavut and research in Svalbard. NSR transits declined following Russia's 2022 invasion of Ukraine but recovered by 2023, including LNG exports to Europe. Japan kept utilizing the NSR even as it condemned Russia. The U.S. stands to lose out as allies weigh economic benefit against geopolitical alignment. (Hughes, 2024)

Canada aims to maintain Arctic leadership in government through the Arctic Council and other platforms like the Arctic Coast Guard Forum and the Central Arctic Ocean Fisheries Agreement. Canada also acts internationally, such as with the UN and the IMO prohibition on heavy fuel oil in the Arctic. International law, specifically UNCLOS, governs the governance of the Arctic Ocean. (Government of Canada , 2024)

President Trump's 2019 offer to buy Greenland strained Denmark-U.S. relations and highlighted the need for Denmark to reassess its U.S.-oriented Arctic strategy. While the offer was rejected, it revealed growing U.S. strategic interest in Greenland and the Arctic as Russian militarization and Chinese investment plans expand. In the aftermath of intelligence estimates that the Arctic will remain stable, the Trump administration was aggressive, highlighting competition at the expense of cooperation. Long-standing U.S. partner Denmark has traditionally closely followed American foreign policy. Changing Arctic conditions have, however, led Denmark to increase its defense presence in the Arctic, such as expenditures, upgraded forces, and closer alignment with Greenland. (Simon, 2020)

Norway; as being the part of NATO; playing a crucial role in Arctic in order to deter Russian aggression by increasing its military capabilities such as F-35 fighter jets and P-8 maritime patrol aircrafts in order to protect from possible conflicts in future. (The Norwegian Government , 2021)

Finland's Arctic strategy emphasizes on rights and well-being of the Saami people, climate change mitigation, economic diversification, infrastructure and SDGs compatibility. However; 2021 strategy highlights greater importance of Arctic military security due to climate change and geopolitical interests. (Middleton, 2023)

The Arctic is home to 22% of world resources, with 25% of unexploited oil and gas. Its accessibility and resources are revolutionizing global trade and security, and it is at the hub of future strategic thinking of Arctic States.

- **Role of International Law and International Organizations:**

The effects of global warming, specifically the melting of ice, have put the Arctic on the world stage. Previously inaccessible because of the persistent sea ice, the distant and inhospitable region is becoming increasingly accessible as rising temperatures make the ice recede. By mid-century, reducing ice coverage can potentially open up new shipping lanes and allow for the extraction of unexploited natural resources. (Singh, 2017)

The growing exposure has drawn international interest in Arctic ownership and control. The Arctic coastal nations have established clear-cut boundaries; in this case, the United Nations Convention on the Law of the Sea (LOSC) offers a structured legal framework to delimit maritime boundaries and outline rights and obligations in the Arctic Ocean. From Coastal State rights to Arctic Continental shelf, Arctic straits and Arctic high seas; UNCLOS may not be enough for the protection of environment in the region but it provides a deep insight regarding the role of each state and protection of maritime sovereignty. (Singh, 2017)

Beside United Nations; there are several other organizations that can dealt with changing maritime dynamics in the region through multilateral diplomacy. These organizations include Arctic Council, Arctic Coast Guard Forum, NATO, and European Union.

Arctic Council having 8 major powers; Canada, Sweden, Denmark, UK, US, Norway, Iceland, Finland and Russia besides several working groups and observers. (Arctic Council, n.d.) It can play a strategic role in multilateral dialogues among the powers in the region for the protection of environment and to reduce any conflicts. On the other hand; NATO plays a role of hard security actor in the region in case of maritime exercises and naval deterrence against Russia. The Arctic Coast Guard Forum (ACGF) is a self-governing, unofficial, operations-focused organization that is subject to no treaty. (Arctic Coast Guard Forum, n.d.) It can provide as practical response to the crisis in a region that has been changing strategically at high pace. European Union; being an observer in Arctic Council; is one of the most crucial organizations in the region especially in case of environmental protection and promotion of dialogues among the regional actors to prevent crisis.

Governance Challenges in Multipolar Arctic:

- **Fragmented Regulations:**

The Arctic's governance framework is characterized by fragmentation in the absence of a unified treaty or inclusive legal regime governing the region's shifting maritime balances. Although the United Nations Convention on the Law of the Sea (UNCLOS) provides a general legal foundation for territorial claims and passage rights, it is inadequate in its response to the emerging challenges of climate change, commercialization, and regional militarization. Arctic coastal nations have interpreted provisions of UNCLOS differently, for instance in the expansion of their continental shelf claims (for example, Canada, Russia, and Denmark's disputed claims to the Lomonosov Ridge), creating legal uncertainties and overlapping areas of jurisdiction. (Cross, 2023) Moreover, organizations such as the Arctic Council, while beneficial for encouraging scientific collaboration and environmental management, function on a consensus principle and deliberately leave out military security from their mandate. This leaves a regulatory vacuum in key sectors like naval deployment, hybrid threats, cyber infrastructure protection, and sustainable maritime development. Secondly, non-Arctic actors like China are increasingly making economic and scientific claims over the region, dealing closely with states like Russia in military (Garamone, 2024); making the region strategically more complex.

- **Great Power Rivalry**

The Arctic is no longer an isolated periphery; it has become a strategic arena in global great power politics. The region's untapped natural resources; estimated to hold 13% of the world's undiscovered oil and 30% of undiscovered gas (EIA, 2012); combined with the strategic value of shorter trans-Arctic maritime routes, have drawn the attention of major powers. Russia has adopted an aggressive stance, extensively increasing its military presence in the Arctic by reopening old Soviet bases and developed hypersonic missiles (Pedersen & Fouche, 2022). Concurrently, China has positioned itself as a "near-Arctic state" and is investing in Arctic infrastructure initiatives under the Polar Silk Road, fueling doubts by NATO members regarding its political, military and economic objectives (Adler, 2025). The United States is strengthening its Arctic policy with greater naval maneuvers and defense coordination with Canada and Nordic allies. Such strategic rivalry erodes the cooperative frameworks like the Arctic Council and raises the chances of securitizing the Arctic environment. The absence of specific conflict-resolution means or arms control measures geared to the region implies that this multipolar competition can spiral into aggressive posturing or miscalculation, especially within disputed waters or in the course of overlapping exercises and patrols.

- **Risk of Conflict:**

As the Arctic becomes increasingly accessible, the possibility of conflict; while still not imminent; has risen substantially owing to the failure of effective security governance mechanisms. The area is experiencing a spiral of militarization: Russia's Arctic Command, United States Navy reactivation of the Second Fleet, and NATO's rising military exercises are all evidence of growing distrust and strategic signaling. Behind the rhetoric of cooperation, most of the Arctic nations are quietly fortifying their surveillance system and military presence. The absence of a region-specific security dialogue platform, as exists in Europe through the OSCE and in Asia through ASEAN Regional Forum, heightens the risk of unintended escalation. Maritime mishaps, undersea cable interference, or cyber-attacks on Arctic-based infrastructure may act as escalatory triggers for larger clashes. In addition, new security challenges like hybrid warfare, cyber sabotage, and espionage remain unaddressed within current treaties, creating a blind spot in regulation. The melting ice creates new chokepoints and shipping routes, where freedom of navigation disputes e.g., U.S. and Canada's dispute over the Northwest Passage (Alì, 2025) could be potential flashpoints. These changing security challenges highlight the imperative for the introduction of a new institutional mechanism or treaty system able to broker competing interests and avoid the Arctic becoming the next geopolitical battlefield.

Evolving Maritime Security: Risk of Human & Environmental Security in Arctic

The evolution of maritime security in the Arctic is characterized by rising military presence, commercial shipping, resource development, and geopolitical interest; it is of seminal importance for the human and environmental security of the region. Whereas maritime security conventionally is interpreted in the context of sovereignty protection, surveillance, and freedom of navigation, its escalation in the Arctic is a double-edged phenomenon. At one level, better maritime stewardship and development can boost safety and disaster resilience. Conversely, unmitigated securitization and commercialization have the danger of heightening the vulnerabilities both of local populations and of vulnerable ecosystems.

Militarization of Arctic waters in the name of maritime security is perhaps the most acute of worries. With major powers such as the U.S., Russia, and China expanding their naval and coast guard operations, the Arctic is transforming into a theater of strategic signaling. As much as this enhances state control and deterrence, it also increases the danger of war and environmental damage. Military training in ecologically vulnerable areas can disrupt marine life, destroy sea ice, and add to underwater noise pollution that leads to disorientation of Arctic animals such as whales and seals. Moreover, greater military traffic increases the risk of fuel spills, dumping of waste, and accidents in isolated waters with low cleanup capacity. In this regard, improved maritime security efforts might in a sense undermine environmental security, particularly if done with minimal environmental control.

Commercial expansion under more favorable maritime security arrangements also carries important dangers. The expansion of shipping and offshore drilling is motivated by the economic and strategic imperatives of opportunity. However, such expansion puts under enormous stress the Arctic's untouched environment. Greater emissions from ships, black carbon deposition on ice (which speeds up melting), and the potential for industrial accidents threaten the long-term viability of Arctic ecosystems. Maritime security architectures that emphasize economic throughput over strong environmental protections risk compromising the very conditions for environmental resilience and local well-being.
From a human security viewpoint, maritime security transformation shifts the socio-political interaction among Arctic communities. The implementation of stronger maritime surveillance, responsible shipping, and military zones can limit indigenous mobility, access to fishing grounds, and cultural activities associated with the sea. Traditional communities, in turn, can become disengaged from decision-making regarding their waters, exacerbating tensions between state power and local autonomy. From economic to food, health, environmental, political and even individual security would get a drastic impact by the evolving strategic situation of Arctic. A region of several indigenous communities can face serious crisis by the conflict of powers in future. (Shiblee & Rashid, 2021) In addition, the entry of outside actors; either military, industrial, or commercial can be a cause of demographic change, inflation, and intensified competition for resources in a region. This creates an atmosphere of insecurity, economic dislocation, and undermining of indigenous livelihoods, even if the ultimate aim is regional "security."

In addition, the securitization of Arctic waterways presents a tendency to give predominance to state-centric interest as opposed to global human development needs. The investment goes towards enhancing navies and shipping routes, while existing infrastructures in local communities; such as healthcare facilities, sanitation, and educational institutions in Arctic villages are not developed. This prioritization insinuates reinforcement of structural inequalities and erodes the trust of the Arctic people in national and global systems of governance.

Need For “Cooperative” Security:

Since the Arctic becomes a more accessible and strategically valuable area as it changes from a remote, ice-covered territory into a more open and vulnerable zone, old maritime security strategies; based on military capability and state sovereignty are not adequate anymore. Transboundary environmental threats of the Arctic, its geopolitical tensions, and multiplication of state and non-state actors necessitate a shift from traditional to cooperative security. This idea puts a focus on transparency,

mutual trust, institutional participation, and peaceful management of common challenges. It provides a broad way of minimizing the threats of militarization, climate exposure, and competition for resources; particularly in maritime areas in the Arctic.

- **Confidence-Building Measures (CBMs):**

CBMs are necessary to ensure peace and stability in an area with strategic ambiguity and overlap of climate-access. As Arctic states expand their naval activities, border patrols, and observation in the area, there is a danger that such measures can be seen as menacing by other players. In the absence of CBMs, it could lead to an arms race or retaliatory deployments. CBMs like notification of naval activity, early warning of military exercises, and observation of drills by multiple parties can lower the chances of misperceptions (Schaller, 2014). In addition, code-of-conduct agreements on maritime encounters; like the Incidents at Sea Agreement (INCSEA) that helps to prevent accidental escalation (U.S. Departement of State, 2017). Such mechanisms permit states to communicate intent, resolve capabilities, and establish long-term strategic trust, stabilizing maritime security despite shifting power relationships.

- **Crisis Management:**

The Arctic environment is severe and capricious, and much rides on the outcome when crises do arise; either natural, accidental, or geopolitical. Sea-ice melting is enabling longer navigation periods, which enhance the amount of commercial shipping, cruise tourism, and hydrocarbon production. These are accompanied by increased potential for oil spills, ship collisions, search and rescue operations, and even cyber-attack on seafaring facilities. Efficient crisis management in this region must not be dependent on one nation's capacity due to the region's vastness and inaccessibility. Rather, what is required is multilateral crisis coordination mechanisms to facilitate coordinated responses in a timely manner. The Arctic Coast Guard Forum is a good direction in this regard, coordinating interoperability and response protocols (Arctic Coast Guard Forum, n.d.). Likewise, the merging of scientific data exchange and joint training exercises for maritime emergencies can improve readiness and prevent crises from spilling over as wider security threats. A cooperative crisis management system assists in fostering resilience to conventional and non-conventional threats.

- **Non-Arctic Stakeholder Role:**

Arctic strategic and economic importance is attracting more attention from non-Arctic states such as China, Japan, South Korea, and members of the European Union. They are investing in infrastructure development, scientific inquiry, and shipping industries (like China's Polar Silk Road) (Garamone, 2024). While Arctic countries have understandable apprehensions about outside influence, it is not pragmatic or beneficial to keep those actors out of the regional security discourse altogether. A cooperative security approach acknowledges that their rights and responsibilities exist but takes measures to ensure they act according to the norms and regulations in the Arctic. Inviting non-Arctic actors into platforms such as the Arctic Council (as observers) or into dedicated maritime security and environmental treaties can enlarge burden-sharing, diminish unilateral actions, and promote transparency. Furthermore, engagement with foreign companies and scientific organizations guarantees that the development of the Arctic is founded on sustainability instead of competition, lowering the threat of geopolitical exploitation and environmental degradation.

- **Institutional Mechanisms:**

Effective institutional structures are the pillars of cooperative security. Though the Arctic Council has been the main venue for conversation and cooperation, it is a consensus-based entity that does not have enforcement powers and a mandate to exclude military-security issues. Thus, there is an increasing requirement to enhance current institutions or establish complementary ones that can treat new threats at sea. For instance, efforts have been made through the Arctic Coast Guard Forum towards operational coordination, but it lacks legal backing and financing. Likewise, organizations such as the International

Maritime Organization (IMO) ought to be more involved in policing polar shipping norms and environmental safeguards (Anchetaa, 2024). Multilateral agreements, such as the 2018 Agreement on Central Arctic Fisheries, demonstrate that the governance of the Arctic can be inclusive and binding (Arctic Council, 2021). Institutional innovation should also incorporate indigenous governing institutions and scientific councils to guarantee data-driven, culturally respectful, and inclusive policies. Collectively, these mechanisms can institutionalize norms, deconflict interests, and establish a rules-based order in Arctic maritime affairs.

Commitment to SDGs:

According to the Sustainable Development Goals given by United Nations in its 2030 Agenda for the prosperity of the people and planet; this paper contributes to goal 12; Responsible Consumption and Production, goal 13; Climate Action; goal 14; Life below Water, goal 15; life on Land, goal 16; Peace, Justic and Strong Institutions, lastly, goal 17; Partnership for the goals. (United Nations , n.d.)

The changing of the Arctic marine environment under climate-driven ice loss poses stern threats to SDG 12 (Responsible Consumption and Production). With the increasing openness of the region, more pressures are emerging to extract resources, conduct commercial shipping, and industrialize. These tendencies threaten to spur accelerated environmental degradation unless carried out sustainably. Your work highlights the necessity of having strong regulations on shipping emissions, sustainable fishing, and mining, in line with SDG 12's objective of reducing ecological impacts. Furthermore, SDG 13 (Climate Action) is central to the paper since it articulates how climate change, aside from redefining the physical space, is also generating new geopolitical rivalries. The assessment of marine risks, e.g., oil spills and black carbon emissions, underpins the vision of mainstreaming climate resilience in national policies and security structures.

In tandem, the paper's invocation of confidence-building measures, crisis management mechanisms, and multilateral governance clearly resonates with SDG 16 (Peace, Justice, and Strong Institutions) and SDG 17 (Partnerships for the Goals). Through encouraging institutional cooperation and legal arrangements such as the Polar Code and Arctic Council protocols, your work contributes to stressing the significance of peaceful negotiation and robust governance structures for controlling maritime hazards. SDG 14 (Life Below Water) is supported by your critique of environmental threats to marine biodiversity in the Arctic and SDG 15 (Life on Land) through conversations about how Arctic militarization and ecological disruption are affecting indigenous communities and wildlife habitats. Lastly, the participation of non-Arctic stakeholders, including Asian and EU nations, complies with SDG 17 by promoting inclusive, cross-regional collaboration to preserve the sensitive Arctic ecosystem and uphold maritime stability.

Findings:

This research paper finds that:

1. Arctic has been facing drastic change in its climate that is now opening new maritime routes through melting of ice leading to a strategic transformation of the region.
2. The presence of great powers in the region has given rise to new rivalry in maritime security dynamic.
3. Due to extreme climate change, states are now militarizing the maritime routes for deterrence which is now evolving the regional security arrangements.
4. Melting Arctic has created a new resource battle due to the presence of undiscovered oil and natural gas in the region which is leading towards economic benefits and rivalries.

Conclusion:

The Arctic is no longer a distant and passive periphery; it is now a central arena of geopolitical competition, environmental susceptibility, and maritime strategic redefinition. As the ice melts, new sea routes and resource frontiers are opening up, altering the strategic significance of the region and challenging the Arctic and non-Arctic states to stake their claims. The new maritime security dynamics of the Arctic, this research has demonstrated, cannot be explained by power-politics alone; they must be explained by a multi-dimensional framework involving neo-realism, securitization theory, and the general concept of human and environmental security.

The region's great power realignment; driven by environmental transformation, resource competition, and economic interests has led to increasing militarization, policy shifts, and greater extra-regional great power engagement. Robust, integrated governance institutions, however, have not been a consequence of the increased interest. Fragmented regulation and great power competition continue to govern the Arctic, increasing the risk of war and environmental degradation.

The current trend jeopardizes the stability of the region and security and rights of the Arctic people, and the sensitive ecosystems. It is therefore not only desirable but absolutely necessary to shift towards cooperative security. Confidence-building, crisis management institutions, and open communication, particularly with the indigenous people and non-Arctic interests, are indispensable to prevent escalation and facilitate sustainable development in the region.

Finally, the future of the Arctic must be safeguarded by a pledge to international norms and multilateralism and by cooperation with the Sustainable Development Goals. The SDGs offer a system to balance environment protection, economic interest, and institutional integrity. The development of the Arctic constitutes a test case for global governance in a multipolar world, and the international community's reaction will serve as a precedent for the security issues of climate change globally. Only through shared responsibility and ongoing cooperation can the Arctic remain a region of peace, security, and shared progress.

Recommendations:

1. Arctic nations are required to take measures for the protection of environment collaboratively in order to avoid any devastating situation.
2. International organizations in the region can play a significant role in letting states to sit together and work for the betterment of the region and its people.
3. Indigenous people; if have enforcement power; can help to protect the region from environmental damage as they belong and care for their land more than anyone.
4. Strong maritime security law enforcement is required and need to be accepted by each and every state in the region for minimizing the any conflict in the future.

5. Underlying reasons of climate change and melting of ice are need to be addressed at every regional and international stage for ruling out the real cause of evolving maritime security.

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