ISSN E: 3006-1466
ISSN P: 3006-1458
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
CJSSR
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
Vol.03 No.01 (2025)

THE CLIMATIC RAMIFICATION OF ARCTIC ICE MELT: A COMPREHENSIVE ANALYSIS

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Abstract
The Arctic, which has long been seen as a secluded and unexplored area of planet, is changing dramatically as a result of climate change. With significant effects on the Arctic environment as well as the climatic system of areas far outside the Arctic, the thawing of Arctic ice has emerged as one of the most noticeable and concerning sign of global warming. Despite the significant environmental effects of Arctic ice melting, the regions political and economic dynamics are just as significant. Great nations like the USA, Russia and China hold economic and strategic interests in the Arctic, making it a disputed area. There is frequently an inability in taking significant action to address the urgent problems driven on by Arctic climate variability as a result of a combination of global power dynamics and environmental reality. This study is to investigate how the loss of Arctic ice disrupt atmospheric and oceanic patterns, which in turn adds to the destabilization of regional climates, and how the geopolitical and economic interest of major countries imped effective action on climate change in the Arctic. The study aims to offer a thorough grasp of the factors behind Arctic environmental change and the obstacles to international collaboration in tackling it by examining these aspects.

Key words: Arctic ice loss, Climate Change, Geopolitics, Global Warming, Albedo Effect

Introduction
An enormous and vulnerable ecosystem, the Arctic is now one of the most apparent indications of climate change globally. The process known as Arctic amplification shows that unprecedented climatic changes have occurred in the area recently, with temperature rising at a rate that is around three times higher than the world average. The Arctic sea ice has significantly decreased as a result of this severe warming, and current forecasts indicate that summers may be almost ice free by the middle of the century. The continuous melting of ice profound effect on human culture, ecosystem and regional and global climate systems in spite of signaling a significant change in the environment (Agbontaen et al., 2024). Because of its particular position in the earth's natural climatic cycles, the Arctic plays a vital part in controlling weather patterns and world temperatures, as well as affecting air conditions and sea level rise. Developing effective response of this escalating crisis requires an understanding of the region's complex dynamics, especially as it relates to how the melting of Arctic ice contributes to regional climate instability and how global political and economic interests constrain action.

The Arctic plays a central role in the earth's climate system, as a key component of the earth's climate system. By reflecting solar energy, it plays a vital part in maintaining the planets temperature and maintaining the global thermal balance, the regions extensive ice cover mainly the sea ice has ice has a high albedo effect. The earth however absorbs more heat when ice melts and is replaced by darker land or ocean water, speeding up warming through a feedback loop. One of the main causes of Arctic fast warming is the amplification of this phenomenon. Moreover, the loss of ice has major effect on oceanic and atmospheric circulation pattern, including the jet stream. In places distant from the Arctic, such as Europe,

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North America and Asia, the temperature differential between poles and the equator is weakened as Arctic warms more quickly than the mid-latitudes. This results in more unpredictable and intense weather patterns. Extreme weather phenomena, such as heat waves, cold snap, and storms are becoming more often and severe, which is already a sign of instability of weather systems. The loss of Arctic ice is not only a local problem; it has an impact on weather patterns worldwide, upending conventional climate models and necessitating a reassessment of the stability of the regional and global climate (Altukaya &Emirhan ,2024).

Alongside these factors, the Arctic is a hotbed of geopolitics and economic interest, especially from major nations like China, Russia and USA (Devyatkin, 2024). These nations' interests in the area are diverse and frequently contradictory: they range from strategic military placement to access to untapped natural resources including minerals, oil and gas. The likelihood of a new shipping lanes and resources exploitation is growing as the Arctic ice continues to recede. The political and economic incentives of these nations however make addressing Arctic climate change more difficult. The research being conducted aims to evaluate the political, strategic and economic interests of major countries in the Arctic (Babauta &Rebecca, 2023). The environmental effects of Arctic ice los on regional climates, and the ways in which these influence the international response to Arctic climate change. This study offering a more comprehensive knowledge of how environmental, political, strategically and economic issues impact Arctic climate policy. With ramification for global climate policy overall, the ultimate goal of this research is to emphasize the necessity of extensive, collaborative efforts to address climate change in the Arctic. This paper divided into two sections. The first section addresses the ramification of artic ice melt on global climate system. And the second section highlights how the individual interest of great powers hinders the global effort to climate mitigation in this region.

Objectives

The primary objective of this research is

- To analyze the impact of Arctic ice melt on the stability of Arctic region climate model.
- To evaluate the economic and strategic interest of major power's in Arctic region
- To understand in what ways the individual interest of great power's contributes to inaction to address Arctic climate change

Research Questions

1. How does Arctic ice loss impact on the behavior of climate system in northern hemisphere?
2. How does the economic and strategic interest of great power's limited action to address Arctic climate change?

Significance

The relationship between environmental deterioration and geopolitical interests in the Arctic is still poorly understood, despite increased awareness of the regions changing climate. Fewer studies have examined how these two areas combine and exacerbate the difficulties of effective climate governance. The significance of this research resides in its capacity to connect two important fields of inquiry: the geopolitical factors that influence the global response to climate change and the environmental effects of Arctic ice loss. The phenomena of regional climatic instability brought on by Arctic ice loss impacts both Arctic nations and the region that are distant from the Arctic zone. Moreover, how well international agreements work and how rapidly climate action shift forward is highly influenced by the

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political and economic objectives of major nations. Establish more efficient ways to control climate change and protect delicate ecosystem needs an understanding of these interrelated actors. This research purposes to give a comprehensive analysis of how Arctic ice loss leads to regional climate instability and the status of global power dynamics in steering climate change policies.

Literature Review

The reduction of sea ice in the Arctic is transforming atmospheric and oceanic systems, which is destabilizing climate patterns both regionally and globally. Recent research has demonstrated the significant effects of Arctic ice loss on the jet stream. A study by Screen &Simmonds (2013) reveals that the weakening of the jet stream, resulting from temperature variation between the Arctic and mid-latitudes, has resulted in sustained weather patterns. This disruption of the jet stream is linked to extreme weather phenomena, including extended cold spells in Europe and North America and heat waves in Asia. The link between Arctic warming and mid-latitudes weather extreme spot light the interconnected nature of the global climate composition. Moreover, the disturbance of thermohaline circulation, that is a global ocean circulation system liable for heat distribution, symbolize another major repercussion of the loss of Arctic ice. According to Wang et al. (*2023)*, as the Arctic ice fade and discharge freshwater into the ocean, this circulation is hurled off balance, potentially emanating in severe effects on regional climates, notably in the north Atlantic. These modifications not only affect the region as well as create cascading impacts that dismantle climate trends worldwide, following in increasingly regular and severe extreme weather occurrences.

Regardless of increasing evidence related the harmful effects of Arctic ice loss, vital action to mitigate climate change in the area still limited because of economic and political interests. The Arctic huge natural resources including natural gas, oil and rare minerals, induce it a focal point for geopolitical enmity among countries including Russia, the United States, and Canada. Heininen. L. (2018) point out that the geopolitical race in the Arctic hinders exertion to formed international agreements on climate change, as nations focus on economic gains and security issues above the environmental preservation. Namely, Russia's growing military exercises in the Arctic and it compel to assert sovereignty over greater sections of the region is visible manifestations of these geopolitical interests. The militarization complicates collaborative climate governance, as a security issues and territorial conflict take precedence over climate issues.

Large Multinational Corporation significantly impact Arctic policy. Ksenija.H et al. (2022) point out the influence of major oil firms, like EXXON Mobil and Gazprom, in advocating for the relaxation of environmental regulation to promote resource extraction. These corporations have considerable financial interests in tapping into Arctic resources, and their sway in both national and international policy forums weakens efforts to enforce stringent climate policies. According to Young (2021), the Arctic international governance's framework is hindered by a deficiency of enforceable agreement that can mandate climate action. The dependence of the global community on fossil fuels, along with the economic and political agendas of Arctic nations, suggests that even sincere initiatives for collaboration frequently fall short due to national interests that favor economic development over ecological sustainability.

Methodology

This research is based upon both qualitative and quantative methodology. Descriptive research design has been applied to address this issue. Global climate change or environmental shifts cannot be studied easily in controlled setting, so descriptive research design is effective for studying these kinds of broader phenomena's. This descriptive study

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will not go deep into the underlying causes of ice melt but will document the observable effects. The data for this study will mostly be secondary sources obtained from other existing reports, academic articles, government publications, and media content. To determine the various views on the subject, the data sources were chosen to include scientific research, government policies, and community experiences. The content analysis method was utilized to systematically analyzed and interpret qualitative data from several sources. In this case, the objectives are to identify repeated themes, patterns and major issues regarding the effect of melting Arctic ice on the region.

Theoretical framework

The destabilization of regional climates resulting from the loss of Arctic ice can be analyzed through the lenses of climate system theory and climate dynamics theory. Climate system theory suggests that earth's climate functions as an interconnected, dynamic and intricate system, where alterations in one element can trigger widespread impact throughout the system. This viewpoint is reinforced by studies from researcher who characterize the climate system as a collection of interrelated physical, chemical and biological components that affect one another. The Arctic is viewed as a primarily vulnerable area owing to its vital part in balance the earth's energy balance. As ice melts there is decline in the region's positive albedo, showing darker ocean surfaces that absorb more heat, steering to increase warming (Sellers, 1983). This feedback system is in concord with the basic principles of climate system theory, which focus on the nonlinear and feedback propelled characteristic of climate change. Additionally, the destabilization of regional climates following from loss of Arctic ice shows how an agitation in one region of the climate system can causes to far-reaching impacts in other areas, mainly when blended with the positive feedback loops exist within the system.

From the view point of climate dynamics theory, the Arctic lungs in global atmospheric and oceanic circulation. This theory shows that climate system is dynamics, nonlinear interactions, where small change in one part of the system can lead to extensive effects (Essex, 2011). For instance, alternation in the Arctic ice cover affect patterns of ocean circulation, including the thermohaline circulation, which plays a vital part in distributing heat throughout the oceans. Recent research, including findings, indicates that changes in Arctic can cause shifts in atmospheric pressure systems, which in turn modify weather patterns across the northern hemisphere. The reduction of Arctic sea ice and its potential impact on global ocean currents serve as a clear example of how alternations can interact with larger, more intricate dynamics, aligning with climate dynamics theory. Furthermore, the warming of the Arctic accelerates changes in atmospheric and oceanic circulation, highlights the interconnectedness of climate components as proposed by the theory. This interdependence illustrates how Arctic amplification can disrupt regional climates and weather patterns that are located far from the Arctic. Theoretical models that highlight these dynamics reveal how the loss of Arctic ice alters jet stream behavior, thereby affecting extreme weather patterns in mid-latitude region. These findings support the fundamental concepts of climate dynamics theory, where minor yet consistent changes can lead to larger, often unpredictable transformations within global systems.

Nevertheless, the lack of effective international measures to combat Arctic climate change can be analyzed through the perspective of governance theory and the "tragedy of the commons". The concept of collective action, as articulated by ostrom1990, indicates that common-pool resources such as the Arctic ice cover encounter governance difficulties since individual nations frequently emphasize their own economic and geopolitical interest over the shared benefit. This is especially pertinent in the Arctic where the competition for resources and geopolitical tension obstruct genuine collaboration. Furthermore, the absence of a

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CJSSR
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
Vol.03 No.01 (2025)

centralized authority to manage the sustainable use of the Arctic complicates efforts to effectively address environmental consequences (Young, 2021). Consequently, on economic and political dynamics restricted collective efforts to combat climate change in the Arctic, aligning with the governance issues associated with global commons (Ostrom, 2008).

Effects of Arctic Ice melt on Climate system

The Arctic is at the hub of extreme climate shifts, in which the impacts of global warming are as of now causing irreversible tumult in natural system. The contemporary changes, plenty of which are irreversible, pledge to reshape the Arctic region considerably in the coming decades. These changes in the Arctic are crucial to complex feedback loops that both manifest the direct consequences of climate change and pitch in to its intensification. From Arctic wildfires to greenhouse gas emission, from thawing permafrost to coastal erosion, the fate of the Arctic is deeply interlinked with the future of the whole planet.

The disruption of thermohaline circulation and ocean current

Fresh scientific studies point out the critical persona of Arctic Sea ice melt in tweaking the delicate stability of ocean currents, especially in the north Atlantic. The international panel on climate change (IPCC), layout on wide research, has revealed that the Atlantic Meridional overturning circulation (AMOC) is "prone to deteriorate" throughout the 21st century, determined by climate change. This course of action driven by the thermohaline circulation which spot temperature and salinity determine water density has been fundamental to global climate stability for millennia. New satellite data spanning over a decade reveals the precarious state of Beaufort gyre, a circular ocean current that serves to store and release freshwater into the north Atlantic. The gyre, which moves in a clockwise direction, naturally accumulates freshwater from melting glaciers, precipitation, and river runoff. This fresh water acts as a protective layer over sea ice, slowing its melt and thereby regulating earth's broader climate. However, as the gyre releases increasing volumes of fresh water into the Atlantic Ocean, its potential to disrupt ocean currents and cool the climate of Western Europe becomes more pronounced. A study published in Nature communications warns that warming in the polar region could significantly disrupt these oceanic currents, with far-reaching consequences for both regional and global climates.

Scientists are deeply concerned about the potential consequences of this disruption. As Mohamed Ezat from the iC3 polar research Hub observes, the historical record reveals that the infusion of freshwater from sea-ice melt could have profound cooling effects, as seen in past climatic shifts. This alteration in salinity and water density could disrupt circulation patterns, dramatically changing the heat distribution across the globe. The implications of these changes are profound with the potential to stop the deep-ocean currents that drive the global climate conveyor belt, a phenomenon that has occurred in earth's history, such as during younger dryas event around 12,700 years ago.

Permafrost thawing

Permafrost a frozen reservoir of an ancient organic material is rapidly thawing as the Arctic warms. Once released from its icy grip, permafrost radiates extensive amounts of CO2 and methane, strong greenhouse gases that exacerbate climate change. This release initiates a dangerous feedback loop. As a temperature rise permafrost thaw accelerates, causing further warming, which in turn accelerates the thawing process? This cycle threatens to significantly amplify global warming in the coming decades the "compost bomb instability" model, first proposed in 2010 by mathematicians Sebastian Wieczorek and his team, predicts that thawing permafrost will not only release carbon but generate enough heat to further accelerate soil decomposition. This self-reinforcing cycle of thawing and gas release could have catastrophic effects. In fact, scientists estimate that thawing permafrost could emit between 110 and 231

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CJSSR
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
Vol.03 No.01 (2025)

billion tons of co2 equivalents by 2040, leading to more rapid and severe global warming. This thawing also carries the potential for unearthing ancient viruses, some of which have already led to disease outbreaks as seen with the 2016 anthrax outbreak in Siberia. Moreover, the Arctic thawing landscape has witnessed unprecedented wildfires. Similarly, wildfires in the Siberian region have become more frequent and intense: further releasing carbon and exacerbating air pollution. These dangerous changes are part of a broader pattern of Arctic destabilization that will have cascading global effects.

Jet stream disturbances and shifting weather patterns

The retreat of Arctic sea ice is implicated in the modulation of the jet stream a high-altitude band of winds that circumnavigate the globe. Research indicates a strong connection between sea ice loss in the Barents and Kara seas and extreme weather events in Eurasia and North America. As the Arctic warms and ice cover decreases, the surface of the Arctic Ocean absorbs more solar energy. This leads to a warmer, moister atmosphere, which may in turn affect the jet stream making it wavier. This wavier jet stream can trap weather systems in place for extended periods, causing extreme weather events such as prolonged heat waves, heavy rainfall, or intense cold spells. The link between Arctic Sea ice loss and extreme patterns is visible in increasing regularity and severity of storms, hurricanes and heat waves. As an example, the Arctic change has been associated to the 2021 wildfires in California, which were compelled by transition in atmospheric circulation caused by the weakening jet stream (Hughes, 2025). As well as colder winters in North America and Europe owing to instability in the polar vortex on forward demonstrate the long-term effects of Arctic warming on global weather ((Tandon, 2021).

The loss of Arctic Sea ices a major catalyst of this weather transformation. Just as the ice cap retreats, the cozy of the ocean surface and the moisture exonerated into the atmosphere fabricate more fragile and volatile atmospheric stipulation. The result is an increased frequency of extreme weather events in regions far removed from the Arctic itself. As the contrast between the Arctic and mid-latitudes diminishes due to warming, it is predicated that the jet stream will shift southward. This change could have profound effects on weather in UK, such as influencing the frequency of severe storms, hurricanes, and other extreme weather events. The connection between Arctic sea-ice loss and weather patterns further illustrates the complex interplay between regional Arctic changes and global climate dynamics.

Rising sea levels and coastal flooding

The Arctic region plays a pivotal role in regulating the earth's climate, akin to how the amazon is often referred to as lungs of the world. Loss of ice from the Polar Regions has been identified as a largest contributor to global sea level rise over the past several decades, a trend expected to continue through the century. NASA led analysis indicate that nearly 96%of countries with coastlines have experienced rising sea levels since 1970, with the rate of increase accelerating in recent years. The melting of glaciers and thermal expansion of warming oceans are the primary drivers of sea-level rise. As the ice sheets in Greenland and Arctic a continue to melt, the potential for even more substantial increase in sea level becomes evident. If the Greenland ice sheet were to melt entirely, it could contribute an additional 5 to 6 meters (16 to 20 feet) to global sea levels, posing a catastrophic threat to coastal communities worldwide. Major cities, including New York, Tokyo, Mumbai and Dhaka are particularly vulnerable to the rising tide, as are low lying regions such as Bangladesh and parts of the USA gulf coast.

Moisture cycling and precipitation patterns

The Arctic also plays an essential role in regulating global moisture cycling. Rapid warming has resulted in a significant reduction in Arctic sea ice, which has in turn, increased

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CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
CJSSR
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
Vol.03 No.01 (2025)

evaporation from Arctic marginal seas (AMS). This change has profound implications for precipitation patterns, particularly over high-latitude land areas. Recent studies show that the loss of sea ice had led to a 30% decline in the sea- ice areas in AMS between 1980 and 2021(Liu *et al.*,2024*)*. This drop is linked to an important increase in downpour over land, mainly in coastal areas including the Greenland, Scandinavian mountains, and the Labrador Peninsula. Moreover, this amplifying in snowfall is not a silver lining. The broader indication of Arctic changes in moisture cycling are wide-ranging, poignant everything from storm vigor to regional precipitation patterns. The outcomes increase in atmospheric moisture has leading to more extreme snowfall events in these regions, which could possibly mitigate some of the consequences of climate warming on ice sheets, like the Greenland ice sheet. The more moisture supply from AMS evaporation is stringing to more extreme weather events, which profound consequences for agriculture, water resources, and infrastructure in influenced areas. Contrary, the broader ramification of these changes in moisture cycling is even now it being understood, and their enduring impacts remain uncertain.

Strategic interest of great power in Arctic region

The warming of the Arctic due to climate change is having an impact on the ecosystem and escalating tension between major countries. as they pursue their own strategic goals, nations like the USA, China and Russia are all getting increasingly active in the Arctic, often creating security concerns in order to do so (Mastoi,2023). Russia approaches the Arctic with a realistic, pragmatic perspective, intent on establishing control over its borders and taking advantage of its natural riches. By investing in economic and infrastructure projects, China on the other hands is attempting to increase its influence in the area through programs such as the Belt and Road initiative.

The United States interests are at risk due to the expanding influence of China and Russia in the Arctic, as the USA strives to preserve its control in the area to oppose both countries (Shireen, M,2023). Great powers continue to place a high priority on infrastructure development and economic recovery despite the overwhelming scientific evidence of the serious environmental damage occurring in the Arctic. This is seen in programs like EU recovery package and the U.S global infrastructure plan. These strategic frequently ignore the environmental effects in the Arctic despite their emphasis on economic expansion (Heininen, 2022). The Arctic faces the most threat from the worsening ties between these nations. Russia may be compelled to pursue even more ecologically damaging energy project farther into the Arctic if western sanctions against it cause problem in its oil exports. In a similar vein given its rising energy needs, Canada may be persuaded to resume contentious oil drilling projects that were previously shelved owing to environmental concerns. Because of its sparse population and inadequate infrastructure, the Arctic is ill-prepared to handle environmental catastrophes like oil spill (Hough, 2022). The region will only see an increase in pollution, environmental damage, and social unrest as infrastructure and resources extraction projects proliferate.

To put it briefly although Russia, China and the United States make decision in the Arctic based on their geopolitical interest, these actions are increasing environmental hazard and jeopardizing regional attempts to mitigate climate change. The Arctic is at a crossroad where political and environmental concerns are at odds, increasing the risk to the ecosystem and regional stability. The emphasis on resources exploitation and economic expansion is also accelerating environmental degradation.

Russia

Strategically, the Arctic is crucial for military placement, especially for nuclear-armed nations. With enormous natural gas and oil deposits beneath the ice, Russia is one of the top countries in the Arctic. To make it easier to establish new trade lanes and guarantee year-

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CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
CJSSR
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
Vol.03 No.01 (2025)

round access to Arctic resources, Russia has made investments in nuclear-powered icebreakers. When the Russia submarine K-429 sunk in 1993 following a nuclear reactor accident in the Arctic Ocean it was one of the most important nuclear events in Russia Arctic history. The usage of nuclear-powered ships and nuclear accidents in the Arctic present major environmental hazards. Degradation of the environment is more likely in the area where nuclear waste is present.

Rosatom, Russia's state- owned enterprise began working to improve the NSR accessibility in 2020. This included building more icebreakers and establishing ports along the route (Starchak, 2024). Exxon Mobil and Rosneft, the state-owned oil company of Russia, joined together to drill in the Arctic in 2017. Large oil deposits in the Pechora Sea and other parts of the Russian Arctic were the projects aim. Russia continues to explore for and produce oil in the region in defiance of international recommendations to restrict the exploitation of fossil fuels in order to stop future climate change. Additionally, Russia is making significant investment in the Arctic liquefied natural gas (LNG) production (Rumer, 2021).

Developing new gas reserves in the Russian Arctic LNG-2 project is anticipated to generate over 19 million tons of LNG per year, making it one of the world's largest gas production facilities (Mongilio,2024). Fossil fuel extraction in the Arctic contributes to global greenhouse gas emission which hastens climate change and Arctic ice loss. Even though the area is vulnerable to climate change, Russia still puts economic growth ahead of environmental preservation, which undermines global efforts to stop Arctic warming. Russia official policies, including the northern sea route policy, the Arctic doctrine, and the emphasis on fossil fuel exploitation, are indicative of a larger trend to put economic growth, territorial control, and national security ahead of environmental concerns (Nikita &Devyatkin, 2023). These doctrines not only facilitate the acceleration of resources exploitation in the Arctic but also impede collective international efforts to mitigate climate change in the region.

USA

Similar to Russia, the United States has economic, military and geopolitical interest in the Arctic that greatly impact how it responds to climate change there (SWP, 2023). Drilling in the Arctic has been permitted under U.S laws administered by the Bureau of ocean energy management (BOEM) of the department of interior. There is a great deal of interest in the oil deposited in Chukchi Sea and Beaufort Sea off the coast of Alaska. The trump administration overturned the Obama administration decision to temporarily ban offshore drilling in the Arctic, allowing for further exploration of the area. Attempts to lessen dependency on fossil fuels are hampered by U.S government's decision to allow oil drilling in Arctic seas despite worries about climate change.

.The regions climatic challenges might be exacerbated by oil spills or mishaps in these delicate areas which could have disastrous long-term environmental effects. The 2017 national security strategy emphasize geopolitical competition with China and Russia and gives the Arctic a high priority. The United States wants to protect its claims to the Arctic and keep its resources available. The establishment of military installation and infrastructure in the Arctic as a result of US military's presence there has harmed the ecology.

While fewer nuclear weapons have been stationed in the Arctic since the end of the cold war, the United States has used unclear powered submarines and strategic bombers that can fly in Arctic airspace to maintain a nuclear deterrent in the area. But to conduct operation in Arctic seas, the U.S navy has deployed icebreakers and submarines with nuclear propulsion (White, 2024& koening,2022). The fragile ecosystem of the Arctic may become permanently contaminated if nuclear waste from submarine is dumped in its seas. The United States exit from pair's agreement which signified a change in focus from international climate goals. Climate mitigation in the region is hampered by a number of U.S policies and doctrines,

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CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
CJSSR
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
Vol.03 No.01 (2025)

including the national Arctic strategy (2013, revised 2016), the oil and gas leasing polices (bureau of ocean energy management); the U.S Arctic military strategy, the Arctic national wildlife refuge (ANWR) drilling policies, and the nuclear posture review (2018).

China

China is not an Arctic country, but its increasing influence is fueled by geopolitical, economic, and environmental consideration. The Arctic enormous undeveloped natural resources, especially its minerals, oil, and gas are of great interest to China. The shift away from fossil fuels is hampered by China investments in Arctic energy projects, such as joint partnerships with Russia in Arctic oil reserves (Graceffo, 2024). China drive to develop its Arctic resources is heavily reliant on Chinese state-owned companies, especially in the mining and energy industries. Arctic oil and gas explorations is carried out by firms such as China national petroleum corporation and China national offshore oil corporation (CNOOC)(Gad,.2022). The yamal LNG project and oil extraction from the Russian Arctic are two examples of cooperative ventures that worsen the global climate catastrophe in addition to causing local environmental deterioration. The construction of the polar silk road, a maritime route that would link China and Europe across the Arctic Ocean has been investigated by China as part of their belt and road initiatives (BRI) (Respinti, 2024).

Traditional maritime routes via the Strait of Malacca or Suez Canal are the thought to be slower and more expansive that this route. Black carbon is especially detrimental to the Arctic ecosystem because it promotes ice melting when it is deposited on snow and ice surfaces and increased maritime traffic raises levels of this gas. In 2018, China unveiled its Arctic policy, which highlights its aim to participate in Arctic governance while exploring prospects for regional economic cooperation. Through energy transition regulations, China has pledged to reduce its carbon footprint domestically (Xinhua, 2018). However, its foreign investments, especially in fossil fuel projects in the Arctic, may jeopardize these objectives. Chinas environmental pledges and the oil and gas development it has undertaken in Arctic region are directly at odds.

Conclusion

The Arctic plays a pivotal part in the earth's climate system, serving as a buffer to confrontation global warming. The thawing of Arctic ice poses serious threats to the global climate system, encompassing accelerated warming, Permafrost thawing**,** rising sea levels, disrupted current flow and disruption to weather patterns. The Arctic region, considering its vast natural resources and strategic significance become a venue of competition, at what point national security concerns and economic growth commonly outweigh environmental concerns. The political trends surrounding the Arctic entangle efforts to confront climate change. The national priorities of great powers, notably in the areas of resource extraction, economic growth, and military strategy, frequently disrupt cooperative efforts to alleviate climate change in the region. There is an exigent need for resilient, legally binding multilateral agreement to limit resource elicitation in the Arctic and lessen emissions from the region. States must focus on global environmental goals beyond short run national interests. A more vigorous framework subject to the Paris agreement, particularly addressing the Arctic might assist to ensure coordinated action. Nations with significant wagers in the Arctic, namely Russia, USA, and China, should involve in more meaningful climate diplomacy. By limiting military tensions and concentrating on shared environmental objectives, they can develop space for more valuable dialogue on climate mitigation in the region.

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