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CLIMATE CHANGE AND HUMAN SECURITY IN THE ARCTIC

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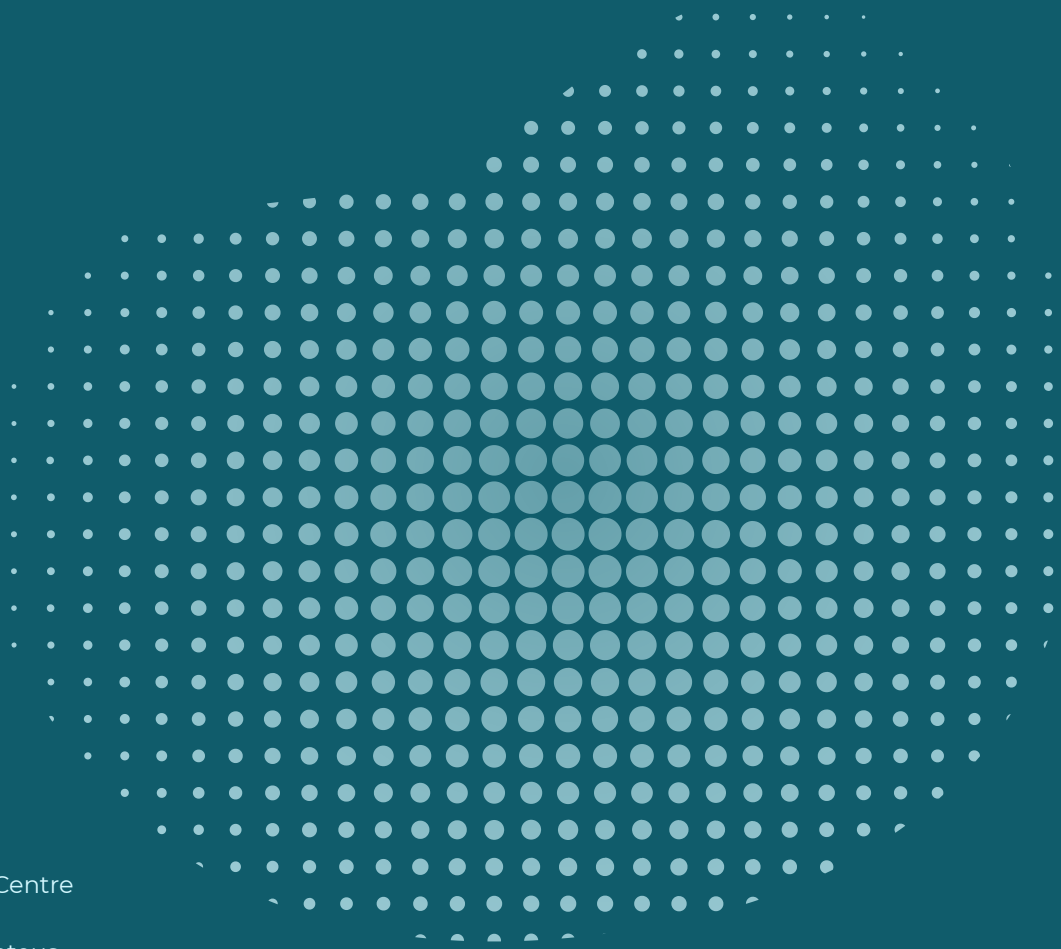

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Abstract

The Arctic is warming at a rapid rate, generating cascading impacts that extend beyond environmental degradation to encompass social, economic, and cultural dimensions. These changes disproportionately affect Indigenous communities whose livelihoods, identities, and well-being are deeply connected to the environment. This paper examines the interplay between climate change and human security in the Arctic, arguing for a shift from traditional state-centric frameworks toward a human-centred approach. It explores how climate change functions as a "threat multiplier", exacerbating pre-existing vulnerabilities, and assesses the role of Arctic governance. Through the lens of human security, the conclusion highlights the urgent need for integrative governance that aligns environmental protection with social equity and Indigenous empowerment.

Introduction

Climate significantly influences and defines globalisation (and vice versa), even though these two concepts are not inherently linked in their definitions, as noted by Elizabeth Malone in her article "Hot Topics: Globalization and Climate Change" (2002). Across various historical epochs, globalisation has contributed to climate change in multiple ways and forms. In the modern age, globalisation and climate change have become intertwined phenomena. Nevertheless, globalisation should not be mistaken for sustainable development. Instead, it is frequently associated with environmental degradation and the excessive exploitation of resources, resulting in what Garrett Hardin (1968) termed the Tragedy of the Commons. All global commons, "those areas of the planet that lie beyond national jurisdictions" (Brundtland Report, 1987, p. 216), are impacted, including the atmosphere, oceans, Antarctica, and outer space.

It is essential to emphasize that climate change is not merely an environmental issue, it poses a significant threat to security and stability, potentially leading to conflict, particularly in the Arctic region. However, we continue to support military investments, which remain a primary concern, rather than focusing on environmental security.

"The first step in creating a more satisfactory basis for managing the interrelationships between security and sustainable development is to broaden our vision. Conflicts may arise not only because of political and military threats to national sovereignty; they may derive also from environmental degradation and the pre-emption of development options. There are, of course, no military solutions to 'environmental insecurity'. (..) The global commons cannot be managed from any national centre: The nation state is insufficient to deal with threats to shared ecosystems. Threats to environmental security can only be dealt with by joint management and multilateral procedures and mechanisms (Brundtland Report, 1987, p. 248)."

The United Nations Framework Convention on Climate Change (UNFCCC) asserts that human activity´s impact is integral to the definition of

climate change, indicating that such changes are either directly or indirectly linked to human actions that alter the global atmospheric configuration, with consistent observations over time (UNFCCC, 1992). From Favier´s viewpoint (2019), the 1972 Meadows report, "The Limits to Growth", along with the 1979 Geneva World Climate Conference, which convened World Meteorological Organization (WMO) experts to discuss climate change and its implications for humanity (Nº. 537), were largely overlooked by both politicians and the media. It was not until 1983 that this issue began to gain traction in public discourse. René Favier notes that the exceptionally hot summer of 1983 significantly heightened awareness of this topic.

In 1988, the WMO and the United Nations Environment Programme (UNEP) established the Intergovernmental Panel on Climate Change (IPCC) with the purpose of evaluating the scientific, technical, and socioeconomic data pertinent to comprehending the risks associated with human-induced climate change (IPCC, 2007). This issue is increasingly gaining prominence on the political agenda concerning climate vision. The second report was delivered at the Rio Conference in 1992, coinciding with the development of Agenda 21, which encompassed 2500 recommendations intended for implementation in the 21st century, along with two Conventions on Biological Diversity (CBD) (CBD, 1992; 1995). It was estimated that the Kyoto Protocol (1997) would obligate nations to reduce greenhouse gas emissions. The Paris Agreement, ratified at COP 21 in 2015, which aims to embody a consensus on human impact on global warming, has demonstrated challenges in its implementation. The term global warming was first used in 1975 by Wallace Broecker in his article "Climate Change: Are We on the Brink of a Pronounced Global Warming?" where the geologist forecasted that global temperatures would rise more by *the first decade of next century than any in the last 1000 years* (1975, p. 461).

The Arctic region is increasingly recognized as a geopolitical and environmental hotspot of the 21st century. This designation encompasses not only the growing international interest in the area but also the potential for substantial changes in cooperation and peace, primarily influenced by climate change. It serves as a central point for both environmental and political transformation. Professor Lassi Heininen asserts that climate change represents the most significant *global threat or challenge in the Arctic* (2011, p. 37).

The Arctic is experiencing rapid and unprecedented transformation. As the region warms four times faster than the global average (Rantanen, 2022), it faces melting sea ice, thawing permafrost, and increasingly volatile ecosystems. These environmental shifts directly affect the livelihoods, cultures, and security of the region´s inhabitants, Indigenous peoples, whose identities are inseparable from the land, sea and cryosphere.

In this context, climate change operates as a threat multiplier, intensifying existing pressures such as food insecurity, health inequities, and economic marginalization. Traditional state-centric security paradigms, focused primarily on sovereignty and defence, fail to capture the complexity of these interlinked challenges. A human security framework, by contrast, foregrounds people´s safety, dignity, and resilience, offering a more holistic response to climate-driven transformations.

The Arctic Council, the leading forum for regional cooperation, has been instrumental in shaping environmental and social governance. Under the Kingdom of Denmark's 2025–2027 chairship, priorities include integrating Indigenous knowledge, promoting sustainable

development, and advancing climate adaptation.

The next sections will focus on: climate change identified as a threat multiplier; the Arctic governance by developing the role of the Arctic Council and the indigenous peoples´ organisations representation and the priorities defined by the Kingdom of Denmark for the two-years chairship; look at the origins of human security; understand what human security means in the context of the Arctic with recent situations confirming the changes felt by Arctic Indigenous communities. It will be concluded that embedding human security within Arctic governance is essential to safeguarding both ecological and cultural resilience amid accelerating change.

The accelerating climate crisis has placed human security at the centre of global governance. UN Secretary-General António Guterres has progressively reframed climate change from a *threat* (2009) to a *global emergency* and *time bomb* (2023), to *a factor of insecurity, of instability* (2025). Both the IPCC and the Human Rights Council now recognize climate change as a systemic risk to human rights and security, disproportionately affecting vulnerable groups such as Arctic Indigenous peoples.

Climate Change as a Threat Multiplier

Climate change has evolved from an environmental concern into a global security issue. The Center for Naval Analysis (CNA) Military Advisory Board (2007), led by Mrs. Sherri Goodman, coined the term *threat multiplier* to describe how environmental change amplifies instability without directly causing conflict.

In the Arctic, the accelerating pace of warming, twice to four times faster than the global average, has intensified pressures on infrastructure, health,and food systems. Melting permafrost threatens settlements, while shifting ecosystems undermine traditional livelihoods.

Goodman and Baudu (2023) note that institutions such as the European Union (EU), United Nations (UN), and North Atlantic Treaty Organization (NATO) have progressively integrated the *threat multiplier* concept into policy discourse. The European Union (EU) first used the term in 2008 in the paper "Climate Change and International Security - Paper from the High Representative and the European Commission to the European Council", followed by the UN General Assembly A/64/350[1] (2009) and NATO´s 2021 Climate Change and Security Action Plan, (Rodrigues, 2025). The Alliance took considerable time to adopt the expression and recognize its relevance for the organisation´s future. Climate change was only briefly mentioned in the 2010 Strategic Concept. It was not until 2021, in the document titled "NATO Climate Change and Security Action Plan", that the term *threat multiplier* appeared explicitly, with the Secretary General also using the expression in his speech at COP26 the same year. The "Regional Perspectives on the Arctic – Strategic Foresights Analysis 2021" report references the term multiple times. Both the New "Strategic Concept 2022" and the "Climate Change Security Impact Assessment" fully embrace the term, framing it as a crisis and explicitly linking it to the Arctic region within the strategic concept (Rodrigues, 2025). A Centre of Excellence on Climate Change (CCASCOE)[2] was created in 2023 and is located in Montreal, Canada.

[1] United Nations, General Assembly. (2009). Climate change and its possible security implications. Report of the Secretary-General. UN A/64/350. . https://documents.un.org/doc/undoc/gen/n09/509/46/pdf/n0950946.pdf?token=Bm06asW33OvrYd6toW&fe=true

[2] Portugal should consider becoming an Observer and/ or full member of this Centre of Excellence.

Although the concept has heightened awareness, it risks reinforcing militarized security approaches that obscure ecological and human dimensions (Goodman & Baudu, 2023). It underscores the urgency of preventive, cooperative measures to address climate impacts that transcend borders (Tuchman Mathews, 1989).The Arctic can be perceived as a multifaceted convergence of various elements, regions, and processes. As articulated by Klaus Dodds and Mark Nuttall in their book *The Arctic: What Everyone Needs to Know* (2019), this encompasses land (which is categorized into the high Arctic and low Arctic based on the distribution of tundra and boreal forest), sea (which includes the central Arctic Ocean along with its neighbouring seas such as the Barents, Beaufort, Chukchi, Kara, Laptev, and Hudson Bay), and ice (which is evident in the thickness of sea ice and the extent of snow cover). Frequently referred to as the *air conditioner* of the Northern Hemisphere, the Arctic is crucial for cooling and stabilizing the global climate system.

The Arctic Region and Governance

The Arctic encompasses territories of eight nations: Canada, the Kingdom of Denmark (Greenland), Finland, Iceland, Norway, the Russian Federation, Sweden, and the United States (Alaska), and spans roughly 20 million square kilometres. It is a region of profound ecological importance, functioning as a global climate regulator and containing critical tipping elements such as permafrost and sea ice (Lenton et al., 2008; Nakicenovic et al., 2016). The region's transformation has far-reaching implications: opening maritime routes, reshaping biodiversity, and altering economic and geopolitical dynamics.

Since the late 20th century, Arctic governance has evolved. The Arctic Environmental Protection Strategy (AEPS), launched in 1991 through the Rovaniemi Declaration, marked a turning point by establishing working groups on pollution control, biodiversity, and emergency response, while slowly granting Indigenous peoples institutional representation as observers at the time.

Building upon the AEPS, the Arctic Council was founded in 1996 under the Ottawa Declaration to promote environmental protection and sustainable development. Its structure includes three categories: Members (eight Arctic states); Permanent Participants (six Indigenous organizations: Aleut International Association, Arctic Athabaskan Council, Gwich´in Council International, Inuit Circumpolar Council, Russian Association of Indigenous Peoples of the North, Saami Council). Canada, under the leadership of Mary May Simon, was pivotal in championing this inclusion (Rodrigues, 2023); and Observers (includes non-Arctic states, institutions and NGOs).

The Ottawa Declaration (1996) also establishes that the chairmanship of the Arctic Council rotates among member states every two years. To effectively manage the Council´s activities and represent national interests, each Arctic state appoints a Senior Arctic Official (SAO), who engages in regular meetings to advance their country´s priorities within the Arctic Council framework. The first country to chair the Arctic Council was Canada (1996–1998), followed by the United States (1998–2000), Finland (2000–2002), Iceland (2002–2004), the Russian Federation (2004–2006), Norway (2006–2009), the Kingdom of Denmark (2009–2011), and Sweden (2011–2013). The second cycle of chairmanships began in 2013 with Canada (2013–2015), Finland (2017–2019) and the Russian Federation currently holds the chair during this

turbulent period (2021–2023).

Despite increasing militarization over the past decade, primarily driven by Russia, the Arctic Council has maintained a peaceful zone in the region for the past almost thirty years. However, the situation shifted following the full-scale invasion of Ukraine in February 2022. In this context, the March 2022 Joint Statement, titled "Joint Statement on Arctic Council Cooperation following Russia's Invasion of Ukraine"[3], effectively marked a pause in the Arctic Council activities.

Scholars are now debating potential reforms. Some, like Timo Koivurova (2022) and Alice Rogoff (2022), propose an upgraded version of the Council, referred to as *Arctic Council* 2.0, while others, including Stefan Kirchner (2022), suggest establishing a *Nordic Plus Cooperation*. According to Kirchner, this approach would avoid forming an exclusive Arctic club and instead create an international organization based on shared values, committed to international law, the rule of law, and respect for human rights.

The pause initiated in March 2022 concluded on June 8, 2022, with the release of a Joint Statement[4] declaring that the Arctic Council would continue its operations without the participation of the Russian Federation. The statement also highlighted the ongoing study and consideration of modalities to ensure the Council's work could proceed effectively in this new context.

[3] U.S. Department of State. (2022, March 3). Joint Statement on Arctic Council Cooperation Following Russia's Invasion of Ukraine: https://www.state.gov/joint-statement-on-arctic-council-cooperation-following-russias-invasion-of-ukraine/

[4] Government of Canada. (2022, June 8). Joint statement on limited resumption of Arctic Council cooperation. https://www.canada.ca/en/global-affairs/news/2022/06/joint-statement-on-limited-resumption-of-arctic-council-cooperation.html

The Kingdom of Denmark assumed in May 2025 the Chairship of the Arctic Council for the next biennial 2025-2027, following Norway´s Chairship 2023-2025.

The five thematic priorities of the new chairship are:

1. Indigenous Peoples and Communities of the Arctic: Inclusion of Indigenous Knowledge, youth empowerment, mental health, and gender equality.
2. Sustainable Economic Development and Energy Transition: Support for Arctic-led initiatives, connectivity, blue bioeconomy, and clean energy innovation.
3. Oceans: Marine ecosystem protection, sea-ice monitoring, and pollution control.
4. Climate Change in the Arctic: Mitigation and adaptation coordination, including black carbon and methane reduction.
5. Biodiversity: Enhanced monitoring and ecosystem protection.

(Chairship of the Kingdom of Denmark, 2025).

These priorities align closely with human security objectives, emphasizing inclusivity, sustainability, and well-being. While the Arctic Council does not engage in military issues, its focus on environmental protection, adaptation, and cultural preservation directly advances human security in practice.

The Arctic is home to approximately four million inhabitants, around 10 percent of whom are Indigenous, representing about 40 distinct groups (Koivurova et al., 2021; Dodds & Woodward, 2021). Indigenous peoples, including the Sámi, Inuit, Nenets, and Chukchi, have inhabited the region for tens of millennia, maintaining intricate relationships with local ecosystems (Figure 1).

Indigenous resilience is deeply tied to Traditional Ecological Knowledge (TEK), a cumulative

system of observation, practice, and adaptation that the IPCC (2007, 2022) recognizes as vital for climate adaptation. Yet, TEK faces unprecedented strain as climate change undermines traditional hunting, fishing, and herding systems (Koivurova, Tervo, & Stepien, 2008). Preserving and integrating Indigenous knowledge within policy frameworks is therefore essential to both human security and environmental sustainability (Watt-Cloutier, 2015). Contemporary Arctic governance increasingly reflects multi-actor participation, involving governments, Indigenous peoples, scientists, and NGOs. Scholars such as Wilson Rowe (2018) warn that the erosion of cooperation could re-politicize the region. Sustaining dialogue and inclusivity thus remains central to Arctic stability.

The Roots of Human Security

Understanding human security requires tracing its evolution from both human-rights traditions and state-centred security paradigms. The concept, formally recognized by the United Nations as a policy approach (UN A/78/665, 2024), represents a conceptual bridge between individual well-being and collective stability. It has deep philosophical roots in Enlightenment social-contract theory and later international human-rights law, reflecting centuries of debate about the relationship between the individual, the community, and the state.

Human rights, codified in international and domestic legal systems, are historically linked to Western political thought (Galtung, 1994). Johan Galtung characterizes them as a social contract between citizens and the state, comprising both entitlements and obligations. As Adrian Vasile Cornescu (2009) explains in "The Generations of Human Rights", these rights developed in three broad *generations*.

The first generation, shaped by the English (1688), American (1776–87), and French (1789) revolutions, emphasized civil and political rights grounded in Enlightenment ideals of liberty and individual autonomy. Yet Cornescu notes that these ideals often proved unrealistic when confronted with structural inequalities.

The second generation of rights emerged during the nineteenth and twentieth centuries, expanding to include economic, social, and cultural rights, such as education, health, and social protection, requiring proactive state involvement. The post-war period saw their institutionalization through the Universal Declaration of Human Rights (1948) and the European Convention on Human Rights (1950). However, the Cold War's preoccupation with state sovereignty limited the development of people-centred approaches to security.

By the late 20th century, global awareness of interlinked risks, economic inequality, environmental degradation, and conflict, gave rise to a third, solidarity-based generation of rights (Cornescu, 2009; Hossain, 2013). Key milestones included *The Limits to Growth* (1972), the Stockholm Declaration (1972), and the Brundtland Report (1987), which explicitly linked environmental decline with conflict and insecurity.

Human Security since 1994

The 1994 Human Development Report (HDR) presents an interpretation of human security through the lens of Mahub ul Haq, who promotes the creation of an innovative concept of human security. This concept aims to *revolutionize the 21st century* and is based on four fundamental characteristics: 1) it is a universal concern; 2) the elements of human security are interconnected; 3) it is more effectively achieved through early prevention; 4) human security is focused on people (1994, pp. 22-23). The author of the 1994

report asserts that the emerging concept of human security is pertinent to individuals globally. The effects of various insecurities are felt worldwide, and it is more advantageous to address the threats at their source rather than after they have manifested. He identified seven core components: *economic, food, health, environmental, personal, community, and political security*, each interwoven and mutually reinforcing (Human Security Handbook, 2016, p. 7). Policy networks such as the Human Security Network (1998, Lysoen Declaration), led by Canada, Norway, and Japan, institutionalized the approach internationally. Canada´s role in the International Commission on Intervention and State Sovereignty (2000) reinforced its commitment to people-centred governance.

Subsequent elaboration by the Commission on Human Security (2003) defined the goal as *safeguarding fundamental freedoms* while building political, social, environmental, and economic systems that secure survival, livelihood, and dignity.

In order to clarify its policy scope, the UN General Assembly adopted the Resolution A/RES/66/290 (2012), defining human security as an *approach* to help states identify and respond to cross-cutting threats to people´s survival, livelihood, and dignity. Human security thus complements, rather than replaces, state sovereignty: states remain primarily responsible for their citizens´ welfare, supported by international cooperation based on non-intervention and mutual respect.

As Sato (2024) argues, human security is not merely about mitigating threats but affirming human autonomy, interdependence, and dignity within communities. In regions like the Arctic, where ecological vulnerability, cultural continuity, and political marginalization converge, the concept offers a holistic framework for inclusive, sustainable security.

Human Security in the Arctic Context

Climate change presents a multidimensional threat to Arctic human security, undermining health, livelihoods, and cultural integrity (Rodrigues, 2024). Indigenous communities face intersecting insecurities as ecological transformations disrupt traditional subsistence systems, leading to food scarcity, mental health challenges, and displacement.

Examining human security within the Arctic framework requires focusing on Arctic Indigenous communities, which have long experienced the effects of climate change. For several decades, these communities have demonstrated remarkable resilience and adaptability to shifting environmental conditions. However, the accelerating pace of change suggests that their capacity for continued adaptation may soon face critical limits. The Arctic landscape is undergoing profound transformation, raising pressing questions about the future of these communities and the preservation of their cultural integrity.

As Rob Huebert (2004) observes one of the fundamental challenges to human security lies in addressing the needs of a young and expanding population, particularly as globalization transforms the long-standing lifeways of northern peoples. Many Arctic Indigenous populations are facing unprecedented pressures that are reshaping modes of living that have persisted for millennia. The feasibility of traditional livelihoods is steadily declining, driven by both reduced access to customary food sourcesand environmental contamination from transboundary pollutants.

Huebert (2004) further emphasizes that climate change is disrupting traditional ecological knowledge, making it increasingly difficult for communities to determine safe periods for travel across land and ice. At the same time, the

widespread availability of television and modern communication technologies has influenced younger generations to move away from customary practices and lifestyles. Yet, the decline of traditional customs, coupled with the region's harsh physical environment, has hindered the younger population´s ability to fully integrate into the contemporary wage economy. Employment opportunities remain limited, and many northern communities face persistently high unemployment rates.

These economic challenges are compounded by the high cost of imported foods from southern regions, which remain unaffordable for many families. As reliance on traditional diets diminishes, health problems are increasing, particularly among youth. Rising consumption of low-nutrient, processed foods has contributed to what Huebert (2004) describes as an emerging public health crisis in the North. Consequently, as the Arctic environment and economy evolve, Indigenous communities confront mounting threats to both food security and public health.

The impacts of these transformations vary across communities, with some demonstrating greater capacity for adaptation than others. Nonetheless, evidence suggests that an overarching crisis of sustainability is unfolding. Ongoing environmental and socio-economic changes pose profound risks to the cultural integrity and continuity of Arctic Indigenous peoples. Given the scale and speed of these pressures, it appears increasingly unlikely that traditional ways of life will persist in their current forms. This reality prompts fundamental questions: How will these communities respond to the accelerating pressures of globalization emanating from the South? Which elements of their cultural heritage and traditional livelihoods can be preserved, and which are likely to be transformed or lost?

For Huebert (2004), the answers to these questions remain uncertain. He warns that, without substantial intervention, Indigenous and non-Indigenous communities alike may face the risk of losing not only their livelihoods but also the foundational aspects of their social and cultural systems in the coming decades. This prospect underscores the interconnectedness of national security and human security, emphasizing that the state's duty to protect its citizens cannot be separated from the broader obligation to ensure the well-being of individuals and communities.

Although climate change represents a profound global threat to humanity, the notion of human security differs significantly across regions, countries, and specific contexts (HDR, 1994; Hossain, 2013). This diversity becomes particularly apparent when examining the localized and national dimensions of climate impacts. Historically, Indigenous peoples have exhibited extraordinary resilience and adaptability; however, the accelerated pace of contemporary environmental changes increasingly infringes upon their human rights. Adapting to these rapid transformations has emerged as a major challenge for the broader ecosystem, including human societies. The disruptions associated with the Anthropocene have intensified insecurities across multiple domains, with Arctic Indigenous communities being especially at risk. These communities frequently experience a sense of powerlessness in their efforts to protect and sustain their environment—an element they view as fundamental to their conception of human security. Professor Kamrul Hossain, in his chapter "Securing the Rights: A Human Security Perspective in the Context of Arctic Indigenous Peoples" (2013), underscores this point, asserting that *the employment of a human security approach includes securing the collective nature of rights* (p. 517). Within the Arctic context, it is therefore essential to acknowledge that human

security aligns with the idea of the collectiveness of individuals (idem), a perspective that highlights the collective affirmation of individual human rights:

"Persons who identify as indigenous enjoy all of the human rights that their states have accepted, on the same basis as everyone else. However, indigenous peoples also enjoy certain rights because of their indigenous status, including both individual rights and collective rights. These include rights to self-governance, land and resource management, education, language, and culture. Arctic indigenous peoples are also minorities in their states and enjoy certain rights by virtue of that status (IPCC, WGII, 2014, p. 154)."

As Sato (2024) argues, human security encompasses more than physical safety, it embodies the recognition of individuals as autonomous beings situated within collective, interdependent communities. Understanding human security in the Arctic thus requires an Indigenous perspective, one that centres lived experience and community-defined priorities.

Sheila Watt-Cloutier (2015) emphasizes that those who inhabit the Arctic region perceive it as safe and secure, grounded in deep knowledge of the land and its functions. These populations maintain diverse cultural traditions and languages, yet share common challenges: climate change, globalization, and governance systems that often marginalize their participation in decision-making. She also adds that these losses are not only ecological but moral and existential, undermining *the right to be cold*, the right to maintain cultural and environmental identity in a rapidly warming world.

The human security of Arctic Indigenous peoples is deeply entwined with environmental change, cultural continuity, and socio-economic transformation. Addressing their needs requires moving beyond state-centric paradigms to embrace inclusive, community-driven approaches that honour Indigenous knowledge, safeguard cultural resilience, and ensure equitable participation in shaping the Arctic's future.

Permafrost thaw and coastal erosion are forcing community relocations across Alaska, Canada, and Russia (Creel, et al, 2024). Meanwhile, changing migration patterns and unstable ice routes erode Traditional Ecological Knowledge, threatening intergenerational continuity.

The impacts of climate change exert substantial stress on and disrupt a wide range of ecosystems, both marine and terrestrial. Continued research is therefore crucial to deepen our understanding of how these ecosystems can adapt to the evolving challenges brought about by climate change (WWF, 2022). Within marine environments, factors such as rising ocean temperatures, diminishing sea ice, and increasing acidification are negatively influencing marine life, including algae. This has led to a notable decline in biodiversity, largely due to the limited capacity of many plant and animal species to swiftly adjust to rapidly changing conditions—thereby facilitating the potential spread of invasive species into the Arctic region (Koivurova et al., 2021). Moreover, "The Arctic Climate Impact Science – An Update Since the ACIA Report" (citing Driscoll et al., 2005; Pisaric et al., 2006) highlights that numerous studies have observed divergent treeline trends since the 1950s, with certain regions exhibiting reduced growth likely linked to temperature-induced drought stress (WWF, 2022). As ice coverage continues to recede, the Arctic is evolving into a greener landscape, with tundra zones becoming increasingly vegetated, indicating a potential future in which the region may no longer be described as a *désert de glace*.

The interconnectedness of ecosystems is increasingly reflected in the challenges faced by Indigenous peoples, who are confronting the

transformation of their ancestral livelihoods and cultural practices—particularly those tied to fishing and harvesting. These traditional ways of life, carefully adapted over generations to endure the extreme conditions of their environments, are now being profoundly disrupted. The shifting environment, landscapes, and ecosystems are heightening the vulnerability of these communities, compelling them to adapt swiftly and cultivate resilience in response to a rapidly changing reality. As highlighted by Eskeland and Flottorp (2006), traditional food systems, along with the social and economic well-being of these populations, are being negatively impacted—especially in regions already burdened by poverty and unemployment (Koivurova, Tervo, and Stepien, 2008). Importantly, these repercussions extend beyond local contexts, bearing implications on a global scale (Eskeland and Flottorp, 2006).

Subsistence practices and Indigenous traditional knowledge (which embody a profound understanding of local ecosystems) are now under threat. Preserving this knowledge requires its oral transmission to younger generations through songs, stories, and legends. Despite some resistance, Indigenous knowledge has gained growing recognition at the international level as a legitimate form of scientific understanding, offering crucial insights for addressing and mitigating the effects of climate change experienced by these communities. Reinforcing this point, the Secretary-General of the United Nations, António Guterres, emphasized in his World Environment Day message (June 5) that "indigenous and traditional knowledge must also be respected and harnessed to help protect our fragile ecosystems" (2022). The sweeping transformations occurring in the Arctic region are inseparable from their economic dimensions, driven by activities such as commercial fishing, resource extraction, and the trade of harvested goods (Koivurova, Tervo, and Stepien, 2008).

The ongoing transformations in the Arctic region present serious threats to the livelihoods of its inhabitants. Indigenous peoples across the Arctic are being forced to adapt to a rapidly changing reality that disrupts their traditional practices rooted in fishing and harvesting, activities that have historically enabled generations to survive in the region's extreme and unforgiving environment. The combined effects of environmental, landscape, and ecosystem changes are deepening the vulnerability of these communities, further intensifying challenges such as poverty and unemployment (Koivurova, Tervo, and Stepien, 2008).

At the same time, the preservation of Indigenous traditional knowledge, embodying a profound understanding of ecological systems and environmental dynamics, is increasingly at risk (IPCC, 2022b). Safeguarding this knowledge requires its continued oral transmission to younger generations through cultural expressions such as songs, stories, and legends. Although initially met with resistance, Indigenous knowledge has gained international recognition as a form of scientific knowledge (IPCC, AR6, WGII, 2007), providing valuable insights into strategies for mitigating the impacts of human-induced climate change currently faced by these communities.

Indigenous peoples have long recognized the necessity of sustainable resource management, acknowledging that their ancestors managed to thrive in the Arctic over countless generations (McGhee, 2007). Ultimately, the threat to livelihoods in the Arctic extends beyond Indigenous communities, posing implications for all of humanity, regardless of geographic boundaries.

Anthony Pfaff (2019) identifies seven key factors influencing human security in the Arctic, particularly as new maritime routes open in the

American Arctic (Table 1).

In sum, Pfaff (2019) emphasizes that the interplay of geopolitical, economic, and environmental forces in the Arctic poses complex challenges to human security, demanding careful governance, international cooperation, and sustainable development strategies.

Ole Aggo Markussen, in his work "Maritime Security in the Arctic: The Absence of the People in the High North" (2019), draws attention to a critical issue: the Arctic´s harsh living conditions contribute to its extremely low population density. This demographic reality underscores the region's limited capacity to sustain human life and poses distinct challenges for maritime security, particularly regarding search and rescue operations. Despite the scarcity of available personnel, the number of global visitors to the Arctic continues to grow. All individuals in distress, including adventurers testing the limits of endurance, must receive assistance. Moreover, thousands of tourists traveling on luxury cruise ships expect immediate rescue services in case of emergencies.

These emerging tourism trends, combined with the region's limited infrastructure and resources, place immense strain on local communities and existing rescue systems. Harsh and unpredictable weather further complicates these challenges, while safety standards on remote cruise vessels often fall short. Markussen emphasizes the necessity of incorporating local knowledge and traditional practices into the development of efficient and context-appropriate rescue strategies.

Climate change exacerbates Arctic health inequalities through food contamination, changing diets, and emerging diseases. Declining access to traditional foods increases dependency on imported, processed products, contributing to obesity and diabetes (Aarskog, 2025). The psychological toll, ecological grief, anxiety, and loss, has become an urgent yet under-recognized dimension of human security (Ojala, et al., 2021).

Addressing these intertwined insecurities requires a comprehensive Arctic human-security framework that integrates environmental governance, Indigenous rights, and social justice. Policy responses should emphasize co-production of knowledge, participatory decision-making, and rights-based adaptation strategies. Strengthening community agency and resilience ensures that Arctic peoples can not only adapt but thrive in the face of transformation.

Although climate change poses a significant threat to humanity on a global scale, the concept of human security varies greatly depending on the specific region, country, and context in which it is considered (HDR, 1994; Hossain, 2013). This variation is particularly evident when analysing the localized and national impacts of these changes. While indigenous communities have historically demonstrated remarkable adaptability over centuries, the swift pace of contemporary changes has begun to infringe upon their human rights. The necessity to adjust to a rapidly evolving environment has emerged as a substantial challenge for the entire ecosystem, including human populations. The disturbances caused by activities associated with the Anthropocene have resulted in increasing insecurities across multiple sectors, particularly endangering Arctic Indigenous communities. These communities often experience a sense of helplessness in their efforts to safeguard and maintain their environment, which they regard as crucial to their perception of human security. This perspective is articulated by Kamrul Hossain (2013) by asserting that the employment of a human security approach includes securing the collective nature of rights. In this regard, it is essential to recognize and emphasize that, within

the unique framework of the Arctic region and its Indigenous populations, human security corresponds to the collectiveness of individuals, a distinction that is grounded in the collective recognition of individual human rights.

An important point to note is that the idea of the human being includes both individuality and belonging to different groups or communities, as emphasized in the elements of personal and community security. This viewpoint indicates that *human security is not directed at the individual in isolation, but rather at the individual as a member of various groups* (Sato, 2024, p. 89). The author contends that the notion of *human* is often taken for granted without thorough scrutiny. This necessitates a reassessment of the term *human*, redirecting the emphasis from the security dimension inherent in the term human security. In 2003, a revision took place under the auspices of the Commission on Human Security (CHS), which released a report titled "Human Security Now". This report defines the concept as follows:

"to protect the vital core of all human lives in ways that enhance human freedoms and human fulfilment. Human security means protecting fundamental freedoms— freedoms that are the essence of life. It means protecting people from critical (severe) and pervasive (widespread) threats and situations. It means using processes that build on people's strengths and aspirations. It means creating political, social, environmental, economic, military and cultural systems that together give people the building blocks of survival, livelihood and dignity (CHS, 2003, p. 4)"

The intricate nature of the Arctic calls for further scientific investigation to achieve a more comprehensive understanding of the region. It is essential that all Arctic stakeholders work collaboratively to enhance research initiatives and promote the sharing of data, thereby improving cooperative management of critical ecosystems and enabling the dissemination of effective responses to challenges associated with rising temperatures. Strengthened scientific collaboration can foster greater transparency and support regional efforts to combat climate change while advancing environmental cooperation. In this context, the role of scientific diplomacy becomes increasingly vital (Gosnell and Hildenbrand, 2019).

Conclusion

The Arctic typifies the global intersection of climate change and human security. As a region undergoing rapid ecological transformation, it challenges conventional definitions of security and demands human-centred, cooperative governance. Climate change acts as a threat multiplier, intensifying pre-existing vulnerabilities across environmental, social, and cultural dimensions.

Embedding human security into Arctic policy, integrating Indigenous leadership, traditional knowledge, and sustainable development will be essential to building equitable and resilient Arctic societies. Ultimately, protecting the Arctic's people and ecosystems is inseparable from safeguarding the planet's collective future.

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Appendix A: Table

First	the successful 2018 voyage of the Venta Maersk through the ice-free Northeast Passage marked a turning point for Arctic security dynamics. Increased shipping, along with expanding extractive industries such as oil, gas, mineral, and fishery exploitation, is expected to draw more industrial activity and population growth. This could lead Arctic nations to strengthen territorial claims, potentially creating tensions similar to those in the South China Sea (Norderman, 2015).
Second	Pfaff warns that new maritime routes could also attract transnational criminal and terrorist groups. With limited U.S. capacity to monitor northern routes, unregulated areas could become vulnerable to organized crime, paralleling lawlessness seen in parts of Mexico (Pfaff, 2019).
Third	navigation disputes may emerge between the United States, Russia, and China over the Northwest and Northeast Passages, mirroring geopolitical rivalries elsewhere. While Russian aggression remains unlikely without provocation, peaceful resolutions—such as the 2022 Canada–Denmark agreement on Hans Island ("Whisky War")—offer constructive precedents (Government of Canada, 2022; Bueger & Edmunds, 2024).
Fourth	the Arctic holds immense resource potential, including 240 billion barrels of identified oil and gas, an estimated 412 billion yet to be discovered, and vast reserves of minerals and fish. Although most resources lie within recognized jurisdictions, disputes over ownership persist, and competition for access to these resources is expected to intensify (Pfaff, 2019).
Fifth	the high financial and environmental costs of Arctic extraction—due to harsh conditions and the global shift toward renewables—raise doubts about long-term profitability. The U.S. Geological Survey estimates that Arctic reserves account for only 10–15% of global oil and gas supplies, though uncertainty remains (Pfaff, 2019).
Sixth	rising ocean temperatures are altering marine ecosystems and fishing patterns, increasing risks from invasive species and resource conflicts. Concerns over unregulated fisheries led to the 2021 Agreement to Prevent Unregulated High Seas Fisheries in the Central Arctic Ocean, a precautionary, legally binding pact among ten parties, including Canada, China, the EU, and the U.S., effective until 2037 (U.S., 2021). Yet, data gaps and uncertainties persist regarding the sustainability of Arctic fisheries (European Parliament's Committee on Fisheries, 2015). The Wilson Center's Polar Institute (2025) is launching a series on Alaska's fisheries crisis, highlighting threats to Indigenous livelihoods.
Seventh	the seventh factor concerns the growing risk of humanitarian and environmental crises resulting from intensified industrial, fishing, and shipping activities. Increased maritime traffic heightens the likelihood of oil spills, contamination, and accidents, challenging Arctic nations' response capacities (Pfaff, 2019).

***Table**: Pfaff's seven key factors*
***Source**: Based on Pfaff, 2019*

Appendix B: Figure

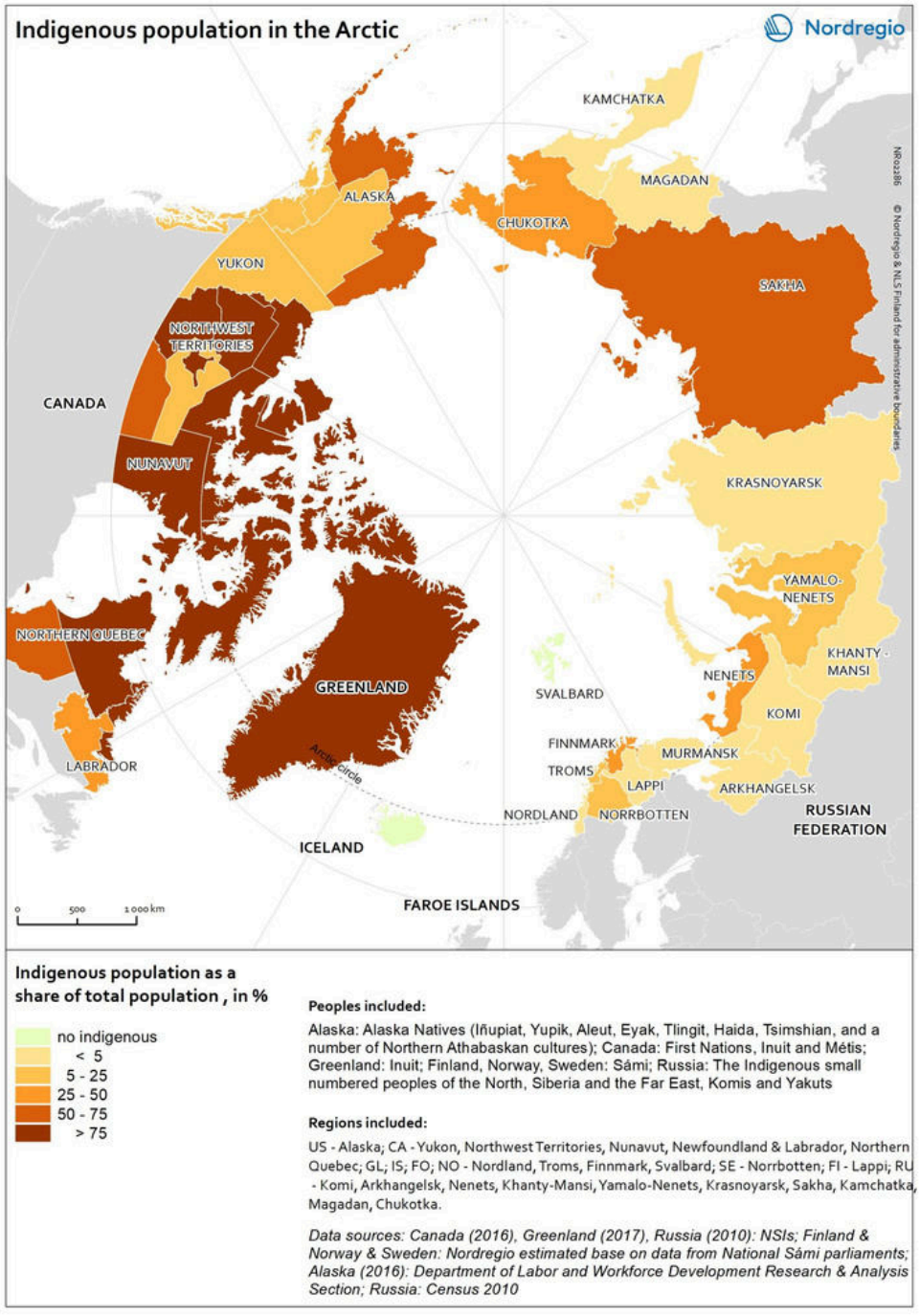

***Figure**: Indigenous population in the Arctic region*

***Source**: Nordregio*