Briefing Note

Development in the Arctic: The Full Perspective on Critical Infrastructure Checklist (Full POCI)

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The Arctic has long suffered from a dearth of infrastructure, and the shifting security situation has made infrastructure a critical priority. To understand exactly what infrastructure is considered "critical," the Fulbright Arctic Initiative IV's Arctic Security and Governance Group (ASGG) listened to communities, scientists, business leaders, and young people in the Arctic on this topic. This briefing note shares insights from the listening sessions and from the authors as it explores: 1) various views of critical infrastructure; 2) highlights different definitions in use; 3) explains the challenges these differences create; and 4) offers a practical checklist for future multi-use infrastructure development.

Introduction

"*Critical Infrastructure*" is a key security concern that lacks a shared definition across nationalities, cultures, languages, and professions. Both the terms "critical" and "infrastructure" are disputed. At one end, sea ice acts as a crucial platform for supporting the mobility and subsistence harvesting practices of Arctic coastal Indigenous Peoples. At the other end, states seek to build nuclear icebreakers that can plough through this ice, seeing it not as infrastructure, but an obstacle to their

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movement (Skripnuk et al., 2020; Sukhankin, 2019; Watts et al., 2026). The definition of infrastructure – and whether it manifests in the natural or built environment, or both – is therefore contingent on culturally and geographically specific needs and interests(Newbill, 2019).

Given the diverse understandings, what is considered critical infrastructure can no longer be defined solely by state perspectives. The definition needs to be more comprehensive, including considerations at the state, regional, Indigenous, and community scales, as well as others. Many Arctic communities are isolated, and therefore have Island Mode Systems, meaning their infrastructure is isolated, local and is a unique infrastructure setup that differs from other localities within the state. Due to the remote areas in the Arctic, multi-use infrastructure is often more economic. While the locals benefit from telecommunications and transportation infrastructure, so can the military and businesses(Kähkönen & Nystén-Haarala, 2024).

The lack of a shared definition challenges the maintenance and development of infrastructure that genuinely supports communities, acknowledges national security concerns, and maintains international relations. This complexity concerns multiple stakeholders, including not only the people living in the Arctic, but scientists, diplomats, businesspeople, and policymakers too.

The different perspectives

The North American Arctic, including Kalaallit Nunaat (Greenland), is often considered an area of limited built infrastructure even though natural structures like sea ice and frozen rivers have been essential for Inuit for millennia. The Nordic Arctic, in contrast, has more built infrastructure in some places, such as extensive road networks in large parts of Sápmi. Geopolitical changes in the Arctic have also brought increased attention to critical infrastructure. For example, recent investments in transportation and renewable energy infrastructure across Sápmi are often framed as improving access, security, connectivity, and the energy transition, especially as the Finnish and Swedish NATO ascension has increased transportation infrastructure for security (Lynch et al., forthcoming 2026; Regeringskansliet, 2026). However, many Sámi communities view these roads and additional renewable energy infrastructure as fragmenting and degrading tundra ecosystems, which they regard as a critical form of infrastructure that supports reindeer herding, cultural practices, and ecological integrity (for example: (Mósesdóttir, 2024)). Further, much of the built infrastructure in the Russian Arctic is constructed on permafrost, which has served as a strong foundation for cities and airfields. While critical infrastructure is often understood as the built assets themselves, in the Russian Arctic the permafrost is effectively critical natural infrastructure as the viability of settlements, roads, and airfields depends on its stability.

These stark differences in understanding of exactly what infrastructure is "critical" within the Arctic, led us to listen to communities, scientists, business leaders, and young people in the Arctic on this topic. This includes attending the Arctic Science Summit Week 2025 in Boulder, Colorado, session "Research Coordination Network (RCN): Co-creating Research for Just Arctic Future Infrastructure Transformations, Resilience, and Adaptation to learn about North American and Russian community and scientist infrastructure perspectives (Kuklina et al., forthcoming 2026); holding a listening session with business leaders in Greenland operating companies critical for society; attending the Arctic Six (an alliance of Nordic universities: Luleå University of Technology, Umeå University, UiT The Arctic University of Norway, Nord University, the University of Lapland, and the University of Oulu) Forum on Arctic Security; and holding a listening session with youth over 18 who live in Rovaniemi, Finland. Our listening sessions allowed us to speak to

people from the US, Canada, Russia, Finland, Norway, Sweden, and Greenland. We were unable to speak to people in Iceland and note that limitation. The word cloud below demonstrates the variety of words used to describe very different things, all critical infrastructure to who is saying them.



The many vocabularies, conceptualizations, and prioritizations of what is critical demonstrates the different needs across the Arctic. It is not possible to talk about "Arctic Critical Infrastructure" under one umbrella as there are different Arctics with different states, with different governance structures, peoples, cultures, histories, and needs. Below we share the following perspectives: Indigenous, Local/Municipal, State, and Industry. These perspectives are not exhaustive, and at times may overlap.

Indigenous Perspectives

Critical infrastructure sustains Indigenous lifeways, foodways, cultural practices, and reciprocal relationships with the environment. For many Arctic Indigenous Peoples, the most essential forms of infrastructure are sacred sites and place-based Indigenous Knowledge Systems. These are often described in terms of culture, traditions, and connections to the natural world. They are frequently framed as under threat from states, colonial systems, climate change, and industrial development. At the core, Indigenous critical infrastructure is grounded in self-determination, governance, participating in decisions, respect for Indigenous Knowledges, and the wellbeing of the community and natural world.

This form of infrastructure and Indigenous considerations includes:

- Cultural infrastructure, including places and systems that support Indigenous identity, language, heritage, and continuity across generations;
- Marine and land infrastructure for food security including access to marine and land areas for hunting, fishing, and gathering, including access to sea ice and frozen tundra that are at threat from climate change;
- Nature-based solutions to climate impacts on infrastructure that uses local materials and ecological knowledge (e.g., shrubs for erosion control);
- Community-led adaptation: local knowledge as a driver of infrastructure design and resilience, Indigenizing data and AI used in industrial monitoring;
- Protecting sacred sites and subsistence infrastructure from industrial encroachment;
- Co-production of knowledge and Indigenous-led planning.

Local and municipal perspectives

Critical infrastructure supports daily life, safety, and subsistence practices. It includes built physical infrastructure like roads, housing, and water systems as well as soft infrastructure like knowledge, culture, and social networks. Municipalities often discuss these in terms of investment, policy, and development. Sometimes one local community competes with another within the same country. Other times municipal perspectives compete or struggle to be heard by States and governments.

The youth we spoke to are concerned with their future, jobs, education, and virtual life, as well as climate change, which requires strong investment in community infrastructure that does not always align with local or State interests.

This form of infrastructure and local and municipal considerations includes:

- Municipalities have administrative power over land use in some places;
- Housing to address affordability, shortages, and homelessness as well as mold, frost damage, collapsing roofs, outdated construction codes and vulnerability to climate change;
- Utilities such as sewer, water, and energy systems;
- Telecommunications that include reliable internet and phone services (e.g., satellite, fiber optics);
- Climate adaptation with infrastructure that is resilient to snow, ice, storms, erosion, floods, and permafrost thaw. Increase community capacity to engage in planning and monitoring;
- Water systems that include sanitation, potable water, snow management;
- Waste disposal that includes safe sites for solid waste and sewage that does not leach toxins;
- Transportation such as access to airports, seasonal roads, bridges, and river crossings;
- Community infrastructure including libraries, youth centers, literacy programming, mental health support, health care, and jobs;
- Community-based energy systems like renewable energy projects that support energy sovereignty;

- Industrial development that ensures local benefit, supports community well-being, and integrates with urban planning;
- Ensure infrastructure supports both economic and residential needs;
- Balance between economic development and environmental/cultural preservation.

State perspectives

Critical infrastructure supports national security and defense, economic development, growing populations, and climate resilience in Arctic cities. States often discuss these in terms of dual-use infrastructure, rather than multi-use infrastructure. States also tend to think strategically in terms of national security, military, international relations, and economic development.

This form of infrastructure and State consideration includes:

- Deepwater ports and transport corridors as strategic assets for defense and commerce;
- Energy infrastructure that connects Arctic resources to global markets;
- Emergency and disaster resilience that is codified in national policies for infrastructure protection;
- Asset mapping to identify infrastructure trends and vulnerabilities (e.g., International Congress on Arctic Research Planning efforts);
- Engineering innovation, including adaptive designs for permafrost, snow, and remote conditions;
- Pan-Arctic land use planning that accounts for managing military, environmental, and community interests;
- Data integration to connect databases and research centers across borders;
- Regional collaboration for infrastructure development;
- Climate modeling to generate robust predictions that inform infrastructure design;
- Search and rescue.

Industry perspectives

Critical infrastructure is needed to operate a profitable business and will be different from country to country. It includes administration, access to work force, capital expenditure, and built infrastructure. Business often discusses infrastructure in terms of cost, strategic needs, reliance, and redundancy. Some focus on their responsibility in terms of providing essential services while others focus on profit maximizing, often searching for investment to pass the cost of investment onto governments, municipalities, or communities.

This form of infrastructure and industry consideration includes:

- Energy systems like oil and gas pipelines, renewable energy installations (wind, solar, tidal, hydrogen), boiler systems, and community-based energy grids;
- Extractive infrastructure including mining roads, processing facilities, and transport corridors for mineral and fossil fuel extraction;

- Transport and logistics for deepwater ports (e.g., Nome, Alaska, USA), railroads, highways, and airstrips supporting industrial supply chains;
- Utilities such as large-scale water, sewer, and waste systems serving industrial operations;
- Telecommunications including broadband and satellite networks that support industrial monitoring and remote operations;
- Labor and materials, such as sourcing for construction and maintenance.

The challenges

Conversations about infrastructure investment and solutions can be derailed because participants use different meanings for what is considered critical infrastructure during decision making discussions and processes. In some cases, those most impacted by built infrastructure are not even invited to the table.

In particular, there is a problematic history of infrastructure as a medium of colonization and resource extraction (Silva, 2022), especially with national security justification in the Arctic. Some regions have histories of industrial projects reducing access to subsistence lands and resources. Other projects have led to environmental degradation and a lack of maintenance post-construction. Cultural and environmental impacts are under-assessed.

Today, lack of Indigenous involvement in decision-making may result in infrastructure being built where it is not wanted or needed, while urgent community needs go unmet. State governments should therefore be wary of making decisions without consulting communities or local government. For instance, infrastructure development often prioritizes tourism or extraction over local needs. In Alaska, for example, infrastructure development is contested through the courts over traditional fishing, whaling, and walrus rights (for example: (Joling, 2012)). In Sápmi this may look like windmill building, and dams. Meanwhile, state policies may overlook and undervalue infrastructure that communities consider vital (e.g., seasonal access routes, reindeer herding lands, cultural infrastructure).

Given the historical and ongoing links between colonialism and infrastructure development, when States claim that multi-use infrastructure will benefit everyone, these projects will become contested without co-development with local and Indigenous Peoples.

Recommendation

Companies, politicians, and other decision makers need to understand how local communities are talking about infrastructure across sectors, disciplines, and communities, *before* planning a project. They must identify all the actors that need to be part of the conversation and not seek their input after-the-fact or ignore their inputs altogether. Below we offer a check list for ensuring that everyone is on the same page on critical infrastructure.

Checklist to ensure full perspective on critical infrastructure (Full POCI)

- ☐ **Identify more:** There are municipalities, territories, state, federal, regional, Indigenous Nations, organizations, corporations, treaties, private and military landowners or rights holders, that could be involved. Identify and meet with them all.

- ☐ **Understand what infrastructure already exists before planning new construction:** The Arctic has built infrastructure that may have been forgotten. Maintenance is often deprioritized in favor of new construction.
- ☐ **Listen more:** Ensure that you have exhausted the list of people and organizations that may have insight into every project when making your assessment. What works in one place may not work in another.
- ☐ **Widen your definition:** Critical infrastructure is defined differently by user and place. Understand the definitions and principles shared above when going into discussions.
- ☐ **Things can benefit both:** Competitors can become partners in an emergency. Critical infrastructures are not static, and some become critical in winter or summer. Commercial projects can also help national security, for example with telecommunications.
- ☐ **Free, Prior and Informed Consent includes matters on national security:** Governments often do things under the banner of "national security." Balancing state priorities with local and Indigenous needs is essential, yet infrastructure is often planned without community input, consent, or control.
- ☐ **Shared framework**: Without common definitions, infrastructure planning becomes siloed and each group works from different assumptions and often that clashes. Defining the lines between safety, security, commercial, community, municipal is key.
- ☐ **Communicate across borders and sectors:** Siloed national approaches ignore the cross-border nature of Indigenous People, and coordinating efforts may have benefits. The same can be said of private, public and science sectors. This will also avoid fragmented planning and policies on cross-border problems.
- ☐ **Identify opportunities of cost sharing:** Arctic projects cannot be single purpose (ideally). Rather, they need to have multi-use infrastructure development to achieve multiple objectives. Close cooperation between Indigenous communities and other actors can help with access to funding, removing barriers of funding.
- ☐ **Align priorities:** Build new infrastructure within the community so local people can maintain and secure it, while agencies make use of what already exists, lowering costs and improving access.

Notes on the listening sessions

1. North America/Russia: Scholars and community members from the U.S., Canada, and those from Russia now living abroad. Participants included those attending Arctic Science Summit Week 2025 in Boulder, Colorado, including the session "Research Coordination Network (RCN): Co-creating Research for Just Arctic Future Infrastructure Transformations, Resilience, and Adaptation (CRAFT)" that was led by Dr. Vera Kuklina and supported by International Congress on Arctic Research Planning (ICARP) and discussion leads Drs. Howard Epstein, Cana Uluak Itchuaqiyaq, and Heather Sauyaq Jean Gordon.

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2. Greenland: Business leaders in Greenland that operate critical societal companies.
3. Norway: Attendees of the first ever Arctic Six conference on Arctic.
4. Finland: Young people over the age of eighteen who live in Rovaniemi.

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