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About the publication:

3 Main Points:

Can the Arctic become a secure alternative to vulnerable global data corridors? Climate change and rising digital demand make Arctic submarine cables viable, supporting economic activity, scientific research, Arctic communities, and military operations. Competing Western and Russian projects are turning digital infrastructure into a new arena of geopolitical rivalry, reshaping power dynamics in the Arctic.

Highlight Sentence:

"Climate change and rising digital demand are turning the Arctic into a strategic digital infrastructure, where submarine cables will reshape global connectivity and increase geopolitical competition."

Definition:

An underwater optical fibre cable is a cable laid on or beneath the seabed to transmit data and communication signals across seas, oceans, and between continents.

Introduction

At present, over 90% of Europe-Asia network traffic flows through underwater optic fibre cables in the Red-Sea Corridor, a chokepoint that has recently revealed its strategic vulnerability. Evidence of such cables being cut and sabotaged by unknown actors in order to disrupt digital latency and overall internet connectivity, leading states to develop safer underwater optical fibre cables.

In this context, the Arctic is increasingly perceived as the alternative for a safe global digital infrastructure. As ongoing climate change accelerates sea ice retreat, Arctic seabeds that were once inaccessible have now become technically reachable to lay submarine optical fibre cables. This environmental transformation, combined with the region's geographic position that offers the shortest routes between Europe, North America and Asia, both in terms of shipping and underwater cables, places the Arctic as the future digital infrastructure. Beyond data transmission and communication, the Arctic's digital infrastructure has the potential to support the economic and social development of Arctic communities, scientific research, natural resources extraction activities, and military operations. However, this opportunity simultaneously increases geopolitical competition mainly among Arctic states, creating a clear divide between the Western countries and Russia. The digital infrastructure has become a new power dimension in one of the planet's last frontiers.

Drivers behind the emergence of a digital infrastructure

The emergence of an Arctic digital infrastructure can be understood through the convergence of environmental change, the growth of the global digital economy, societal needs, and security aspects.

Climate change is the main driver of this emergence. The accelerated Arctic sea ice melting has made Arctic waters more accessible, making the operations of laying submarine optical fibre cable more technically feasible. Routes that were previously covered by ice are now accessible, making maintenance operations easier and less costly. However, the Arctic is still a hostile environment, and such operations are still risky and costly. As proof of that, some cable-laying projects are not yet underway as icebreakers are still being constructed, while other operations ensure to either bury the optical fibre cable under the seabed to ensure their safety, or to protect the cable by an armor that can resist pressure of up to 50 tons, since Arctic waters may freeze all the way to the bottom during cold periods, thus endangering the structural integrity and functionality of the cable.

Economic demand for high-speed connectivity is another key driver. The Arctic is home to a growing number of energy extraction sites, mainly oil and gas, as well as an expanding port infrastructure tied to the emergence of the Northwest Passage and the Northern Sea shipping routes. These sites require high-speed connectivity and overall better digital infrastructure to improve the efficiency of the processes of enterprise management, to automate processes in the oil and gas industry, and to develop a robust network of digital communications, among others.

Apart from energy extraction sites, the Arctic is also home to scientific research stations and weather monitoring systems. A study shows that recent technological developments have allowed underwater optical fibre cables to be equipped with acoustic and seismic sensors capable of monitoring the ocean. Whales are detected and tracked to both follow their migration patterns and avoid collisions with ships navigating the Arctic Ocean. Earthquakes are identified through seismic sensors, while storms and ocean swell are also detected and studied through acoustic sensors. Evidently, the Arctic's digital infrastructure is key for scientific research and weather forecasting.

From a social perspective, the digital infrastructure also plays a key role. Arctic settlements are often secluded from safe, stable, and accessible internet connectivity, posing a threat to social stability and raising the debate of whether access to the internet should be considered an essential human right. The lack of reliable broadband in the Arctic creates a barrier to democratic participation and essential services for aboriginal communities. By providing stable connectivity, the digital infrastructure enables telemedicine, distance learning, e-commerce, and government engagement, services which are vital for societal resilience. Overall, the digital infrastructure will be a tool for improving the living standards of the Arctic communities.

Finally, from a military perspective, NATO's renewed focus on the Arctic and increasing concerns over Russian military activity have increased the need for a secure digital Arctic infrastructure that establishes a resilient communications network. With the modernisation of NORAD, the Arctic digital infrastructure will be key to improving surveillance capabilities, early-warning systems, and communications. At a time when the sabotage of underwater cables in the Baltic Sea increases, developing an Arctic digital infrastructure is key to guaranteeing safe data transmission and communication. The dire consequences of the hybrid war that threatens Europe can be reduced by developing a digital infrastructure in the Arctic, as the region's harsh conditions and remoteness make any sabotage on underwater cables unlikely and very costly.

Infrastructure developments

The debate around the Arctic being a possible future digital infrastructure is relatively recent, and that is the reason why the region is still far from becoming a digital hub. However, some projects to develop this infrastructure are already underway and could already be finished by the end of this decade.

Far North Fiber

One of the ongoing digital infrastructure developments in the Arctic is the Far North Fiber project, which intends to build the first underwater optical fibre cable system connecting Europe and Asia. A joint venture between three companies of the digital network sector (Cinia Oy from Finland, Far North Digital from the US, and ARTERIA Networks Corporation from Japan), the plan is to build and lay a 14,500 km cable that will connect Japan to Europe via the Northwest Passage. Landings of this cable are expected in Alaska and the Canadian Arctic in America, and in Norway, Finland and Ireland in Europe.

With an estimated cost of 1 billion euros, this route is expected to minimise signal latency (the time it takes for a signal to travel from a source to a destination) to 142 milliseconds Round-Trip Delay (RTD), which Far North Fiber argues is unrivalled speed. Additionally, this digital infrastructure project plans to connect cloud networks, hubs of the data industry and Low-Earth Orbit satellite systems, with the aim of increasing network speed and decreasing energy costs.

Polar Connect

Polar Connect is another digital infrastructure project that aims to connect Europe with Japan, but through a different route. A conglomerate of Nordic government-owned research and education entities known as NORDUnet, which includes organisations from Sweden, Finland, Norway, Denmark, and Iceland, aims to build an underwater optical fibre cable that traverses east of Greenland, through the North Pole, and connects with Japan and South Korea. This project is still at an early stage, with the marine survey not expected to take place until 2027 at the earliest, once the construction of a new icebreaker has been completed. Funded by the Nordic governments and with financial support from the EU's Connecting Europe Facility (CEF Digital), the project is expected to end by 2030 and, along with Far North Fibre, represents one of the two European efforts to develop a digital infrastructure in the Arctic.

Polar Express

While Far North Fibre and Polar Connect will be the West's digital infrastructure through the Arctic, Russia has also made moves to develop its own Arctic digital network. First announced by the Russian government in 2020, the project aims to connect Teribeka, a tiny village located in Murmansk Oblast, a region very close to the border with Finland, with Vladivostok, in Russia's Far East.

The cable will be 12,650 km long and traverse the Northern Sea Route through the Bering Strait and into the Pacific Ocean, which is the shortest route from Europe to Asia. This cable is expected to be able to transmit up to 100 terabytes of data per second and to minimise signal latency down to 90 milliseconds, to achieve the fastest transmission of information and create an alternative to satellite communication systems in the far north. The total cost of the project is estimated at 65 billion roubles (approximately €700 million).

So far, Russia has managed to lay underwater cables almost to the village of Tiksi, almost halfway to the total distance to Vladivostok. It is estimated that by 2026, the cable will have reached Tiksi, while the Polar Express project is expected to end in 2028.

Geopolitical implications

The development of the Arctic's digital infrastructure does not simply have a technological, social, or economic purpose, but rather broader geopolitical implications that may reshape Arctic states competition and power dynamics in the region. As underwater optical fibre cables become imperative for the functioning of the global digital economy and for Arctic peoples, controlling the routes, landing points, and structural security of the cables becomes essential.

One of the geopolitical considerations is sovereignty and territorial relevance. For instance, Greenland, which has been at the scope of the Arctic geopolitical debate, is gaining renewed strategic importance as a potential cable landing site and a hub for the transit of submarine cables, as planned with the Polar Connect project. As part of Denmark and by extension of NATO, Greenland's role in the Arctic's digital infrastructure will strengthen Europe's influence in the Arctic, adding an additional layer to Greenland's already existing strategic value regarding military and natural resource considerations.

In the meantime, Europe's will to develop its own digital infrastructure intensifies the longstanding NATO-Russia competition. Far North Fibre and Polar Connect aim to create a secure network of communications and data transmission between Europe and Asia, reducing dependence on existing, more vulnerable routes. But Russia is not falling behind in the development of this infrastructure, with Polar Express being Moscow's way to consolidate control over the Northern Sea Route, both as a shipping route and in the future as a digital infrastructure exclusively under Russian jurisdiction. With these projects, the Arctic fragments into a sphere of technological competition with ramifications for economic, scientific, social, and military aspects.

China, while not an Arctic state, has long expressed its interest in becoming a relevant actor in the Arctic. Its Polar Silk Road (PSR), which is part of the broader Belt and Road Initiative, with which China intends to develop a global infrastructure and economic development strategy, mentioned its interest in improving connectivity in the Arctic. Even though negotiations between China and Russia regarding the PSR seem to have reduced after the war in Ukraine started, China's economic and geopolitical might must not be overlooked. In the near future, it is not unlikely to see Chinese firms as underwater optical fibre cable suppliers for Arctic operations, as investors in massive submarine cable projects or as future partners with Russia, with whom they are more likely to side rather than the West. Europe should remain alert regarding Chinese involvement in the Arctic's digital infrastructure.

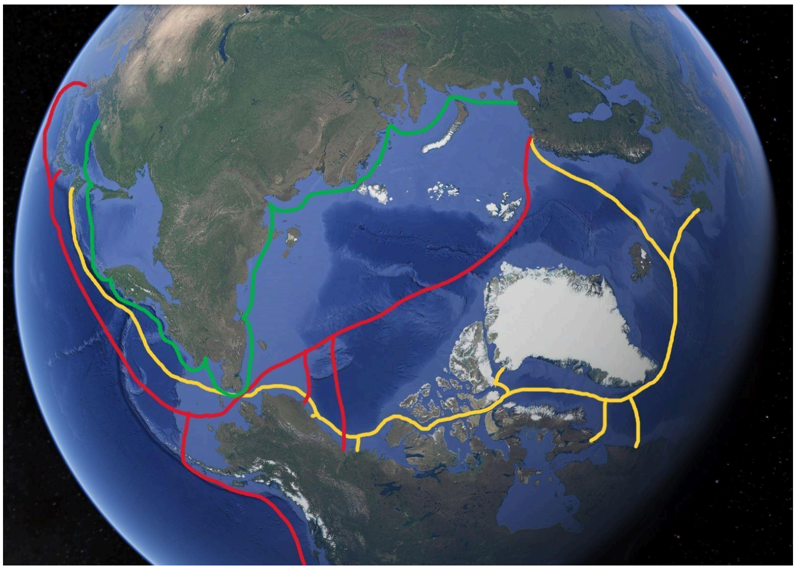
It is evident that the Arctic's digital infrastructure is transforming the region into a field of geopolitical competition, where security, sovereignty and technology intersect. As climate change reshapes the Arctic, digital connectivity will not only redefine economic and social development, but also strategy and geopolitics in one of the planet's last frontiers.

Conclusion

The emergence of the Arctic's digital infrastructure illustrates the increasing connection between climate change, technology and geopolitics. What used to be a remote and harsh region is progressively transforming into a space of digital infrastructure, natural resources operations, scientific research, and military operations. The fact that several countries are willing to spend millions on digital infrastructure in the Arctic shows how the region will be inherently tied to the global digital economy.

While projects such as Far North Fibre, Polar Connect, and Polar Express are pioneering digital infrastructure in the region and make promises of improved connectivity and safer infrastructure, this digital transformation also deepens geopolitical competition between NATO states, Russia, and potentially China. As reliance on the digital infrastructure grows, control and competition over digital routes and infrastructure security will only increase in the coming years, making the Arctic the field of competition for the future of global communications.

Map of the three Arctic undersea optical fibre cable ongoing projects



Yellow line - Far North Fibre

Red line - Polar Connect

Green line - Polar Express