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INDO-ARCTIC

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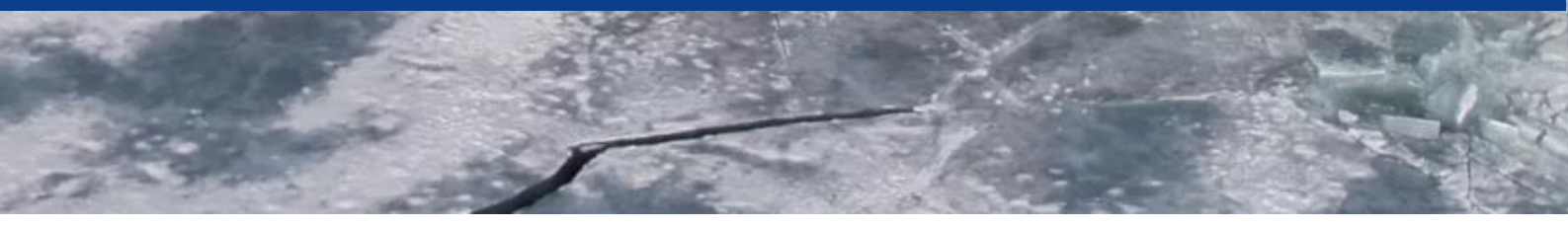
RUSSIA-CHINA ARCTIC AMBITIONS



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Global Politics is a primary focus of the NIAS Programme on Science, Technology and International Relations (STIR). The primary focus is on contemporary world affairs. The Programme publishes *The World This Week* and *NIAS Fortnightly on Science Technology and International Relations*.

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Polar and ocean research plays a key in developing a knowledge database on the unknown horizons in the earth's system. We currently witness vast changes in ocean temperatures, glacier shrinking, and ice sheets in the polar regions, which could have a critical impact on the seas, life in the ocean and land. Understanding the nature of the polar regions and oceans is essential through a multidisciplinary approach.

NIAS Polar and Ocean Studies aims to study the polar regions - the Arctic and Antarctic. On the Oceans, it aims to study the following verticals: Governance, Conservation, Blue Economy, Security, Infrastructure, Ocean Health, Ocean Science, Ocean as a Global Common and Maritime Security

Indo-Arctic Reader will focus on capacity building amongst young scholars, expert lectures by prominent academicians and diplomats, monthly discussions on Europe and a Monthly Dispatch – *Indo Arctic Reader*.

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NIAS

About NIAS

The National Institute of Advanced Studies (NIAS) was conceived and founded in 1988 by the late Mr JRD Tata, who sought to create an institution to conduct advanced multidisciplinary research.
The objective is to nurture a broad base of scholars, managers and leaders who would respond to the complex challenges that face contemporary India and global society, with insight, sensitivity, confidence and dedication.

About Indo-Arctic Reader

Indo-Arctic Reader is an academic initiative started by NIAS Global Politics under the Science, Technology and International Relations Programme.

The Monthly is an integral part of NIAS Polar and Ocean research. It includes focused commentaries on the Arctic and the Antarctic and daily updates on contemporary Polar. The opinions expressed in this publication are those of the authors. They do not purport to reflect the opinions or views of any institutions or organisations.

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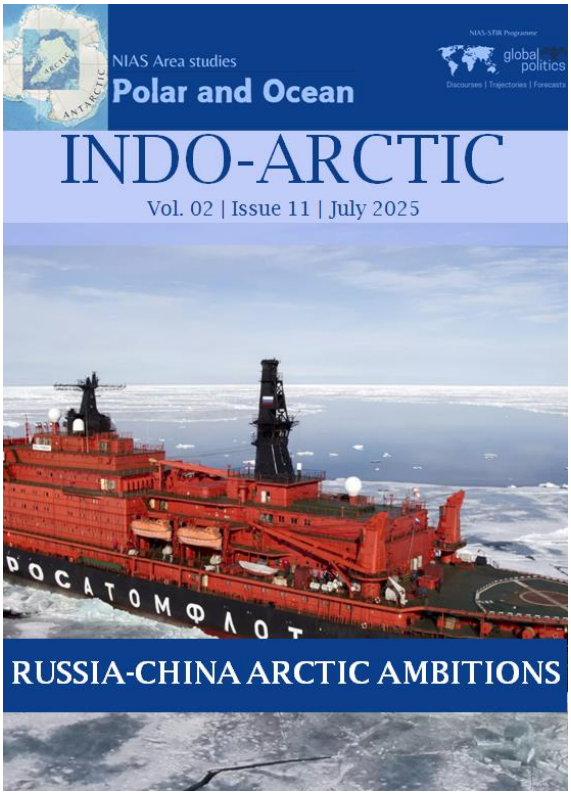

US Coast Guard expedition in the south pole Image Source: Wikimedia

IA COMMENTS

Arctic Council: Denmark takes over the Chair amid geopolitical tensions
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IA DAILY BRIEF

By Lekshmi MK and Padmashree Anandhan

Source: KSAT, Liu Shipping, polarbearsinternational, Niels Fuchs, University of Hamburg, Murmansk Telegram, Down to Earth

IA Daily Brief provides a brief overview of the latest developments in the Arctic and Antarctic from climate change, economy, politics, science and technology, security and governance aspects.

COMMENT

Arctic Council: Denmark takes over the Chair amid geopolitical tensions

By Padmashree Anandhan, NIAS, Bangalore

On 12 May, the 14th Arctic Council meeting was held virtually, marking the end of Norway's chairship between 2023 and 2025. Representatives from the eight Arctic States and six Indigenous Permanent Participants took part in the session, which ended with the release of the Romssa-Tromsø Statement. The joint declaration affirmed the Council's commitment to peace, stability and cooperation in the Arctic region. Norway's Minister of Foreign Affairs said: "In a challenging time for Arctic cooperation, I am pleased that the Arctic Council remains united."

According to the Arctic Council report: "Arctic States and Permanent Participants emphasized the importance of dialogue and collaboration through the Arctic Council, highlighting the Council's nearly three-decade legacy as the preeminent forum for circumpolar cooperation. They also reaffirmed their commitment to addressing the region's environmental, social, and human challenges, with the well-being of Arctic communities—and particularly Indigenous Peoples—at the center of its mission."

On 12 May, Denmark assumed the Arctic Council chairmanship following the end of Norway's term. The US and Russia have not issued major statements; however, prior to the Arctic Council Meeting, the US assured its commitment to Arctic cooperation through a resolution 167, emphasising the need for increased collaboration among Arctic Council member states. Whereas Russia's Foreign Ministry indicated its readiness for dialogue on Arctic agenda if "conducted on an equal and mutually beneficial basis."

What is the background?

First, a brief on the Arctic Council. The Arctic Council in an intergovernmental forum formed in 1996 to promote cooperation and interaction among the Arctic states, Indigenous communities and Arctic residents on issues mainly relating to sustainable development and environmental protection. Its eight member states include Canada, Denmark, Finland, Iceland, Norway, Russia, Sweden and the US, along with six Indigenous Permanent Participant organizations and 35 observers, including non-Arctic countries, intergovernmental organizations and NGOs. The Council operates through six working groups with ministerial meetings every two years to set its priorities and review the progress. Its focus so far has been away from geopolitics. Following the war in Ukraine, it has faced immense pressure, resulting in the suspension of direct cooperation with Russia.

Second, Arctic and the geopolitical background. The geopolitical tensions after war in Ukraine and Trump's presidency have heightened with increased presence of NATO, China and Russia. Trump's proposal to purchase Greenland underlines the US's focus on increasing its influence in the Arctic, raising concerns among the Nordic partners. Simultaneously, China's growing investments in scientific stations, infrastructure investments and strategic partnership with Russia under the "Near-Arctic State" label threaten the Arctic governance. Following the war in Ukraine and isolation by the West, Russia has also increased its military and economic engagement in the Northern Sea Route. Another major addition would be NATO's expansion through surveillance and infrastructure development from Finland and Sweden's accession. All combined has led militarization of the Arctic and heightened concerns over Arctic peace and environment among the Arctic Council members and observer states.

Third, takeaways from Norway's chairship of the Arctic Council. During its chairship, Norway focused on "The oceans, climate and environment, sustainable economic development, and people in the North." Amid the war in Ukraine and Arctic council members pausing the cooperation under Russia's chairship, Norway became the bridge between the stalled Arctic Council cooperation and focused on maintaining the operations of the council without disruption, setting the stage for a smooth transition to Denmark. Its initiatives on wildfire management, Arctic Ocean Research Cruise II helped in circumpolar collaboration but the absence of full participation of all Arctic Council member states remained a major gap. It showcased the limitations of the Arctic Council to address the geopolitical issue.

What does this mean?

Responding to the growing geopolitical tensions and maintaining the Council's operations a challenge to Denmark. The chairship comes at a critical time, which calls for strong diplomatic efforts to tackle the high-level geopolitical challenges. The Arctic cooperation remains stalled without Russia's participation and Denmark holds the responsibility to manoeuvre the polarized Council. Apart from this, its internal dynamics with Greenland (call for independence) make it more complex for Denmark to have a stronger voice in the Arctic governance. At the external, responding to increased military activity of NATO, US-China rivalry and Russia's aggression while balancing the Indigenous rights and preserving the consensus among the Council would be the major challenges for Denmark.

IA DAILY BRIEF [1]

By Lekshmi MK, and Padmashree Anandhan

BIODIVERSITY

IUCN lists Blue Sharks in the Pacific Ocean as "Near Threatened" due to destructive fishing practise

On 20 May, the Oceanographic reported that blue sharks were being listed as "Near Threatened" by the International Union for Conservation of Nature (IUCN). In 2023, industrial liners were reported to have caught 438,500 blue sharks in the Pacific Ocean. This figure is double the number that was recorded in 2015. Blue sharks were being bycaught by longline fishers across the Western and Central Pacific Fisheries Commission (WCPFC) region over the past nine years, and in the Tasman Sea between Australia and New Zealand, made up more than 90 per cent of bycatch. Greenpeace Australia Pacific highlighted that industrial longlining was being destructive and indiscriminate fishing practice. This practice led to the deaths of hundreds of thousands of marine animals annually. Greenpeace urged the Australian government to ratify the Global Ocean Treaty within the first 100 days of its term after the United Nations Ocean Conference in France. (Rob Hutchins, "Half a million blue sharks killed in Pacific Ocean in 2023," *Oceanographic*, 20 May 2025)

Scientists recreate the environment where Polar dinosaurs lived 120 million years ago

On 12 May, *Live Science* reported that scientists recreated the environment where polar dinosaurs lived 120 million years ago. During the Early Cretaceous, areas within the polar circle were experiencing months of darkness. Despite these harsh conditions, dinosaurs thrived and left behind fossil evidence. The Cretaceous period was a mildest climate, with temperatures averaging between 6 to 14 degrees Celsius warmer than today. However, it allowed such ecosystems to exist in polar regions. Now, the reconstruction was revealing cool-temperate forests with rivers and large ferns in southern Australia. ("See the reconstructed home of 'polar dinosaurs' that thrived in the Antarctic 120 million years ago," *Live Science*, 12 May 2025)

Scientists find presence of synthetic chemicals in fat tissue of Polar Bear due to pollution impact

On 19 May, *Phys.org* reported the fat tissue biopsies conducted on polar bears in Norway's Svalbard archipelago for the first time. The research team captured 53 bears, fitting 17 with satellite collars, and tracking 10 mothers with cubs to gather extensive data on their health and behaviour. The scientists studied the impact of pollutants on their health. An analysis of the collected fat samples revealed the presence of persistent synthetic chemicals in the environment known as per- and polyfluoroalkyl substances (PFAS). Despite being exposed to pollutants, Svalbard's polar bears were showing no signs of ill health. With diminishing sea ice, polar bears were adapting by altering their diets to include reindeer, bird eggs, and seaweed, spending more time on land than in previous decades. They were also attaching small "health log" devices to some bears, which were recording pulse and temperature data to provide insights into their physiological responses to environmental changes. ("Polar bear biopsies to shed light on Arctic pollutants," *Phys.org*, 19 May 2025)

Research finds dynamic changes in plants due to climate change in the Arctic

On 16 May, *Utah State Today* reported that scientists were embarking on a wide-ranging study over more than 2,000 tundra plant communities in 45 Arctic sites, monitoring how the ecosystems were

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reacting to a rapidly changing climate. More than 40 years of field data were being examined, showing that, while some regions were seeing growing biodiversity, others were seeing declines. Taller shrubs were spreading in some areas, creating shading that was inhibiting lower growing flowering species, but this trend was not being uniformly observed throughout the Arctic. The research team, which consisted of 54 researchers from 50 institutions, was reporting that plant communities were not converging in response to climate stress but instead displaying a mosaic of responses. This variability was challenging earlier assumptions about ecological change, demanding that warming patterns and local conditions were influencing plant dynamics in different ways. The findings were highlighting the complexity of Arctic ecosystems and the central importance of cooperative, long-term research in explaining the intricacies of climate change effects. (" No Clear Winners: New Research Shows How Arctic Plants Are Responding to Warmer World," *Utah State Today,* 16 May 2025)

CLIMATE CHANGE

Scientists warn temperature rise about 1.5 degree Celsius would lead to unmanageable sea level rise

On 20 May, *The Guardian* reported on Scientists warning over sea level rise will become unmanageable even with a global temperature increase of just 1.5 degrees Celsius, leading to "catastrophic inland migration." Despite efforts to curb emissions, sea levels are projected to rise by one centimetre per year by the end of the century, faster than coastal defenses can be built. The primary cause of this rise is the accelerated melting of Greenland and Antarctic ice sheets, which could eventually lead to a devastating 12-metre rise in sea levels if global warming reaches 2.5 to 2.9 degrees Celsius. This would threaten millions of people living near coastlines and cause trillions of dollars in damage annually. Though the 1.5 degrees Celsius target is nearly out of reach, the study emphasizes that every fraction of a degree avoided still matters, providing more time for adaptation. The scientists suggest that a "safe limit" for ice sheet stability might be around one degrees Celsius, but a rise of one to two meters is now inevitable, with major implications for both developed and developing nations. The study also highlights the risk of self-reinforcing feedback loops that could drive even faster sea level rise, potentially displacing billions in the long term. (Damian Carrington, "Sea level rise will cause 'catastrophic inland migration', scientists warn," *The Guardian,* 20 May 2025)

University of Birmingham reports findings revealed the shift in deep ocean circulation

On 20 May, the University of Birmingham reported on Tom Jones study on marine algae to interpret the sedimentary records. Dunkley's study offers new insights into the evolution of deep ocean currents that were impacting Earth's climate. For predicting future climate scenarios, understanding the historical behaviour of ocean currents was considered important. The findings revealed the shift in deep ocean circulation through the intensification of Iceland-Scotland Overflow Water (ISOW) 3.6 million years ago. In contrast, the Denmark Strait Overflow water (DSOW) and North Atlantic Deep water (NADW) exhibited a more consistent presence since the Late Miocene period. This contrast was underscoring the dynamic nature of oceanic systems and their complex responses to climatic shifts. (Tom Dunkley Jones, "New Research Illuminates Ancient Ocean Currents and Climate Change," University of Birmingham, 20 May 2025)

Land was warming faster, and the permafrost was thawing says the brighter side

On 16 May, *The Brighter Side of News* reported that the Arctic might have been appearing barren and lifeless, but its carbon-rich soils were quietly performing vital climate work beneath the surface. While tree planting was being promoted as a climate solution, it was actually addressing timber demands more than climate mitigation. In the rush to green the Arctic, several were overlooking how the

region was highly prone to natural hazards. Newly planted forests were being put at serious risk, especially as reduced albedo was causing surfaces to absorb more heat, which in turn was rapidly melting snow and ice. The land was warming faster, and the permafrost was thawing. Meanwhile, herbivores like caribou were playing an unsung role by grazing, they were helping maintain the albedo effect and reducing insulation. True climate solutions were needing to emerge from the wisdom and involvement of Arctic communities, whose lives and traditions were being intertwined with the fragile ecosystem they were trying to protect. (Joseph Shavit, " Planting trees in the Arctic could have dire consequences," *The Brighter Side of News*, 16 May 2025)

Uneven rates of ice melting found in Antarctica

On 18 May, *Wodne Sprawy* reported that a team of scientists from the University of Leeds was observing an unusual phenomenon in Antarctica, termed "ice piracy," where one glacier was capturing ice from its neighbour. This interaction was being believed to unfold over a century, but new observations were showing it was already underway and accelerating due to changes in the Kohler East and Smith West ice streams. The team was estimating that the annual balance of this ice transfer could become equivalent to the length of seven football fields. There was slowing down being seen in Kohler West by roughly a ten per cent decrease in pace, attributed to presumably uneven rates of melting of nearby ice masses. This result was opposite to the deeply entrenched assumptions about glacial alteration, the alterations turning out to be feasible within less than 20 years images were assisting in the detection of this new ice diversion, which had major implications for the knowledge of glacial action and its effects on oceanic sea levels. (Zespol Redakcyjny, "Glaciers in Antarctica steal ice from each other at a surprising rate," *Wodne Sprawy*, 18 May 2025)

Slow-moving rivers found underneath west Antarctica

On 14 May, *Earth* reported on recent discovery of how underneath rivers in Antarctic fastened the melting of ice sheets. According to the report. An international team of scientists drilling 500 meters through West Antarctica revealing a slow-moving water channel under the ice. The subglacial river which is observed to emerge only once a decade has now altered the assumptions on how the meltwater circulated under the ice shelf. The report stated that the discovery and subsequent study would help predict the sea-level rise. The expedition leader, Huw Horgan said that the slow flow of water does not mean a stable system but removal of sediments from the floor preserve could be a sign to larger floods. According to Horgan, the water from the subglacial lakes fills and empties in cycle leading to a flow into the sea. However he said that core sample by the research team indicate the possibility of large water flushes every 10 years which could lead to increased melting. (Andrei Lonescu, "Hidden rivers accelerate the melting of Antarctica's ice sheets," *Earth.com,* 14 May 2025)

DEEP-SEA MINING

Government plans to extract minerals from the US Continental Shelf

On 20 May, *Bloomberg* was reporting that the Trump administration was planning to sell mining rights off the coast of American Samoa. Trump's administration was aiming to extract the valuable mineral resources located on the US Outer Continental Shelf. This initiative was setting a stage to strengthen the US's resilience and protect its self-interest. This move was increasing the domestic access to critical minerals that were crucial for various industries. However, environmentalists and conservation groups were expressing serious concerns about the damage that these deep-sea mining activities were causing to marine ecosystems. (Jennifer A Dlouhy, "Trump Sets Stage to Sell Ocean Mining Rights Off American Samoa," Bloomberg, 21 May 2025)

DEFENCE & SECURITY

Russia's deploys Tu-95MS bombers for strategic advantage

On 19 May, the *Bulgarianmilitary* reported that Russia had sent two more Tu-95MS strategic bombers to the airbase of Olenya in the Arctic. The Tu-95MS bomber has nuclear capability and can carry long-range cruise missiles, thereby increasing Russia's deterrent. As a part of the modernised fleet, the aircraft features upgraded avionics and weapons systems to extend its operational lifespan and effectiveness. The move reflects Russia's symbolic move to the other Arctic powers and NATO members that it is prepared to defend its regional interests. Russia is observed to be bolstering its military presence amid geopolitical tensions, global warming, emerging maritime routes, and unexploited natural resources. The selection of Olenya is considered strategic due to its proximity to NATO and to shield bombers from Ukrainian drones. Symbolically, it is projecting power toward the West. Yet the reliance on ageing platforms like the Tu-95MS is raising doubts about the sustainability of Russia's air campaign. (Bokyo Nikolov, "Russia deploys two more Tu-95MS bombers to remote Arctic hub," *Bulgarianmilitary*, 19 May 2025)

Canada's military to deploy more forces longer in the Arctic budget

On 15 May, in an interview to *CBC News,* Canada's military operations commander, Lt-General Steve Boivin stated Canada's plans to expand its training in the Arctic by deploying more forces upto 10 months this year. He said: "We want to be in the Arctic on a near permanent basis." He added that Canada's well known military exercise "Far-North-Operation Nanook" would have additional elements for consistent presence and increased focused in the region. According to one of the defence experts, the expansion plan by the government is aimed largely to make the NATO countries follow trait to strengthen their sovereignty. This comes after the Canada government increased its investment adding USD 420 million as part of its defence budget aimed at increasing its presence in the far North. The government has also ordered the military in September 2024 to revise its schedule to conduct seven training regimes in its annual exercise. Boivin said that the expansion move does not mean exclusion of the US but rather believed in regular interactions. (Murray Brewster, "Canada's military plans to be in the Arctic 'on a near permanent basis,' says commander," *CBC News,* 15 May 2025)

ECONOMY

Russia receives USD 160 billion from Northern Sea Route

On 19 May, the *High North News* reported that Russia was expecting to earn USD 160 billion from businesses operating along the Northern Sea Route (NSR) by 2035. Russia's Minister for the Development of the Far East and the Arctic, Alexey Chekunkov said: "The Arctic is one of the key economic engines of Russia's development," highlighting its expanding economic role. The Arctic contributes to 7.5 per cent of Russia's GDP and is projected to account for up to 10 per cent soon. Projects like Yamal LNG, Arctic LNG 2, and Vostok Oil are crucial in exploring Russia's oil and gas reserves in the Arctic. It aims to meet Asia's growing energy demand. Russia is investing heavily in the NSR, which is emerging as an alternative shipping route between Europe and Asia. It is aiming to increase cargo volumes to 150 million tons by 2035. Russia's long-term focus in the NSR remains on sovereignty, logistics, and economic growth with an allotted budget of USD 40 million. (Malte Humpert, "Russia to Earn $160bn in Taxes From Northern Sea Route by 2035, Arctic Region Accounts for 7.5 Percent of GDP," *High North News,* 19 May 2025)

EXPEDITIONS

India to lunch its first deep-ocean mission Samurayaan by 2026

On 13 May, during the national training programme, National Institute of Ocean Technology (NIOT) Director Balaji Ramakrishnan announced India's first manned deep ocean mission. The mission called as "Samudrayaan" will travel 6000-metre depth using a submersible vehicle "Matsya" built using indigenous technology is expected to be launched by 2026. The mission will carry three scientists to create potential for India's deep-sea research to

assess living and non-living resources. Ramakrishnan said: "The mission will be instrumental in collecting critical samples from the deeper oceanic zone, offering opportunities for scientists to understand the unique characteristics of the organism and the water in the region." He added that the technology will be called "Samudrajivah" that focuses on "large-scale open sea age farming." This involves monitoring fish biomass individually and water quality by submerging fish cages in the offshore and rich deep-sea zone to improve fish growth. He added: "The technology is expected to be one of the major developments in India's food security." ("'Samudrayaan': India's first manned deep ocean mission to be launched by 2026 end," *NIOT,* 13 May 2025)

FISHERIES

Research finds new fishing grounds after reduced ice in west coast of Greenland

On 13 May, research at the University of Strathclyde reported on emerging new fishing opportunities near the west coast of Greenland due to climate change. The new fishing grounds were a result of reduced ice coverage resulting in extended trawling although the research warns of over exploitation, ecological sustainability, and sediment dispersion. According to the study, the water suitable for fishing is expected to increase by 6.2 per cent by 2040 and 11.4 per cent by 2090s compared to 2010. The researchers called for a sustainable management of the fisheries to adapt to a changing environment. One of the researcher said: "The increase in areas suitable for activity could enhance opportunities, leading to increased economic benefits." ("New opportunities for Arctic fishing 'must be carefully managed'," *Phys.org,* 13 May 2025)

GEOPOLITICS

China and Russia to expand Arctic collaboration with new shipping and logistics hubs

On 13 May, *Marine Insight* reported on China and Russia's plan to deepen ties in the Arctic by building new shipping and logistics hubs along the Northern Sea Route (NSR). This comes after Russia's President Vladimir Putin held a meeting with China's President Xi Jinping in Moscow. With Arctic trade between the two on the increase, with 95 per cent NSR cargo, Putin stressed that the route was gaining importance, with nuclear icebreakers, expanded border infrastructure, and energy exports, particularly LNG. However, Western sanctions have slowed deliveries from Russia's Arctic LNG 2 project, as Chinese firms remain cautious of violating US restrictions. Despite such barriers, both have active collaboration in LNG ventures. The partnership, under the direct sight of Putin, also showcases ambition to strengthen Eurasian transport routes. ("China & Russia Plan To Strengthen New Arctic Shipping & Logistics Hubs," *Marine Insight,* 13 May 2025)

Former NATO leader calls for NATO Arctic strategy in response to Russia's Arctic Militarization

On 13 May, former NATO Secretary General Anders Fogh Rasmussen called for developing a formal Arctic strategy in response to Russia's growing military presence. He highlighted the latest Russian air bases and defence investments and urged NATO to create Arctic capability targets to induce member investment. As NATO prepares to finalise its new defence goals in the upcoming summit in June summit, and significance of the Arctic is increasing, mainly with Sweden and Finland part of NATO. Although Denmark faces pressure to boost its Arctic defences, especially in Greenland, after Trump's claims. He signalled its readiness to expand US military presence under existing treaties. Rasmussen emphasized the need for "genuine defence investment over provocative takeover rhetoric." (Sanne Wass,"NATO's Former Head Says Allies Must Counter Russia's Arctic Rise," *Bloomberg,* 13 May 2025)

GOVERNANCE

Denmark takes over Arctic Council Chair amid geopolitical tensions

On 12 May, *The Guardian* reported on Denmark assuming the Arctic Council

chairmanship from Norway at heightened geopolitical tension. This is especially after US President Donald Trump's renewed interest in acquiring Greenland, a semi-autonomous Danish territory. In this background, Denmark, in a symbolic move, appointed Greenland's Foreign Minister, Vivian Motzfeldt, as chair for Greenland's aspirations for independence, and also in an attempt to reset ties with Greenland. The Council, so far kept away from security matters, focusing more on environmental cooperation and indigenous rights. Following the war in Ukraine, it has faced immense pressure, resulting in the suspension of direct cooperation with Russia. Despite these challenges, Norway was successful in keeping the Council intact, focusing on diplomacy. Apart from Trump's ambitions and China's growing Arctic involvement is also expected to challenge the Council's unity. Motzfeldt affirmed Greenland's desire for both independence and strong US ties. At the same time, the inclusion of the Indigenous community and maintaining Arctic stability are on the agenda. ("Denmark takes over as Arctic Council chair at a time when Trump eyes its territory, Greenland," Halifax city news, 12 May 2025; Miranda Bryant, "Norway hands over Arctic Council intact after 'difficult' term as chair," *The Guardian,* 12 May 2025)

SCIENCE & TECHNOLOGY

China launches high-resolution ocean simulator for the ocean modeling

On 17 May, China has made a groundbreaking advancement in ocean simulation technology with the launch of LICOMK++, an ultra-high-resolution ocean simulator capable of modeling sea currents with a remarkable 0.6-mile resolution. Developed by the Chinese Academy of Sciences, this tool offers unparalleled precision in studying oceanic and climatic interactions, providing crucial insights into phenomena like typhoons and marine heatwaves. By overcoming significant computational challenges, especially in the face of Western tech restrictions, LICOMK++ sets a new global standard for ocean modeling, with applications ranging from better weather forecasting to enhanced disaster response and climate adaptation strategies. This achievement highlights China's growing role in scientific innovation and its pursuit of technological independence. (Hina Dinoo, "China's Ocean Simulator Stuns World": New Tech Recreates Sea Currents With Unmatched Half-Mile Resolution for Climate and Naval Mastery," *rudebaguette*, 17 May 2025)

NASA in collaboration with CNES develops SWOT satellite to track movement of water and materials

On 18 May, a new NASA satellite mission built a satellite to improve understanding of ocean currents by providing unprecedented detail about small-scale ocean features. The Surface Water and Ocean Topography (SWOT) satellite, developed in collaboration with NASA and France's CNES, can detect submesoscale eddies and waves—tiny ocean currents often just a mile wide. These features play a crucial role in the movement of heat and nutrients across marine ecosystems. For years, scientists knew of their existence but lacked the tools to study them in detail. SWOT's high-resolution images now allow researchers to track how water and materials move, revealing how these small currents influence both ocean temperatures and marine life. This data is crucial for improving ocean circulation models and understanding how the ocean interacts with the atmosphere, with implications for weather patterns and climate change predictions. ("Study reveals healing ozone hole helps Southern Ocean take up carbon," *The Tribune*, 18 May 2025)

NASA satellites reveal temporary Antarctic Ice Gains amid temperature anomalies

On 13 May, *Live Science* reported on the historic ice gain in the Antarctic despite decades of significant ice loss and rising global temperatures between 2021 and 2023. This was discovered in a study by NASA satellite data where researchers from Tongji University examined the data from the GRACE and GRACE-FO satellites, finding Antarctic ice sheet gain on an average of 119 billion tons of ice per year. This anomaly was due to an unusual spike in precipitation, mainly snowfall in East

Antarctica, where "four major glaciers shifted from losing to gaining mass." According to climate experts, the reversal is not predicted for the long term and is seen as a brief gain. During 2002 and 2020, Antarctica lost ice steadily, with more loss in the early 2000s, from 81 to 157 billion tons per year in the 2010s. The recent gains are seen as only temporary, with 2025 satellite readings reflecting levels seen before the anomaly. According to the scientists, global warming allows more moisture in the atmosphere, provoking occasional heavy snowfalls without a counteract to the glacial retreat. The ice loss from glaciers continues to warm rapidly and melt into the ocean. As per the global sea ice cover, there are new "near-record lows and highs." The report highlights the complexities in Antarctica, resulting in short-term changes despite a long-term warming trend. (Patrick Pester, "NASA satellites show Antarctica has gained ice despite rising global temperatures. How is that possible?," *LiveScience,* 13 May 2025)

"Two-dimensional thermal overturning was a key driver of water movement" finds a study

On 13 May, the report by *EOS* examined the importance of Arctic ponds in influencing permafrost thaw and the release of greenhouse gases. However, its internal mixing processes are yet to be understood. As per traditional models, mixing occurs vertically, "where surface water cools, becomes denser, and sinks straight down, mixing the water column from top to bottom." According to a study by Henderson and MacIntyre conducted in 2025, counters that in shallow permafrost ponds, lateral (sideways) movements dominate the mixing process. This is in case of "cold, dense water formed by nighttime cooling in shallow zones flows downslope along the pond bottom." These horizontal gravity currents "displace and renew deeper water layers, effectively ventilating the pond's bottom even when the water remains stratified." It found that two-dimensional thermal overturning was a key driver of water movement. This discovery changes the understanding of how Arctic ponds function and has key implications for modeling biogeochemical processes and scaling greenhouse gas emissions across Arctic regions. (Valeriy Ivanov, "Beyond Up and Down: How Arctic Ponds Stir Sideways," *EOS.org,* 13 May 2025)

Europe launches smart tools for Arctic resilience to monitor real-time air and wildfire

On 07 May, the European Commission introduced two cutting-edge monitoring tools under the EU-funded Arctic PASSION project to support Arctic communities facing rapid environmental change. One is AURORAE, which forecasts real-time air quality, and the other is INFRA, for localized wildfire risk management. AURORAE, developed by the Joint Research Centre (JRC), is a web-based platform that delivers up-to-date air quality data and two-day forecasts focused on particulate matter (PM10) across Northern Europe and the Arctic. The user-friendly platform has an interactive map with colour-coded indicators, hourly forecasts, downloadable data, and daily pollution bulletins to help residents make informed health decisions. While INFRA, developed by Italy's National Research Council (CNR), improves wildfire preparedness by offering localised, actionable fire risk information. These tools help address urgent environmental threats to the Arctic, which is warming three times faster than the global average. The tools are supported by the EU's Arctic policy, the European Green Deal, and the Biodiversity Strategy for 2030, which show a growing commitment to blending research, innovation, and local empowerment to safeguard Arctic ecosystems and communities. (Joint Research Centre, "New tools to enhance environmental monitoring in the Arctic," *European Commission,* 07 May 2025)

SHIPPING

Greenland's shipping firm sets precedent to use cleaner fuels in the Arctic

On 19 May, the *American Journal of Transportation* reported on the Royal Arctic Line (RAL), Greenland's shipping firm, phasing out the use of heavy fuel oil (HFO) in its operations. This comes ahead of the full ban set for 2029 by the International Maritime Organisation (IMO). While the IMO's ban on HFO came into effect on 01 July 2024, with exemptions to certain ships to continue using HFO until 2029. RAL has indicated early compliance, while the company is setting a powerful precedent for other shipping firms operating in the Arctic. RAL seeks to avoid oil spills within the Arctic environment and to limit black carbon emissions that could contaminate the ice and glaciers. RAL emphasizes the need to implement cleaner fuels in maritime operations and engages in active guarding of the Arctic. ("Greenland shipping firm Royal Arctic Line to end heavy fuel oil use," *American Journal of Transportation*, 19 May 2025)

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