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Changing Tides of the Arctic maritime situational awareness – opportunities and challenges

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Figure 1: Arctic Ocean is smallest of the World´s oceans, centering on the North Pole (Britannica).

ABOUT AI-ARC

The AI-ARC "Artificial Intelligence based Virtual Control Room for the Arctic" project's main objective is to create an innovative and user-friendly AI based platform, the Virtual Control Room (VCR), that has the power to greatly improve maritime situational awareness, decision-making, communication, available rescue resources, and thus the safety of all maritime actors, particularly in the Arctic Sea.

The AI-ARC project will develop a shared collaboration workspace based on innovative and efficient AI-services, a VCR that will significantly enhance border and external security, as well as support cooperation managing external borders in the Artic and High North Seas. The platform will be tested and developed together with practitioners and other end users in order to properly address their needs. The new technological solutions to be developed rely on existing systems, in compliance with EUROSUR. Further, the platform is integrated with the CISE environment to ensure a seamless cross-sector and cross-border interoperability. This ensures a quick uptake of the platform by the practitioners, and the platform does not require costly investments or increased workload. Finally, AI-ARC pays specific attention to societal resilience and aims to improve citizens´ perception safety too.

Through novel technologies and innovations, AI-ARC will improve maritime situational awareness, decision-making, communication, available rescue resources, and thus the safety and security of all EU maritime actors, particularly in the Arctic Sea. The AI-ARC solution will be most particularly valuable for Coast and Border Guard Authorities, private communities and private enterprises, such as the fishing and cruise industries and commercial shipping. By enhancing capabilities of these end-users, AI-ARC partakes in the efforts of the European Union to improve the management of EU borders, build secure societies and protect the freedom and security of Europe and its citizens. AI-ARC also fully embraces the European Union's ambition for a stronger engagement towards a peaceful, sustainable and prosperous Arctic throughout.

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Changing Tides of the Arctic maritime situational awareness – opportunities and challenges

1.1 Challenges ahead

Civil Security readiness and cooperation measures can take many different forms. After all the goal is to enhance the societal resilience and citizen safety. This task is particularly important in the remote and vast areas of the Arctic where challenges are present but resources to respond to them are few and scarce. Arguments around the Arctic have more recently centred on oil company drilling such as Shell's controversial and now abandoned attempts to explore off the coast of Alaska and new plans to open up the Norwegian far north.

The increasing scope for industrialising the region as the ice melts has also triggered geopolitical tensions and talk of a new cold war because the legal status of who owns what up there is uncertain. The wildlife charity WWF has accused cruising companies of putting at risk "the very thing that tourists would come to see" – a pristine wilderness and home to endangered species such as polar bears and walrus. Their argument has been that the unique wildlife is already stressed by a warming climate and the loss of sea ice, and the arrival of mega-cruise ships in this part of the world could push it further towards the edge.[1]

New tensions in the great power politics are affecting international cooperation also in the Artic areas. Especially spill-over effects of the conflict resulting from the war in Ukraine could be devastating for the Arctic cooperation arrangements. Therefore, it is important to develop political and functional measures for the damage limitation, and for that purpose are good communications and surveillance methods very much needed.

The main objective in the AI ARC project is to improve and enhance capabilities to respond to major challenge: how to effectively combat surprising and diverse situations in a very challenging operative environment in the Arctic and the High North.

It can be anticipated that civil security related activities in the Arctic will likely expand in the near and mid-term, as new commercial maritime routes will be utilized and countries increase law enforcement and policing activities amid the uncertain geopolitical climate. New geostrategic and geopolitical frictions are rapidly emerging in the Arctic and High North. For example, an increase in military activities by some Arctic states are the result of the need to patrol and defend access to new maritime routes and ensure greater access to maritime resources. Increased Navy or Coast Guard patrolling implies a need for enhanced capabilities for SAR activities and for providing up-to-date information on situational awareness.

Therefore, Arctic Coast Guards, Search and Rescue services and Law Enforcement agencies should, where possible, invest in new assets that are capable of operating or facilitating operations in the region, such as the procurement of new icebreakers and Arctic-capable patrol vessels.[2] They also need a good system for the management of surveillance and communication networks. Moreover, interoperability is needed where distances are long and conditions for the successful SAR operations are more demanding. Cross-cutting and cross-border cooperation should be seamless and fast when needed, time for bureaucratic processes will be time out from response and action.

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[1] Large cruise ship voyage through Arctic ice rekindles rows. The Guardian. 13.8.2016. Available at: https://www.theguardian.com/environment/2016/aug/13/large-cruise-ship-voyage-arctic-ice-crystal-cruises

[2] Gosnell, R., Hildenbrand, A., and Aunina, E., (2018) 'Emerging Challenges in Arctic Security and Recommendations for the Future' September 2018, The Marshall Centre [online] available at HYPERLINK https://www.marshallcenter.org/en/publications/perspectives/emerging-challenges-arctic-security-and-recommendations-future-perspectives-european-security

As the effects of climate change increase, and the sea ice continues to break up and melt, sea ice forecasting will become increasingly unpredictable. Therefore, for Arctic patrols, Coast Guard vessels will need to comply with Polar Code standards so they can withstand icy waters. For example, Finland has 'ice-class' vessels within their fleets, for patrolling in the Gulf of Bothnia and parts of the Baltic Sea that experience sea ice during the winter months. Ice-class OPV´S (Offshore Patrol Vessel) are very important also because of SAR capability at ice covered areas.

The key Arctic institutional structures that engage with civil security issues, including the Arctic Council, the Arctic Coast Guard Forum and the North Atlantic Coast Guard Forum are under development. While these organisations have been active in promoting SAR cooperation, maritime preparedness also extends to the safeguarding of critical infrastructure operations. The importance of Arctic infrastructure, in particular ports and telecommunications, has been highlighted previously within the Arctic Council, for instance during the US Presidency. During the Russian Presidency the role of the Arctic Council was discussed as many of its activities had been undermined by the paralyzed East-West relations and spiral of sanctions. Now the chairmanship is taken over by Norway on 11.5.2023.

Undersea cables are extremely important in the global digital society in the context of growing volumes of internet traffic and services provided for the global economy. As the Arctic Ocean continues to melt, telecommunication companies are also looking north to develop new trans-ocean routes from the Pacific to the Atlantic. However, with new opportunities, there is also the risk of new threats. For example, Russia has been swift to develop its ability to tap undersea cables and has been accused of playing a role in the outage of an undersea fibreoptic internet cable in January 2022, located between mainland Norway and the Svalbard archipelago in the Arctic Ocean[3]. Svalbard has been on news also due the fact that Russia staged military-style propaganda parade with more than 50 vehicles, a helicopter and snowmobiles driven by men in military-like uniforms on the 9th of May 2023 paraded down the main street of Barentsburg. Many of the parading vehicles were brought there by Arktikugol, the Russian state mining company that runs most of the local economy.[4]

More recently, many directions have been accused of sabotaging the Russian–German Nord Stream gas pipeline in the Baltic Sea in September 2022. This leads to the question of how can critical infrastructure be protected in future? Enhanced surveillance and situational awareness, information sharing and new technologies that incorporate anomaly detection services can all contribute to this effort.

Coast guards and navies in Arctic & North Atlantic states should enhance their resources and technologies to detect and counter threats to critical infrastructure. Technologies to rapidly detect suspicious behaviour should be prioritised. It is also very important to avoid misunderstandings that can easily emerge between policing agencies of different countries in the wide common sea areas. For this goal, there is need to develop general technical and also functional pre-standardization of communications, as well as organize exercises between all parties.

1.2 Promote technologies that improve safe navigation in the Arctic

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[3] Cuningham, Alan (2022) 'Underneath the Ice: Undersea cables, the Arctic Circle and International Security' The Arctic Institute. Available at https://www.thearcticinstitute.org/underneath-ice-undersea-cables-arctic-circle-international-security/

[4] Russia stages military-style propaganda parade on Norway's Svalbard archipelago. The Barents Observer 9.5.2023. Available at: https://thebarentsobserver.com/en/security/2023/05/russia-stages-military-style-propaganda-parade-norways-svalbard-archipelago

Safe navigation also falls under the theme of civil security cooperation. The Arctic ice sheet has shrunk by about a quarter in the last twenty years. Over time, the melting sea ice is likely to open the sea routes that have been closed so far. For example, the Northern Sea Route (NSR) will increase its opening time, from approx. 40% of the year, to 94–98% of the year by 2040–2059. This will require new maritime safety mechanisms and technological platforms to promote safe navigation, sustainable shipping corridors and maritime infrastructure in the Arctic; and to ensure that the Northern Sea Route is as safe and commercially attractive as other sea routes in the world.

The opening up of the Arctic for greater volumes of commercial shipping also lays the groundwork for Arctic "politicization" and new business opportunities in a whole new way. There are also remarkable natural resources available in the Arctic and the ocean floor. The Arctic states have applied through the United Nations Convention on the Law of the Sea to extend their exclusive economic zones (EEZ's) for the explicit purpose of being able to extract these offshore natural resources including oil and gas reserves. This process might lead to competition, tensions and increasing traffic along strategic Arctic shipping routes, that in turn can increase the level of risk to the environment and put pressure on SAR emergency services. For instance, technology and data sets that can estimate the cost of oil spills and clean-up infrastructure in an Arctic shipping corridor, in addition to calculating potential compensation required to the local (especially indigenous communities), can all facilitate marine insurers to establish a framework that can effectively set insurance premiums to shipping companies operating in the region[5].

Furthermore, such assessments can also facilitate policymakers to design better regulatory frameworks for specific Arctic corridors. Some areas of the Arctic might be identified as being too vulnerable and therefore prohibited from being assigned as shipping corridors, in order to protect biodiversity and fragile ecosystems. At the same time, developing multiple 'sustainable' Arctic navigation corridors with supporting infrastructure and ports can serve the purpose of promoting sustainable shipping networks while also improving safe navigation, route planning and fuel efficiency[6].

No country alone can prepare for large-scale maritime accidents, and maritime disasters. Search and Rescue (SAR) coordination for such incidents would potentially require the cooperation of several Arctic and non-Arctic states, navies, coast guard and law enforcement agencies working together. In this way, it is important to develop ways to achieve comprehensive situational awareness in the region and develop new mechanisms for the continual monitoring of shipping traffic and information sharing to ensure safe navigation and maritime security in the region. In addition of those SAR capacities, the fastest help to distract vessel might be some another vessel at the same area. Therefore it´s very important to have some kind of situation picture at the merchant ship too. To utilize the location data of merchant ships and their willingness to provide platform for AI based surveillance capacities should be studied more broadly.

Situational awareness is a multidimensional concept, in that it is not only knowledge (perception and understanding) but also risk assessment and anticipation of threats, and preparation for them. Situational awareness is also based on each individual's own experiences and assumptions, which are confirmed or modified by new information. This aspect highlights that the sharing of information is not one-directional, but that there is also a valuable contribution to be made from regular seafarers who could provide in-situ data on a maritime area. Within the AI-ARC project, a technological gap in current systems that provide situational awareness is recognised, namely the inability of current systems to upload information from an in-situ point of reference. The AI-ARC project aims to address this gap by incorporating such functionality within the Virtual Control Room platform.

For Arctic Coast Guard agencies, becoming more climate resilient will make sure that facilities and assets are built to withstand changing environmental conditions. To be ready to respond to challenging operational environments in the Arctic, CGs need to ensure that they have the necessary equipment, assets and

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[5] Adolf K.Y. Ng, Jonathan Andrews, David Babb, Yufeng Lin, Austin Becker (2016) 'Implications of climate change for shipping: Opening the Arctic seas, *WIREs Climate Change*, 9:507

[6] ibid

infrastructure in order to be operationally successful[7]. Planning for future capabilities should include elements such as Arctic-ready SAR helicopter coverage, oil spill combatting resources, and enhanced inter-agency communications, for example.

Some Arctic Coast Guards are taking the approach of setting up Climate Change committees or sub-groups within their organisation such as the US Coast Guard's Climate Community of Interest (CCOI). This initiative will carry out assessments to ensure that any new infrastructure is energy efficient while also identifying any existing infrastructure or assets that are no longer sufficient due to aging or degradation. The Arctic Coast Guard Forum could consider the merits of developing a similar group that could assist the member states to address specific challenges such as the ones mentioned above and others that relate to climate change readiness.

1.3 The way ahead - conclusions

In the Arctic, major crises may require an international emergency response; and all crises potentially have an international / political component. A combined SAR and environmental emergency response is likely to be required in the Arctic when a maritime disaster occurs. Poor weather conditions, and long distances from critical infrastructure imply that special challenges will be met in the Arctic. This highlights the need for well-thought-out preparations devised by experts who have a good situational understanding and experience in managing emergency cooperation, resource planning, safe navigation, and long logistics chains to support the operation.

Therefore, developing effective crisis management strategies requires mechanisms for effective multinational communication and cooperation in emergency situations, in order to be prepared for joint SAR responses in a crisis. SAR preparedness is not achieved as a once-off action, but requires continuous development and reinforcing, to prevent skills and institutional knowledge from atrophying. This applies to multinational collaboration preparedness, as much as to a single organisation's preparedness. Therefore, preparedness for multinational cooperation in times of emergency requires wide-ranging commitment and foresight from various actors. Its functionality is only tested in practice, but preparedness can and should be tested under normal conditions, for example by joint exercises between authorities in different states.

While live exercises are part of normal training routines for SAR authorities, and bilateral joint live exercises between countries do take place – for example between Norway and Russia in Exercise Barents, and between Norway and Iceland – it is comparatively rare for live exercises to involve academia and industry partners. The ARCSAR LIVEX22 live exercise brought together SAR technology partners, universities with Arctic-related maritime safety research interests, an expedition cruise company, the Arctic Expedition Cruise Organisation and several Arctic & North Atlantic coast guards, to conduct a set of rigorous tests and evaluations in a realistic SAR situation. This type of exercise holds great future potential to bring academic techniques and industry technology testing together with real-world scenarios for SAR collaboration and training. Therefore, it is recommended that this type of exercise should be conducted on a more frequent basis, to deepen and strengthen the preparedness of multiple actors for collaborative SAR and other emergency responses.

One of the key measures to promote safety and security in the Arctic is to develop ways to achieve a common incident situational awareness among the various states and authorities in the region. Achieving this objective requires systems that can operate across multiple agencies' platforms in a shared way, in close to real time. Technologies and communication infrastructure are required to enable a common situational awareness to be created; the AI-ARC Virtual Control Room concept is one example of such technologies. Measures to enable full development and deployment of such systems should be prioritised.

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[7] US Coast Guard (2022) 'The Coast Guard has established a working group to focus on climate change'. Available at https://www.mycg.uscg.mil/News/Article/2729033/the-coast-guard-has-established-a-working-group-to-focus-on-climate-change/

In terms of joint emergency response structures, in the Baltic region, Maritime Incident Response Groups (MIRGs) assist with operational planning and rapid response for fire and rescue services. Firefighting capability and SAR personnel are transferred on scene by helicopters, in the event of an incident of sufficient seriousness. Consideration could be given to developing MIRGs with Arctic capabilities for operation in the Arctic & North Atlantic.

Involvement of local communities to assist with SAR incidents is more critical in the Arctic compared to more southern regions. Well prepared local groups can provide a first-response capability e.g. for oil spill response; and can act as a critical resource in mass rescue situations, e.g. to set up a reception base for evacuees. The potential importance of local communities in emergency situations is increasing, in line with the growing traffic and numbers of tourists visiting the Arctic. Therefore, it would be appropriate to involve local communities in coordination structures, decision on deployment of resources, and to further develop their capacities for SAR response planning & training.

In relation to SAR, there is also scope for greater engagement with local Arctic communities for civil security. Some Arctic coast guards have created an auxiliary coast guard (the US and Canada) which enables greater participation amongst local indigenous Arctic people in SAR and other civil security and emergency preparedness activities. Further engagement and development on such matters is required.

These aspects can be understood as part of a broader range of measures to improve socio-economic opportunities and social mobility among Arctic peoples. Indigenous populations generally do not have the same opportunities that are available to their southern counterparts with respect to education, training and access to finance for business start-ups, for example.

Climate change affects the Arctic and Arctic communities to a greater extent than almost anywhere else in the world, and risks causing significant damage to existing infrastructure through extreme weather events and thawing permafrost, for example. These factors, together with a lack of transportation links, critical telecommunications and other infrastructural networks, will increasingly impose stress on communities in the north, which will threaten their resilience and ability to act as effective SAR resources in times of emergency. Therefore, it would be appropriate to research the likely climate change impacts at key SAR support locations in the north; and create action plans to mitigate against them, ideally as part of a broader set of measures to improve economic opportunities for Arctic communities.

So why AI ARC project is needed now more than ever before? Answer is simple, the Artificial Intelligence needs to be taken promptly into account by the maritime operators and search and rescue agencies in order to be step ahead rather than late in collecting relevant data at right time at right place. If this is not done in a coordinated fashion there is risk of malfunctioning and misusage of valuable resources and risking the critical infrastructures, not to speak about lacking the effectiveness and efficiency of the national resources.

It is also clear that benefitting from the advanced AI technology requires shaping of a well-functioning framework of infrastructure as well as practicing the users for effective cooperation. Therefore, the development of new technology and shaping of the needed user-environment should be done simultaneously. The AI ARC project takes account of those both aims.

Partners