CENTRE FOR MILITARY STUDIES
UNIVERSITY OF COPENHAGEN

Utilising Local Capacities

Maritime Emergency Response across the Arctic

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Denne rapport er en del af Center for Militære Studiers forskningsbaserede myndighedsbetjening for Forsvarsministeriet og de politiske partier bag forsvarsforliget. Formålet med rapporten er at studere og analysere de forskellige måder, hvorpå landene i Arktis benytter sig af lokale kapaciteter i forbindelse med maritim sikkerhed og beredskab i Arktis. Dette muliggør en vurdering af, hvordan beredskabsniveauet i nordlige farvande kan øges yderligere, samt hvilke spørgsmål som burde undersøges af fremtidige studier.

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This report is a part of Centre for Military Studies' policy research services for the Ministry of Defence and the political parties to the Defence Agreement. The purpose of the report is to examine and analyse the different ways Arctic countries are utilising local capacities when managing emergency situations in the maritime Arctic. This enables an evaluation of how the level of preparedness can be further enhanced in northern waters, as well as what questions should be examined by future studies.

The Centre for Military Studies is a research centre at the Department of Political Science at the University of Copenhagen. The Centre undertakes research on security and defence issues as well as military strategy. This research constitutes the foundation for the policy research services that the Centre provides for the Ministry of Defence and the political parties to the Defence Agreement.

This report contains an analysis based on academic research methodology. Its conclusions should not be understood as a reflection of the views and opinions of the Danish Government, the Danish Armed Forces or any other authority.

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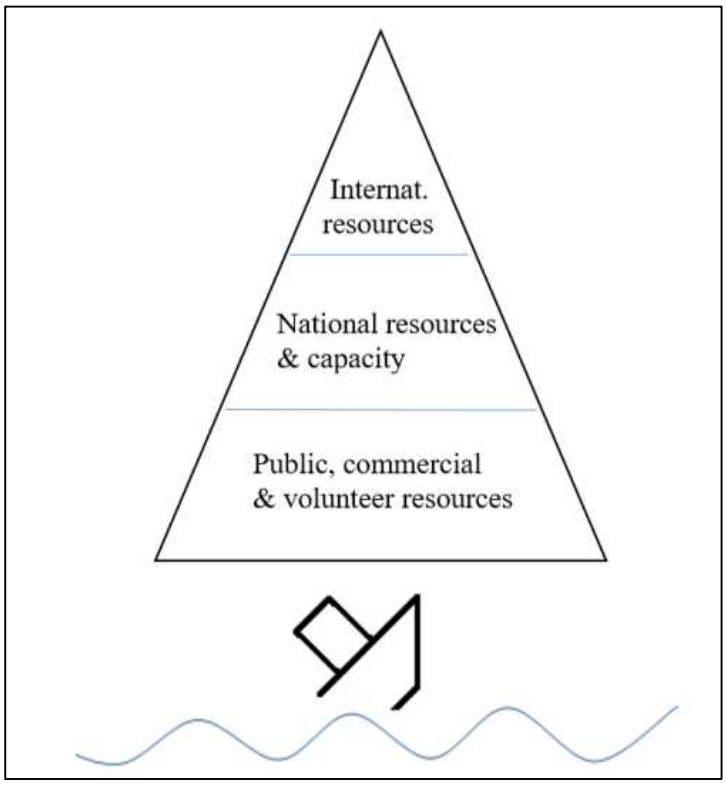
Executive summary

Debates concerning capabilities in the Arctic have developed over the last decade as increased activity has led to questions concerning the lack of public investment in the capacity to manage potential emergencies. Maritime regions have received particular attention due to fears of oil spills or sinking cruise ships. Offshore incidents are inherently more challenging than land-based environmental protection and search and rescue. Discounting the avid discussions concerning the 2016 voyage of the *Crystal Serenity* cruise ship[1], or the boom–bust cycle of northern oil and gas exploration, the number of *small-scale* maritime emergency incidents occurring in Arctic waters is increasing.

Demands have been made for national governments to invest in and sustain relatively expensive Arctic capacities, such as coast guard vessels, long-range helicopters, and oil-spill response units. An often-overlooked dimension, however, are the local resources already present in Arctic communities. **This report suggests that a more efficient utilisation of local resources can reduce costs and save lives.** Questions remain, however, concerning *what* type of resources exist in Arctic communities and *how* national governments can further utilise them. This also concerns how we conceptualise and understand the various layers of emergency management in the Arctic, which are intrinsically bound together.

Figure 1: The foundations of maritime emergency response



This report has examined four Arctic territories stretching across the North Atlantic: from Nunavut (Canada) in the west to Greenland (Denmark), Iceland, and Svalbard (Norway) in the east. Although this study has primarily addressed the utilisation of *local* resources, we must also place them in a larger context, where both the national capacities *and* international efforts interplay with one another. Separating these layers can prove challenging and somewhat futile. It is therefore not possible to discuss one – the local – without also including the national and the international. Still, as the figure above highlights, any immediate response effort will be inherently based on the initial efforts at the local level, whether in the form of **public**, **commercial**, or **volunteer resources**.

Understanding local efforts

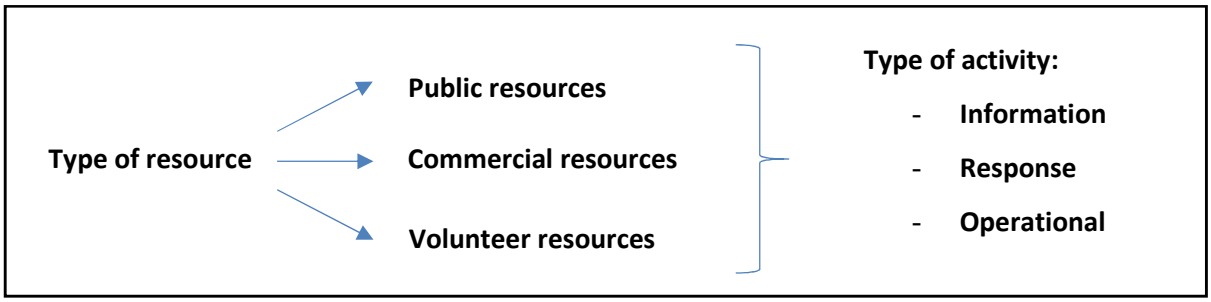
There is growing demand for the re-consideration of investments and utilisation on every level described above. Not surprisingly, each part of the Arctic has a unique emergency response set-up, with various combinations of public, commercial, and volunteer assets working in tandem. This report outlines some of the local efforts that seem to hold relevance for the Arctic in general:

- **Information activities**, such as training, education, and regulations concerning equipment and operations, can cover large gaps to help reduce the number of dire situations in the Arctic. Similarly, the oil spill training by local organisations, such as the WWF's efforts in North Norway, provide an example of how to enhance local capacity in a cost-effective manner.

- **Response activities**, such as recruiting locals and their vessels under an umbrella organisation (e.g. the Canadian Coast Guard Auxiliary or the Icelandic Association for Search and Rescue (ICE-SAR)), constitute another relatively cost-efficient remedy to local capacity concerns. Similarly, recruiting local fishermen and outfitting fishing vessels to handle oil spill response equipment can help provide additional layers of response.

- **Operational activities**, such as regular surveillance and monitoring conducted by the Canadian Rangers or by regular government agencies tasked with maritime safety in the north, are less relevant when discussing low-cost, local-level efforts.

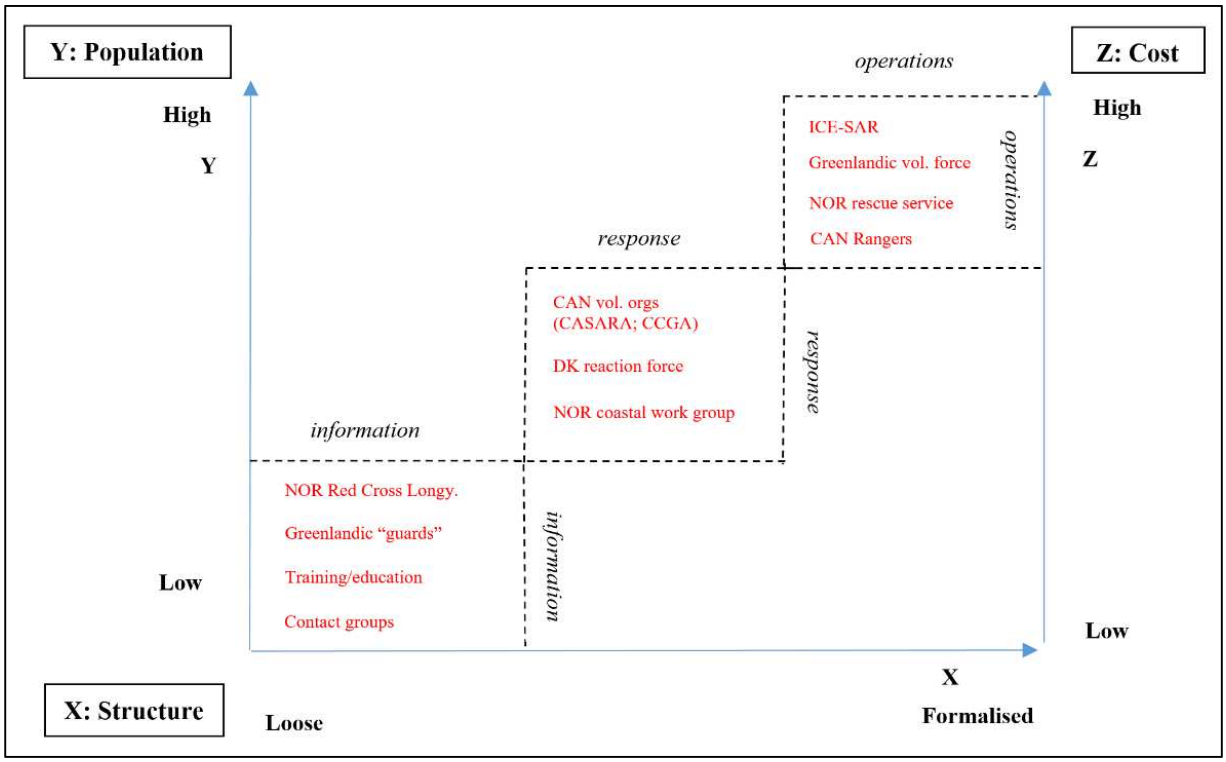
Figure 2: Local resources for maritime emergency management



Of the four areas in question in this report, Iceland is arguably the best equipped to handle a large-scale maritime incident through an advanced system of maritime volunteering that is integrated in the national emergency response system. Communities in Nunavut and Greenland are slowly developing their capacities from relatively low levels. Several proposed schemes target local capacity utilisation, although it remains to be seen how they will be implemented. The small population base in Svalbard limits the local efforts across the Archipelago.

In sum, the figure below outlines these different categories and their respective traits along *structure*, *cost*, and *population demand*. It highlights the overarching relationship between the structure of a local effort and its cost in tandem with the dependence of these efforts on population numbers. A more formalised structure is likely to be costlier if only in terms of administration and operational management. As community efforts move from the lower box towards the upper-right corner, the requirements and costs change. It is therefore not a given that all of the communities across the Arctic can sustain all types of local efforts.

Figure 3: Three categories of local efforts, determined by structure (x-axis), population (y-axis), and cost (z-axis)



Recommendations

From the range of efforts examined, the debate concerning Arctic preparedness and response requires further nuance. Distinction must be drawn between large-scale maritime incidents and closer-to-shore emergency situations. Community volunteers and mandatory training can go a long way to supporting the latter but have a limited impact on the former. When (or if) an oil spill reaches shore, local efforts can be organised to assist the clean-up. The first response to a sinking oil tanker or a cruise ship will inevitably be a combination of private and public assets. Another crucial point beyond saving the passengers off a sinking cruise ship is the impact of tourists stranded in a small Arctic community with limited resources.

This report has outlined a number of recommendations for further enhancing Arctic emergency response capacities:

Information

- Improve the spread of information concerning offshore safety and survival for the local population.

- Mandate training/exercise participation for maritime actors.

- Mandate so-called ‘self-rescue’ training and equipment for maritime tourists.

- Organise ‘how to’ campaigns in local communities together with relevant non-profit organisations.

- Make use of the Arctic engagement of non-profit organisations with additional resources, like the WWF and Red Cross, to create projects aimed at local capacity enhancement.

Response

- Increase the number of vertical and horizontal exercises between the various local actors.

- Enhance community role-clarification with clearly defined lines of responsibility in preparation for large-scale incidents.

- Explore how local maritime industries can be further included in a system or network for local emergency response.

Operations (permanent)

- Every Arctic community has some form of local engagement in case of an emergency. It is thus up to the local and national governments to provide a framework in which these resources can be further improved and utilised.

- Explore the options for a maritime component to the already existing schemes, such as the Canadian Rangers or Longyearbyen Red Cross.

- Consider establishing a dedicated tool or hub for learning and knowledge enhancement concerned with maritime emergency management that can work on both the local and national levels by informing communities and the public debate.

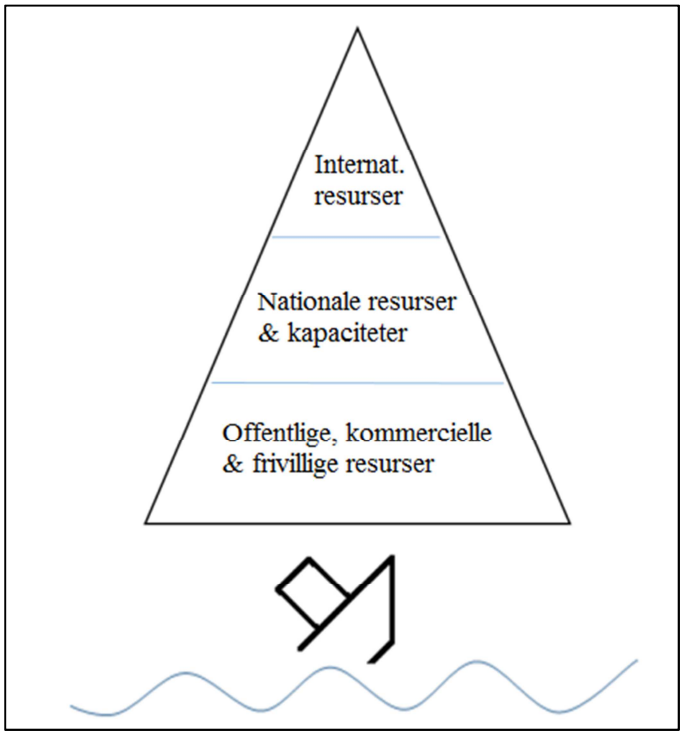
These points are not uniformly tailored to all Arctic regions, yet they pinpoint the room for increased efforts to the benefit of the given Arctic state and its local northern communities before the situation becomes direr.

Dansk resumé

Øget aktivitet i Arktis i løbet af det seneste årti har ført til spørgsmål og bekymring om den manglende evne til at håndtere potentielle kriser. Det hænger sammen med begrænsede offentlige investeringer. Maritime regioner har fået særlig opmærksomhed pga. frygt for oliespild og synkende krydstogtskibe. Hændelser fjernt fra kysten er mere udfordrende end landbaseret miljøbeskyttelse og eftersøgning og redning. Foruden ophedede diskussioner om 2016-rejsen med krydstogtskibet *Crystal Serenity*[1] og potentialet for olie- og gasudvinding mod nord, så er antallet af maritime krisesituationer i mindre skala i arktisk farvand stigende.

Der er blevet stillet krav til nationale myndigheder om at foretage investeringer med henblik på at kunne opretholde de relativt dyre arktiske kapaciteter, herunder krydsvagtfartøjer, langtrækkende helikoptere og udstyr til at imødegå olieudslip. En ofte overset dimension er imidlertid de lokale resurser, som allerede findes i arktiske samfund. **Denne rapport påpeger, at en mere effektiv udnyttelse af lokale resurser kan reducere omkostninger og redde liv**. Spørgsmålet er dog, *hvilke* typer af resurser der findes i arktiske samfund, og *hvordan* de nationale myndigheder vil kunne udnytte dem yderligere. Svarene herpå hænger også sammen med, hvordan vi konceptualiserer og forstår de forskellige niveauer i arktisk beredskab – niveauer, som er afhængige af hinanden.

Figur 1: Grundlaget for maritimt kriseberedskab



Denne rapport har undersøgt fire arktiske områder, som strækker sig over Nordatlanten: Fra Nunavut (Canada) i vest til Grønland (Danmark), Island og Svalbard (Norge) i øst. Selvom rapporten primært har sit fokus rettet mod udnyttelsen af lokale resurser, sættes disse også ind i en større sammenhæng, eftersom både nationale kapaciteter og internationale resurser indgår i et tæt samspil med hinanden. At adskille disse niveauer er både udfordrende og uhensigtsmæssigt. Det er således ikke muligt at diskutere ét niveau – det lokale – uden også at inkludere det nationale og internationale niveau. Alligevel vil enhver umiddelbar responsindsats, som figuren ovenfor viser, grundlæggende være baseret på den lokale indsats – i form af **offentlige**, **kommercielle** eller **frivillige resurser**.

Lokalt kriseberedskab

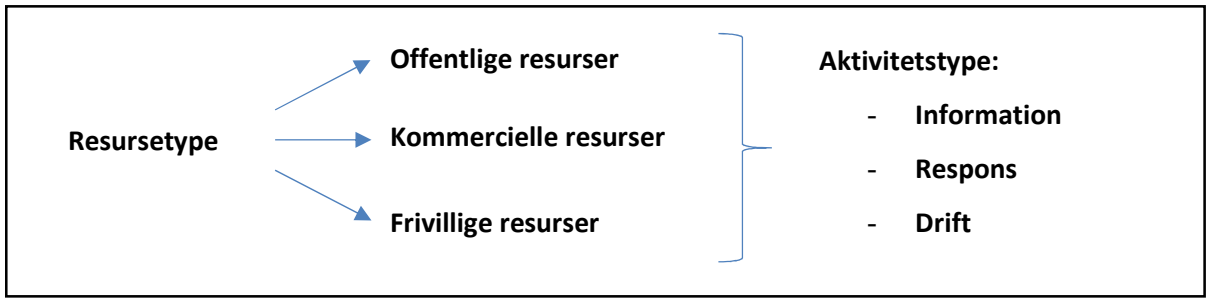
Der er stigende krav om revurdering af investeringer og udnyttelse på alle tre niveauer beskrevet ovenfor. Ikke overraskende har hver del af Arktis et unikt beredskabssystem, der er sammensat af forskellige kombinationer af offentlige, kommercielle og frivillige resurser. Denne rapport skitserer de dele af den lokale indsats, der synes at have en mere generel relevans for Arktis:

- **Informationsaktiviteter** – fx oplæring, uddannelse samt regulering vedrørende udstyr og operationer – kan bidrage til at reducere antallet af krisesituationer i Arktis. Oplæring i håndtering af olieudslip foretaget af lokale organisationer, ligesom WWF's indsats i Nordnorge, tjener som eksempel på, hvordan man kan forbedre lokal kapacitet på en omkostningseffektiv vis.

- **Responsaktiviteter** – fx muligheden for at rekruttere lokalbefolkningen og deres fartøjer under en paraplyorganisation (fx Canadian Coast Guard Auxiliary eller den islandske Association for Search and Rescue (ICE-SAR)) – udgør et andet relativt omkostningseffektivt middel til at forbedre den lokale kapacitet. Tilsvarende kan rekruttering af lokale fiskere og udrustning af fiskefartøjer med udstyr til håndtering af olieudslip bidrage til at skabe en mere robust responskapacitet.

- **Driftsaktiviteter** – fx regelmæssig opfølgning og overvågning udført af de canadiske Rangers eller af traditionelle offentlige myndigheder med ansvar for maritim sikkerhed i nord – er mindre relevante, når man diskuterer en begrænset indsats på lokalt niveau.

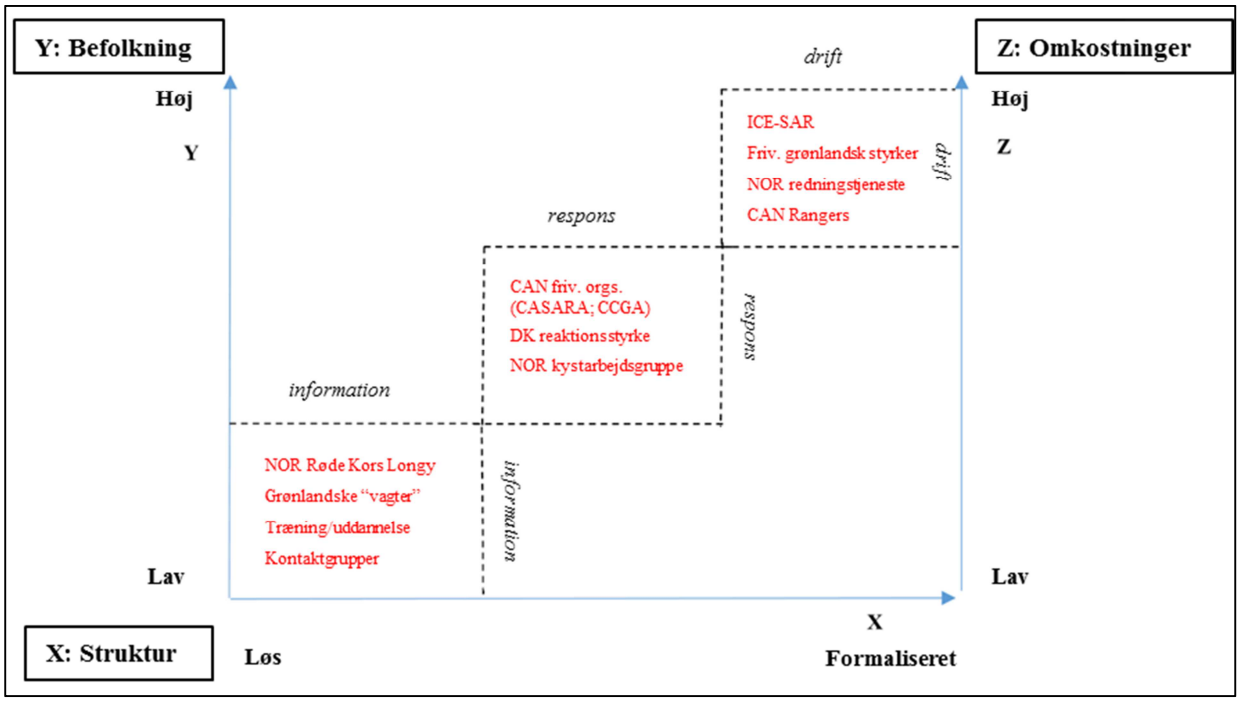
Figur 2: Lokale resurser for maritimt kriseberedskab



Af de fire områder undersøgt i denne rapport er Island bedst rustet til at håndtere en større maritim krisesituation via et avanceret system af maritim frivillighed, som er integreret i det nationale beredskab. Lokalsamfund i Nunavut og Grønland har langsomt påbegyndt udviklingen af deres kapaciteter fra relativt lave niveauer. Flere forslag til ordninger rettet mod lokal kapacitetsudnyttelse er i implementeringsfasen, selv om det til stadighed er uvist, hvordan disse skal gennemføres. Det begrænsede befolkningsgrundlag på Svalbard lægger begrænsninger på den lokale indsats her.

Figuren nedenfor skitserer de forskellige kategorier og deres respektive egenskaber langs akserne *struktur*, *omkostninger* og *befolkningsbase*. Figuren illustrerer den overordnede sammenhæng mellem en lokal indsats' struktur og omkostninger og hvor afhængig indsatsen er af en aktiv lokalbefolkning. En mere formaliseret struktur vil sandsynligvis være dyrere, blot i form af administration og operativ ledelse. I takt med, at den lokale indsats går fra den nederste boks og op mod det øvre højre hjørne, ændres krav og omkostninger. Det er derfor ikke givet, at alle typer af lokale indsatser kan opretholdes i alle samfund på tværs af Arktis.

Figur 3: Tre kategorier af lokale indsatser, bestemt af struktur (x-akse), befolkning (y-akse) og omkostninger (z-akse).



Anbefalinger

Ud fra undersøgelsen af de udvalgte områder, som foretages i denne rapport, fremstår det tydeligt, at diskussionen om beredskab og respons i Arktis må nuanceres yderligere. Der må foretages en distinktion mellem store maritime krisesituationer og krisesituationer tættere på land. Lokale frivillige og obligatorisk oplæring kan udgøre et substantielt bidrag i sidstnævnte situationer, men vil have en begrænset effekt i førstnævnte. Når (eller hvis) et olieudslip fx når land, kan den lokale indsats organiseres til at bistå med oprydningen. Den første respons til en synkende olietanker eller krydstogtskib må derimod nødvendigvis komme fra en kombination af private og offentlige kapaciteter. Et anden centralt punkt, ud over at redde passagerer ud af et synkende krydstogtskib, er den negative effekt som turister strandet i et lille arktisk samfund med begrænsede resurser kan få på lokalsamfundet.

Denne rapport har skitseret en række anbefalinger med henblik på yderligere styrkelse af arktiske beredskabskapaciteter:

Information

- Styrk informationsdeling om maritim sikkerhed og om overlevelse for den lokale befolkning

- Obligatorisk trænings- og øvelsesdeltagelse for maritime aktører

- Obligatorisk såkaldt '*self-rescue'* oplæring og udstyr til maritime aktører

- Organiser '*hvordan*'-kampagner i lokalsamfundet sammen med relevante civilsamfundsorganisationer

- Benyt det arktiske engagement hos civilsamfundsorganisationer, som har resurser, for eksempel WWF og Røde Kors, til at etablere projekter rettet mod at forøge lokale kapaciteter.

Respons

- Forøge antallet af vertikale og horisontale øvelser mellem de forskellige lokale aktører

- Forbedre rolleafklaring med klart definerede ansvarsområder i forberedelsen til at håndtere alvorlige krisesituationer

- Undersøge hvordan lokale maritime industrier kan indgå i et system eller netværk for lokalt beredskab

Drift (permanent)

- Ethvert arktisk samfund har en form for lokal kapacitet i tilfælde af en nødssituation. Det er dermed op til lokale og nationale myndigheder at skabe de rammer, inden for hvilke, disse resurser kan blive yderligere forbedret og udnyttet.

- Udforsk mulighederne for en maritim komponent i allerede eksisterende ordninger, som for eksempel de canadiske Rangers eller Longyearbyen Røde Kors.

- Overvej at etablere et dedikeret værktøj eller et center for læring og konceptudvikling specialiseret i maritimt beredskab under kolde forhold, som kan arbejde på både lokalt og nationalt niveau ved at informere lokalsamfund og den offentlige debat i øvrigt.

Disse punkter er ikke skræddersyet til alle aktiske områder, men de peger på muligheder for at øge indsatsen til gavn for en given arktisk stat og det lokale nordlige samfund, inden en maritim krise udvikler sig.

Contents

1. Introduction

Maritime activity in the Arctic is changing. Arctic coastal states are forced to provide presence and capabilities to deal with emergency incidents in Arctic waters. Debates concerning Arctic emergency response have largely been dominated by demands for investment in vessels and infrastructure. Sometimes the mere acquisition of a new icebreaker seems to be presented as the solution to all Arctic capacity problems. There are, however, numerous other measures that can be taken to enhance general response capacity.[2] When the oil tanker *MV Prestige* split in half off the coast of Portugal and Spain and released heavy oil into the Atlantic Ocean in 2002, volunteer efforts removed more than 70% of the oil from European shores.[3] Similarly, when small fishing vessels regularly capsize in waters outside Lofoten, in North Norway, the volunteer society for sea rescue often saves lives as the first responders.[4]

To what extent can local capacity enhancement based on volunteers or small-scale public arrangements contribute to maritime emergency preparedness and response in northern waters? The primary purpose of this report is to outline suggestions for what can be done to further improve maritime capacities in advance of a major incident. It does so by examining and comparing how four of the North-Atlantic/Arctic states are utilising local resources in managing the new maritime challenges arising in their Arctic waters. Some key questions lay the foundation for this report:

1. How is the local capacity that exists in the Arctic states being included in national maritime emergency response schemes?

2. How do these different types of mechanisms fit in the larger emergency management in the Arctic?

3. How can these capacities be utilised further?

The implicit hypothesis in this report is that local capacity enhancement and utilisation can help improve acute, dire situations in the Arctic. There has been considerable writing on search and rescue (SAR) and environmental protection in the Arctic.[5] Most of these studies have been preoccupied with one specific country or region. The strength of the study in hand therefore lies in its comparison of Arctic states and their respective efforts while explicitly focusing on the involvement of local assets.

The focus is specifically on safety – not state (military) security. Many of the institutions dealing with maritime safety also perform traditional military tasks, but they are not in the spotlight here. As difficult as this distinction may be to draw – insofar as it is even possible to do so – this report also focuses on the *maritime* aspect of emergency preparedness and response. This includes aeronautical SAR when the incident takes place at sea but excludes ground/land-based SAR. Finally, it is important to emphasise that this is but a mere snapshot, relevant to this specific study, and not an exhaustive overview or review of all the initiatives and assets in the respective countries.

Having conducted an in-depth study of the role of local resources throughout the Arctic region, I argue that this constitutes an invaluable but often-neglected dimension of maritime emergency response. By placing further emphasis on this dimension, we are able to find ways of achieving higher levels of emergency response at relatively modest expense. Given the uniqueness of the Arctic operating environment, however, we must re-think the traditional set-ups of the institutions tasked with emergency preparedness and response. Managing maritime SAR and responding to an oil spill from a shipping vessel require very different skill sets and equipment than land-based SAR. Moreover, that which has been developed for and proven successful in one Arctic operating environment is not necessarily transferable to another.

Next, I will briefly discuss the methodology of this paper (1.1), describe how the maritime situation in the north is changing (2.), and who is responsible for managing the subsequent challenges (2.1–2.3). Thereafter, we can embark on a study of how the respective regions are utilising local capacities (3.1–3.3), before connecting this to maritime emergency management in the Arctic at large (4.1–4.3).

1.1 Methodology

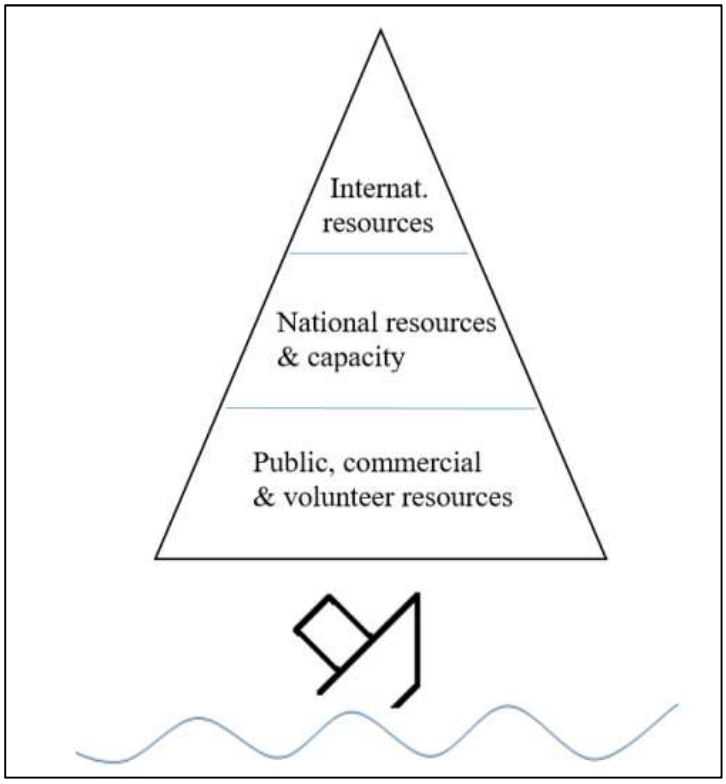
This report is part of the research-based public sector services provided by the Centre for Military Studies (CMS). It is the result of academic research and follows the CMS guidelines and procedures for quality control. The process itself started with a couple of basic questions: How is the Arctic maritime environment changing in terms of human activity, and how are the various Arctic states responding to the challenges that derive from these changes in activity? The analysis underlying the report was organised and conducted by the author on the basis of interviews with various officials in the four countries in question. Each of these officials is working directly with maritime SAR in their part of the Arctic at the local or regional

level, or they are employed at the national level providing oversight to Arctic emergency management. Cross-comparison aimed at answering the questions presented above has been made by combining the input from the interviews with reporting from the various governments on their efforts to improve capabilities in the Arctic and relevant literature concerned with community engagement.

Finding answers to these questions also leads to a focus on the various *layers* of emergency management. Consequently, it serves our purpose to sketch out the three different layers comprising maritime emergency management. The figure below succinctly highlights how the foundation of the efforts will always be based on the existing local capacities and whether they are operating on behalf of public authorities, volunteer organisations, or commercial actors. The overarching responsibility, however, lies with the national government (sometimes at the provincial/regional level), which in turn can utilise or request assistance from the international community. Thus, international agreements and mechanisms help states overcome barriers when cooperating in response efforts or managing international traffic in their maritime zones.

The focus here is on the bottom part of the triangle, which constitute the fundament of any maritime emergency scenario in the Arctic, and *how* it interrelates with the other layers depicted above. At the same time, it must be remembered that these layers are – to some degree – inseparable; a theme to which we will return later in this report.

Figure 1: The foundations of maritime emergency response



2. A changing maritime situation

This report is concerned with the northern parts of the North Atlantic Arctic, defined as Iceland, Greenland, Norway (Svalbard) and Canada (Nunavut). The Faroe Islands and the Canadian provinces of Newfoundland & Labrador and Quebec are excluded, given their relative integration with emergency response systems further south in Europe and Canada, respectively. Nunavik (northern Quebec) proves an interesting contrast to Nunavut, although it is not the primary focus of the report. Russia, Alaska, and the eastern Arctic territories of Canada (Northwest Territories and the Yukon) are also excluded, as this report is concerned with Arctic territories in relative proximity to each other.

Image 1: Maximum Arctic sea-ice extent in 2015 (February 25). The red circles highlight a crude distinction between the (overlapping) maritime regions in question in this report. [6]

2.1 Activity patterns

Arctic conditions vary; between these four parts of the Arctic, we can draw a line between the challenges faced in Nunavut and Greenland as opposed to those faced in Iceland and North Norway/Svalbard. At the same time, given the integration across the North Atlantic, it is reasonable to compare and contrast all four regions. The aim of this report is thus to showcase and contrast the variations across these maritime regions. In the maritime areas in question, the overall trend has been a steady increase in the number of maritime vessels since the 1990s. As with climatic conditions, the situation varies; the number of vessels falls when sea-

ice does not retract as expected or commercial ventures are postponed or cancelled altogether. Yet the trends all confer an increased number of vessels or vessel activity becoming more complex, diverse, and spread-out.

In *Canada*, an ice-free Northwest Passage in the summer months is creating expectations of increased freight traffic and tourism,[7] although the number of ships in recent years actually making use of the complete route during the summer months has been limited.[8] In the Canadian Arctic at large, the Canadian Coast Guard estimates an increase from approximately 100–150 vessels in 1990–2005, to 300–350 vessels in 2010–14.[9] Activity is spread along a vast maritime domain, where a limited portion traverse the waters between Greenland and Nunavut (Davis Strait and Baffin Bay). For *Nunavut*, most traffic takes place along the Hudson Strait, as the beginning (or end) of the Northwest Passage. A small population in Nunavut (approx. 32 000), spread out amongst approximately 25 communities, does not entail considerable maritime activity. Despite this, the Canadian Coast Guard is challenged, as a single serious cruise ship incident is enough to demand rapid and sufficient emergency response. As the luxury cruise liner *Crystal Serenity* traversed the Canadian Arctic in the summer of 2016, debate raged in Canada as to whether these types of adventure cruises should be allowed at all given the pressure they put on emergency response systems.[10]

Waters around *Greenland* have experienced growing levels of maritime activity over the last decade. When seismic activity was conducted in tandem with exploratory petroleum drilling in 2010–11, vessel numbers increased dramatically.[11] There has also been a steady increase in the number of cruise ships around the world's largest island.[12] In total, vessel activity is a combination of local transport, fisheries, cargo transport, and cruise-ship tourism. The fishing fleet makes up a significant portion of this activity. In 2014, there were 530 vessels with licenses in Greenland, while 1500–2000 smaller boats exist, used for small-scale hunting and fishing.[13] While there number might be far less – 60–100 vessels in Greenlandic waters annually – cruise ships account for the greatest number of passengers, between 20 000 and 30 000 per year.[14] It should also be noted that the traffic numbers vary with respect to which part of Greenland we examine. Most activity takes place in the south or south-west, as this is where most Greenlanders reside and ice conditions are less severe. Activity is far more limited in the waters to the north and north-east.

In contrast to the waters around Nunavut and Greenland, the *Icelandic* Arctic waters are ice-free. A relatively large population (in the Arctic context) of 323 000 also means high local

activity levels. As with the waters around Greenland and Canada, activity is predominantly made up of fisheries, local transport, cargo transport and cruise ship tourism. Since the economic crash in 2008, however, the number of goods shipped to and from Iceland has decreased.[15] In sum, the number of vessels related to transport and cargo has slightly decreased in the last decade. Nevertheless, as in the other Arctic maritime domains, cruise ship tourism and fisheries have increased. Ingmundarson and Gunnarsdóttir found that out of 2300 vessels registered in Iceland, 1700 are fisheries-related.[16] Warmer waters have resulted in fish stocks moving further north, which is advantageous for Iceland and the Faroe Islands.[17] Cruise ship tourism around Iceland has also changed, as numbers have steadily increased from around 9000 passengers in the 1970s and 1980s to around 90 000 passengers in 2013. Almost all vessels arrive in Reykjavik, but many also traverse further north to less developed ports such as Akureyri and Isafjordur. Cruise ship tourism is expected to continue to increase, at least in terms of vessel size.[18]

With almost 500 000 inhabitants, *North Norway* (the mainland) is the most populated of the four areas in question, and thus confer a higher basic level of maritime activity. As with Iceland, climatic conditions are less harsh than in the North American Arctic, and population density is higher. Along the coast of the mainland there is considerable industry-related shipping going to and from industrial hubs in North Norway and Northwest Russia. Some of this activity is directly linked to the petroleum industry, operating in the Barents Sea and stretching northwards in the Norwegian Sea. Many of the vessels also come from, or are going to, Murmansk, as a hub for much of the regional maritime transport in the Russian Arctic. Maritime traffic patterns are, however, divided between vessel activity along the mainland and the traffic surrounding the *Svalbard Archipelago* further north. Svalbard only has a population of 2600, with around 2100 residing in Longyearbyen. While the amount of local traffic is therefore limited, the number of cruise ships has been increasing slightly, the number of annual cruise ship passengers having almost tripled since 1997.[19] Svalbard is unique in the Arctic context, as it is the only place large cruise vessels can reach as far as 80 degrees north without ice-classification.[20] Fisheries around Svalbard have also been increasing and constitute roughly 70% of all traffic.[21] The movement of stocks has led to more complex fishing vessel patterns, especially when it comes to shrimp fisheries to the north and east of the archipelago.[22]

The four regions in question have somewhat different characteristics, as laid out in table 1. Population is particularly spread out in Nunavut and very low in Svalbard. Iceland, on the other hand, is densely populated (for the Arctic), the towns and communities even being connected with roads. Shipping activity varies greatly, and the summer activity levels generally constitute the annual peak in all areas.

Table 1: Information concerning the four regions in question

Region	Population (ca.)	Level of maritime activity (in total)	Degree of autonomy (self-governance)	Location of emergency response centre
Canada (Nunavut)	32 000	Low	Intermediate	Trenton/Halifax (Ontario/Nova Scotia)
Greenland	56 000	Intermediate	High	Nuuk (Greenland)
Iceland	323 000	High	Independent state	Reykjavik (Iceland)
Norway (Svalbard)	2 600	Intermediate	Low	Bodø (North Norway)

2.2 Challenges

As the number of ships in Arctic waters increases, there is a corresponding increase in the risk of accidents. The factors that contribute to a heightened risk of emergencies in the Arctic can be categorised as (1) geographic factors, (2) the lack of infrastructure, and (3) limited information. Geographic factors (1) include the ice conditions, which are increasingly difficult to predict as the ice thaws and areas previously covered by sea-ice are opening. Related factors include low temperatures and the winter darkness. There is a limited amount of (2) infrastructure in the region, given the few human settlements and the distances between them. In Canada, for example, SAR aircraft can take anywhere from 6–10 hours to travel from southern airbases before arriving to drop equipment in the Arctic.[23] Finally, (3) lack of information relates to the understanding of the area in which you operate. There are issues with the use of satellites, making it difficult to perform missions with the precision needed for SAR. Related to this is the fact that great portions of the underwater Arctic geography have yet to be mapped sufficiently.[24]

In turn, the increase in traffic increases the number of incidents requiring the involvement of public assets as well the risk of a severe emergency. In their annual shipping report for 2015,

the insurance company Allianz highlights how there were 55 shipping incidents (termed causalities) in Arctic waters in 2014 as compared to only three a mere decade earlier.[25] Similarly, the number of emergency response incidents in northern Norway rose by 10.5% from 2013 to 2014.[26] This new Arctic reality has spurred demand for presence and capabilities amongst the Arctic states. When fisheries grow in volume, so does the need for regular fisheries inspections. Similarly, other constabulary tasks under the prerogative of police authorities demand a constant presence in the maritime domain. In instances where vessels traverse maritime borders, control is required. Such tasks, in addition to military actions, are part of maintaining national sovereignty. At the same time, public assets are needed to respond to immediate incidents, such as the search and rescue of sailors and passengers, or environmental protection due to a spill from a vessel or a platform. Less immediate, but still in response to specific demands, are tasks related to the assistance of navigation and passage.[27]

2.3 Who's in charge?

When a maritime incident occurs, the first point of contact is usually the ***Joint Rescue Coordination Centres (JRCCs)*** located in the various Arctic countries. Their set-up varies, as illustrated in table 2.

Table 2: The various JRCCs and their organisational affiliations

Region	Name and location	Organisational Affiliation
Canada (Nunavut)	JRCCs Trenton Ontario and Halifax Nova Scotia[28]	National Defence Canada
Greenland	JRCC Nuuk	Joint Arctic Command, under the Danish Defence
Iceland	JRCC Iceland, Reykjavik	Icelandic Coast Guard
Norway (Svalbard)	JRCC Northern Norway, Bodø	Ministry of Justice and Police

After contacting a JRCC, how each country responds to a given incident depends on the national structure and the capabilities available. In most instances, ***the military*** provides additional capacities and information relevant to the emergency response. The different operational headquarters serving the armed forces in the case of a maritime response in are depicted in table 3.

Table 3: The military headquarters/coordination centres relevant to Arctic maritime response and their organisational affiliation

Region	Name and location	Organisational Affiliation
Canada (Nunavut)	Joint Task Force North (JTFN), Yellowknife	Canadian Armed Forces
Greenland	Joint Arctic Command, Nuuk	Danish Defence
Iceland	Icelandic Coast Guard HQ, Reykjavik	Icelandic Coast Guard
Norway (Svalbard)	Norwegian Joint Headquarters, Bodø (Reitan)	Norwegian Armed Forces

After the initial coordination between the civilian and military structures outlined above, ***coast guards*** are often the first institution tasked with handling a maritime emergency response. Nonetheless, coast guards vary greatly across the countries in question. Each coast guard is tailored to the national and historic circumstances in which they were developed, while they are also often a result of the size of both the country itself (geographically), its population and economy.[29] The *Canadian Coast Guard* (CCG) is a civilian agency under the Department of Fisheries and Oceans Canada (DFO). For Arctic waters around Greenland, Denmark does not have a specific coast guard entity, as the *Royal Danish Navy* (Søværnet) is responsible for providing the services that would normally fall to a coast guard. The *Icelandic Coast Guard* (ICG) is a semi-civilian institution belonging to the Ministry of Justice, but as Iceland does not have any defence of its own, the coast guard is central in the Icelandic defence capacities. Finally, the *Norwegian Coast Guard* (Kystvakten) is part of the Royal Norwegian Navy and thus part of the Norwegian Armed Forces. The coast guard is separated from the regular Navy, however, specific legislation from 1997 regulating its mandate. The various structures, as well as a simplified illustration of the civilian–military spectrum, is found in table 4.

Table 4*:* The various coast guards and their roles, mandates, and organisational affiliation

Region	Name	Tasks	Organisational Affiliation
Canada (Nunavut)	Canadian Coast Guard	Civilian	Department of Fisheries and Oceans
Greenland	Royal Danish Navy (*Søværnet*)	Full spectrum	Danish Defence
Iceland	Icelandic Coast Guard (*Landhelgisgæsla*)	Full spectrum (albeit limited defence capabilities)	Ministry of Justice
Norway (Svalbard)	Norwegian Coast Guard (*Kystvakten*)	Full spectrum	Royal Norwegian Navy

Another essential component when responding to maritime emergencies are ***airborne search and rescue services***. Again, set-ups vary across Arctic countries. In *Canada*, the Royal Canadian Air Force operates the search and rescue airplanes and helicopters, spread across several locations across the country.[30] It is worth noting that the locations of these resources are in southern Canada, and the travel times to potential maritime incidents in the Arctic are considerable. In *Greenland*, airborne capacities are split between the civilian company Air Greenland – operating on behalf of the Danish National Police – and the airborne capacities on board the Navy vessels present in Greenlandic waters.[31] In *Iceland*, the Icelandic Coast Guard operates the airborne SAR services[32] adjacent to the JRCC and Coast Guard HQ in Reykjavik.[33] In *Norway (on Svalbard)*, the Norwegian Government has a contract with Lufttransport AS, a private company, to operate two SAR helicopters.[34] The Norwegian Government has additional SAR helicopters stationed at bases on the mainland, with those located in Bodø and at Banak specifically dedicated to the Arctic.[35] Table 5 highlights these various airborne structures.

Table 5*:* The various airborne services and their organisational affiliation

Region	Name	Organisational Affiliation (or on behalf of)
Canada (Nunavut)	Royal Canadian Air Force	National Defence Canada
Greenland	Air Greenland/Royal Danish Air Force (*Flyvevåbnet*)	Danish National Police/Danish Defence
Iceland	Icelandic Coast Guard (*Landhelgisgæsla*)	Ministry of Justice
Norway (Svalbard)	Lufttransport AS/Royal Norwegian Air Force (*Luftforsvaret*)	Governor of Svalbard/Norwegian Defence

Finally, table 6 provides a brief overview of the institutions responsible for ***environmental protection*** at sea in the respective Arctic territories. It should be noted that how these organisations are tasked varies in each country; while the Canadian Coast Guard and the Danish Davy have been given complete responsibility for environmental protection in Arctic waters, the Norwegian Coastal Administration is responsible for marine pollution but delegates authority to the Norwegian Coast Guard to respond to incidents at sea.

Table 6*:* The various agencies responsible for environmental protection services in the maritime Arctic and their organisational affiliation

Region	Name	Organisational Affiliation
Canada (Nunavut)	Canadian Coast Guard	Fisheries and Oceans Canada
Greenland	Royal Danish Navy (*Søværnet*)	Danish Defence
Iceland	Icelandic Coast Guard (*Landhelgisgæsla*)	Ministry of Justice
Norway (Svalbard)	The Norwegian Coastal Administration (*Kystverket*)	Ministry of Transport and Communications

These four countries have also taken multiple steps in regional and international forums to create mechanisms to alleviate growing security and safety concerns in the Arctic region. Yet as Jessica Shadian aptly summarises it: "*While co-operation between organisations is critical and necessary, there is the reality that much of what happens during a SAR mission will take place on the ground with and within local communities*."[36] Expanding circumpolar – or even bilateral – measures is often not enough to deal with specific emergency response needs arising from vessels traversing the Arctic. We must therefore turn towards local resources.

It should be noted that I have refrained from delving into the topic of regional/local governance and how the various layers of government have chosen to arrange their mandates and competences in the case of a maritime emergency. In Greenland, for example, the police are responsible for maritime incidents in territorial waters, whereas the Danish Navy manages the rest of the maritime domain. This could be the topic of a report of its own but is less relevant for the core task of this report; namely, investigating how the various regions have organised and utilised their local community resources. The following section aims at examining this dimension of maritime preparedness and response.

3. Utilising local resources

As pointed out in the introduction, the focus in this report is on maritime emergency response, including both SAR and environmental protection. To what extent are the various Arctic regions able to respond to emergency incidents at sea? And to what extent are local resources included and utilised in maritime emergency response? As with climatic conditions and economic activity, the local resources available in Arctic regions vary greatly. There is a natural correlation, as high economic activity entails the presence of greater emergency response capacity. At the same time, lessons can be learned from examining how the various regions have chosen to enable and utilise local communities and their capacities.

An instructive report on the topic was published in 2012 by Kristensen, Hoffmann, and Petersen.[37] Based on two workshops, they examined potential ways of increasing and organising volunteer efforts in Greenland. Overall, there is a proven benefit from utilising volunteer services in planning and preparing for emergencies. At the same time, such efforts also involved trade-offs and limitations.

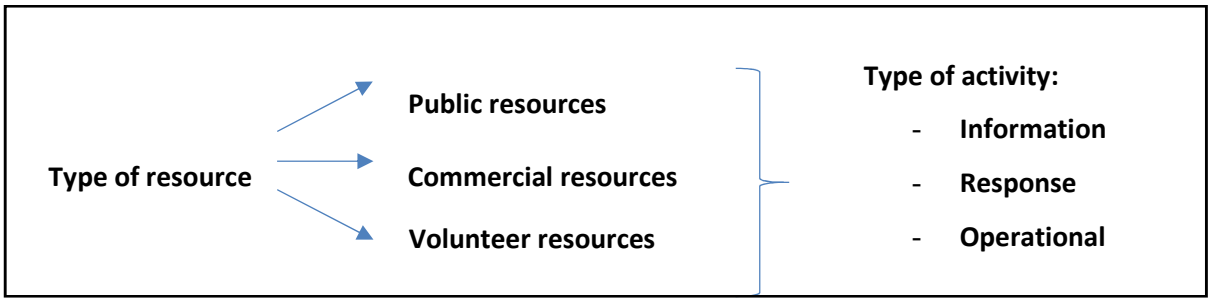
First, any local service depends on some form of formal structure. Such structure can be loose or strict but requires – in any case – financing. Education, training, facilities, and related equipment, in addition to administrative staff, require investments; the higher the level of readiness and capacity, the costlier the structure. Second, and crucial for the Arctic, there must be a critical mass of residents in a given community. The amount of resources invested in training and the organisational set-up are irrelevant if nobody is present and willing to spend time and effort partaking in the service. Third, we should distinguish between the various types of activities performed by the local services.

The 2012 report can roughly be separated into activities concerned with *information, response,* and *operations.*[38] Information requires relatively few resources and relies on the willingness of local residents to report on a given issue. Response requires more resources in organisation, training, and education, as this typically helps advance the public capacity to respond to an emergency incident. As Kristensen, Hoffmann, and Petersen point out, the last category – operations – can blur into regular employment, as locals assist in maintaining the daily operation of a service.

The following section expands on these points and covers three parts: (1) *public resources,* (2) *commercial resources,* and (3) *volunteer and community resources.* I have chosen to sepa-

rate the various types of local resources and capacities into these three overarching groups, although they are by no means exclusive. They often blend into each other and, crucially, all of the available resources are drawn into the response effort in a large-scale emergency. Yet the categories outlined in figure 2 help distinguish between different types of available assets, thereby helping to conceptualise where improvements might be made.

Figure 2: Local resources for maritime emergency management



3.1 Public resources

The overarching public maritime response structure in each country in question has been outlined in the previous section. This section deals with the public resources present in each community equipped and tasked to deal with potential maritime incidents. These vary per geography and population patterns but tend to include public services, such as the police, the military, and the coast guard.

In *Canada*, the federal police force – the Royal Canadian Mounted Police (RCMP) – is the primary point of contact in a local-level emergency. While limited in its Arctic coverage, it has outposts and units spread across the Canadian north. These police officers are the foremost public authority in the range of Arctic communities.[39] In addition, the Canadian Rangers, a subcomponent of the Canadian Forces Reserve under the command of Joint Task Force North in Yellowknife, constitute the backbone of the local resources available in the north. They perform: 'national-security and public-safety missions in those sparsely settled northern, coastal and isolated areas of Canada which cannot conveniently or economically be covered by other elements or components of the CF [Canadian Forces].'[40] They are described as the eyes and ears of the military.[41] The Rangers are comprised by the community in which they reside, giving them a connection to the local area that other public services lack. Salary is paid when doing work for the Canadian Forces and participating in training exercises.[42] Under the government of Stephen Harper (2006–15), the number of Rangers in the Canadian

North was increased from 1600 up towards 1900 in some 60 of 71 communities across the three Arctic territories.[43]

There have also been discussions concerning plans to expand and modernise this system even further, as highlighted during a Canadian Senate committee hearing in 2010–11: 'BGen Millar spoke of creating rapid reaction force high-readiness Ranger units, building a new centralized training facility for Ranger recruits and senior leadership, and helping them develop a coastline watercraft capability.'[44] Some, however, like Whitney Lackenbauer, argue that 'the Rangers are not broken, and I see danger in trying to fix them.'[45] Regardless of how the Rangers are modernised, this local involvement in military surveillance and preparedness has been highly effective in dealing with emergency response. For incidents in the maritime, however, the Rangers have limited equipment and training. In the case of a large-scale offshore incident, they would constitute the backbone of first-responders but would not – currently – be able to mount a comprehensive response to a sinking cruise ship or leaking oil tanker several miles from shore.[46]

Beyond the presence of the RCMP and the Rangers, there are few local resources acting on behalf of the federal government in the Canadian north. One inherent limitation is the size of the communities themselves. The largest community in Nunavut – Iqaluit – has approximately 6700 inhabitants. Thereafter, the population size ranges from 200–2000 inhabitants. Beyond the resources provided by the federal level, the local and regional (territorial) levels provide additional public resources. In Nunavut, the territorial government based in Iqaluit has its own Protection Services, which serve as a mobiliser and organiser of land-based SAR services. In the maritime region, however, this organisation has a limited mandate and few resources, as the Canadian Coast Guard holds the overarching responsibility for incidents at sea. During the summer months, the Coast Guard establishes a forward operating base in Iqaluit, from which they operate. Its environmental response system incorporates a "cascaded approach."[47] If a marine spill exceeds the capability of a community to respond, air-transportable equipment would be deployed from environmental response bases in the north, where equipment is stored. Similarly, the Royal Canadian Air Force has prepositioned equipment to operate four Forward Operating Locations across the Arctic territories. Nonetheless, the JRCCs and the bulk of the public emergency resources used in the Arctic are located considerably further south.

In *Greenland*, local public resources are split between the police and defence forces. The various maritime tasks are divided between the Danish and Greenlandic governments. The Danish Defence manages tasks in the maritime region beyond the territorial waters (3 nautical miles). Through its naval and land-based presence in Greenland, the Danish Defence also assists the civil society whenever needed. The Danish Defence emphasises how they believe that their solution – tasking the military with the whole range of tasks that other Arctic states often divide amongst various civilian authorities – is the most efficient in the case of Greenland.[48]

As highlighted in the previous section, the Danish Navy/Air Force and Air Greenland provide assets, coordinated by Arctic Command and the JRCC Greenland (located within Arctic Command) in Nuuk. The Greenlandic Police authority additionally handles all incidents on land and within the territorial waters of Greenland.[49] Albeit highly relevant for Greenlandic emergency response at large, the police are less capable in a large-scale offshore incident. Still, the police hold four vessels for limited offshore use and work with the JRCC and Arctic Command, as needed.[50] In contrast to Canada, the presence of *both* the Navy (which also acts as a coast guard) and the Greenlandic Police has the potential to enable a division of labour depending on the type, scale, and location of the emergency incident. Whereas the Canadian Arctic (Nunavut) lacks port facilities, the western coast of Greenland is better equipped. There are numerous ports along the coast all the way up to the American Thule Airbase. On the east coast, however, the only port is at Tasiilaq, in tandem with fewer communities in general.[51] In addition to the Joint Artic Command and the naval presence, the Danish Defence also makes use of the Sirius Patrol to perform reconnaissance and surveillance across Greenland. This patrol is particularly relevant in the most remote parts of Greenland.

As the Danish Ministry of Defence's analysis of future missions in the Arctic from June 2016 emphasises, however, a capacity gap in the waters surrounding Greenland remains. On the one hand, requirements to managing fisheries as well as claims to the extended continental shelf might demand more from the Danish Navy; on the other hand, there is a lack of situational awareness in the Arctic. The Arctic Command is understaffed and there is no coherent monitoring of environmental damage at sea.[52] In response, the Danish Defence is in the process of establishing an Arctic Response Force (*Beredskabsstyrke)*. This force will be transported from Denmark to rapidly deploy to improve the capacity of the Arctic Command in responding to a given incident. This force could thus enhance local capacities, although it

would still be reliant on initial first-responder capacity due to the deployment time from Denmark.

Compared to the three other regions in question, *Iceland* is the most developed in terms of emergency preparedness capacities. Even remote parts of Iceland (e.g. the Westfjords) are relatively well integrated in the general national emergency response system, and it is possible to drive around most of the island in 24 hours. The comparison can be deemed somewhat unfair, however, given that Iceland is a separate and independent country, whereas Nunavut, Greenland, and Svalbard all answer – in varying degrees – to capitals located further south.[53] Another contrast between Iceland and the other countries is the lack of a dedicated defence institution in Iceland. Up until 2006, the United States' Armed Forces had managed the US Iceland Defence Force, operating out of Keflavik Naval Air Station. The Defence Force had been present since 1951, established after a joint NATO decision. The Icelandic Government was openly disappointed with the American decision to leave, and there have been signs that a limited US force might return in the future.[54]

The Icelandic Coast Guard constitutes the core of the national and local capacity when dealing with maritime emergency response. With around five hundred employees and the whole range of emergency responsibilities, it is – in contrast to the other set-ups in question – a one-stop shop for maritime emergency response in waters around Iceland.[55] Beyond that, however, Iceland does not have a local force operating on behalf of civilian or military authorities dedicated to maritime response. The Icelandic Police is divided into nine districts throughout the country, but their responsibilities exclude the maritime domain.

The core challenge for the Icelandic Coast Guard, however, is a limited budget. When the United States left Keflavik, the helicopter capacity in Iceland was markedly reduced. Not tailored to Icelandic SAR, the American helicopters were still an integral part of capacities present in Iceland. Today, around 3/5 of the Coast Guard's budget is spent on the aviation division, managing its SAR helicopters.[56] It is thus not necessarily the lack of coast guard vessels that constitute a core concern, but the lack of funding for crews to keep the vessels operational. Similarly, the Coast Guard's single surveillance aircraft (Dash-8) could be utilised further to a maximum of 1000 hours annually, but is currently only operating at 300 hours per year due to budget constraints. After the US left is in 2006, the Danes have increasingly become a partner to help fill a capacity gap, and the Danish Defence has considered utilising the aircraft further for domain awareness operations along the east of Greenland.

This would serve both the Icelandic need for continued usage of the aircraft and the Danish need for improved surveillance around Greenland.[57]

Finally, in *Norway*, or specifically in the *Svalbard Archipelago*, resources are limited. Of the regions in this study, it has the smallest population. Most reside in Longyearbyen (the Norwegian settlement) or Barentsburg (the Russian settlement), with a few inhabiting Ny-Ålesund (primarily a research settlement). More than 95% of Svalbard's residents are thus located around Isfjorden, the main fjord cutting across Svalbard from the west. This entails long response times to most areas outside of the immediate proximity the fjord. The Norwegian Government reckons that responding to an oil spill from a vessel along the east coast of Svalbard might take as long as 1–2 days.[58]

Norway was granted sovereignty over the Svalbard archipelago with the Svalbard Treaty, signed in 1920 in Paris, which came into effect in 1925. The Treaty gives all signatories the right to live and work on the islands, while it places some limitations on Norway's ability to tax and use Svalbard for military purposes. The latter restriction complicates the use of military equipment, although not when the military is performing civilian tasks. The Norwegian Coast Guard, as well as Navy vessels from time to time, make use of Longyearbyen for bunkering. Similarly, although the Norwegian Government has restricted the use of Longyearbyen Airport to civilian aviation, military aircraft can use it when performing 'civilian tasks', such as SAR and environmental response.[59]

The overarching responsibility for emergency preparedness and response on Svalbard lies with the Governor of Svalbard, acting on behalf of the Norwegian Government. The office of the Governor has increased in size, with new police staff coming onboard from 2014.[60] The office also operates a local emergency response centre (*den lokale redningssentralen på Svalbard)*, which maintains contact with the range of relevant societal actors on Svalbard. The Governor's office also has its own state-of-the-art, multi-purpose vessel, *Polarsyssel*, which it received in 2014. Lufttransport AS additionally provides SAR services through two Super Puma helicopters, leased in 2014.[61] In a large-scale incident in the maritime domain, this local centre on Svalbard will contact the JRCC located in Bodø, North Norway, which in turn can call on the Armed Forces' Joint Headquarters located outside of Bodø.

The Norwegian Air Force are also in the process of replacing its Lynx helicopters with the NH90, which will be stationed on all the large coast guard and navy vessels. The Norwegian

Government is similarly replacing its land-based SAR helicopters, the Sea King, with the Leonardo-Finmeccanica (former Agusta Westland) AW101. The first helicopter is expected to arrive in 2018.[62] These are, however, based on the mainland, and will predominantly not be of use in Svalbard. The Coast Guard itself constitutes the core public resource in maritime emergency incidents, as it aims to be continuously present in waters around Svalbard. During the summer months, the number of coast guard vessels around Svalbard ranges between two and four, whereas this is slightly reduced in winter months.

In terms of environmental response, it is reckoned that heavy bunker oil spills from vessels are the main concern around Svalbard. In 2012, a public piloting service was established, and in 2015 this was made mandatory for vessels larger than 70 meters (50m if it is a passenger vessel). To limit the use of heavy bunker oil, requirements on the quality of fuel have banned its usage for vessels sailing in the natural reservoirs and national parks on the west and east coasts of Svalbard.[63] The Governor's office and the Norwegian Coastal Administration jointly manages an oil spill response depot in Longyearbyen and smaller equipment in Ny-Ålesund. The vessel *Polarsyssel* also constitutes a core element of the environmental response around Svalbard. Yet, the Norwegian Government highlights that studies have shown the need for more local personnel and equipment to be able to respond sufficiently in the case of a large-scale spill.[64]

3.2 Commercial resources

Another relevant dimension of local emergency response in the north is the presence of private assets in tandem with commercial activity. Especially large-scale hydrocarbon extraction requires maritime assets applicable to an emergency. On a smaller scale, fishing vessels and/or shipping vessels might be utilised when in demand. At the same time, it is not a given that these resources are available at all times, or even incorporated into local and regional emergency plans.

In *Canada*, the limited amount of offshore economic activity entails low levels of potentially relevant capacities available. When economic activity was at higher levels in the 1980s and 1990s, a relatively developed system existed in case of oil spills. As Bernard Funston describes in his report, the oil company Imperial has outlined how Beaufort Sea development in the 1980s was closely linked to local capacities:

> …the Beaufort Sea Oil Spill Cooperative…employed as many as 20 Inuvialuit in the early 1980s. The Beaufort Sea Oil Spill Cooperative was jointly funded by three operators in the 1970s to the 1990s, with the goal of maintaining an inventory of equipment and a core group of trained personnel for spills beyond Tier 1 capability. Each company maintained a base level of Tier 1 equipment at Tuktoyaktuk and at various drill locations and other operating areas such as McKinley Bay. In addition to stock piling a range of equipment for offshore oil spills, the cooperative developed a group of trained and committed workers to provide routine spill responses, field experiments and provide support for other environmental projects.[65]

As per the Canadian Senate enquiry from 2009, there were discussions concerning a volunteer organisation supported by the private industry's efforts in the area.[66] Today, however, activity levels – initially thought to rise – have dropped with limited resource prospects and falling market prices. Regarding fisheries, the activity along the coast of Arctic Canada – and Nunavut in particular – is also limited, compared to some of the other Arctic regions. Albeit relevant in an immediate emergency, the fishing vessels are often too small and far between to amount a considerable capacity in a large-scale emergency.

The shipping going to and from various mines can – in theory – constitute an additional capacity to draw on. Baffinland's iron ore mine in Mary River, Baffin Island, in Nunavut shipped its first iron ore to Europe in 2015. It ships through the company Fed-Nav, which operates three ice-strengthened vessels, the *MV Arctic*, the *MV Umiak I*, and the *MV Nunavik*. In addition, Fed-Nav makes use of these vessels to ship copper and nickel from the Raglan and Nunavik Nickle mines in Nunavik (northern Quebec).[67] There are other mines that have the potential to increase shipping in the region as well, such as the Ungava Bay Iron Deposits. These resources could be utilised in an emergency incident, although both vessel capabilities and time in northern waters are limited.

In *Greenland*, maritime economic activities are generally at higher levels than in the Canadian Arctic. Consequently, there are more actors to rely on in case of an emergency. Although the oil and gas industrial development has been placed on hold, some of the equipment and competence that came with the 2010 and 2011 drillings remain, and can be further developed in case of a renewed interest in offshore petroleum exploration.[68] Another point of relevance in Greenland is mining activity at various locations along the coast, and what this entails in terms of infrastructure. The need for local airstrips to land C-130s, for example, could be met

through industrial ventures along the coasts of Greenland. Additionally, the Danish Defence is considering tasking a potential Home Guard force with the skills and tools to create and operate local airstrips.[69] However, as with the petroleum industry, the mining projects that were envisioned a few years ago have failed to materialise. Fishing vessels, on the other hand, are a more consistent resource in Greenlandic waters. Yet, they constitute a demand for emergency response, as well as a potential capacity in the case of an emergency. Finally, the Danish Ministry of Defence is looking to expand agreements made with private ship-owners and airlines to improve surveillance and joint reporting, as a remedy to the surveillance gap around Greenland.[70]

In *Iceland*, the core of commercial assets available in the maritime are fishing vessels and local and international transport of passengers and freight. I will turn to this in the next, when discussing volunteer services and fishermen. Beyond that, there is currently no active off-shore petroleum industry around the island, although there are hopes of potential exploratory drillings in the future.[71] The high number of vessels operating in Icelandic waters, does, in any case, constitute potentially available resources in an immediate emergency. Yet, these are not resources that can be regularly relied upon, and their emergency management capacities are inherently limited beyond initial assistance.

Finally, around *Svalbard*, offshore commercial activity has been limited. Still, activity in the Barents Sea could help helicopter capacity to be utilised when in need for the southern waters around Svalbard. Currently, however, the only operating platform is the ENI's Goliat plat-form, whereas Statoil has sub-sea production from its Snøhvit field. Along the coast of the Norwegian mainland, the Norwegian Clean Seas Association for Operating Companies (NOFO) works to ensure the oil spill recovery response when needed. This is done in tandem with the Norwegian Coastal Administration as the lead government agency for the protection of material value and nature. NOFO, however, is owned by the oil and gas companies operat-ing on the Norwegian continental shelf. They conduct training, education and more than 100 exercises annually, although most of their efforts are located in the south.

As ENI started production in the Barents Sea, the licence holders (ENI and Statoil), together with NOFO, established two depots in the north for storing and maintaining clean-up and response equipment for use in near-shore areas.[72] They also established a 'Coastal Work Group' (*InnsatsGruppe kyst)* through NOFO to involve fishing vessels in local areas should an oil spill float towards the open sea. Around 30 vessels and more than 100 fishermen par-

ticipate per ENI.[73] With the education and training of local fishermen combined with remuneration and salary, their vessels are adapted to handle oil recovery equipment. However, the distances from the coast of Finnmark up to the waters surrounding Svalbard are considerable in any case; ENI's efforts therefore serve more as an example for inspiration should petroleum exploration and production expand in any of the four regions in question.

On Svalbard, *Det Store Norske*, the Norwegian coal company which has been one of the pillars of Longyearbyen, rents helicopter services during the summer months. The same goes for the Norwegian Polar Institute, a public research institution. Several other countries and tourism companies operate on Svalbard during the summer, thus bringing along equipment and capacity that could be relevant in a large-scale scenario, albeit not specifically targeted at emergency response. On a regular basis, the efforts provided by the various companies and institutions on the Archipelago are organised under the 'committee against acute pollution' (*utvalg mot akutt forurensing*), which is led by the Governor of Svalbard. The largest public and private companies participate and convene annually or when needed to advise the Governor on how to best combat maritime pollution. The company *Det Store Norske* contributes with 10 people to the depot-force on its own in combination with smaller contributions from other actors.[74] This is done to ensure the involvement of local institutions and commercial actors.

3.3 Volunteer resources

Finally, we turn toward local capacities beyond those provided by public authorities and private companies. Volunteer services can be organised by the government – federal, regional, or local – or as a non-profit to provide services in a gap not filled by other organisations or the public. The following section looks at what services and efforts the various regions have in place or are considering expanding to deal with the challenges in their maritime domains.

In *Canada*, three volunteer organisations have specialised in emergency response to form a layer of local preparedness capacity. Funston argues that these are integral components of the government's capacity to respond to incidents in the north.[75] Given the vast geography of the Canadian Arctic, they provide capacity where the government is unable to be present. Yet there are questions of how active they are in the various Arctic communities. The organisations can roughly be divided into aeronautical, maritime, and land-based services.

The Civil Air Search and Rescue Association (CASARA) is funded by the Canadian Armed Forces to increase its capacity to respond to aeronautical incidents nation-wide, with private aircraft and volunteer crews trained in search and communication services.[76] In 2011, its resources were expanded to include the Arctic. By 2013, 30 civilian SAR spotters for two new units in Arctic Bay and Pond Inlet, Nunavut, were trained and certified.[77] Yet the CASARA model is based on volunteers providing local aircraft and expertise. This is a challenge in Canada in general and the Arctic in specific given the sparse population and limited private resources. Across Nunavut, only two or three privately owned aircraft are available. CASARA's efforts are therefore contingent on access to airplanes.[78] There is also a debate concerning the nature of the emergency incident, as CASARA is primarily concerned with aeronautical cases; however, most of the incidents in the maritime region are not aeronautical in nature.[79]

The Canadian Coast Guard Auxiliary (CCGA) is funded by the Canadian Coast Guard to increase its capacity to respond to maritime emergencies. It consists of commercial fishermen and pleasure boaters who donate their time and vessels or volunteers from local communities who volunteer to crew community-based response vessels. A Canadian Senate committee report from 2009 on the Canadian Coast Guard in the Arctic subsequently argues: "*In Canada's North, the CCGA provides critical marine SAR in many isolated coastal areas.*"[80] In total, more than ten vessels with several operators are available under this volunteer organisation. The Coast Guard pay for the work done by the volunteers as well as for equipment and the training of those participating. Yet capacities are limited. The CCGA is particularly absent in communities in eastern parts of northern Canada and does not have any considerable resource base in Nunavut. There are plans to establish Coast Guard Auxiliary units in the communities with the most maritime emergencies.[81] Thereafter, units will be established in another 10–15 communities, with plans to have Auxiliary unites in all Canadian Arctic coastal communities. This can come to resemble efforts made further south in Nunavik (northern Quebec), where local and regional authorities acquired community boats in response to what was perceived as limited public support when a canoe capsized and four died in 2003.[82] These vessels were later included in the CCG Auxiliary structure.[83] There are, however, limitations to what these units can provide in large-scale incidents. As I will return to later in this report, it is worth nothing that these capacities along the coast of Nunavut and Nunavik are predominantly being developed to handle small-scale, local incidents.[84]

The Search and Rescue Volunteer Association of Canada (SARVAC) is a volunteer organisation concerned with SAR on land, working for more attention to related issues, and – as with the other organisations – providing training and assistance when in demand. It is funded by the National Search and Rescue Secretariat, a body under Public Safety Canada, which is part of the Canadian Government. Albeit active across the country, this organisation has not been specifically targeted when improving Arctic capabilities and is – in contrast to the two other bodies – less relevant for maritime emergency response incidents. Beyond these three public volunteer structures, there are few volunteer efforts apart from ad-hoc participation across Nunavut. Some, like Funston, have argued for more tailor-made training to improve the basic skill-sets concerning emergency response in the northern communities, thereby increasing the general capacity.[85] This would be an addition to the already established volunteer organisations and the resources outlined in 3.1.

In *Greenland*, the thinking concerning volunteering in the Arctic seems quite developed, although few efforts have been implemented. To what extent can these efforts help improve maritime crisis management? The model of inspiration is the Danish Home Guard (*Hjemmeværnet*), which has almost 50 000 volunteer members and provides considerable capacity to preparedness and response in Denmark in general.[86] On this basis, the 2012-report by Kristensen, Hoffmann, and Petersen concludes with several possible efforts for implementation in Greenland. They argue that a model like the Canadian Rangers can be expanded in Greenland in terms of the greater involvement of the local communities in military education and tasks. At the same time, this need not – or should not – take the form of an armed organisation. Instead, a Reaction Force (*Beredskapsstyrke*) could take on a wider set of functions, predominantly civilian in nature. They also note that any set of efforts would have to be built on a culture of volunteering, as found in Denmark. The question is the extent to which it also exists in Greenland and how it can be developed further.[87]

Many of their recommendations appear to have found their way into a 2016-report by the Danish Ministry of Defence (MoD), which examines the future of the Danish Defence in the Arctic. The report highlights the involvement of local inhabitants to improve the capacity to perform sovereignty tasks, SAR response, and environmental protection.[88] The efforts commissioned by the 2016-report are extensive:

- Education and information:
    - Information campaigns across Greenland
    - Increased focus on education/training under the Danish Defence in Greenland
    - Increased inclusion of Greenlanders in the SIRIUS-patrol

- Volunteering:
    - Pilot project 'Greenlandic Guardians'
    - Pilot project 'Greenland's Volunteer Force'
    - Pilot project 'Junior Rangers'

The MoD points out how knowledge and understanding of the military itself in Greenland is limited. Information campaigns concerning Danish Defence activities in Greenland in general and efforts to reduce incidents at sea in specific are therefore recommended. Moreover, by encouraging more Greenlanders to partake in military activities or undergo military training and education, the general level of preparedness can be improved. The Danish Defence is therefore considering how to establish a specific 'Greenlandic track' in its military education. This is in line with the work being carried out by the Canadian Rangers with local community assets that also possess knowledge of the military and its operations. Additionally, the MoD aims to foster increased local involvement in the SIRIUS sled patrol.

Effort is also being made to expand the Danish system of environmental guardians (*Havmiljøvogtere*), who report to the military when observing pollution at sea.[89] A similar system with Greenlandic guardians (*Grønlandsvogtere*) is being piloted as a way of reporting across Greenland. This system falls under the larger umbrella of a Greenlandic Volunteer Force (*Grønnlands Frivillige Styrke*), which is initially proposed as a pilot project. Inspiration is again drawn from the Canadian Rangers.[90] It will be a force aimed at supporting the various public authorities in Greenland when needed across the whole spectrum of tasks ranging from sovereignty enforcement and surveillance, to logistical, practical, and humanitarian assistance for civilian purposes. In the end, it is envisioned that this organisation assumes the form of a public agency with its own administration and budget.[91] The Greenlandic Volunteer Force – should it become permanently established – thus seems to constitute a considerable effort by Danish authorities developing a locally administered structure to handle the growing number of challenges in the Danish Arctic.

Another tool to be used with some aspect of volunteering is the operative contact group for the Arctic (*Den Operative Kontaktgruppe Arktis*), a network of relevant authorities dealing with maritime and aeronautical SAR. Arctic Command, JRCC Greenland, the Greenlandic Police, the coastal radio Aasiaat Radio, and Air Greenland all participate to inform and enhance the SAR capacities in Greenland. This seems to resemble similar structures found on Svalbard. Additionally, a coordination network run by the Home Guard in Denmark between relevant societal actors and the Home Guard is being conceived for Greenland. It would be based on volunteer efforts and consist, amongst other things, of practical exercises and simulations.[92] The MoD report concludes that '… even a limited engagement from the Greenlandic population in volunteer emergency preparedness could add operational value for those authorities supported by the efforts.'[93] In the Arctic context, these efforts are a considerable push to increase volunteer capacities in Greenland.

Iceland has lengthy volunteering traditions. In many ways, the Icelandic system has served as a blueprint for other Arctic states – Denmark in particular – when developing their volunteer organisations. In advance of the recommendations in the Danish MoD report described above, several Danish and Greenlandic officials called for implementing the 'Icelandic model'.[94] The Icelandic ICE-SAR system (Icelandic Association for Search and Rescue) came into being in 1999 when the National Lifesaving Association of Iceland (founded in 1928, with a rescue team formally established in 1918), the boy scouts (founded in 1932), and Air Ground Rescue (founded in 1950) combined forces. ICE-SAR is a non-profit volunteer structure specialised in search and rescue on both land and sea.[95] It consists of more than 100 teams and 3000–4000 volunteers spread out across Iceland, all of whom undergo ICE-SAR education and training. All of the rescue teams in Iceland operate under this umbrella, making it a unique nation-wide body of volunteers.

Headquartered in Reykjavik next to the Icelandic Coast Guard, the organisation aspires to be self-financed through efforts such as the sale of fireworks and souvenirs in addition to income from slot machines around the country.[96] The idea is that a local volunteer effort under ICE-SAR need not be all-encompassing to begin with. It can initially consist of recruiting locals with an interest in the outdoors, like former fishermen, who meet weekly to train and discuss potential emergency scenarios.[97] When an incident occurs, these individuals will provide the first-response effort. At its peak, ICE-SAR owned and operated 15 vessels, whereas 13 are currently operational. Representatives from the ICE-SAR HQ and/or local rescue teams al-

ways participate in international and national SAR exercises. In this sense, ICE-SAR is not only an additional volunteer force in the Icelandic emergency response system; it is an integral component comprising most of the country's capacities.

ICE-SAR also operates a maritime safety and survival training center, established in 1985, to provide support for Iceland's considerable fisheries industry. Icelandic law dictates that all Icelandic seamen, including fishermen, must receive training at this center.[98] In 1998, the centre acquired an old coast guard vessel, *Sæbjörg*, for training purposes. As tourism is the largest Icelandic industry, the number of annual visitors being more than double the total population, these efforts by ICE-SAR are crucial for the Icelandic SAR capacity.[99] As highlighted by an increasing number of articles and the Icelandic Coast Guard, the ICE-SAR resources are limited.[100] Inherently, there are restrictions on what can be demanded of volunteers choosing to dedicate their own time in assisting operations. Moreover, as the number of emergency incidents is increasing, the ICE-SAR resources are being stretched thin.

Finally, on *Svalbard*, volunteering is an important cornerstone of the local response, albeit limited in its expanse. Given the small population, there are few human resources from which to draw. The most considerable effort is the Red Cross Corps *Longyearbyen*, founded in 1951, which consists of around 60 active and 250 dues-paying volunteers divided among various groups depending on their skill sets.[101] Their education runs over 2 years and consists of extensive instruction. The Corps also manages equipment such as a mobile field hospital. This is crucial on Svalbard given the limited hospital capacity.[102] It has also developed an 'Arctic Survival Kit' similar to efforts in other Arctic countries. The Corps is thus deemed an 'essential' component in emergency response in Svalbard.[103]

Beyond that, volunteer efforts on Svalbard are limited. The local port authority in Longyearbyen has some vessel capacity, although they are not specifically dedicated to emergency response.[104] Norway has several active organisations that constitute the core of the Norwegian SAR-response on land and sea. Yet the Sea Rescue Society (*Redningsselskapet*), which operates as a maritime volunteer service along the coast of the mainland, does not operate in Svalbard. The same goes for the Home Guard (*Heimeværnet*) as part of the Norwegian Armed Forces and the Norwegian Civil Defence, a semi-volunteer organisation drawing on conscription that operates under the Directorate for Civil Protection and Emergency Planning. In previous emergency incidents, volunteers from the mainland have been flown up to be of assistance.[105] However, most of these efforts have been aimed at local, predominantly land-

based incidents. As with the other Arctic regions in question in this study, a large-scale, offshore incident would constitute efforts beyond the scope of these volunteer capacities. Yet this does not discount the efforts local volunteers can provide in support, through shelter, supplies, and labour assistance, if required by the outcome of a maritime incident.

In terms of oil spill preparedness and response, the World Wildlife Fund (WWF) has been running practical courses on beach cleanup and oil spill response in communities along the North Norwegian coast. Some of these courses have targeted Longyearbyen in cooperation with private industry and public authorities.[106] Norwegian labour and safety laws, however, add constraints to the extent volunteering can be utilised for oil spill preparedness and response. Given the risky nature of oil spill response work, it is a requirement that those participating in such efforts have a clearly defined contract outlining the responsibilities of the government and/or private companies for their employees. In effect, this hinders the formation of large-scale volunteer systems tasked with oil spill response. Still, efforts aimed at educating and informing the local population about oil spill incidents can be valuable, as the WWF-scheme exemplifies.

Seen in comparison, the volunteer efforts across these four parts of the Arctic are considerable. While organised differently, Canada, Greenland, and Iceland have made, or are planning to make, active use of local engagement to remedy for their limited public capacities with respect to maritime emergency response. The efforts outlined in the Danish 2016 report are especially encompassing, inspired by the Canadian and Icelandic systems. Norway, on the other hand, has fewer human resources on Svalbard from which to draw, relying instead on public capacities through the Coast Guard and private operators in Longyearbyen. Building on the previous tables, table 7 tries to illustrate some of the nuances and differences between the four regions in question.

Table 7*:* Regional attributes concerning local capacities, developed from Table 6. This table cannot capture all of the nuances inherent in each region; instead, it provides an immediate overview and is thus useful for this report

Region	Level of maritime activity (in total)	Degree of public resources	Degree of commercial resources	Degree of maritime volunteer efforts
Canada (Nunavut)	Low	Low	Low	Low (expanding)
Greenland	Intermediate	Intermediate	Low	Low (expanding)
Iceland	High	Low	Intermediate	High
Norway (Svalbard)	High	High	Intermediate	Low

4. Arctic emergency management

The previous sections provided a detailed review of the four Arctic regions' various schemes and set-ups for handling potential incidents at sea. There are limitations on how effective local capacity building can be when dealing with large-scale maritime incidents. In such instances, response is dependent on the interplay between the various levels of administration in the given Arctic region. This interplay is briefly outlined in the following section, which contributes to our examination of how the efforts examined above can be further improved.

4.1 Public, commercial, and volunteer resources

As outlined in subsection 3.1., public resources provided by federal or national governments are present to varying degrees in all four regions. The next subsection examines the symbiosis between the various levels more closely. It becomes apparent that the local efforts in all of the regions in this report constitute a considerable portion of their country's maritime emergency resources working in tandem with national capacities. Yet there is variation. Svalbard, for example, with a small population, is comparatively more dependent on public resources, whereas volunteer resources in the case of a maritime incident are minimal. Iceland is on the other end of the spectrum, given the limited public capacities and an expansive ICE-SAR system stretching across the country with considerable local engagement. Similarly, the Canadian Coast Guard's Auxiliary (CCGA) and the Canadian volunteer organisation for aeronautical SAR (CASARA) provide permanent capabilities across Arctic communities, albeit not to the same extent as ICE-SAR.

Several systems offer considerable presence in their Arctic regions, albeit limited in the case of a *maritime* incident. These include the Canadian Rangers, the Red Cross in Longyearbyen, and – dependent on its structure and capacities – the envisioned Greenlandic Volunteer Force. Depending on how these organisations are outfitted and planned, they could also be tailored towards maritime incidents, although at a cost. Other efforts, such as the Norwegian oil spill response 'coastal work group' (albeit not on Svalbard) and the Danish Arctic Reaction Force provide additional capacities given a crisis but are not permanent, established services. Finally, several initiatives fall under the category of training and education, whether enabling communities to act as first responders in the case of a maritime SAR scenario or providing information to public authorities about potential environmental concerns.

Returning to the categories roughly sketched out in the 2012 study by Kristensen, Hoffmann, and Petersen, we can attempt to categorise current and planned volunteer efforts in the four Arctic regions in question. To re-iterate, *costs*, a critical mass of engagement from the local *population*, and a separation of tasks into *information*, *response*, and *operations* constitute the core of this categorisation:

- *Costs* are inherent to most operations and response efforts and depend on how national governments, local communities, and private actors choose to organise the division of labour concerned with maritime emergency preparedness and response. In general, the more formalised and capable the local structure, the costlier it is to administer, equip, and maintain. I will return to this balance in the next subsection, although it is worth nothing that – as with most things – it varies a great deal in the Arctic.

- *Population* determines the pool from which local efforts can be drawn. There are, for example, few locals around whom a structure can be developed in places such as Svalbard (beyond Longyearbyen) and outside the largest communities in Canada and Greenland. Yet a small number of inhabitants might also entail (in theory) lower numbers of local emergency incidents; and thus less need for capacities present. Here, we come across a separation between local and far-from-shore emergency management. This distinction is worth noticing, although I will leave it for now and return to it in the final section of this report. Here, focus is on how low or high numbers of inhabitants in communities across the Arctic enable local emergency efforts.

Both the cost of a given system and its demand for a local population to draw from have consequences for the role of national governments in providing capacities. The spectrum roughly ranges from a completely government-funded structure (Svalbard) to a civilian community effort working in tandem with national authorities (Iceland). Falling somewhere in between an all-out civilian effort and a government-funded scheme, the proposals from the Danish Ministry of Defence envision a major role for the Danish military in civilian tasks while also improving and expanding joint efforts with the Greenlandic authorities. Although considerable in their engagement, the Canadian Armed Forces and the civilian Coast Guard cannot be present in *all* of the Arctic communities along the vast coastline of the Canadian Arctic (or even 'just' Nunavut). They are therefore dependent on additional civilian efforts and military efforts through the Rangers.

We can categorise the various schemes found in each of the four regions per level of formalisation, cost, and the need for population. The lightest forms of local services are those that fall under the umbrella of *information*. These are relatively inexpensive, not dependent on a sizable population, and tend to be relatively loosely or informally organised. Efforts include the local contact groups in case of an emergency (as found throughout the regions in question), training and education (whether performed by local or national authorities), the Greenlandic pilot project with 'Greenlandic guards' to report on maritime pollution, and, to some extent, the Norwegian Red Cross' efforts on Svalbard. Naturally, there is variation across these schemes; some are costlier than others, while others require a more active population. In general, however, they fall under 'information', as illustrated in figure 3.

As efforts formalise and require further resources – both in terms of actual costs and local engagement – they move towards the middle box in figure 3, namely *response*-related efforts. These include the envisioned reaction force in Denmark/Greenland, the Canadian volunteer organisations under the Canadian Coast Guard (CCGA), and the Armed Forces (CASARA), and the ENI and NOFO efforts along the coast of Finnmark in case of an oil spill (albeit not on Svalbard). These structures respond in the case of a maritime emergency but are not continuously operational. Note that they also assume varied forms, from Canadian volunteer efforts (funded by the national government) to commercial efforts under ENI/NOFO. Although these efforts require a larger population from which to draw and a more formalised structure, they are still less costly and easier to administrate than full-scale operations.

Finally, the remaining box, *operations*, entails the more or less continuous systems or volunteer efforts, meaning higher costs and a relatively formalised structure. They also require a somewhat large (in the context of the Arctic) population from which to draw. ICE-SAR is the best example of such an effort. Not discounting the countless unpaid hours that go into the organisation, it remains a relatively costly volunteer organisation, as it has its own administration, equipment, and training facilities.[107] It also requires a large, active population to be effective together with a clear, formal structure. The core concern is maintaining levels of volunteer participation while recognising that volunteers are there by their own free will.[108] The other structures in the same box share some of the same traits, although the Canadian Rangers are arguably both less costly and depend less on a large community. Yet with almost 2000 participants across several communities and the training, equipment, and payouts this infers, the Rangers go well beyond the efforts of the Red Cross or the Canadian Coast Guard

Auxiliaries. Similarly, according to the Danish Ministry of Defence, the Greenlandic Volunteer Force looks to follow some of the same logic. The Norwegian organisation with the Sea Rescue Service is another example in this category, although – as with the NOFO coastal group – this is an effort only available on the Norwegian mainland.

Figure 3: Three categories of local efforts, determined by structure (x-axis), population (y-axis), and cost (z-axis)

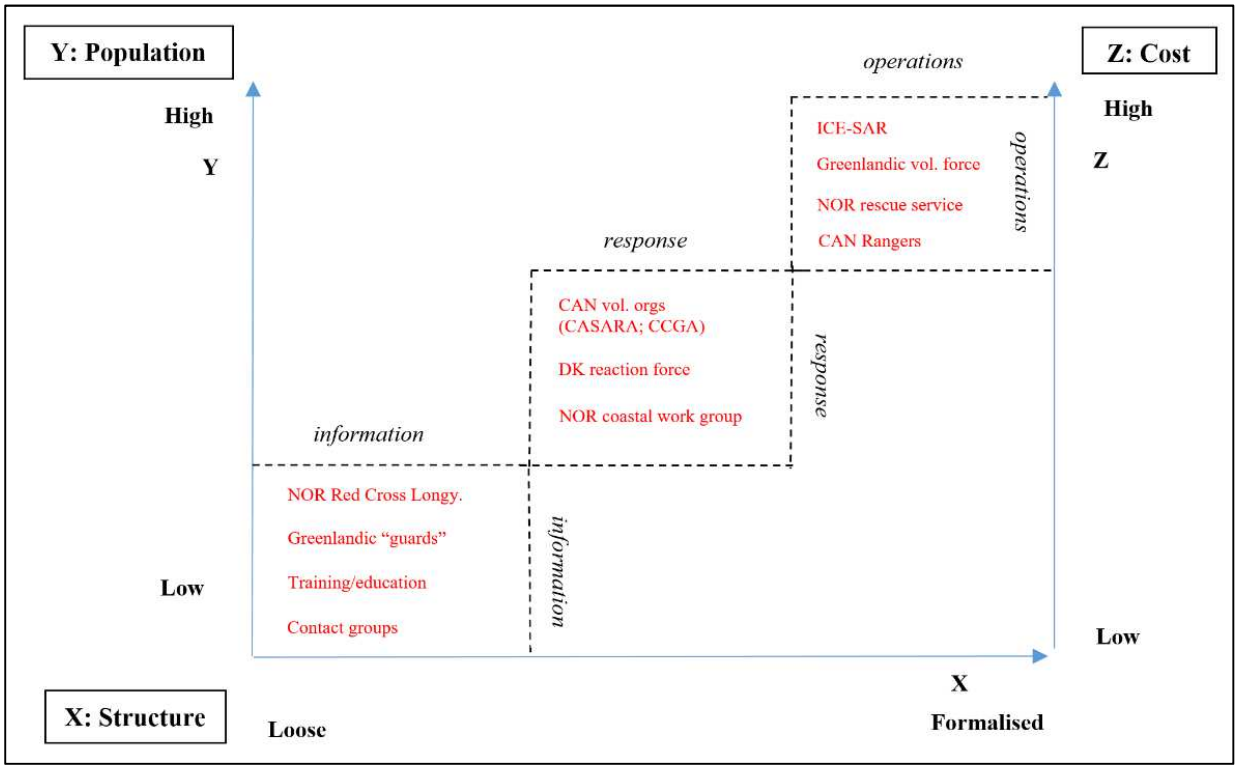


Figure 3 draws up the different categories and their respective traits along the three axes described throughout this section. While this figure does not intend to display a clear correlation between the various factors, it highlights the overarching relationship between the structure of a volunteer effort and its cost together with the dependence of the effort on population numbers. A more formalised structure is likely to be costlier, if only in terms of administration and operational management. Similarly, a more formalised structure might require further engagement from the local population and continuous, active participation.

Undoubtedly, different set-ups exist than those categorised here. This relatively simplistic schematization does not capture the nuances of these various local efforts nor does it claim to be entirely accurate in terms of defining the relationship between the different categories and the axes. But it does aim to enhance our understanding of how we can identify and organise the various local efforts in the Arctic when dealing with a maritime emergency. As communi-

ty efforts move from the lower box towards the upper-right corner, requirements and costs change. It is therefore not a given that communities throughout the Arctic can sustain all types of volunteer-based or local efforts.

4.2 Recommendations

We now turn to how maritime emergency preparedness and response could be further improved in the regions in this study. Making use of the separation between activities concerned with *information*, *response*, and *operations*, some points stand out.

All of the reports and documents concerned with the topic emphasise the role of *information* through efforts such as education and training. As relatively cost-effective measures, avoiding an incident occurring in the first place seems to be the easiest and most obvious way of saving lives. In Iceland, for example, the law *requires* fishermen to attend courses at the ICE-SAR maritime survival center.[109] In Canada, locals in Nunavut have actively called for training in oil spill containment to provide a first line of defence until public assets can arrive.[110] In Norway, the WWF has initiated several training sessions in communities to prepare for volunteer participation in a potential oil spill. As well as educating and training the local population, efforts can be made to increase individuals' survival skills by teaching them to rescue themselves from dire situations. Termed 'self-rescue', this is particularly focused on visitors to the Arctic region. As Brynn writes:

> While self-rescue is a best practice everyone should employ, the implementation of it within the Arctic tourism industry would be of particular benefit, as these travellers represent a larger portion of SAR calls and are more inclined to be unprepared for the Arctic environment.[111]

Further enhancing *response*, another highly relevant point, is the need for exercises. This relates to international cooperation and local actors alike. Exercises like TAPPIK in Greenland are essential, where authorities learn to cooperate and enforce divisions of labour while *also* including local assets and volunteers. These are *vertical* exercises, including all levels relevant to local response. They come in addition to *horizontal* exercises, where states jointly practice their emergency response capacities. While perhaps obvious, it is still worth pointing out that vertical exercises should not be neglected in favour of horizontal exercises. It is especially crucial with clear divisions of responsibility and a clear understanding amongst local actors of the role they hold during an emergency.[112]

Moving to *operations*, this report has described the inherent limitations of local efforts when responding to maritime incidents at a regular, constant level. Yet certain public assets that are more or less continuous, like the Canadian Rangers and the envisioned Greenlandic Volunteer Force, could take notice from the Icelandic organisation of ICE-SAR and carry out cost–benefit analyses of how to further increase maritime response capacities. All local communities have some measure of local capacity that can be drawn upon given that the community consists of able-bodied adults with local knowledge and the interest and willingness to participate in volunteer efforts. Yet there is often a lack of permanent structures in place under which these efforts can be organised. It therefore falls to the regional and national governments to explore how such frameworks can be developed further. Acquiring SAR vessels for local use might not constitute a large sum for regional or national governments but can raise local capacity from basically nothing to a minimum. Another permanent arrangement to be explored is the centralisation of the knowledge and learning concerned with maritime emergency competence. This is done in Iceland with the ICE-SAR maritime survival and training centre and in projects considering similar Norwegian arrangements. Such a centre or hub will assist with training and knowledge enhancement for local communities and/or maritime actors as well as contribute to the more general public debate on Arctic maritime emergency management.

In sum, the outlined suggestions include:

Information:

- Improve the spread of information concerning offshore safety and survival for the local population.
- Mandate training/exercise participation for maritime actors.
- Mandate so-called ‘self-rescue’ training and equipment for maritime tourists.
- Organise ‘how to’ campaigns in local communities with humanitarian/non-profit organisations.
- Make use of Arctic engagement by non-profit organisations with additional resources, like the WWF and Red Cross, to create projects aimed at local capacity enhancement.

Response:

- Increase the number of continuous vertical and horizontal exercises between the various local societal actors.

- Enhance community role clarification in the event of a large-scale incident with clearly defined lines of responsibility.

- Explore how local maritime industries can be further included in a system or network for emergency response.

Operations (permanent):

- Every Arctic community has some form of local engagement in case of an emergency. It is thus up to the local/national government to provide a structure/framework under which these resources can be further improved and utilised.

- Explore the possibility for a maritime component to already existing schemes, such as the Canadian Rangers or Longyearbyen Red Cross.

- Consider establishing a dedicated tool or hub for knowledge enhancement concerned with maritime emergency management that can work on both the local and national levels by informing communities and the public debate.

4.3 Not everything can be solved locally…

> They [Coast Guard volunteers] are looking more at the hunters and fishers that are along the shorelines that get into trouble. If you have a large fishing vessel that gets into trouble or a cargo vessel, they have no capability. They'll go out and they'll do what they can, but they really are not the resource that's needed in that situation.[113]

The statement above – made by Nunavut's Director of Protection Services Ed Zebedee, who was concerned with the role of Coast Guard volunteers in Canada in 2016 – highlights another crucial point in the discussions concerning local resources and capacities. Regardless of local capacity enhancement, *federal or national governments* have a role to play in managing emergency situations in the Arctic. The maritime domain is challenging, and local resources can only go so far. Tellingly, a 2016 report from the Danish Ministry of Defence recognises that, while important, a Greenlandic Volunteer Force will only be able to assist in maritime emergency incidents within three nautical miles.[114] In northern Norway in general and on

Svalbard in specific, public authorities together with integral actors, such as *Store Norske*, provide the core of local capabilities, and there is no volunteer force dedicated to the maritime region. The Icelandic ICE-SAR organisation – probably the most encompassing volunteer effort in this study – seems to be the only system aimed directly at maritime emergency response. Even there, however, capacities are limited in the face of a severe, far-from-shore incident.[115]

Most of the local schemes outlined also require some form of funding. Albeit impressive, selling fireworks (as in the case of ICE-SAR) is only possible in relatively populated parts of the Arctic or in areas where fireworks are in continuous, high demand. Longyearbyen, with only 2100 inhabitants, and Nunavut, with vast distances between communities, struggle to reach the critical mass needed to financially support considerable volunteer organisations. In both cases, there is dependence on a broader national framework, such as the Red Cross in Norway or the various air/sea/land organisations in Canada. The Rangers in Canada and the envisioned Greenlandic Volunteer Force also require permanent funding to cover administration and personnel costs. This funding must come from national institutions, like the armed forces. Obviously, some volunteer efforts are costlier than others. Providing first-aid training and land-based SAR in Arctic communities is relatively inexpensive compared to the acquisition and use of maritime vessels or airborne capacities that require infrastructure, training, and fuel.

These limitations entail a symbiotic relationship between the various layers of public administration. Local communities are unable to procure new maritime vessels or helicopters. When they do go to such lengths under the umbrella of a local organisation, it is even more impressive, as costly infrastructure projects and investments in emergency response equipment are by definition beyond their scope. Here, federal/national governments have an active role to play. Similarly, central governments can provide the financial and institutional structures required to organise volunteer or semi-professional emergency response efforts in the Arctic. As outlined in this report, the local level can add an additional or supplementary layer to emergency preparedness in the Arctic and help alleviate the pressures faced by national governments; yet it cannot replace public efforts.

Another layer briefly mentioned (in section 3.5.) is *international cooperation*. As with local capacity development, expanding and improving such collaboration can help improve scarce national resources. I will not go into lengthy detail in this report; instead, I will briefly high-

light some of the underlying potential that exists. Beyond efforts such as the agreements signed under the auspices of the Arctic Council or establishing an Arctic Coast Guard Forum, several measures could be developed at the international level. First, efforts to expand already existing cooperation on satellites seem to be a relatively cost-effective way of solving some of the severe communication issues in the Arctic. For Denmark, Iceland, and Norway, the cooperation related to the European Space Agency already provides a framework in tandem with the EU Satellite Centre (SatCen) in Spain.[116]

Moreover, joint efforts in surveillance, patrolling, and emergency response seem to have great potential. Between Nunavut and Greenland, efforts can be expanded. In 2016 alone, Danish vessels around Greenland had to come to the assistance of sinking Canadian fishing vessels twice.[117] The Danish MoD report seems to recognise this, as it discusses further formalising the contact between the nearby Arctic countries to improve emergency response and coordination.[118] There are also obvious advantages in establishing hubs and shared assets in central locations, such as Keflavik Airport, Thule Air Base, and possibly the Norwegian island of Jan Mayen. Denmark and Iceland have already established a system for sharing assets, efforts which can be further developed.[119]

Finally, the joint procurement of relevant emergency response equipment should be explored further. Denmark, Canada, and Norway are all in the process of acquiring new fighter planes, which will be given a considerable role (also civilian) in their Arctic regions. Norway and Denmark have chosen the Lockheed Martin F-35, and Canada might make the same decision soon. Similarly, these countries are considering new maritime surveillance aircraft, such as the Boeing P-8 Poseidon (Norway has already decided to acquire it). Given the similarities between the countries and their needs coupled with their memberships in defence organisations tailored for joint procurement (e.g. NORDFECO, NORAD, NATO), it is almost surprising that further progress has not been made in this area.

In sum, there seems to be unexplored potential for further international cooperation, ranging from exercises and the sharing of surveillance data to joint procurement and asset-sharing arrangements. These topics should be examined in further studies and scenario-building.

5. Conclusion: room for improvement

All activities entail inherent risks. The question is, however, what level of risk society deems acceptable and, subsequently, how different actors can mitigate risk. In the Arctic, where maritime activities indisputably have higher risk levels than activities further south, this question is key. The distances in the Arctic and variations in region-specific challenges leave the bulk of the solutions to be found at the national and local levels. The Arctic states and their respective public institutions are, thus, under mounting pressure.

This report has laid out (1) how the maritime situation is changing, (2) how states are working to manage risk in their respective Arctic regions, and (3) how these regions are currently utilising local-level public, commercial, and volunteer assets. The latter, namely the role of Arctic communities and local organisations, is a rapidly expanding area gaining attention in debates on northern emergency management. This report has also examined some proposals for the further improvement of maritime preparedness and response while conceptualising the various layers of emergency management. I will not repeat all of these points here. Instead, I encourage a final re-examination of how we conceptualise maritime emergency management.

Many reports and studies on the topic seem to argue that the focus should shift away from 'big crisis' incidents and debates concerning ice-breakers towards local communities and their emergency response needs.[120] Although I strongly support a more holistic (and less ice-breaker-focused) debate, there should be a clear, practical, and conceptual separation between the various types of demands. Managing a sinking cruise ship with 1500 passengers 40 nautical miles off the coast of Greenland does not require the same tools and capacities as dealing with local inhabitants requiring SAR on land or ice. Discussing these issues like they are the same under an umbrella of 'Arctic emergency response' risks conflating two very different sets of issues.

In fact, not only do these emergency situations require different sets of resources and capacities, they also take place in two different domains, namely in or around communities versus the offshore. A cruise ship might run aground far from northern communities. Yet there are also spill-over effects. A large-scale maritime incident might possibly affect nearby local communities. Similarly, capacities can be developed to serve both types of incidents. Still, this categorisation must be recognised and managed, albeit not under the same banner. Arguing for one set of concerns over the other risks downplaying the severity in each set of inci-

dents. If concern in a community revolves around being stranded on moving ice or rescuing local fishermen, capacities to manage offshore oil spills or a large-scale cruise ship evacuation might not be best suited. Moreover, conflating these issues tends to argue for a hierarchy in which the one set of concerns trumps the other.

The discussion concerning the 2016 voyage of the luxury cruise ship *Crystal Serenity* highlights some of these key dimensions. In the event of an accident onboard the vessel, a small local community in Nunavut – most likely located at some distance from the ship – can initially provide limited assistance. Efforts to rescue passengers from the ship would first come from the British research vessel *RSS Ernest Shackleton*, hired to pair up with the *Crystal Serenity* along its voyage. Thereafter, public efforts from Canada through its Coast Guard and Air Force would be employed. In the second phase of the response effort, local community capacity might be utilised. Communities might be strained from hosting a high number of elderly cruise ship passengers for an extended period of time, depleting local resources that can only be replenished with air or sea transport.

Equally important – and more likely to occur frequently – small-scale incidents involving local fishermen and local transport demand attention in the Arctic. Here, community efforts are better suited and can – as in the example of Nunavik's acquisition of its own rescue vessels – add to non-existing or limited public capacities. Similarly, including private sector companies already operating in the area in more formalised arenas for dialogue and response is a cost-effective measure to enhance resources to draw on in the case of an emergency. Nonetheless, any utilisation of local capacities and volunteer efforts requires some form of structure in addition to funding and an engaged local population. On all these accounts, intervention from the local, regional, or national government is crucial to provide the basic support that spurs local efforts.

The great variation between the four Arctic areas in question in this report must also be acknowledged. Iceland in particular is conceptually different than the three other regions examined in this study. The population is larger and possesses complete autonomy to implement decisions and dedicate funding as it sees fit. The other areas in question (Greenland, Nunavut, and Svalbard) all depend on relations to capitals located south of the Arctic. What works in one region might not work in another. For example, ENI's extensive work with NOFO and local fishermen in North Norway is relatively expensive and requires *both* fishermen and an active organisation like NOFO. At the same time, it can provide an example

worth emulating should the petroleum industry or other large-scale commercial activities expand in Arctic areas.

In sum, this report has tackled several issues across Arctic regions. One key take-away is that a great deal of unexplored space for further research remains, particularly regarding international cooperation and local governance structures. Yet this report has also identified several measures that can help improve local capacities across the north. Similarly, conceptual nuance is needed when discussing maritime emergency management. The risk of a cruise ship sinking and the disappearance of a small boat require very different responses. Capacity, however, is lacking to deal with both types. The good news is that relatively limited efforts can have disproportionately large effects in a region where resources are few and far between.

6. Notes

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