UNIVERSITY OF COPENHAGEN

Maritime emergency management capabilities in the Arctic

Roud, Ensieh Kheiri Pileh; Borch, Odd Jarl; Jakobsen, Uffe; Marchenko, Nataly

Published in:
Proceedings of the International Offshore and Polar Engineering Conference

Publication date:
2016

Document version
Publisher's PDF, also known as Version of record

Citation for published version (APA):
Roud, E. K. P., Borch, O. J., Jakobsen, U., & Marchenko, N. (2016). Maritime emergency management capabilities in the Arctic. *Proceedings of the International Offshore and Polar Engineering Conference*, 1241-1248.

Download date: 28. okt.. 2020

Maritime Emergency Management Capabilities in the Arctic

Ensieh Kheiri Pileh Roud [a] , *Odd Jarl Borch* [b] , *Uffe Jakobsen* [c] *and Nataly Marchenko* [d]

[a,b] Bodø Graduate School of Business, Nord University, Bodø, Norway

[c] Department of Political Science, University of Copenhagen, Copenhagen, Denmark

[d] Department of Arctic Technology, the University Centre in Svalbard, Longyearbyen, Norway

ABSTRACT

Growing commercial activities in the High North increase the possibility of unwanted incidents. The vulnerability related to human safety and environment as well as a challenging context, call for a strengthening of the maritime preparedness system, cross-border and cross-institutional collaboration. In this paper, we look into the different stressors and risk factors of the sea regions in the High North. We elaborate on emergencies where integrated operations like mass evacuation is needed. We build upon in-depth studies of two cruise ship incidents close to the Spitsbergen Islands, and full-scale exercises in the Arctic region. We claim that coordination of such operations where several institutions and management levels are included demands significant integration and communication efforts. Implications for the training of key personnel responsible for coordinating such operations are discussed.

KEY WORDS: Maritime preparedness system; integrated emergency operations; High North; cross-border cooperation; competence and training.

INTRODUCTION

Emergency situations are often characterized by lack of overview and uncertainty about cause, consequences and suitable safety barriers. In areas like the High North, due to limited infrastructure and the scarcity of emergency capacities, a simple emergency situation can quickly turn into a crisis involving significant risk for people, nature and vulnerable societies. The turbulent weather conditions facing emergency actors, makes rescue and relief operations a challenging and time consuming task. In this paper, we examine how the emergency management has to be configured to overcome challenges related to large-scale emergencies with limited local infrastructure, long distances and harsh weather conditions in icy waters. In addition, we consider the limited availability of emergency support systems and the time delays caused by the geographical distances.

By examining the various emergency situations we reflect on suitable composition of the infrastructure, emergency groupings, and coordination mechanism.

THEORY

Emergency Management and Emergency Response Pattern

High levels of uncertainty combined with a need for fast and reliable action are the main characteristic of emergencies (Kyng, Nielsen, and Kristensen 2006). Major incidents like shootouts and terror action, or cruise ship groundings with mass rescue operations (MRO) are categorized by lack of sufficient resources to meet the emergency situation. These situations are often chaotic and stressful with a large number of causalities, and a mix of SAR capacities. Thus, obtaining and maintaining an overview for such an incident become extremely hard for the coordinators and the different levels of command.

According to Borch and Andreassen (2015), emergency management is regarded as a tightly knit interplay between different management levels from the strategic level and operational headquarters down to the on-scene coordinator and incident commander. This calls for attention on roles and capabilities at all decision levels and the horizontal and vertical interaction patterns. Uncertainties and conflicts over the roles between the levels might influence negatively on managers' performance. In extreme environment, a huge number of aspects towards a broader range of stakeholders has to be taken into consideration (Mintzberg, 2009). Not the least, the next in kin and media pressure will be extremely high and will demand extra focus and more roles to fill.

A managerial role can be defined as a set of actions and responsibilities. Mintzberg (1973) suggested that the managerial roles within an organization can be categorized into three key categories: interpersonal, decisional and informational.

The interpersonal roles cover the relationships that a manager needs to have with others. It involves three roles named as figurehead, leader and liaison. The figurehead role involves internal motivation and inspiration. It also represents the crisis organization externally towards different stakeholders. According to leader's roles, managers have to reflect on the needs of an organization and those of the individuals they manage and work with. The third interpersonal role, which is liaison, deals with the 'horizontal' relationships to other emergency and support agencies. Contact and coordination outside the vertical chain of command are referred to as the liaison's role.

The processing of information is a key part of the managers' duty. Managers must collect, disseminate information and these activities have three corresponding informational roles: monitor, disseminator and spokesperson. By means of interpersonal contacts, these roles are essential in an organizational unit. Managers have to scan the environments continuously to seek and receive information about both internal and external events and transmit it to subordinates and others. Constant information flow is critical in order to be able to allocate resources and achieve efficient mitigating actions with lowest possible risk to the personnel.

The decisional roles involve the entrepreneurial action, disturbance handling, resource allocation, and negotiator roles. Information is the basic input for managers to make decisions. In the entrepreneurial role, managers search for improvement the unit to adopt it to changing conditions in the environment. They also respond to high-pressure disturbances and handle ad hoc problems. In the resource allocator role, managers make decisions about how to allocate people, budget, equipment, time and other resources to attain desired outcome.

Quick decisions may be critical to meet dynamism in the environment. In stable organizations, formal duties descriptions may contribute to harmonized action. On the other hand, in a crisis organization, the defined standard operating procedures that have functioned well in the past may not be appropriate (Rosenthal et al., Boin and Comfort, 2001). Thus, in organizations facing volatile environments, there is a need for innovation and entrepreneurial, dynamic capabilities related to specific persons or integrated into the present roles (Borch and Madsen, 2007). The operational and tactical management may have to improvise and work on reconfiguration, including new action pattern, repositioning of resources and up linking to other roles and processes. This is of critical importance in emergency situations that run through several phases, that each may run over a long time span.

Different Emergency Phases

In this paper, emergency situations are divided into four phases according to IAEM (2009): Prevention, Preparation, Response, and Recovery. The main characteristics of these phases are:

***Prevention*:** Preventing a disaster or its consequences should be the prime directive for every organization or administration involved in emergency management (EM) procedures. Early warning, forecasting, and monitoring systems have improved significantly over the past decennium, mainly due to improved communication and positioning capacities. The most crucial factor in disaster prevention is time. The earlier an upcoming threat is known the better people and organizations can apply countermeasures to prevent a hazardous outcome. This means that all involved EM organizations and authorities must plan ahead to identify preventative and protective measures before a situation escalates (Van de Walle and Turoff et al., 2009; Wisner and Adams, 2003).

Preparation: If a critical situation cannot be prevented and starts to expand, being prepared for it is the second most important phase. Unfortunately, one cannot be prepared for every kind of emergency. Even if a disaster is of the same kind its severity, extent, and progress cannot be rehearsed in every facet. The situation, however, can be compared to a football game. Each game for itself is unique; though, endurance, strength, fitness, health and the knowledge of different tactics can influence the outcome of a game significantly. The same principle can be applied in emergency management. Preparing for the unknown by providing reliable equipment and tools, having a good organizational structure, educating the team, and having a repertoire of best practices can be crucial in hazardous situations. Nevertheless, it is essential that all levels of government and volunteers undertake a thorough vulnerability analysis, which assesses the variety in types, impact, and frequency to formulate possible regulations and emergency plans (Turoff, et al., 2009; Wisner and Adams, 2003).

In case of an unforeseen disaster the response teams and emergency managers have to act as fast as possible to prevent additional damage. Preparation can help to mitigate the consequences in first place but fast ad-hoc decisions are needed to react to such a threat and moderate its impact. The faster and more precise a decision can be made on a strategic and operational level the faster the tactical teams can react (Turoff, et al., 2009). This demands adequate and timely information (Iannella and Henricksen, 2007) as well as fast reliable information and proper logistics, infrastructure maintenance, and supply management (Wisner and Adams, 2003).

Resource Configuration

To achieve high performance, an operation has to be supported by appropriate resources and distinct competencies (Barney, 2002). The resource-based view of the organization emphasizes the significance of an organization's unique or distinctive resources, and how they are pooled together to achieve superior performance (Amit and Schoemaker, 1993; Barney, 1991; Black and Boal, 1994).

However, resources may not be easily accessible or it may take time to develop them within own organization. Special challenges are present if you need resources that are rare, costly to buy or copy, and less mobile (Barney, 1991; 2001). The lack of available technology and managerial competences means that the organizations have to build resources on their own, or enter into cooperation with other organization that may have some of this capability. Through host-nation support schemes the emergency coordination centers may mobilize support from neighboring countries in major incidents and regions where resources are scarce.

At operational level, the managers' task will be to decide upon the resources needed and how they should be bundled together. Basic resources refer to resources such as skilled workers, machines and financial capital. Capabilities are combinations of physical resources and individual competence bundled in the organization to provide a special output (Amit and Schoemaker, 1993).

Another type of resources is the dynamic capability emphasizing the organizations' ability to adopt or innovate, i.e. capabilities to develop new resources, to reconfigure new and existing resources and remove abundant resources to improve efficiency (Teece et al., 1997; Borch and Madsen, 2007). By identifying, utilizing, and recombining valuable assets, the organization should be able to meet unforeseen challenges, increase operational effectiveness and keep the costs down. In complex and volatile environments, managers have to be efficient on the specified tasks of an operation in coordinated action with other organizations. Thus, the managers have to be eloquent in both

exploiting present resources, and in exploring new ones to meet new challenges, all performed in a different context (Black and Boal, 1994; March, 1991, Borch, 1994). Therefore, the operational efficiency is dependent on the configuration of physical resources, human capabilities and managerial core competence to prosper in the volatile and highly complex environment of regions such as the High North.

The Importance of Context

The operational environment of the High North is characterized as both complex and volatile (Borch and Batalden, 2014). The High North is defined as the geographical regions north of the Polar Circle where maritime operations are challenged by long physical distances to civilization, limited harbor infrastructure, low temperatures with ice, icing, polar lows, and vulnerable nature. This calls for extra competence and capabilities for all activity in this region (Gudmestad et al., 1999; Thunem, 2010). In the High North the instability parameter denotes the difficulties the actors face on predicting nature, and the functionality of available resources, among others due to different cultures, political interests and training. In emergency systems there are capabilities that are needed for response to mitigate the crisis. The resource challenges are present both related to equipment, personnel and organizations (Comfort and Kapucu, 2001).

Institutional factors

Formal institutional elements are important in the Arctic region. One factor present is the political sensitivity present with shared responsibility between the Arctic countries on emergencies, including the USA, Canada, Denmark, Finland, Sweden, Iceland, Norway and Russia. The Arctic states are committed to several bilateral and multilateral agreements in relation to certain emergency preparedness activities. The question of emergency preparedness in the High North has a primary focus on search and rescue operations, and on preparedness for pollution caused by extensive maritime activities from shipping, fisheries, offshore petroleum installations and maritime tourism.

From May 2011, search and rescue operations in the High North are governed by the Agreement on Cooperation on Aeronautical and Maritime Search and Rescue in the Arctic. The responsibility is assigned to the eight Arctic states. The responsibility of oil spill response in the High North is coordinated by the Agreement on Cooperation on Marine Oil Pollution Preparedness and Response in the Arctic since 2013. The United Nations Convention on the Law of the Sea (UNCLOS) is the international treaty created at the third United Nations Conference on the Law of the Sea. These international agreements demonstrate the commitment for joint coordination of emergency response in the Arctic.

Unfortunately, climate change and its unpredictable consequences make emergency response in the region complicated. We still lack knowledge on how these composite contextual elements may influence the operational interaction between the institutions within the preparedness system.

Resources for providing effective emergency response in the Arctic are limited (Arctic Council, 2009). There is limited police authority present to deal with violent action. Having limited resources countries depend on each other's help.

Host Nation Support

There is a broad political consensus to maintain the high priority of an effective SAR services with focus on cross-border support or the so-called Host Nation Support. HNS can be defined as civil or military assistance rendered by a nation to foreign forces within its territory during crisis and emergencies based on agreements concluded between nations. The consent of Host Nation Support was developed by international organization Red Crescent National Society, the UN Officer for the Coordination of Humanitarian Affairs and European Union (EU) (DSB, 2014).

Host Nation Support uses mainly four principle for interaction within crisis management in case of assistance from abroad; responsibility, equality, subsidiarity and interaction. The principle states that the organization responsible for an area manages the response in case of a crisis. The equality principle states that an organization in emergency should be as similar as possible to this organization during its day-to-day activities. The subsidiarity principle states that crisis should be managed at the lowest organizational level. The interaction principle states that the governments, businesses, or agencies are responsible to ensure the best possible cooperation between relevant actors and organization in all phases of emergency management (DSB, 2014).
The criteria for host nation support and inland emergency management put a heavy strain especially on the coordinators at each level of command within emergency situations balancing different types of resources and allocating command and responsibility for different managerial tasks and roles.

CASES

Cruise ship Maxim Gorkiy. 1989. Greenland Sea, near Svalbard/ Spitsbergen

The accident of the cruise ship *Maxim Gorkiy* has become a vivid illustration to the question of tourism safety at sea in harsh Arctic conditions and has been discussed widely (Svalbardposten, 1989, 2014; Kvamsad et all, 2009; Hovden, 2012, Marchenko, 2015).

On the way from Iceland to Magdalena fjord (North Spitsbergen) at around midnight of 19 June 1989, the *Maxim Gorkiy* hit an ice floe and begun to sink rapidly. It happened in the Greenland Sea, 60 nm (111 km) west of Spitsbergen. There were 575 passengers and 378 crewmembers onboard, totally 953 people. All passengers and a third of the crew had to abandon the ship. The situation was quite dramatic while they were waiting for help on the ice floes and lifeboats, surrounded by drifting ice. The Norwegian coast guard vessel *Senja* happened to sail in Svalbard area and receiving midnight call was dispatched to assist immediately. A P3-Orion surveillance plane from the Norwegian Air Force came to the location and served as air coordinator. CV *Senja* arrived on scene three hours later, when the *Maxim Gorkiy* was already partially submerged. The passengers were evacuated from the lifeboats and ice floes by helicopters and the *Senja*., taken to Svalbard and later flown back to Germany. Meanwhile the crew of the cruise ship and CV *Senja* had managed to stop the *Maxim Gorkiy*'s sinking. On 21 June, the *Maxim Gorkiy* was towed to Svalbard, where quick repairs were made to make her watertight enough to survive a return to Germany for repairs.
The Norwegian forces with the commander of CV as on-scene-coordinator were keeping close contact through the navigator staff and radio communication officer at CV Senja. However, it was difficult to communicate with forces from other countries including Russian surveillance planes and helicopters. These units communicated directly with the cruise ship captain in Russian, causing challenges both to the correct use of resources and air safety. The aircraft also used different channels for communication.

Cruise ship Hanseatic. 1997. Murchinson fjorden, Northern Svalbard

The *Hanseatic* case was of a smaller scale (less people involved), so it is not well known. (Mellgren, 1997).

On 13 July 1997, the cruise ship *Hanseatic* (Germany), was stuck in Murchinson fjorden in the Hinlopen Strait, a passage between the Spitsbergen and Nordaustlandet islands (210 km from Longyearbyen). There were 145 passengers and 115 crew. The captain tried to approach land at risky distance to show walruses to the tourists. The ship had left a measured shipping lane through Rossøysundet and passed close to the land in Beinbukta, where it went on a cutting sticking up above sea level only 20-30 meters from the ship railing. *Hanseatic* ran aground with a heel of nine degrees. All passengers were evacuated to the land by lifeboats and transported further to Longyearbyen by the coast guard ship *Tromsø*. The Norwegian Coast Guard coordinated the rescue activity. The *Hanseatic* was grounded for 4 days while the *K/V Nordkapp* took fuel from the *Hanseatic* (to make the ship lighter and to avoid spills) and it helped to extricate the ship.

The reported cause of the accident was navigation mistakes, although the captain was very experienced in Arctic navigation. In this case, the weather was fine and none of the 260 people on-board was injured due to the presence of the coast guard and favorable conditions.

SAREX Greenland Sea 2013

The SAREX Greenland exercise is aimed at training key personnel responsible for SAR coordination of different types of resources in a context that included limited infrastructure, long distances and harsh weather conditions. The scenario of the 2013-exercise was multi-faceted. The climate change impact on sea ice extent even in northern Greenland has resulted in increasing maritime activity from both cruise tourism and prospects for extractive industries in the area. In addition, the national, regional, and global political focus on the threat of climate change impacts, the capacities of search and rescue (SAR), and oil spill response (OSR) in the area was part of the background for the exercise. Finally, the relation between SAR resources and the specific Arctic context was important for the setting of the area of the exercise because the geographical distances and the sparse resources in the vast area make transport time for evacuation enormous.

On 4 September 2013 the cruise ship *Arctic Victory* went missing in the Greenland Sea. All ships in the Greenland EEZ are obliged to send a message to the GREENPOS system with information on position, course, speed, and destination every six hours. When the mandatory message from *Arctic Victory* did not arrive at the Maritime Rescue Coordination Centre (MRCC) in Nuuk, it notified other Rescue Coordination Centers in the High North and asked all available aircrafts and surface vessels for a search operation in the Greenland Sea. Next day, the *Arctic Victory* reported its position. However, the day after Arctic Victory ran aground near Ella Island in King Oscar's Fiord with all 200 passengers and 50 crewmembers on-board, an explosion in the engine room resulted in multiple injuries, fire on-board and tilting of the ship. Hence, the need arose for an extensive rescue operation to save the crew and the passengers who either were on-board the vessel or had entered the vessel's life rafts.

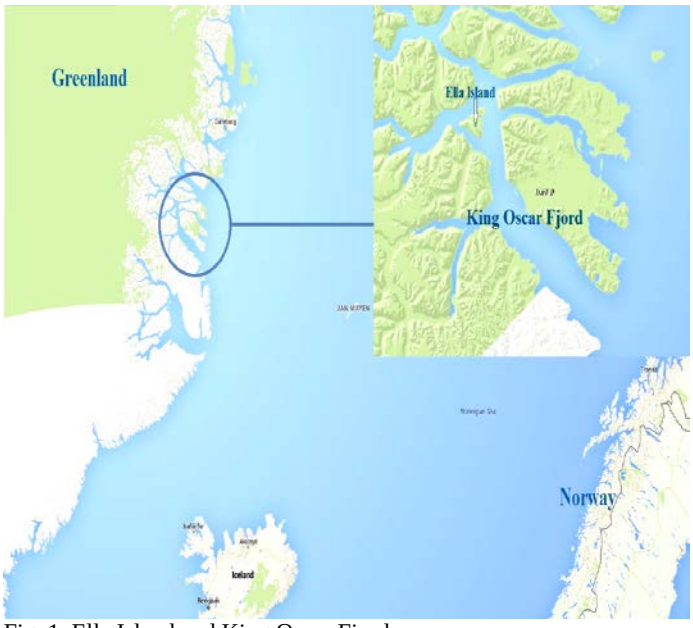

Fig. 1. Ella Island and King Oscar Fjord map

The biggest challenges during the exercise were communication with and coordination of a huge multinational search and rescue effort in the high Arctic. The report concluded that it should be investigated whether MRCC Nuuk had all the needed communication systems at disposal for a SAR operation of this size. In addition, increased capacity was recommended including a fixed wing search aircraft be on SAR alert in Greenland throughout the summer season in addition to the available helicopter capacity. Moreover, it was recommended to test mobile satellite internet transceiver solutions for their capability, since reliable means of communication were a major problem during the exercise. Furthermore, a standard operational procedure for local emergency plane for casualty assemblies should be developed, and also that a formal SAR cooperation agreement between the national coordination forums at the strategic level in Greenland and Iceland were established. The handling of the large number of aircraft during the exercise produced the recommendation of establishing an air-task organization as part of the contingency plans of the Joint Arctic Command in Nuuk. The proper handling of media and the press also became an urgent problem during the exercise, Therefore, it was recommended that a communication plan for future purposes were developed and that training media and press handling both internally and with external counterparts was continued. It was regards as essential that information was spread to stakeholders and the interested public in general (Joint Arctic Command 2013). This was especially important in an area with political sensitivity and a broad range of stakeholders such as the indigenous people.

ANALYSIS

We have used the real data from presented cases for our analysis. At the end of this section, our suggested analytical model is presented. The table below shows the overview of the three cases.

Table 1. Overview of three cases

Cases / Feature	Maxim Gorkiy Summer	Hanseatic Summer	Arctic Victory Autumn
People on board	953	260	250
Phase and type of Emergency	Response Phase-Unexpected	Response Phase-Waveform	Response Phase-Unexpected
Problem	Hitting an ice	Stuck in fjord	Lost, Engine explosion. fire on board
Cause	Captain's decision to cross an ice field while keeping significant speed	Navigation mistakes	No information available
Challenges	- lack information, lack of support from ashore and communication between Russian and Norwegian rescue team - 2 km wide ice field with about 1m thickness- The cultural and language differences between Russian and Norwegian crew - poor VHF channel communication	- long distance to the nearest settlement Longyearbyen - ice conditions on site, that made rescue efforts difficult - poor VHF channel communication	- long distance - communication with and coordinating of a huge multinational search and rescue - harsh Climate - coordination of large number of aircrafts -media handling -information to stakeholders

The dramatic Maxim Gorky cruise ship accident demonstrates the challenges and potential consequences of lack of information when conducting mass evacuation coordination and planning in extreme environment. It illuminates the cultural differences related to cooperation, including language problems.

In the Hanseatic case, the long distance to nearest settlement, icy condition and poor communication caused difficulties for the SAR operation. The challenge of transporting a large group of passengers is critical in this region. In addition, the presence of coast guard emergency platform with a broad range of capacities including both logistics, communication and specialized competence on SAR and oil spill was crucial in mitigating the effects.

In the SAREX exercise, it soon became clear that a full evacuation was necessary. Therefore, the condition and infrastructure of the area of operation for search and rescue became essential. Evacuees had to be transported in small boats on-shore Ella Island, then by helicopters to the military facilities of Mestersvig Airstrip, and then onwards by large aircrafts to Iceland, where the nearest hospital with sufficient capacity was located. The distance from Mestersvig to Reykjavik in Iceland is approximately 1.000 km. The conditions for this exercise were certainly extreme but still not unrealistic. Cruise ships of this size do go this far north in remote areas in spite of the Eastern coast being unpopulated except from two smaller towns and a number of even smaller settlements with very limited medical or paramedical resources. This incidence demonstrated that evacuation destinations are the key problem. It also demonstrated that resources are present and could be mobilized from immediate response forces from Greenland and Iceland such as offshore patrol vessels, maritime surveillance aircrafts, neighboring countries air support, local helicopters and other assistance are available in the area. However, there would be a time-lag that may prove critical in harsh weather. The capacities of the vessels in distress are therefore critical. Thus, the new Polar code stresses that the vessels should manage to keep the passengers and crews alive and well for five days in cases of critical incidents. This calls for both significant increase in equipment onboard as well as training for a broad range of safety personnel on-board.

Crisis Context and Emergency Management

The crisis context as to weather, distances to incident site, and number of persons in distress influence on the emergency management. In mass evacuation operations such as the Maxim Gorkiy case, with many passengers sitting on the ice floes at the same time as the vessel risked sinking with a large number of crew on-board, made the logistics planning and priorities crucial. Our case confirmed that it was not easy to plan all possible details for the rescue operation and it was complicated to take aboard from the ice. Salvage of the vessel to secure crew increased complexity. Distances make response time uncertain. Mobilizing all resources available as soon as possible is imminent and demands knowledge of all resources including other nations support capacities.

The incidents with larger ships such as cruise vessels or oil installations put the entire national preparedness system to the test (Marchenko, 2015). In our cases, the limited visibility, summer fog, dynamic water condition, and floating blocks of ice, made it challenging to rescue the passengers of the wrecked ships. As for visibility, the two incidents happened in summer, so the polar night was not present in the Arctic region, otherwise the situation could have been much worse.

The infrastructure and resources capacities are crucial when it comes to emergency situations in the High North. Long distance, lack of suitable means of communication and poorly developed SAR facilities and services make emergencies more difficult to manage (Kvamstad et al, 2009). Borch et al., 2015 describes the limited emergency resources capacity and the increased activity level in the region. In cases, limited capacity of resources, both in terms of helicopters and aircrafts and their flying capacity influenced the emergency situations. In the Maxim Gorkiy case, the first responder arrived at the site of the accident after 4 hours due to favorable circumstances.

In 1989, the coast guard vessel did not have satellite communication facilities. Around Svalbard, there were established military communication lines with poor signal. Kvamstad et al. (2009) highlighted that getting access to necessary information and dependable means of communication are crucial for any emergency operation in High North. Currently, the challenges may be connected to the problem of intensive load on communication lines, and therefore the principle of information priority has become important in emergency management, especially in the High North where the satellite communication can be limited. Additionally, the language problems of different nationalities can cause challenges in SAR coordination on-scene. In the Maxim Gorkiy case, Norwegian coast guard as on-scene commander was not able to communicate with Russian military and civilian helicopters and airplanes due to language problem and lack of joint procedures (Hovden, 2012).

Crisis Type, Resources and Emergency Management

All three cases have confirmed that there is a need for dynamic capabilities related to acquiring for new resources, teaming old and new resources and finding new solutions in high ambiguity settings.

Human resources and management competence in the High North can be considered difficult to obtain. This is due to a broad range of knowledge, long time experience and intensive training that are needed to cope with the challenges. To achieve this objective we need increased knowledge accumulation and knowledge transfer across institutions and borders to facilitate transparency in emergency response management. Training in improvisation on site is important for competence building. The cases have shown that we risk incompetent actions and failures, and loss of effects of valuable and scarce capacities. In particular, there is a need for clear design of training schemes and large-scale, combined exercises. This lead to increase understanding on management of capabilities needed at operational, tactical and strategic levels in high-risk operations in the High North.

Host Nation Support Network and Emergency Management

Mobilizing all the available resources was very crucial in all of the presented cases. In the Maxim Gorkiy case, passengers were moved to unstable ice floes and if the vessel sank, there were still crew on-board the ship that had to be evacuated fast. The accident occurred in a region with well-equipped local communities both in the Russian village of Barentsburg and Longeyarbyen. Even though the cold war had hampered the cooperation between Norway and Soviets, there had been good cooperative relations between Norwegian and Soviets authorities at Svalbard.

The formal agreements and joint practices were, however, limited. The first bilateral agreement between Norway and Russia on search and rescue came in 1995 and opened for annual exercises. In the Maksim Gorkiy case, the absence of routine for cooperation and means of communication between the Russian and Norwegian units, prevented the Russian side from participating actively in a coordinated SAR operation, even though Russian helicopters resources and surveillance aircraft were on site. Nevertheless, in SAREX and Hanseatic case communication challenges were present due to limited radio communication capacities in the region, as were the presence of languages problems. Much of the same communication challenges are still present in spite of increased political focus, R&D efforts and joint exercises (Kvamstad et al., 2009; Borch, 2015).

The emergency management must be skilled in the language and culture of the neighboring countries, in addition to understanding technological capabilities in the specific maritime context. Moreover, they should know the capabilities and limitations of the personnel involved. These capabilities have to be present for emergency managers within logistics, staffing, and information and liaison personnel at every functional level. In emergency situations, the SAR coordinator at the rescue coordination center is at the core of operational and needs all the support available from higher authorities to speed up decision processes. This calls for well-functioning information channel at national levels to the government of supporting countries, as well as negotiation skills and fast decision-making skills for coordinators at top directorate and ministry levels.

Creating networks in the High North may potentially facilitate the cooperation in emergency situations. This can be achievable by building trust within emergency actors and strengthening the relations. Joint education and research programs may serve as trust-creating platforms. As Gausdal (2014) argued, trust has a positive effect on relation building where it can be used as a practical vehicle for facilitating commitment in development of network procedure. Frequent close interactions between actors may lead organizations to understand each other's expertise (Abrams et al., 2003).

As Buck et al. (2006) states, the emphasis should be on shared knowledge and technical aspect, a shared vision of response, high level of mutual trust, a trained response community with knowledge of each others preparedness system, and not the least a collective recognition of capabilities and limitations. If these criteria are not met, there may be significant challenges in joint emergency operations.

The model below summarizes the factors that should be integrated into emergency management system when a wide range of actors are involved in an operation.

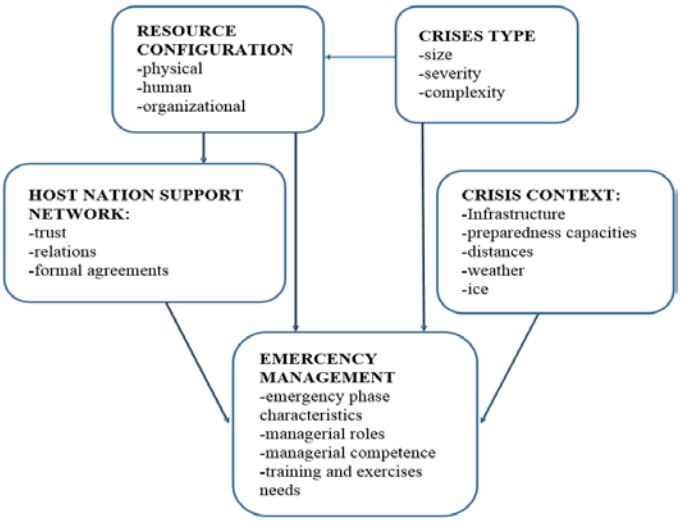

Fig. 2. Analytical Model

CONCLUSION

In this paper, we have highlighted challenges facing the emergency preparedness system in the High North. We have emphasized emergency operations that calls for mass evacuation of large number of people. A general lack of infrastructure for emergency situations, a harsh climate, sea ice, and poor communication may cause delays in the mobilization of sufficient SAR and relief capacities. Emergency management is complicated due to multiple management levels, different operational concepts and communication barriers. Extra challenges are present when forces from multiple countries are involved. People coming from different culture, with different languages and different procedural standards may find it increasingly difficult to communicate with each other. This calls for additional cross- cultural liaison roles, and fast reconfiguration of the roles and procedures of the units involved. Both inter-personal, information and decision-making capabilities must be scaled up as fast as possible with competent personnel that can improvise and find solutions with limited resources.

There is a need for preparedness system with broader range of managerial competence to face the challenges of complexity and volatility in the High North. However, we still lack cross-border integrated programs for education, training and exercises in the High North. Cooperation between Arctic states may be facilitated through developing joint educational and research programs on emergency management. Better cross-institutional understanding may emerge from close interaction and face-to-face dialogue based on realistic scenarios linked to cross-national education and training schemes including both universities and professional academies.

The Arctic Council plays and important role in facilitating joint

competence platforms. As a third party they can build solid relation among nations and contribute to processes toward unified and standardized emergency system in the High North. Creating a central data repository that contains each nation's resources and capabilities may improve the nation's awareness and transparency in the emergencies. With regard to ship safety, there is a need for special training course for operators the Arctic. The polar code regarding five days survival requirement creates the platform for competence efforts in this area, and calls for cooperation between vessel operators, governments and academia.

Limitations and Implications for Further Research

This study was based on three cases all taking place in favorable weather conditions where the outcomes were on the positive side, saving all lives and salvaging all the vessels. There should be studies of cases and exercises in more extreme conditions and with a scale where improvisation and mobilization of resources from a broad range of institutions and host nation support are included. This may provide a greater focus on tactical and operational level coordination and communication issues, especially related to the on-scene coordinators, incident commanders, and the operational and strategic management on shore. In addition, there is a need to emphasize the resource mobilization, decision-making process and logistics challenges of the host nation support cases of the Arctic region.

ACKNOWLEGEMENT

The authors wish to acknowledge the support from Norwegian Ministry of Foreign Affairs and the Nordland County Administration for their support via the MARPART project, and all MARPART partners for cooperation.

REFERENCES

Abrams, L.C., Cross, R., Lesser, E., and Levin, D.Z. (2003). Nurturing interpersonal trust in knowledge-sharing networks. Academy of Management Executive, 17(4), pp. 64-77.

Amit, R., Schoemaker, P. J. (1993). Strategic assets and organizational rent. Strategic Management Journal, 14(1), 3-46.

Arctic Council, Arctic Marine Shipping report, (2009). Revised January 10, 2016. from http://www.arctic.noaa.gov/detect/documents/AMSA_2009_Report_2nd_print.pdf

Barney, J. B. 2002. Gaining and sustaining competitive advantage. (Second edition ed.). Upper Saddle River, NJ: Prentice Hall

Black, J. A., Boal, K. B. (1994). Strategic resources: Traits, configuration and paths to sustainable competitive advantage. Strategic Management Journal, 15(Summer), 131-148.

Borch, O.J. 1994. The Process of Relational Contracting. Developing Trust-Based Strategic Alliances among Small Business Enterprises. I Paul Shrivastava, Jane Dutton and Anne Huff (eds.): Advances in Strategic Management, JAI Press Inc., Greenwich, Connecticut, 1994.

Borch, O.J and Madsen, E.L. (2007). Dynamic capabilities facilitating innovative strategies in SMEs. International Journal of Techno entrepreneurship, 1(1): 109-125.

Borch, O.J. and Batalden, B. (2014). Offshore service vessel logistics and entrepreneurial business process management in turbulent environments. *Maritime Policy and Management*: The flagship journal of international shipping and port research (forthcoming)

Borch. O.J and Andreassen, N. (2015). Joint-Task Force Management in Cross-Border Emergency Response. Managerial roles and structuring mechanisms in high complexity-high volatility environments. Paper prepared for the 11th International Conference *Transnav 2015 On Marine Navigation And Safety Of Sea Transportation, Gdynia, Poland.*

Buck, D. A., Trainor, J. E., & Aguirre, B. E. (2006). A critical evaluation of the incident command system and NIMS. *Journal of Homeland Security and Emergency Management, 3*(3).

Chaczko, Z., and Ahmad, F. (2005). *Wireless Sensor Network Based System for Fire Endangered Areas.* Paper presented at the Proceedings of the Third International Conference on Information Technology and Applications (ICITA'05) Volume 2 - Volume 02.

Comfort, L.K. and Kapucu, N. (2006). Inter-organizational coordination in extreme events: The World Trade Center attacks, September 11, 2001, Nat Hazards, 39, 309-327.

DSB Norwegian Directorate for Civil Protection (2014) Veileder for vertsnasjonstøtte I Norge (Host Nation Support) general guideline, available. Revised January, 20, 2016, from http://www.dsb.no/global/publikasjoner/2014/tema/veileder_vertsnasjonstotte.pdf

Gausdal, A. H. (2012). Trust-building processes in the context of networks. *Journal of trust Research*, *2*(1), 7-30.

Gudmestad, O.T., Zolothukhin, A.B., Ermakov, A.I., Jacobsen, R.A., Michtchenko, I.T., Vovk, V.S., Løset S. and Shkinek, K.N.(1999). Basic of offshore petroleum engineering and development of marine facilities with emphasis on the Arctic offshore, ISBN 5-7246-0100.-1.

Hovden, S. T. 2012. *Redningsdåden: om Maksim Gorkiy-havariet utenfor Svalbard i 1989*, Sandnes, Commentum, 186.

Iannella, R., and Henricksen, K. (2007). *Managing Information in the Disaster Coordination Centre: Lessons and Opportunities.* Paper presented at the Proceedings of the 4th International *ISCRAM Conference*, Delft, Netherlands.

IAEM, I. A. o. E. M. (2009). Principles of Emergency Management. Retrieved January 20, 2016, from http://www.iaem.com/page.cfmp=about/em-principles

Joint Arctic Command: Search and Rescue Exercise Greenland Sea 2013 (SAREX Greenland Sea 2013). Final exercise report. Nuuk:

Kvamstad, B., Fjortoft, K. E., Bekkadal, F., Marchenko, A. V., Ervik, J. L., and Eik, K. (2009). A case study from an emergency operation in the Arctic Seas. *Marine Navigation and Safety of Sea Transportation*, 455-461.

Kyng, M., Nielsen, E. T., and Kristensen, M. (2006). Challenges in Designing Interactive Systems for Emergency Response. In DIS '06.University Park, PA, USA.ACM.

March, J. G. (1991). "*Exploration and Exploitation in Organizationa Learning.*" Organization Science 2(1), 71-87.

Marchenko, N. A. (2015). Ship traffic in the Svalbard area and safety issues. *The 23rd Int. Conf. on Port and Ocean Eng. under Arctic Conditions (POAC 2015).* Trondheim.

Mellgren, D., (1997). Coast-guard-to-evacuate-cruise-ship-stranded-in-Arctic. Associated Press, 1997, Jul 16. Revised January 20, 2016, from http://www.apnewsarchive.com/1997/Coast-guard-to-evacuate-cruise-ship-stranded-in-Arctic/id-9d04680952d7651d4bcd9a6f899db29b

Minzberg, H. (2009). Managing. Williston, VT, USA: Berrett-Koehler Publishers

Mintzberg, H. (1973). The Nature of Managerial Work. New York: Harper Row.

Mintzberg, H. (1980). Structure in 5's: A Synthesis of the Research on Organization Design. *Management science*, *26*(3), 322-341.

Norwegian Government (2006). The Norwegian Government's High North strategy. Oslo, Norwegian Ministry of Foreign Affairs. 76 p.

Rosenthal, U., Boin, R. A., & Comfort, L. K. (2001). The Changing World of Crisis and Crisis Management.'. *Managing crises: Threats, dilemmas, opportunities*, 5-27.

Van de Walle, B., and Turoff, M. (2008). Decision support for emergency situations. *Information Systems and E-Business Management*, *6*(3), 295- 316.

Wisner, B., and Adams, J. (2003). *Environmental health in emergencies and disasters*. Geneva: World Health Organization (WHO).