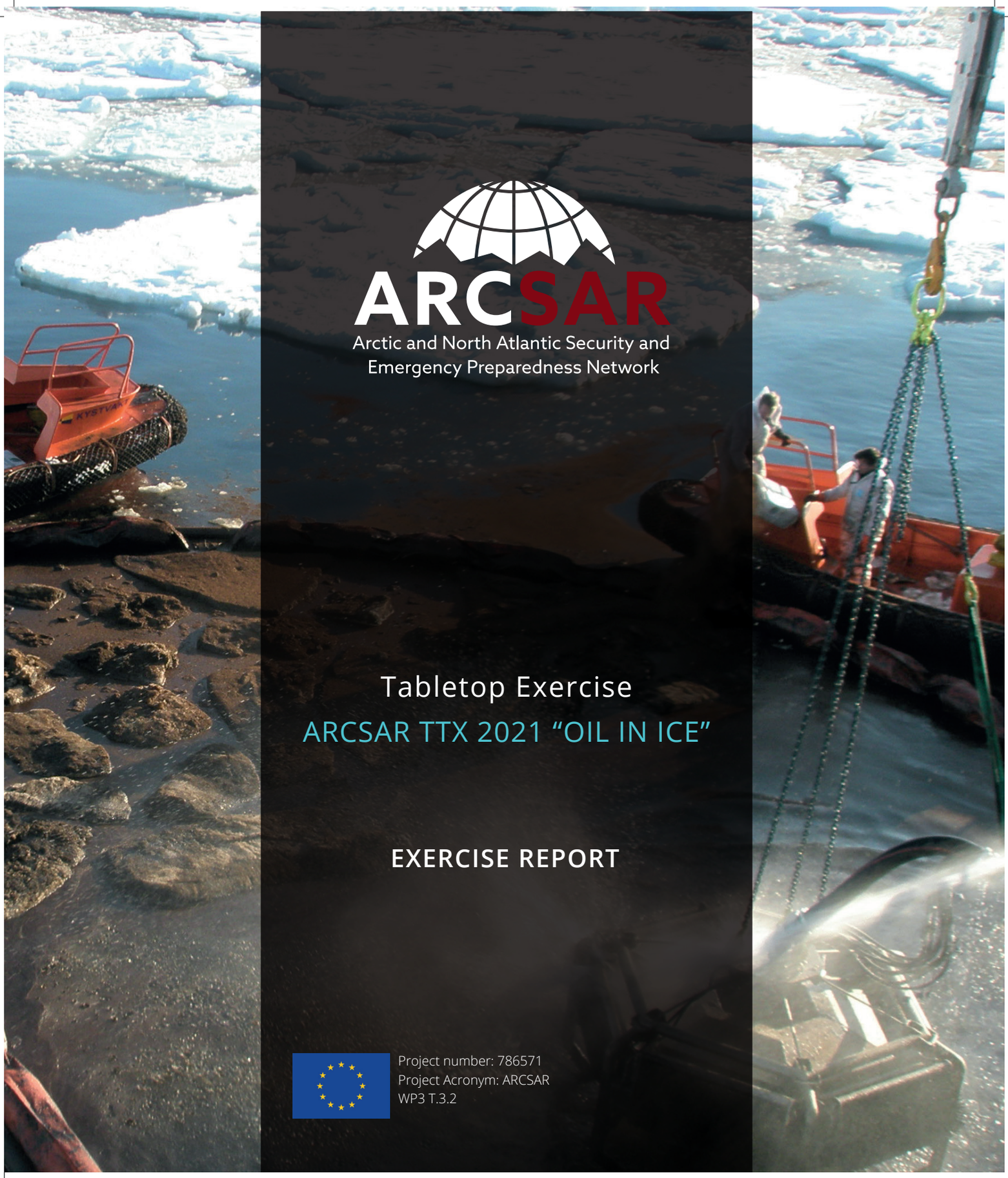

ARCSAR

Arctic and North Atlantic Security and Emergency Preparedness Network

Tabletop Exercise

ARCSAR TTX 2021 “OIL IN ICE”

EXERCISE REPORT

Project number: 786571
Project Acronym: ARCSAR
WP3 T.3.2

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SUMMARY

The ARCSAR Tabletop exercise (TTX) Oil in Ice 2021 took place between the 9th and 10th of November 2021. The TTX was organized in a hybrid format in which the main training audience attended the TTX in person on NORDLAB's premises (Nord University, Bodø, Norway), the secondary training audience attended via Zoom, and the observers had access to the streaming of the exercise and an online platform, on which they could share their ideas and ask questions in written format.

The TTX was moderated by the Norwegian Coastal Administration and the Canadian Coast Guard. Thirty-one organizations from 14 different countries participated in the event.

The main purpose of the Oil in Ice 2021 exercise was to discuss how oil spill preparedness and response are organized in the case of a large-scale operation in the Svalbard region of the maritime High Arctic, and to identify possible lessons from other locations and agencies in the Arctic and North Atlantic regions.

This report presents framework of the ARCSAR TTX Oil in Ice 2021 including the involved parties, the objectives, the conduct of the exercise, and the outcomes and lessons learned, as well as a summary of the feedback from the various audiences.

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1 INTRODUCTION

1.1 About the ARCSAR project

The Arctic and North Atlantic Security and Emergency Preparedness Network (ARCSAR) project is funded by the EU Horizon2020 programme. The project period is from September, 2018 to February 2024. The ARCSAR consortium includes 21 partners from the following 13 countries in the Arctic and North Atlantic region. The number of associated partners has increased as the project has progressed.

ARCSAR is the first project of its kind to establish an international network that brings together search and rescue practitioners, authorities, industry, academia, and other organizations to identify gaps and opportunities and to develop further capabilities to face the increasing demands of the Arctic and North Atlantic (ANA) regions.
Furthermore, the project aims to establish international best practice and to monitor innovation and research within security and emergency response in the ANA region.
It focuses on increased interaction in targeted networks between professional institutions, academia, and innovators in the preparedness service and equipment industry.

1.2 Aim of the exercise

The main purpose of the Oil in Ice 2021 tabletop exercise (TTX) was to discuss how oil spill preparedness and response is organised in the case of a large-scale operation in the Svalbard region, as well as to identify lessons from other locations and agencies in the Arctic and North Atlantic regions.

The specific objectives of the exercise were as follows:

1. Improve understanding of the roles, responsibilities, and needs of Marine Environmental Response (MER) responders while preparing to take over authority from the search and rescue (SAR) authorities.
    - 1.1. Improve understanding of the Governor's[1] and Norwegian Coastal Administration's MER responsibilities, capabilities, and challenges.
2. Improve understanding of handling a damaged vessel in the High Arctic.
    - 2.1. Finding a place of refuge.
    - 2.2. Covering long distances with an open hull.
    - 2.3. Emergency offloading.
3. Improve understanding of the functionality, capacity, and limitations of:
    - 3.1. Remote sensing technology and oil drift models.
    - 3.2. Equipment and methods for oil spill response (in the High Arctic at sea and shorelines).
    - 3.3. Logistical challenges connected to the oil spill response in the region.
4. Improve understanding of the challenges related to shoreline response operations and long-term recovery in the Arctic.

[1] Governor of Svalbard

2 EXERCISE CONDUCT

2.1 Exercise team

SCENARIO AND DESIGN	·Jan Pedersen, Norwegian Coastal Administration ·Ole Kristian Bjerkemo, Norwegian Coastal Administration ·Rune Elvegård, Nord University ·Emmi Ikonen, Joint Rescue Coordination Centre North Norway (JRCC NN)
MODERATORS	·Ole Kristian Bjerkemo, Norwegian Coastal Administration ·Dan Cowan, Canadian Coast Guard and Chair of the Marine Environmental Response (MER) Expert Group of the Arctic Council's Emergency Prevention, Preparedness, and Response (EPPR) Working Group ·Jan Pedersen, Norwegian Coastal Administration
EXERCISE CONDUCT	·Jan Pedersen, Norwegian Coastal Administration ·Ole Kristian Bjerkemo, Norwegian Coastal Administration ·Emmi Ikonen, JRCC NN ·Rune Elvegård, Nord University ·Natalia Andreassen, Nord University ·Espen Olsen, Governor of Svalbard ·Dan Cowan, Canadian Coast Guard and Chair of the MER EG of the EPPR Working Group ·Ida Kristin Schjesvold, Nord University ·Hege Christin Stenhammer, Nord University ·Hekla Jósepsdóttir, Icelandic Coast Guard ·Anton Örn Runarsson, Icelandic Coast Guard ·Mikel Dominguez Cainzos, JRCC NN ·Håkon Kjøllmoen, JRCC NN ·Øyvind Fagerheim, Norwegian Coast Guard ·Robert Lynch, Munster Technological University ·Bengt Hansen, Nord University

Figure 1:

Family photo during the first exercise day.

2.2 Participants

MAIN TRAINING AUDIENCE	·Governor of Svalbard ·Norwegian Coastal Administration ·Joint Rescue Coordination Centre Northern Norway ·Norwegian Coast Guard
SECONDARY TRAINING AUDIENCE	·Canadian Coast Guard ·Maritime NZ ·Rescue Coordination Centre New Zealand ·Greenland Oil Spill Response A/S ·Finnish Border Guard HQ ·Marine Rescue Service ·VØRN-MRCC Torshavn ·United States Coast Guard ·Institute of Marine Research ·H Henriksen AS ·Norwegian Meteorological Institute ·Uusimaa Regional Fire and Rescue Association (Finnish Rescue Services) ·HM Coastguard, UK ·Icelandic Coast Guard ·Environment Agency of Iceland ·e-GEOS ·Association of Arctic Expedition Cruise Operators ·Norwegian Coastal Administration

OBSERVERS	•University of Iceland •Nord University •NTNU •The Arctic University of Norway (UiT) •Centre for Integrated Remote Sensing and Forecasting for Arctic Operations, UIT •PolarQuest •CASP/U.S. Coast Guard •U.S. Coast Guard Academy •University of Limerick •The Norwegian Oil and Gas Association •High North Center at Nord University Business School •EMERCOM of Russia, International Cooperation Department •Ecole Nationale Supérieure Maritime (ENSM) •Centre for Oil Spill Response and Marine Environment •USG •SAFECLUSTER •Varanger Kraft •University of Portsmouth •Admiral Makarov State University of Maritime and Inland Shipping •Marine Institute, Memorial University •Lapland University of Applied Sciences •UArctic Thematic Network on Arctic Safety and Security •University of the Arctic •University of Stavanger •Royal Danish Defence College •Texas A&M University •Alpha Ridge Consulting and Advisory •High North News

2.3 Exercise design

The tabletop exercise Oil in Ice 2021 was designed as a discussion-based exercise revolving around four themes and a simulator-based visualization of the scenario development. There were four discussion rounds with themes that corresponded to the learning outcomes. The contextual challenges in a harsh environment, including darkness, waves, ice in waters, and limited visibility, were demonstrated by short videos.

Figure 2:

A screenshot of a simulator-based visualization.

The design was constructed to achieve increased interaction in the targeted networks. The audience was divided into three groups: the main training audience (MTA), the secondary training audience (STA), and observers. Such a design ensured a discussion in the MTA that focused on large-scale operations in the Svalbard region, as well as a discussion within the STA and observers to identify lessons from other relevant agencies and locations in the Arctic and North Atlantic regions.

Authorities, responders, and other stakeholders who are directly involved in MER in Svalbard, as well as actors that participate in the transition phase from SAR to MER in Norway, were placed in the MTA. The MTA members were in NORDLAB, Nord University's innovation center for safety and emergency preparedness collaboration. Two of the MTA participants (the governor of Svalbard and one individual from the Norwegian Coastal Administration (NCA) had to be connected via Zoom. The four discussion rounds were facilitated by the main moderator (NCA) and the exercise coordinator (NORDLAB).

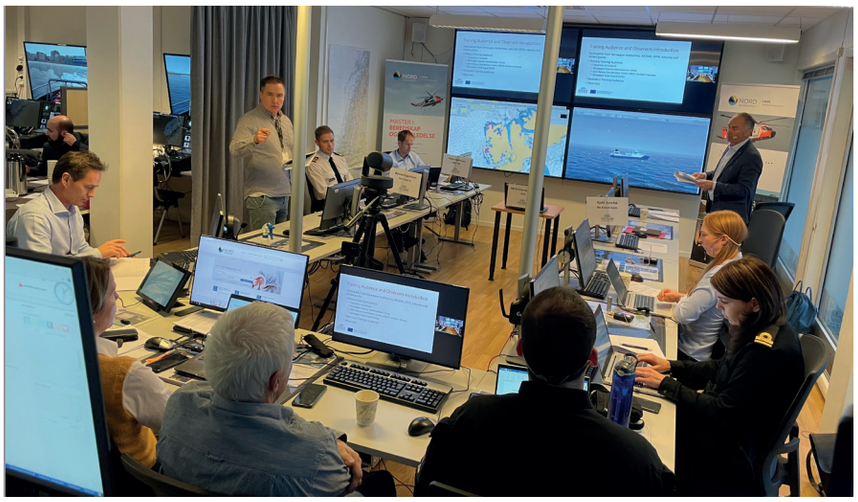


Figure 3:

Facilitation of MTA at NORDLAB.

Authorities, industry, responders, and other stakeholders involved in oil spill preparedness and response, or search and rescue in other regions and countries were placed in the STA. The STA participated in the exercise via Zoom. The discussion was arranged through a chat function and facilitated by a second moderator (the Canadian Coast Guard on the first day and the NCA on the second day). The four discussion rounds of the MTA were followed by a Q&A session with the online audience on the same topics. The moderator for the STA summarized the discussion from the chat and called upon some participants for reflections and questions for the MTA.

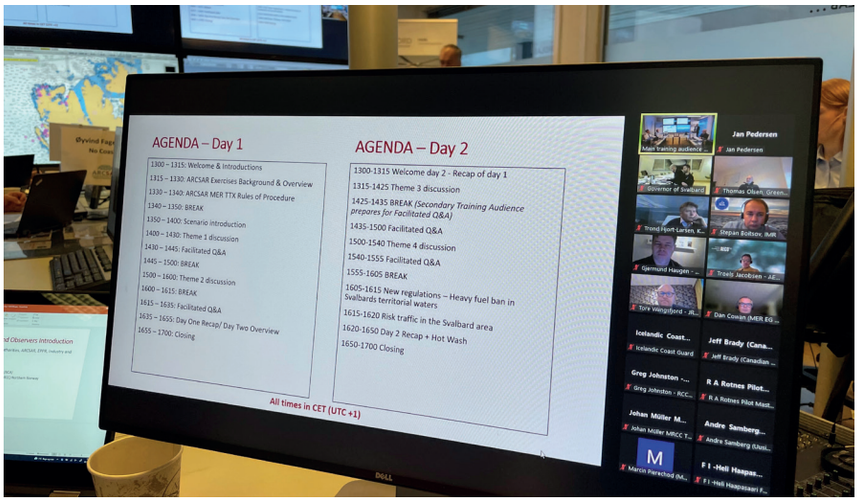


Figure 4:

Facilitation of the STA in Zoom.

The observers were ARCSAR network members and other interested stakeholders. A stream was set up for the observers by Nord University's center for learning and technology (KOLT). The registered observers could watch live video streaming and were provided with a link to Padlet, an interactive collaboration tool, with four prepared themes opened for reflection and feedback. The observers were invited to pose questions and ideas for the MTA. During the Q&A sessions, the moderators included the observers' reflections and questions in the discussions.

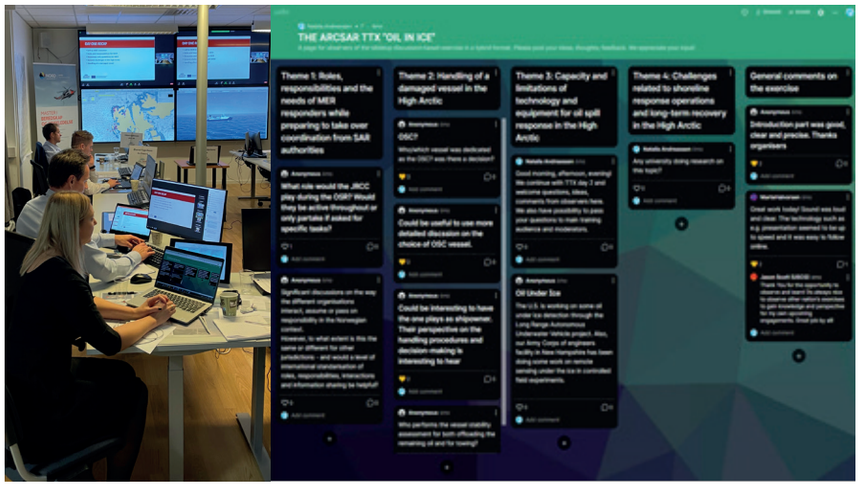


Figure 5:

Interaction with Observers in Padlet

2.4 Scenario

On November 7, the M/S Northern Quest started her voyage from Longyearbyen to the northern part of Svalbard to fish shrimp. M/S Northern Quest is a Norwegian-flagged, Norwegian-owned, 85-meter-long trawler with 12 persons on board.

On November 8, while engaged in fishing activity, a fire in the engine room occurred, that results in a in a blackout on board, rendering the vessel without propulsion and steering. As a result, the vessel collides with an ice floe that punctures one of the bunker fuel tanks. This causes a 200m3 leakage of Wide Range diesel out of the 500m3 on board into the sea and ice around.

The crew eventually extinguish the fire and stabilizes the vessel using bilge pumps. The vessel is stable but listing to port. The Master sends a MAYDAY. The distress call is received by Coastal Radio North and forwarded to Joint Rescue Coordination Centre North Norway (JRCC NN). The Master communicates a request to evacuate the crew.

Figure 6:

Scenario illustration with M/S Northern Quest.

4 EXERCISE EVALUATION

4.1 Evaluation Method

SAR to MER transition

When the scenario occurs, the JRCC will notify the NCA. The incident is notified via the usual channels which is the Vardø Vessel Traffic Services (Vardø VTS). Vardø VTS will notify the Environmental Response Duty officer. The JRCC will convey the initial information gathered from the master of the vessel in distress (DV). This notification should be done as soon as possible for NCA to start planning and organizing the MER operation.

Communication between the JRCC and NCA should be maintained during the SAR operation, if possible, and later, if necessary, during the MER operation. This will be done through SAR communication channels and over the phone.

NCA will be interested in, among other things, learning about the measures taken by the crew, the situation regarding the rooms and watertight compartments, the damage to the DV and prognosis, whether any preparations for emergency towing is done before evacuating the vessel, the situation regarding blackouts and generators onboard, whether the ship is listing or not, the presence of ice, drift, and the speed of the ice caps and whether any oil or other pollution to sea is observed/ confirmed. In addition, it is paramount for the NCA to receive an overview of the resources that have been mobilized for the SAR operation by the JRCC. NCA will pursue this information as soon as possible.

Norwegian Coast Guard (NCG) will deploy resources to the area to assist in both the SAR and MER operations.

When the SAR operation is finished, the handover starts. At this point, it will be important to inform all Search and Rescue Units (SRUs) and involved actors (including the shipowner) that the NCA is taking over the operation. This transition should be completed as swiftly as possible.

If the incident is major enough, assistance from the other Arctic states might be required. Notification based on the Arctic Oil Spill Agreement (MOSPA) will be considered (first informational, and then, if needed, Request For Assistance (RFA).

The scenario will attract media attention. Both the JRCC and the NCA will take a proactive stand in the information that will be shared with the media. JRCC will hold a press brief about the SAR operation. Questions regarding the oil spill and the MER operation will be forwarded to the NCA, and NCA will keep media and the public continuously updated on the MER operation. The NCG might be contacted by media as well. The captain of the vessel will only respond to questions regarding the involvement of the CG unit.
The governor's office will notify MV Polarsyssel and start preparing for MER. The vessel will take between 12 and 24 hours to reach the DV's position. Meanwhile, a task force will be activated to organize the response. They will ask for a liaison from the NCA.

NCA and Governor's responsibilities

The first thing the NCA will do as the lead of the MER operation is to contact the shipowner and inquire about their capabilities to take action and manage the situation. If the shipowner is not able to control the situation, clarification of the capabilities of the shipowner and the types of actions that they can take will be required.

As is typical of these types of incidents, the shipowner will likely argue that they do not have the capacity to handle the oil spill. The NCA will then officially take charge of the operation, applying its jurisdiction and power. All participants and stakeholders will be notified of the overtake.

NCA's role and responsibilities are defined in the national plan for MER; this plan describes the roles and responsibilities of all stakeholders, including the NCA, private companies, municipalities, and other governmental bodies.

The office of the governor of Svalbard, the NCG, and Joint Headquarters – Armed Forces will be notified. At the same time, due to the location of the incident, delegates from the NCA will travel to Svalbard to deal with the incident.

The NCA will appoint an On Scene Commander (OSC), usually a Coast Guard vessel. They will also try to embark up to two NCA personnel in the OSC vessel. Polarsyssel could also be a suitable OSC, as it would simplify the embarking of NCA personnel through its helipad. Salvage company workers could also be flown using the governor's helicopters.

Capabilities

The governor's office does not have many resources available to take action during these types of incidents; nevertheless, some resources exist (e.g., Polarsyssel or helicopters, if necessary). In addition, up to 35 people could be mobilized on short notice.

NCA's multi-purpose vessels are designed and equipped to participate in MER operations; however, their home ports are in mainland Norway. In this scenario, OV Bøkfjord will be mobilized, but the ETA could be days. The NCA can, in addition, send a maritime surveillance aircraft to survey the situation. This aircraft is equipped with e.g infrared camera and SLAR radar, and can operate in darkness. Furthermore, the NCA has a depot with the necessary equipment, in cooperation with the governor's office. There is also a strike team of 20 members from local companies capable of causing pollution in the region.

The governor's office has the MV Polarsyssel, which is capable of navigating in drift ice; two SAR helicopters that can be used to transport people, other types of equipment; and personnel who can assist in these operations. The Polarsyssel also has a high-speed boom (Current Buster System) and an Artic Foxtail skimmer on board. The boom system, however, has limitations on operations in ice.

The NCG will be a key resource for the MER operation; they have several vessels in continuous patrol along the Norwegian coast, including the Jan Mayen and the Svalbard. Some of these vessels are ice-reinforced with a limited ice class. The NCG has one icebreaker. Most of the vessels are equipped with oil booms, skimmers and oil detection radar; two of them have larger booms than the others. The vessels' towing capacity varies from 10 to 275 tons.

The NCG has a duty watch officer 24/7. The duty officer will not wait for the NCA to request assistance but will dispatch the appropriate resources when informed of the incident.

In addition, the officer is capable of organizing a Remotely Piloted Aircraft System (RPAS) or drone team.

In addition, private resources can be mobilized. If the situation occurs during the summertime, the Association of Arctic Expedition Cruise Operators (AECO) could assist with vessels in the area. Some of these vessels have started carrying oil spill recovery equipment. In addition, there might be research vessels with an appropriate ice class. Nevertheless, long estimated time of arrival (ETAs) should be expected. This is also emphasized by STA members operating in other regions of the Arctic and Antarctic.

Challenges

The challenges that responders face are tightly linked to the location of the incident. At the time of the incident, there is almost no daylight. This will complicate the operation. In addition, communication is challenging at Arctic latitudes. Communication via mobile phones is not possible, and radio communication with VHF/MF/HF is probably not very reliable. Communication will be, most likely, limited to Iridium.

In the area, responders will have to deal with drifting ice, icing, and extreme weather conditions. Responding vessels might face difficulties in reaching the DV or get stuck in place. Furthermore, their response times might be prolonged due to the need to sail at lower speeds.

Non-specialized oil spill response equipment will be difficult to use, and even equipment designed to operate in cold conditions could face challenges (e.g., breakdowns).

Shoreline clean-up will be difficult if not unviable at this time of the year due to ice formations. In addition, there are few places of shelter in the area. This means that ad hoc shelters must be built or transported. When organizing land operations later, the danger of encountering polar bears must also be considered.

Participants from other regions of the Arctic point to similar challenges (long distances, scarcity of resources, or lack of capabilities among ship owners at Arctic latitudes). SAR/MOSPA agreements are often activated. Vessels of opportunity (VOO) needs to be used, and equipment often needs to be transported by helicopters and plane or, on some occasions, airdropped.

Communication challenges should also be considered. This is seconded by some of the STA participants operating in Antarctica. A suggestion to conduct communication tests has been proposed.

The risks that responders will face were also discussed. The NCG points out that although risk is part of their daily work, a risk assessment needs to be conducted when personnel from the CG ship are to transfer to the DV in smaller craft that are not secured for explosions; a diver needs to be sent down to inspect the hull, or to enter the vessel in open sea. In addition, the earlier fire onboard the DV raises the question of the need for specialized equipment for responders, as well as adequate personal protective equipment (PPE).

Remote sensing

Strategies for detecting and supporting MER operations using satellites, aircraft and drones, among others, are being developed. Norway uses the two satellite services that covers the area, and the NCA aircraft, which is also used by the NCG will be directed to Svalbard to operate in the scenario. NCA and NCG also cooperate on using drones, operated from five of the NCA vessels in service. Such a drone system, with operators, could possibly be transferred to the NCG vessel(s) operating at Svalbard in this scenario. An elevated platform with infrared cameras for detecting oil on water in darkness is of high value.

During the exercise, one of the ARCSAR partners, an Italia company called E-geos who provides satellite services, informed that they had managed to do 18 passes over the area (in real time) with their satellites. They provided a list of coordinates and mapping examples. They stressed that it is paramount to task satellites as soon as possible and contact their operators to program the satellites to limit latency. Satellites could also be tasked with facilitating communication and mapping ship positions and real-time ice movements. E-geos argued for the benefits of establishing a "satellite emergency coordination center."

The use of unmanned aerial vehicles (UAV) to track oil under the ice was also considered; however, the technology might not be readily available for the area. International research regarding the development of this technology is ongoing.

Towing, emergency offloading, and POR

Emergency towing cannot be a one-sided decision; relevant actors have to be contacted, and their advice considered. In addition, the stability of the DV has to be considered, and a prognosis made. To facilitate this, the MTA agreed that it would be beneficial to have the master of the DV or other relevant personnel with knowledge of the ship. Contact with the salvage team and representatives from the company that owns the vessel would also help.

The towing operations' first and second concerns should be the safety of the personnel and the possible environment repercussions, respectively. Regarding the latter, the NCA and the governor's office will discuss the pros and cons of taking the action and come to a decision.

The MTA, after being informed of the ice drift situation, will consider towing to be the best option. The proposed plan is to first tow the DV out of the oil spill and then, if possible, to a Place of Refuge (POR). Then, the plan is attempting to seal the hull before towing it further.

The discussion between the STA members indicated differences in the ways that emergency towing and POR designation are conducted. Some countries have, for example, predesigned PORs based on suitability studies, while others have to find a suitable place while the MER operation is ongoing.

Emergency off-loading was also considered. NCG Harstad was capable of conduct this task; however, the MTA decided not to conduct it due to contextual factors.

Due to possible communication problems, information regarding towing and POR, as well as the plan, should be as complete as soon as possible before launching the operation. A viable possibility to secure communications would be deploying a surveillance aircraft. This aircraft could serve as a communication link between land and transit data and voice.

Shoreline operations

The MTA agrees that shoreline operations at this time of the year are not viable and should instead be conducted in the spring. The governor's office has a contingency plan that would be activated once it is possible to start the operation. The law regulating acute pollution gives the possibility to activate all available resources.

The STA mentioned that oil spill studies will be carried out. This includes e.g. which pollutants in fish species around Svalbard will be observed. Sampling for these studies would start quickly, if possible during the spill or as soon as possible after the spill, and will continue for a long time. In addition to fish, samples will be taken from shellfish and sediments near the shore. If oil is trapped in the ice, this could influence the Pollock spawning season in the spring. This problem will be bigger than it initially appears.

3.2 Major learning points

After the exercise, the participants acknowledged several main learning points.

Theme 1: Improving understanding of the roles, responsibilities, and needs of MER responders while preparing to take over from SAR authorities:

1. It is important to pre-plan and clearly define the roles and responsibilities for both search and rescue and MER incidents as the established organization influences the decisions made in such operations. This ensures that the key contacts of local, regional, and national authorities collaborate well at the time of the incident.

2. The initial assessment is vital, and the necessary measures must be taken during the SAR phase. Acknowledgement of the limitations is critical.

3. The exercise demonstrated that early and continuous information sharing, early warning between SAR and MER authorities, and a common understanding of the needs and availability of resources ensure an effective response.

4. A transfer of responsibility does not take place suddenly but occurs over a longer period and with overlap. The SAR organization continues to stay alert to MER activities, as they will likely be re-activated and required to rescue the MER given challenging the area's conditions, remoteness, etc. Cooperation between the NCA and JRCC during the transition from one phase to another is important for a seamless transfer from JRCC to the Norwegian Coastal Administration.

5. There is a written joint handover procedure between JRCC and NCA in Norway. However, there are differences in the separation of duties, responsibility, and authorities across the Arctic states.

6. The situation in the Svalbard area is quite difficult, as there are multiple actors from the SAR and MER sectors who need to collaborate to handle the incident. This includes actions for oil spill response, the rescue of people, and securing the vessel and the environment.

7. Such incident response operations are also challenging considering the possible lack of resources that can operate in an Arctic climate. This includes maritime resources and the logistics that come with such an operation. Remote locations always require logistics for the deployment of personnel, in addition to plans for operations in near-zero or sub-zero conditions.

8. Exercises like this are of great value for enhancing the knowledge of representatives from all stakeholders. Being in the same room provides an excellent opportunity for them to address complex challenges.

Theme 2. Improving understanding of handling a damaged vessel in the High Arctic:

1. Concerns over offloading and the safety priority for the tow weight are prioritized over environmental concerns. It may not always be the best option to tow a vessel to certain locations as such locations may lead to more environmental damage than if the vessel is left in the open sea. Handling an abandoned ship in the High North is a many-sided problem with no clear answer.

2. If possible, it is important that the crew on board the distressed vessel prepare the vessel for emergency towing before evacuating.

3. Early information is important for decision-making during the handling of a damaged vessel. However, there communication possibilities are restricted.

4. Such operations in the High Arctic at this time of the year are challenging due to ice, cold and darkness. Heavy dependence on weather conditions (icy conditions and poor visibility) can complicate the process of handling a damaged vessel. The health and safety of the responders will be vital, but there is also a risk that vessels with limited ice class will get stuck in ice and thus face subsequent danger.

5. The pre-assessment and pre-designation of places of refuge (PORs) mentioned by many participants was seen as very helpful and a way to save valuable time. The discussion on the characteristics and assessment of POR was a good way to adjust the collective mindset to the complex problems that a MER operation poses.

Theme 3: Improving understanding of the functionality, capacity, and limitations of remote sensing technology, equipment, and methods for oil spill response, as well as logistical challenges:

1. There is a constant need to advance technology and learn from R&D and academic institutions about ongoing research.

2. There is a need for careful consideration as to the equipment that is carried on board vessels (from authorities and vessels of opportunity). It is important to understand what is required to do the job, as conditions may be extremely harsh. Various types of oil react in different ways, requiring containment and recovery using different types of equipment. Mobilize 2-3 times as much as needed.

3. Low temperature and ice limits use of equipment and detection of oil
    a. I.e. ice may block skimmer intakes
    b. Difficult to distinct between oil and ice from satellite pictures

4. The distances are great. It takes time to put in place all the relevant resources. We don't jeopardize life, health, and vessel resources to take up oil anywhere or at any time

5. One size does not fit all! Deploying equipment that is not functional for any reason can be detrimental to the environmental clean-up effort due to delays in transporting suitable equipment to the spill site.

6. Equipment that can be used will depend on conditions at the incident site, such as whether ice is present. There are huge mechanical recovery limitations during Arctic winters.

Theme 4: Improving understanding of challenges related to shoreline response operations and long-term recovery in the Arctic:

1. There are huge environmental impacts and concerns regarding oil spills in the Arctic. Shoreline response during the winter seems to be almost impossible in the Northern part of Svalbard.

2. A prior belief was confirmed during the discussion that once the oil has drifted to shore in an area like this, it is not possible to clean it up until spring.

3. Shoreline response is challenging at this time of the year due to the available equipment and the conditions. The most important action is to be on the lookout for the ice to open for better working conditions in the area.

4. It is important to address the use of voice telecommunications and data communication between responders and the command center. This is a challenge during all sorts of response in the High North.

5. Personal safety always comes first, and there are few alternatives to securing wildlife.

6. Cold temperatures and 24-hour darkness can severely limit response activities, or even the ability to reach a remote location. A major challenge for shoreline response is the logistics of getting shoreline equipment to remote sites in the High Arctic.

7. Long-term impacts on marine life and wildlife may be unavoidable, and cold temperatures extend recovery time. It may be possible to protect some vulnerable areas/islands with booms or patrolling.

3.3 Mentioned best practices

The participants discussed several relevant practices in the Arctic, North Atlantic, and other regions:

- The Arctic Council Working Group Emergency Prevention, Preparedness and Response (EPPR) has tools and database resources on their website https://eppr.org/resources/tools-and-databases/. These guidelines and data tools are: Arctic marine risk assessment, circumpolar oil spill responsibility viability analysis, and the Arctic environmental response management application database.

- The Norwegian Coast Guard has its own system for lessons learnt and lessons identified, which is shared with the NCA.

- E-Geo's shared practices of modeling and the use of satellites: international forces and civil protection services can base their actions on the careful planning and analysis of the territory to manage emergencies more quickly and effectively.

- Expedition cruise vessels may carry some oil spill response equipment, and in some situations their response time could be fast if they are in the area.. Hence, the vessels may be involved in work as a type of first responder for containment.

- The management system, ICS, with the establishment of a Unified Command and a Joint Information Centre is one proven tool for collaboration in many countries.

- Heating facilities for equipment deployed to shore may ensure continuous operations for both people and machinery.

4 EXERCISE EVALUATION

4.1 Evaluation Method

The evaluation method included several sources with the purpose of identifying recommendations, gaps, challenges, and best practices; developing and improving the exercise planning process; and mapping possible future training needs. The sources included feedback received during the exercise, within a chat, during the discussions, during the Hot Wash, and from observers in Padlet.

A questionnaire was prepared to collect individual written responses on the following points:

1. Participants – to understand learning prerequisites and categorize the answers

2. Achievement of learning objectives – to measure the achievement of the objectives

3. Questions – to map the main points and lessons learned from all the MTA discussions and the input from other regions/organizations

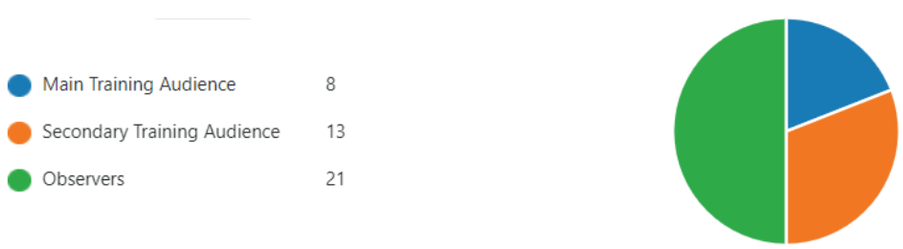
4. Scenario and exercise conduct – to ask questions about exercise design

5. Future training needs—to ask several questions to determine the ideas the participants have in mind for future exercises

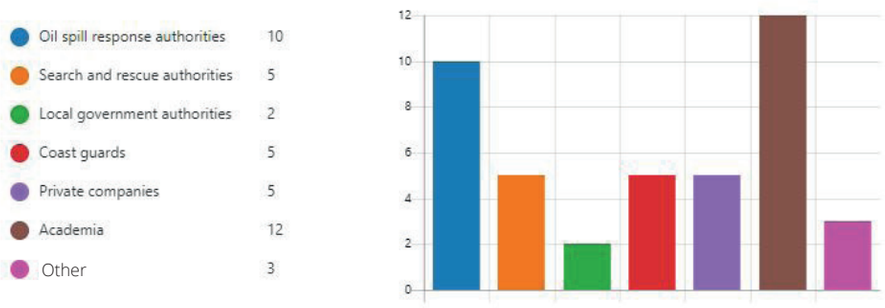
The observers were given a shorter version of this questionnaire that included questions to categorize the participants, scenario conduct, and future training needs. All answers were anonymized. Feedback was used for the development of the Exercise Report.

4.2 Participants' responses

Total number of respondents: 42



Type of organization that the responded participants represented:

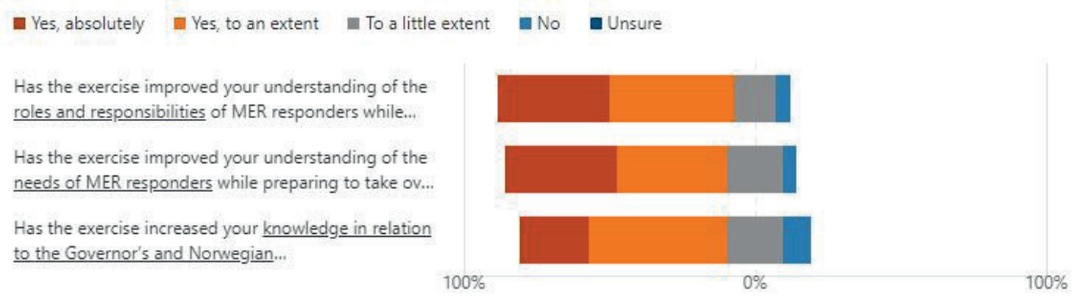


Respondents' experience in MER in the Arctic:

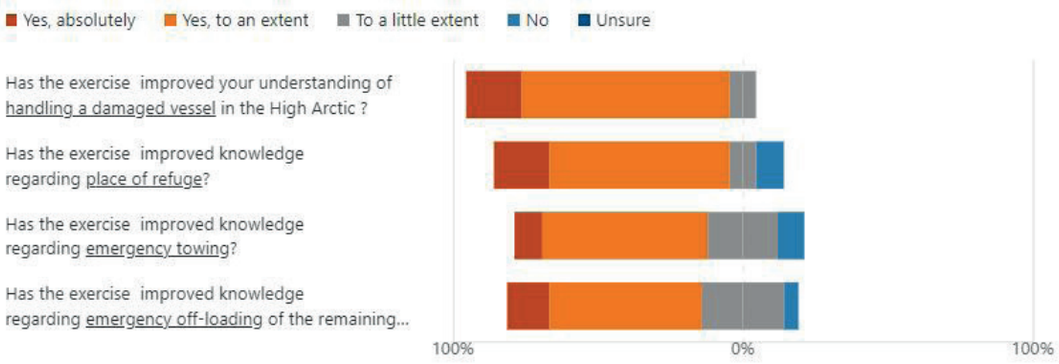
4.3 Achievement of the learning objectives

The participants were asked the following questions:

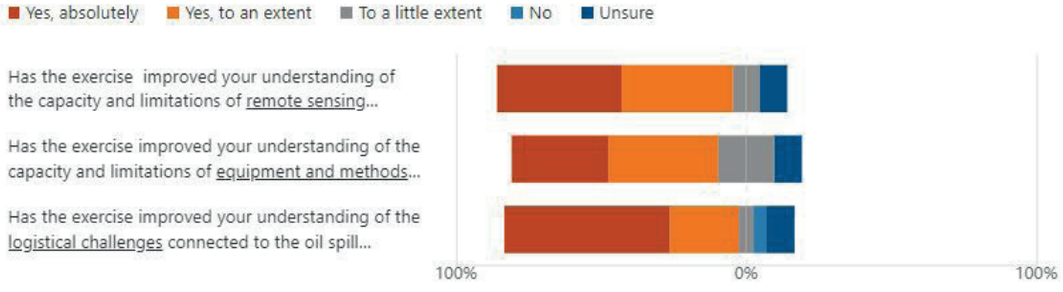
Please assess whether the exercise has achieved learning objective 1 "Improve understanding of the roles, responsibilities and the needs of MER responders while preparing to take over authority from SAR authorities"



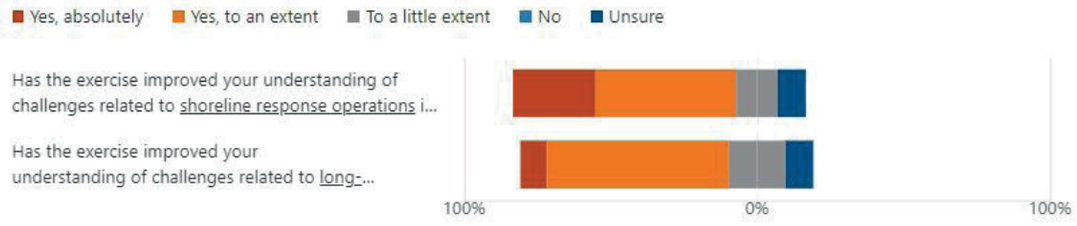
Please assess whether the exercise has achieved learning objective 2 "Improve understanding of handling a damaged vessel in the High Arctic"



Please assess whether the exercise has achieved learning objective 3 "Improve understanding of the functionality, capacity, and limitations of the equipment and technology in the High Arctic"



Please assess whether the exercise has achieved learning objective 4 "Improve understanding of challenges related to shoreline response operations and long-term recovery in the Arctic"



4.4 Evaluation of the scenario and exercise conduct

Evaluation question		Average rate based on 42 answers
Was the scenario realistic and credible?		4.52
Did the scenario have an appropriate level of complexity?		4.40
Did you get enough information/instruction before the exercise?		4.26
Did the technology work sufficiently during the exercise?		4.55
Was the timing of the exercise appropriate?		4.55
Overall, how would you rate the exercise?		4.57

Selected feedback:

The exercise was very well planned and very well moderated, and the training audience was very engaged. Thank you for a great exercise!
Great work from the planning team!
Again, great internal, parallel discussions about our resources, capacities, and capabilities.
The TTX was an inspiration regarding how discussion-based exercises can be conducted in the future, both domestically and regionally.
A very well organized and conducted exercise.
Exceptionally well done, especially across all the platforms and with a global audience. It was a very impressive undertaking, and your willingness to have international observers should be commended!
What an incredibly valuable exercise for multiple agencies—we are grateful for the opportunity.
Everything went well. It would have been great to participate in the meeting physically. Also, the remote/online method worked pretty well. Thank you for organizing it.

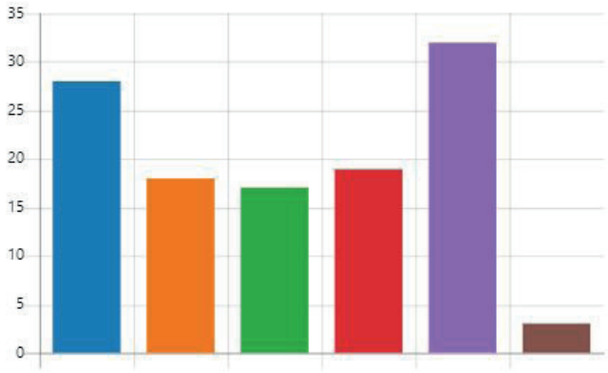
5 FUTURE TRAINING AND THE WAY FORWARD

Participants' acknowledgement of the need for additional exercises:

Yes	36
No	6

Participants' opinions on the type of future training and exercises that are needed:

Tabletop exercises	28
Game / role-play	18
Functional exercises (for exam...	17
Simulator-based exercises	19
Full-scale exercises	32
Other	3



Participants' ideas for future exercises:

- There are clear benefits to understanding the roles and responsibilities among parties and sectors, and the transition procedures should be written, updated and exercised regularly. There is also a need for procedures to be developed between MRCC and the Coast Guard.
- There is a need to practice and train more on emergency towing, preferably involving the two most relevant vessel categories: fishing boats and expedition cruise vessels. Many limitations currently exist.
- There is a need to share more exercises and lessons learned, including show-and-tell events between countries regarding equipment/technologies being developed and currently used.

- The TTX was a reminder of the importance of live exercises, and we need more functional exercises to get more hands-on with the discussed procedures and test them in practice, as well as strengthen ties across borders and domains such as SAR and MER, and land, sea, and air.

- There is a need for more tabletop exercises; the next one may be more complex and intense if a specific composition of participants is in place.

- The logistics of mobilizing people and equipment to remote areas that are high risk should be a focus.

- It may be beneficial to discuss smaller issues individually and then eventually connect them together via a major exercise.

- It would be great to have a simulator that can enact situations.

- It might be interesting to exercise similar scenarios in different conditions. For instance, how would the decisions that are made change if it were summer and the seabird colonies were more populated? Would there be a response to clean birds covered in oil both locally (with teams searching the shoreline/ocean) and in Longyearbyen?

The TTX Oil in Ice illustrated the logistical challenges of the MER operations in the Arctic, with a high demand on very limited means in a challenging environment. It was clear that the response system offered little redundancy, thus indicating the need for close cooperation between stakeholders. Specific challenges in this regard were the very limited availability of communication channels, the limited on-scene response due to the weather conditions and darkness, and the limited means of transportation for both responders and equipment. Plans and procedures should thus help stakeholders share relevant information to determine and prioritize actions taken under these circumstances. The pre-designation of liaison persons to facilitate the process might be an area of improvement for some organizations. More exercises and experience are needed to fully understand the limitations in MER procedures and the plans that exist regarding such procedures in the High Arctic.