Gap analysis and improvement suggestions for OSR in the NPA region

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POPCORN
Preventing Oil and Plastics Contamination of Ocean Regions of the North

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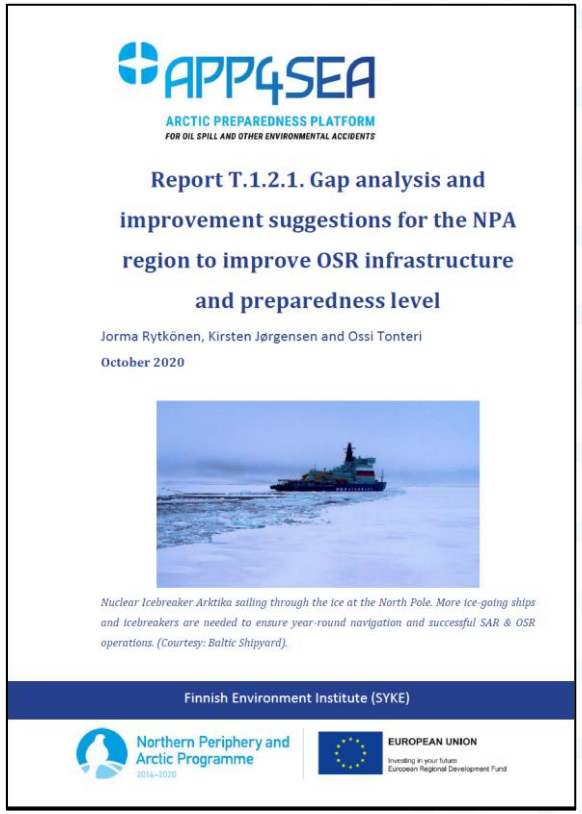
Introduction

- Report highlights some of the most essential challenges and gaps found for the NPA region in improving oil spill recovery (OSR) infrastructure and the preparedness level
  - Environmental factors which will influence the selection of OSR tools
  - Arctic traffic analysis has been made due to the expectations for the rapid increase of shipping in the Polar area
  - Significant gaps identified in the latest guidebooks and viability analyses for the Arctic oil spill recovery including lessons learned in the full-scale ice trial in Oulu in 2016 and the EU-funded Arctic OSR project GRACE



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Environmental factors limiting the use of certain OSR tools

- Arctic forms a unique and sensitive environment
  - Extreme seasonal variations
  - Seasonal daylight variability
  - Rich environment for aquatic life
  - Very large area with different geological formations
- Shore line types are numerous
  - Greatly affects oil recovery options or coastal protection operations against drifting oil slick.

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Environmental factors limiting the use of certain OSR tools

- Ice is one of the most dominant forms of water in the area and a key feature of Arctic conditions
  - Open water conditions have a freezing phase with different ice forms all having their own behavior with spilled oil
  - Once the sea area is frozen, conditions can be characterized as stable
  - However, winds may cause the formation of ice ridges, and form dynamic drifting ice conditions.

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Environmental factors limiting the use of certain OSR tools

- The cold climate means that the spilled oil will usually have a slower oil alteration process with slower weathering and persistence of spilled oil
- From the operational point of view, perhaps the main challenges for OSR operations are the long distances and remoteness of the Arctic area.
  - No infrastructure or logistical support to conduct operations.
  - In the case of an oil spill, the resources to deal with the oil may be very limited and the deployment time to get necessary equipment and other resources may be long.

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Essential Challenges in OSR Preparedness

- One of the ways to enhance the emergency and SAR preparedness in the Arctic areas would be the training of locals with volunteer organizations to support the authorities and to enhance the local emergency capacity.
  - For example, in Norway fishermen may use their trawlers in the case of a large-scale oil accident to transport booms and equipment.
- Logistical challenges in the Arctic
  - Icebreaker assistance is needed for year-round presence
  - Need for aviation capacity for rapid response

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Essential Challenges in OSR Preparedness

- Communications challenges in Arctic
  - Limited VHF coverage in Arctic
  - Only fixed communication available to vessels operating in the Arctic are satellite communications.
  - US Coast Guard has employed Mobile Arctic Support System to help communications in Alaska
- Remote surveillance and detection technologies (i.e., satellite communications, GPS availability, weather stations) are critical for establishing situational awareness for both preventive and response issues.
  - This overall capability is limited in the Arctic due to a lack of coverage and the availability of real-time weather information.

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Mechanical Recovery

- Mechanical oil recovery is usually considered the most favorable method from the environmental point of view
- Possible disadvantages in Arctic conditions:
  - Logistical difficulties
  - Demands special equipment and vessels
  - Time-consuming, laborious, and costly
  - Ineffective

Oil recovery brushes.
Source: SYKE

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Mechanical recovery

- Ice forms many problems for mechanical recovery, e.g:
  - limited access to oil
  - icing/freezing/jamming of equipment
  - detection of oil among ice or under ice is difficult
  - separation of oil from ice is difficult
- There are mechanical recovery systems available designed for winter conditions with modern heating systems for the key parts of the systems
  - However, if one component of these system fails due to freezing, usually it means the whole oil recovery efficiency will remain practically close to zero.

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In situ burning

- In situ burning (ISB) is controlled burning of oil that has spilled from a vessel or a facility, at the location of the spill.
- Limited “window of opportunity” defined by the time when takes the oil slick to emulsify
  - Window could be longer in Arctic conditions due to slower weathering
- If the oil is trapped among and under ice and stay for a longer period of time, method may not be effective

Shoreline experimental in situ burning experiment in GRACE project.
Source: Aarhus University

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In situ burning

- Most of the ISB tests conducted in cold and ice conditions have been carried out as small-scale or intermediate tests
- More research is needed on the health or environmental effects from burning in actual spills in full-scale conditions.
- It is unclear how the environmental impacts caused by the oil itself or burning residues should be evaluated when choosing the optimal OSR method.
- More research is also needed on igniters, fire-resistant booms, floating burners and additional supporting techniques such as ignition and burn promoters, smoke suppressors and herding agents.

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Dispersants

- Dispersants are chemicals that enhance natural dispersion by reducing the surface tension at the oil and water interface
- Most oils are dispersed also in cold temperatures
- Can be sprayed from aircraft
- An overly calm water surface will not produce enough energy for dispersants to mix
- Ice floes could limit the use of dispersant as they block the wave energy required for the mixing of the oil and dispersant

Nondispersed and dispersed oil in laboratory scale experiment.

Source: SYKE

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Dispersants

- After deploying dispersants, recovery of oil is very difficult and most of the oil will remain in the environment.
- Dispersed oil droplets may have severe impact in shallow waters or areas having rich underwater or near-bottom marine habitat
- Testing protocols and data on the impacts to the oxygen level near the bottom or impacts to the food web is scarce.
- Chemical analysis of oil concentrations in the environment is challenging and the choice of methods needs more harmonization.

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Conclusions

- Main issues for OSR in Arctic area are the lack of infrastructure and human resources together with the long distances and severe weather conditions
  - Need for better emergency response systems and suitable tools for environmental protection
- It is likely that if any oil spill were to take place in the Arctic with the presence of ice, some amount of oil would always stay in the nature due to the limitations of the recovery tools.
- More studies are needed on how oil will impact the Arctic over the longer term
- Impact-assessment procedures need to be developed to better understand which areas near navigation channels or areas of offshore activities need to be better protected.

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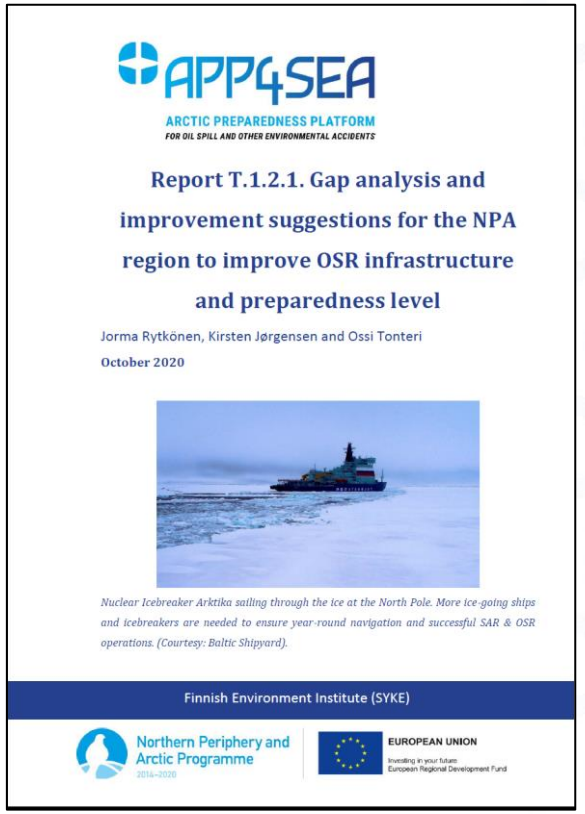
Thank you for listening!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ARCTIC PREPAREDNESS PLATFORM

FOR OIL SPILL AND OTHER ENVIRONMENTAL ACCIDENTS

Report T.1.2.1. Gap analysis and improvement suggestions for the NPA region to improve OSR infrastructure and preparedness level

Jorma Rytkönen, Kirsten Jørgensen and Ossi Tonteri

October 2020

Nuclear Icebreaker Arktika sailing through the ice at the North Pole. More ice-going ships and icebreakers are needed to ensure year-round navigation and successful SAR & OSR operations. (Courtesy: Baltic Shipyard).

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