

# SEASONAL VARIATION IN VULNERABILITY OF ARCTIC ECOSYSTEMS TOWARDS OIL SPILL

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## Background

High global demand for energy has led to increasing interest in the exploration and use of Arctic resources. Due to melting of sea ice and predicted richness of petroleum resources, there is an increasing interest and activity in Arctic regions both for shipping and the oil&gas industry. Operations in the Arctic represent specific challenges due to both physical and biological environmental factors. Arctic development creates many dilemmas that business and society must address in order to be able to balance the need for energy with the need to protect the environment. By combining pan- Arctic seasonal distribution patterns of arctic species at vulnerable life stages with ship traffic obtained from Automatic Identification System (AIS) data, existing oil and gas activity, and statistics on data related to the physical environment (ice coverage and features, temperature, etc.) we have constructed a map based risk matrix in order to communicate to key stakeholders and support their most important decisions.

## Methodology

The vulnerability assessment was performed for mammals, birds and fish and their different ecological uses of about 100 areas of heightened ecological significance (AHES) within the 17 Arctic large marine ecosystems identified in the AMSA IIC report [2](Figure 1). To capture how the effects of an oil spill vary across different regions and seasons we have developed a geographically detailed, dynamic GIS- based model reflecting both species vulnerability and the general sensitivity of the area (Figure 2).

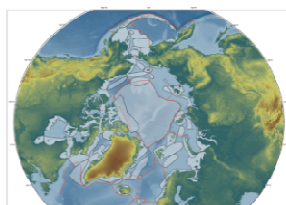


Figure 1. Areas of heightened ecological significance

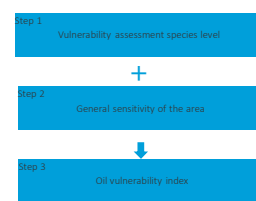


Figure 2. Outline of methodology

## Results and conclusions

By combining information about environmental vulnerability and different risk driving activities in the Arctic we have identified areas and periods of heightened environmental risk in the different regions. The framework we have developed can be used to study the environmental impact of a number of different activities and regions. Figure 3 illustrates, as an example, areas where there is a substantial overlap between vulnerable environmental resources and the risk of spill of Heavy Fuel Oil from shipping. The most extensive overlaps were identified in the Davis Strait, Hudson Strait, west and south-eastern part of the Barents Sea, Chukchi Sea and along the Northern Sea Route. These are also areas where activities are expected to increase in the coming years. The map conveys that the Arctic is not a uniform environment and the environmental vulnerability is continuously changing with seasons. Responsible activities in the Arctic must understand and adapt to this dynamic combination of risk factors.

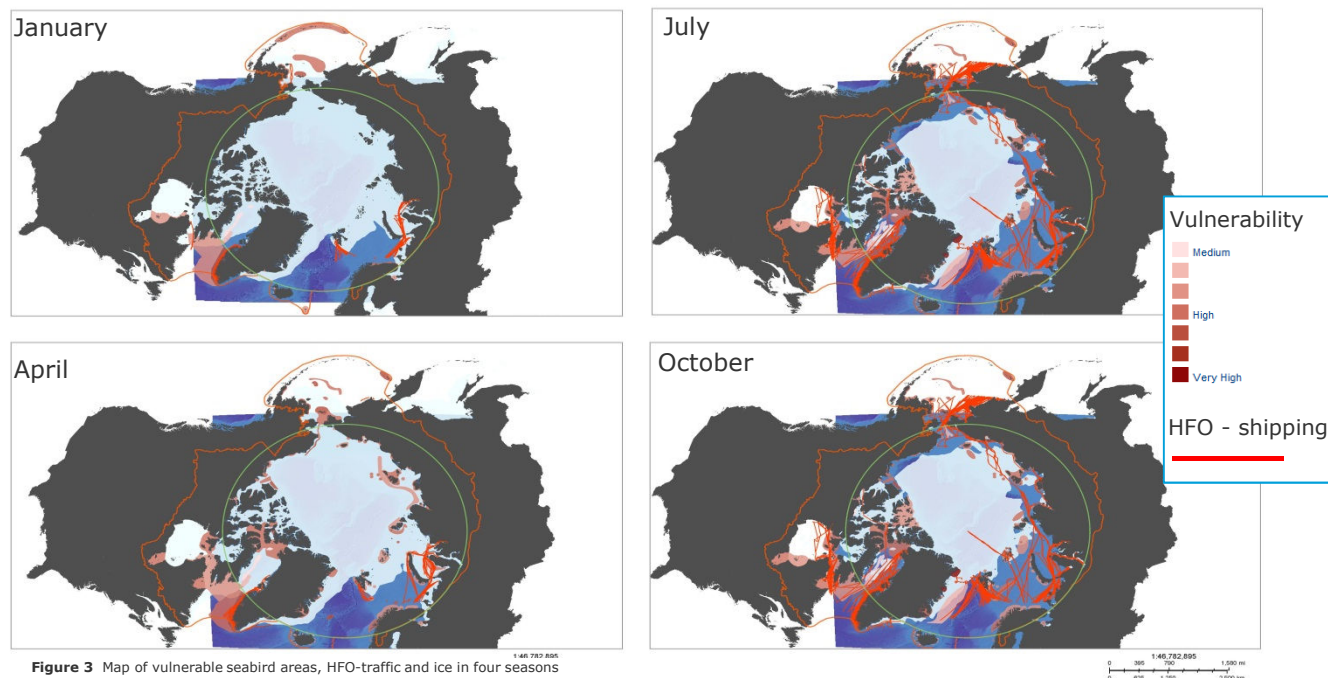


Figure 3 Map of vulnerable seabird areas, HFO-traffic and ice in four seasons

## References

1. AMAP, Arctic Oil and Gas 2007. Arctic Monitoring and Assessment Program (AMAP), Oslo. 2007.
2. AMAP/CAFF/SDWG, Identification of Arctic marine areas of heightened ecological and cultural significance: Arctic Marine Shipping Assessment (AMSA) IIC. Arctic Monitoring and Assessment Programme (AMAP), Oslo. 2013