



## EXPLORING HYDROCARBON RESERVES NORTH OF NORWAY

**Environmentally responsible oil and gas solutions for one of the most sensitive regions of the world.**

The opening of new areas in the Arctic in addition to development of new technology for safe and sustainable operations has resulted in increased exploration activity. However, the early phases of oil and gas activities require detailed, multidisciplinary planning.

Ramboll offers a unique combination of planning, management and engineering combined with local know-how from our Stavanger and Tromsø offices.

### Harsh and vulnerable environment

The Arctic environment is characterised as harsh and vulnerable; factors that constitute additional challenges. The climate in the Arctic is varying from region to region and from season to season with respect to:

- Icebergs and sea ice, thickness and extent
- Hours of daylight

- Temperature
- Ocean currents
- Winds and storms

The Arctic environment is especially sensitive to disturbances. Potential spill of contaminants may cause long lasting impact. Thus, solutions to safeguard the environment constitute the power to explore in these regions.

### Local environmental teams

The environmental team in Norway consists of environmental oil and gas specialists. Engineers, biologists, chemists, geophysicists and geographers are collaborating to offer health, safety and environmental services.

The Ramboll environmental teams are actively present in Northern Norway, Russia and Greenland, with in-house experts who possess locally based knowledge regarding Arctic

conditions, authorities, logistics and environmental legislation.

### Legislation requirements

The oil and gas industry in the Arctic region is regulated under the legislation of different countries. Potential environmental challenges associated with such activities must therefore also be taken into consideration, e.g. activity in the Barents Sea may require assessments of transboundary impacts. There are significant environmental aspects and risks to consider that require locally based knowledge with regard to

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conditions and culture. To succeed in cross-boundary projects, there is a need for understanding of local legislation and requirements for environmental assessments before initiating oil and gas activities.

### Exploration drilling and field development

The particularly unique and challenging environment of the Arctic can make the drilling operations highly difficult. The requirements concerning oil and gas activities in certain areas of the Barents Sea have been heightened in comparison with the remaining Norwegian Continental Shelf. For instance, zero environmental harmful discharges of drill cuttings and produced water have been implemented in this area. The sensitivity and great value of the environment in the northern region is of particular concern, which must be taken into consideration and assessed prior to the specific oil

and gas activity. Furthermore, the potential for blow-outs during exploration drilling and operation is of outmost importance in such a fragile ecosystem. Therefore, proper measures need to be implemented to prevent such an accident. Our vast experience covers areas such as:

- Identification of potential project impacts
- Conducting risk and safety analysis
- Environmental Impact Assessment
- Recommendations on mitigation measurements
- Authority management

### Oil spill mitigation

Spill prevention, preparedness and response capabilities are important mitigation factors that should be assessed prior to an exploration drilling and potential production. The limited infrastructure in the Arctic region is a challenge with respect to potential environmental

impacts due to long response time, as the availability of equipment and personnel can be relatively remote. Prediction of the potential impact, development and behaviour of an oil spill constitute an important basis for mitigation measures.

We are experienced in assessing environmental impacts of oil spills and appurtenant mitigation measures where we offer the following services:

- Risk analysis
- Oil spill modelling (Oscar/Mike)
- Oil spill contingency analysis and planning

### Our approach

We offer identification and prediction of potential environmental challenges and impacts in early project phases and assist our clients throughout the project.

More at [www.ramboll.com/oil-gas](http://www.ramboll.com/oil-gas).



Our competence is achieved through involvement in several major projects in the Arctic.

We combine country specific knowledge of the requirements and regulations of oil and gas activities with international best practice.