

Risks and potential impacts of oil exploration in the Arctic

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Key Facts:

- The United States Geological Survey estimates that 90 billion barrels of technically recoverable oil lies in offshore reservoirs in the Arctic. That's about a third of the size of Saudi Arabia's reserves.ⁱ
- Oil industry activity in an area off Greenland's west coast is increasing rapidly as companies such as Cairn Energy, Chevron and Exxon Mobil secure drilling licenses.ⁱⁱ
- The drilling season is short, and is ended by the arrival of the Arctic winter and a thickening of sea ice which makes drilling of primary or relief wells impossible.ⁱⁱⁱ
- A blowout in a scenario where a relief well cannot be completed in the same drilling season could lead to oil gushing unchecked for two years,^{iv} with spilt oil becoming trapped under sheets of thick ice.
- The environmental consequences of a spill in the Arctic environment would be far more serious than in warmer seas such as the Gulf of Mexico.^v Serious impacts of the Exxon Valdez spill in Alaska are still being felt over 20 years later.^{vi}
- Baffin Bay is home to 80 to 90% of the world's Narwhals. The region is also home to blue whales, polar bears, seals, sharks, cormorants, kittiwakes and numerous other migratory birds.^{vii}
- According to a senior official at a Canadian firm that specialises in oil-spill response, "there is really no solution or method today that we're aware of that can actually recover [spilt] oil from the Arctic".^{viii}
- Freezing temperatures, severe weather and a highly remote location pose unprecedented challenges to any spill response.^{ix}
- The U.S Minerals Management Service estimated a one in-five chance of a major spill occurring over the lifetime of activity in just one block of leases in the Arctic Ocean near Alaska.^x

- 'Ice management' techniques used in the area – where icebergs are towed out of a rig's path or blasted by water cannons – are ineffective against the largest icebergs. In extreme cases rigs themselves might have to be moved to prevent catastrophic collisions.^{xi}
- Working on the rough assumption that a barrel of crude oil produces 300kg of Co2 after refining and combustion,^{xii} the Arctic's recoverable offshore reserves could be responsible for 27bn tonnes of Co2. This amount is comparable with the world's total annual emissions.^{xiii}

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Introduction

Oil companies are expanding their search for oil to new frontiers previously considered too inaccessible, expensive or risky to exploit. This relentless expansion has now reached the Arctic, where large areas of the ocean are opening up each summer as climate change causes sea-ice to melt.^{xiv} Some scientists have warned Arctic sea ice could disappear altogether this decade.

The dangers of drilling for oil in the Arctic are immense. Oil spilt into near freezing water takes many times longer to dissipate than in warmer oceans. The freezing temperatures, severe weather and remote location pose unprecedented challenges to any spill response. Oil pollution in Arctic seas could poison some of the most important and productive marine ecosystems in the world. The industry cannot ensure that a spill would never happen and their response plans remain wholly inadequate.

High stakes exploration

According to the United States Geological Survey, about 30% of the world's undiscovered gas and 13% of the world's undiscovered oil may be found in the area north of the Arctic Circle. Drilling licenses and exploration activities have increased rapidly over recent years.^{xv} It is estimated that approximately 84% of the undiscovered oil and gas in the Arctic occurs offshore; with about 90 billion barrels of technically recoverable oil.^{xvi}

Working on the rough assumption that a barrel of crude oil produces 300kg of Co2 after refining and combustion,^{xvii} the Arctic's recoverable offshore reserves could be responsible for 27bn tonnes of Co2. This amount is comparable with the world's total annual emissions.^{xviii}

A fragile and unique ecosystem

The Arctic ecosystem is perhaps the most vulnerable to oil spills on earth.^{xix} Cold weather, thick ice cover, and slow turnover of plants and animals mean that toxic oil lingers, exposing multiple generations of organisms to contamination.^{xx} Lack of sunlight will also inhibit the breakdown of spilled oil.^{xxi}

The area is rich in seabirds, such as the Brünnich's guillemot, cormorants, kittiwakes and king eiders.^{xxii} Seabirds are especially vulnerable to oil spill as the oil can destroy the insulating capacity of the plumage. Furthermore, spilled oil will keep its sticky and damaging properties for a longer period in cold water.^{xxiii}

The area is also important to many unique species of marine mammal.^{xxiv} Bowhead whales, narwhals, white whales and walrus are winter visitors to Davis Strait and Baffin Bay. Bearded seals also congregate in the area during winter. Between May and June, minke, humpback, fin and blue whales arrive to the area from the south. Ringed seals are seen throughout the year. Harp and hooded seals start their migration along the West Greenland coasts in May-June and stay until November-December. Polar bears can also be present from February to May.^{xxv} Seal pups are more vulnerable to oiling because they are dependent on their natal fur for insulation.

Arctic oil spills may set off irreversible chain-reactions of contamination because inland species, such as polar bears and foxes, rely heavily on coastal resources.^{xxvi} As a result, the 'footprint' of an oil spill will extend far inland because coastal species will bio-accumulate toxins as they consume oil-exposed marine prey.

The impact of an oil spill may be larger during summer months because of seasonal migrations such as that of blue whales and salmon, and the crucial reproductive periods of migrating birds.^{xxvii} Millions of birds pass through the Arctic on their global migrations.

The construction of platforms and pipelines directly threatens the survival of ancient cold-water corals, some of which are 2,000 years old – among the oldest living animals on earth.^{xxviii}

Fisheries production is worth more than \$2.5 billion and 80% takes place in the three Arctic marine areas that are the main focus of offshore oil exploration, namely West Greenland, the Norwegian Sea and the Barents Sea.^{xxix}

“No solution”

It is very difficult to detect oil below ice and amongst broken ice sheets, and experts suggest there is no way to contain an oil spill if it is trapped underneath a large body of ice.^{xxx} According to a senior official at a Canadian firm that specialises in oil-spill response, “There is really no solution or method today that we’re aware of that can actually recover [spilled] oil from the Arctic”.^{xxxi} Oil skimmers – used so extensively in the Gulf of Mexico - are simply unable to operate if they cannot reach the spilled oil due to sheet ice.^{xxxii}

The impact of the 1989 Exxon Valdez spill into the Gulf of Alaska continues to plague marine and coastal environments over two decades since the tanker ran aground. Twenty one years on, pockets of oil remain in sediment under gravel beaches.^{xxxiii} Decimated populations of sea otters, whose numbers were cut in half, have yet to fully recover^{xxxiv} and local populations of marine mammal species, with toxins

incorporated into their blubber,^{xxxv} are nearing extinction. Populations of killer whales (*Orcinus orca*) were reduced by 40%^{xxxvi} and their survival in Prince William Sound remains uncertain.^{xxxvii}

Even in the absence of a major spill, regular ongoing industry practices, such as exploration, seismic testing, and production of offshore oil have the potential to disrupt seasonal migrations of whales, spawning run of salmon, and crucial reproductive periods of migrating birds.^{xxxviii}

Unacceptable risks

The U.S. Minerals Management Service estimated a one-in-five chance of a significant spill occurring over the lifetime of energy activity in just one block of leases in Arctic waters off Alaska.^{xxxix} The overall chance of a spill therefore increases as more blocks are explored.

The so-called 'iceberg hazard' has increased in recent years, because several of Greenland's largest glaciers have begun to disintegrate as a result of climate change. An ice island four times the size of Manhattan recently calved from Petermann Glacier and will eventually make its way south through Nares Strait into Baffin Bay and the Labrador Current.^{xi} Some of these icebergs are likely to be too big to be towed out of the way, meaning the rigs themselves will have to be moved at very short notice.^{xii} Trudy Wohleben, who works for the Canadian Ice Service and discovered the giant chunk of the Petermann glacier that recently sheared off, commented, "The danger is - once they get to where the oil platforms are - if the icebergs are too big then the normal methods used to break up the ice as it approaches the platform will have a lot more difficulties."^{xiii}

Cairn Energy admits that the Arctic poses extreme challenges,^{xiiii} and that 'logistics are complex'.^{xlv} The group says it is developing an oil spill response capability for Greenland and reports suggest it has 14 vessels in the area with relevant equipment.^{xlv} In contrast, the response marshaled to fight BP's spill in the Gulf of Mexico involved more than 6,500 vessels.^{xlvi}

Can the industry afford to drill safely?

The decimated wildlife of Prince William Sound, the Alaskan site of the 1989 Exxon Valdez tanker spill, remains a stark indicator of the impact such a spill can have. The Exxon Valdez disaster was a finite amount of oil spilled from a tanker. As we have seen in the Gulf of Mexico, a well blowout on the seabed can lead to unprecedented quantities of oil being spilt into the marine environment. No company can guarantee that a similar incident would never occur in the offshore Arctic.

It is therefore of particular concern that until the Gulf of Mexico disaster caused a halt to the proceedings, oil companies were appealing to the Canadian government to relax the very safety regulations that would help prevent an uncontrollable blowout at wells drilled in the Arctic's Beaufort Sea.^{xlvii} The companies, including Exxon-owned Imperial Oil and BP had called on the Canadian National Energy Board to relax rules which stipulate that a relief well must be drilled at the same time as a main well.

A relief well can be used to reduce pressure in a blown out well, reducing the quantity of oil spilled and assisting in the capping of the well. But in the Arctic, the short drilling window means that it may not be possible to complete a relief well before the winter freeze-over.^{xlviii} This could potentially leave oil gushing into the ocean throughout the winter until drilling operations can resume. In the Beaufort Sea, where wells can take up to three seasons to complete,^{xlix} this could mean that oil would spill from a blowout for years.

Imperial Oil argues that same-season drilling of relief wells in the Beaufort Sea will essentially block the development of oil resources there,^l presumably because it will be too costly. Their argument says that essentially it is too expensive to drill for oil in the Beaufort Sea with any real guarantee of safety. It therefore follows that if the industry cannot afford to drill safely, then it should not be drilling at all.

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- i Gauthier, D.L. et al. 2009. Assessment of Undiscovered Oil and Gas in the Arctic. *Science* 29 May 2009 324: 1175-1179 and <http://www.guardian.co.uk/world/2010/sep/13/greenland-oil-environment-arctic-global-warming> and <http://news.bbc.co.uk/1/hi/sci/tech/8073363.stm> for a map
- ii http://www.bmp.g/petroleum/list_of_licences_20100701.pdf and <http://www.bbc.co.uk/news/business-11389043>
- iii WWF, Offshore Exploration in the Arctic
- iv A. Mayeda 2010. Oil-spill relief well off Canada's Arctic coast would take three years: regulators. Postmedia News <http://www.canada.com/news/spill+relief+well+Canada+Arctic+coast+would+take+three+years+regulators/3347296/story.html>
- v Brandvik, P.J, Sørheim, KR, Singsaas, I, and Reed, M (2006). Short State-of-the-Art Report on Oil Spills in Ice-Infested Waters: Oil Behaviour and Response Options. SINTEF. 19 May.
- vi Li H.L. & Boufadel M.C. 2010. Long-term persistence of oil from the Exxon Valdez spill in two-layer beaches. *Nat. Geosci.*, 3, 96-99
- vii Potential environmental impacts of oil spills in Greenland, National Environmental Research Institute, Ministry of the Environment, Denmark. 2002. http://www2.dmu.dk/1_viden/2_Publikationer/3_fagrappporter/rappporter/FR415.pdf
- viii <http://www.sikunews.com/News/Canada-Northwest-Territories/No-one-knows-how-to-clean-up-an-Arctic-oil-spill-7692>
- ix http://wwf.panda.org/what_we_do/where_we_work/arctic/publications/?122240/Oil-Spill-Response-Challenges-in-Arctic-Waters
- x Revised Oil-Spill Risk Analysis: Beaufort Sea Outer Continental Shelf Lease Sale 170 <http://www.boemre.gov/itd/pubs/1997/97-0039.pdf> p.25
- xi "Huge ice island could pose threat to oil, shipping" Associated Press, August 10th 2010
- xii <http://numero57.net/2008/03/20/carbon-dioxide-emissions-per-barrel-of-crude/>
- xiii <http://www.eia.doe.gov/pub/international/real/all/tahle1002.xls>
- xiv Hassol S. 2004. Impacts of a Warming Arctic. Arctic Climate Impact Assessment. Cambridge University Press. And <http://www.bbc.co.uk/news/science-environment-13002706>
- xv Faroe Petroleum plc. Annual Report and Accounts 2009 Page 25. <http://www.faroe-petroleum.co.uk/get.file?ID=4590>
- xvi Bird, K.J. et al. 2008. Circum-Arctic Resource Appraisal: Estimates of Undiscovered Oil and Gas North of the Arctic Circle. USGS.

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- xvii <http://numero57.net/2008/03/20/carbon-dioxide-emissions-per-barrel-of-crude/>
- xviii <http://www.eia.doe.gov/pub/international/iealf/tableh1co2.xls>
- xix Hollebone B. & Fingas M.F. 2008. Oil Spills in the Arctic: A Review of Three Decades of Research at Environment In: Oil Spill Response: A Global Perspective (eds. Davidson WF, Lee K & Cogswell A). NATO Science for Peace and Security Series C: Environmental Security
- xx Arctic Marine Assessment Programme 1998.
- xxi Email from Gordon Hamilton, Associate Professor, Climate change Institute, University of Maine, Orono, 10th August, 2010
- xxii Environmental Oil Spill Sensitivity Atlas for the West Greenland (68° -72° N) Coastal Zone, P48, NERI Technical Report, No 494, 2004
- xxiii Potential environmental impacts of oil spills in Greenland, p25, National Environmental Research Institute, Ministry of the Environment, Denmark. 2002.
http://www2.dmu.dk/1_viden/2_Publikationer/3_fagrappporter/rapporter/FR415.pdf
- xxiv <http://www.dmu.dk/en/arctic/oil/spillsensitivityatlas/>
- xxv Environmental Oil Spill Sensitivity Atlas for the West Greenland (68° -72° N) Coastal Zone, P51, NERI Technical Report, No 494, 2004
- xxvi Fuglei, E. 2010. Norwegian Polar Institute. The Arctic Fox. <http://npweb.npolar.no/english/arter/fjellrev>
- xxvii Hollebone & Fingas. 2008. Op. Cit.
- xxviii The Pew Environment Group. 2010. Oceans North Canada. Baffin Bay & Davis Strait. <http://www.oceansnorth.org/baffin-bay-davis-strait>
- xxix <http://www.searoundsus.org> 2010
- xxx <http://www.yukon-news.com/news/18126/>
- xxxi <http://www.sikunews.com/News/Canada-Northwest-Territories/No-one-knows-how-to-clean-up-an-Arctic-oil-spill-7692>
- xxxii WWF. 2009. Not So Fast: Some Progress in Spill Response, but US Still Ill-Prepared for Arctic Offshore Development.
- xxxiii Boufadel et al. M.C. 2010 Op. Cit.
- xxxiv Associated Press (AP). 2004. Survival of sea otters in southwest Alaska threatened. 8th February, 2004. http://helenair.com/lifestyles/article_630e8150-cfa3-5205-b15e-2b50ef26dfbf.html
- xxxv Hooker S.K., Metcalfe T.L., Metcalfe C.D., Angell C.M., Wilson J.Y., Moore M.J. & Whitehead H. (2008) Changes in persistent contaminant concentration and CYP1A1 protein expression in biopsy samples from northern bottlenose whales, *Hyperoodon ampullatus*, following the onset of nearby oil and gas development. *Environ. Pollut.*, 152, 205-216
- xxxvi Than, K. 2010. Oil Spill to Wipe Out Gulf's Sperm Whales? *National Geographic*. 21 May, 2010.
<http://news.nationalgeographic.com/news/2010/05/100521-science-environment-gulf-mexico-oil-spill-sperm-whales/>
- xxxvii Matkin C.O., Saulitis E.L., Ellis G.M., Olesiuk P. & Rice S.D. 2008. Ongoing population-level impacts on killer whales *Orcinus orca* following the 'Exxon Valdez' oil spill in Prince William Sound, Alaska. *Mar. Ecol.-Prog. Ser.*, 356, 269-281
- xxxviii Bailey, L. 2010. Arctic animals at risk: Which animals are most threatened by oil development? *Wilderness Society*. 27th May, 2010. MAY 27, 2010
<http://wilderness.org/content/arctic-animals-risk-energy>
- xxxix Revised Oil-Spill Risk Analysis: Beaufort Sea Outer Continental Shelf Lease Sale 170
<http://www.boemre.gov/itd/pubs/1997/97-0039.pdf> p.25
- xl Email from Gordon Hamilton, Associate Professor, Climate change Institute, University of Maine, Orono, 10th August, 2010
- xli <http://www.dw-world.de/dw/article/0,,5888748,00.html>
- xlii <http://www.dw-world.de/dw/article/0,,5888748,00.html>
- xliiii <http://crr2009.cairnenergy.com/key-issues/greenland/spills.html>
- xliiii <http://www.cairnenergy.com/uploadedFiles/Investors/Downloads/Petroleum%20Exploration%20Greenland%20Conference,%20Copenhagen.pdf> P.21
- xliv <http://www.ft.com/cms/s/0/2755cb2c-892b-11df-8ecd-00144feab49a.html>
- xlvi <http://www.ft.com/cms/s/0/2755cb2c-892b-11df-8ecd-00144feab49a.html>
- xlvii Contenta, S. 2010. Canadians have their own oil worries. *GlobalPost – International News*.
- xlviii Contenta, S. 2010. Op. Cit
- xlix Contenta, S. 2010. Op. Cit.
- l Contenta, S. 2010. Op. Cit.