

# **Oil and Gas Developments in Northern Canada**

*Dan Kellar, beingthechange.ca*

## **Introduction**

Oil and gas developments in Canada's arctic have the largest and most widespread environmental impact possibilities of any northern development, excluding hydrological dams. New roads, new construction, increased vehicular traffic, disruption of land, pipelines and the possibilities of spills are all negative environmental impacts of oil and gas development. Economic prosperity for those involved in the developments, less northern dependence on the federal government through job creation, and ability to better show sovereignty are all obvious positives. This paper will look at the environmental and social dangers and the economic benefits of northern oil and natural gas development.

## **Economics**

Many factors influence oil and gas development: current market price for the gas; cost of exploration and development of the field; amount of gas or oil in the field; cost of extraction; and finally cost of transportation. As the demand for natural gas and oil increases, and supplies dwindle, exploration for these non-renewable resources will increase. Furthermore, development of more fields will take place, and as technologies becomes more refined, more gas will become available from existing fields.

Currently, market prices are favorable, hovering just above a plateau of USD \$4/mcf (million cubic feet). With such a high price, many projects that were not economically viable in the past have become viable. Two such projects, which will be

discussed in more detail later, are the Alaskan Highway and Mackenzie valley pipeline projects. These two projects, which will link huge known and unknown reserves of gas and oil to the market, required baseline prices of \$3.48 and \$3.37 respectively to proceed (Duncan, 2003). The price requirement has been reached, now the fate of the projects rests in the outcomes of social and environmental impact assessments. There is no doubt there are numerous other such projects just waiting for more favorable market prices.

With increased prices, resource companies will be more willing to spend money on exploration and technology development, increasing the number of fields to develop, and at the same time, through higher technology, lowering the cost of extraction:

The frontiers are both horizontal and vertical. There are new areas to explore, and deeper drilling to be done in both developed and undeveloped regions. Additional opportunities include the potential of increased production of unconventional gas, chiefly coal bed methane, tight sand reservoirs, shale gas, and the possibility that gas hydrates may eventually become commercially viable. There also are research and development frontiers whereby previously overlooked gas deposits can be discovered, and production techniques developed for gas reservoirs now uneconomic (Duncan, 2003).

Gas hydrates in particular offer the largest potential growth area for development. It is estimated that large methane hydrate reserves, which are found in offshore and high latitude basins, exist in many areas of Canada's north including the Mackenzie valley and is found under permafrost zones (Hannigan, 1999). Another exciting new area is deep drilling. New technologies have allowed 'deep' gas (4.5 km and deeper) to be accessed. For oil and gas companies, this means more development in areas thought to be out of reach, and a return to old areas that were thought to be depleted (Cook, 2002). The economic benefits of oil and gas development are obvious for the extraction companies, but what is less obvious are the economic benefits for the territories where the development takes place.

Historically, the territories have relied heavily on government funding as employment opportunities in the north are limited. Increased development in the oil and gas industries has meant more jobs are created in the north, and less people are unemployed. Being more self-sustaining is another step for the territories in their quests of becoming provinces. Construction projects such as road and infrastructure building are other spin-off jobs created by oil and gas development. Finally, the design and construction of pipelines (5-20 year projects) creates more jobs.

With the settling of land claims, Native groups are increasingly becoming players in the oil and gas business. In some cases Native-owned oil and gas related companies are appearing, and in other cases, current oil and gas companies are paying huge sums of money to develop on native-owned land. The proposed Mackenzie valley pipeline could see millions of dollars going to Native groups (such as the Deh Cho, and the Dene) for use of their land for the pipeline.

Climate change, especially the warming of the Canadian north is another hot topic in the oil and gas world. An increase of around 4 degrees Celsius by the next century is a generally agreed upon number. Such an increase would reduce the polar pack ice and allow the opening of the Northwest Passage as a shipping route for a longer season. Oil tankers could move the oil from artic island developments, which would become economically viable, and the need for pipelines would be greatly reduced.

If the Northwest Passage was to become navigable, Canadian claims of sovereignty over the waters would come into question. Oil tankers may, if Canada loses its sovereignty over the water, become a constant sight as the Artic Waters Pollution

Prevention Act would no longer be valid (Wonders, 2004). The possibilities existing for accidents and huge oil spills similar to the Exxon Valdez spill would become a reality.

### **Threats**

There are large threats to the environment and the people of the arctic made by oil and gas development and in some cases, these threats have outweighed the economic benefits and stopped development. The most famous of these cases is the Berger Inquiry to the Mackenzie Valley pipeline. In 1975 Justice Thomas Berger of the British Columbia Supreme Court flew to the Mackenzie valley to look at the pipeline project proposal. He spoke to Natives in the area over three months and published his report indicating a need to preserve resources and culture in the north. He noted that the pipeline was currently a bad idea due to the expected environmental damage and would be unfair to the natives who were seeking the land in a claim: “the Berger Inquiry was more than an investigation into a single project; it was an examination of the purpose of northern development, the place of the environment in Canadian society, and the potential role of northern peoples in that development” (Bone, 2003).

Since the time of the Berger Inquiry much progress has been made in pipeline construction techniques, and impacts better known (through extensive studying of the Norman Wells pipeline). Also many native groups have settled their land claims and are in a better position to have a say in what happens on their lands. Though environmental impacts will still be large, and many of the same impacts will be seen, the pipeline will without a doubt be built, but the time that has elapsed gave significant protection to a large corridor in the north. The pipeline will still threaten the area surrounding it, and

any water bodies it comes near. If at any time, along any point the pipeline became ruptured, a large and expensive clean-up would have to take place. The negative impacts to the environment would be hard to predict and they would be long lasting. Migration patterns would be disrupted and huge amounts of trees and vegetation would have to be cleared and be kept clear.

New construction including roads, buildings, water pipelines, and power lines accompany all new developments. These projects all have negative environmental impacts. Road construction disrupts the very fragile soil, creates corridors of impermeable surfaces, requires the destruction of trees, and interrupts migration routes. The vehicles travelling on these roads pollute the air and the surrounding ground and because of de-icing requirements, sodium and chloride build-ups occur at roads' edge and can infiltrate the hydrological cycle, increasing levels of these chemicals in the water.

Building construction destroys land, which after the buildings removal will take hundreds of years to recover. Also construction machines and materials introduce chemicals to the area that will persist long after the building is complete. The new buildings need power, which is either moved along power lines or is generated on site. The generation of the energy pollutes the air as renewable sources of energy are not sufficiently used.

Another major threat is the release of methane hydrate gases from melting permafrost regions. As the temperatures continue to rise in the north, a northward shift in the permafrost line will occur. As permafrost melts, the methane hydrates, which have built up under the permafrost will leech out and be released into the air. In the Mackenzie Basin this threat is especially large as there are large reserves of this gas in the

area. The gas could very well cause more damage if released in its pure form, and once it spreads out in the air, it will be useless as a fuel (Hannigan, 1999). If the last sentence is proven true it can be concluded therefore that the technologies needed to refine the gas should be developed faster so extraction of this resource may occur. It is important to use the resources we have, and not let them go to waste when we have a shortage. In this case, it is the lack of development that is the problem.

The possibility of an oil spill is another major threat to that would be introduced with increased oil and gas development. The threat from a pipeline rupture has already been discussed, its more destructive companion, a spill in the ocean will now be addressed. On March 23<sup>rd</sup> 1989 the Exxon Valdez oil tanker ran aground off the Alaskan coast in Prince William Sound. 257 000 barrels or 38 800 metric tonnes of oil was spilled out into the water causing widespread damage and death along 2092 km of shoreline and stretched 740 km (EVOS, 2004). The area is still recovering from the spill, parts of it may never fully return to their pre-spill state. The probability of an oil spill in the Canadian Arctic increases with every oil tanker that is allowed in the waters there. With the rough waters and difficult passages, clean-up efforts after a spill would be much more difficult to undertake. The impact on the environment is not worth risking, even with new methods of boat construction and new methods of spill monitoring and clean-up. Two such methods are described below:

A laboratory sensor has now been developed to measure the absolute thickness of oil on water slicks. The successful application of this technology to the measurement of oil slick thickness will benefit the scientific community as a whole by providing information about the dynamics of oil slick spreading and the spill responder by providing a measurement of the effectiveness of spill countermeasures such as dispersant application and in situ burning. (Lee, 2002)

Both organic and inorganic particles have been implicated in the transport of oil from surface waters to the benthic environment. In particular, the formation of oil-

mineral aggregates (OMA) has been shown to contribute to the removal of stranded oil from low-energy, inter-tidal environments. This natural self-cleaning process is attributed to the reduction in oil adhesion when oil droplets become stabilized by their interaction with mineral fines. Increasing knowledge of this process has fostered the development and evaluation of oil spill countermeasure strategies based on the promotion of oil-particle interactions. (Brown, 2003)

We can see that with new innovations combined with present oil spill clean-up technology and practices, any spill would not have the impact it once did, but one must question to whether any negative environmental impact is worth the economic benefits.

The release of any persistent chemical in the north has enormous effects, chiefly biomagnification and the contamination of the water. Low level organisms become fouled by the chemical, and higher order creatures eat them. At every level of the network, increasing levels of the chemical can be found. By the time the highest level predator consumes their meals, the chemical could be at a very harmful concentration.

## **Conclusions**

Before any development takes place in Canada's north large impact studies, cost-benefit analysis, and discussions must take place. This is especially true for oil and gas developments as these have the possibilities of being one the most destructive (behind only hydrological dams). The scale of oil and gas developments places them in a special category, all by themselves. Land use agreements with governments and First Nations, environmental and social impact assessments, and risk-analysis must all be completed and approved before any projects may move forward. These are difficult due to the uniqueness of the northern landscape; both social and environmental.

Another positive is the Native involvement in development. All new projects have a consultation phase where Native concerns and questions are heard and answered.

In many situations it is the Natives with the final say towards project approval. The Berger inquiry brought it to the limelight, and now Native involvement has become an integral part of the process.

The problem of more oil and gas development could be side-stepped altogether. Instead of changing the human dependence on non-renewable fossil fuels, new technologies are being introduced to find more and more of it, and to use it more efficiently. If instead of fossil fuel exploration, the money was put into renewable energy technology there would be no need for oil tankers in the northern seas, nor a use for an oil pipeline to feed the energy addicted south. It is good to see the development of cleaner burning fuels and engines, and technologies to clean up after we make a mistake, but all these are countermeasures combating the real problem; overuse and over consumption of fossil fuels. Can the damage brought on by oil and gas developments ever be justified by economic benefits?

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