

THE OIL SANDS AND THE ENVIRONMENT

Introduction

Focus

In just a few years, Alberta oil sands development has made the province the greatest economic power in Canada. As the price of oil has risen, activity in the oil fields has also increased. With this growth have come new threats to the environment and new challenges to Canada in its attempt to rein in the emissions that contribute to climate change. This *News in Review* story looks at how Alberta's north is being transformed, and what this transformation may mean for the future.

On January 26, 2008, *The Globe and Mail* began a week-long series of articles on the Alberta oil sands with this headline: "Shifting Sands: How Alberta's Oil Boom Is Changing Canada Forever." The series' thesis is that oil sands development has turned Alberta, and therefore Canada, into one of the world's major energy players. This transformation, in turn, will permanently change Canada physically, politically, and economically, touching all aspects of Canadian life.

The initial article was accompanied by stunning photographs by Edward Burtynsky, a Canadian famous for his large-scale photographs of landscapes that have been transformed by human activity. The photographs show what was an almost untouched forest turned into a lunar landscape and an industrial hell. They make it very clear that, environmentally, at least, the change that has begun is extensive.

The economic benefits of Canada's oil boom to Canada and, especially to Alberta, are inarguable. Over \$100-billion dollars has been earmarked by oil companies to be spent in Alberta over the next decade. Investment has created thousands of jobs and drawn workers to the oil fields from every Canadian province. Oil stocks have soared in value and become part of almost every Canadian investor's portfolio. Money pours into government coffers—royalties for Alberta, taxes for Ottawa.

And it looks like a boom that will last for a very long time. Investment in oil sands development is driven by one thing: the price of oil on world markets. Oil from the sands is relatively expensive to produce—in the range of \$25-\$35 per barrel. But with world prices in the \$90 range, large profits for the oil companies are a given.

Environmentalists, however, see another side to development—and it is a side that is becoming more and more apparent to many Canadians. The environmental damage is real, it is extensive, and much of it is probably irreversible. This damage includes:

- 3 000 square kilometres of pristine boreal forest dug up and destroyed, along with its wetlands and muskeg
- The reduction in the flow of the Athabasca River by the removal of over 300 cubic metres of water annually and the consequent reduction in available water for other human activities, such as agriculture
- The creation of gigantic man-made lakes of toxic sludge, the unwanted parts of the cocktail required to separate the valuable bitumen from the rest of the oil sands
- A huge increase in greenhouse gas emissions in Alberta, much of it due to the burning of the millions of cubic feet of natural gas required to heat water for the separation process. This increase will complicate any federal plans for reductions in the overall national production of greenhouse gases and has turned Alberta industry into Canada's largest emitter

Some scientists and environmentalists have begun a campaign to slow the pace of new oil production in the oil sands. They point to statements by Alberta's own review panel that grants licenses to new producers. In early 2007, the panel, while approving new applications, spoke of "critical" environmental challenges in the region, as well as an "absence of sustainable long-term solutions" (*The Globe and Mail*, March 1, 2007). They also expressed a belief that there is only "a short window of opportunity" to solve the region's problems.

Further Research

To learn more about the history of the oil economy in Alberta, consider a visit to the CBC Digital Archives at www.cbc.ca/archives and view the audio-visual file "Striking Oil in Alberta." You might also wish to explore the University of Calgary file "The Oil and Gas Frontier 1913 to Present," at www.ucalgary.ca/applied_history/tutor/calgary/oil.html.

Alberta's government, however, has expressed a real reluctance to do anything that might slow oil sands growth. Premier Ed Stelmach has said that he believes slowing growth could devastate both the Canadian and Alberta economies and argues: "Green politics are as much about emotion as they are about science" (*The Globe and Mail*, February 27, 2007).

Alberta released its new green plan on January 24, 2008. It called for the smallest reduction in greenhouse gases of any jurisdiction in Canada—far short of the reductions called for by the federal government's plan. Alberta industry enthusiastically backed the new plan.

For Reflection

In a recent poll, Albertans and Canadians from across the country were asked how they felt about the pace of oil sands development. While there was a range of responses, 52 per cent of Canadians said it had been about right and 24 per cent felt it had been too fast. Albertans, however, who live with and presumably benefit from oil sands development, had a different viewpoint. Forty-eight per cent said it was about right and 43 per cent felt it was too fast.

As you watch the video, ask yourself that same pollster's question: Has oil sands development been about right, too fast, or too slow? Poll your classmates to get their opinions.

However, critics argue that this places an unfair burden on other parts of the country.

Former premier Peter Lougheed has been one Alberta voice calling for a slowdown in oil sands development. He has said that unchecked oil sands development will be a major contributing factor to a constitutional battle between the federal and provincial governments. The battle will involve the right of the federal government to protect the environment versus Alberta's right to develop its resources. One can only hope that somewhere there are policymakers willing to find a compromise where all Canadians can be winners.

THE OIL SANDS AND THE ENVIRONMENT

Video Review

Further Research

The Pembina Institute of Appropriate Development can be visited at www.pembina.org.

This Video Review is in two parts. Answer Part I in the spaces provided.

Part I

1. How large is the area of northern Alberta that has been approved for oil sands development?

2. In what year did oil sands developers meet their original target of one million barrels per day? _____
3. How much water may oil sands companies draw per year from the Athabasca River?

4. How many homes could be heated by the amount of natural gas burned by oil sands producers?

5. Greenhouse gas emissions from oil sands development are now equivalent to the gasses emitted by how many Canadian automobiles? _____
6. Tailing ponds now cover how many square kilometres of northern Alberta?

7. What problems has Métis trapper and fisher Ray Ladouceur identified as likely being caused by pollution from the oil sands?

8. What human health problems among Aboriginal populations in the Fort Chipewyan Area are suspected of being associated with oil production?

9. What steps has the Alberta government taken to investigate concerns expressed by the residents of the Fort Chipewyan area?

10. What does University of Alberta scientist David Schindler believe should happen before further oil sands development takes place?

THE OIL SANDS AND THE ENVIRONMENT

A Profile

Did you know . . .

Until recently, the Alberta oil sands were often called the Alberta tar sands. A conscious effort has been made to discourage the use of that name. "Tar sands" is an inaccurate description; what is contained in the sands is an extremely heavy form of crude oil, not tar. And, of course, "oil sands" sounds much less repulsive to the average person than does the term *tar sands*.

Further Research

An excellent introduction to oil sands and heavy oil—its production and use—is available from the Centre for Energy at www.centreforenergy.com/generator2.asp?xml=/silos/ong/oilsands/oilsandsAndHeavyOilOverview01XML.asp&template=1,1,1.

The oil sands of Alberta extend over a huge portion of the northern area of the province. The size of the operation to extract the oil from these sands is equally impressive.

Where the Sands Are

The oil sands deposits are located in northern Alberta, in an area of about 140 000 square kilometres of boreal forest. Four major deposits, covering over 77 000 square kilometres, are currently being mined: Peace River, Athabasca, Wabasca, and Cold Lake.

The centre of the region—and the centre for mining operations—is the Regional Municipality of Wood Buffalo, which includes the town of Fort McMurray. Wood Buffalo is currently the fastest-growing municipality in Canada. Its population has doubled since 1999 and continues to grow at a rate of nine per cent per year.

Thanks to the oil sands, jobs are plentiful and salaries in Fort McMurray are high. In 2004, the median family income was \$120 000. Albertans often refer to the town as "Fort McMONEY." Rapid growth, however, has led to many civic problems (these will be discussed on page 43 of this resource guide, "Wildlife and People").

Giant Reserves of Oil

The amount of oil held in the Alberta oil sands is staggering, even if much of it will never be removable. About 1.7 trillion barrels of oil are contained in the sands.

There are already 174 billion barrels of oil on record as being profitably recoverable using current technology. This amount of oil is exceeded only by the identified reserves under Saudi Arabia.

As techniques for extracting oil are refined, and if extraction costs drop and prices rise, more barrels should become available. The British magazine *The Economist* (May 26, 2007) estimates that rising prices and lower costs alone could result in making an additional 141 billion barrels worth extracting. New techniques could open up even more production.

Most extraction currently takes place by open-pit mining, where the sands are dug up and then separated into their various components. The process of separation is a simple one that has been known for years. The sands are mixed with hot water and shaken; the water, sand, and bitumen (the crude oil portion) then separate. The process is both water-intensive and energy-intensive. It takes two to five barrels of water to produce one barrel of oil. At current production rates, producers use 17 million cubic metres of natural gas every day—enough to heat 3.2 million Canadian homes.

Only about 10 per cent of the reserves can be extracted in open-pit mining. The remainder of the oil sands, located far below the surface in porous rock, will have to be extracted by a much more complicated process, called *in situ* extraction. The costs associated with this process will be higher. Both methods have serious environmental consequences (see "The Environmental Impact," on page 41). *In situ* extraction causes far less surface damage than open pit mining. On the other hand, it requires a much greater expenditure of energy and produces far more greenhouse gases.

The Producers

As of May 2007, Alberta oil sands production was up to 1.2 million barrels of oil per day—an amount that, less than 10 years ago, experts predicted would

not be reached before 2020. Many now expect that Alberta oil sands production in 2020 will reach four million barrels per day—the same amount that Iran currently produces.

Today, there are 14 companies producing at least 5 000 barrels of oil per day (and many others producing smaller quantities) at 24 sites in the oil sands. Another 30 projects have been approved or are already under construction. While

there are many companies involved in extracting Alberta oil, three major companies are responsible for about two-thirds of the output. Suncor (in 1967) was the first company to become a serious investor in the oil sands. Syncrude followed in 1978. Together, these companies produce about 560 000 barrels per day. International giant Shell began working in the oil sands in 2002 and now extracts 160 000 barrels per day.

Analysis

1. What other resources are used in great quantities in oil sands extraction?
2. Briefly note the differences between open-pit and *in situ* extraction of the oil from the oil sands.
3. What are some of the possible results of Canada being in possession of such vast oil wealth?

THE OIL SANDS AND THE ENVIRONMENT

The Economic Impact

Did you know . . . Current regulations require companies to pay only one per cent in royalties until they have recovered all of the money required—billions of dollars—to set up operations. After that the royalty rises to 25 per cent of revenue. This formula was originally created to encourage oil sands development when oil was selling for considerably less per barrel and profits were much lower.

There is no question that oil sands development has—and will likely continue to have—an enormous economic impact on Alberta and the whole of Canada. Planned oil sands investment in Alberta will reach \$100-billion over the next decade. This will turn the region into one of the world's biggest suppliers of crude oil.

Investment has made Alberta very rich. Oil sands development has turned the province into Canada's economic engine. Its economy is booming at a time when Ontario, Canada's manufacturing centre, is in decline—especially hard-hit by cutbacks in the automotive industry.

With the boom has come a need for skilled and unskilled labour that is drawing workers from across Canada, but especially from the eastern provinces. Because oil production is expected to at least triple by 2020, the demand for workers is expected to continue. Meanwhile, the median income for workers in the oil sands has risen to become the highest in Canada. Companies, however, find that they are still unable to hire all the help they need at home in Canada and have begun aggressively recruiting foreign workers.

Alberta's Wealth

Thanks to oil, Alberta is now Canada's only debt-free province and is posting huge annual surpluses—about \$7-billion in 2006-2007. Much of the surplus is due to royalties that companies pay for the oil they remove from the ground.

However, an Alberta government panel report recently argued that those royalties are much too low and that rates should be increased. It also claimed that companies are not even paying the full amount they are now required to by

law—falling short by almost \$2-billion in 2006 alone.

In response, the government has announced that it will be bringing in legislation to change the royalty formula, beginning in 2009. As far as the oil sands are concerned, the increases will be significant, but tied to the price a company receives for its oil. Rates will now begin rising when the price of a barrel exceeds \$55, climbing to a maximum of 40 per cent of net revenue (note that the current price is close to \$100 per barrel). The old rate was fixed at 25 per cent. This could mean an additional \$1.4-billion for the Alberta treasury in 2010. The government says it will use the extra money for infrastructure projects—desperately needed in a booming province—and for savings.

Federal Reaction

The federal government has also been looking into its relationship with the companies involved in developing the oil sands. While resource development is a provincial responsibility, the federal government has assisted oil companies in past years by giving them significant tax breaks as they established themselves in the oil sands. According to the House of Commons Natural Resources Committee, these tax breaks are worth hundreds of millions of dollars annually. The Pembina Institute, one of Canada's leading sustainable energy research institutes, puts the value of tax breaks to oil and gas industries at \$1.4-billion per year.

The Natural Resources Committee has recommended that the tax break (called the accelerated capital cost allowance) be removed, phasing it out between

Did you know . . .

Many nations, including India, China, France, Abu Dhabi, and the United States, among others, have indicated a keen interest in buying into Canada's oil sands. Should Canada restrict ownership of the oils sands or should it invite foreign investment? Explain your position.

now and 2010. Environmentalists are especially keen to see this happen and hope the money gained will be redirected toward the development of clean energy resources.

This is not a move favoured by the oil companies, who have responded by threatening to reduce future investment in oil sands development. Nor is it favoured by the government of Alberta. That government believes that any slowing of oil sands development is a threat to the economies of both Canada in general and Alberta in particular. Ed Stelmach, Alberta's premier, was quick to point out that, over the next 20 years, the federal government can expect to

receive \$51-billion in taxes on Alberta oil—far more than they will gain by removing the tax break. He also points to the number of jobs for people from other provinces that will continue to be created by the industry.

Tax break or not, experts predict that the oil sands will continue to boom for years to come. The task of the governments of Canada and Alberta will continue to be a difficult one: to extract the maximum benefit for their citizens with a minimum of loss. Economy and environment both have a major role to play in determining policies and methods.

For Discussion

Experts agree that the high price of oil is going to continue for a long time for three main reasons: increased demand from developing countries (China and India especially), steady growth in demand from developed countries, and restricted supplies from traditional suppliers (especially in the Middle East). High prices are what make the oil sands a profitable investment. How big an effect is an increase in royalties or a decrease in tax breaks likely to have on future investment by major players in the international oil business? What government actions might make a company decline to invest in the oil sands? In your opinion, should governments be involved in oil sands issues? Explain.

THE OIL SANDS AND THE ENVIRONMENT

The Environmental Impact

Did you know . . .

Because natural gas is a relatively clean-burning fossil fuel, environmentalists are especially concerned to see it being used to produce one of the dirtiest fuels. And, even though it is “clean-burning,” natural gas does make a significant contribution to the increase of greenhouse gases in Canada’s atmosphere.

Quote

“Air pollutants from tar sands processing include not just greenhouse gases, but large emissions of nitrogen oxides, sulphur dioxide, volatile organic compounds, and particulates, causing smog, acid rain, and a variety of human health problems.”
— Herizens, Fall 2007

No one can deny the enormous environmental impact of Alberta’s oil sands development. A brief description of the mining process tells a large part of the story.

Destroying the Land

“In most cases, extracting oil involves chopping down the forest that blankets the region, draining the boggy ground, stripping off the topsoil, and literally digging up the oily sand below” (*The Economist*, May 26, 2007). The resulting open-pit mines are the current standard method and are planned for about 3 000 square kilometres of Alberta’s north. Another 35 000 square kilometres will see subterranean mines, where steam is pumped into oil sands deposits in porous underground rock, and the resulting slurry (a mix of water and fine particles) is pumped out to the surface.

The oil sands themselves are grains of sand surrounded by water and coated with bitumen, which is a complex and viscous hydrocarbon. On average, the tar sands are 85 per cent sand, five per cent water and 10 per cent bitumen. The overburden (the trees, muskeg, rock, clay, and soil) that covers the sands can be up to 75 metres thick. Once the landscape has been devastated, the task of actually extracting the bitumen from the sand begins. This requires large quantities of two other natural resources: water and natural gas.

The water is used to separate the bitumen from the sand, but first it must be heated. This is where the natural gas comes in—17 million cubic metres of gas per day. This gas is used to heat the two to 4.5 barrels of water required to produce one barrel of oil.

Fouling the Waters

The bulk of the water used in processing is drawn from the Athabasca River. Mining operations are currently licensed to draw 349 million cubic metres of water per year from the river. Only about 10 per cent of that water makes it back into the Athabasca. The rest is so polluted by the extraction process that it needs to be stored indefinitely in tailings ponds to keep it from re-entering the environment.

In the November 2007 issue of *Alberta Views* (www.albertaviews.ab.ca), writer Andrew Nikiforuk took a hard look at the tailings ponds. Describing their contents as having water “the consistency of toxic ketchup,” he reported that there are now almost a dozen ponds along the Athabasca. He also found that many were “leaking and creating their own toxic wetlands.”

In 2006, the World Wildlife Federation (www.wwf.ca) produced a report on the Athabasca River that pointed to threats from declining flows due to climate change and overuse by oil sands industries. The report found that flows, especially in the winter, will soon be insufficient to meet the needs of both oil sands production and the other “industrial, commercial, agricultural, municipal, and environmental users” (*The Globe and Mail*, November 13, 2006). The report recommends that no further projects be approved until substantial water conservation measures are introduced by the industry.

Polluting the Air

Not to be overlooked are the greenhouse gas emissions. Environment Canada has reported a 39.4 per cent increase in greenhouse gas emissions in Alberta

Further Research

One of the most important critics of oil sands development projects is the Pembina Institute. Its Web site is www.pembina.org. It has a site specifically devoted to oil sands matters at www.oilsandswatch.org.

Another critic is the Polaris Institute, with www.tarsandswatch.org specifically devoted to oil sands matters.

The Alberta government provides oil sands information at www.energy.gov.ab.ca/OurBusiness/oilsands.asp.

between 1990 and 2004. By 2005, Alberta had seven of the 10 biggest industrial polluters in Canada, and its industries ranked first in greenhouse gas production in the country.

Oil sands development is a major reason why greenhouse gas emissions have soared and why Canada's emissions are 30 per cent above its Kyoto target. In its report on the oil sands industry, the (U.S.) Natural Resources Defense Council noted that every barrel of oil sands oil creates three times as much greenhouse gas as a barrel of conventional oil. Not only is it more difficult to extract, it is also much more complicated to refine.

Inquiry

1. Briefly describe the general impact of oil sands development on the land, water, and air in Alberta's north.
2. In your view should oil sands development be halted or slowed until Canada has the technology to reduce its impact on the environment? Explain in detail.

Just over a year ago (January 2006), Pierre Alvarez, president of the Canadian Association of Petroleum Producers, (www.capp.ca) stated that the technology does not currently exist that would substantially reduce emissions in his industry. Both the federal and Alberta governments, however, have said that they will be setting emissions targets that will require real reductions in the amount of emissions produced per barrel of oil (intensity targets). The federal government has already given \$156-million to Alberta to study the feasibility of capturing carbon dioxide as it is emitted and storing it underground.

THE OIL SANDS AND THE ENVIRONMENT

Wildlife and People

Did you know . . . Aboriginal groups living in the Northwest Territories' Mackenzie River Basin depend on inflows of water from northern Alberta. They have complained to Alberta's energy regulators that oil sands projects are causing declines in water levels in the Slave River, which feeds Great Slave Lake. The NWT government is now insisting that it should have a role in assessing any new oil sands projects.

Environmentally speaking, the oil sands are situated in one of Canada's most important ecological regions. Their exploitation threatens a large part of Canada's boreal forest, potentially causing the destruction of an area the size of the U.S. state of Florida.

The Forest

In an open letter to Canadians, 1 500 scientists from 50 countries have asked the country to strengthen the protection of its northern forest. While oil sands development is not singled out as the only threat to the forest, it is seen as one of the major ones.

Why protect the forest? Scientists point to it as a home to millions of birds and to a network of predators and prey, including wolves and caribou. Further, its wetlands serve as a filter for the water that enters the area's rivers and streams.

Terry Root, a scientist at Stanford University, highlights the role the forest can play during a period of climate change (*The Globe and Mail*, May 14, 2007). Climate change may wipe out the usual habitat of many species. A protected forest, however, would provide a refuge for many plants and animals while the world reduces its greenhouse gas emissions to acceptable levels.

The Waters

Environmental damage to the area's waters is a matter of heated discussion among area residents. Oil companies insist that their impact on water in the rivers, especially in the Athabasca River, is minimal when compared with other human activity in the region.

Environmentalists disagree. They point to the huge amounts of water withdrawn annually by the companies—up to 349

million cubic metres—only a small percentage of which is returned to the river. This water is pulled from a river whose flows have already declined by about 20 per cent over the last 50 years and that may lose another 10 per cent thanks to climate change. Many experts believe that oil sands water use is not sustainable if the river is to meet the other needs of area residents.

Furthermore, a considerable amount of anecdotal evidence is pointing to oil sands pollution as a source of serious environmental damage to wildlife and to humans that rely on the river. Aboriginal communities are noting high rates of thyroid problems and of rare cancers. Fishers speak of large catches of deformed fish. Nicholas Kohler, writing in *Maclean's* (October 8, 2007), claims that the Athabasca is becoming too polluted to fish. "Even now, fish pulled from the Athabasca downstream of the oil sands taste of gasoline and smell of burning galoshes in the fry pan."

Some of this pollution may well be coming from the tailings ponds lining the river used to store the water fouled by the separation process. The ponds are so toxic that companies are forced to use propane cannons and scarecrows to keep birds from landing on them. Many are leaking and creating toxic wetlands in the areas surrounding them.

Too Big, Too Fast?

The rapid influx of new workers into the oil sands has created huge problems for the town at the centre of the area, Fort McMurray, part of the Regional Municipality of Wood Buffalo (www.woodbuffalo.ab.ca). Melissa Blake, the municipality's mayor, has bluntly assessed the situation. "The municipality

doesn't currently have the infrastructure such as roads, sewage systems, or social, education, and health-care services to cope with the growth. Neither, she says, can the landscape" (*The Globe and Mail*, February 27, 2007).

The Alberta government would seem to agree and has promised \$386-million in emergency funding for health care, affordable housing, and other services over three years. But the mayor and others argue that this is far too little to deal with the many problems the boom has created. These include:

- Water and sewage treatment plants unable to keep up with demands
- A shortage of hospital beds and health workers, including doctors
- An inflation rate that is the highest in the country

- A lack of affordable housing, forcing many oil sands workers to live in company barracks in camps
- A soaring crime rate

Much of the crime in Fort McMurray is blamed on rowdy workers who come to town after long hours in the oil fields to blow off steam. A frequently cited statistic is that drug abuse in Fort McMurray is more than four times higher than the Canadian average. *The Economist* (June 30, 2007) noted that "40 per cent of the workers test positive for cocaine or marijuana in job screening or post-accident tests." The job accident rate in the oil sands industry has risen by 17 per cent in the two years from 2004 to 2006. Many experts believe that drug abuse is a significant cause of this jump.

For Discussion

1. List some of the major problems associated with rapid oil sands development. Discuss which you feel is most important, and why.
2. Why do you think drug abuse might have become such a problem in Fort McMurray? What positive measures might the government and companies take to reduce the size of the problem?

THE OIL SANDS AND THE ENVIRONMENT

Activity: Making Choices

A recent poll by *The Globe and Mail* asked Albertans about the pace of oil sands development. The results showed that 48 per cent of Albertans felt the pace had been about right; 43 per cent, however, felt it had been too fast.

The concern of that 43 per cent is shared by many environmental groups and even by the review panel that approves all oil sands development in Alberta. On the other hand, the petroleum industry and the government of Alberta would like to continue or even accelerate the pace of industrial growth in the oil sands. Should a moratorium on further development be called until some of the environmental issues can be resolved and some of the problems solved? If so, which problems are critical and should be tackled first?

To Do

In small groups, discuss and answer the question: Should the Alberta government call a moratorium on future oil sands development? Compile a list of reasons why it should or should not take this action.

Whether or not your group agrees that the government should take action, it should prepare a list of those areas—social and environmental—that it feels most urgently need to be addressed by the governments and the petroleum industry.

Each group should present its results to the class and compare their decision and priorities with those of other groups.

In addition to the material presented in the video and this guide, you may wish to look at additional information before your discussion. Here are some research suggestions.

CBC: www.cbc.ca/news/background/oil/alberta_oilsands.html

Government of Alberta: www.energy.gov.ab.ca/OurBusiness/oilsands.asp

Pembina Institute: www.oilsandswatch.org

Polaris Institute: www.tarsandswatch.org

Canadian Association of Petroleum Producers: www.capp.ca/default.asp?V_DOC_ID=6

A CAPP publication: www.capp.ca/raw.asp?x=1&dt=NTV&e=PDF&dn=92079 (“Oil Sands Economic Impacts Across Canada”)

Athabaska Regional Issues Working Group: www.oilsands.cc/pdfs/2007%20RIWG%20Oil%20Sands%20Fact%20Sheet.pdf