Crude Co$ts

A Framework for a Full-Cost Accounting Analysis of Oil and Gas Exploration off Cape Breton, Nova Scotia

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> *"The GDP makes no distinction between a dollar spent on a Lennie Gallant CD or a dollar spent repairing a window smashed by vandals."*- GPI Atlantic Press Release (2001)
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> *"We might say that GDP, technically a measure of the rate at which money is flowing through the economy, might also be described as a measure of the rate at which we are turning resources into garbage."* David C. Korten, former advisor to the U.S. Agency for International Development (USAID)

The old measure:

Today, one of the yardsticks used to measure how well the economy is doing is The Gross Domestic Product (GDP). It is defined as the total quantity of all goods and services produced and the total money earned and spent. It makes no difference to the GDP *where* or on *what* the money is spent.

"The way our economy currently works, places like Chile are held up as a model and a beacon for development in the Third World," explains Ronald Colman, who heads up Genuine Progress Index Atlantic, an organization trying to measure the economy differently. "But in Chile, they've cut their trees, depleted their fish stocks, people are sprayed with pesticides, and child poverty and infant mortality has increased to levels of African countries."

Colman says the GDP sends inaccurate information because it counts only money exchanges. "Cleaning your house, taking care of your own children, voluntarily helping the elderly and disabled count nowhere in our measures of progress, but paying someone else to do these same things makes the GDP go up and is counted as progress."

Under the current economic system, events such as the Oklahoma City bombing or the Exxon Valdez oil spill off of Alaska for instance, were good for the economy. Clearly the GDP is not providing a true reflection of the real costs to the environment or to society as a whole. The concept of measuring what is truly happening in the economy isn't new. It has been evolving over the last 20 years as policy makers grew more disenchanted with the limitations of the GDP. Policy, is where Colman hopes these measures will make a difference.

"The GDP sends misleading signals to policy makers about the state of our environment and our natural resources, which are the true basis of our prosperity." For instance, Colman says the GDP counts huge fish exports and timber sales as growth but it ignores completely the depletion of our fisheries and forests – the natural capital on which that wealth is based. "This is simply bad accounting," remarks Colman. "Revenue Canada would never accept a business or household income statement that showed the sale of capital assets as pure profit."

The GDP, as a scorecard for economic policy, is a leftover from the Second World War when it was first introduced by Allied war planners. At the time, John Maynard Keynes, who played a central role in the British Treasury, penned a famous paper called "The National Income and Expenditure of the United Kingdom and How to Pay For the War." This was the groundwork for the GDP. But even then it was considered a crude indicator of a nation's welfare.

"If the GDP is up, why is America down?"

Over the last five decades it has become an end unto itself. Conventional wisdom holds that if the GDP grows, we all should benefit. But this isn't what is happening. "The more we spend the less satisfied we've become," says Colman. The economy, based on the GDP, is booming but this doesn't translate into a more prosperous and happier society. "This current measure can't make a distinction between what is good for society and what is bad."

In an article published in Atlantic Monthly (l995) entitled "If the GDP is Up, Why is America Down?" the authors questions just that. Clifford Cobb, Ted Halstead and Jonathan Rowe use the l994 US election to illustrate their point. They wrote that the strange gap between what economists choose to measure and what Americans experience became the official conundrum of the campaign. "Paradox of '94: Gloomy voters in good times," the New York Times proclaimed on its front page. "Boom for whom?" read the cover of Time Magazine. The article stated that the problem goes much deeper than the two-tiered economy that seems to be benefiting those at the top and not those at the bottom.

"It concerns the very definition of prosperity itself. In the apt language of nineteenth-century writer John Ruskin, an economy produces 'illth' as well as wealth; yet the conventional measures lump the two together," write the authors.

The new measure:

Cobb, Halstead and Rowe were in fact the ones who first developed the Genuine Progress Index in l995 which measured 26 variables. Here in Nova Scotia this is also happening. “We are examining 20 social, economic and environmental indicators to get a truer picture of our well-being and prosperity and to determine whether this region is sustainable over time,” explains Colman.

For instance, in a recent report, GPI Atlantic pointed out Nova Scotia has one of the highest levels of volunteer activity in the country and over a 10 year period beginning in l987 it’s declined by 7.2 per cent, costing the province $60 million a year in lost services – a decline being felt across the country. The report goes on to say the volunteer sector has been unable to bounce back and compensate for government cuts to public services.

"This loss is not counted in the GDP or in any of our measures of progress, even though it directly affects our quality of life and standard of living," says Colman, who penned the report. "Volunteer work is a tremendous asset to our society and economy, but is invisible in our conventional economic accounts because it is unpaid."

In another report, released last year involving crime in Nova Scotia, it was estimated that crime is costing the province $550 million a year in real economic losses to victims, public spending on police, courts and prisons and private spending on burglar alarms, security guards and surveillance systems. This amounted to $600 per person or $1,650 per household in l997. “Imprisonment is one of the fastest growing sectors of the US economy. It’s the largest employer right after General Motors,” says Colman. His report on crime illustrates that crime shouldn’t just be added to the GDP because it’s not a benefit to society. It should be seen as a cost.

One of the GDP's most glaring problems is its failure to place any value on natural resources, except while they are being harvested and sold. It portrays natural resource depletion as economic growth and a sign of progress and well being.

"Reliance on the GDP helps explain why the fishing industry appeared to be booming, with record catches, right up to the eve of the Atlantic groundfish collapse." – Ron Colman

However, if resource extraction is done unsustainably or with disregard for the potential impacts on ecosystems, health and the social fabric of communities, then the long term costs may very well exceed the short term gain by an order of a magnitude. The loss of species and the degradation of natural ecosystems, for instance, while invisible in the conventional economic accounts, represent a decline in natural wealth or an economic cost that will continue to effect future generations unless remedial action is taken.

1.1 Case Study: Exxon Valdez

The oil spill of the Exxon Valdez, an environmental disaster of unprecedented proportions, is perhaps one of the best examples of how incorrect our current accounting system is. In l989, the oil tanker spilled about one-fifth of its load or 10.8 million barrels (equivalent to 125 olympic sized swimming pools) of crude oil off the rugged coast of Alaska near Prince William Sound. Millions of marine mammals were killed and the area still has not fully recovered from the disaster. To date, $2.1 billion has been spent on the clean-up alone.

In l997, eight years after the spill, residents of Chenega Bay were still cleaning up the oil from the beaches. Ten years after the spill a report titled "Legacy of an Oil Spill" listed the state of many of the species that were affected by the ecological disaster.

Table 1 lists the status of many of these affected species to date. Please note that after ten years and billions spent in clean-up, only two species are known to have recovered.

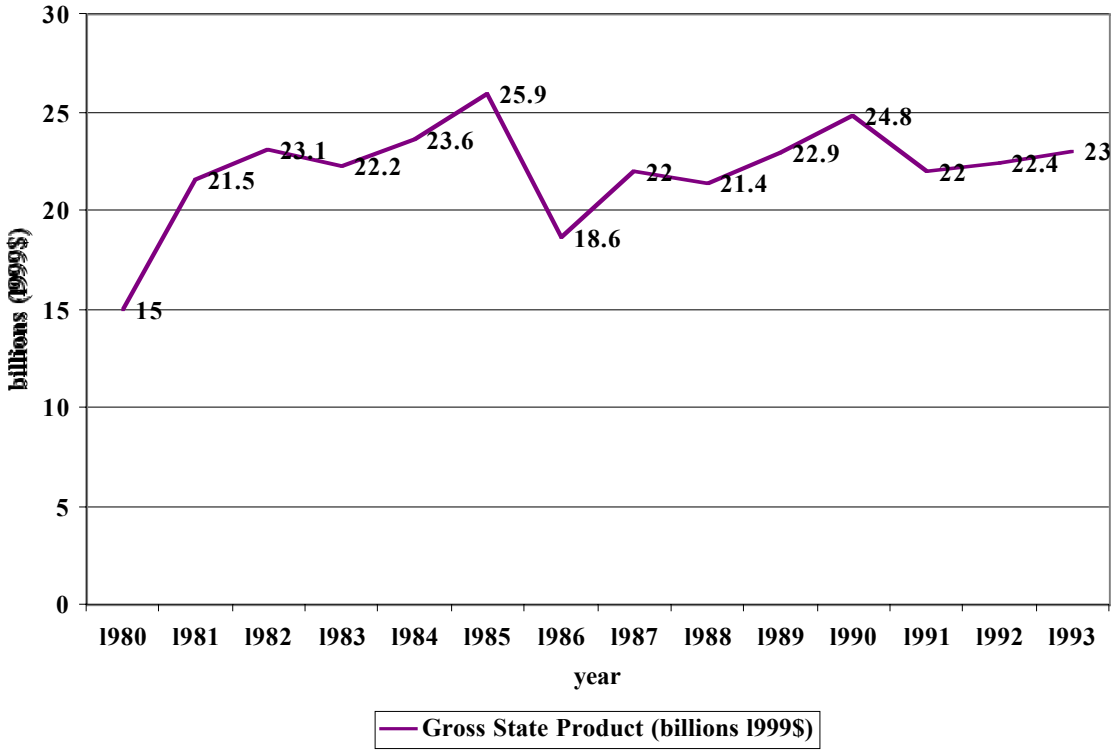
Table 1: Status of Species/Activities Ten years after the Exxon Valdez Oil Spill

NOT RECOVERING	RECOVERY UNKNOWN DUE TO LACK OF DATA	RECOVERING	RECOVERED
Common Loon 3 species of Cormorants Harbour seal Harlequin Duck Killer Whale Pigeon Guillemot	Cutthroat Trout Designated wilderness areas Dolly Varden Kittlitze's Murrelet Rockfish	Black oystercatcher Clams Common murre Intertidal communities Marbled murrelet Mussels Pacific herring Pink Salmon Sea otter Sockeye salmon Subtidal communities <u>Human Services:</u> Commercial fishing Recreation and Tourism Subsistence	Bald Eagle River otter

Source: Legacy of an Oil Spill, Ten Years after the Exxon Valdez. Internet. http://www.oilspill.state.ak.us/injury/injury.htm. Accessed Nov. 19/01

According to a report by University of Alaska Professor of Economics, Scott Goldsmith (1999), Alaskas GSP[1] experienced pronounced cycles in the 1980s and early 1990s. According to Goldsmith, these were the result of "the construction of an oil pipeline, the high oil prices of the early 1980s, and the Exxon Valdez oil spill in 1989." Figure 1.1 shows the total GSP for Alaska in 1999 dollars. Take note of the increase in GSP after 1989. [2]

Figure 1.1: Gross State Product for Alaska from 1980- 1993



Source: Goldsmith, Scott. 1999. *Alaska Gross State Product, 1961-1998*. Institute of Social and Economic Research, University of Alaska. Alaska Department of Commerce and Economic Development. Anchorage.

Over the last ten years more than $2 billion has been spent on the clean-up effort, an amount that would contribute to the States GSP. However, the costs of the spill – the

[1] GSP is the State counterpart of the Nation's gross domestic product (GDP). GSP for each State is derived as the sum of the gross state product originating in all industries in the State. In concept, an industry's GSP, or its value added, is equivalent to its gross output (sales or receipts and other operating income, commodity taxes, and inventory change) minus its intermediate inputs (consumption of goods and services purchased from other U.S. industries or imported).

[2] How the Exxon Valdez affected the US economy as a whole depends, for example, on whether oil spill cleanup workers were displaced from other activities, or whether new employment was created. What the example fundamentally illustrates is simply that many activities that contribute to GDP may signify a decline in well-being rather than an improvement (Walker 2001).

long-term damage to the ecosystems, the loss of marine life, the impacts on the viability of local marine populations, the impacts on existing industries such as the fishery and tourism, are all invisible. These costs have not been measured in economic terms. But economic measures that are truly representative of what is taking place in society must address these costs.

1.2 Full-cost Accounting

In l992, the Nova Scotia Round Table on the Environment and the Economy urged that full-cost accounting be adopted as the essential basis of any strategy of sustainable development for the province. This has not yet happened here in Nova Scotia. (Walker 2001).

The Genuine Progress Index uses full-cost and benefit accounting to evaluate alternative investment options and to monitor indicators of genuine progress in our society. The goal of GPI is to integrate the measurement of social, economic and environmental indicators to further sustainable progress, which includes the protection of natural assets (natural capital), and the maintenance of ecosystem services and functioning (Walker 2001, Wilson and Colman 2001, Charles 2001).

The value of clean air and water, rich biodiversity (terrestrial and marine), productive soils, and healthy societies cannot be appropriately described in monetary terms. Nevertheless, it is essential that when an ecosystem is degraded and no longer able to provide these benefits, this should somehow register in our economy. Monetization is therefore a necessary step if these values are to be adequately recognized in today's dominant economic system.

The principle of Full Cost Accounting should be used for any sustainable development strategy. "Sustainable" and "sustainable development" are tricky words that often get used to say very little, or even to cloak very "unsustainable" practices. When we say "sustainable development" in this report, we mean any development – resource extraction; jobs; change – that does not lead to long-term woes. Sustainable development does not contribute to the long-term decline of biological diversity. It blends social and economic progress to meet present needs without compromising the needs and dreams of future generations. The word "development" should also be broadened, according to Thomas Berger, the Commissioner for the Mackenzie Valley Pipeline Inquiry between l974 and l977. In his book about what lead him to conclude against the pipeline, Berger writes:

"*We need a broader definition of development. One that encompasses not only industrial activity but also the strengthening of the traditional subsistence economy. It is not an either/or proposition."*

"Sustainability is the original economy of the species."
– William D. Ruckelshaus

Full Cost Accounting requires that environmental and social benefits as well as costs be fully incorporated into the economic accounting system. There are three related processes included in full cost accounting:

- the valuation of non-market values
- the internalization of external costs
- the replacement of fixed with variable costs

Current oil and gas exploration, production, and use in Canada and indeed the world externalize costs. In other words, the true costs of those activities are not paid for today, but rather, are assumed by future generations. For intance, the costs associated with greenhouse gas emissions over the last fifty years caused by the burning of fossil fuels such as oil do not register as a cost anywhere in our current accounting system. However, the many unknown consequences of warming the earth will be paid at some point in the future, and many argue are already being paid by today's generation if natural disasters such as flooding or droughts are being considered.

In a report penned by The Maritime Awards Society of Canada regarding B.C Offshore Hydrocarbon development (2001), a number of potential costs are listed:

"On the negative side, there will be some adverse impacts on other sectors. Commercial fisheries will be excluded from zones around the rigs and platforms; seabed debris will accumulate; and the costs of shipyard and harbour space and other marine services could be expected to go up. Conceivably, but not necessarily, there may be losses in aboriginal and recreational fisheries, tourism and forestry (from which skilled labour may be siphoned off to better-paying employment on the rigs and platforms). Oil spills would, of course, affect various forms of sea-life and, at least temporarily, spoil the pristine beauty of the shoreline. At least in the short term, offshore activity will cause inflation in the local economy including the real-estate market. There may also be social dislocation costs."

An oil and gas operation that does not internalize costs (some listed above) today is placing a burden on the generations of the future who will have to deal with the consequences. These costs may involve lower productivity due to degraded ecosystems, health costs and societal costs.

To illustrate this point here are some steps which can be taken by any industry toward **internalizing** costs.

- reduce fossil fuel dependence
- reduce transportation distances for employees and finding closer markets, using local materials and hiring local employees
- reduce carbon emissions
- reduce air pollution
- reduce toxic effluents to water sources
- reduce damage to fish/mammal habitat
- reduce job related stresses and health costs

1.3 A Framework for future work

This report is not intended to be a full-cost/benefit study of the proposed oil and gas exploration in the Sydney Bight and Southern Gulf of St. Lawrence areas. It is intended, however, to set out a framework for such a study. The following chapters address those areas that have been identified as *concerns* expressed at the *Identification of Issues/Information Meetings* held in September-October 2001 by the Public Review Commission. These concerns have been organized and presented in this report to reflect the Genuine Progress Index approach.

Assessments of natural capital, sustainable industrial development and sustainable employment (and by extension, communities) provide the key ingredients to a comprehensive measurement of genuine progress in regards to the petroleum industry.

For a full GPI Study on the Petroleum Industry the following indicators of genuine progress would have to be addressed:

Ecological Indicators

-resource depreciation
-extent of marine protected areas
-extent of coastal habitat protection
-level of species (marine/bird) diversity
-level of toxic contamination
-level of discarded waste
-level of impacts on marine mammals
-extent of the internalization of costs

Socio-Economic Indicators

-level of sustainable, long-term employment
-level of exports
-concentration of wealth
-level of benefit to the local and nearby communities
-level of public accountability
-safety

A full-cost accounting analysis is by definition long-term. Therefore, such an analysis would have to consider not only seismic testing and exploratory drilling, but would have to address the true costs and benefits of all stages of petroleum activity.[3] In addition to the stages it

[3] According to Kenchington's report (l999) the stages of petroleum activity that must be addressed are exploration, development,

would also have to address the *upstream, midstream and downstream* costs. [4]

In light of the limitations outlined in the *Terms of Reference,* this report has focussed primarily on seismic exploration and exploratory drilling, however, some attention has also been paid to petroleum development and production.

"So this is the start of the process. If you allow the seismic in, okay, you are starting down the road hopefully to full-scale development. People don't shoot seismic just to have a picture on their wall. They shoot it to get drilling targets. They drill to find commercial quantities of oil and gas and they take that to market."
-Jim Livingstone K2 Energy (The Battle at our Shores, 2001)

It is also clear from the *Report of Concerns (*2001) that the impacts of petroleum development are very much on the minds of Cape Bretoners.

"*The Commissioner has also included three additional topics: Petroleum Development and Production, Policy Issues, and issues related to the Review itself. Although these matters lie outside her authority to examine, the Commissioner concluded that, because the terms of reference require her to report on 'the views of the general public and interested parties,' they should be included as part of these proceedings."*
–Public Review Commission (2001)

A full GPI analysis would help policy-makers distinguish between the real costs and benefits of different options. One option that might seem to generate considerable economic activity coupled with positive GDP growth in the short-term may have such great social and ecological costs (invisible in our current accounting system) that in the long-term a net negative impact is produced.

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production and decommissioning. "Each of those has unique impacts and the effect of the leasing on the environment cannot be assessed until all four have been considered."

[4] Upstream includes exploratory drilling and seismic as well as production. Midstream includes distribution systems (ie.pipelines, tankers) that connect the producers with the consumers. Downstream includes the refinement of the oil and gas as well as all the products formed from them. Gasoline is the most important downstream product, accounting for 40% of all downstream sales in l997 (Bott l999).

Chapter 2 Precautionary Principle: Shining a bright light on science

Inevitably, the assessment of economic values for ecosystem services is an imprecise science, and predicted long-term changes caused by current practices are uncertain. When future impacts are uncertain but *potentially* damaging and even irreversible, the Genuine Progress Index follows the "precautionary principle." This widely accepted dictum, enshrined in the Nova Scotia Environment Act,[5] in Canadas international committments and more recently in a Supreme Court of Canada ruling,[6] holds that scientific uncertainty must not be a cause for inaction when there is the potential for serious environmental damage.

"*The precautionary principle flows directly from the underlying principle of sustainability that is the underlying framework of the GPI. The essential components of any definition of sustainable development are that we live in such a way that the next generation will not be worse off than we are and that we live within the capacity of the natural world to provide essential resources and to assimilate human waste." (*Walker 2001)

From this perspective, the precautionary principle simply means viewing any potential oil and gas exploration from the perspective of our children rather than ourselves.

In a recent Memorandum of Understanding between the Canada-Nova Scotia Offshore Petroleum Board and the Department of Fisheries and Oceans, the "Precautionary Approach" was recognized as consistent with Canada's Oceans Act as well as other relevant legislation. It was also listed as one of five "principles of cooperation" to "guide the actions of the CNSOPB and the DFO" (CNSOPB 20001).

[5] The Nova Scotia Environment Act, Part One, Section 2 (b)(ii) states: "The precautionary principle will be used in decision making so that where there are threats of serious or irreversible damage, the lack of full scientific certainty shall not be used as a reason for postponing measures to prevent environmental degradation."

[6] In l991 the town council of Hudson, Quebec passed Bylaw-270, banning the use of pesticides for aesthetic reasons. Pesticides could only be used in the cases where the insects, animals, or plants constituted a danger to humans. Farms were exempt from the By-law and golf-courses were given a five-year reprieve. In l992 two companies, Spraytech and Chemlawn, were cited with violating the By-law. They sued the municipality saying the chemicals could not be banned since they were already approved for use by the Federal government. The two companies lost the case and have since appealed the case twice, the last time in the highest court of the land. In a landmark decision on June 28, 2001, seven justices of the Supreme Court of Canada unanimously ruled that local authorities have the right to ban the use of residential pesticides. In the ruling the court cited the international law known as the **precautionary principle**, a "better safe than sorry" approach that says protective measures can be implemented without full scientific certainty when there are threats of serious or irreversible damage to the environment.

The Rio Declaration from the 1992 United Nations Conference on Environment and Development, also known as Agenda 21, states:

"In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation." – Agenda 21 (cited in Raffensperger and Tickner 2000)

In 2000, the federal government began looking at ways to uniformly use the precautionary approach. The Privy Council and a number of federal departments – including the Department of Fisheries and Oceans, Environment Canada, Industry Canada, Health Canada and Natural Resources Canada – chronicled their discussions in a document titled "A Canadian Perspective on the Precautionary Approach/Principle." The paper is posted on several government Websites, along with requests for public feedback.[7]

"Even though scientific information may be inconclusive, decisions have to be made to meet society's expectations that risks be addressed and living standards maintained," reads a pamphlet about the new precautionary principle initiative (Privy Council, 2001). While government use of the precautionary principle itself isn't new, the principle is playing a growing role in government policy-making.

The litmus test for knowing when to apply the precautionary principle is the combination of threat of harm and scientific uncertainty. Some would say the threat of harm must be serious or irreversible, but others point out that this does not allow for the cumulative effects of smaller impacts.

According to an article penned by David Appell in Scientific American (2001), the precautionary principle can be summed up this way: "When an activity raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause and effect relationships are not fully established scientifically." He points to the fact that while it has been taken up by the international community, it is also being accepted more widely in the United States. New Jersey Governor Christine Todd Whitman in a speech to the National Academy of Sciences in Washington, D.C, October 2000:

*"Policymakers need to take a precautionary approach to environmental protection…We must acknowledge that uncertainty is inherent in managing natural resources, recognize it is usually easier to prevent environmental damage than to repair it later, and shift the burden of proof away from those advocating protection toward those proposing an action that may be harmful." (*Appell 2001)

[7] The document can be found on the Privy Council Website at: http://www.pco_bcp.gc.ca/raoics_srdc/default.asp?Language=E&Page=precaution

According to Carolyn Raffensperger and Joel Tickner, editors of the book *Protecting Public Health and the Environment: Implementing the Precautionary Principle*, instead of asking what level of harm is acceptable, a precautionary approach would ask instead: How much contamination can be avoided? What are the alternatives to this product or activity, and are they safer? Is this activity even necessary?

The precautionary principle focuses on options and solutions rather than risk. It forces the initiator of an activity to address fundamental questions of how to behave in a more environmentally sensitive manner. The precautionary principle also serves as a "speed bump" to new technology, ensuring that decisions about new activities are made thoughtfully and in the light of potential consequences.

Chapter 3 Oil and Gas Primer

3.1 Science of Seismic

Seismic exploration is a way of probing beneath the ocean floor using sound. Basically, seismic surveys allow the oil and gas industry to create a "picture" of the rock formations commonly to depths of 10 km beneath the seabed.[8] Certain types of rock are associated with oil and gas.[9]

The way it works is the ocean is divided up into vertical and horizontal blocks, then a ship, towing a series of air guns, travels along these mapped lines.

"It's quite a formidable object," says Doug Gregory, describing the boat. He's the Manager of East Coast Operations for Shell Canada Inc. He says a typical boat can have 6 to 8 seismic streamers behind it, 100 metres apart, and up to 7.5 kilometres long.[10]

The air guns, at a depth of about 6 metres, emit sound explosions (by electical discharges or compressed gas) at regularly timed intervals (every ten seconds or so for 20-30 days[11])[12] which are reflected back from the seabed at different levels and at different speeds by different types of rock formation. Behind the air guns, these "streamers," filled with hundreds of underwater microphones called hydrophones, receive the sound reflected by the rocks beneath the sea bed. In shallow waters the hydrophones may be laid directly out on the sea bed.[13] The hydrophones convert the reflected sound into electrical impulses which are transmitted along the streamers back to the ship where they are digitally recorded and interpreted using computers and specialized software.

The result: a 3D representation of the rock structure below the ocean floor.

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[8] Data from a single line of hydrophones can give a 2D picture. Corridor Resources Inc. is planning to collect 2D data. 3D or even 4D views of the sub-sea structure are also possible. Hunt Oil and TotalFinaElf are planning 3D seismic. The 4D technique involves shooting 3D seismic repeatedly, at intervals months or years apart (Petroleum Communication Foundation).

[9] According to the Petroleum Communication Foundation limestone and sandstone are typical oil and gas traps. In a typical "trap," gas accumulates on top of the reservoir as a "gas cap" over the "oil leg" which in turn lies above the water-saturated zone. Traps are formed when these saturated porous rock types are surrounded by impermeable rock formations such as shales. Below the seabed in Eastern Canada, the "salt dome" is a common oil and gas trap. Oil and gas get trapped in the folds and along the faults above the dome and within porous sandstone along side of the dome (www.pcf.ab.ca).

[10] Doug Gregory, spoke at: Oil and Gas Offshore Nova Scotia," A Panel discussion at St. Mary's University, Halifax, Nov. 5/2001. The panel included geologists, industry representatives and a spokesperson from the research/academic sector.

[11] In a Canadian Press article (May 28, 2001) Glen Miller of Hunt Oil was quoted as saying that the company would take steps to minimize impacts of seismic during the 20-30 day survey. He described how the boat towing up to 30 air guns would probe 580,000 kilometres of ocean floor in the Sydney Bight.

[12] At this rate (one shock wave every 10 seconds for 30 days), one air gun would emit approximately 259,200 blasts in a 30 day period. Thirty air guns (the scenario described by Hunt Oil representative Glen Miller) would produce nearly 8 million sound explosions.

[13] Information obtained from the Petroleum Communication Foundation Web site: http://www.pcf.ab.ca

Gregory says that with new seismic, they only get 30 per cent accuracy. "What that invariably means is most of the time we'll be wrong. We really don't know until we drill."

Good descriptions of seismic survey vessels and equipment specifics as well as types of seismic surveys (2D and 3D) can be found in Davis et al. (l998).

What is the intensity of the sound being produced by seismic air guns?

A sound pulse generated by a single air gun is typically 226 decibels (dB)[14] or 242-252 dB for an array. Both low and high frequencies (measured in Hertz)[15] are produced by the air gun, even though it is primarily the low frequency sound, which travels further in the marine environment, that surveyors are interested in.

There is no simple way to compare the intensity of an underwater sound with its equivalent in air because the standard reference pressures used in underwater and in-air acoustics are not the same. In other words, 140 dB in air (where sound becomes painful to the human ear) is not the same as 140 dB in water. A jet engine, for instance, is 140 dB at 1 metre. When a conversion factor is applied, it is equivalent to 202 dB underwater.

An in depth discussion regarding the physics of sound propagation in water is not within the scope of this report. However, it should be noted, that regardless of how the formulas for measuring sound intensity were derived (and how they differ for air), measuring sound intensity in water is no easy task. Numerous factors have to be considered when determining how the noise produced by a seismic vessel will travel through the ocean. Wind, water depth, water temperature, and ocean bottom types must all be considered in order to accurately define how sound will propagate (McCauley et al. 2000). To make matters even more complex, the composition of the seabed to at least 50-100 metres below the seafloor might also be necessary to determine how sound propagates horizontally. According to McCauley et al., (2000) whose recent study looked at the implications of seismic on humpback whales, sea turtles and the fisheries near Australia, the role the ocean floor plays in the propagation of seismic shouldn't be underestimated. "Seabed properties are known to be crucial in horizontal sound propagation. Sound energy from an in-water noise source may reflect directly off the bottom or may enter the bottom and be reflected or refracted back into the water."

[14] Decibels are logarithmic units used to measure the intensity or power of a sound and because the dB scale is relative, reference pressure levels (1 micropascal in water and 20 micropascals in air) and reference intensity levels are necessary in order to make the dB values meaningful.

[15] Increase in frequency corresponds with an increase in pitch. Humans can hear sound waves whose frequencies are between 20 and 20,000 Hertz.

Table 2 lists some of the natural and human-made noises produced beneath the ocean and the intensity of the sound they produce. Note that a seismic air gun array is louder than a lightening strike (at one metre) but quieter than a seafloor volcanic eruption.
Blue Whales, for instance, the largest creature on earth, probably produce the loudest sounds of any animal. Their calls, lasting about 15 seconds have a source level of 160-188 dB.[16] According to The Whale and Dolphin Conservation Society, these low frequency sounds are very well adapted for long range transmission, but are still "nowhere near as powerful as the sounds produced by air guns."

Table 2: Natural and human-made source noise comparisons

NOISE SOURCE	MAXIMUM SOURCE LEVEL (DB)*
Undersea earthquake (4.0 on the Richter scale)	272
Seafloor Volcano Eruption (massive steam explosions)	255 +
Seismic Air gun Array	**255**
Lightening Strike on Water surface	250
Seismic exploration devices	212-230
Container Ship (274 metres long/travelling at 23 knots)	198
Supertanker (340 metres long/travelling at 20 knots)	190
Blue Whale (vocalizations)	160-188
Fin Whale (vocalizations)	155-186
Offshore Drill Rig	185
Offshore Dredge	185
*Humpback Whale(*fluke and flipper slaps)	175-180
Bowhead Whale (vocalizations)	152-180
Right Whale (vocalizations)	172-175
Gray Whale (vocalizations)	175
Open ocean/Ambient Noise	74 - 100

[16] Information from http://www.wdcs.org

Source: Ocean Acoustic Observatories Alternate Source Test. http://www.fas.org/man/dod-101/sys/ship/acoustics/htm
*These are the levels that would be measured by a single hydrophone (reference 1 micropascal @ 1 metre) in the water.

The potential impacts of seismic surveying on marine life will be discussed in detail in Part 2 of this report.

3.2 Exploratory Drilling

Exploratory drilling happens in stages. In the first stage, a revolving steel bit at the bottom of a length of pipe bores a hole through sediments and rock. For added strength, the drill bit is sometimes studded with tungsten carbide or industrial diamonds. This surface drilling – to depths of 60 to 400 metres – is called "spudding in" the well.[17]

In the next stage, drill crews insert steel pipe casing into the well hole. The casing is cemented in place to prevent the well from caving in. Because oil and gas deposits are under pressure, drill crews install large valves, called blowout preventers (BOPs), at the top of the well casing. The valves help keep natural gas pressure and fluids within the well, and also stop seawater from entering.

Next, workers may drill several kilometres before hitting oil and/or gas deposits. During this drilling, a fluid called "drilling mud" – a thick, heavy emulsion of chemicals and minerals – is used to lubricate the bit, control pressure within the hole, and flush rock chips or drill cuttings to the surface. Drill cuttings are pieces of pulverized rock broken free by drilling; they have the consistency of silt or sand.

As the drill begins to move more quickly and easily through the rock, traces of natural gas and oil often begin to turn up on cuttings that are flushed to the surface. One way to determine how much oil or gas might be extractable is to perform a "drillstem" test. During this test the drill bit is replaced with a tool that captures a sample of liquids or natural gas. The sample shows what volume and quality of oil or gas the well has tapped, as well as its pressure and rate of flow.

If tests show the well cannot produce commercially viable quantities of oil or gas, workers plug the hole with cement and abandon it as a "dry hole." Wells can also be capped until full production facilities arrive.

Times vary on how long exploratory drilling wells can take. CEF Consultants peg the time from three to nine months. Shell Canada's manager of East Coast operations, Doug Gregory, says one well can take anywhere from one to three months. The entire process – including several exploratory wells – can take three to five years, he said (D. Gregory pers. comm. 2001).

[17]Except where otherwise noted, all information about exploratory drilling is taken from:
CEF Consultants Ltd. 1998. *Exploring for Offshore Oil and Gas.* Halifax.
And, the Petroleum Communication Foundation. 1999. *Canada's East Coast Offshore Oil and Gas Industry, A Backgrounder.* Calgary.

3.2.1 Drilling Mud

Drilling mud is a vital – but messy – component of exploratory drilling. Two types of muds are used in offshore operations. *Water-based mud* is made of clay, water, chemical additives and the mineral barite (barium sulphate) to add weight. Chemical additives include starch, lime, soda ash, or sodium bicarbonate. *Oil-based mud* is comprised of mineral oil, chemical additives and barite. A third type of *synthetic mud* has been developed as a replacement for oil-based mud, which is environmentally damaging. Synthetic mud is not yet widely used.

Canadian regulations permit dumping of water-based drilling mud. When it is no longer useful for drilling, the mud is typically dumped into the ocean in bulk discharges of roughly 500 cubic metres. Drilling a single well can create 6000 cubic metres of mud and cuttings, which are also coated in drilling mud.

Canadian regulations do not permit the dumping of oil-based mud, which has to be shipped to land, or reinjected into the well. Cuttings covered in oil-based mud, however, can be dumped overboard, as long as they contain a maximum (dry weight) 15% mineral oil.[18]

Rock cuttings from a typical well can add up to 300 to 1200 cubic metres. Mud *and* cuttings can add up to 3200 cubic metres per well. "While the environmental footprint at a wellsite is relatively small, being confined to the vicinity of the drilling operation, the environmental impact near the rig can be significant."[19]

Other wastes from exploratory drilling include:

- blow-out preventer fluid
- excess cement slurry from washing equipment
- cement, mud and cuttings released when the drill is pulled up
- test fluids from wells
- accidental discharges of cements or drill muds
- deck wash containing traces of oil, hydraulic fluid and other fuel used on the rig
- waste from onboard laboratories
- sewage and wastewater from crew
- waste from painting, such as sandblast sand, paint spray and chips
- formation water (called *produced water* during full production drilling). This water is salt water from the hydrocarbon-bearing rock formations. It contains nutrients and sometimes, dissolved metals and radioactive material from rocks

[18] The German, Dutch, Danish and Norwegian governments forbid any dumping of cuttings from oil-based mud drilling (Kenchington 1997).

[19] Schlumberger Ltd. 2001. "The Many Roles of Drilling Fluids." Available at http://www.slb.com/seed/watch/mud/char.html Recent Canadian studies say the "environmental footprint" from exploratory drilling is much bigger than previously thought. Environmental monitoring during exploratory drilling on Georges Bank in 1981-82 found increased levels of barium in sea sediment far from the drill site. The level of barium doubled at a site 35 kilometres from drilling, and rose by six times at a monitoring site 65 kilometres away (Kenchington 1997). Kenchington cites similar examples of wide-spread effects from tests in the North Sea's East Shetland Basin, and Sable Island Bank.

- air emissions from rig machinery and support vessels

3.2.2 Accidental Spills

"All oil and gas is risky. It's a risky business," says K2 Energy's Jim Livingstone, who adds that while equipment today is much better than in previous decades, there's always a chance for error. Blowouts – when pressure blasts hydrocarbons to the surface – are the biggest risk. "It'll blow out the bottom of the ocean floor if they hit pressure it can't handle" (J. Livingstone pers. comm. 2000). Such blowouts are rare – occurring roughly one per cent of the time – but destructive.

A blowout during exploratory drilling north of Sable Island in 1984 took nine days to control, releasing natural gas and 240 cubic metres of condensate – a light, gasoline-like oil.

PART

2 Natural Capital

AND THE IMPACTS OF OIL AND GAS DEVELOPMENT

Chapter 1 Natural Capital and the Value of Ecosystem Services

"*Because ecosystem services are not fully 'captured' in commercial markets or adequately quantified in terms comparable with economic services and manufactured capital, they are often given too little weight in policy decisions…The economies of the Earth would grind to a halt without the services of ecological life-support systems, so in one sense their total value to the economy is infinite." (*Costanza et al. 1997)

Money, assets and accumulated wealth are all forms of capital. When a company starts up a business, capital, in the form of money or machinery, are needed. A great deal of wealth is also stored in natural resources or in "natural capital." Natural capital has been shown to be the source of a very large portion of human economic wealth. The fundamental approach used in the GPI is to value all ecosystems and resources as natural capital assets that perform a wide range of interconnected ecological, social and economic functions and provide both direct and indirect services to human society and the economy *(Wilson and Colman 2001).* These assets are also subject to depreciation, just as manufactured capital is, with two important caveats. First, unlike manufactured capital, the services provided by renewable natural capital can be sustained over time, and there is therefore no inherent reason for forests, soils, fisheries and water resources to depreciate if they are used responsibly. Secondly, again unlike manufactured capital, lost ecosystem services are frequently irreplaceable, as for example when species become extinct. Nevertheless, it is completely appropriate to consider resource depletion and degradation as a depreciation of value from an economic point of view (Wilson and Colman 2001).

As was discussed in Part 1, natural resources usually only register in our current accounting system when they are extracted or used. They are treated as a cheap source of capital to be used for short-term economic gain. However, natural resources and ecosystems as well as the services they provide are valuable capital assets and should be recognized as such. Their value should register in our economy and their careful use, akin to spending only the interest while safeguarding the principal, would ensure sustainability of natural systems and provide goods and services in perpetuity.

One of the most comprehensive attempts to calculate the value of ecosystem services appeared in the journal Nature in 1997. Drawing from a number of previous studies, an international team of scientists headed by Robert Costanza of the Maryland Institute of Ecological Economics proposed[20] a comprehensive figure that would cover the costs of 17 categories of ecosystem functions and services ,[21] traditionally regarded as free. The report estimated that the annual value of all ecosystem services is somewhere in the range of US$16-$54 trillion, with an estimated average of US$33 trillion. This number is almost twice the total gross domestic product for all the countries on Earth combined. A number so large, it is nearly unimaginable. However, the authors describe the calculation as "crude" and "conservative."

"Economic estimates ignore the fact that many ecosystem services are literally irreplaceable." - *Costanza et al.*

According to Costanza et al. (l997) the world's ecosystems provide the following goods and services:

1. gas regulation
2. climate regulation
3. disturbance regulation
4. water regulation
5. water supply
6. erosion control and sediment retention
7. soil formation
8. nutrient cycling
9. waste treatment
10. pollination
11. biological control
12. refugia
13. food production
14. raw materials
15. genetic resources
16. recreation
17. culture

Costanza devised a classification scheme whereby estimates were made for each of the 17 categories of services for the entire range of environments on earth, including both marine and terrestrial environments. The authors' estimates indicate that coastal environments, including estuaries, coastal wetlands, beds of seagrass and algae, coral reefs and continental shelves are of disproportionately high value. They cover only 6.3% of the world's surface, but are responsible for 43% of the value of the world's ecosytem services or US$ 14 trillion annually.[22] Table 3 lists some of the primary goods and services provided by coastal ecosystems. According to Constanza, these environments are particularly valuable in regulating the cycling of nutrients which

[20] The international group of scientists used replacement values and contingent valuation methods to determine the values. Replacement values seek to assess what it would cost to replace nature's free services with human engineering or other works. Contingent valuation methods are used to assess people's "willingness to pay" for these services.

[21] Ecosystem functions are the physical, chemical, and biological processes or attributes that contribute to the self-maintenance of an ecosystem; in other words, what the ecosystem does. Some examples of ecosystem functions are provision of wildlife habitat, carbon cycling, or the trapping of nutrients.
Ecosystem services are the beneficial outcomes, for the natural environment or people, that result from ecosystem functions. Some examples of ecosystem services are support of the food chain, harvesting of animals or plants, and the provision of clean water or scenic views.

[22] Coastal environment estimate based on the average value of ecosystem services (US$ 33 trillion/yr).

control the productivity of plants on land and in the sea.

The authors of the seminal study acknowledge the huge uncertainties involved in their estimates but also suggest that the values are probably on the low side. "This is because improving the estimates, by for example, studying more ecosystem services more intensively, would likely increase their value," writes Constanza.

"Because ecosystem services are largely outside the market and uncertain, they are too often ignored or undervalued, leading to the error of constructing projects whose social costs far outweigh their benefits." - Constanza et al.

Table 3 Primary Goods and Services Provided by Coastal Ecosystems

GOODS	SERVICES
❑ food: fish, shellfish, seaweed ❑ fishmeal (animal feed) ❑ raw materials ❑ seaweeds (for food,industrial and other uses) ❑ salt ❑ genetic resources	❑ moderate storm impacts ❑ provide resident wildlife (marine and terrestrial) habitat ❑ provide habitat for transient wildlife populations ❑ maintain biodiversity ❑ dilute and treat wastes ❑ regulate the cycling of nutrients ❑ provide harbours and transportation routes ❑ provide human habitat ❑ provide employment ❑ contribute aesthetic beauty and provide recreation ❑ provide opportunities for non-commercial uses

Source: Constanza et al (l997); World Resources Institute, 2000.
http://www.wri/org/wr2000/goods_and_services.html

A full-cost accounting analysis of inshore oil and gas development must therefore take ecosystem services and functions into account. In order to do this, there must first be knowledge of what natural capital assets currently exist. Then, there must be an assessment of how oil and gas development (from exploration to decommissioning or depletion of a finite resource) would impact this natural capital.

"Whatever value one may choose to assign natural capital, zero is surely the wrong answer." – Hawken et al. (l999)

Generally, the success of the oil and gas industry is determined by the quantities of oil and gas extracted. But how will oil and gas development near Cape Breton effect natural capital? If ecosystem services and functions were monetized, to the extent that they can be, then the intrinsic value of the ocean's fish stocks, biological diversity and habitats would be analogous to a savings account from which the interest could be harvested every year. Will oil and gas development lead to the depreciation[23] of this natural capital?

[23] In the late l980s we had an increase in fisheries GDP while we were catching, selling and exporting more fish. However, we were simultaneously depleting the fish stocks, the natural capital. This is called resource depreciation and is analagous to what happens as business capital stock wears out over time.

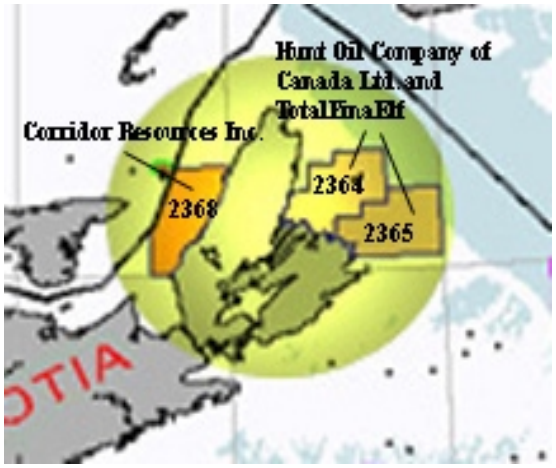
Chapter 2 Ecosystems and Biological Diversity within and adjacent to permit areas

"Understanding the geography of biological production is essential in assessing the potential threat of oil and gas exploration, exploitation and transportation activities on living resources" *(Loutfi l973).*

For the purposes of this report, information regarding the chemical and geological profile of the ocean adjacent to Cape Breton will not be discussed. Description of seafloor compostion, water temperatures, ice formation, turbidity, salinity, and nutrients, as well as detail with respect to ocean currents, tides, water layering and wind in the southern Gulf of St. Lawrence and Sydney Bight areas can be readily found elsewhere. The St. Georges Bay Ecosystem Project (GBEP) at St. Francis Xavier University (Davis et al. 2000) and the Natural History of Nova Scotia Volumes I and II (Davis and Browne l996) are excellent sources of this information. This chapter will focus on describing some of the geographic regions as they relate to biological diversity [24] present in the permit areas. Please note, however, that a complete description of biodiversity in these areas is also beyond the scope of this study.

[24] Biodiversity means the variety of life on Earth. It is measured as the variety within species (genetic diversity), the variety between species, and the variety of ecosystems.

Map: Oil and Gas permits adjacent to Cape Breton



2.1 Southern Gulf of St. Lawrence (permit # 2368)

On the western shoreline of Cape Breton running from Port Hood to Cheticamp and twenty miles west into the Gulf of St. Lawrence, Corridor Resources Inc. has a permit (#2368) covering 240,000 hectares (600,000 acres) of seabed.

The sea-bottom, or benthic, habitat in St. Georges Bay and along the western edge of Cape Breton is part of the Magdalen Shelf and is bounded to the east by the Cape Breton Trough (Davis et al. 2000). As the name suggests, the seabed drops off in some places forming a trough and is relatively deep. For instance, depths within the Cape Breton Trough range from 18 m to 140 metres (Davis et al. 2000). Near Cheticamp and Pleasant Bay, water depths range from 50-60 metres (Davis et al. 2000).

Three types of beaches dominate the Cape Breton coastline from Port Hood to Pleasant Bay. These are barrier beaches, which are located where major rivers empty into the ocean; pocket beaches found between cliffs; and limited cobble, or shingle beaches located beneath cliff areas (Davis and Browne 1996). In addition to beaches, there are true sand dunes at Mabou Harbour, Port Hood, and Aspy Bay. The most well-developed dunes on Cape Breton's west coast are located at Inverness (Davis and Browne l996) where "copious sand supply coincides with strong on-shore winds."

There are also a number of islands off the western coast of Cape Breton. Islands are of particular importance to wildlife as many of them provide unique habitat. The islands in or adjacent to parcel 1 are: Henry Island, Port Hood Island, Margaree Island (also called Sea Wolf Island, a national wildlife area), and Cheticamp Island.

Five major estuaries[25] can be found along the western shore of Cape Breton

[25] Estuaries are partially enclosed, tidal areas receiving fresh and saline waters, with associated habitats. Some key habitats associated with

within the permit area. These are the Margaree River (a heritage river and important Atlantic Salmon river) which empties at Margaree Harbour , Cheticamp River which empties near Grande Falaise, Broad Cove River which empties at Inverness, and the Grande Anse and MacKenzie Rivers which both empty near Pleasant Bay (Davis et al. 2000; Davis and Brown 1996).

Wetlands in estuaries rank with coral reefs as the most productive ecosystems in the world. In this type of species-rich ecosystem, a few species of plants grow very quickly, providing food and nursery areas to a wide variety of animals. These environments would be among the most sensitive to oil spills, since they are highly productive and biologically diverse.

According to Loutfi (l973), the main production system in the Gulf of St. Lawrence is driven by the vertical mixing of nutrient-rich deep waters, which are essential for plant production.[26] This high level of plant production gives way to high levels of marine animal production in the southern Gulf of St. Lawrence and Magdalen Shallows (also known as the Magdalen Pocket (Davis and Browne l996)) (Loutfi l973). Animal Plankton in turn supports fish species (commercial and non-commercial) in that area.

2.1.1 The Magdalen Shallows

The Magdalen Shallows, as the name suggests, is a shallow enclosed sea with depths averaging less than 80 metres. Shallow waters mean warmer waters – the warmest marine waters in Canada supporting several kinds of algae that are commonly found in the Virginian Marine Region, as well as a relict population of oyster (Mondor et al. 1995).

estuaries are saltmarshes, mudflats, and seagrass beds.

[26] Production here is defined as the quantity of living matter produced mainly by growth and reproduction per unit time.

Map: Magdalen Shallows

In l973, M. A Loutfi, professor with McGill University's Department of Economics, assisted by a multidisciplinary team, authored a book titled *Canadian Maritime Oil Exploration, Exploitation, and Transport: A Multidisciplinary Study.* The report, prepared for Environment Canada, provided a comprehensive look at the environmental implications associated with oil and gas activities in seven regions of Canada. The Gulf of St. Lawrence area was one of them. According to Loutfi, the Gulf of St. Lawrence is far too valuable to place in harms way. He points out that the Magdalen Shallows is one of the most important feeding and spawning areas of many commercially important species and supports more than half of the total fisheries in the Gulf. "Present evidence suggests the Gulf to biologically the most productive Canadian marine region" (Loutfi l973). Not surprisingly, major commercial fisheries including herring, cod, plaice, white hake, mackerel, witch flounder and winter flounder, lobsters, oysters, other molluscs and shrimp are located there. He points out that economically important fish and shellfish species are dependent on the plankton production cycle which begins in the nutrient-rich waters of the estuary. In order to protect the economically important biological resources or what is referred to as "capital," in this report, "the first priority should be to minimize the risk of pollution in the area, from the St. Lawrence estuary to the Magdalen Shallows, inclusive."

When it comes to oil and gas exploration, exploitation, and transport in the Gulf of St. Lawrence, Loutfi is clear:

*"It is likely that large-scale pollution in **any** part of the Gulf would result in the eventual contamination of these important areas because of the semi-enclosed nature of the circulation pattern of the Gulf. On the basis of the incompatibility of oil pollution and living resources, minimizing the oil pollution risk would entail **the banning of oil drilling, keeping the area free of trans-shipment terminals, refineries and petro-chemical plants, and minimizing tanker traffic."***

---------- 2.2 Sydney Bight (permit # 2364 & 2365) ----------

In the summer of l999 the Canada-Nova Scotia Offshore Petroleum Board (CNSOPB) granted Hunt Oil Company of Canada Ltd. two permits (# 2364, #2365) for oil and gas exploration on the eastern coast (Sydney Bight) of Cape Breton, covering nearly 1.5 million acres. Its partner is TotalFinaElf which holds a 25% interest in the parcels.

The two parcels roughly overlap the Sydney Bight, an area that extends from the eastern part of Cape Breton, near Scatarie Island, to Cape North, on the northern tip of the Island (Davis and Browne l996). As can be seen on the map of the parcels above, the northern permit (2364) connects with the eastern coast of Cape Breton near Wreck Cove. From just north of Scatarie Island to Wreck Cove, the two permits combined, include the coastline.

Sydney Bight is located within the Inner Shelf District which extends from the Northumberland Strait to the Bay of Fundy. St. Anns Bank, the only major bank in the Inner Shelf Zone is formed where the relatively flat sea bottom slopes offshore in Sydney Bight (Davis and Browne l996).

The shoreline of eastern and northeastern Cape Breton is dominated by rocky cliffs (5-20m) and upland cliffs (5-100 m). Generally the beaches that do exist are narrow. Barrier beaches and spits are well developed in eastern Cape Breton. Pocket beaches can be found in the Highlands. Dominion Beach, for instance, located in Lingan Bay, is one of many popular beaches in the area.

Islands have high value as wildlife habitat, especially for breeding seabirds. Off the coast of Cape Breton, near St. Anns Bay, are the Bird Islands. These islands provide nesting sites for birds, including the Atlantic puffin, and rare arctic-alpine plants are found there. One of the islands is owned by the Nova Scotia Bird Society, the other by the Nova Scotia Department of Natural Resources (Davis and Browne l996). Scaterie Island, located south of the two parcels, is a Protected Area in Nova Scotia. The 25 square kilometre island is largely forested with rocky shores, heath barrens and sphagnum bogs. The island provides habitat for numerous species of birds.

Bras d'Or Lake, a mixture of ocean water and freshwater runoff, is a unique inland brackish body of water covering 260 square kilometres. On the western side the lake is shallow. Sheltered bays such as West Bay, Denys Basin, and Whycocomagh Bay can be found there. The Great Bras d'Or Channel, which extends to the east connects to the open ocean in the Sydney Bight. St. Andrew's Channel connects with the sea near Point Aconi, via the Little Bras d'Or Channel (Davis and Browne l996).

Estuaries, as noted earlier, are among the most productive ecosystems on Earth – comparable to coral reefs and rainforests. The shallow, nutrient-rich waters from the river are mixed with the tide. Estuaries can be found along the eastern shore of Cape Breton wherever a river meets the sea. There are three main estuaries: The North, Middle, and South Aspy Rivers drain into Aspy Bay; a number of watersheds drain into North Bay Ingonish and South Bay Ingonish; and, a number of watersheds drain into St. Anns Bay (Davis and Browne l996).

---------- *2.3 Biological Diversity* ----------

Biodiversity is not simply the counting of species. If it were, then zoos would be biologically diverse places. Biodiversity is the variety of life and *all* its processes, and includes the living organisms, their genetic differences *and* the communities in which they naturally occur. The diversity that makes up an ocean ecosystem, for instance, is one that includes marine mammals, benthic flora and fauna, all fish (not only commercial species), invertebrates, resident and migratory birds, reptiles, algae, starfish, urchins, sponges, plankton as well as corals, sea caves and other structural elements. Hundreds, if not thousands of different species interact. An impact on any one species could have far reaching and unexpected implications.

Estimates of how many species of plants and animals inhabit the Earth have varied from 2 million to 100 million with a best estimate of somewhere near 10 million. Of those, only 1.4 to 1.8 million have been identified (Pimentel et al. 1992; Environment Canada l995). For instance, there are estimated to be 5,000 species of sponges alone, worldwide; 22,000 species of fish; 6,000 species of echinoderms (starfish, urchins) and 50,000 species of mollusks (snails, oysters, mussels) (Pimentel et al. 1992). The list goes on. In Canada there are estimated to be 71,900 known species and an additional 53,800 species thought to exist (Bourdages and Labelle 2000). According to Davis and Browne (l996) Canadian Atlantic waters are home to a vast array of species including 56 species of jelly fish, 400 species of sponges, 200 species of shrimp and crabs, 150 species of molluscs and 70 species of echinoderms (starfish, urchins).

Clearly, assessing the value of biological capital is very difficult when we consider how little we currently know. With this in mind, any valuation of the full-range of functions and services provided by biological diversity in the permit areas would be limited by our current knowledge and therefore highly conservative.

In light of the interdependence of species within ecosystems, any environmental assessment of the impacts of oil and gas development on the natural environment must address all the potential interactions between project activities and as many components of the natural environment as possible. The Environmental Assessment of Seismic Exploration and Drilling on the Scotian Shelf (Davis et al 1998; Thomson 2000) did not do this. It only looked at what were referred to as "Valued Ecosystem Components (VECS)" defined in the assessments as "rare or threatened species or habitats; species or habitats that are unique to an area, or are valued for their aesthetic properties; and species that are harvested by people." This definition fails to recognize that a negative impact on a species not deemed to be "valued" could have significant effects on one that is. The fundamental way in which species depend on and influence each other cannot be ignored.

2.3.1 Biological Diversity in and Adjacent to Oil and Gas Parcels

"*There's a bit of a no-mans land in terms of marine research…There's sort of a gap between that 10 metre depth contour and maybe five miles out onto the shelf. That really, as far as I can tell, has not had a lot of work done."*
-Bruce Hatcher, Director, Marine Affairs Program Dalhousie University

The biological structure of the Southern Gulf of St. Lawrence and the Sydney Bight areas are complex. Food webs are intricate relationships between interdependent organisms. Interference with one species will have an impact on other species. For instance, tiny organisms such as phytoplanton and zooplankton are fundamental in the web of life that includes marine mammals, fish and birds.

However, a discussion about all the known species present in these areas and how they interact is beyond the scope of this report. Instead, Table 4 lists certain species that have been selected to illustrate the diversity that does exists. A complete listing of commercial fish species can be found in Part 3 of this report.

Table 4 Biological Diversity in and Adjacent to Oil and Gas Parcels

SPECIES OR PLANT/ANIMAL GROUP	PARCEL 1 & VICINITY	SYDNEY BIGHT & VICINITY	COSEWIC STATUS [27]	REMARKS
phytoplankton	X	X		The base of the marine food chain. 90-95 % of these microscopic marine plants occur within the top 20 metres of the water column. Phytoplankton are an important part of the diet of zooplankton and larval stages of a variety of other marine invertebrates. Phytoplankton have also been found to help increase the ocean's abililty to absorb carbon dioxide – implicated in global warming. Phytoplankton also produces a gas (dimethyl sulfide) which stimulates cloud formation, thereby cooling the Earth.
zooplankton	X	X		The base of the marine food chain. Comprised chiefly of small crustaceans and the egg/larvae stages of marine animals. Zooplankton is the mainstay of larval fish and invertebrates. They are fed on by all species of fish at some time in their life cycle. Studies are currently being conducted on the effects of global warming and UV radiation on zooplankton and other marine life. Is it exacting a toll on both abundance of marine organisms and on species diversity? Any decline in zooplankton would impact its chief consumers – fish.
algae	X	X		

[27] In the recent government report *Wild Species 2000: The General Status of Species in Canada, 2001,* 1,600 species in Canada were classified as Exterpated/Extinct, At Risk, May be at Risk, Sensitive, Secure, Undetermined, Not Assessed, Exotic, or Accidental. These new, less familiar categories are not intended as a replacement for the more specific COSEWIC listings and therefore COSEWIC categories are used in this table.

algae (continued)				There are 121 species of algae reported in Pomquet Harbour within the St. Georges Bay Ecosystem Study area. Of these, 74 are benthic. Little is known about the algae in the Cape Breton coastal area.
plants: eel grass irish moss rockweed	 X X X	 X X X		Eel grass beds contain incredible diversity, providing food and important habitat for invertebrate herbivores. Irish moss provides important habitat for green sea urchins and molluscs. It is also commercially harvested. Rockweed provides important food and habitat for a variety of intertidal organisms. It is also an environmental health indicator (ie. pollution and thermal stress).
marine invertebrates*:* rock crab lobster scallops snowcrab shrimp	 X X X X X	 X X X X		No detailed benthic invertebrate work currently exists for the Cape Breton area. Damage to marine invertebrates will affect other organisms that depend on them for food or for other functions.
Fish: ** **estuarine fish** Gaspereau Atlantic Salmon American Shad **groundfish** Atlantic Cod flounder, plaice, halibut, redfish, haddock, pollock, hake **pelagic fish** herring, mackerel, swordfish,	 X X X	 X X X	Atlantic Salmon is listed as Endangered. Atlantic Cod is listed as Special Concern.	The Margaree River (parcel 1) is a very important Atlantic Salmon river. It is the only river in Nova Scotia where salmon stocks met conservation requirements in 2000. Apart from the tidal fish species, concentration and movement of the other groups depend on temperature, salinity, bottom characteristics and food resources. Shallow waters have higher species diversity whereas further offshore, species diversity is lower but biomass is high. There are about 20 species of

fish (continued) Bluefin Tuna				estuarine fish in Nova Scotia waters. Egg and larval stages of groundfish drift with the ocean currents and settle on the seabed. Groundfish are carnivorous and feed largely on benthic (sea bottom) invertebrates as well as on other fish. Pelagic fish generally feed on zooplankton and on smaller fish. Are very migratory, travel in schools and feed mainly in surface-middle waters. Approximately 34% of fish species are harvested commercially. ***
Seabirds and shorebirds: Great and Double-crested cormorants, Herring and Iceland gulls, Arctic terns, gannets, Harlequin ducks, Kittiwakes, Black guillemots, Atlantic puffins	X	X	The Harlequin duck is listed as Special Concern	Includes breeding colonies and non-breeding seasonal residents. In St. Georges Bay alone there are 10,000 breeding pairs of birds (50% are gulls, 40% cormorants and 10% are terns). These feed on 1,500 tonnes of fish – 5% of the total landings for that area in l987. Fish (larval and adult) are a staple in the diet of many sea and shore birds. An impact on one would impact the other. Atlantic puffins can be found on the Birds Islands. Effects on migratory species may be felt elsewhere.
Marine Turtles*:* Atlantic Leatherback	X	X	The Leatherback sea turtle is listed as Endangered	Three species of sea turtle are found in Nova Scotia waters. Very little is currently known about the Leatherback. Its presence in Nova Scotia waters was discovered in l999. It feeds almost solely on one of the most poorly understood creatures –

				the jellyfish.
Marine mammals **Pinnipeds** Grey seals Harbour seals **Cetateans* (Baleen)** Blue whale Right whale Minke whale Fin Whale Humpback Whale **Cetaceans* (Toothed)** Sperm whale Pilot whale Beluga whale Common dolphin White-beaked dolphin White-sided dolphin Atlantic harbour porpoise	 X X X X X X X X X X X X X X	 X X X X X X X X X X X X X X	Right Whale is listed as Endangered – only 325 identified individuals remain of the North Atlantic stock. Fin whale, Humpback whale and Blue whale are all listed as Special Concern. Harbour porpoise listed as Threatened.	Major breeding areas of Grey seals are shifting ice off of western Cape Breton and Hay Island, adjacent to Scatarie Island. Whelping patches for Harp and Hooded seals is on ice surrounding the Magdalen Islands. Harp seals are also abundant in the Gulf of St. Lawrence. Whelping area for Hooded seals was found in l986 off Cape Breton near Cheticamp. Little is known about local Harbour seal populations. Information about whales in the Gulf and Sydney Bight are scant at best. Occurences of whale species are identified through strandings or reported sightings. Diets consist of krill, plankton, herring, capelin, mackerel, cod, hake and others. Cetaceans have extremely low reproductive potential and therefore are extremely vulnerable to habitat or environmental changes. The International Union for the Conservation of Nature (IUCN)lists four whale species as endangered: Blue, Northern Right, Fin and Sei. Vulnerable species include Humpback, Sperm, Bowhead and Minke.

Sources: Department of Fisheries and Oceans, Management Maps, http://www.gfc.dfo.ca/fish_mgmt/maps/; Department of Fisheries and Oceans, Environmental Habitat Quality, http://www.mar.dfo-mpo.gc.ca/science/hab/e/rockweed.htm; Department of Fisheries and Oceans, (2001a) The Importance of the

tiny organisms forming plankton, http://www.qc.dfo-mpo.gc.ca/iml/en/produits/encart10.htm; Phytoplankton and Zooplankton, DFO Science Stock Status Report G3-02 (2000); Atlantic Salmon, Overview for 2000, DFO Science Stock Status Report D3-14 (2001); (COSEWIC 2000); (Davis et al 1998); (Davis et al. 2000); (Davis and Browne l996); (Mondor et al. l995); (M. James pers. comm. 2001); (D. Tobin pers. comm 2001);
(Hay 2001).

* Based on sightings and strandings (Davis et al. 2000), (D. Tobin pers. comm. 2001)
** There are also numerous non-commercial fish species which are an integral part of the biological diversity present in the parcel areas.
*** Figure is derived from St. Georges Bay Ecosystem Project. During a bottom trawl survey in l978 in St. Georges Bay, 47 fish species were found and 20 more were expected but not found. Of the estimated 67 species, 23 or 34% are harvested commercially.

At the time of publication of this report, the Department of Fisheries and Oceans released its Regional Advisory Process (RAP) report regarding the biological richness of the Southern Gulf of St. Lawrence and Sydney Bight areas – to be submitted to the Public Review Commission. According to an article that appeared in the Halifax Chronicle-Herald, (Lucas 2001) the DFO report says the Gulf region is "rich and diverse, a key spawning, hatching and feeding area for many important fish stocks." The report also points out, writes Lucas, that fish breed and feed in the Gulf all year long and therefore there might not be a "good" time of year to do seismic or exploratory drilling. "Any impact of oil and gas exploration will be amplified because of the shallow, enclosed nature of the gulf," adds Lucas.

Endangered: Atlantic Salmon

Cape Breton is very important to the dwindling stocks of Atlantic Salmon – now listed as an Endangered species by COSEWIC. Unlike most of the rivers in the Maritime Region, the Margaree, Middle, Baddeck and North Rivers still carry relatively pristine water from the Highlands to the ocean. The Margaree River was the only river in 2000 that met conservation requirements for Atlantic Salmon (DFO 2001b). There is no commercial fishery for Atlantic Salmon any more. Only recreational fishers and Mi'kmaq are allowed to fish for them. In 2000, this very limited fishery took place exclusively in the Southern Gulf of St. Lawrence rivers, which are still able to support the once plentiful species (ibid). Any oil and gas development must consider the risk it poses to a species that is already on the brink of extinction.

The Biodiveristy table above illustrates that all species inter-relate and are inter-dependent. A full-cost accounting analysis which places a value on the biodiversity present in these areas off Cape Breton must be accompanied by

the knowledge that there is still so much that is not known about the role each species plays within their respective ecosystems. Any valuation, therefore, would be conservative at best. One need only look to the Dodo for this lesson.[28]

In addition, there is a paucity of information about fish species which we do not currently harvest commecially. It is both short-sighted and ill-advised, from an ecological perspective, to consider only those species from which humans benefit commercially.

In general, the lack of baseline data, with regard to many species, including those currently listed as endangered, poses serious limitations in terms of accurately assessing the value of the natural capital and in terms of assessing the risks of oil and gas development.

[28] A tree species on the island of Mauritius produces large seeds that will not germinate unless they pass through the gut of a bird. Only the dodo was capable of eating their fruit and seeds. For more than two hundred years after the dodo extinction not a single seed germinated and the remaining old living trees were dying out. Scientists force fed the seeds to (unhappy) turkeys and collected and planted the seeds that passed in their droppings. Thus the tree species has been saved by human intervention. The key is that no one had any idea of the relationship until long after the dodo was lost.

Chapter 3 Oil and gas exploration: Seismic Impacts

"There is a myth that terms and conditions that will protect the environment can be imposed, no matter how large a project is proposed. There is a feeling that, with enough studies and reports, and once enough evidence is accumulated, somehow all will be well. It is an assumption that implies the choice we intend to make."
-Thomas R. Berger, Commissioner of the Mackenzie Valley Pipeline Inquiry, l974-l977

What is the difference between a sound and a noise? And at what point does noise negatively impact an animal's ability to function and ultimately, survive? In Part 1, Table 2 listed some of the natural and human-made noises and their accompanying intensity underwater at a distance of 1 metre (measured in decibels). Blue whales, for instance, the loudest creatures on Earth, communicate acoustically and can create sounds in the range of 160-188 dB. A seismic air gun array can produce sounds as loud as 255 dB.

But what is 255 dB like under water? This is a difficult question to answer. We know that a seismic air gun array, at a distance of 1 metre, is louder than a lightening strike on water, but quieter than a seafloor volcanic eruption (at the same distance). But how does this affect marine life? According to the Environmental Assessment done on seismic exploration on the Scotian Shelf in l998 (Davis et al.), a marine animal can experience permanent physical damage if it is near the air gun blast. Further away from the source, the sound pressure decreases in intensity and other types of damage can occur including hearing loss, disturbance effects and changes in behaviour. Determining how the sound will travel underwater is a formidable task.

Seismic sound is directed at the ocean floor, but there is also an amount of seismic energy that travels horizontally (Davis et al. l998). According to Greenpeace, "underwater sound impulses from air gun arrays and similar sources are often audible many tens of kilometres away. Seismic ships will avoid each other by 50 miles to ensure 'competing' sound does not interfere with other seismic operations." (Davis et al.) also states that given certain circumstances sound waves can travel very long distances. Peter Tyack, a marine biologist at the Woods Hole Oceanographic Institution (WHOI) says air gun noise can travel up to 1,000 kilometres underwater (Lambie 2001). In addition, the seismic pulse changes as it travels through the water. At the source, it may be very short, lasting only 10 to 15 milliseconds, but when it's heard a few kilometres away it will have different frequencies and the length of the pulse can be longer – one-quarter to half a second long.

Numerous factors have to be considered when determining how the noise produced by a seismic vessel will travel through the ocean. Wind, water depth, water temperature, and ocean bottom types must all be considered in order to accurately define how sound will propagate. The pressure produced by a "seismic pulse" decreases by one half with each doubling of the distance away

from the air gun (Davis et al. l998). However, estimating the spread of sound through water is a difficult one and complicated by "reflections from the surface and bottom and sub-bottom layers, and differences in propagation for different frequencies" (ibid).

As noted earlier in Part 1, McCauley et al. (2000) write that seabed properties are known to be "crucial in horizontal sound propagation." In addition to their own research, the report's authors draw on a "large [military] literature base [that] exists on sound propagation in shallow water," and state that in order to get an accurate idea of how sound moves along any underwater travel path one would have to know not only what lies above the seafloor but what lies below to a depth of at least 50-100 metres. This is because sound may reflect off the bottom or it may enter the bottom and be refracted or reflected back. The reflection of sound from beneath the seafloor is essentially the basis of seismic exploration in the first place. There is no question that sound energy directed at the seafloor will come back as sound energy. Therefore, any noise impact study must also consider the noise that is reflected back and how it will propagate through water.

"*Once source levels and propagation loss have been evaluated, the question becomes, 'what are the effects of noise on marine animals?' This is clearly the most complicated and least understood component of the source: path:receiver model…There are many gaps in the information on hearing capabilities and on the responses of animals to sounds that they hear. Thus, it is not yet possible to establish unequivocal criteria for determining the zone of influence or zone of effects around a noise source."*
– Davis et al. l998

Assessing the impacts of oil and gas exploration and subsequent development on all species present in and adjacent to the parcel areas is beyond the scope of this report. Instead, a discussion regarding the impacts of seismic testing has focussed on some of those marine animals we know can hear and are known to communicate using sound.

3.1 Fish

3.1.1 Known impacts of seismic on fish

"I had a chance encounter with somebody who works on a seismic vessel and they were doing some seismic around Sable Island in shallow water there and he said at night the floor of the vessel shook so much that they couldn't sleep and that you could see, when the seismic air guns went off, you could see fish get propelled out of the water."
-Mark Butler, Ecology Action Centre (cited in Livingston 2001)

The frequency range of sounds produced by air gun arrays are within the most sensitive hearing frequencies of many marine fish (Engas and Lokkeborg 2001). Fish can not only hear the sounds, they react to them and in some cases suffer severe physiological damage.

Fish with swim bladders – gas-filled organs used to control buoyancy – are particularly vulnerable to underwater explosions of sound. Swim bladders can oscillate and rupture in response to shock waves, in turn causing haemorrhages in nearby organs (Davis et

al. l998). Shock waves produced from air guns can impact fish to differing degrees depending on their distance from the source. Stunning, internal injuries, egg/larval damage and mortality are all possible effects (ibid).

In addition to causing physical harm to fish, evidence suggests that seismic testing also affects the behaviour of fish (Rowe 2001) The loud noises scare the fish away from their usual habitats and can therefore interfere with spawning and feeding (Davis et al l998; Kenchington l999; CNSOPB 1998; Engas and Lokkeborg 2001; Boudreau et al. l999; McCauley and Fewtrell 2001). The range in which these noises will have an impact on fish behaviour depends on a number of factors including the source sound level, temporal structure of the sound, background noise, and sound propagation conditions (Rowe 2001).

"Both air gun and vessel sounds have been shown to elicit avoidance reactions, e.g a descent deeper in the water column. Few studies have investigated how commercial catch rates are affected by sounds emitted by vessels and geographic survey activities. Studies have found reductions of 45-85% in trawl and longline catches." –(Engas and Lokkeborg, 2001)

"*The common fish response to increased air-gun level, was to increase swimming and circling behaviour, move to cage bottom, then finally huddle in the cage-bottom…behavioural observations on previously exposed fish suggested damage to hearing systems had occurred."* – (McCauley and Fewtrell 2001)

"*Underwater noise can scare some fish. Sudden changes in noise level can cause fish to dive or to avoid the sound by changing direction." – (Davis et al. l998)*

"A small change in the survival rate of larvae can have a very large effect on recruitment to the adult population" (ibid). Given that only a few out of the thousands and millions of fish eggs produced by female cod, every reach maturity, any additional loss caused by seismic could be devastating – causing a ripple effect in not only the adult population of the fish (and therefore all other interdependent ecosystem components) but on the commercial fishery. Designing an experiment to address the effect of seismic on larvae is extremely difficult, says Dr. Christopher Taggart, a professor of Oceanography at Dalhousie University. Taggart doesn't mince any words about what he thinks of the existing research on the impacts of seismic on fish or fish larvae. "Most of it's grey, most of it's bad." He says decisions are being made based on "guesses" and that "nobody is funding this overwhelmingly needed research."

"*The oil companies have the money and are holding society hostage through the politicians. I don't know why we waste our time with these crazy reviews." (C. Taggart pers. comm. 2001)*

3.1.2 Fish can hear and communicate using sound

"It is clear that many species of fish, including some of those occurring in the study area, can hear low frequency sound pulses such as those created by airguns." (Davis et al. 1998)

For one week in spring 2001, hundreds of fish-hearing specialists[29] from around the world gathered in Evanston, Illinois for a conference[30] on Fish Bioacoustics. More than 80 topics and scientific papers were presented ranging in subject from the basic physiology of fish hearing to how fish react to external sound stimuli. The knowledge that fish can hear and produce sounds has been around since the l950s, when it was discovered that the male frill-fin goby swooned using sound during courtship. Since then, there have been many discoveries of sound-making fish. One study that looked at the sounds of Western North Atlantic Fishes found that of over 220 species from 59 families, sounds were made by 153 species or 70% (Parmly Hearing Institute 2001).

Specifically, many fish produce sounds during courtship, spawning, aggressive encounters with other fish of the same species and as a response to threats from predators (ibid; J. Hutchings pers. comm. 2001; V. Srivastava pers. comm. 2001). For instance, Harbour porpoises like to eat herring and shad. These cetaceans use echolocation or high frequency clicks to identify objects in the marine environment, including fish. Studies have shown that these target fish are also able to detect the clicks of the hungry porpoise and will swim away (Parmly Hearing Institute 2001). For both haddock and cod (discussed in further detail below) it has been found that sound plays an important role during complex spawning rituals.

"*Sound production by most fishes has not been examined in detail and consequently, the extent of their acoustical repertoire and the functional significance of sounds produced is unknown*." (Rowe 2001)

But what happens if fish can't hear eachother above the underwater din? For discussion purposes we will focus on one species, Atlantic Cod.

[29] There weren't only fish-hearing specialists. Max Deffenbaugh works for Houston-based ExxonMobil Upstream Research Company. He was at the conference presenting a "new low intensity marine seismic source [that] has been developed." The "new marine vibrator" plays out a longer duration, but lower amplitude signal" and is potentially more benign for fish. Deffenbaugh attended the conference to "solicit feedback" from the fish-hearing community. In an email he wrote "I had the chance to speak with several biologists at the fish-hearing conference. The ones I spoke with felt that the long-duration, low-amplitude marine vibrator signal would have less impact on fish than the short duration, high-amplitude air gun impulse. Some expressed a strong preference for the vibrator over airguns. Others expressed a weak preference, feeling that more research was necessary on the question (pers. comm. 2001).

[30] The conference was titled: *Fish Bioacoustics: Sensory Biology, Behavior, and Practical Applications*.It was held in Evanston, IL from May30-June 2, 2001. It was sponsored by the Parmly Hearing Institute at Loyola University Chicago, National Science Foundation, Office of Naval Research, Minerals Management Service, and the Electric Power Research Institute.

Atlantic Cod

"The destruction of the northern cod was not a one-act play, but a pageant of greed that went on for decades before the curtain finally came down. At every step of the way, Cassandra wailed, but no one listened." –Michael Harris*, Lament for an Ocean, l999*

"The seas are dying, as if you didn't know."
-"disaffected Fisheries biologist" quoted in Farley Mowat's *Sea of Slaughter* (published 8 years before the groundfish collapse)

The beleaguered groundfish, Atlantic Cod[31], registered on the radar screens of the national media in l992, the year that marked the collapse of the east coast groundfishery. Huge reductions in the number of cod capable of spawning, something that came as a shock to much of the government department charged with monitoring the stocks, eventually lead to the cod closure. All groundfish stocks in fact – cod, haddock and pollock – were at their lowest levels since the l970s. Meticulously chronicled in his book Lament for an Ocean, Michael Harris describes the events leading up to the closure. He describes a combination of political expediency, greed, faulty mathematical modeling and bungled scientific interpretations.

"Fishermen had been catching the very year-classes of fish that scientists had been counting on to grow the stock... belief in the ocean's inexhaustible bounty continued to bedazzle Ottawa."

Nearly ten years later, the cod stocks have yet to recover. Cod are currently listed as a Species of Concern (COSEWIC 2000). Jeff Hutchings is a professor of Biology at Dalhousie University. He studies cod behaviour and spawning. Hutchings says that anything that may be negatively affecting their reproductive success has to be avoided.

When it comes to reproductive success, the odds are stacked against them.

[31] *There are 12 cod stocks in the Northwest Atlantic, two in the Gulf of St. Lawrence.*

Female cod lay millions of spherical eggs which float to the surface and drift with the prevailing current, food for other marine animals. Of several million eggs hatched, only one will become an adult fish. With odds like that, any negative impact on spawning success is magnified.

Like many other fish species, male Atlantic cod use sound to court their mate. To date, very few studies exist documenting sound production in cod. What is available suggests they also make sounds when they are aggressive and when they are frightened (Rowe 2001). Wild cod have been described as "versatile vocalists." In addition to grunts and single bops they frequently produce a long series of bops or knocks (Parmly Hearing Institute 2001). Brawn (l960) found that adult cod produce a deep, brief grunting sound in a number of situations and that generally these sounds are produced by both males and females (between 25 and 37 cm in length) but by only the males during the prespawning and spawning period (ibid). Hutchings (l999) writes that there is evidence that female cod may choose their male mate, and that auditory displays might have something to do with it.

In light of the importance of sound in cod spawning, there is only one way to know if seismic testing, or any underwater noise for that matter, is negatively impacting spawning. "There should be more research undertaken," says Hutchings. "Right now we are dealing with an empirical vacuum – we know these fish are producing sound during spawning periods – so anything that affects the production of sound during spawning would reasonably affect spawning. We need to do the research."

Cod expert, Vivien Srivastava[32] says seismic noise could have a negative impact on spawning success. "It could break off some of the pairings," she says. It could also frighten them and temporarily displace them. Anything that could further harm the already beleaguered stocks would be a "bad thing" (pers. comm. 2001). She says more research is required. "I was one of those old-fashioned biologists. It's out of fashion now to do the basic research and it's such a pity because you need it just to interpret the other data."

"*Since l993, fishers have stayed ashore to allow Groundfish stocks to rebuild. It is unacceptable that governments should now cast this sacrifice aside by leasing vital fish habitat to the petroleum industry without our knowledge or consent.*" – Percy Hayne, President Gulf NS Fleet Planning Board[33]

In addition, cod are highly migratory. The Southern Gulf of St. Lawrence cod stock, for instance, spawn in the Shediac Valley and around the Magdalen Islands from late April to early July. In the fall, this same stock[34] leaves the Gulf of St.

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[32] Formerly Vivien Brawn, who penned the l960 report on cod acoustics.

[33] Excerpt taken from a Letter to the Editor, Halifax Chronicle Herald. Internet. Available from SOS(2) website http://www.nsis.com/~egilsson/sos2_letters.htm# Groups. Accessed March 12, 2001

[34] According to the DFO (Stock Status Report A3-02, l998) the 4Vn region (Sydney Bight) is a mixing ground for the resident (4Vn) cod stock and the larger neighbouring stocks, the 4TVn stock to the west and the 4VsW stock to the south. The Southern Gulf cod (4TVn) migrate to the Sydney Bight for the winter.

Lawrence and overwinters along the shelf edge from Sydney Bight to the Banquereau Bank region, returning to the Gulf in the spring. Oil and gas proponents have stated they would conduct seismic at a time of year that would impact the fishery the least, but according to Percy Hayne, the president of Gulf NS Fleet Planning Board, that doesn't exist. "There is no time when these waters are not sensitive. Even when adult cod migrate to Sydney Bight for the winter, the juveniles remain, and the migration times of salmon or tuna are different from herring or cod."

Clearly, more research needs to be done on the impacts of seismic and fish, especially in shallow waters. Any negative impacts caused by seismic testing should be viewed as a depreciation of the extremely valuable natural capital in and adjacent to the parcel areas. Where the impacts are not known, the precautionary principle should be applied.

A discussion about seismic and catch rates can be found in Part 3 (The Fishery).

3.2 Turtles

"Turtles will certainly hear sound pulses from a seismic program"
(Davis et al. l998)

"*When it comes to sea turtles, the only thing that is on our side is that we have one of four species listed with endangered status and nothing should be done to alter their foraging activities."* – Mike James, Dalhousie University Doctoral Student

There is a lack of research on the impacts of seismic and sea turtles. McCauley (2000) conducted experiments using caged loggerhead and green sea turtles and found that the turtles did react to the noise from a single air gun: "Their behaviour became more erratic possibly indicating the turtles were in an agitated state…turtles spent increasingly more time swimming as the air gun level increased. The point at which the turtles showed the more erratic behaviour would be expected to approximately equal the point at which avoidance would occur for unrestrained turtles.

The Environmental Assessment (Davis et al l998) for the Scotian Shelf relied on the O'Hara study (l990) to conclude that seismic effects on turtles would be "negligible." However, McCauley (2000) points out that O'Hara did not measure the air gun levels heard by the turtles. In other words, it was not known how loud the received air gun levels were when the turtles actively started to avoid the noise. McCauley estimates that turtles would begin to show a behavioural response to an air gun array at a received level of 166 dB and avoidance around 175 dB.

"Important sea turtle habitats mostly occur in shallower water, often less than 20 metres deep," states the report (ibid). There is currently little information regarding how seismic pulses travel through shallow waters.

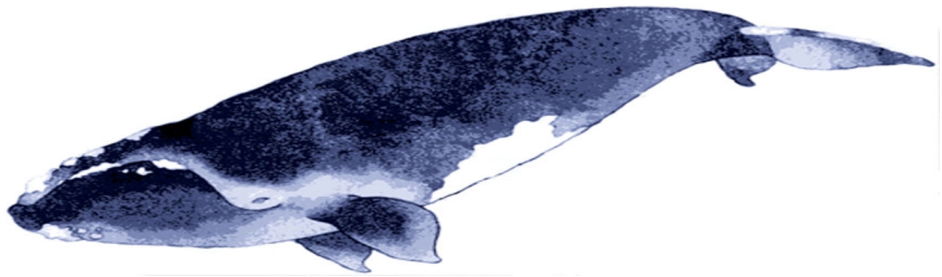
Mike James is a doctoral student researching the foraging movements and migratory behaviour of Leatherback sea turtles in Canadian waters. The Leatherback, the largest of all turtles (an adult can weigh 400 kilograms), is endangered. A few years ago no one even knew leatherbacks were frequenting Nova Scotian waters. "It's just recently that we discovered we even have them here," says James " and so there is not much information regarding sea turtles in Nova Scotia." In the last three years, 75-100 Leatherbacks have been sighted in the Sydney Bight and Gulf of St. Lawrence (M. James pers. comm. 2001).
"This species is critically endangered worldwide," says James. And some of these turtles come here in the summer to eat. "These are foraging populations, that typically move offshore by the end of October. No nesting occurs here." Leatherbacks nest further south in places such as Costa Rica, French Guyana and Surinam.

"Leatherbacks are next to impossible to find and they feed almost exclusively on one of the most poorly understood creatures, the jellyfish." James makes it clear there is still much to be learned about the Leatherback and what it does here. When it comes to seismic testing James says he doesn't know if it harms their hearing. "We don't know that. What role does hearing even play in a leatherback, we don't know." But studies do show that it affects their behaviour. "If an animal shows avoidance then you are affecting behaviour and if you're dispersing these turtles then you are also affecting foraging," argues James.

James points to the Nova Scotia Endangered Species Act which prohibits disturbance of animals at already low population levels. "The Act [35] says you shouldn't disturb, harm, harrass, kill anything that's endangered. With industry, though, there are always exceptions made for economic reasons," he says. "We should be operating under the precautionary principle. Let's be conservative here. Just because it hasn't been studied doesn't mean it can't be affected" (pers. comm. 2001).

[35] Currently, 16 species are protected under the Endangered Species Act in NS. The Leatherback Sea Turtle isn't one of them. For further discussion on the limitations of the NS Act refer to Chapter 7: Protection of Biological Diversity.

3.3 Whales



"The sea is cold, but the sea contains the hottest blood of all," writes D.H Lawrence, in his poem Whales Weep Not. For millions of years these massive mammals have swum the seven seas in such multitudes that it would take a "prodigious effort of the imagination" to visualize it (Mowat 1984). In his book, *Sea of Slaughter,* Farley Mowat cites one French missionary who reported that at one time whales were so numerous in the Gulf of St. Lawrence that "they became very tiresome to us and hindered our rest by their continuous movement and the noise of their spoutings."

We all know what followed. But in l986 the International Whaling Commission (IWC) had enough. It declared a moratorium on whaling[36] – the first step away from the brink. But the restoration of whale populations is an extremely slow process largely due to the fact that they have extemely low reproductive potential.

Table 4 above illustrates the many species of Cetaceans (both toothed and baleen) that feed on plankton and fish in the biologically rich waters around Nova Scotia. These same creatures return to warmer climes every winter to calve and mate. While it is generally believed that whales often return to the same few kilometres of ocean every year to feed, for the most part, their migration routes are unknown.

We do know, however, that hearing is crucial to whales. Their own acoustic repertoire is also varied and complex. Dr. Christopher Clarke is the Director of the Bioacoustics Research Program at Cornell University. He has studied the hearing capabilities of marine mammals and their response to man-made sounds. Clarke says that whales "have exquisite abilities in terms of their sensory perception and their sound production." Using sound they create an acoustic map of their ocean world, he says (Livingston 2001).

Clarke explains:

"Imagine a blue whale that sends out a powerful low frequency sound and it takes seconds and minutes before it strikes an underwater sea mound or continental shelf and then returns and it can hear those echoes and build an image of the world from those echoes. So their whole world, their whole sense of self and consciousness is centred around

[36] Not all nations belong to the IWC and so whaling continues. Japan and Norway still kill minke and pilot whales.

the perception and the production of sound… There is this massive mixture and on top of that you have the humpback whales chattering away like jazz musicians and it is just this fantastic cacophony of sound. And along we come in the last twenty, thirty, maybe fifty years and we start inventing tools for probing the ocean. And how do we probe the ocean? We produce sound. (Clarke cited in Livingston 2001)

Different sounds serve different purposes. A whale produces high frequency (pitch) clicks to locate objects in its path (echolocation). The longer, low-pitched sounds produced by blue whales, for instance, can under the best of circumstances travel hundreds, if not thousands of kilometres underwater (Hoyt l991). Cetaceans rely on sound for communication, food finding and obtaining a wide range of information about their environment.

A detailed investigation into the mechanics of whale hearing, however, is beyond the scope of this report. In addition it would be unrealistic for us to attempt to explain how received levels (what the whale is hearing) at any one frequency might cause trauma in whales. Received levels are different for each species and are themselves dependent on numerous factors (Ketten l998).

3.3.1 Seismic and Whales

Physiological Damage

"Underwater, the Gulf [of Mexico] sounds like a factory floor. Engines hum. Drills grind. Propellors hiss. Hulls vibrate. The commotion can disrupt the whales' ability to navigate and communicate by echolocation, a natural form of sonar... With the largest brain in the animal kingdom, the whale's head bulges with features that organize sounds, map terrain, avoid obstacles. Noise pollution silences whales and drives them away. Extreme noise causes hemorrhaging and fatally damages their echolocation equipment." (Associated Press 2001a)

It's the "scale" of seismic testing that harms whales, says Cornell University's Dr. Christopher Clarke. "This is not some little trivial sparker or someone tapping on the side of the boat. These are explosions that are happening at regular intervals, every ten seconds, every thirteen seconds, for hours and hours and hours and days and days and days, " he says. "I would not be surprised if one looked at the ears of animals living in these areas of high seismic activity that you could actually find notches in their ears where they had lost the ability to hear in certain frequency ranges because of just physiological damage" (Livingston 2001).

Physiological damage from seismic can include lethal and sublethal impacts. [37] Because so little is currently known about how intense underwater sound explosions impact whales' hearing, scientists have little to go on. However, there have been recent incidents which suggest that dangers do exist.

[37] "Lethal impacts are those that result in the immediate death or serious debilitation of the majority of animals in or near an intense source. Sublethal impacts are those in which a hearing loss is caused by exposures to sounds that exceed an ear's tolerance to some acoustic parametre. Sublethal impacts may ultimately be as devastating as lethal impacts, causing death through impaired foraging or predator detection" (Ketten l998).

In May l996 a dozen Cuvier's beaked whales stranded and died on the shore of Greece's Kyparissiakos Gulf coast at the same time[38] that NATO was testing its low frequency sonar submarine detector. The strandings were unusual because these whales, not known to strand, had stranded far apart from one another. Autopies on the dead whales showed no sign of illness or disease but did reveal "hemorrhaging in their acoustic regions" (Balcomb 2001).

In March 2000 another mass stranding occurred in the Bahamas. This time, 13 Cuvier's beaked whales, two Minke whales and one Spotted dolphin rammed themselves onto the sandy coastline. Nine died and the other eight whales were "rescued"[39] and successfully pushed back out to sea. Again, it was discovered later that US Naval fleets were testing anti-submarine exercises off of northern Bahamas immediately preceding and during the whale strandings (ibid). Dr. Ken Balcomb is a whale biologist who did autopsies on four of the dead whales. He says the animals' deaths were linked to "resonance phenomena in [their] cranial airspaces that are tearing apart delicate tissues around the brains and ears" (ibid). Again, there was hemorrhaging around the ears.

Dr. Darlene Ketten is a specialist in marine mammal hearing at WHOI.[40] She has done numerous post-mortem examinations of dead whales' ears and has written extensively on the subject of acoustic trauma in marine mammals. She says "the coincidence of the timing and the pattern of the stranding with the presence of Navy sonars raises the red flag and I think there's reason for concern."

In an article that appeared in the Halifax Daily News, reporter Chris Lambie interviewed Dalhousie University whale specialist Hal Whitehead regarding the use of a new type of sonar being tested by the Canadian and US navies (Lambie 2001). Whitehead pointed to the Greece and Bahamas strandings as "clear evidence" that whale's ears can be damaged by loud sounds. Lambie then turned to Peter Tyack, a marine biologist at the Woods Hole Oceanographic Institution (WHOI), who has also been hired by the US Navy to study low frequency sonar on whales. Tyack is quoted as saying "Air gun noise from oil and gas exploration, which can travel up to 1,000 kilometres underwater, is more likely to hurt whales."

According to Ketten, whale ears can certainly be damaged by seismic testing (pers. comm. 2001). "We see ears with noise impacts, but in general we do not know the noise source." Despite her own work and the work of others in her field

[38] The tests were carried out from May 11 to 15. Strandings occurred on the 12th and 13th of May.

[39] The word *rescued* is in quotation marks because no one actually ever saw these whales again. In Dr. Balcomb's letter to the US Navy he writes, "In retrospect, it is probable that all Cuvier beaked whales in the region when the naval exercise commenced were killed by the sonar, whether or not they were returned to the sea by well-wishers…The whales that we observed swimming toward shore and stranding were only temporary survivors of an acoustic holocaust that can be likened to fishing with dynamite."

[40] Ketten is an associate scientist at WHOI as well as an assistant professor in the Department of Otology and Laryngology at the Harvard Medical School.

she describes the subject of marine mammal hearing loss as "virtually unexplored." She writes: *"Despite increasing concern over the effects on marine mammals of man-made sound in the oceans, we still have little direct information about what sound frequency-intensity combinations damage marine mammal ears, and at present there are insufficient data to accurately determine acoustic exposure guidelines for any marine mammal"* (Ketten l998).

Other physiological effects include permanent and temporary hearing loss, chronic stress leading to lowered resistance to disease and increased vulnerability to environmental disturbances which may ultimately affect reproduction (Moscrop l997).

There is a reasonable concern that any effort involving the use of loud, repetitive noises in the ocean will adversely effect marine mammal species within "acoustic reach" of the source.

Behavioural Effects

Seismic testing can be heard hundreds of miles from the source. Whale acoustics expert, Dr. Christopher Clarke explains how this might impact a whale:

"Seismic exploration and oil and gas development and production produce large amounts of noise and the whales depend upon sound and this noise, if you can think of it as an invasion, it's an insult into their lives. How does that affect you if you're a whale? The first thing it does is it shrinks your world. The world that you were used to living in where you could hear and communicate with other animals hundreds of miles away has suddenly been shrunk so you can only hear your nearest neighbours. We don't know enough about the breeding habits and feeding habits of these animals to predict how the shrinkage of their communication system and their navigation system will affect their populations" (Livingston 2001).

Noise is associated with all phases of offshore/inshore oil and gas exploration and production: seismic surveying, drilling, production, transport, air and ship support vessels as well as the operation of off and onshore facilities (Moscrop l997). Underwater noise can also affect the behaviour of whales in the following ways:

- It can "mask" or interfere with a whale's ability to communicate or echolocate (Davis et al. l998; Ketten l998; Moscrop l997). Seismic testing as well as other petroleum associated noises may make it harder for whales to hear each other and "image" their underwater environment.
- It can alter their behaviour (McCauley 2000; Davis et al. l998; CNSOPB l998; WDCS 2001; Moscrop l997). Acute and/or chronic underwater noise may cause animals to stop vocalizing or socializing. Increased diving (to avoid noise) and avoidance behaviours in response to noise have been documented. Whales have also been seen to stop feeding and resting in the presence of seismic noise.
- It can result in their displacement (Moscrop l997). Moscrop cites numerous studies that have shown that many species of whales have been permanently or temporarily

displaced as a result of loud industrial activities.

- It can result in interrupted feeding (CBC 2001; Moscrop l997; Ketten l998). This can affect the overall health of the whale, especially in the case where they are migrating or lactating and have already finely tuned energy budgets.[41]
- It can increase stress levels especially when the foraging or breeding habitats are important ones (Moscrop l997).

The Canadian Endangered Species Conservation Council recently stated in its report *Wild Species 2000,* that an "increase in vessel traffic and noise associated with offshore oil and gas developments" is among the reasons for the decline in whale populations (CESCC 2001).

Deborah Tobin is no stranger to declining whale populations. She is with East Coast Ecosystems – an organization that advocates on behalf of the endangered Northern Right whale. Tobin says these whales have been sighted on both sides of Cape Breton, along with many other species of cetacaeans. "We haven't been looking for Right whales in this area so the number sighted is proportional to the effort." Typically about 200 Right whales are sighted feeding in Canadian waters during the summer months. In the last three years, four Right whales have been sighted around Pleasant Bay, on Cape Breton's west coast. This may not sound like a lot but Tobin points out that "when you say four, four is a lot when there are only 300." Officially, approximately 325 identified Right whales remain of the once plentiful North Atlantic stock.

Tobin says Cape Breton is a "definite area of concern" for her organization. There are regular reports of sightings from the Gulf of St. Lawrence as well as Sydney Bight, she says. When it comes to oil and gas development, Tobin points to the fishery. "Clearly there is no acceptable level of [whale] by-catch in the fishing industry – the numbers are too low. We are losing the breeding females and there are some years when more Right whales are dying than being born."

"We have decided as a country that there is an inherent value by listing them as endangered. Culturally those kinds of values have already been established. With numbers so low, there is no acceptable level of injury or mortality" (D. Tobin pers. comm. 2001).

"Mitigation, like estimation of impact, requires a case by case assessment. At this time we have insufficient data to accurately predetermine the underwater

[41] Underwater noise is one of the factors being linked to the demise of the British Columbia Killer Whale population between Vancouver Island and Washington State. In l998 there were 98 orcas in the population. Today there are only 78 – a decline of 20 per cent in the last 6 years. The population was recently listed as Endangered by COSEWIC. Underwater noise is one of the factors believed to be attributing to the whales' demise. The others are PCBs and the decline in salmon populations. John Ford of the Department of Fisheries Marine Mammal Research says the noise pollution, from boat traffic and continuous whale watching, may affect the whales' ability to find prey through echolocation or sonar. It was suggested that whale refuge areas should be created where whales can escape the boats and rest. [Information from CBC TV News, The National, Nov. 30/01; CBC Radio, As it Happens, Dec. 3/01; CBC Internet www.cbc.ca Dec. 3/01]

acoustic impact from any anthropogenic source.Consequently, it is not possible to definitively state what measures will ameliorate any one impact." – D.R Ketten

Chapter 4 Oil and gas exploration: Drilling Impacts

An explanation of what is involved in exploratory drilling can be found in Part I (Oil and Gas Primer) of this report. Table 5 below summarizes of some of the known impacts of activites associated with exploratory drilling. According to the Environmental Assessment for Exploratory Drilling off the Scotian Shelf (Thomson et al. l999) the drilling of a single exploration well would take 50-100 days up to 6 months. If hydrocarbons are found, the well is tested – an activity that typically takes 10-40 days.

It should be noted that all impacts listed here do not address cumulative impacts which is discussed in further detail below.

Table 5 Summary of Ecosystem Impacts related to Exploratory Drilling Activities

ACTIVITY AND/OR DISCHARGE	IMPACTS AND REMARKS
drill rig anchoring	18. loss of benthic (sea floor) habitat (1, 5)
drill muds and cuttings	❑ Known chemical and physical disturbances in the vicinity of the rigs. (1, 5) However, bulk of studies done to date focus only on short-term lethal effects rather than long-term toxicity or sub-lethal effects. (5) ❑ Water-based muds, while better than oil-based muds, are still toxic. They also have a higher capacity for dilution and are disposed of overboard in mass dumpings. (2, 5) ❑ EA (Thomson l999) states that water based muds are used "where practical." Oil-based muds are also used but cannot exceed 1% by weight on cuttings, unless authorized by the CNSOPB. (4) ❑ Muds and cuttings could smother living organisms and toxic effects could slow growth, decrease species

	abundance and alter reproduction. (3) ❑ Tainting of finfish and invertebrates. (4, 5, 6) ❑ Long-term implications of the accumulation of these discharges have yet to be fully assessed. (3) Recent studies have shown there are wide-spread effects of discharges, well beyond the immediate vicinity of the drill rig. (See Part 1, Section 3.2.1, *Drilling Muds)*
NOISE underwater (boats and stationary sources) aircraft	❑ Similar to seismic effects, especially in regard to behavioural effects on marine animals. Please see section on seismic testing. Duration of noise from exploratory drilling can also exceed by seismic by several months.
lights and flares	❑ attract and kill or strand birds (4, 5)
restricted access	❑ Exclusion zone around the drill rig effects on the fishery (discussed in detail in Part 3) (5)
oil spills and oil blowouts	❑ See Chapter 6 below for oil spills ❑ oil blowouts occur when reservoir pressure blasts the oil out into the environment.
blow outs (natural gas)	❑ Contamination of marine habitats. Blow outs are caused when pressure blasts the hydrocarbons to the surface. Can sometimes take days to control (e.g. Sable in l994) (7) ❑ When a gas blowout occurs, approximately 75% of the gas evaporates in the first 24 hours. The impacts of these products in the atmosphere, including effects due to long distance transport, are not well known. (6)
OTHER ROUTINE DISCHARGES grey and black water, cooling water, bilge and displacement water	❑ could have potential effects on health of marine animals (4) ❑ could cause death or mortality (4) ❑ discharges that may exceed the maximum allowed oil concentration level of 15mg/l are reported to the Chief Conservation Officer within 24 hours, but are still discharged into the environment. (4) ❑ biocides and chlorine(for cooling system) may be released into environment (4)
rig structures	❑ often attact fish and turtles etc. (1), altering normal behaviour and bringing them closer to sources of

rig structures (continued)	potential contamination (5) ❑ could result in increased predation ❑ disturb natural habitat/ecosystems

Sources: 1.(The Maritime Awards Society of Canada 2001); 2. (Patin and Reddy l995); 3.(MMS l997 cited by Sisskin l997); 4. (Thomson et al. l999); 5. (Reddy et al. l995); 6. (Boudreau et al. l999) 7. (Livingstone pers. comm. 2001)

Cumulative Effects

"If you ask the question 'and what is the effect of 50 years of nearshore oil and gas development?' There's virtually no data available on that."
-Bruce Hatcher (pers. comm. 2001)

The cumulative effects of exploratory drilling are not known. Studies that have been conducted are short-term and localized (site-specific). But what happens when these contaminants are transported elsewhere? What happens when they accumulate? What happens 50 years from now?

Dr. Enid Sisskin is a biologist who heads up the Gulf Coast Environmental Defense in Gulf Coast, Florida. She says "drilling does not take place in a vacuum. Cumulative impacts of drilling must be added to, not compared, to those from all other sources" (Sisskin l997). According to an even-handed account of the oil and gas industry by Russian biologist Stanislav Patin (l999), the most serious concerns arise regarding possible sub-lethal effects. Such effects begin subtly enough, and cumulatively lead to changes in feeding, reproduction and growth. These effects are happening all over the world because of chronic contamination of the marine environment from many sources. Determining offshore oil and gas's precise contribution to such degradation is an as-yet unaccomplished task. Patin writes:

"The available data suggests that primary sub-lethal responses of marine biota (including commercial species) in the form of biochemical changes, histological anomalies, diseases and some other effects of chronic stress have become global phenomena in the marine coastal zone. An early diagnosis of these responses is presently an important and challenging task, especially in areas directly affected by anthropogenic impact. These areas undoubtedly include places of the offshore oil and gas developments" (Patin l999).

A more detailed discussion on how exploration drilling impacts fish and their ecosystems can be found in Part 3 of this report.

Chapter 5 Oil and gas production: Accidental Spills and other impacts

The authors of this report recognize that a discussion about oil and gas production falls outside the CNSOPB's Terms of Reference (CNSOPB 2000). However, as outlined in Part 1, the intent of this report is to lay out a framework for a full-cost accounting analysis of oil and gas development off Cape Breton. Full-cost accounting is by definition long-term and therefore includes production as well as other petroleum related activities. The following therefore, is in keeping with this framework and must be considered within the scope of any future analysis of this nature.

Through the use of examples, the following section skims the surface of ecosystem impacts that may result from the production and the transporting of oil and gas.

The production phase of oil and gas development is very similar to the exploratory drilling phase, but on a much larger scale. Noise, flaring, lights, structure and discharges are all part of the gargantuan task of removing and transporting vast quantities of hydrocarbons from beneath the ocean floor. All of the associated ecosystem costs from these activities must be considered before an overall economic gain can be concluded.

Louisiana's degraded Bayous

In Louisiana, oil wells are as much a part of the coastal landscape as lighthouses are in Nova Scotia.[42] Literally, thousands of "onshore"[43] wells pump hydrocarbons from below the seafloor. According to Larry Wall, spokesperson for the Louisiana Mid-Continent Oil and Gas Association, Louisiana hasn't seen the oil the way California has. "Back in the l960s there was a major spill off the Santa Barbara coast. Ever since then they've been very reluctant," he says. Oil and gas is met with opposition on the other coast too. "People in Florida are worried about tourism and have so far managed to keep the oil wells out. I'm not sure what's worse, having condos blocking the beach front or building oil wells." In Louisiana, the coast isn't a big draw for tourism, Wall concedes. "We don't have sandy beaches. It's all marshland so no one's out there looking out."

Despite Wall's positive spin on the oil and gas industry, it has had effects on the bayous Louisiana is known for. Canals built for oil and gas exploration, pipelines, well maintenance and transportation have resulted in wetland loss. At least 10-30% of the loss is directly attributable to the petroleum industry with an additional unknown

[42] This comparison can be attributed to Larry Wall, Director of Public Affairs for the Louisiana Mid-Continent Oil and Gas Association. (L. Wall pers. comm. 2001)

[43] Wells located within 3 miles from the shoreline are located in the "onshore." Everything else is called offshore. The terms "nearshore" or "inshore" are not used in Louisiana.

percentage due to indirect effects.[44] One US$3 million restoration program involved the installing of numerous plugs in abandoned oil and gas access canals.[45]

It was recently reported in Harpers Magazine that the oil released in the Gulf of Mexico accounted for 75% of all US marine spillage. The Gulf was also the site of the country's third largest marine spill when in l990 a tanker exploded 57 miles from Galveston leaving behind five million gallons of crude. Another spill source, says the article, is abandoned barges off the Louisiana coast. "Stripped of identification markers, they are pumped full of waste oil and left to corrode and leak" (Harpers Magazine 2001).[46]

California and inshore oil

In January l969, a Union Oil well located approximately 5.5 miles south of Santa Barbara, California sitting in 190 feet of water erupted gas and crude oil for eleven days. By the time the well was officially plugged, 726 metric tons (5,000 barrels) of oil per day escaped into the Santa Barbara Channel. The well continued to leak for 100 days and by the end researchers estimated that a minimum of 12,000 metric tons of oil had escaped (approximately the same amount oil that reached the shores of Cornwall following the l967 "Torrey Canyon" [47] disaster – an oil spill that polluted the north coast of France and Guernsey). Eleven days after the blow-out, every kilometer of shoreline was coated with 115 metric tons of oil (Loutfi l973). Within four months of the spill the entire Santa Barbara basin was covered by oil. Nealy 4,000 birds were killed – most of them the diving birds: grebes, cormorants, scoters, loons, pelicans and mergansers (ibid).

According to Loutfi, the small number of bird losses was due only to circumstances, not by the quanity of oil. He cites Senator J. Hemphill, who during the United States Senate Hearings in l969 stated: "That the bird losses have been low is purely fortuitous; the ingredients for a major avian disaster

[44] Information from http://www.biology.usgs.gov/s+t/SNT/noframe/gc138.htm. Accessed Oct/18/01.

[45] In l995, more than $35 million was being spent annually on almost 60 projects aimed at restoring Louisiana's coastal wetlands. Among the causes of wetland damage was construction of oil and gas canals and abandoned and leaking canals. Funding for the projects came from the Coastal Wetlands Planning, Protection and Restoration Act. Information from http://www.publicaffairs.noaa.gov/pr95/march95/wetlands.html

[46] The article goes on to say that since l990, there has been an annual average of 30 million gallons of oil spilled in the US from wells, pipelines, vehicles and storage facilities. The most spill-prone part of the country's oil infrastructure are the pipelines – 155,000 miles of it.

[47] March l967. The Torrey Canyon on it's way from the Persian Gulf to Milford Haven was carrying 118,000 long tons of Kuwait crude oil. It ran aground on the Seven Stones Reef. Sixteen of her eighteen storage tanks were torn open on impact releasing 30,000 tons of black crude immediately. This drifted up the English Channel and polluted the North Coast of France and Guernsey. The next week, 20,000 more tons escaped, polluting 200 miles of the West Cornish Coast. A few days later the vessel broke and 50,000 more tons flowed into the Bay of Biscay. Finally, the Torrey Canyon was bombed with 160,000 pounds of explosives, 10,000 gallons of aviation kerosene and 3,000 gallons of napalm and several rockets, destroying most of the remaining 20,000 tons of oil (Loutfi l973).

were present…bird populations in the area were generally low, due in part to the storm immediately preceding the spill. Many birds were driven out of danger. It is frightening to think what might have happened had the usual flight of brant landed here during the critical period. Almost the entire population of this species could have been exposed to extirmination" (ibid).

United Kingdom

In Canada, the oil and gas industry claims it contributes only a very minor amount of oil to yearly reported discharges. The Maritime Awards Society of Canada (2001) says that of all Canadian oil discharges, 45% come from tanker traffic and 2.5% from offshore oil and gas operations.

An annual survey conducted for Britain's Maritime and Coastguard Control Agency tells another story (ACOPS 2001).

The survey tracked 743 reported discharges within the United Kingdom's Pollution Control Zone and national waters. "Offshore oil & gas installations were identified as the source of 67% of confirmed discharges," reads the report.

Offshore support vessels accounted for another 2%, while oil and chemical tankers made up 6%. Fishing boats accounted for 10% of discharges and general cargo vessels 4%.

East Coast Oil/Gas Spills

In recent history there have been five oil/gas spills on the East Coast alone. In February l970, the *Arrow* spilled 9,000 tonnes of oil in Chedabucto Bay, killing 4,800 birds offshore and 2,400 birds inshore. Exposed shorelines took 5 years to clean up while sheltered bays took much longer (Maritime Awards Society of Canada 2001). In March of l970, the *Irving Whale* lost 30 tonnes of oil to the sea as it sank to the ocean bottom south of Newfoundland. According to the Canadian Wildlife Service, the slick drifted across an eider feeding area, oiling approximately 5,000 birds. "The toll was nearly as large as *Arrow's,* from a spill only 1% of the size" (CWS 2000). In March l979 the *Kurdistan* lost 7,900 tonnes of oil that slicked Cape Breton island again. In the winter of l989/l990 about 17,500 oiled murres washed up in Placentia Bay, Newfoundland. The source of that pollution, they say, was oily bilge water pumped into the sea from passing ships (ibid). There have been two gas blowouts near Sable Island – one at *Venture (N-91)* and the other while drilling the *Uniake G-72* – a blowout that released natural gas and 250 cubic metres of condensate. It took nine days before it could be controlled.

Conclusion

As noted in Part 1, full-cost accounting requires that environmental and social benefits as well as costs be fully incorporated into the economic accounting system. To recap, three related processes included in full-cost accounting are:

- the valuation of non-market values (natural capital)
- the internalization of external costs
- the replacement of fixed with variable costs

Current oil and gas exploration, production, and use in Canada and indeed the world externalize costs. In other words, the true costs of those

activities are not paid for today, but rather, are assumed by future generations. For intance, the costs associated with greenhouse gas emissions over the last fifty years caused by the burning of fossil fuels such as oil do not register as a cost anywhere in our current accounting system. However, the many unknown consequences of warming the earth will be paid at some point in the future, and many argue are already being paid by today's generation if natural disasters such as flooding or droughts are being considered. Any full-cost accounting of the oil and gas projects proposed for Cape Breton would be incomplete without addressing the costs of greenhouse gases. Please refer to *The Nova Scotia Greenhouse Gas Accounts for the Genuine Progress* (Walker et al. 2001) for an in depth analysis of the true costs of greenhouse gas emissions for Nova Scotia.

In Part 4 of this report (The Real Cost of Oil and Gas) direct and indirect subsidies to the petroleum industry are discussed in detail. These subsidies, a form of externalized cost – are not paid by the petroleum industry but by the taxpayer. The depreciation of non-market values, such as natural capital, also occur at every phase of petroleum development. Efforts must be made to minimize these.

The CNSOPB Terms of Reference limited the scope of this report to include only the exploratory phase of petroleum development. However, there are at least 5 more phases which should be assessed in terms of cost externalization. These include:

1. Exploratory (seismic, drilling)

2. Production (recovery and extraction of hydrocarbon)

3. Processing (making of commodities, gas processing and upgrading)

4. Transportation (pipelines and tankers)

5. Refining and Petrochemicals

Chapter 6 Protecting Natural Capital

"Almost three times as many bird and mammal species alone–112– became extinct from 1810 to 1995 than were lost between 1600 and 1810 – 38 species. The loss of other life forms, such as mollusks, plants, fish, and insects, numbers in the thousands. Factors contributing to species loss include habitat destruction, invasion of new habitats by non-native species, global warming and depletion of the ozone layer in the atmosphere."
-(United Nations l997)

Canada was one the first of 177 countries to sign onto the United Nations Organization's International Convention on Biological Diversity in l992. The Convention took effect in December, l999 and required signatories to make a commitment to protect threatened species and their habitats. Here in Canada there is no question that legislation is badly needed. According to the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) there are currently a total of more than 350 known species at risk in Canada, including 52 species of birds, 22 marine mammals, 73 fish, 34 amphibians and reptiles, 8 molluscs, and 117 vascular plants.

According to another report, released by the Canadian Endangered Species Conservation Council (CESCC 2001), Canadian waters are home to about one-quarter of the world's Cetaceans (including whales, dophins and porpoises) and Pinnipeds (seals, sea lions and walrus). As was noted earlier, many Cetaceans only spend the warmer summer months in Canadian waters feeding on krill, zooplankton, and forage fish species. The report concedes that of the more than 70,000 known and described species in Canada only 2% or 1,600 species have been assessed. The report states, "For some species there is not enough information fo assess whether they are secure or already in trouble…with our vast landscape and large number of wild species it is not surprising that for some species we simply have too little information to evaluate their status."

6.1 Protecting Species at Risk

For those species we know are in decline, habitat loss is directly responsible for an estimated 80% (Bourdages and Labelle 2000). Therefore, one of the key ways of protecting these species is to protect their habitats. There have been a couple of failed attempts in the last several years to address this issue on the federal level, but as it stands there is still no legislation protecting species at risk. Earlier attempts – Bill C-65 and Bill C-33 – died on the order papers in l997 and 2000 respectively. The current legislation**,** Bill C-5 went to second reading, was referred to the Standing Committee on the Environment and Sustainable Development which reported with amendments on December 3, 2001. The *Species at Risk Act* (SARA) legally recognizes COSEWIC for the first time and purports to "protect species at risk and their critical habitats" (Environment Canada 2001b). However, the legislation has been a contentious one from the start.

According to the a recent article that appeared in the magazine *Science*

(Withgott 2001), SARA differs from the much more stringent U.S Endangered Species Act[48] on a number of fronts. The Canadian legislation would resort to enforcement only after incentives and voluntary compliance have failed. Environment Minister David Anderson was quoted in Science saying, "We do not want to hamstring our own efforts to recover species with a confrontational and immediately prohibitive approach." But according to the same article scientists say this "carrot-and-stick approach is too much carrot and not enough stick." The Bill provides no mandatory protection of habitat and leaves the designation of what is critical habitat up to local and regional officials, landowners and industry, states Withgott.

David Schindler, a well-known ecologist at the University of Alberta and organizer and co-signatory to a letter drafted by scientists to the Prime Minister[49], says that "anyone with Ecology 101 knows that without habitat, it is impossible for a species to survive." He is also critical of the proposed listing process. Scientists would like to see COSEWIC, which has long maintained a list of species at risk, to be given the legal authority to continue to do so. But the final say on what gets listed and what doesn't is in the hands of Cabinet Ministers, not scientists, says Schindler.

"Scientists worldwide recognize that the key to saving species is preserving and restoring their habitats – the places where they feed, breed, and raise their young. Species protection without habitat protection is nearly always a scientific impossibility. A homeless species is a doomed one. Remarkably, the proposed SARA still fails to require habitat protection. It prohibits the destruction of an animal's nest or den, but not the rest of its habitat – which is comparable to protecting a person's bedroom, but not the rest of their house or neighbourhood. The Bill says that a species' critical habitat "may" – not "will" – be protected. This is deeply disappointing. For the Act to have a real impact on endangered species conservation, habitat protection must be a requirement, not a political option." – Excerpt from Letter to Prime Minister signed by 1,331 Scientists, September, 2001.[50]

It is questionable whether Bill C-5, if passed, would be able to protect fish, reptile and marine species at risk – especially when their habitat often encompasses very large expanses of open ocean and coastal waters.

Nova Scotia Endangered Species Legislation

In 1998 Nova Scotia passed the Endangered Species Act which currently

[48] The U.S Endangered Species Legislation (first passed in 1973, its progressive roots can be traced back to the extinction of the Whooping Crane) provides for the development of a list of endangered species, the identification of their habitats, and the implementation of recovery plans for each of the species listed. They also prohibit a range of activities that could be harmful to endangered species.

[49] Letter can be seen at www.scientists4species.org

[50] Nearly 50 scientists from Nova Scotia signed the letter, including a number of scientists who work in the fields of Biology, Oceanography and Environmental Studies at Dalhousie University.

lists 16 species, four birds, two turtles, one mammal and nine plants (Percy 2001). For those species which are listed the Act provides three levels of protection: it prohibits the disturbance, killing or sale/trade of the species or their parts; it protects their residence, such as bird's nest; and, it protects "core habitats." The Act falls short in the marine department. "The selection of species is not based on jurisdictional responsibilities, but on whether or not the law will benefit the species," says Sherman Boates, the manager of Wildlife Resources-Biodiversity with the Nova Scotia Department of Natural Resources. "In the case of the Right whale, for example, it is unlikely that provincial laws could do much to improve things over what is already being done by the recovery team set up by the Department of Fisheries and Oceans" (ibid).

6.2 Marine Protected Areas and Bill C-10

"Not every place in the ocean is compatible with every type of activity."

- Faith Scattolon, Regional Director, Oceans and Environment[51]

For a number of years the Canadian Wildlife Service's Marine Habitat Working Group has been working to define Environment Canada's role in marine habitat conservation and in particular, the establishment of Marine Protected Areas (MPAs)[52] (Zurbrigg l996).

Important wildlife habitats have been described by the CWS as:

"Coastal, estuarine and marine areas [that] provide a variety of productive habitats, supporting diverse assemblages and an enormous abundance of marine birds and other wildlife. These habitats include coastal islands, wetlands, salt marshes, estuaries, seagrass beds, and intertidal mudflats; further offshore, they include polynyas, sea mounts, shelf breaks, banks, and upwellings of nutrients in the ocean."(ibid)

There is very little currently protecting Canada's marine ecosystems and its associated biodiversity. In l994 the *Canada Wildlife Act* was amended to include up to the 200-mile limit. This made sense since many marine species (much like large terrestrial mammals) know no boundaries. Birds, fish and whales, for instance, are migratory and therefore networks of protected areas are really needed to "safeguard the critical habitats that are used in different locations throughout the life cycle" (ibid).[53]

[51] speaking at panel discussion titled *Moratoria on Oil and Gas Development in the Canadian Offshore,* October 22, 2001.

[52] The internationally used definition of an MPA is "any area of intertidal or subtidal terrain, together with its overlying water and associated flora, fauna, historical and cultural features, which has been reserved by law or other effective means to protect part or all of the enclosed environment" (Zurbrigg l996).

[53] For instance, many whales spend the winter months in warmer southern waters and feed in the biologically rich waters near Nova Scotia. All of the habitats used throughout the species' life cycle must be protected if the populations are to remain viable. In some cases, where the species is already at risk, even more protection must be granted.

According the the CWS report, individual MPAs can serve one or more conservation-related goals:

- to protect critical habitat (ie. feeding, spawning or nursery grounds)
- to protect an ecological feature or process (ie. upwelling zone, estuary)
- to protect a special or unique site or feature (ie. migratory bottleneck)
- to protect ecologically representative or typical habitats
- to establish a "control" area for research and monitoring, and
- to support the rehabilitation of populations, species and habitats.

Much like Bill C-5, Bill C-10 has gone through a number of reincarnations. First tabled as Bill C-48 in l998 and then as Bill C-8 in 2000. Both died on the order papers. The latest, Bill C-10 was introduced in February, 2001. If passed, it would allow for the establishment of national marine conservation areas intended to conserve representative examples of Canada's 29 marine environments in coastal zones and the Great Lakes. The Bill was referred to the Standing Committee on Canadian Heritage in May, 2001, and reported with amendments in November, 2001. It was given third reading and is in Senate.

According to Boris Worm, a research scientist with the biology department at Dalhousie University, species recovery within MPAs can be quick. "It's actually quite amazing how fast some species recover in these areas, depending on how big they are and where they are." He adds that " a lot of the science that has been done on this – not in Canada but elsewhere – has suggested it works fairly quickly and it works to everybody's advantage." Worm points out that if a place is not already considered important enough to protect then it may be too late. "The Gully now is spared from licencing because it was in the box before the boom began. It was just good luck that the people from Dal knew that this was critical for Bottlenose whales, for example, and that there's no way an oil rig can go in there."

The parcel areas around Cape Breton are not in the same position as the Gully was, says Worm. "If anybody now discovers that Cape Breton must become a marine park, and you already have licenses given out, then it becomes very difficult." Worm is critical of the environmental assessment process because he says "they are based on literature reviews of mostly other areas. Nobody actually goes out there and looks at what's there and determines how important these things are."

According to whale researcher Andrea Ottensmeyer, we don't even know where the sensitive areas are for many whale species. "If we don't have that kind of basic knowledge then if some kind of activity goes on which endangers the life that's out there, we have no idea what we have lost" (Livingston 2001).

"We shouldn't trade fish for gas. We shouldn't trade our coastal communities for gas, it is not worth it." -Andrea Ottensmeyer, whale researcher

PART

3 Social Capital

AND THE ECONOMIC VALUE OF FISHING AND TOURISM

Fishing and Tourism

20% of the workforce

The fishing industry is well-established in Cape Breton, while the tourism industry is relatively new. Together, these two industries employ roughly 11, 000 people,[54] representing roughly 20% of the Cape Breton workforce as a whole.[55]

Fishing and tourism co-exist, and to some degree, tourism relies on fishing for the cultural capital it provides. Fishing towns and kindly Cape Islanders painted in appealing, home-spun colours have great tourist appeal. Similarly, the knowledge that a seafood dinner in a Mabou restaurant was caught in waters a stone's throw away is important to the Cape Breton tourism experience.

Both fishing and tourism – if pursued properly – are sustainable industries. If the marine climate is protected, fishing jobs will be protected in perpetuity. Similarly, if Cape Breton's reputation, natural beauty and culture are protected, tourism jobs should also follow suit.
Offshore development along the Gulf and Sydney Bight coasts of Cape Breton could directly affect fishing and tourism.

[54]Total fishing jobs (see Fishing section) estimates are from the NS Department of Agriculture and Fisheries (2001), while total tourism jobs estimates are from the NS Department of Tourism and Culture (2000).
[55]Average employment in Cape Breton in 2000 was 52.4 thousand (HRDC 2001b). As a single sector, the wholesale and retail trade sector is Cape Breton's biggest employer, with 10,100 workers in 2000, representing 19.4% of the workforce.

Chapter 1 The Fishery

Any analysis of the potential impacts of oil and gas exploration along the Cape Breton coastline must consider the people who most often occupy waters along that coast: fishermen. Fishing is one of the largest industries in the province (HRDC 2001a) and the Cape Breton fishery plays a major role within both the provincial and Cape Breton economies.

1.1 The Economic Value of the Cape Breton Fishery

The economic value of fishery resources and the marine environment can be determined by the following indicators:

- Total landed value
- Fishery Gross Domestic Product (GDP)
- Value of fishery exports
- Employment per unit of landed value
- Employment per unit of landed weight
- Market price
- Natural capital (value of fish stocks)
- Annual depreciation (or appreciation) in natural capital
- Value of Marine ecosystem services

from the Nova Scotia GPI Fisheries and Marine Environment Accounts, 2001, A. Charles et al.

Conventional economic analysis of the fishery uses measures such as the Gross Domestic Product (GDP – the total monetary value of fish production); landed value (the gross income of fishers from the sale of fish); the level of exports; and the level of employment in the fishery. Broader analyses also account for the level of natural capital within the fishery system (see Section II).

It goes without saying that fishing plays a significant role in the Cape Breton economy. However, attempts to calculate just *how* vital a role the fishery plays turns up a host of unknowns and conflicting information. Unlike tourism, the Nova Scotia and Cape Breton fishery's role in the economy is poorly documented. Astonishingly, no government agency comprehensively calculates total numbers of fishermen (from skippers to deckhands) and fish plant workers in Cape Breton.[56] And there is great variation in the numbers that *are* provided by various departments. Coming up with a hard-and-fast number of fisheries workers is difficult if not impossible, until researchers – government or private – make an effort to calculate the total value of the Cape Breton fishery. A full economic valuation of Cape Breton's fishery and the marine environment would be necessary to weigh the costs and benefits of inshore oil and gas along Cape Breton's coast.

The most comprehensive and updated information about the provincial and Cape Breton fishery comes from the Nova Scotia

[56]Statistics Canada and DFO quit compiling information about fish plant workers in 1998, says Alexa Vodicka, an analyst with NS Agriculture and Fisheries. Vodicka tries to compile provincial fishing employment figures yearly, and says determining exact numbers of fish plant workers is "a struggle" every year. She says coming up with solid numbers of total fisheries workers in Cape Breton is a Herculean task, because numbers change during the year, are collected at different times during the year, and perhaps most significantly, they come from a variety of sources, from Statistics Canada, DFO (Moncton and Halifax) and HRDC to the NS Finance department.

Department of Agriculture and Fisheries marketing department. This department relies on numbers provided by federal Fisheries and Oceans and Statistics Canada.[57] While DFO divides Cape Breton into East/West divisions for statistical and fishing regulatory purposes, Human Resources Development Canada takes a slightly different slant. Richmond and Inverness counties are included in North Nova Scotia numbers, while employment figures reading "Industrial Cape Breton" include both Cape Breton and Victoria counties. Employment statistics from HRDC – when added up for the whole island – differ greatly from those supplied by DFO. And employment statistics supplied by the NS Department of Finance – gathered from DFO and HRDC – are different yet again.

[57]A note on statistical *vs.* fishing areas, and how information is gathered by different government agencies:
DFO and fishermen divide Nova Scotia's fishery into two areas: Gulf Nova Scotia – the area from Pictou county Northeast to the tip of Cape Breton's Inverness county – and Scotia-Fundy, all other areas, including Cape Breton's Victoria, Richmond and Cape Breton counties.
Landed values are reported by county, yet DFO employment statistics are reported by district. These statistical fishing districts basically divide each Cape Breton county into two.

1.2 Employment

Table 6 Total fisheries workers in Cape Breton

TYPE OF JOBS	NUMBER OF JOBS
Total fishermen/women	**3,089**
Total fish processing workers (numbers include line workers, clerical staff, etc.)	**1,200 to 1,400**
Total Fisheries workers: (numbers include fishermen, fish plant workers)	**4,289 to 4,489**[58]
Total jobs created by fishery, including spin-offs	**4,942**[59]

sources: 1) Scotia-Fundy Core Summary by Province and District, 2001b, by Fisheries and Oceans Canada. 2) Nova Scotia Department of Agriculture and Fisheries, 2001.

Using the Department of Agriculture and Fisheries formula of 0.6 spin-off jobs for every fisherman in Cape Breton, 3,089 fishermen create approximately 450-650 spin-off jobs, besides fish processing jobs. The accuracy of these calculations is questionable, since they are based on employment theories and formulae. They seem to be conservative estimates, and are lower than the estimates of many fishermen who intimately know the fishery.

Total Gulf Nova Scotia and Sydney Bight fishermen

The fisheries workers potentially affected can be broken down by area as well, with the fishermen largely potentially affected by the Corridor Resources licence listed as Gulf Nova Scotia, and those affected by the Hunt Oil licences called Sydney Bight fishermen, for the purposes of this report.

Gulf Nova Scotia fishermen ONLY (Counties Inverness; Antigonish; Pictou): **2,173**

[58]Number of fishermen (3089) added to estimates for fish processing workers (1200 to 1400).
[59]Statistics Canada and the NS Dept. of Finance both have formulae for calculating spin-off jobs. For fishermen, every job leads to 0.6 other jobs (including fish processing jobs).

Total Gulf fishermen (includes Gulf Nova Scotia, Gulf PEI and Gulf New Brunswick): **12,330.**[60]

Sydney Bight fishermen (fishing area 4Vn; Counties Victoria and Cape Breton): **2,024**

The native fishery also stands to be affected by petroleum exploration. The Eskasoni First Nation, for instance, reached a three-year, $50 million fishing deal with DFO in June, 2001 (HRDC 2001a). At the time, HRDC reported Eskasoni had nine certified captains and a fleet of over 20 vessels. "The community is poised to see hundreds employed in long-term sustainable positions in the groundfish, shrimp and snow crab industries" (HRDC 2001a).

Native fishermen living in places such as Pictou Landing, along the North Shore, also fish waters affected by Parcel 1 .

A majority of Cape Breton fisheries jobs are full-time but seasonal, and HRDC predicts employment in the fisheries will remain stable (HRDC 2001a). By HRDC (2001a) calculations, in Industrial Cape Breton alone there are 1,280 direct fisheries workers, not including fish processing jobs. The average income for fishery workers in Industrial Cape Breton ($37,000) is higher than fisheries jobs elsewhere in the province ($32, 273), making the fishery one of the highest-paying industries in the area (ibid). Industrial Cape Breton also has a large number of employers in the fisheries industry, each having less than five workers.

1.3 Landed Value

From 1975 onward, landed fish values in Nova Scotia rose steadily, from the $100 million range steeply upward. They peaked in 1987, at $701 million, even after adjusting for inflation (Charles 2001). After 1987, however, landed values decreased. By 1997, they equalled $482 million. Despite the drop, landed values in 1997 were still double what they were in 1970. And in 1999, landed values are creeping upward again, to $634 million (Dept. of Finance 2001).

The rise can be explained by an increased effort to harvest species such as lobster and crab, which fetch a high market value. The crab fishery continues to grow as this report is written, with processing plants expanding and boat-building/repair businesses working steadily (J. Brownstein pers. comm. 2001). The most recent Fisheries and Oceans landings data[61] are from 1999, which means the growing crab fishery – and its attendant higher landed values – cannot be reflected in these numbers.

It's also important to note that landed values have their limitations as a benchmark for the worth of the Cape Breton fishery. Many fish caught along the Gulf side of Cape Breton are landed in ports on the mainland or by PEI fishermen. The Gulf waters serve all Gulf fishermen. And Cape Breton fishermen do not always land their fish in their home counties.

[60] DFO 2000 – the most recent year for which total Gulf numbers were available. All other numbers are 2001.

[61] The Nova Scotia Dept. of Agriculture and Fishing Marketing Department will have 2000 numbers available in the spring of 2002. As this report was being written, landed values for 2000 were still being calculated.

Table 7 Landed value for Cape Breton, 1999

COUNTY	LANDED VALUE ($000)
Cape Breton	67,236
Inverness	28,774
Richmond	7,189
Victoria	13,934
Cape Breton Total:	117,133

source: NS Dept. of Agriculture and Fisheries Statistical Overview 1999

Tables 8, 9 and 10 give a detailed breakdown of the fish species caught and the landed values for the three of the counties affected by oil and gas development. Gulf Nova Scotia fishermen based in Antigonish and Pictou counties landed $10 million and $11 million respectively in 1999. Landed values for the total Gulf (l999) were $359,938,316.

Table 8 Commercial Species Landed in InvernessCounty, l999

SPECIES	METRIC TONNES	VALUE ($000)
Groundfish		
Cod	714	1,039
Redfish	118	111
Halibut	2	13
American Plaice	476	431
Yellowtail Flounder	1	1
Greysole/Witch Flounder	325	448
Winter Flounder	3	3
Greenland Halibut	24	27
Dogfish	121	36
Pollock	1	1
Hake White	63	70
Catfis	1	0
Monkfish	0	1
Groundfish Total	**1,849**	**2,181**
Pelagics		
Herring	3,997	682
Mackerel	186	118
Alewives	256	169
Tuna, Bluefin	37	909
Eels	4	24
Smelts	3	9
Shark, Porbeagle	7	10
Shark, unspecified	2	3
Pelagics Total	**4,492**	**1,924**
Molluscs/Crustaceans		
Sea Scallop	21	48
Squid	1	1
Lobster	1,050	11,808
Crabs, Toad	40	18
Crab, Rock	25	24
Crabs, Snow	2,152	12,770
Molluscs/Crustaceans Total	**3,289**	**24,669**
Total All Species	**9,630**	**28,774**

Source: Statistical Overview, l999, NS Department of Agriculture and Fisheries

Table 9 Commercial Species Landed in Victoria County, l999

SPECIES	METRIC TONNES	VALUE ($000)
Groundfish		
Cod	340	533
Haddock	1	1
Redfish	1	0
Halibut	18	134
Flounder Plaice	200	199
Flounder Greysole	66	89
Greenland Turbot/Halibut	4	4
Dogfish	10	3
Pollock	2	2
Hake White	76	61
Catfish	1	0
Groundfish Total	**719**	**1,026**
Pelagics		
Herring	597	103
Mackerel	730	300
Swordfish	0	3
Alewives	121	32
Eels	3	9
Smelts	1	5
Pelagics Total	**1,452**	**452**
Molluscs/Crustaceans		
Squid, unspecified	1	1
Lobster	628	7,420
Crabs, Rock	640	3,267
Crabs, Queen	514	1,758
Molluscs/Crustaceans Total	**1,763**	**12,446**
Other		
Sea Urchins	5	10
Total All Species	**3,939**	**13,934**

Source: Statistical Overview, l999, NS Department of Agriculture and Fisheries

Table 10 Commercial Species Landed in Cape Breton County, 1999

FISH AND INVERTEBRATES	METRIC TONNES	VALUE ($000)
Groundfish*:*		
Cod	696	1,013
Haddock	6	11
Redfish	2,427	1,332
Halibut	36	224
Flounder Plaice	1,059	1,039
Flounder Yellowtail	309	306
Flounder G/sole	155	219
Greenland Turbot	881	2,833
Flounder Unspecified	288	253
Pollock	12	9
Hake White	87	64
Cusk	2	1
Catfish	8	3
Monkfish	4	5
Groundfish Total	**5,970**	**7,312**
Pelagics:		
Herring	1,134	199
Mackerel	27	16
Swordfish	49	337
Marlin White	1	1
Alewives	37	10
Eels	13	42
Skate	571	228
Smelts	1	6
Shark Mack., Mako	1	2
Shark unspecified	0	1
Pelagics Total	**1,834**	**842**
Molluscs/Crustaceans:		
Clam, Propeller	226	123
Clam, unspecified	8,013	7,829
Scallops	14	30
Lobster	785	9,662
Shrimp, Borealis	9,565	33,404
Rock Crab	115	96
Queen Crab	1,470	5,121
Crabs, unspecified	1	1
Shrimp, Pand Montagui	757	2,600
Sea Urchins	84	216
Molluscs/Crustaceans total	**21,030**	**59,082**
Total all species	**28,834**	**67,236**

source: Statistical Overview 1999, NS Department of Agriculture and Fisheries

1.4 Employment per unit of landed value and landed weight

Employment can be measured as the number of people working in the fishery per unit of harvest – either per metric tonne of fish caught, or per million dollars in landed value (Charles 2001). These indicators assess the benefits obtained "per fish" taken from the sea. Employment per tonne of fish has been increasing since the mid-1980s, mostly due to a decline total landings by weight (ibid). The employment per unit of landed fish also declined in late 1980s, but is increasing again. The increase is likely caused by the shift toward lower-volume but higher-value fish, such as shellfish. Table 11 shows the employment per unit weight or biomass and the employment per unit of value. In both cases the number used for total employment is 4,942.

---------- Table 11 Employment per Unit Biomass and Landed Value ----------

UNITS (1999)	EMPLOYMENT PER UNIT
Total Landed Weight: 44,970 metric tonnes	0.1 job for 1 metric tonne landed
Total Landed Value: $117,133,000	0.04 job for $1000 landed value

1.5 Wages Earned By Fisheries Workers

The average yearly income for fishermen is $24,598 (HRDC 2001a). This number does not reflect the higher incomes earned by crab and lobster fishermen – which can be in the $50,000 and even $100,000 range. Using this conservative estimate, Cape Breton fishermen earned roughly $76 million in 2000. HRDC says fisheries workers in the Industrial Cape Breton zone (Cape Breton and Victoria counties) earn an average of $37,000 yearly – higher than the provincial average. By this calculation, some 2,024 people in these counties alone earned a collective $75 million.

By comparison, the average salary for fish plant workers is $10,769 (HRDC 2001a), meaning they collectively earned $15 million. Since fisheries workers tend to spend their money locally (House et al. 1986), most of this money likely went directly into coastal communities.

1.6 Market Price

Market price of Nova Scotia's fish is significantly higher than the landed values. In 1999, provincial landed values were $540 million. The market value of this fish, at $1 billion, more than doubled its landed value.

1.7 GDP

Gross Domestic Product (GDP) is a measure of the total quantity of all goods and services produced, and the total money earned and spent. Nova Scotia's GDP for 2000 (in 1997 dollars) was roughly $23 billion ($22,815 million). Determining Cape

Breton's GDP is a tricky task, since no government agency breaks down GDP by provincial economic region. Instead, we have an estimate of Cape Breton's GDP provided by the NS Department of Finance. Employment and GDP have a close correlation. Therefore, this GDP estimate was reached by calculating the Cape Breton share of total employment for Nova Scotia applied against the Nova Scotia GDP. "It's a crude estimate," says Finance Department senior economist Bill Steele, who uses such calculations to predict growth trends. Average employment in Cape Breton in 2000 was 52,400 – roughly 12.5% of the provincial average of 419,500. This percentage multiplied by the real GDP gives us an estimated Cape Breton GDP of $2.8 billion.

But as Steele points out, this GDP number is only a guess. A full-cost accounting study of the potential impacts of oil and gas would need to determine the Cape Breton GDP, and calculate the fishery's contribution to that GDP. This GDP number would then make up one of the variables weighed in determining the full social, environmental and economic effects of exploration on the fishery.

1.8 Values of Fisheries Exports

Fish is Nova Scotia's #1 export product group, at $1.1 billion in 2000. Fish exports account for 21% of all 2000 exports, up nearly 10% from 1999 (Dept. of Finance 2001). Nova Scotia exports more seafood worldwide than any other province (ibid). On a chart with other Nova Scotia exports – including paper and lumber – fish and fish products stand out as the only export product group to reach the $1 billion mark. The next largest export product group is non-metallic minerals and mineral fuels, at roughly $940 million, followed closely by Special Transactions Trade, including tires. By comparison, the next largest group – paper and paperboard – sits at roughly $540 million.

Chapter 2 Factors Potentially Affecting the Fishery

2.1 Loss of access to fishing grounds

One of the most immediate effects to the fisheries is vessel exclusion zones. In Atlantic waters, sea traffic (excluding vessels associated with the rig) is expected to stay 500 metres from drilling rigs or 50 metres beyond their anchors, whichever is greater (CEF Consultants 1998). Many exclusion zones are 1000 metres. Exclusion zones change during stages of oil exploration and production, depending on how many pipelines, platforms or buried storage tanks are present.

Exclusion zones can mean considerable loss to fishermen. An exploratory rig with an exclusion zone of 1.5 kilometres, for instance, would exclude roughly 7 square kilometres from fishing vessels. Seismic testing periods also preclude fishing activity in affected areas.

"The long-term experience in some countries indicates that the main concern of the fishing industry is not connected with pollution and environmental consequences of the offshore oil and gas industry's activities. Instead, the most serious impact involves displacement of traditional fishing areas and physical interference with trawl fishing (including vessel and gear damage)" (Patin 1999).

Compensation for losses

Patin points out that there are no hard and fast rules obligating oil companies to compensate fishermen for damages and losses (see Scotland case study).The oil and gas industry off Nova Scotia has a voluntary fund to compensate fishermen for damages to gear and vessels, and also lost catch if these damages can be related to the oil industry. But again, the "rules" are not hard and fast, and this is an industry – not a government – initiative.

At the beginning of offshore development in the North Sea, U.K. fishermen, in an appeal to the government, estimated they were excluded from 800 to 5,200 square kilometres of fishing grounds along the UK continental shelf (Patin 1999). The resulting losses in catch range from £580,000 to £3 million a year (ibid), or roughly $1.3 million to $6.8 million Canadian dollars (current value).

Over the past 15 years, North Sea fishermen have filed 1,200 compensation claims for interference, accidents or damage to gear and vessels. Oil and gas companies in Norway pay an estimated £3.3 million, or $7.5 million CAD yearly in losses to fishermen (ibid). It is unclear how many of these claims are the result of losses and foul-ups due to exploratory drilling, since, as far as losses are concerned, there is no clear demarcation in much of the literature between the drilling itself, and later exploitation of the oil and gas fields. Patin uses the following example to illustrate potential fishing losses. This method for calculation could be applied to losses caused by exploratory drilling exclusion zones as well:

"The amount of possible fishing losses can be illustrated by calculating the potential catch in the zone that will be alienated from fishing because of planned laying of a main pipeline in the Barents Sea. This zone covers an area of 5 miles on both sides of the 500-km long pipeline. this would cause the possible loss from 4,000 to 11,000 tons of

bottom fish catch and from 12,000 to 45,000 tons of annual total catch (in case of a complete ban on any fishing). In other words the fishing industry would lose 14 to 53 million dollars annually, depending on the way the pipeline is laid" (Borisov et al. cited in Patin 1999).

But there is another assumption behind the notion of compensation: the potentially offensive idea that money solves everything. Money has always been the main tool of conflict resolution between fishermen and offshore oil and gas (Heber 1986). "The philosophy of compensation implies a right to disrupt based on a willingness and ability to pay" (ibid). And although compensation redresses immediate loss, it doesn't account for long-term environmental or social effects. A more meaningful approach, says Heber (1986), is environmental planning for offshore development that emphasizes prevention for conflict and hazard, "to ensure that fishing remains a viable industry to support future generations of Nova Scotians." Potential for conflict is magnified when considering inshore oil and gas (see below).

2.2 Debris

Debris from offshore oil is another problem commonly cited by fishermen working in the same areas occupied by oil and gas (Goodlad 1986).

At the end of the 1980s on the British Shelf of the North Sea, for example, there were 250-300 suspended well-heads spanning 3-4 square metres each (Patin 1999). The concrete structures bordering the wells look like upside-down tables with legs approximately four metres long and a central pipe of roughly the same length (ibid). "It is easy to predict the result of the bottom trawls encountering such structures and to imagine what British fishermen feel and say in such cases," writes Patin. In response to the North Sea situation, Canada has regulations requiring that debris be removed after drilling.

2.3 Offshore vs. Inshore Oil and Gas

Competition for space can create serious conflict between offshore industries and the fishing industry. This competition becomes even more acute when offshore gas moves "inshore," to the areas most densely fished. Proximity is at the crux of Gulf and Sydney Bight fishermen's opposition to the inshore parcels. "We are willing to work co-operatively, where we need to, when the (oil and gas) areas are truly offshore," says fisherman Jeff Brownstein (2001a), a representative for the Maritimes Fisherman's Union. Brownstein points out that fishermen did not oppose exploration in the areas off Sable or Banquereau Bank, even though these are important fishing areas. "But we feel it is not too much to ask to protect the inshore areas, that are so much more fragile, and that so many fishermen, and others, depend on for our livelihood."

Because the parcels cover well-established fishing grounds, the location, as well as the timing and duration of seismic and drilling activities, creates varying scenarios for impacts to the fishery. The fishing business is dependent on natural cycles as well as government-set seasons for certain fisheries. There would have to be great co-operation and understanding between the fishery and oil industries to ensure that no fishing season or area was compromised by petroleum exploration activities.[62]

[62]In the past, communication and understanding between fishermen, fishing regulatory bodies, and

Both fishermen and DFO define "the inshore fishery" not by mile limits in the water, but by boat size. "It's always been attached to the boat – not the sea," says Brownstein (pers. comm. 2001), who adds that fishermen consider any boat under 45 feet an inshore vessel while DFO uses a measure of 64 feet.

Any full analysis of potential effects from oil and gas exploration off Cape Breton would have to look at case studies from other places. There is inshore exploration occurring on the Western Australian coast, in the Perth Basin between Geraldton and Perth, for instance. However, it is unknown whether this exploration is affecting a fishery, and attempts to contact Roc Oil Company Ltd. – which is performing the exploration – went unanswered.

Similarly, the Scottish North Sea experience is often cited as a possible case study to compare to Nova Scotia. However, the only inshore oil and gas in Scotland is Talisman Oil's "Beatrice" field, located roughly 22 kilometres from the Moray Firth (see case study for Scotland).[63]

Another possibility would be the Gulf coast of the United States, which CEF Consultants (1998) calls "the darker side of the offshore" because of all the pollution and problems associated with the decades-old oil industry. (See case study for Gulf Coast as well as *Louisiana's Degraded Bayous* in Part 2, Chapter 5 of this report)

The competition for space onshore

The competition for *onshore* space is another consideration, as vessels servicing exploratory drilling rigs compete for dock space. Again, the potential impacts to local fishermen would depend on the duration and timing of exploratory drilling.

2.4 Rigs to reefs – a misconception

One positive effect frequently cited in favour of oil rigs is their tendency to act as artificial reefs, attracting fish and increasing both commercial and sport fishing catches. The "rigs to reefs" notion was touted in the Gulf of Mexico area, with many sport fishermen and scientists in the early and mid 1990s observing increased population and stock near rigs. "However, further analysis of the fishing situation in the Gulf of Mexico showed that the growth of the fish catch in this case was connected not with increasing the total stock and abundance of commercial species, but rather their redistribution due to the reef effect of the platforms" (Patin 1999).

other ocean industries has been weak. For instance, a major conference on the oceans and coasts that took place in Halifax in 1998 did little to accommodate fishermen and the fishing industry. The 5-day conference, "*Pacem in Maribus XXVI – the Crisis of Knowledge: New Directions for Learning and Informed Decision-making for Oceans and Coasts,"* brought oceans and fisheries experts from all over the world. Topics discussed included the impact of offshore oil and gas, and "new approaches" for the Atlantic fisheries. The only glaring absence in the plans and proceedings was a lack of any fishermen or fishermen's associations. Furthermore, the conference kicked off on the opening day of lobster season – one of the busiest times of the year for fishermen in the surrounding area. In protest to the lack of consideration given to the fisheries, some fishermen from Shelburne picketed outside the conference.

[63]From Scottish Coastal Forum, at www.scotland.gov.uk, and pers. comm. with Martyn Cox, Coastal Project Officer with the Scottish Coastal Forum (2001).

Rigs modify water currents and patterns, as well as an area of seabed (Bayne et al 1988). They also attract fouling organisms. These organisms – along with discharges of sewage and garbage from the rigs – then attract shoals of fish to feed (ibid). Both Patin and Sisskin (2001) point out that rigs merely *attract* fish; they don't necessarily *create* more fish. In the North Sea, no similar correlation between rigs and better fish catches has been noted (Patin 1999). Furthermore, Sisskin questions the health effects on fish and other sea creatures that spend considerable lengths of time near rigs, and also making them potentially more vulnerable to predators.

2.5 The lucrative crustacean fishery

The crustacean fishery is the most lucrative in both the Sydney Bight and Gulf of St. Lawrence areas. Since the 1970s, shellfish landings have steadily grown, accounting for roughly 22% of overall landings in the 1980s, but representing much more in terms of landed value (DFO 1998). And while many Nova Scotian groundfish species declined in recent decades, shellfish did not (Charles 2001). Shrimp seems to have increased in biomass since 1995, and lobster biomass – as measured by catch levels – seems to have stayed constant since 1990 (ibid). Landed values for crab and lobster in the Bight area were worth more than $27 million in 1999 (NS Dept. of Agriculture and Fisheries 2000). Shrimp in the Bight area were worth $36 million (ibid). Crab and lobster in the Gulf – only calculated by Cape Breton landings – had landed values of over $24.5 million.

2.6 Faith in technology – and our past misconceptions

Environmental monitoring of oil installations in the North Sea seabed has been going on since 1973, with much of it focussing on oil-based drilling muds (UK DTI 2001). In previous decades, these muds were thought to be safe, and were freely dumped at sea. Yet in 2001, countries have strict regulations on oil-based muds. Countries such as Norway, Denmark, Holland and Germany forbid any dumping of cuttings from oil based mud drilling (Kenchington 1997) while Canada allows washed cuttings, containing traces of oil, to be dumped overboard. Where possible, industry uses water-based muds, which are thought to be benign.

Science and public policy has a history of following a steady trajectory toward better, brighter, cleaner and more efficient technologies. And with each new technology – be it improved drilling muds or seismic methods – safety and environmental soundness is heralded as second to none. Yet inevitably, many of these technologies fall out of favour as people discover – and eventually "prove" through science – nasty side effects. The history of drilling muds is as case in point.

Early drilling used to use diesel oil in muds (CEF Consultants 1998). When experts determined diesel oil was toxic, they found a clean alternative: mineral oil. But that also turned out to be toxic (ibid). So they refined the mineral oil to create oil-based muds that are "virtually free of harmful contaminants; however, they have *other* objectionable environmental effects, and their use is highly regulated" (ibid [emphasis added]).

Enter water-based muds – a kinder cousin. Yet in the early days, water-based muds contained chromium and unacceptable levels of mercury and cadmium. Chromium has been removed from one of the main additives in water-based muds, and mercury and cadmium levels have also been cut (CEF Consultants 1998). Today, it seems absurd that oil-based muds were ever considered innocuous. Or that chromium, mercury and cadmium – in any levels – were thought safe to dump overboard. Yet it is easy to imagine past concerns about these muds being dismissed as illegitimate ravings of doom-saying anti-oil advocates. "In the past, PCBs and halocarbons were viewed as inert and non-toxic" (UK DTI 2001). Today, we know better. But what don't we know?

"They're asking us if we know what damage it'll do. But we're asking them if they can prove it won't do any," says John Andrew Boyd, 48, an Antigonish-area fisherman who fishes crab, lobster and herring in the area of Parcel 1. "These guys are going to come in, take the gas, and be gone. We're still gonna be here. Gosh, it's only short term. The fishing's been here for generations and generations" (J.A. Boyd, pers. comm. 2001).

2.7 Fishing and seismic testing

"In general, there seems to be no reason for the optimism that is sometimes expressed regarding the ecological safety of seismic surveys and their harmlessness to fish resources."
–Dr. Stanislav Patin, Head Scientist at the Russian Federal Research Institute of Fisheries and Oceanography (VNIRO), Moscow. 1999.

In the 1960s, as a young biologist working for the Russian federal government, Stanislav Patin saw roughly 200,000 huge dead sturgeons in the Caspian Sea. The mass mortality happened as a result of geophysicists setting off explosions to generate sound waves, in order to estimate undersea oil and gas reserves (Patin 1999). These were the days before seismic testing.
Today, Patin writes of the undeniably "impressive" scale and volume of seismic testing – a vast improvement from the crude explosions of yore. "However," he cautions, "even the modern technology of generating seismic waves poses a certain threat to marine biota, including commercial species" (ibid).

Studies on the effects of seismic signals on marine life are "rather limited and contradictory" (ibid). Patin cites six studies[64] from 1980-1994 that show the hazardous and sometimes lethal effects of seismic signals on most water fauna species. However these studies do not quantify effects on stock as a whole, or their reproduction (ibid). One study (Kriksunov et al. 1993, cited in Patin 1999) says seismic causes little damage and that depending on water depth and intensity of seismic activity, fish fry mortality caused by seismic is comparable to the impacts of natural hydroclimatic factors.

But other researchers (Dalen, Knutson, 1987; Matishov, 1991, cited in Patin 1999) point to more serious effects, including death of 90% of fish fry, larvae and some adult fish within a 2 metre radius of seismic impulses. They also report damage such as hemorrhage, paralysis and loss of vision in fish within a 4 metre radius of seismic waves. Norwegian scientists noted that school pelagic fish – especially herring –

[64]Balashkand et al., 1980; Protasov et al., 1982; O'Keeffe, 1985; Davies, Kingston, 1992; Side, 1992; Pavlov et al., 1994.

can respond to a seismic signal generated 100 kilometres away (Dalen et al., 1996, cited in Patin 1999). "Both air gun and vessel sounds have been shown to elicit avoidance reactions, e.g. a descent deeper in the water column. Few studies have investigated how commercial catch rates are affected by sounds emitted by vessels and geographic survey activities. Studies have found reductions of 45-85% in trawl and longline catches" (Engas and Lokkeborg, 2001).

One study in the Barents Sea, for instance (Engas et. al. 1996, cited in Rowe 2001) looked at whether seismic affected abundance or catch rates of cod and haddock. Fishing trials with trawls and longlines 7 days before, 5 days during, and 5 days after seismic shooting found that fish distribution was severely affected, as was local abundance and catch rates in the entire investigation area of 40 X 40 nautical miles (Rowe 2001). Within the shooting area, trawl catches of both species, and longline catches of haddock, were reduced by about 70% and longline catches of cod by 45%. "Abundance and catch rates did not return to pre-shooting levels during the 5-day period after seismic shooting ended" (ibid).

In the Norwegian economic zone, scientists studied and mapped waters to show areas where seismic testing would pose an increased environmental risk. These areas included spawning grounds and places where eggs, larvae and fry develop, as well as migratory routes of commercial fish (Bjoerke et al., 1991, cited in Patin 1999). Furthermore, Patin notes, " the combined impacts of large numbers (30-40 and more) of seismic sources are poorly studied.

2.8 Fishing and Exploration drilling

Aside from exclusion, discussed in more detail above, both seismic testing and exploratory drilling can affect fishermen by affecting the source of fishermen's livelihood: fish and fish ecosystems. A more detailed discussion of environmental effects of exploratory drilling can be found in Table 5 in Part 2 of this report. Potential environmental effects of exploratory drilling are summed up as follows (Boesch, D.F., Rabalais N.N. et al., 1987, cited in Reddy et al. 1995). (Also see section 3.1 for a more extensive list of wastes from exploratory drilling.)

CAUSE	POTENTIAL EFFECT
rig fabrication	dredging and filling in of coastal habitat
drilling	discharge of drilling muds and cuttings; risk of blowout
routine rig operations and sanitary wastes	deck drainage discharge from support vessels
rig servicing	coastal port development

"Using water-based formulations does not fully eliminate the environmental hazards" (Patin 1999). Some water-based muds still contain toxic biocides and heavy metals. Water-based muds, compared with oil-based, have a higher capacity for dilution. And perhaps most significantly, water-based muds are disposed of overboard in mass dumpings (see Section 3.2 on Exploratory Drilling). Studies show that extreme toxic effects associated with water-based muds are limited to high concentrations, typically

within a radius of several metres of the discharge point (Patin 1999). But Patin and Reddy et al (1995) point out that the bulk of studies focus on short-term lethal effects rather than long-term toxicity or sub-lethal effects. "Repeatedly, hazards which could have potentially long-term, serious impacts on our environment are dismissed as insignificant, when the information is unknown," says Dr. Enid Sisskin, a biologist who heads up the Gulf Coast Environmental Defense in Gulf Coast, Florida. "Drilling does not take place in a vacuum. Cumulative impacts of drilling must be added to, not compared, to those from all other sources"(Sisskin 1999).

Waste discharges – mainly occurring during production but also occurring in smaller doses during exploratory drilling – could affect "biological communities should they smother living organisms or should their toxic substances become assimilated into the living organisms to exhibit such anomalies such as impeded growth, decreased species abundance, or altered reproduction," reads the Draft Environmental Impact Assessment for offshore development along the Pensacola, Florida coast (MMS 1999 cited by Sisskin 1999). Still, the assessment concluded that the cumulative impacts of muds would be minor and contained to areas around rigs. However, it says drilling discharges would add to long-term degradation of water quality. The U.S. Environmental Protection Agency pegs the levels of drilling muds deposited over the northern Gulf of Mexico to be 748,000 tons. "The regional impacts of the discharged muds and cuttings has yet to be fully assessed" (MMS 1999 cited by Sisskin 1999).

Indeed, people trying to assess the relative worth and risk of offshore oil and gas quickly run into uncertain territory when examining potential impacts of exploration. This is the domain of science. And judging by the literature cited in various sources – from industry to environmentalists – it's possible to indicate everything from the benign to the calamitous. But the one constant running through all the literature is that it is very difficult to *prove* anything.

In his 1999 book *The Environmental Impact of the Offshore Oil and Gas Industry*, Russian biologist, chemist and ecologist Stanislav Patin gives an even-handed account of the scientific evidence and debates surrounding offshore oil and gas. In his conclusion, he says that all things considered, the most serious concerns arise regarding possible sub-lethal effects to commercial fish species. Such effects begin subtly enough, and cumulatively lead to changes in feeding, reproduction and growth. These effects are happening all over the world because of chronic contamination of the marine environment, from many sources. Determining offshore oil and gas's precise contribution to such degradation is an as-yet unaccomplished task. Again, there are a host of unknowns.

Patin writes:

"*Of course, such hazardous consequences of the long-term chronic impact of the offshore oil and gas industry on fish and other commercial species are only a general possibility. No quantitative assessments of these effects in different regions are available yet. At the same time, the problem attracts more and more attention. The available data suggests that primary sub-lethal responses of marine biota (including commercial species)in the form of*

biochemical changes, histological anomalies, diseases and some other effects of chronic stress have become global phenomena in the marine coastal zone. An early diagnosis of these responses is presently an important and challenging task, especially in areas directly affected by anthropogenic impact. These areas undoubtedly include places of the offshore oil and gas developments"
–Stanislav Patin, 1999

Patin notes some studies[65] that dismiss the lethal effects of oil spills – potentially caused during exploratory drilling – on adult pelagic fish. Most adult pelagic fish can merely swim away, they say. Commercial fisheries are still affected, however, in that they must avoid the area of the spill. And other species, important to commercial fishing, are adversely affected by spills. Spills in shallow coastal areas with limited water circulation can kill large numbers of shrimp and crab (ibid).

Sisskin points to other studies which show the lethal and sub-lethal effects of drilling muds on invertebrates and bivalves.[66]

"There is an unfortunate tendency in the oil pollution literature to assume that an effect that cannot be detected is not significant. This idea has an obvious appeal since, in everyday experience, if something is of so little consequence that we do not know that it is happening to us, it is hard to accept that it matters. In reality, that logic is entirely fallacious as daily exposure to carcinogens or radioactive materials would demonstrate"

[65]1)Clark, K.R. 1987. *"Summary and conclusions: environmental effects of North sea oil and gas developments."* Phil.Trans.R.Soc. London.
2)Payne, J.F. 1989. *"Oil pollution: a penny ante problem for fisheries (if it weren't for erroneous perception)"* in *Proceedings of the 1st International Conference on Fisheries and Offshore Petroleum Exploitation.* Chamber of Commerce and Industry. Bergen.
3)Baker, J.M., R.B. Clark and P.F. Kingston. 1990. *Two years after the spill: environmental recovery in Prince William Sound and the Gulf of Alaska.* Institute for Offshore Engineering, Heriot-Watt University. Edinburgh.
4)Neff, J.M. 1993. *Petroleum in the marine environment: regulatory strategy and fisheries impact. Report to Exxon Company.* Texas.

[66]Drilling Fluid Effects to Developmental Stages of the American Lobster. Judith M Capuzzo & Jennifer G. Smith Derby. EPA-600/S4-83-039. August 1982 (Exposure to fluids led to reductions in growth rates, molting frequencies, respiration rates, respiration rates, feeding rates, and growth efficiencies)
2) Effects of Drilling Muds on Behavior of the American Lobster, *Homarus americanus,* in Water Column and Substrate Exposures. J. Atema et al. Can. J. Fish. Aquat. Sci. 39:675-690. 1982. (Shows toxic and sublethal effects)
3) A Survey of the Toxicity and Chemical Composition of Used Drilling Muds. EPA-600/S3-84-071 July 1984 (Variety of invertebrate species and lists arrested shell development in bivalves as a stress indicator.)
4) Acute and Sublethal Effects of Whole Used Drilling Fluids on Representative Estuarine Organisms. N.I. Rubinstein & C. N. D'Asaro. (Results indicate that the drilling fluids were moderately toxic to mysids at 30-100ppm, oyster growth was significantly inhibited at these conc., lugworm survival significantly reduced, etc.)
5) Project Summary: Effects of Drilling Fluids on Embryo Development. Richard B Crawford. EPA -600/53-83-021 (Different drilling muds have different toxicities and effects differ from embryo species.)
6) Impact of Drilling Fluids on Seagrasses: An Experimental Community Approach. Morton, R.D. et al. ASTM STP 920, John Cairns, Jr. Ed., Amer. Soc for Testing and Materials. Phil, PA 1986, pp199-212. (Muds decreased macroinvertebrates, and statistically significant differences in community structure.)

(Kenchington 1997). Our ability to measure change in the ocean is so weak that gross damage could occur without anybody even knowing, says Kenchington. For example, "death rates in the NAFO Divisions 4TVW haddock management unit could rise from about 20% (their likely normal level) to well over 30% and yet the possibility of that change would only be argued over years later when the resulting errors in management caused another collapse of the fisheries" (Kenchington 1997). Since Nova Scotia's fisheries have landed values of over half a billion dollars ($634 million in 1999) annually, with overall contributions to the economy higher yet, such a change in fish stocks could mean a billion dollar penalty to the provincial economy (ibid). "Such an effect would most certainly be "significant" in a social and economic sense, despite remaining undetectable at the resource level," writes Kenchington.

2.9 Perceived contamination or pollution

Another potential impact of offshore oil and gas on the economic well-being of Nova Scotia's fishery is a change in the perception of the fishery and the nutrition of fish. If people suspect inshore waters are somehow tainted by industry, this perception – however accurate – may influence their consumption of these fish. An anecdotal case in point would be an unwillingness among some people to eat beef, after repeated news stories about Creutzfeld-Jakkob or "Mad Cow Disease."

Chapter 3 Fish vs. Oil as a Staple Economy

Fish is a staple; oil is another staple, says Patricia Marchak, a University of British Columbia sociologist (1986). Staples economies are vulnerable because they can be depleted, or the market for certain staples may disappear as new technologies or substitutes develop. Marchak points out that even renewable staples, such as fish, can be depleted – as we saw so acutely with the collapse of the cod fishery (see Part 2, Chapter 3).

Furthermore, she says, staples economies rarely generate their much-touted spin offs. *"All these fates have occurred regularly for Canada's staples producing regions. We have seen this history before, with fur, with wheat, with minerals, with timber, and we should by now have learned that unless an industrial strategy is actively developed and implemented for purposes of diversifying the economic base, staples economies remain staples economies until the staple is exhausted or rendered obsolete."*

So the question for Nova Scotia is, do we want to pursue another staple-driven economic venture – especially when the resource in question is undeniably finite? Marchak argues that offshore oil is a raw deal for people living in rural areas. Most jobs benefits go to "outsiders" such as investors and people living in urban areas. The royalties and taxes do not flow into local government coffers, yet the cost of infrastructure is largely borne locally. But in arguments of fish vs. oil, oil often comes out on top because of what it can do for the economic profile of a country as a whole.

Fish is a local staples economy, conferring largely local benefits. Oil and gas, on the other hand, are expected to confer benefits to an entire nation, with the promise of royalties, taxes and urban jobs (see Hibernia Case Study, Part 4 Chapter 5). Fishermen have little political power compared to groups attached to the oil industry, says Marchak. "Put another way, the oil industry was not established for purposes of enabling fishermen to improve their economic lots; it was established to enable urban centres and nations suffering trade deficits to improve their own positions."

3.1 Case Study: The Scottish Experience

"On the whole, the negative impacts of oil activities upon the fishing industry in the North Sea have outweighed the positive."
– J.D. House, sociologist and offshore oil expert, Memorial University of Newfoundland, 1986

Scotland is often suggested as a suitable case study for weighing the potential impacts of offshore and inshore oil and gas on Nova Scotia.[67] The Scottish experience may be a good one because Canada can learn (and to some degree has learned) from problems in the Scottish offshore industry. Both offshore proponents and opponents use the Scottish North Sea oil and gas experience to make their points. As with most situations, the Scotland experience does not present a clear-cut case *for* or *against* offshore oil. What is clear is that there is a mixed bag of costs and benefits. A comprehensive study of the Scottish offshore experience would help Nova Scotia weigh those costs against the benefits, or vice versa.

[67]For a broader analysis, see "Fish is Fish and Oil is Oil: The Case for North Sea Comparisons to Atlantic Canada," by J.D. House, in *Fish vs. Oil*, by J.D. House et. al. 1986. Institute of Social and Economic Research. Memorial University of Newfoundland.

One thing *is* fairly clear from the Scottish experience: Fishermen are not pleased to co-exist with the oil industry.

"Our conclusion is that there is, in fact, a real conflict of interest between the fishing and oil industries," wrote John Goodlad, general manager of the Scottish Fishermen's Association (SFA), in 1986. "We conclude (with the benefit of hindsight) that the interests of the fishing industry have been inadequately safeguarded, to varying degrees, in respect to all of these problem areas." The problem areas he lists are safety of navigation; loss of access to fishing grounds; and debris and pollution.

Goodlad predicted the greatest ongoing problem related to future exploration and development would continue to be loss of access to fishing grounds. Loss of access brings up the question of compensation. In the early 1970s, fishermen and oil companies in Scotland worked out "disturbance agreements" which the fishermen soon criticized as being paltry. Later agreements were deemed "fair" by most fishermen, but loss of access remained a cause of great conflict (Goodlad 1986). Furthermore, Goodlad says there is the unexpected loss of access to fishing grounds caused by fishermen's tendency to avoid risky areas. For instance, if fishermen know that another boat has encountered anchors, disturbed seabed, wires or chains in an area, they will avoid that area. And there is no compensation for precautionary avoidance.

The imbalance of power between the oil industry and fishermen has been written about by many scholars and critics. "The oil industry is much stronger (than the fishing industry) and has brought such substantial economic benefits to the Scottish and U.K. economies that the industry and individual companies have been able to influence policies," wrote Inverness economic consultant G. Anthony Mackay, at the height of the Scottish North Sea oil boom (1986). "Fishing interests have had the weaker bargaining position in their negotiations with the oil companies."

Mackay (1986) identifies five main conflicts between the fishing and oil industries. He is speaking in terms of the "big picture," from exploratory drilling to full production. But most of his analysis – possibly with the exception of the final two – can be related to potential situations arising as a result of exploratory drilling:

- competition for resources such
- as harbour space and repair facilities
- loss of access to fishing grounds
- pollution
- damage to nets and gear from oil-related debris
- the movement of fishermen and vessels away from the fishing industry

Overall, the positive effects of North Sea oil on the U.K. economy goes undisputed.[68] However, the effects on communities – economically, environmentally and culturally – are less clear-cut. "It has been generally found that the traditional industries of these areas (agriculture, fishing, etc.), with their greater degree of local interaction, are far more efficient generators of regional wealth" (McNicoll 1986).[69]

McNicoll says that since oil didn't "fit in" with Scotland's fishing-and-farming based economy, it developed as an "enclave industry" (ibid). Today, many Scottish coastal communities are facing a new challenge: After some two-plus decades of offshore oil and gas, reserves are depleted (J.D. House, pers. comm. 2000). Many places (House points to the Shetland Islands) have become dependent on the oil industry.

[68]There are varying opinions about the socio-economic effects of offshore industry on rural communities. A fuller discussion – both positive and negative – can be found in House et. al, 1986. *Fish vs. Oil: Resources and Rural Development in North Atlantic Societies.* The information in this section is largely taken from this book.

[69]Seventy-five per cent of Shetland oil employees in 1980 were non-residents (McNicoll 1986).

3.1.1 Inshore Oil in Scotland – the Moray Firth

We should point out that the Scottish oil industry is well offshore – similar to Nova Scotia's current offshore oil and gas developments, which thus far haven't caused Nova Scotia fishermen much grief. The Cape Breton parcels, however, present another situation entirely. The closest Scottish example is the Beatrice oil field located in the Moray Firth, roughly 22 km. from the coast. The Beatrice field, operated by Talisman Energy, has three production platforms that are visible from shore (UK DTI 2001). The field has been operating since 1976, and Talisman predicts it will be in operation for another 5-10 years.

An onshore facility for the Beatrice field – the Nigg terminal – receives oil from the Beatrice field and has 29 full-time workers and creates 16 indirect jobs, says Talisman Energy Inc. [70]
Production was shut down in August, 2000, after a leak in an oil pipeline. The leak caused environmentalists to call for stricter monitoring of pipelines.[71] Talisman replaced 35 miles of pipeline and resumed production nine months later, after requesting that it be excused from an environmental assessment. The UK Department of the Interior granted the application.[72]

3.1.2 Shetland Islands

The Shetland Islands can serve as a darling example of the oil industry co-existing with a coastal fishing community. Sociologist Doug House uses it in speeches about rural coastal communities and offshore petroleum development.

Shetland Islands communities such as Lerwick – with a population of roughly 20,000[73] – fared well acting as receiving centres for offshore oil. They took in a small royalty from every barrel of oil, and spent the money on social programs. They have programs such as "meals-on-wheels" and house help for seniors, as well as equipment to help handicapped people drive cars. They saved their pennies and invested in aquaculture, which is now a thriving local industry, with strict guidelines ensuring aqua-farms are small and locally owned. "They've been quite progressive in Shetland in the way they've handled oil-related development there," says House, who has extensively studied the Scottish offshore oil experience. However, he warns, "You can't really compare the Cape Breton situation with the Shetland situation."

"There was no real question in the Shetland situation of any environmental damage being done during the actual drilling for oil or the production of oil, because it was so far away from the Shetland Islands and the Shetland fishery." Shetland is a "special case" where strong local government and strict regulations on the oil industry have worked to locals' benefit. "The Shetland Islands Council had very strong leadership, and they took a very strong position with the oil and gas industry and the British government," he said, adding that since the price of oil was high and the Shetland economy was doing well at the time, they were in a "good bargaining position."

"Basically they said, 'We don't really want it, but if we are going to have it, we need to get some special powers in local government.' They got a special act of parliament passed which gave the Shetland County Council a lot more control over the development than is usual for a local government." And they ensured that the new

[70] http://www.talisman_energy.com. Accessed Dec.14/01

[71] Hodnett, Myles. 2000. *"Shutdown as Flotta power fails."* The Orcadian, Nov. 16/2000. Internet. Available at http://www.orcadian.co.uk/archive/flottapowerfails.htm

[72] "Results of Request that Environmental Assessment need not be carried out." submitted May, 2001. Report Date 13-Dec-2001, available at http://www.og.dti.gov.uk/environment/permits/eis/eisr005.html Accessed Dec.14/01

[73] Mackay (1986) writes that during the Shetland Islands construction boom some 7,000 construction workers came to town.

economy would deliver plenty of local benefits.

House is doubtful that a similar situation could happen in Cape Breton or Newfoundland. “Local people there don’t have any kind of controls or say in development in the way the Shetland people did.”

“It would take a big change, in terms of a provincial government to be willing to delegate more authority and decision making to a municipal or county council,” he says. The Shetlands experience hasn’t been wholly beneficial, adds House. Because of a maze of underwater pipelines, many fishermen don’t have the access they previously had. “There’s been some debris from oil vessels that have fouled up fishing vessels and so on,” says House. “And they feel they didn’t get a fair deal. They didn’t get the level of disturbance compensation that they should have got. So there is some dissatisfaction there within the fishing community in Shetland. It’s not large scale, but it’s there.”

Chapter 4 Tourism

"Nova Scotia's most outstanding single tourism asset is its relationship to the sea."
– Nova Scotia Marine Tourism Study, 1997 commissioned by NS Economic Devt. and Tourism

4.1 Introduction

Tourism, like fishing, is a mainstay of Cape Breton and the Gulf area. Prince Edward Island is known for its vast stretches of red sand and temperate waters. Cape Breton is known for its stunning, unblemished coastline and the charm of its small coastal communities. Cape Breton relies on its well-established and unique culture as well as its natural capital as tourist draws.

"Tourism" is almost a mantra in Nova Scotia, where governments look to tourist dollars to bolster an often-sagging economy. Now, the province is also looking to the oil and gas industry. And with the prospect of exploratory drilling rigs some 20 kilometres from shore, tourism and oil and gas are meeting head on. The ocean – and a pristine, largely unindustrialized environment – are key to tourism in Cape Breton. Many tourism operators see the inshore oil and gas industry as a threat to that pristine, undeveloped environment.

Any analysis of the potential impacts of inshore oil and gas exploration must consider possible effects to tourism. In order to examine these potential effects, it is first important to determine what tourism means economically and socially to Cape Breton. We must also assess the value of the social components that act as the economic underpinnings of tourism: culture (social capital) and the environment (natural capital).

4.2 Tourism revenues – a $227 million industry[74]

Nova Scotia's licence plates boast "Canada's Ocean Playground," and for the province's tourism industry, Cape Breton is central to that playground. Tourism revenues on the island in 2000 were $227 million – second only to Halifax[75] (NS Dept. of Tourism 2001). Tourism revenues in Cape Breton represent just over 18% of total tourism revenues for the province.

Tourism is steadily growing as Nova Scotia markets itself as an ocean playground. What was formerly "pretty scenery" – cliffs and vast expanses of ocean coastline – is now a marketable commodity to the province of Nova Scotia, which spent $4.5 million in 2000 alone peddling tourism (R. Graham pers. comm. 2001). In return, the province reaped $94 million in provincial sales taxes from tourism activity. Total taxes collected by municipal, provincial and federal governments totalled $200 million in 2000. Of this total, the Cape Breton tourism industry contributed $36 million, or 18%.

4.3 Employment – 6,300 Cape Breton jobs

The number of direct and indirect jobs generated by tourism is another way of measuring the importance of this industry to both the Nova Scotia and Cape Breton economies. For Nova Scotia as a whole, tourism generated 34,800 jobs in 2000. In Cape Breton, the total was 6,300 – again, just over 18% of the total (NS Dept. of Tourism and Culture 2001).

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[74] source: Nova Scotia Department of Tourism and Culture. 2001. "2000 Tourism Activity by Region."
[75] *The 2000 Halifax-Dartmouth tourism industry was worth $562 million.*

The growth potential for tourism in Cape Breton needs to be fully assessed. Tourism revenues have steadily risen in Nova Scotia over the past five years – from $925 million in 1995 to $1.25 billion in 1999-2000. A rise in tourism jobs should follow a rise in tourism revenues.

Wages earned

In terms of direct and indirect payroll, tourism generated $488 million in provincial income in 2000. Cape Breton's share was $89 million.

Tourism on the North Shore

The North Shore could be affected by exploration in the Gulf area as well. Tourism on the North Shore created 2,400 direct and indirect jobs in 2000 with tourism revenues of $85 million and a payroll of $33 million.

Tourism on Prince Edward Island

PEI boasts the "Tuna Capital of the World"in the North Lake region at the tip of Eastern Kings Region, and has a number of marine-related tourism businesses. Since Parcel 1 extends roughly half-way to PEI, potential impacts to tourism and fishing on PEI also exist.

4.4 Visitors – Cape Breton is a draw for 760,000 non-Nova Scotians

It's hard to determine just how many people visit Cape Breton each year, since there is no official method of "tracking" visitors. Indications of visitor volume come from tourism revenues; museum and national park attendance; cruise ship registries; accommodation activity; numbers of enquiries at tourist information centres; and numbers of people entering at the North Sydney ferry terminal.

Roughly 2 million out-of-province residents visited Nova Scotia in 2000, an estimated 760,000 (or 35%) of whom went to Cape Breton (NS Dept. of Tourism and Culture 2001). Since many Nova Scotians also vacation in Cape Breton, the number of tourists visiting Cape Breton is significantly higher.

Money spent by tourists

On average, visitors spend $145 per day in Nova Scotia, with "pleasure travellers" spending an average of $253 per day (NS Dept. of Tourism and Culture *2001d Visitor Exit Survey*). There is potential for loss of some of this tourism revenue because of oil and gas exploration.

According to the latest NS Department of Tourism and Culture *Visitor Exit Survey*, people visiting the province for pleasure – tourists – are "the most lucrative marketing segment."

A 1997 study commissioned by the Department takes this analysis one step further, by analysing "types" of tourists and tourism activities. It concluded that "marine tourism activities" – including whale watching, boating or beach activities – are "high yield" activities attracting high-yield tourists who spend more money and stay in the province longer than other tourists. It recommended working toward getting more of these high-yield tourists to the province, and to ensure their experiences in the province are positive.

The Nova Scotia Marine Tourism Study (1997) noted that Maine is one of Nova Scotia's chief tourism competitors. However, it notes that once-reliable "public

access to the Maine coastline…is increasingly problematic with the private development of much of the land along the coastline." The report stressed the benefits of Cape Breton's undeveloped areas, and also recommended heavy marketing of marine-based tourism such as whale watching, bird watching.

Under the heading "Environmental Sustainability," the report cautions against industrializing the coastline. "While Nova Scotia's coastal environment may appear to be in relatively good shape compared to other areas of the world, this is largely due to the province's low population density and limited industrialization."

It goes on to say that the marine and coastal environment are indeed under stress because of human pollution. It says that while volunteer-led programs such as the Clean Nova Scotia Foundation's "Beach Sweep" program are effective to remove litter and raise awareness, "significant cooperative efforts" between government, industry, residents and community groups are needed to ensure a sustainable coastline.

The notion of coastal industries such as inshore oil and gas goes against the recommendations of this study.

4.5 Cape Breton's natural and social capital

A full-costs analysis of oil and gas exploration would attach a value to Cape Breton's non-market assets. It goes without saying that the Cabot Trail brings tourism dollars to Cape Breton. But the vistas of the Cabot Trail – essentially, an entire ecosystem – are not "counted" in Nova Scotia's official measure of economic prosperity.

The Nova Scotia Department of Tourism (2001e) calls the Gulf waters near the Cabot Trail "one of the most scenic coastal touring routes on earth." Roughly one in ten visitors to Nova Scotia identify a specific place as their favourite aspect of the province, and of those people, one half mention the Cabot Trail or Cape Breton in general (NS Dept. of Tourism 2001d). But what is a stunning vista of pristine water worth?

One study in Florida found that water clarity and quality had an effect on property values (Wilson 2000). Many lakes experience "eutrophication" – a growth of dense plant life usually due to nutrient-rich industrial run-off such as farm fertilizers. "In Orange County, Florida, researchers found that the degree of eutrophication had an impact on lakefront property values (Feather 1992). The study concluded that each unit increase in the trophic state index results in a US$1,549 (1983 U.S. dollars) decline in the parcel selling price. A similar study in Maine, found that a one metre improvement in water clarity increased property values by US$34/ foot of water frontage to US$81/ foot of water frontage" (Wilson 2000).

GPI Atlantic's Ron Colman uses the example of an apartment facing a scenic park to make the point of the economic value of aesthetics. Such an apartment could ask a higher rental price than the same apartment facing a parking lot or a street. Yet the economic value of the park – or any similar scenery – is rarely considered.

Cape Breton Highlands National Park

In 2000, Cape Breton Highlands National Park was the most popular park in the province, attracting 390,000 people. By comparison, the Halifax Citadel had 167,000

visitors. The park's main season runs from May to October, peaking in July and August.

"[I]t is widely rumoured that the area proposed, by an anonymous company, for what later became Parcel 1 originally extended to Cape North and was cut off at the southern boundary of the Cape Breton Highlands National Park by the (Canada-Nova Scotia Offshore Petroleum) Board, presumably to avoid perceived conflicts between the objectives of the Park and those of offshore petroleum development" (Kenchington1999).

Ocean tourism: a growing trend

"Nova Scotia's most outstanding single tourism asset is its relationship to the sea," states a 1997 marine tourism study commissioned by Nova Scotia Economic Development and Tourism. The report recommended the province "aggressively promote Nova Scotia as North America's Premiere Seacoast Destination" by advertising "the most compelling points of differentiation to set it apart from the competition. Quite clearly no other destination has the variety of benefits Nova Scotia's shoreline has to offer (ibid).

Indeed, 45 per cent of visitors polled for the study said the seacoast was "critically important" to their decision to visit Nova Scotia, while another 43 per cent said it was "important but not critical." Only 10 per cent said the seacoast isn't terribly important to them.

Ocean tourism in the whole Atlantic region has steadily grown since the late 1980s, mainly because of coastal tourism and the sea water recreational fishery (DFO 2001b).[76] From 1988 to 1996 in the Atlantic region, total direct expenditures in tourism grew at an average rate of 4.4% yearly. Direct revenues and investment from coastal tourism grew from $38.2 million to $58.5 million, or at an average rate of 5.3 % a year (ibid).

Tourism in Cape Breton – as in the rest of Nova Scotia – peaked in 1997, 1998, and 1999 (Tourism Insights, Feb. 2001a issue, Dept. of Tourism and Culture). After a "market correction" in 2000, the Dept. of Tourism and Culture estimated tourism would continue to grow in 2001, but at "a more modest pace." Numbers for the 2001 tourist year won't be available until roughly February, 2002.

Whale watching

In Nova Scotia and New Brunswick in 1998, more than 140,000 tourists spent $38 million on whale watching (Van Horne 2001). A recent report by the International Fund for Animal Welfare shows that whale-watching in Canada has risen dramatically since 1991 – when it was a $44 million industry – to present. Today, whale-watching creates annual revenues of $287 million (CP 2001). The report's author, Canadian Eric Hoyt, says Nova Scotia and New Brunswick have "outstanding potential" to further develop their whale-watching industries (ibid).

"In many places, whale watching provides valuable, sometimes crucial income to a community, with the creation of new jobs and businesses," said Hoyt. "It helps foster an appreciation of the importance of marine conservation, and provides a ready platform

[76]Department of Fisheries and Oceans statistics. *Ocean Tourism Industry, Atlantic Region*. Internet. Available at www.dfo-mpo.gc.ca/communic/statistics/Oceans/rascal/part_04 4.htm Accessed Sept.28/01.

for researchers wanting to study cetaceans or the marine environment" (ibid).

Cape Breton is promoted within provincial tourism literature as a prime destination for whale-watching. A recently-opened Whale Interpretive Centre in Pleasant Bay is an indication of the popularity of whale-watching in Cape Breton. Figures 4.1 and 4.2 show the increases in numbers of whale watchers and money spent in Canada between 1991 and 1998.

Figure 4.1 Comparison of money spent on Whale Watching in Canada between 1991 and 1998

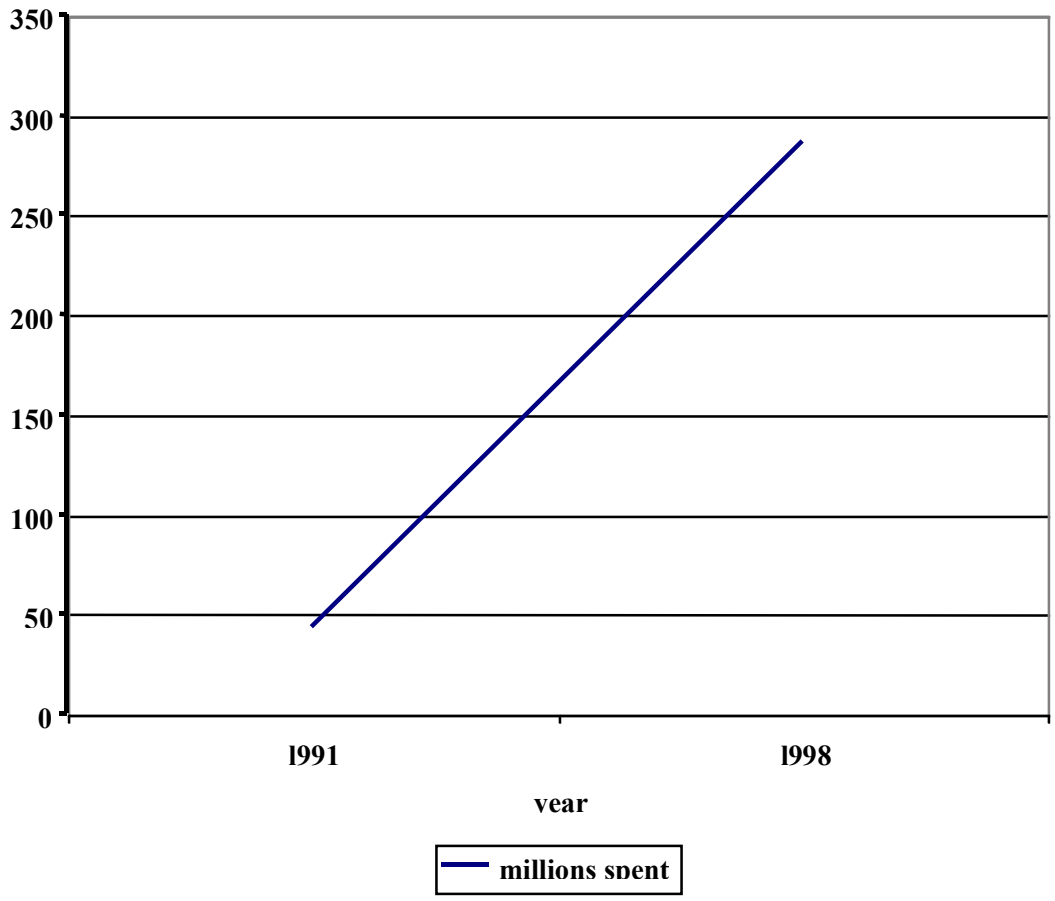
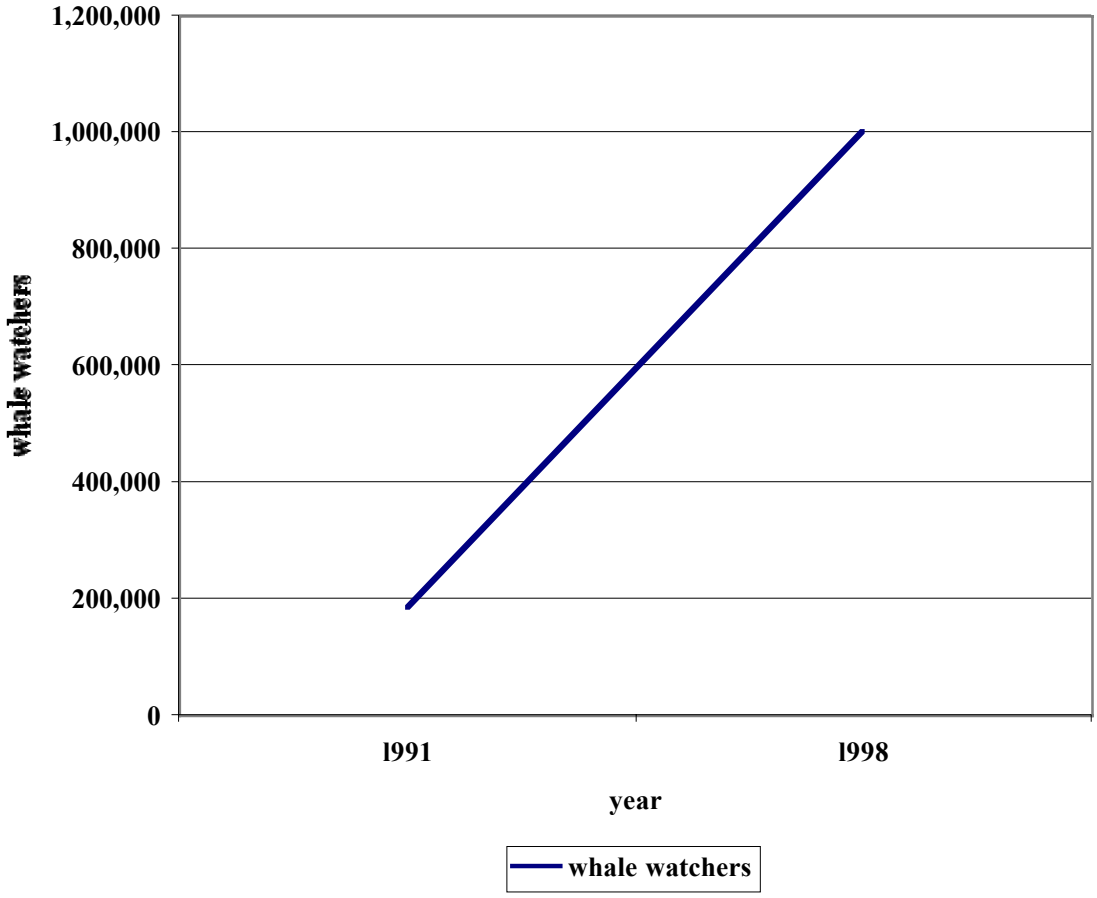


Figure 4.2 Comparison of number of whale watchers in Canada between l991 and l998



Cruise ships in Cape Breton: another growing industry

24,000 people visited Cape Breton aboard cruise ships in 2000. The Department of Tourism says that cruise ship activity potentially doubled for Cape Breton in 2001(numbers for the 2001 tourism year will not be available until the New Year). This is one tourism activity that could be negatively affected by exploration drilling, depending upon the timing of drilling.

4.6 The value of water-based recreation

According to a 1996 Environment Canada survey, *The Importance of Nature to Canadians*, 630,000 Nova Scotians (85.2% of the total population) participated in nature-related activities in Nova Scotia (DuWors et al. 1999). A second publication by Environment Canada estimated the economic benefits of nature-related activities for Nova Scotians.[77]

In 1996, the residents of Nova Scotia spent $249.7 million (1997$) on nature-related activities – the greatest revenue among the Maritime provinces. In addition, Nova Scotian residents place an additional economic value of $65.1 million (1997$) on the enjoyment they derive from these activities, over and above their expenditures. Therefore, the overall economic value of nature-related activities by Nova Scotia residents, within Nova Scotia, can be estimated at $314.8 million per year (Wilson 2000).

Using the same data from the 1996 survey, 316,900 Canadians participated in water-based recreational activities in Nova Scotia. These Canadians took 3.9 million trips for water-based activities in the province (2.8 million same-day and 1.1 million overnight trips), for a total of 5.2 million days spent on such activities in Nova Scotia. The average daily expenditure per person, from the 1996 survey, is $20.40 (1997$) on recreational activity in Nova Scotia (Federal- Provincial-Territorial Task Force on the Importance of Nature to Canadians 2000).. Based on expenditures of $20.40 per day, the total expenditure on water-based recreational activity in Nova Scotia, by Canadians, is estimated at $106.2 million per year.

This value indicates a direct economic value provided by natural areas and the maintenance of high water quality, and demonstrates the importance of preserving natural water capital,
especially given the burgeoning tourism industry in the province. An additional economic value based on the enjoyment value placed on water-based recreation is derived from the $65.1 million explained above. Therefore, the estimated economic value for water-based recreation above the total expenditures is $43.8 million based on willingness-to-pay (WTP) estimates.

Thus, the total direct economic value plus the additional value that is placed on the enjoyment of participating in water-based recreation is estimated at $150 million per year.

"In the case of offshore development, as with so many other controversies over technological risk, the greatest simplification ***possible*** *is to reduce at least the risk-related issues to two questions, not one. The first, which at least in principle could be answered scientifically, is "How safe would it be?" The second, which*

[77] Federal-Provincial-Territorial Task Force on the Importance of Nature to Canadians 2000

cannot *be answered except as a matter of values and individual judgments, is "Is that safe enough?" There is also a third question, although it is most often left unasked: "What are the blind spots that result from our current frame of reference – or from spin doctors' efforts at diversionary re-framing?" (Freudenburg and Gramling 1994).*

4.7 The Value of Reputation

The tourism industry relies on reputation. Roughly 3/4 of Nova Scotia's yearly visitors are repeat-visitors (NS Department of Tourism 2001d).
The tourism department reports that 21% of all visitors surveyed in 2000 got their information about Nova Scotia from the Internet.
Good reports of Nova Scotia as a tourism destination are vital to future tourism. Oil and gas exploration could negatively affect the island's reputation as a pristine tourism destination.

Chapter 5 Case Studies: Northern California; Southern California; The U.S Gulf Coast

5.1 Northern California

While interviewing residents of coastal Northern California, sociologists Freudenburg and Gramling (1994) were surprised by the unanimity of opinion among residents. Even traditionally pro-development business leaders had reservations about offshore industry along their coastline. "It would maybe be a boomtown for a while, but it would be a short-term, artificial thing that you would probably never recover from," said one Fort Bragg business spokesperson (Freudenburg and Gramling 1994). "Tourism is strong and growing, but people don't come here to lie on a warm, sunny beach...The weather is cold and foggy, so it really is the relatively untouched natural environment that brings tourists here," said another. "We find that *any* kind of negative publicity [snaps fingers] is enough to keep people away."

Even declared Republicans and conservatives came out against offshore oil development, saying it is "the one issue that cuts across all the lines. And we've got a lot of lines!" (Ibid). The sociologists noticed plenty of "say no to offshore!" bumper stickers, with similar messages hanging in local stores and gas stations. Most Bed and Breakfasts posted a list of reasons why they oppose offshore exploration.

The sociologists were puzzled to find so many people *against* an offshore oil industry, and they wondered if they had missed polling a significant portion of residents. However, they concluded that the kinship ties of people living in these small coastal California towns cemented their opinions. The main industries in the towns were fishing, logging and tourism.

Usually, a portion of the working-class population will welcome offshore industry for the higher paying jobs it can bring, and this might influence politicians' decisions to pursue petroleum exploration. However in coastal California, one resident explained the consensus of opinion against offshore oil and gas this way: "We've never really had that sort of undercurrent that you see in Louisiana, where there are a lot of shrimpers who have relatives in the oil business" (ibid).

Offshore oil and gas remains a "come-from-away" industry along the California coast, while in places like Louisiana, it's become a "home" industry. Also, residents of

Northern California express a concern for the marine and coastal environment, while those in Louisiana mainly expressed concern about coastal esthetics. As one formerly pro-oil Northern California resident put it: "I guess, growing up, just being exposed to Louisiana and ultimately Texas, Galveston...it just seemed like the pollution and contamination was a way of life. Nobody seemed to really give a damn about it...because it was the fundamental economic basis for the existence of everything down there, and people just seemed to tune out the pollution problem" (ibid).

One of the only – if not *the* only – northern coastal California town to support offshore oil is Eureka (ibid). But even there, things are turning around. "I'm still an advocate of offshore oil," said one Eureka community leader. "But its time has come and gone." "I'd honestly have to say our position has become less popular in the last few years," said another pro-oil Eureka political leader. "There are still many businessmen who support it, but I'd have to think that if it went on the ballot, most people would vote against it" (ibid).

5.2 Southern California – Santa Barbara and San Luis Obispo

Santa Barbara

In well-heeled Santa Barbara, up to 26 oil rigs are visible from the coast (S. Cushman, pers. comm. 2001). In the 1960s, the development of the coastline was following the same booming pattern of the Gulf coasts of Louisiana and Texas. However, on January 28, 1969, everything changed. During a routine change of a drill bit while drilling a well about five miles from shore, Union Oil Platform A had a blowout that sent oil and drilling mud gushing over 100 feet into the air (Pacific Research Institute 1999). A temporary cap on the well failed, and new fissures on the ocean floor began leaking oil at a rate of 1,000 gallons per hour (ibid). Union Oil's promises to plug the well within 24 hours fell through, and the oil gushed for 11 days. The pipeline continued leaking for 100 days. In the end, an estimated minimum 12,000 metric tonnes spilled into the coastal waters of Santa Barbara.

It was a national calamity, complete with oiled beaches and dead birds. Two month's later, when then-President Richard Nixon paid a visit, there was still oil on the beaches.
The 1969 oil spill shut down tourism and caused "hundreds of millions of dollars of lost tourism revenue for one year after the incident," says Steve Cushman, executive director of the Santa Barbara Chamber of Commerce.

The infamous blowout, (something that can happen during exploratory drilling), prompted *Time* magazine to name the environment "issue of the year" in 1970, and *Life* magazine one-upped them by declaring the 1970s "the environmental decade" (Pacific Research Institute 1999). "Within a year, the Environmental Protection Agency had been established, and a slew of landmark environmental legislation, including the Clean Air Act and the Clean Water Act, followed shortly after" (ibid).

The incident changed the way inshore oil and gas operates in Santa Barbara, says Dr. Michael Costanzo, a geographer who has contributed to several environmental impact statements on oil drilling off the California coast. For one thing, water traffic is restricted and rigs are mainly serviced by helicopters. "They recognized that they don't want to have those guys going back and forth a lot in their boats," says Costanzo.

And secondly, "We've got watchdogs out there. These guys [the oil companies] want to make money, and they'll shortcut as much as they can, I suppose, unless there's somebody standing over them watching them."

As for the aesthetics of offshore rigs, "a lot of people like them," says Costanzo, who claims the Door's song "*The Crystal Ship"* referred to California's blinking, twinkling oil rigs at night. "But most don't. They're just out there on the horizon." "Beyond that, if you want to talk ugly things, we've got a lot of ugly things around here," says Costanzo in his offhand manner. There used to be a meadow along the coastal road. "Now we have a big gas and oil processing plant, and it's pretty damn ugly. And unfortunately, operating about 5 to 10 per cent of its capacity."

Santa Barbara Chamber of Commerce executive director Steve Cushman says his chamber is not united on its stance toward inshore oil and gas. "We all still drive cars. The support is not unanimous." Both tourism (which accounts for 40% of the Santa Barbara economy) and fishing (a "very small" industry) have lobbied against inshore oil and gas, said Cushman.

In 1999, the California Coastal Commission said it would attempt to block exploratory activity and further development plans in the 40 approved-but-undeveloped leases along the Santa Barbara Coastline (Trujillo 1999).

San Luis Obispo County

"The impact of oil and gas development in our county is already profound. From loss of property values, to loss of business to environmental and social impacts, we have been harmed."

–San Luis Obispo Chamber of Commerce and the Environmental Center of San Luis Obispo, 1998

The Santa Barbara situation – past and current – also served to mobilize towns further down the coast. After seeing what oil and gas has done for Santa Barbara, the residents of San Luis Obispo vowed to keep their coastline free from further exploration (P. Wilmore, pers. comm. 2001). "People come here from all over the world to enjoy it," said Patricia Wilmore, director of governmental affairs for the San Luis Obispo Chamber of Commerce. "To look out at an oil rig is unacceptable."

In 1998, then President Bill Clinton extended a moratorium on California's offshore leases until 2012. The moratorium prevents the government from selling new leases, but does not affect California's existing 83 leases, about half of which are developed or producing oil and gas (WSPA 1999). Some of those undeveloped leases are off San Luis Obispo County.

San Luis Obispo County (population: roughly 300,000) has experienced offshore and onshore development in the past. In the 1920s, it served as a major shipping port for crude oil. And recent spills at the Guadalupe Oil Field and Avila Beach Marine Terminal have affected the county. It boils down to a question of how much the natural beauty is worth, says Wilmore. In San Luis Obispo, it's worth $500 million in yearly tourism revenues.

People stand fairly united in their stance against inshore and offshore exploration, says Wilmore, whose Chamber represents 1,400 business people and organizations. In 1998, the Chamber of Commerce teamed up with the Environmental Center of San Luis Obispo to produce a position paper called

The Costs of Oil and Gas Development Off the Coast of San Luis Obispo County. The study says, among other things, that a government evaluation of potential effects of offshore oil and gas exploration[78] exaggerates the positive economic impacts of offshore development. Together, they determined that to the contrary, "offshore oil and gas development would have tremendous negative impacts on the economy of San Luis Obispo."

5.3 The Gulf Coast

Louisiana[79]

In Louisiana, inshore oil and gas is an old business. The first well was drilled in 1938, in nine feet of water. Ten years later, there were 24 projects in Gulf waters over three miles from the Louisiana coastline (CEF Consultants 1998). In 1998, there were more than 7,000 active leases spanning over 39 million acres of water (ibid). Louisiana has experienced many boom and bust cycles with the offshore industry, and serves as a prime example of poorly planned development. By the mid-1970s, Louisiana's roads, schools and health care system were strained. Development "significantly altered" the coastline, with rural communities feeling the consequences most acutely (ibid). The once-thriving shrimp fishery collapsed and Morgan City – once the "shrimp capital of the world" – lost its resident shrimp fleet and operating shrimp plants (ibid).

Today, if the annual "Morgan City Shrimp and Petroleum Festival" is any indication, the shrimp fishery may have recovered. The festival celebrates "the unique way in which these two seemingly different industries work hand-in-hand culturally and environmentally in this area of the 'Cajun Coast.'"[80] Its 2001 sponsors include the city, the church, and the petroleum industry.

As sociologists Freudenburg and Gramling point out in their analysis of offshore industry along the Gulf (1994), Louisiana is staunchly pro-petroleum, and the offshore is the backbone of its economy. However, the pollution caused by the offshore is undeniable.

CEF Consultants (1998) write:

"Many parts of the American Gulf of Mexico coast, especially that of Texas and Louisiana, show scars from many years of oil and gas development without adequate environmental or community planning controls. Parts of the Mississippi Delta and Texan coastal estuaries have been heavily polluted by the effluent from petro-chemical factories; one stretch is locally known as "Cancer Alley." Charges have been raised repeatedly of "environmental racism" the deliberate siting of polluting plants in small, poor, black communities. Many coastal communities have highly transient populations, with resulting social problems unstable relationships, drug use, high crime rates. Louisiana ranks #3 out of the entire nation for violent crimes; from 1983_1993, Louisiana's overall crime rate increased 36.2 percent, and fluctuations in the rate closely parallel oil prices and how 'hot' the industry is. Offshore development has not been a benign force on this coast."

[78]The California Offshore Oil and Gas Energy Resources Study (COOGER) was commissioned by the U.S. federal government in 1995 to study the onshore impacts of offshore and inshore oil and gas development along California's Central Coast.

[79]Photos of the Louisiana inshore oil rigs can be seen on the Internet at http://www.southerncitizen.org/gced/articles/no_rigs/9_5_98ftmorgan.html

[80]http://www.shrimp_petrofest.org/main2.htm

Alabama

Roughly 32 miles of the Alabama coast borders the Gulf of Mexico. Unlike neighbouring Louisiana – which has a decades-old inshore/offshore petroleum industry – Alabama's sandy coast remained untouched by exploration until the mid-1990s.

Tourism is the main industry of the coastal towns of Gulf Shores, Orange Beach and Fort Morgan, bringing in $1 billion yearly, says David Lawrenz, former chairman of the Alabama Gulf Coast Chamber of Commerce, which represents all three towns. "I've been all through this," says Lawrenz, who lives in Gulf Shores, population 6,200. When the government opened up inshore gas exploration leases, people along the Gulf Coast were nervous. Alabama's once-thriving shrimp fishery collapsed years ago, says Lawrenz, leaving only tourism as a mainstay. Residents weighing the risks of inshore gas feared the eyesore of rigs more than the threat of environmental damage.

"We determined that the primary threat was an esthetic one," said Lawrenz. Members of the three communities, supported by the Chamber of Commerce, fought for a 15-mile limit for gas exploration and development, and they advocated submersible rigs that would not be visible from the shore. In 1997, they won their 15 mile buffer zone, although Lawrenz says he'd like to see two buffer zones: a 15-mile zone for gas, and a 100-mile zone for oil, which can be more polluting.

Lawrenz is pragmatic about oil and gas development, and feels that the very mention of exploration means it is bound to happen. The best citizens can do, he says, is to mitigate potential damage. "Once something like this starts, the foot is in the door." His opinion springs from living along the most heavily exploited offshore oil and gas region in the world.

To the west of Alabama sits Louisiana, where inshore rigs have been part of the scenery for 30 or 40 years. People in Louisiana are used to the rigs, says Lawrenz. Many have never known anything different. "They say, 'well, we don't know whether they're bad or not,'" he said, adding the oil industry pre-dates the tourism industry in Louisiana. However, he notes, people from the rig-riddled areas come to his small stretch of coastline for their holidays. "They come to a place where they don't have to see all those rigs."

Mr. Lawrenz has a soft spot for Cape Breton, and expressed a special interest in the potential for oil and gas exploration along its coast: He visited the area three years ago, and was so impressed he came back the following year for a motorcycle trip around the island. "I was extremely impressed with Nova Scotia and the Cape Breton area. A lot of people go there, but a lot don't know about it," he said, adding "You need to do more about that." "I would hate like heck to be driving along that beautiful road there and look out and see a lot of damn gas rigs," said Mr. Lawrenz, who says the presence of an inshore oil and gas industry would definitely deter him as a tourist, and would likely deter others.

Florida

Much like San Luis Obispo County, the Gulf towns of Florida fiercely oppose offshore exploration and development. The tiny town of Pensacola (population: 4,000) prides itself on its stretches of sandy, white beaches. Roughly 9 million tourists visit the coast each year (S. Johnston, pers. comm. 2001).

Offshore oil and gas just isn't worth the risk, says Sandy Johnston, executive director of the Pensacola Beach Chamber of Commerce. "It's not the sight of the oil rigs – it's the damage it can do to our economy." "We've been fighting this for years now," Johnston says of one especially controversial lease[81] in which Chevron bought rights to drill 12 miles from the Florida shores.

Florida Governor Jeb Bush has spoken out against expanded exploration and development along the coast. In June, President George W. Bush agreed to limit the offshore activity to 100 miles (160 km.) from Florida's beaches (V. Allen 2001). "I think that having them 100 miles from shore is a very big compromise on our part," says Johnston, who balked at the mention of Nova Scotia's inshore leases. "That just scares me half to death. All it takes is just one accident," she said in a telephone interview. Johnston says people "have to be realistic" – offshore oil and gas development is going to happen. But it should stay well offshore.

The Pensacola Beach Chamber of Commerce is primarily concerned with practicalities, such as the price of cleaning a beach situated close to offshore oil and gas development. Johnston contacted Chambers of Commerce in Alabama, Texas and Louisiana, and was told that they sweep their beaches two to five times daily to clean up trash and tar balls – an expense she wants to avoid.

Texas Tar Balls – "the dark icon of misery."

"Perhaps it is only fitting that a state so profoundly dependent on oil should expect oil's influence to reach into its playgrounds."
- Drew Jubera, *Texas Monthly*

Tourism operators along the Gulf coast rail against one villain: the ubiquitous "tar ball." The beaches of Texas, writes journalist Drew Jubera in the Texas Monthly,[82] are *not* likely to be confused with the Côte d'Azur. "The water is a murky green and the sand a dismal gray, conditions that are imposed upon us by the Mississippi River, which deposits the silt of Middle America into the western Gulf. Still, we might be able to cope with the aesthetic deprivation were it not for a single dark icon of misery: the tar ball."

Tar balls are as they sound: dense balls of hydrocarbons mixed with sea sand and shells. They have two sources: natural leaks from undersea pockets of hydrocarbons; and the oil and gas industry (Jubera; MMS 1993). "Today, the tar ball can be found on the feet of almost anyone who spends an afternoon on a Texas beach," writes Jubera, who says children in seaside towns are taught to wipe their sticky feet with kerosene so as not to dirty floors. Hotels in Texas even hand out complimentary oil-cutting solvent cloths, although Jubera says suntan oil, baby oil or peanut butter work equally well. Scott Joslove, president and CEO of the 1,500-member Texas Motel and Hotel Association, confirms that some hotels do hand out solvent-dampened cloths to clean tar from shoes or feet. However, he says he thinks the hotels are "few and far between," and adds "It's just a service."
But tar balls are not just a comedic problem, feared by folks in Florida (where the pristine beaches are thus far untainted) and endured by residents of Texas and Louisiana.

[81]Chevron USA, Destin Dome 56 Unit.

[82]Jubera, Drew. (undated). *"The Tar Ball."* Texas Monthly. Internet. Available at http://www.texasmonthly.com/ranch/readme/tarball/php Accessed Oct.10/01.

A 1993 technical study by the MMS tried to find the sources of "chronic oiling" on Louisiana beaches. The paper says "stranded oil and tar balls" frequently wash up on the Louisiana coastline, even though no oil spills have been reported. The MMS lists likely culprits as the oil and gas industry, as well as illegal bilge cleaning and dumping, and oil seeps. The MMS looked at 9 sites along 200 miles of Louisiana coastline. The object of the study was to determine whether the oil and tar balls came from small, unrelated events, or "chronic discharges from identifiable sources." Close to 60 per cent of the oil can be associated with transportation activities. About 32 per cent came from bunker or heavy heating oils, while 26 per cent came from tanker washings or sludge discharges.

Researchers found 480 tarballs, or picked up about 40 tar balls per beach, in the heaviest affected areas. "In comparison to other shoreline studies within the Gulf of Mexico, the concentration of tar balls along the Louisiana coast were low." The study goes on to say that given tourists will accept 100 grams of oil per mile of beach, the Louisiana beaches studied were "below a level of social-economic concern." However, it notes, "any stranded oil on a beach is aesthetically unpleasant, and the presence of oil reduces the value placed on that beach as a resource."

PART

4 THE REAL COST

of oil and gas

Chapter 1 Introduction

Ask anyone on the street what benefits the offshore oil and gas industry can bring Nova Scotia, and they'll likely give you one or two answers: 1) economic development – i.e.: jobs or an influx of new people with jobs to spend money, and 2) gas in Nova Scotian homes.

A full-cost accounting analysis would need to appraise both of these potential boons. It would examine both the underlying assumptions about oil and gas as economic development, and the use of gas as a viable energy source for Nova Scotians. It would also need to look into the prickly issue of whether the Nova Scotia government – and by inference the Nova Scotia people – are receiving full benefit from offshore petroleum developments.

As explained in Part 3 of the introduction, it's impossible to fully weigh the pros and cons of inshore oil and gas activity without looking at the long-term scenario. Therefore, an analysis of the effects of seismic testing and exploratory drilling alone – without considering the potential results of such exploration – would be incomplete and perhaps even misleading.

As former Nova Scotia oil man Jim Livingstone says, "If the seismic looks good, then they're going to drill. If the drilling looks good and they find the resource, then they have to develop it."[83] Livingstone continues: "You've got to remember, if you're going down this road, it's not just seismic, it's not just drilling, it's full production. You're going in for a 25 year project. So don't kid yourself."

A thorough analysis would have to consider the possibility of full-scale oil or gas production close to Cape Breton, and all of the issues associated with such production: economic, environmental, social. In this section, we'll raise questions surrounding the *real* costs of the oil and gas industry to Nova Scotia.

[83] Livingstone is the former president of Nova Scotia Resources Limited, the province's oil and gas company. He now heads his own oil and gas exploration company, Alberta-based K2 Energy. His ideas on whether Nova Scotians are getting the full benefit from offshore oil and gas will be presented later in this section.

1.2 To Have or to Have-Not, that is the question.

In l983 everything was supposed to turn around for Nova Scotia. Up until then, the federal government's equalization payments made up nearly 25% of all provincial government revenues (O'Neill 1984) and Nova Scotia had become known as a "have-not" region. But in l982 Canada and Nova Scotia reached a "landmark agreement" resulting in a legal framework for offshore oil and gas resource management and revenue sharing. Finally, oil and gas development was to follow a stable and predictable path.[84] This is probably why then Minister of Finance, Joel Matheson, had the following to say in a January l983 article that appeared in the Globe and Mail:

"*When we look back at the decade, I think l984 will be recognized as the year, in a developmental sense, that the economy of Nova Scotia moved from that of a "have-not" to a "have" province."*

Groups such as the Atlantic Institute of Market Studies (AIMS) would cringe at the thought. Last year their free-market views appeared in many an editorial across the country coinciding with the release of the book *Looking the Gift Horse in the Mouth: The Impact of Federal Transfers on Atlantic Canada* penned by Fred McMahon. The editorials and book reviews slammed Nova Scotia's (and the entire Atlantic region's) continued dependence on federal transfers. "If money from Ottawa was the solution to our problems, they would have been fixed long ago," wrote Brian Crowley, AIMS president, in one Globe and Mail article (2000).

Nearly 20 years after Matheson's prediction, Nova Scotia remains a "have-not" province. Ironically, at the time, oil and gas development – which was going to finally wean the province away from transfer payments – was itself dependent on federal government subsidies. In the early l980s, federal government money was responsible for keeping seven drilling rigs in the Nova Scotia offshore drilling (O'Neill 1984). In l980, Ottawa's National Energy Program provided "incentives" to oil companies willing to bet their chips on Nova Scotia. The subsidies, referred to as the Petroleum Incentives Program (PIP) covered up to 80% of all drilling expenses for firms that were at least 75% Canadian-owned but gave approximately 25% to those companies that were less than 50% Canadian-owned (Jaremko l999). It was said at the time that the PIP grants were so generous that "money can be made drilling dry holes" (O'Neill l984). In total, the federal government shelled out some $7.7 billion in cash grants under the Petroleum Incentives Program (RCESD 2000[85]).

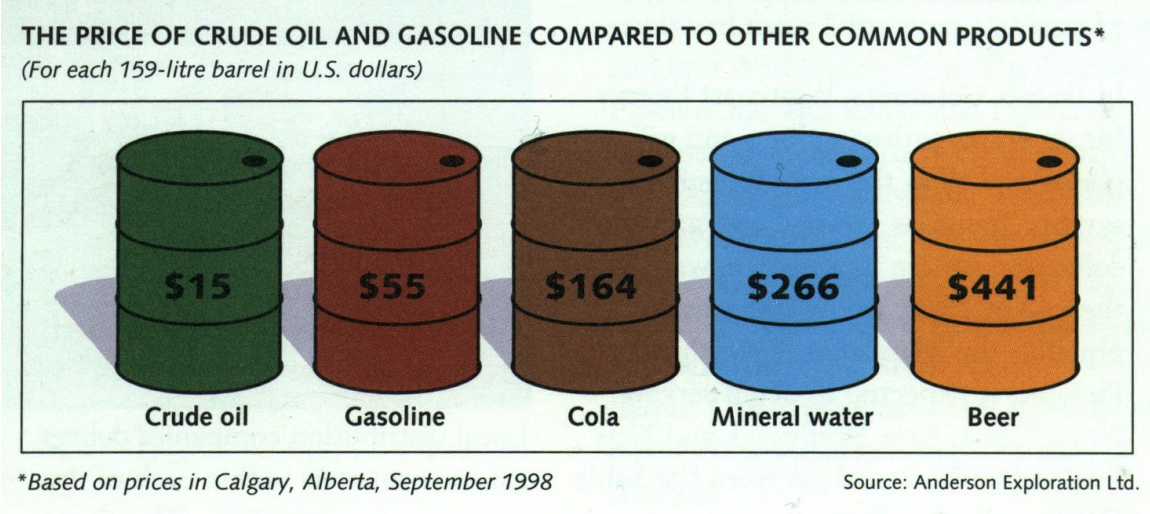
In l990, the feds came to the rescue again when the famed Hibernia find on Newfoundland's Grand Banks ran aground due to the fallen oil prices. Parliament enacted the Hibernia Development Project Act and construction started with 40% of the

[84] Nova Scotia Petroleum Directorate: Nova Scotia Oil and Gas History. Available from http://www.gov.ns.ca/petro/nsoilgasindustry/history.htm.

[85] RCESD 2000) Annual Report of the Commissioner of the Environment and Sustainable Development, 2000, chapter 3, *Government Support for Energy Investments*

$5.6 billion cost covered by taxpayers' money (Jaremko l999).

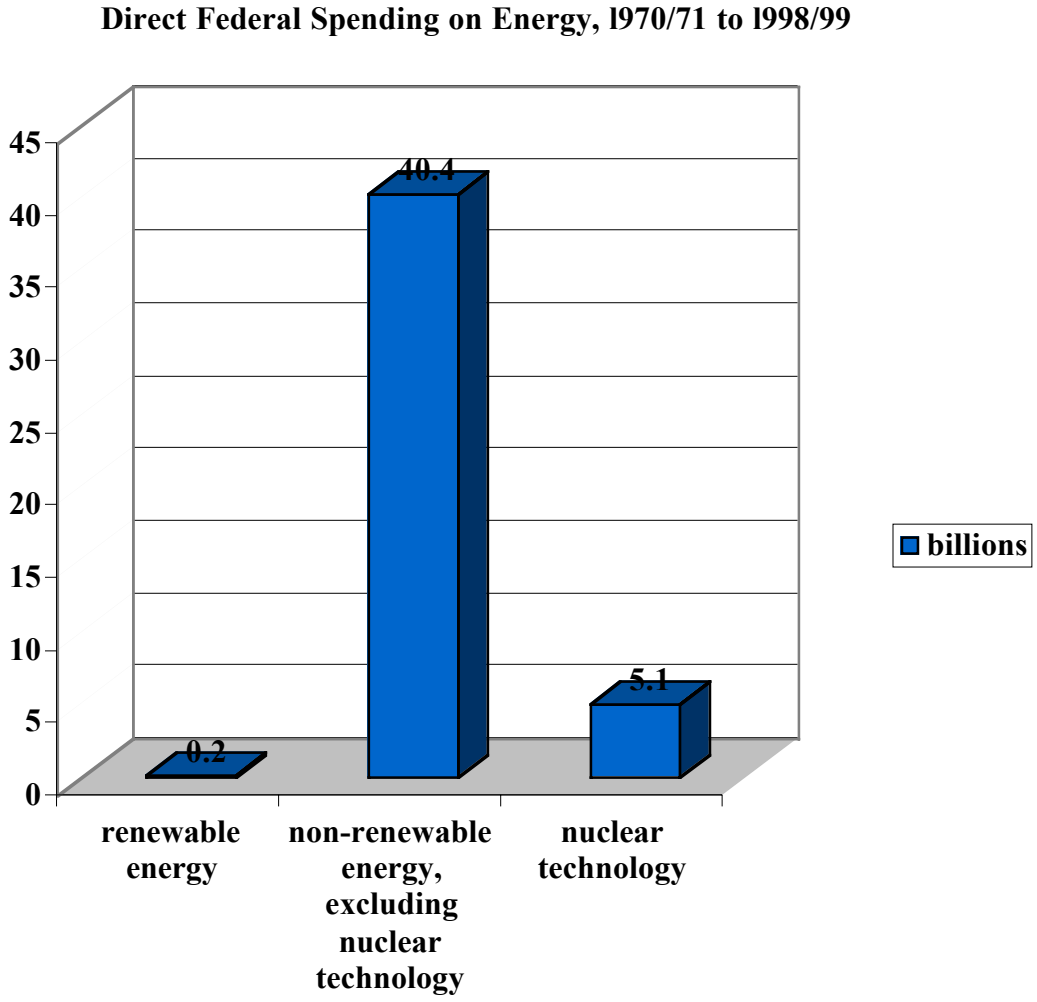
Chapter 2 Subsidies



Since the mid-Seventies, the fossil fuel business in Canada has been heavily subsidized. A line graph of direct federal spending on Canada's oil and gas habit would look like a frightening roller-coaster. It would start out slow but sure in the mid-'70s, when the federal government spent about $1 billion+ per year on oil, gas and coal. And it would peak in the early '80s, with yearly grants in the $5 to $6 billion range (see Figure 4.3). By comparison, today's subsidies seem paltry. But direct and indirect subsidies [86] to the fossil fuel industry are still substantial, and they add to the hidden costs of producing and consuming fossil fuels in Canada. Also, many of today's oil and gas "finds" are possible because of heavy exploration subsidies in previous decades (J. Stanford pers. comm. 2001). As economist Jim Stanford points out, subsidies aren't necessarily *bad*. However, they have to deliver their reciprocal benefits to the public. It's arguable that in the case of offshore oil and gas, the subsidies outweigh the benefits (see case study for Hibernia, Part 4 Chapter 5; sections on renewable energy, Chapter 7 and socio-economic impacts, Chapter 5).

[86] Direct spending is money that flows directly from government coffers to a person, group or industry. Indirect spending is more difficult to tabulate, and includes subsidies through the tax system.

Figure 4.3



source: Report of Commissioner of Environment and Sustainable Development, 2000

In 2000, the annual report of the federal Commissioner of Environment and Sustainable Development devoted a substantial section to the state of energy investments in Canada.

As background, the report listed Canada's floundering commitment to the Kyoto Protocol.[87] It also noted Canada's weak use of renewable energy sources.

[87] In December, 1997, Canada and 160 other countries signed the Kyoto Protocol, which aims to cut greenhouse gas emissions – the main source of which in Canada is production and consumption of fossil fuels such as oil, natural gas and coal. Canada agreed to reduce its emissions to six per cent below 1990 levels, over roughly the next 10 years. But instead of

"Renewable energy appears to be having difficulty getting established, despite its environmental benefits," it said.

The purpose of the report was to find out whether the federal government, through direct and indirect subsidies, favours non-renewable energy sources above renewable sources. Renewable energy sources include wind power; solar power; hydro-electric power[88]; geothermal power; ethanol; biomass power, from plant and animal waste; photovoltaic cell power; and power from waves or tides. Non-renewable power includes oil; natural gas; coal; and nuclear power.

The study said that most federal spending and tax incentives for the energy sector go toward the non-renewable energy sector. And it pointed out that only a small amount of Canada's energy comes from renewable sources. Still, it concluded that the government "does *not particularly* favour" the non-renewable sector over the renewable (emphasis added). However, the study only analysed federal subsidies. It suggests that provincial subsidies and royalty programs could shift the balance in favour of non-renewable energy.[89]

The Federal government spends roughly $12 million annually to support renewable energy technologies (RCESD, 2000). By comparison, it directly spent just under $200 million in 1999[90] on non-renewable energy sources. The bulk of today's subsidies to the petroleum industry, however, come in the form of indirect subsidies, such as accelerated tax credits and royalty holidays (L. Pratt pers. comm. 2001).

2.1 Tax subsidies

During the time of the National Energy Program, watchdogs kept a sharp eye on grants to the petroleum business. People like Dr. James Laxer – a political scientist who has written extensively about the oil industry – kept tabs and regularly reported on subsidies and various give-aways to industry. Then the watchdog groups "sort of drifted into oblivion," said Dr. Larry Pratt, a political scientist who also studies the oil industry (L. Pratt pers. comm. 2001). Nowadays, nobody is really keeping track, says Pratt.

The government uses the tax system – exemptions, deductions and tax credits – as an alternative to direct spending, such

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reducing emissions, we're actually increasing them. In 1997, when the agreement was signed, Canada's levels were already 13 per cent above 1990 levels. Natural Resources Canada estimates that unless something changes, Canadians will have to cut emissions by a dramatic 26 per cent from forecast levels in order to meed the Kyoto goal. (*Report of the Commissioner of Environment and Sustainable Development, 2001*)

[88] Even though hydro-electric energy *is* a renewable energy source, the study noted that some large-scale hydro-electric projects have wreaked great environmental and social damage, by flooding lands and displacing people. When we refer to renewable energy sources throughout this report, we mean *renewable and sustainable* energy. Under both of these criteria, many hydro-electric projects don't measure up.

[89] "Nevertheless, the interaction between the federal and provincial tax systems and the applicable provincial royalty regimes could result in dissimilarities in the overall treatment of energy investments." *Report of the Commissioner of Environment and Sustainable Development, 2000,* 3.71

[90] 1999 is the most recent year for which data were available.

as grants to industry (RCESD 2001). Today, the main tax credits the federal government gives to oil industries are accelerated tax write-offs (ibid). Under these tax credits – which are meant to encourage investment – businesses can reduce their current taxes and delay the day when they have to pay higher taxes. For companies that aren't making any profits yet, accelerated write-offs can be carried forward and deducted for tax purposes when the company begins making profits. These deferrals are mainly a benefit because of the "time value" of money (ibid).

"No one is now collecting the data needed to estimate total tax expenditures related to accelerated write-offs."
–Report of the Commissioner of the Environment and Sustainable Development, 2000

But calculating how much tax income the government forgoes each year because of accelerated tax write-offs "is not an easy task," concluded the 2000 Report of the Commissioner of the Environment and Sustainable Development. The Department of Finance used to keep records of corporate tax expenditures from these tax credits. But now, no one is keeping track. The Commissioner's report recommended that the government begin tallying the total cost of these tax breaks "…to determine whether they are meeting their objectives cost-effectively and to determine whether they are still needed" (RCESD 2000).

2.2 Royalties: is the public getting its share?

According to Jim Livingstone, former president of Nova Scotia Resources Ltd., the answer to the above question is a resounding "No." Although Livingstone is an oil industry "insider" – he heads up his own exploration oil company, K2 Energy – he is a harsh critic of both industry and the Nova Scotia government's attitude toward it. "Why would you give away your resource for peanuts? A one or two per cent royalty? It just doesn't make sense. It wouldn't happen anywhere else in the world, either, " he says (J. Livingstone pers. comm. 2001).

In 2000, for instance, royalties from Sable gas – roughly $6 million – barely met the budget for the Nova Scotia Petroleum Directorate, which administers the royalty regime (Myrden 2001). Yet the province exported close to $1 billion in natural gas (Hamm 2001). NDP leader Darrell Dexter points out that an entire year of royalties amounts to less than one month's revenue from video lottery terminals. Market-driven think-tanks such as the Atlantic Institute for Market Studies, on the other hand, conclude that Nova Scotia's royalties are fair and on par with other areas (AIMS 2001).

A full costs analysis of inshore oil on Cape Breton must determine what basic payment citizens get in return for industry extracting a public resource from public waters. A look at the government's current royalty system, as well as its track record and mandate in dealing with offshore oil and gas, would be necessary.

"Major oil companies negotiate all over the world. They're professionals; they're good at it; and they're going to get the best deal for their shareholders,"said Livingstone, who says it's the

government's responsibility to get the best deal for Nova Scotians – a responsibility it isn't fulfilling. Successful Albertan oil companies pay 20 to 30 per cent royalties. By comparison, companies in Nova Scotia's offshore pay royalties in the single digits. Government says that the lower royalties reflect the higher expense of drilling offshore compared to onshore, and that the royalty pay-out will come down the road.

"But you tell me what Nova Scotians get out of it. Do they get a source of gas? No. Do they get some jobs? Yeah, short term. What do they lose?"
–Jim Livingstone, president, K2 Energy, former president of NSRL

Will Nova Scotians at least get to heat their homes with gas?

"No. I don't think you will," says Livingstone. "It's all sold to the U.S. right now. And it's not economical. Many parts of Nova Scotia [are] too far apart. It would be cheaper to stay with coal, furnace oil or hardwood" (J. Livingstone pers. comm. 2001). Other oil experts agree that it could be a while before Nova Scotians are warming their toes by a blue gas flame. Generally, the gas will go to densely populated areas – such as HRM – first, said Doug Gregory, manager of East Coast Operations for Shell Canada. "Areas that aren't as densely populated – it will be later, if ever" (D. Gregory pers. comm. 2001).

Nova Scotia's Energy Strategy, released in December, underscores Livingstone's assertion. The new policy scrapped the government's promise to make gas available to a majority of households within seven years. Instead, the province plans to rely on the market to determine whether Nova Scotians will have gas as a home-heating option. "The province has done an about-face on natural gas distribution in Nova Scotia," reported the *Chronicle-Herald*'s Bruce Erskine (2001). New government predictions put gas in Nova Scotia homes in 2003, at the earliest – a full four years after NS gas reached New England (ibid).

The Nova Scotia government's record in dealing with oil and gas companies – from royalties to promises of delivery of gas – has drawn criticism from many quarters. "Welcome to the Banana Republic of Nova Scotia, Multinational Oil Company Appeasement Division," wrote former Daily News columnist Parker Barss Donham in August, 2000. Donham criticized the Utility Review Board for allowing a section of Sable offshore pipeline to open, despite its having ruptured twice in tests, and despite National Energy Board warnings that similar flaws likely existed elsewhere in the buried pipe (Donham 2000). Sable needed the pipeline to open on time, Donham said, and the URB commissioner – formerly of the province's oil and gas promotional agency – complied. The URB said the pipe was safe, since it underwent a third test without rupturing. Eight months later, the NEB also allowed another piece of potentially faulty pipeline to open, provided it operate at 50 per cent capacity – supposedly a safeguard against the pressure-ruptures experienced in earlier tests (ibid).

Chapter 3 Jobs

"The fact is that large-scale projects based on non-renewable resources have rarely provided permanent employment for any significant number of native people."
– Thomas R. Berger, Commissioner of the Mackenzie Valley Pipeline Inquiry, l974 to l977.

Thirty years ago, when Mobil Oil discovered oil on the Scotian Shelf, near Sable Island, the promise of jobs rippled across the province. Since then, critics have charged that the jobs simply haven't panned out, while industry and government say the jobs will arrive as development "comes on stream." Both sides have a number of examples and explanations to support their claims.

In early 2002, the Conference Board of Canada will release a study assessing the potential effects of offshore oil and gas, based on a number of varying investment scenarios. The report was commissioned by the Greater Halifax Partnership – a private-sector led group that promotes business and development, and touts the spin-off benefits of an offshore oil and gas boom (Globe 2001). The partnership, along with the Halifax Chamber of Commerce and NovaKnowledge, says that 40,000 people[91] in the province earn at least part of their living from the oil and gas sector. The prospect of even more jobs is the cherry at the centre of their October, 2001 info-advertising spread in the Globe and Mail (ibid), and their funding of the upcoming Conference Board of Canada report.

Like his predecessors, Premier John Hamm is banking on oil and gas. "By promoting Nova Scotia natural gas in the northeastern United States, we will attract new investment to the province and new jobs for Nova Scotians," he said in a news release in anticipation of his December 6/2000 tele-conference "meeting" in Washington with U.S. Vice-President Dick Cheney. "Meeting with Vice-President Cheney will reinforce our province's reputation as North America's east coast energy centre." Hamm sounded like the proverbial "little guy" in the big city when he spoke to the *Daily News* the following day: "We want to become a major participant in the energy industry in North America," Hamm commented, adding that it was a "big advancement in awareness" to be able to speak to Cheney, the U.S.'s top energy official. "If we're not part of the strategy we could get shut out of the process" (Dooley 2001).

People like Roger Taylor, business editor of the *Halifax Chronicle-Herald*, are skeptical that the oil and gas industry will provide a panacea for the province's economic woes. "[I]ndustry executives always seem to take great pains to promote the idea of local benefits," he wrote after a major oil conference in October (Taylor 2001). Yet the real jobs, he said, seem to come in the form of providing food and supplies or "providing paper clips for their local offices."

[91]Speaking at the annual conference of the Offshore/Onshore Technologies Association (OTANS) in October, 2001, Premier John Hamm more conservatively estimated there are currently more than 2,000 people working directly in the industry and in support services.

3.1 Will the local jobs appear?

"It's not a big employer, and it's not in the long-term. It's a highly technical industry that uses less people and more iron." – Jim Livingstone, K2 Energy

"On an investment basis, offshore oil and gas projects create few jobs, and even fewer local jobs," concludes a recent research paper by the Canadian Centre for Policy Alternatives (Marshall 2001). A study prepared for the British Columbia Ministry of Energy and Mines (Oct./01) confirms that the exploration phase of offshore oil and gas has "limited opportunities for local involvement." Contractors usually bring in skilled workers from elsewhere (Marshall 2001). A three-year exploration project proposed by Chevron in BC, for example, promised few local jobs. Chevron estimated it would hire 201 people at the project's peak, with a maximum of 81 local workers. But the likely total of local hires would be 27, it said, since locals often don't have the needed skills (ibid).

Under its newly-released Energy Strategy, the Nova Scotia government won't require oil companies to hire a certain number of locals. Instead, companies can voluntarily agree to provide local jobs (Govt. of NS 2001).
"[In] the exploration phase, you don't employ that many people," says Dr. Doug House, a sociologist at Memorial University of Newfoundland, who specializes in offshore oil and gas (pers. comm. 2001). He points to one exploration project off the coast of Labrador in the 1970s. People were excited at the prospect of a big gas find, and the local jobs and spin-offs it could bring to economically depressed Labrador. "The French company Total was involved, and they brought mainly French people in to work on the rigs. The local people were saying they didn't get the benefits," says House. "They did hire a few local people after a while, and then they left. It just came for a while, and then it's gone."

Pointing to the North Sea example, House says "On the whole...oil is unlikely to serve a replacement economy for more than a very few rural communities in the North Atlantic; and even where it does, it will only be for a limited period of time" (House et al 1986).

Oil companies agree that there are limited opportunities for local employment during the exploration phase. "Initial exploration activities can convey only modest employment and industrial benefits," says Corridor Resources Inc. (Corridor Resources Inc. 2000). A 10-day seismic operation off Cape Breton, for example, would employ a local fisherman as an observer aboard the seismic vessel, and could also employ some locals as crew (ibid). The exploration drilling phase would be better, with potential jobs for "a number of Cape Bretoners" (ibid). Each active exploratory drilling rig would require rig hands, service by supply boats and/or helicopter bases (ibid). Of course, exploratory drilling is short-term. One well can take one to six months, and the whole process – including several wells – can take three to five years. Of course for the oil companies, the faster this process happens, the better (D. Gregory pers. comm. 2001). The real promise of jobs – a promise that needs to be

thoroughly weighed – comes down the road, if and when a successful industry develops.

For the purposes of this paper and the Public Review Commission's hearings, we cannot go into long-term numbers and scenarios. However, any decision regarding inshore exploration should naturally look at long-term scenarios and case studies from other regions, including the North Sea (see Case Study for the Shetland Islands, Part 3, Chapter 1). It is also vital that investment in oil and gas be compared to other investments (for instance, see section on renewable energy). These investments can be weighed by the degree to which money spent and earned stays within the community.

The construction and production phases of offshore oil present different job scenarios again. The busy construction phase creates the most jobs, although of course these jobs are also short term. Employment during full-scale production drops again (Marshall 2001). Since there are finite amounts of oil and gas to be tapped, offshore oil is a short-term business. Nova Scotia's largest reserves could take 20 to 25 years to run dry. And then what?

But even if the best case jobs scenario is realized – and many Nova Scotians get well-paying, satisfying jobs within the offshore industry – there are plenty of things to think about before calling the venture a triumph.

Nova Scotians – and specifically Cape Bretoners – need to ask the oil industry and their government a number of questions.

- How many jobs will this venture create, in all of its potential stages of development: seismic testing; exploratory drilling; full-scale production?
- What types of jobs will they be. Will local people be trained and/or hired for technical jobs within the industry? Or will their jobs be more service-oriented, such as providing food, accommodation and transportation?
- What is the stability and resilience of these jobs?
- And perhaps most importantly, what plans have they set in place to ensure that their good intentions become reality?

3.2 What are the local benefits?

"Local projects beget local benefits," says Corridor Resources Inc. president Norm Miller. "So a discovery in Shelburne County wouldn't have an impact on Inverness County. It really does matter where the discovery is made in terms of infrastructure, services, as helicopter base, supply base, people, gas plant" (N. Miller pers. comm. 2001).

It is unlikely anyone would argue that inshore oil and gas will bring no local benefits to Cape Breton. There are bound to be some local jobs and a temporary influx of people to spend money. These benefits, however, must be weighed against risks – especially to tourism, fishing and the environment.[92]

[92]In Goldboro, Guysborough County, for instance, the Sable Offshore Energy Project is seen as a Godsend. Construction of the gas processing plant employed 600 people at its peak in August/99, with 80 to 100 people getting permanent jobs (C. Szklarski 1999). The Goldboro situation needs to be seen in relation to

Again, they must be put into long-term perspective.

O'Neill (l984) argues that offshore oil and gas exploration, development and production will "have little impact on the province's condition as an underdeveloped economy." "Certainly, even to position the highly capital intensive, highly technological, highly externally-dominated, and highly site-specific offshore oil and gas industry as a medium for solving the problems of Nova Scotia's economy is rather spurious."

Political science professor James Laxer (1983) cautions that the speed of offshore developments, coupled with a lack of local control, means jobs are conferred elsewhere. He points to the Scottish North Sea as an example. In 1976, roughly 60,000 jobs in Scotland – representing only 2.5 to three per cent of total employment – were related to the petroleum industry. In the United States, some 200,000 jobs existed as a result of the Scottish oil boom (ibid). More local control over development can lead to a rosier picture (see Shetland Islands case study); however, House points out, "it would take a big change" in provincial-municipal government relations to create a similar situation in Cape Breton. Furthermore, he points out that the Scottish "success stories" deal with rigs situated well offshore – unlike the Cape Breton parcels.

Even executives from the offshore industry are attempting to temper expectations of an imminent boom. At the October OTANS (Offshore/Onshore Technology Association of Nova Scotia) conference, Shell Canada's manager of East Coast operations advocated caution. Exploratory drilling is expensive and risky, he said, adding that Nova Scotians may be expecting too much from oil companies (Taylor 2001). Similarly, the president of Exxon-Mobil's Canadian operations, Jeff Woodbury, spoke about high costs. Woodbury called for "regional cooperation" to cut costs, and a streamlining of the oil and gas regulatory process (ibid).

Halifax media outlets, including CBC radio, the *Chronicle-Herald*, and the *Daily News*, reported on these cautions from the oil industry, sending a foreboding message across the province: Don't get your hopes up; don't demand too much.

At the same conference, Nova Scotia premier John Hamm gave an optimistic speech. He promised a "competitive and positive business climate" in return for "a positive partnership attitude." It's unclear what a "positive partnership attitude" really means. But it is clear from the conference that the province is hesitant to make demands of the oil industry.

It's within this tense atmosphere of hopes and tenuous offshore developments that the inshore Cape Breton licences are being debated. The proposed development has already caused anger and stress in communities

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the fishery, however. A paper prepared by CEF Consultants quotes local people affected by the Sable developments. "You need a happy medium between offshore oil and the fishery. It's certainly not causing any harm here because there was no fishery left. Georges, well that might be another story," said one local (CEF Consultants 1998). Another pointed out that "You've got a different set of issues in the south-west. If you can still make money at the fishery, you're in a different position from people here" (ibid). In Cape Breton – unlike Goldboro – the fishery is a viable way of life.

within Cape Breton.

Bob Morgan chairs the Industrial Cape Breton Board of Trade's petroleum committee. With a science degree from St. Francis Xavier University and 15 years experience in the oil industry, Morgan said he feels qualified to speak knowledgeably about what inshore oil and gas can do for Cape Breton. An inshore oil and gas industry could emancipate people, says Morgan, who speaks as passionately *for* oil and gas as his opponents do against it. He says people who are opposed to the inshore licences – namely the Sierra Club and the Save Our Seas and Shores coalition – are "fear-mongering" and don't represent most Cape Bretoners. He angrily charges that many of them aren't locals, and they misrepresent local concerns. "As a Cape Bretoner, it sickens me," he said in a telephone interview.

If Morgan's reaction – coupled with the equally appalled reactions of people opposing the licences – is any indication of the mood on and around Cape Breton Island these days, then inshore oil and gas has already conquered the mental space of many people (see Chapter 5). It's become a full-time job for Mary Gorman, of the SOSS coalition. Gorman is not a "Come-From-Away," as Morgan suspected, unless her 10 years of living in New York City erases her Nova Scotia roots. Born and raised in New Glasgow, Gorman now lives outside Merigomish with her fisherman partner, Percy Hayne. She says she'd rather be writing screenplays than trying to stop inshore oil rigs along her coast, but she feels she has no choice (Falconer 2001). "[T]here's nothing more difficult than fighting a preventive battle," she told writer Tim Falconer for his book *Watchdogs and Gadflies*. The book shows how many people, frustrated with an ineffective democracy, are turning their desire for change into activism. Falconer thought enough of Gorman's conviction and work to present her as a banner example of community activism in the book.

But do people like Mary Gorman or Bob Morgan – both fighting for what they believe will benefit coastal communities – have any power over how things will develop in their own backyards?

Chapter 4 Industry Expectations

In order to evaluate the viability and range of possible effects of inshore oil and gas in Cape Breton, analysts must get an inside perspective from the oil industry, and also look to the experiences of other areas.

At a recent panel discussion held by the Nova Scotian Institute of Science,[93] PanCanadian Energy's special advisor to East Coast operations, Brent Austin, spoke about the concerns of oil companies. He stressed the risks of exploratory drilling, saying success only happens 10 per cent of the time. And he emphasized the fragile relationship between "impatient investors" and exploration oil companies. The government-controlled process that takes an oil company from licence to seismic testing/exploratory drilling is often way too slow, said Austin. And impatient investors want results.

"The speed at which all of this can happen is very important because the international investment community is very anxious to see results," he said, pointing to one exemplary speedy example in Canada's north, in which a company went from licence to full production in a few months. To prove his point about the necessity of speed, Austin read from an article in Upstream magazine, "the international oil and gas newspaper."

The article, titled "Flying the flag for gas" (Rogers 2001), quotes Alberta Energy chief executive Gwyn Morgan, who says that for companies like his, time and ease of development is paramount. Government inaction and native blockades – which slow down development – might convince some companies to flee for greener pastures, Morgan said. "Global companies such as ours will not be held hostage to a multitude of artificial and unnecessary barriers that do not exist elsewhere. Global investors won't allow us to take forever to put their money to work." Morgan pointed to countries such as Nigeria,[94] Venezuela and Trinidad, as being poised to lure away prospective investors in Canadian oil and gas exploration.

"Companies can go elsewhere, and they are going to a lot of different places," PanCanadian's Brent Austin warned, in confirmation of Morgan's comments.

Other energy executives echo these warnings. "We seek a regulatory climate that is simple, easy to navigate, allows for timely approvals and does not burden our projects with excessive on-going costs," said Michael Phelps, chairman of Westcoast Energy Inc., a major shareholder of the Maritimes and Northeast pipeline (Bornais 2001). The 1000 km-long pipeline carries Sable gas from Guysborough County to New England.

The idea that government regulations or pesky protesters can send "impatient investors" bolting for oil fields in Ogoniland puts governments – and

[93] "Oil and Gas Offshore Nova Scotia," a panel discussion at St. Mary's University, Halifax, Nov. 5/2001. The panel included geologists, industry reps and a spokesman from the research/academic sector.

[94] Nigeria is a surprising example, considering the appalling record of Dutch Mobil-Shell in that country, and the Nigerian government's complicity in gross human rights abuses in support of the oil company.

potentially, protesters – in a tough spot. Under Nova Scotia regulations, exploratory licences are issued before any environmental assessment or public consultation has taken place. Proper environmental assessments take time – especially if there are big gaps in knowledge about certain areas or species. The necessity for *speed* on the business side, and *time* on the environmental and proper public process side, creates a quandary.

When asked how oil companies balance their shareholders' interests with state interests, PanCanadian Energy's special advisor to east coast operations, Brent Austin, gives a predictable answer: "Principally, we're responsible to our shareholders," Austin said at the St. Mary's panel. "We honour the laws in the places in which we work," he went on, adding that if the laws are slack and regulations substandard, his company – and presumably others – continues to work to the highest standards.

Austin's initial answer – without the sensitive caveat – is one people attempting to preserve the public interest should bear in mind. "Business is motivated by profit; it is not designed to safeguard universal principles," writes George Soros (2000).

"Most businesspeople are upright citizens; but that does not change the fact that business is conducted for private gain and not for the public benefit. The primary responsibility of management is to the owners of the business, not to some nebulous entity called the public interest – although enterprises often try, or at least pretend, to be acting in a public-spirited way because that is good for business."
– George Soros (2000)

Soros points out that traditionally, the nation-state has been responsible for protecting public interest. But as global capital markets have expanded, the powers of the nation-state have shrunk.

"When capital is free to move around, it can be taxed and regulated only at the risk of driving it away. Since capital is essential to the creation of wealth, governments must cater to its demands, often to the detriment of other considerations" (Soros 2000).

Or, to repeat the words of PanCanadian Energy's Brent Austin, "Companies can go elsewhere, and they are going to a lot of different places."

Chapter 5 Social Costs

Offshore development involves complex environmental, cultural, social, economic and political, and even psychological issues. – William R. Freudenburg and Robert Gramling

Clearly, social, environmental and economic costs are interwoven.

American sociologists William Freudenburg[95] and Robert Gramling[96] say the social effects of offshore oil begin long before any physical development actually takes place. They call the early stages of offshore development "the opportunity-threat phase" of development. The social and economic impacts of this phase come as people identify and try to pin down the potential and ongoing implications of development – whether as "opportunities," for people in favour of such development, and/or as "threats" for those who feel otherwise (Freudenburg and Gramling 1994). Cape Breton is currently experiencing this phase.

"*The essential point to realize is that the process of negotiating the "real meanings" of development may play a key role in determining the social and economic impacts of the facility or activity,*" they write (ibid).

Freudenburg and Gramling break the potential effects of offshore oil and gas into six categories:

Biophysical/health systems i.e.: threats to the environment that people value. These threats range from the concrete – such as habitat degradation for fish – to the abstract, such as buildings or infrastructure that compromises the aesthetic, cultural or religious qualities of an area. They are careful to point out that the "abstract" effects shouldn't be dismissed. "These concerns are real, constitute real impacts real impacts in their own right, and lead in turn to real action, organization, and political activity."

Cultural systems "In many cases, the same developments that are seen as posing threats to physical, economic and/or social well-being will almost necessarily imply threats as well in the realm of culture and norms" (ibid). People relying on subsistence activities – in particular many natives – can be adversely affected. Other cultural effects

[95] William R. Freudenburg served six years on the Scientific Advisory Committee of offshore oil drilling for the U.S. Dept. of the Interior.

[96] Robert Gramling served on the advisory board on federal offshore oil leasing for the National Academy of Sciences, and has written extensively about the socio-economic effects of oil and gas.

can be a loss of trust in political systems, as citizens see – or think they see – their elected officials failing to behave in an "appropriately neutral" way.

Social systems Residents can see threats or opportunities to their communities' social structures. When large-scale development comes to rural areas, potential risks include increased crime; drug and alcohol abuse; or mental health problems. Freudenburg and Gramling point to voluminous research on these effects. They also note another social effect that receives less attention from researchers, and which might be more relevant for Cape Breton: threats to the atmosphere that rural residents prize, such as a slow-paced, friendly, peaceful community in which everybody knows everybody else. They point to northern California towns, in which the jobless rate is high. "The relative scarcity of jobs...meant that people really had to want to live there."

Economic systems These effects are usually seen as opportunities rather than threats. The biggest opportunity is jobs, with potential increases in real estate values and business volumes. However, Freudenburg and Gramling say that while studies *do* show that jobs are often created locally, "they often prove to be less significant for the local unemployment rate and less attractive to local youths than is commonly assumed." Even so, they say, offshore oil poses job threats. "Threats can be posed for persons ranging from commercial fishermen, particularly in California and Alaska, to those whose livelihood depends on amenity-based tourism and recreation, as in Florida."

Political/legal systems Some of the most dramatic effects from the "opportunity-threat" phase of offshore development come from legal wrangling and political activities. "Legal processes start from the assumption that the relevant parties are adversaries, and often exacerbate the degree to which the process becomes adversarial."[97] Instead of encouraging talk between opposing parties, the legal system usually forbids it. The result is a "spiral of stereotypes" and dissemination of misinformation that only serves to discredit both sides.

Psychological systems

Finally, say Freudenburg and Gramling, this initial phase

[97] Jim Livingstone, president of K2 Energy, describes the Sable public review as "intimidating," and says he had to wade through about 100 lawyers to speak. "The idea of these local hearings is to allow local people to have their input. It's not for lawyers and oil companies to strut their stuff. It's an opportunity for the people to get a fair hearing." Too often, hearings are dominated by industry and experts, he said, which quashes debate and defeats the democratic spirit of public hearings. "At the end of the day, if people [decide] that it shouldn't go ahead, that should be their verdict," he added (J. Livingstone pers. comm. 2001).

of potential offshore development can affect how people "see themselves as functioning participants in society." Everything from public meetings to letter-writing campaigns will affect how people perceive the effectiveness of the public process – and their roles within it.

-From ***Oil in Troubled Waters: Perceptions, Politics, and the Battle over Offshore Drilling***, by William R. Freudenburg and Robert Gramling, 1994

5.1 The costs of developing a non-renewable resource

"The development of the non-renewable resources of a region can bring serious pressures to bear to its population: people who try to continue to live on the renewable resources experience relative poverty, and may be faced with the loss of a productive way of life," wrote Thomas R. Berger in his 1988 book about the Mackenzie Valley Pipeline Inquiry. Berger was Commissioner of the Inquiry from 1974 to 1977. His analysis of the effects of short-term developments on rural areas continues:

"Gradually more and more people give up one kind of work, and therefore relinquish the way of life associated with it, in favour of another kind of work and life. Where this has happened, they often feel had very little choice in the matter. If the neglected sector of the economy represents a preferred or culturally important way of life, if it is a means of self-identification and a source of self-respect, then the devauation of that way of life can have widespread and dismaying consequences. These consequences are exacerbated if the industrialized economy offers rewards that are only short-term."
– Thomas R. Berger, Commissioner of the Mackenzie Valley Pipeline Inquiry, 1974-1977

In his 1977 ruling, he recommended that for environmental reasons, no pipeline should ever be built along the northern coastal plains. For the remainder of the pipeline project, Berger recommended a ten year moratorium. The possibility of a pipeline should not even be entertained until the Native people settled outstanding land claims issues, he wrote.

5.2 "Boom and Bust" economies

"Most civilizations have defined social well-being as either stability or modest growth. Even prosperity has usually been seen in those terms. Instability, inflation, boom-and-bust – these phenomena, more than that of useful progress, have been associated with growth. Not that boom-and-bust cycles are of no value. Often they leave behind long-term infrastructures – railways, road networks, fleets of airplanes, urban development. But it would be a sign of congenital pessimism to think that civilization can only progress by lurching along irresponsibly."
– John Ralson Saul, *The Doubter's Companion: A Dictionary of Aggressive Common Sense*, 1994

Another feature of developing non-renewable resources is "boom and bust" syndrome. The American Gulf coast is "the most intensely developed and highly exploited offshore oil and gas region in the world," producing roughly 90 per cent of all American offshore oil and gas (CEF Consultants 1998). Over the past 30 years it has undergone classic boom and bust cycles, with many coastal areas scarred from years of quick and careless oil and gas development (ibid).

The population ballooned as offshore created new jobs, drawing new people. Schools, roads and social services were strained, with rural communities faring the worst (ibid). "By the mid 1970s, Morgan City, the former 'shrimp capital of the world,' had no resident shrimp fleet and no operating shrimp plants" (ibid).

A drop in the price of oil in 1986 created

recession and massive unemployment, causing many people to leave the area. Ten years later, exploration companies found oil and gas in deeper waters, and the boom picked up again (ibid).

Fifty years of oil and gas has left its mark. Many coastal towns have transient populations, with their attendant social ills, such as high crime, drug abuse and unstable relationships (ibid). Pollution is also a big problem, with parts of the Mississippi Delta and Texan coastal estuaries rife with effluent from petro-chemical factories. Locals know one toxic area as "Cancer Alley" (ibid). Many people also say the companies commit "environmental racism" by locating ugly, pollution-spewing plants in small, poor black communities (ibid). "Offshore development has not been a benign force on this coast," say CEF Consultants.

Fort McMurray, Alberta, is currently experiencing the boomtown pinch, brought on by the Alberta oilsands. The population has jumped 30 per cent over the last four years, and is expected to grow another 30 per cent over the next four (Saltzman 2001). The rental vacancy rate is hovering around zero and existing rental rates have jumped. Services such as hospitals, schools and homeless shelters are overflowing (ibid). After a fire levelled one apartment building in November, 2001, Fort McMurray made the national news: With a zero-per cent vacancy rate, there was simply nowhere for the 200 newly-homeless people to move.

Sociologists Freudenburg and Gramling (1994) say there has "been a failure to deal systematically with longer-term issues" pertaining to offshore oil and gas. Whether communities experience a boom-bust cycle, or whether they experience longer-term prosperity after the oil companies pull out, things don't return to "normal" in the long term (ibid). "[W]hat emerges after a major industry pulls out does not seem to be anything like "normalcy," either of local residents or of outside researchers" (ibid). Both sociologists have written extensively about the effects of "boom towns" created by offshore oil. They use the term "overadaptation" to describe the tendency for communities – especially rural communities – to become super-reliant on or heavily adapted to big, extractive industries, such as offshore oil and gas.

Voyer (1983) cites the effects of an "overadapted" community feeling the bust in a boom-bust cycle:

"As the oil companies move out, they take their best people, foreign and Scottish, with them; service and supply companies, including local firms, either fold up, follow the oil companies, or find new kinds of business; average incomes decline; depopulation recurs; the bottom falls out of the real estate market; local authorities are left with unused and decaying houses, dock facilities, and warehouse and office space. The situation may be worse than in pre-oil days, as the business elite has given up control over local businesses; and the local labour force has lost its traditional skills." (cited in Voyer l983)

5.3 The value of social capital

"Economic development is not just economic development; it's also social development, and so small communities frequently exist and do well largely

because of the social capital that they have," says Ralph Matthews, a sociologist specializing in rural development and aquaculture. "One begins by looking at what is there, and what one can do to have added value to what exists" (R. Matthews, pers. comm. 2001).

Harvard Political Scientist Robert Putnam showed the value of social capital in his studies of 20 newly-formed regional governments in 1970s Italy (Korten 2001). Their structures were identical. Yet some of the towns stagnated while others flourished. Putnam found the main difference between these towns was what he nebulously called a highly-developed "social capital" (ibid). Put in more tangible terms, that means lots of people who vote, go to libraries, participate in literary and sports clubs, read newspapers, and generally live in an active, vital community. "We have given too little attention to the importance of social capital to the healthy functioning of societies and rarely consider the impact of economic structures and policies on its formation or depletion" (Korten 2001).

Social capital depends a lot on local control over things such as economic development. Matthews (2001) argues that the background issue for any economic development is "who gets to be in control of what." And with a local resource – such as offshore gas – a major factor in "who controls what" is adjacency. People living close to the resource will be most affected by it. Therefore, they should have considerable control over ensuring the development protects their physical and social environment (ibid).

5.4 The case for people-centred development

Most development in the past decade has focused on *business* rather than *people*. The orders of the day have been smaller government, tax cuts and deregulation. In a paper about the Newfoundland economy, economist Dr. Jim Stanford (1998) takes on the notion of business-centred development, in favour of people-centred development. He says the Newfoundland analysis should translate well into a Cape Breton context (J. Stanford pers. comm. 2000).

"[T]he purpose of economic development in the first place is to improve the lives of people. Let's elevate those people to centre-stage in our thinking about economic development and how it occurs, rather than hoping that the trickle-down benefits of private, profit-led activity will somehow suffice."

Private markets and business play a crucial role in any economy, says Stanford. "But we need to keep and eye on those markets and ensure that their workings are compatible with the fundamental goals of economic development: growth, equality, and well-being."

Stanford advocates cooperative, collective community development. He compares Newfoundland to two other rugged Atlantic islands: Ireland and Iceland. Both these islands have a higher GDP than Newfoundland as well as greater personal savings rates and lower unemployment rates. Ireland's economy has been driven by manufacturing exports and the return of former emigres, while Iceland's is based on exports – including the development of geothermal

energy – and high-value services (such as social services) for local "consumption." Stanford says that the greatest differences between Newfoundland and these islands are their *human* resources and strong public services. By comparison, Newfoundland's public sector is withering. And efforts to encourage private development to fill the public void haven't worked. Stanford's paper offers an alternative to business-centred development, based on sound economic arguments.

A full costs analysis of Cape Breton's potential oil and gas situation should consider the value of social capital, and the effects of business-centred development upon it.

5.5 Case Studies

I: The Exploration of the Venture Field

In l979 the Venture field near Sable Island was discovered and was believed to contain more gas than all other discoveries to date. Three years later, Finance Minister Joel Matheson was quoted saying "there is absolutely no question that Sable gas will be flowing ashore in Nova Scotia on or around the mid-l980s" (O'Neill l984). Bill Mason, Mobil president countered at the time that it might take a little longer. Mason said that Venture Gas, if proved viable to develop, might be in production by l990 (O'Neill l984).

In l987 oil and gas prices plummet and the Venture find became unviable and was shelved for a decade. Gas from the Sable Offshore Energy Project is delivered to the Maritimes Northeast Pipeline System in December, l999 – twenty years after the field was first discovered, and 40 years after Mobil Oil was first issued the exploration licences covering the Sable Island area.

In O'Neill's l984 report about the Nova Scotia offshore oil and gas industry, he investigated what were said to be the benefits from the exploratory stages of the Venture find and concluded then that the economic benefits for the province were "few" and that those to reap the greatest benefits were the entrepreneurs who owned the drilling rigs and supply boats whose capital costs were being payed by federal grant money.

The following is a summary of some of O'Neill's findings:

- Provincial, regional, and national demand for Sable gas are insufficient to warrant its production, so markets have to be found in the United States.
- Land-based or marine-based hydrocarbon resources provides no guarantee that the surrounding economy will be developed, diversified, and employ fully the local labour force.
- Scotian shelf oil and gas fields will be relatively small and difficult to make viable due to the fact that the resource is dispersed into numerous small accumulations as a result of a high degree of geologic faulting.
- government subsidies resulted in the wasteful spending of hundreds of millions of dollars with little benefit accruing to the working people and the public as a whole in Nova Scotia.
- Within eight months of the signing of the Nova Scotia Offshore agreement in l982, the federal government (and Energy Minister at

the time Jean Chretien) announced drilling programs on the Scotian Shelf totalling $1.6 billion, with more than $1 billion of this amount to be paid directly to the oil companies in the form of PIP grants.

- Large expenditures in the offshore in l983 (approximately $550 million spent) did increase that year's GDP by 3.4% but it did not generate a significant level of overall economic activity in the province.
- In l983, two-hundred Nova Scotia firms were said to have been directly or indirectly involved in the offshore oil business. However, fifty of those were located in Dartmouth's Burnside Industrial Park, most with small offices opened on "speculation that Nova Scotia's offshore would develop into a booming gas field."
- Only 10-15% of the total expenditures for offshore drilling are sourced in Nova Scotia.
- Major costs of offshore drilling are accounted for by the leasing of drilling rigs and supply boats, most of which are not constructed in Canada, let alone Nova Scotia.
- Nova Scotia's Minister of Development, Rollie Thornhill, complained in l983 that the oil companies "have not been totally co-operative with the provincial government's efforts to ensure that the province gains maximum benefits from offshore development."
- In l982 the provincial government predicted offshore exploration would create 8,000 jobs. In l984, the seven exploratory drilling rigs on the Scotian Shelf employed a maximum of 840 direct offshore jobs for Nova Scotians.
- Indirect jobs (determined by applying a multiplier of 2.25 used in the Scotian Shelf Gas Development Report) were estimated at 1,750. Therefore the total figure for provincial employment related to the offshore was roughly 2,500 jobs – less than 1% of the province's labour force at the time.
- Employment from the production stage of the Venture development will constitute about one-third the number of jobs at a Michelin Plant.

"*This [the offshore] is the only game in town, and we are out to milk it for everything it's worth."* -Minister Rollie Thornhill, l983

II: Hibernia

In Atlantic Canada, the name “Hibernia” resonates with victory. People use it as a reference point for future offshore finds. What could be better than “another Hibernia” – a new industry replete with fuel and, most of all, jobs?

A new costs and benefits analysis of the Hibernia project shows its benefits come with a heavy price tag for the federal and Newfoundland governments (Marshall 2001).[98] “Those governments spent a billion in grants and a billion in investment capital, on top of the billions in tax exemptions, interest-free loans, and loan guarantees,” said the report’s author, Canadian Centre for Policy Alternatives analyst Dale Marshall, in a

[98]Marshall, Dale. 2001. *Should BC lift the offshore oil moratorium?* Canadian Centre for Policy Alternatives. BC. The 15-page report is available on their website, www.policyalternatives.ca.

press release[99]. "Based on the royalties agreement struck with the Hibernia Management Development Corp., there is no guarantee that the governments will recuperate all of their money through royalties and tax revenues."

Marshall uses the Hibernia situation as a case-in-point against offshore development in British Columbia, where a long-standing moratorium on offshore oil and gas is poised to be lifted. Marshall is challenging conventional wisdom with this report. He argues that offshore oil is a sunset industry that makes little sense as economic development for coastal BC. People in towns such as Prince Rupert desperately need jobs, he says, but offshore isn't the answer. Instead, he points to the renewable energy sector, which dollar for dollar, creates 60 per cent more jobs than offshore oil and gas (Marshall 2001 [*Also, see Renewable Energy, Chapter 7*).

Jobs

The expensive exploration phase of offshore oil and gas creates "little opportunities for local involvement," writes Marshall, quoting a consultant's report prepared for the BC Ministry of Energy and Mines.[100]

At Hibernia, the exploration and construction phase of development created an average of 5.5 person-years of employment per million dollars invested (Marshall 2001). The construction phase of development creates the most jobs. Hibernia's $5.2 billion construction phase created about 5,000 jobs for a five-year period. "Somebody living in a depressed area of the country might be impressed with these employment totals. On the basis of total investment, however, employment in the Hibernia project has been dismal," he writes.

The Hibernia example is often held up as a shining light for creating local employment. The record looks great. The Hibernia Management Development Corporation (HMDC) agreed to hire 70 per cent of its workers locally. Roughly two-thirds of Hibernia's jobs went to Newfoundlanders. But there's a catch: the North American Free Trade Agreement. Many of the rules governing Hibernia – as laid out in the *Canada-Newfoundland Atlantic Accord Implementation Act* – are exempted from NAFTA.[101] That means that the Newfoundland government could require oil companies to hire a large number of locals, without facing penalties under NAFTA.

With respect to future projects, NAFTA significantly restricts the ability of governments to impose performance requirements – such as requiring a company to hire locally – on any investor except in exchange for a subsidy. - Dale Marshall, 2001

In other words, says Marshall, if governments want to ensure that offshore jobs go to locals, they "better be ready to pay oil companies for that

[99]Press release from Canadian Centre for Policy Alternatives, Dec. 4/2001, from www.policyalternatives.ca, accessed Dec. 11/2001.

[100]Jacques Whitford Environmental Ltd. 2001. "British Columbia Offshore Oil and Gas Technology Update." Prepared for the BC Ministry of Energy and Mines. Burnaby, BC. Oct.19/01.

[101]*North American Free Trade Agreement*, 1993, Schedule of Canada, Annex I, page I_C_25.

concession." He quotes a consultant's report that underlines the choices available to oil companies: "Companies can terminate their efforts for a variety of reasons including...a local jurisdiction being 'unreasonable' in its requirements for local preference, taxation, and/or environmental performance" (J. Whitford 2001).

Subsidies

Although Hibernia was supposed to be constructed and operated with no government money, it ended up being heavily subsidized. Most provincial subsidies came in the form of tax exemptions, which Marshall conservatively estimates add up to $190 million to date. In addition, the Newfoundland government provided grants, including $11 million to ensure local engineers were hired. The Newfoundland and federal government also chipped in $95 million to build the Bull Arm facility.

When oil prices fell and Hibernia floundered in1988, the federal government stepped in with a $1.04 billion grant and a loan guarantee of $1.66 billion. And when Gulf Canada Resources Ltd. withdrew its 25 per cent share in Hibernia in 1992, the federal government spent close to $1 billion to buy its own 8.5 per cent interest, while also guaranteeing $700 million in loans to an American company that bought into Hibernia (Marshall 2001).

"These subsidies highlight the vulnerability of a project so dependent on global commodity prices," writes Marshall. The federal government also gave an interest free loan for up to $300 million, to go toward the Hibernia consortium's interest payments if and when the price of oil dips below US$25/barrel, in 1987 dollars (Marshall 2001). At the time of the CCPA report – December/01 – the price of oil was below US$20/barrel, says Marshall, who says analysts predict the price of oil to stay in the US$20/barrel range for the next 15 years. He also lists government contributions that are not tallied, including tax credits on provincial corporate income tax; waiving the retail sales tax on the Whiffen Head transshipment terminal; and fuel tax exemptions (Marshall 2001).

Royalties

Royalties – a government's pay for permitting business to extract public resources from public areas – are dependent on the price of oil. Although the Hibernia consortium is supposed to pay the federal government 10 per cent of net profits, that percentage drops as the price of oil drops below US$30/barrel (Marshall 2001). With today's low prices, the required royalties are approximately 3.3 per cent of net profit (Marshall 2001).

Provincial royalties are similarly disappointing. A basic "statutory royalty" of a penny per barrel of oil should bring $7.7 million to the Newfoundland government over the life of the Hibernia project. But those royalties can be deducted by the oil companies when they calculate their second set of royalty payments, "contractual royalties." Contractual royalties are divided into two categories: basic royalties and net royalties. They are also contingent on the price of oil. Marshall conservatively estimates – ignoring things such as transportation

costs and discounts for low oil prices – that the basic royalty paid over the lifetime of Hibernia will total $1.5 billion. That's less than governments spent on Hibernia. And net royalties won't be paid unless the companies' profits reach a 15 % rate of return (Marshall 2001).

In theory, the public also gets its share from corporate income taxes. However, says Marshall, the Hibernia consortium can cut or eliminate its income tax costs by factoring in spending on other, unrelated business ventures. Lastly, he points to personal income taxes as a form of government revenue. All is not lost: The government can recoup some costs from Newfoundlanders employed by Hibernia.

Chapter 6 Consultation of Mi'kmaq

"My family and our people fished here for many generations and it supplied us with a constant supply of fish and food and to think that is going to be in jeopardy, you know, for my kids and their kids, it's a pretty scary thought. I am quite alarmed that a non-renewable resource is given more priority than the renewable resources that we have."
-Kerry Prosper (Livingston 2001)

6.1 History

Until the 18th century, Mi'kmaq occupied a territory called Mi'kma'ki – an area of more than 150,000 square kilometres, extending over five Canadian provinces. Mi'kma'ki stretched from the Gaspe Peninsula of Quebec, along northern New Brunswick, covered all of present day Prince Edward Island and Nova Scotia and included portions of Newfoundland. Today, Mi'kmaq occupy a tiny portion of this former territory.

These first people drew their entire sustenance from the natural bounty of the land. The forests, rivers, lakes, oceans, birds, animals, and fish provided food, clothing, shelter, and medicines. Their ancestors were completely dependent on the natural world for their existence. This balance in which Mi'kmaw societies had evolved and prospered was disrupted with the arrival of Europeans in the early sixteenth century. As happened throughout much of the world during that period, European trade, economics, culture, and spirituality overwhelmed Indigenous cultures. Over the next four hundred years, Mi'kmaw society and culture, under sustained assault by Europeans, was degraded and brought to the edge of extinction (Paul 2000). The largely independent and somewhat nomadic Mi'kmaq bands were relocated and were eventually settled on federal Reserves – generally small, resource-poor parcels of land, isolated from each other and from the rest of society. Without question, one goal of those charged with "the welfare of the Indians" was eventual assimilation into white society and a natural death of Mi'kmaq culture. In one form or another, this assault on Mi'kmaq has continued to this day.

The decline of Mi'kmaw society in Atlantic Canada coincided with the ongoing degradation of the natural ecosystems that sustained Mi'kmaq culture. The pre-European Mi'kmaq civilization was largely sustained by healthy, forested ecosystems that provided a steady flow of benefits – clean water, food, clothing, shelter, and medicines. The earth's bounty was harvested in such a way, and at such a rate, that future availability was not compromised. With the arrival of Europeans, natural resources began a long and steady process of decline.

In a letter to Queen Victoria, Chief Pausaugmigh Pemmeenauweet, on January 25, 1841
wrote:

"My people are poor. No hunting grounds – no beaver – no otter – no nothing. Indians poor – poor forever. No store – no chest – no clothes. All these woods once ours. Our fathers possessed them all. Now we cannot cut

a tree to warm our wigwam in winter unless the white man please…"

6.2 Making History

In Nova Scotia today there are 13 Mi'kmaq First Nations communities. Those communities that would be most affected by oil and gas development in Cape Breton would be: Membertou, Eskasoni, Wagmatcook, and Waycobah. In addition, Pictou Landing and Afton, while not on Cape Breton Island, would also feel the effects. All of these communities have high unemployment rates, not unlike the general Cape Breton population.

At the time of publication of this report, it was not clear whether Mi'kmaq in Cape Breton had been consulted by the oil and gas companies. Conflicting reports stated on the one hand that they had been, and on the other, they hadn't. In October, 2001, Alex Denny, the Grand Keptin of the Grand Council of the Mi'kmaq Nation spoke in Halifax on Treaty Day and had this to say about oil and gas:

"It would also be remiss of me not to mention our deep concerns as they relate to the exploration and exploitation of oil and gas in our waters. We the Mi'kmaq people have not been contacted or consulted in the unending issuance of leases and permits to the oil and gas companies. In particular, we are deeply distressed at the Canada-Nova Scotia Offshore Petroleum Board that refuses to live up to the rule of law. It's actions are infringing upon the constitutional rights of he Mi'kmaq people yet they refuse to have us involved…We wish to remind the governments and the offshore petroleum board that the oil and gas resources are ours too."

However, Chris Wickens, the senior Geophysicist at Hunt Oil Company of Canada Ltd. (HOCC) had a different story to tell: "We're in contact with [the Native people]. We have been for over a year now. They are quite supportive"(C. Wickens pers. comm. 2001)

Supportive?

"Not my neighbourhood, not my food, not in my little harbour. Not to my kids or their kids, you know. Take it somewhere else where we can't see it, where it won't hurt nothing or until you learn how to extract it without hurting something. And when you learn that, come back and talk to us but don't try to fool us because we can see it happening."
-Kerry Prosper (Livingston 2001)

6.3 Case Study: The MacKenzie Valley Pipeline

Thomas R. Berger was the Commissioner of the Mackenzie Valley Pipeline Inquiry from l974 to l977. It was to be the greatest construction project ever to be undertaken by private enterprise – a 3,860 kilometre long gas pipeline proposed by a consortium of 27 Canadian and American companies was to run from Prudhoe Bay, Alaska, across the Northern Yukon, then south from the Mackenzie River delta to mid-continent (Berger l988). At the time, the president of the pipeline consortium stated that hope for northern Natives lay in the jobs constructing and laying the pipeline. The

idea being proclaimed by industry and government alike was that "if subsistence economy is dying, then all the more reason to bring native people into the market economy" (Berger l988).

"What has happened in the north should make us less certain about accepting the preference of bureaucratic and economic power for large-scale, capital-intensive development. Bureaucracy and industry usually share the same priorities: their interests are interlocked, and they ususally lie far from the interests of native northerners."

All this was taking place prior to the settlement of any native land claims. Berger recommended that for environmental reasons, no pipeline should *ever* be built along the northern coastal plains. And although Berger did conclude that an environmentally sound pipeline could be built through the MacKenzie Valley, he recommended a ten-year moratorium to allow time to settle outstanding Native land claims. Now, twenty years later, the pipeline is still not built. But this may soon change. Land claims have since been settled and there are now many Native people who have decided they would be able to reap the benefits they would undoubtedly have been denied twenty years earlier.

Berger – the man who played such a crucial role in the last pipeline drama – was asked by a MacLean's reporter how he felt about the recent turn around. "The whole idea behind the inquiry was to protect the environment and ensure that, if there was major development, native people should be players. And they feel ready, I gather, to do that" (Bergman 2000).

Chapter 7 Renewable Energy – a Sustainable economic alternative

As shown in figure 4.3, direct spending on energy efficiency programs far exceeds spending on renewable energy. But as many advocates of renewable energy point out, investments in renewable energy create more jobs than equal investments in the fossil fuel sector.

Nova Scotia produces eight per cent of its electricity from renewable sources, including hydro (Government of Nova Scotia 2001). The province is currently looking to "find ways to encourage" the development and use of wind power, but says wind power is "not yet fully cost-competitive with traditional large scale electrical generation" (ibid).

Renewable energy is often more expensive than "traditional" non-renewable energy. This is partly because external factors, such as environmental damage, are not taken into consideration when pricing non-renewable energies such as oil or gas. The 2000 Report of the Commissioner of the Environment and Sustainable Development advocates a full-cost accounting analysis of the energy sector.

[A] strategic role exists for governments to help markets take into account all of the benefits and effects of producing and consuming energy. If it were possible to include the value of the externalities in the price of individual energy products, the cost of fuels that create more environmental damage would be higher.
– Report of the Commissioner of Environment and Sustainable Development, 2000

A 1998 study by the International Center for Technology Assessment put the "real" price of gas as high as US $15.14 per gallon (CTA 1998). The study calculated all the external costs involved in producing gasoline: tax subsidies and grants to the oil industry; environmental, social and health costs, such as inhaling smog; and hidden costs such as publicly-funded infrastructure. Depending on the definition of subsidies, the final price-tag for subsidies paid by consumers was as high as US $1.69 trillion yearly (ibid).

Canadian economist William Rees says the U.S. numbers translate well into a Canadian context, since Canadian and American oil subsidies are similar (Rees 2000). He puts the real price of gas in Canada at $2.00 to $5.40 per litre. The price climbs even higher by adding in the rising costs of climate change (ibid). "The invariable consequence of underpricing is overuse," claims Rees. "But there's another issue at hand. The world is running out of oil." For many fossil-fuel powered machines – including heavy farm machinery, diesel trains and jets – there are as yet no alternatives to burning fossil fuels (ibid). "It's no small irony that we need high-intensity fossil fuel to produce the machinery and infrastructure required for most forms of alternative energy," Rees writes. In a potentially unpopular move, Rees advocates higher fuel prices, both to signify the shortage to come, and to spur investment in alternative fuels.

Canadian energy use is rising, up four per cent in 2000 from the previous year (StatsCan 2001). Over half of Canadian energy produced in 2000 went to the U.S. (ibid).

Renewable energy and energy efficiency should be "aggressively pursued" as part of the federal government's job creation strategies, says a recent literature review commissioned by Environment Canada[102] (Marshall 2001). For every million dollars invested in conventional energy projects, such as Hibernia, roughly 7.3 jobs are created (Pembina Institute 2001). By comparison, the renewable energy sector creates 12.2 jobs for every million dollars invested (ibid).

The federal government – through its Renewable Energy Strategy – wants increased investments in renewable energy. And the renewable industry is steadily growing, with the market for renewable technology expected to rise from US$7 billion in 2001 to US$82 billion in 2010 (Marshall 2001). Even the petroleum industry touts renewable energy, with Royal Dutch Shell estimating that by 2050, half of the world's resources will come from renewable energy (Pembina Institute 2001). Shell is currently working with a group of corporations in Iceland to create the world's first hydrogen-powered economy (L. Brown 2001).

Yet developments in Canada seem slow to happen.

In 1999, Canadians generated just one per cent of their electricity from renewable resources (U.S. Dept. of Energy 2001).[103] By comparison, Denmark gets 15 per cent of its energy from wind power (Brown 2001). The renewable energy market has grown quickly in Denmark, where just five years ago, only 2.3 per cent of electricity came from renewable energy (Pembina Institute 2001). Canada's use of electricity from renewable energy has only marginally increased, up from 0.02 per cent in 1996 (ibid).

In 2000, the world used close to 28 billion barrels of oil costing $756 billion per year (Brown 2001). "How many wind turbines will it take to produce this much energy? How many solar rooftops? How many geothermal wells?" asks Lester Brown optimistically. "If the money spent on oil in one year were invested in wind turbines, the electricity generated would be enough to meet one fifth of the world's needs" (ibid). Brown points out that three of the U.S.'s most "wind-rich" states – North Dakota, Kansas and Texas – can create enough wind energy to meet the entire country's electricity needs (ibid).

[102] Campbell, Barbara, Larry Dufay and Rob Macintosh. 1997. "Comparative Analysis of Employment from Air Emission Reduction Measures." The Pembina Institute for Appropriate Development, prepared for Environment Canada-Global Air Issues Branch.

[103] Not including hydro power, which *is* renewable, but on a large scale, can be destructive and unsustainable.

Chapter 8 Oil and Gas Company Profiles

8.1 Hunt Oil Company of Canada Inc. (HOCC)

Hunt Oil was founded by Illinois born H.L Hunt and has been in business since l934, around the time of the discovery of vast amounts of crude in the fields of East Texas.
But since the l970s Texas oil and gas has been on the steady decline.[104] In l985 Fortune Magazine quoted Ray Hunt, the son of the late H.L Hunt and the current Chairman and CEO of Hunt Oil, as saying "We'll never go back to the good old days of the oil industry."

Since the early l980s Hunt Oil set its sights abroad and began exploration and oil extraction in the North Sea, Yemen, Peru, Argentina, Chile, Guyana, Niger and now Canada.

In 2000 the company purchased Newport Petroleum Corporation for US$500 million and formed a new privately-held entity called Hunt Oil Company of Canada Inc. (HOCC). In the summer of 2001 it also purchased Edmonton-based Chieftain International Inc., which had natural gas assets in the Gulf of Mexico, in which Hunt was interested. Hunt Oil currently has offices in Calgary but the company's headquarters remain in Dallas, Texas (Healing 2001).

According to the Hunt Oil Website, since its incorporation, HOCC has focussed on "the deeper portion of the Western Canadian Sedimentary Basin as well as in the frontier areas of Canada, including eastern Canada and the Northwest Territories." In the summer of l999 the Canada -Nova Scotia Offshore Petroleum Board (CNSOPB) granted HOCC two permits (# 2364, #2365) for oil and gas exploration on the eastern coast (Sydney Bight) of Cape Breton, Nova Scotia, covering nearly 1.5 million acres. HOCC was granted the permits based on "work expenditure bids" of $2,165,000 for each of the parcels (Wickens, C. pers. comm. 2001). Its partner in the ventures, TotalFinaElf holds a 25% interest in the parcels.

Hunt Oil and Public Accountability

Quite often, the promise of oil and gas can be a very controversial issue facing a community. When adequate public consultation does occur, questions are undoubtedly raised about what the real benefits will be for the local people – those who are ultimately most affected by the project. Community members often ask, "Why should I assume the

[104] "So dentists have returned to drilling teeth instead of wells, and auto workers-turned-roustabouts have gone back to Detroit. But Texas won't return to old notions of normal because the state's oil and gas are running out.Production has declined steadily since l972, when a record 1.3 billion barrels of oil and 9.6 trillion cubic feet of gas were removed from the ground. And the economics of the business has seriously deteriorated, as two facts make clear: the state produced a third less oil and gas in l984 than it had in l972, while drilling increased threefold." (O'Reilly l985)

risks unless I know for certain there will be good come out of it?" Others are stalwart in their view that there is no avoiding an oil and gas boom and that a community should simply try to get the most out of it. But when it comes to oil and gas exploration there is no predicting what the outcome might be.

Chris Wickens is the Senior Geophysicist for HOCC, based in Calgary. He says "predicting the benefits is all fairly speculative until something is discovered." Apart from employing the seismic company itself (a process that is open to bids) a few local jobs (between 1 and 3) would go to fisher observers on the seismic vessel itself, says Wickens. "We'll also need some people in boats nearby to ensure safety. The cable being towed behind the vessel is 6 km long so people have to stay clear of it." Overall, Wickens concedes that seismic isn't a big job creator. He says it's an "in and out thing." When it comes to exploratory drilling, Wickens would only say it would "potentially employ more than seismic. We would bring in a drilling rig. It's sitting there for potentially longer than a month."

In this uncertain climate, trust is crucial. Community members should feel confident that the oil and gas company will be open, transparent and accountable to the public. As noted earlier, Hunt Oil holds a 75% interest in the two parcels in the Sydney Bight area. Since it is difficult to know how they will carry themselves, should exploration proceed, we investigated some of their other oil and gas ventures abroad.

Peru

In December of 2000 the government of Peru awarded Hunt Oil and its partners, Pluspetrol and S.K Corporation,[105] the contract to develop a portion of what is considered one of the largest natural gas finds in South America: Camisea.[106] Two parallel pipelines will be built to carry gas and gas liquids from Camisea to the coastal area near Lima – delivering oil to Peru's industrial sector and large electrical users. What's left over will be exported. From the start, Oxfam America and Amazonwatch opposed the $2.7 billion natural gas project planned for the Peruvian Amazon. In a letter to the Vice President of Hunt Oil, Steve Suellentrop, Oxfam America wrote:

"As you are undoubtedly aware, the Camisea region is one of unparalleled biodiversity as well as of great environmental sensitivitiy and is inhabited by several vulnerable

[105] In the "upstream" or production part of the Camisea Project, Hunt Oil has a 40% interest, along with Argentinian firm Pluspetrol (40%) and SK Corporation (20%) from South Korea. Hunt Oil is also one of the "downstream" or transportation operators with 19.2% interest. The other partners are: Techint (30%), Pluspetrol (19.2%), SK Corporation (9.6%), Grana y Montero (12%) and Sonatrach (10%). Citigroup is the Financial Advisor for the project and Pluspetrol and Hunt Oil are the financiers. Information available at http://www.amazonwatch.org/megaprojects/camisea1001.html.

[106] When Shell conducted prelimary exploration in the region in the mid- l980s, the Nahua, an isolated group of Indigenous people, were exposed to whooping cough, small pox and influenza. According to Amazonwatch, an estimated 50% of the population died. Information available at http://www.amazonwatch.org/megaprojects/camisea1001.html

indigenous populations whose livelihoods depend on the ecosystem.

The biodiversity survey commissioned by Shell and recently published by the Smithsonian Institute found "extraordinarily high" biological diversity" and "virtually no evidence that human activities have had significant impacts" in the region, and identified the biological communities in the area as being "in nearly pristine condition. Oxfam's policy analyst, who authored the letter, Keith Slack, urged Hunt to begin a "comprehensive and appropriate" consultation process with the local indigenous communities as well as to prevent any negative impacts on the environment**.** Slack says Oxfam has never received a direct reply from Hunt, but has received correspondence from Pluspetrol.[107] "Communication with Hunt hasn't been particularly productive," he says. Currently, Oxfam is trying to put together an independent review of Pluspetrol's Environmental Impact Assessment. Slack says there have been many problems with the process so far. The public were given 15 days to respond to the Environmental Impact Assessment for the upstream portion of the Camisea project. Documents are not readily available to the local people and public hearings were held in two cities, far from the communities most affected by the project (K. Slack pers. comm. 2001; Amazonwatch).

Hunt Oil's Chris Wickens had this to say when queried about who at Hunt might be able to talk about Hunt's interests in Peru:

"No one is going to tell you anything about that. Hunt is privately owned – it does not disclose any of its information to anyone and it doesn't have to. We don't get told anything. I don't even know how much this company makes. It's not our business to get told. It's the way Hunt operates." (pers. comm. 2001)

Yemen

Oil and gas has proven lucrative for Hunt Oil in the small country that shares a border with Saudi Arabia on the Bab el Mandab straight, linking the Red Sea and the Gulf of Aden – one of the world's busiest shipping lanes. There are about five companies currently operating in Yemen. US-based Hunt Oil is one of the largest producers of both oil and reinjected natural gas in Yemen (Energy Information Adminstration 2001).

[107] In November l999 a rupture in a Pluspetrol oil pipeline in the Pucayacu ravine contaminated the Chambira River – important to the Urarina Indians. They suffered severe health problems as a result. Nearly one year later, in October, 2000, a Pluspetrol oil spill on the Maranon River contaminated Peru's largest protected area, the Pacaya Samiria Reserve. The area's 20,000 inhabitants suffered illnesses ranging from diarrhea to skin ailments. Food and water were contaminated. According to Amazonwatch, many of the medicines and foods supplied by Pluspetrol following the spill did not reach the affected communities.
"Those receiving company hand-outs had to sign a document of 'gratitude'."
http://www.amazonwatch.org/megaprojects/camisea1001.html

In l995, in the wake of a civil war, Yemen agreed to the conditions for lending from the International Monetary Fund and the World Bank. The imposed Structural Adjustment Program required Yemen to reform its banking system, privatize state-run industries, invest in major infrastructure and reduce or eliminate altogether subsidies for wheat, flour, gasoline, and electricity. In the last few years there have been a number of kidnappings in the country, many of them oil workers. [108] In addition to the numerous kidnappings there have been attacks on Hunt Oil's oil pipeline in the Marib region of eastern Yemen. One news source stated that the anti-oil violence was a result of poverty among the Yemeni tribesmen. "Yemeni tribesmen often kidnap foreigners to pressure the government into providing money or better services, such as new roads, for their impoverished areas…kidnappers usually treat the hostages as guests and release them unharmed" (KHOU T.V News 2001).

"*The kidnappings, as much as symptom of Yemen's hard times as a cause of them, will continue. The kidnappers almost always demand schools and hospitals for their deprived areas…Yemen's main oil pipeline has suffered more than 20 acts of sabotage." (The Economist, l999)*

[108] Sources: "Tribesmen blow up U.S-owned oil pipeline" Associated Press, December 2, 1998. "Blast damages Marib oil pipeline in Yemen" Reuters, November 22, l998. "U.S oil engineer kidnapped by Yemeni tribe" Reuters, February 17, 1997. "Oil Executive released in Yemen after nearly a month as captive" Associated Press, November 29, l997. "Texas Oil Company worker kidnapped in Yemen" KHOU T.V News, Houston, September 25, 2001.

Clearly, for one reason or another, the benefits of oil have not reached many of the tribespeople of Yemen.

8.2 TotalFinaElf

TotalFinaElf is the world's fourth-largest oil company with oil and gas deposits in more than 100 countries including Iran, Sudan, Burma, China, Colombia and Indonesia (McKay 2001). It also holds a 25% interest in the two parcels in the Sydney Bight area, with HOCC holding the remaining 75%.

Late in l999 one of its oil tankers, Erika, broke in two and sank, spilling 9,000 tonnes of industrial-grade oil that reached the beaches of Brittany by Christmas Day. Five-hundred kilometres of coastline were contaminated, 300,000 seabirds and other marine animals were killed, the tourism industry was ravaged and it cost US$400 million to clean up (McKay 2001; Reuters 2001a).

A French investigation into the spill resulted in two formal charges against the oil giant.[109] A report about the accident, released by judicial experts in France, were cited in the news as stating that Erika was in poor condition and that "TotalFinaElf had not properly carried out safety checks and that the tanker was carrying more than its 30,000-tonne maximum cargo at the time of the accident" (Reuters 2001a). According to the same news article, TotalFinaElf

[109] "Being an accomplice in the obviously deliberate violation of the rules of (marine) safety and prudence required by laws and regulations" and "failing to take the necessary measures to avoid the accident at sea that lead to the pollution. In its capacity as charterer, the company had de facto power and oversight in the ship's management and operation." (McKay 2001)

rejected the accusations, saying it was not warned the ship was unsafe and therefore the security lapse was not its fault. It also said maritime authorities, not the company, should have worked to limit the pollution (ibid).

On September 21, 2001, an explosion ripped through a petrochemicals factory just outside Toulouse, France and killed 29 people, injured thousands and flattened nearly 10,000 homes. The plant (AZF) was a subsidiary of TotalFinaElf. One environmental group, Friends of the Earth, had for years protested the proximity of the residential neighbourhoods and the industrial plants, including AZF and an explosives factory (Reuters 2001a).

In October, 2001 TotalFinaElf, along with the President of Congo Republic, Denis Sassou Nguesso, was named in a lawsuit filed by three Belgian residents, including a Congolese national. The complaint covers alleged war crimes, crimes against humanity, torture and arbitrary arrests and kidnappings in the Congo Republic in l998. TotalFinaElf, which had major production facilities in the country at the time, are being accused of "abetting ethnic cleansing." Reuters obtained a copy of the complaint and in it it states that the "logistic support" offered by TotalFinaElf in the "the complete or partial destruction of a population because of their ethnic origin" is "irrefutable and decisive" (Reuters 2001b).

When it comes to lawsuits of this kind, TotalFinaElf isn't alone.[110]

In a recent BBC news report [111] more questions were being raised regarding some of the alleged practices of TotalFinaElf in Burma. According to the report, "local villagers have been subjected to forced labour, rape and even murder by army units working for the oil companies to protect the pipelines."

[110] Talisman, a Canadian oil company, has recently been filed with a similar lawsuit. The Globe and Mail (Nguyen 2001) recently reported that the lawsuit revolves around allegations that revenue from the oil consortium in which Talisman owns a 25 % interest are both "funding and motivating the war effort of the radical Islamic government in the north against the Christians and Animists in the south" of Sudan. The class-action complaint reads: "Talisman has deliberately and intentionally facilitated, conspired in or aided and abetted in the use of armed forces in the brutal ethnic cleansing campaign against civilian population…for the purpose of enhancing its ability to explore and extract oil from areas of southern Sudan."

According to the same Globe and Mail article, the Talisman suit is just the latest in a string of actions recently brought against oil companies under the U.S Alien Tort Claims Act. The act, which allows non-US citizens to sue in the United States for alleged acts committed abroad, is being used in human rights-related lawsuits against Royal Dutch/Shell Group in Nigeria; Unocal Corp. in Burma; and most recently Exxon Mobil Group in Indonesia (Nguyen 2001).

[111] "EU Probes Burma pipeline abuses," BBC News. October 12, 2001.

8.3 Corridor Resources Ltd.

On the western shoreline of Cape Breton running from Port Hood to Cheticamp and twenty miles west into the Gulf of St. Lawrence, Corridor Resources has a permit (#2368) for 240,000 hectares (600,000 acres) of seabed. They bid just over $1 million for the permit in l999 and were successful.

Source of map: www.corridor.ns.ca

Corridor Resources is a "junior" oil and gas exploration company with interests in New Brunswick, Prince Edward Island, Quebec and the offshore Gulf of St. Lawrence. The publicly -traded, Canadian-owned company currently has no partners in the proposed exploratory work in "Parcel 1" in the southern Gulf of St. Lawrence (N. Miller pers. comm. 2001). The 6-year-old company is headquartered in Halifax and apart from a natural gas find in New Brunswick (McCully), which is planned to go into production within the next six months, Corridor Resources is mostly in the exploration business. "Right now its all shareholder's equity," says Miller. *"We've raised over $20 million on the public markets."*

"*Our philosophy is to work very closely with local communities to make sure they are involved and informed."*

PART

5 Recommendations

- A full-cost accounting analysis should be carried out for the proposed oil and gas development off Cape Breton. By definition, such an analysis is long-term. Therefore, it would have to consider not only seismic testing and exploratory drilling, but would have to address the true costs and benefits of all stages of petroleum activity: exploration, development, production and decommissioning. What might appear to be a generator of economic activity in the short-term may have such great social and ecological costs (invisible in our current accounting system) that in the long-term a net negative impact is produced.

- The Precautionary Principle, which flows directly from the underlying principle of sustainability, has been widely accepted provincially, nationally and internationally as the correct way to deal with uncertainty. When future impacts are unknown but *potentially* damaging and even irreversible, the precautionary principle should be used. This widely accepted dictum is enshrined in the Nova Scotia Environment Act and holds that scientific uncertainty must not be a cause for inaction when there is the potential for serious environmental damage.

- There are many gaps in our current knowledge in regards to the Natural Capital that exists in and adjacent to the parcel areas. It is known that these biologically rich and productive areas provide critical habitat for countless species of birds, marine mammals, fish, reptiles as well as some species that have been listed by COSEWIC as Endangered, Threatened or of Special Concern. The functions and services provided by intact and biologically diverse ecosystems must be weighed against the actual economic benefits of oil and gas development.

- Cumulative and sub-lethal effects from petroleum development should be further studied in order to determine the precise contribution of offshore oil and gas development to marine degradation.

- There is very little currently protecting Canada's marine ecosystems and its associated biodiversity. A moratorium should be placed on oil and gas exploration in the Southern Gulf of St. Lawrence and Sydney Bight areas until such time that Marine Protected Areas are established. At that point, any proposed petroleum exploration must be subject to a complete Environmental Assessment prior to the issuance of licences.

- In regards to the Southern Gulf of St. Lawrence, these words of warning should be seriously considered by the Commissioner: "It is likely that large-scale pollution in

ANY part of the Gulf would result in the eventual contamination of [the Magdalen Shallows] because of the semi-enclosed nature of the circulation pattern of the Gulf. On the basis of the incompatibility of oil pollution and living resources, minimizing the oil pollution risk would entail ***the banning of oil drilling, keeping the area free of trans-shipment terminals, refineries and petro-chemical plants, and minimizing tanker traffic***." (Loutfi l973)

- Any future Environmental Assessment regarding oil and gas development must address the impacts on species and ecosystems as a whole. Addressing Valued Ecosystem Components (VECs) only is not enough. They represent a very small fraction of potentially effected species whose ecological roles may be poorly understood, if known at all.

- Any future Assessements must also address full impacts on social and local economic situations, and acknowledge that the economy is intertwined with natural and social capital.

- The economic value of tourism and fishing to Cape Breton communities should be weighed against the economic value of inshore oil and gas development.

- Alternative energies such as wind power should be explored as a potential industry for Cape Breton and an alternative to hydrocarbon development. Job for job, alternative renewable energy creates more benefts than hydrocarbon development.

- The people living adjacent to a resource should have control over how – or even if – that resource is developed.

- Case studies of the socio-economic and environmental effects of inshore and offshore oil and gas production in other small coastal areas should be undertaken.

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